HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY

GRADUATION THESIS

Study research and create a saas-based search engine for e-commerce websites.

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ABSTRACT

In the era of industrialization and modernization, the purchase and sale of products Online shopping is becoming a new culture with consumers getting used to online shopping habits. In the development of e-commerce, Shopify platform has come a long way in dominating its market. The demand for using Shopify is growing especially high during the Covid-19 pandemic.

Shopify takes the lead in building a system of partners to jointly develop interfaces, applications, and support powerful commerce stores. E-commerce website provides advanced extension features to allow online transactions such as: multi-layer catalog, shopping cart, favorite page, price comparison, cross-selling, ordering, payment, marketing campaign, management Manage customers, manage collections, etc.

With practical needs from using e-commerce products of companies and businesses, I realized that some necessary features need to be added. of an e-commerce product and that product can also be taken to commerce to help the store owner use the product according to the store's needs. This is also the reason why I chose the topic: "Designing a search page application on Shopify e-commerce platform".

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LIST OF ABBREVIATIONS

Abbreviation	**Definition**
2FA	Two Factor Authentication
API	Application Programming Interface
App, app	Application, in the scope of this thesis means Android Application
CRUD	Create - Read - Update - Delete
HTML	HyperText Markup Language
NAVIS	International Center for R&D on Satellite Navigation Technology in South East Asia
ORM	Object Relational Mapping
OTP	One time password
RFID	Radio Frequency Identification
SSMS	SQL Server Management Studio
UI	User interface

CHAPTER 1. INTRODUCTION

1.1 Motivation

In the face of the rapid development of the field of Information Technology, accompanied by the strong development of services and utilities, especially online shopping services, are proving to be effective for people and gradually becoming more and more popular. become a basic human need.

Shopify e-commerce platform helps new users who do not need to be familiar with programming languages to use it. Shopify is a cloud computing platform so store owners don't need to buy a server to put it online. In addition, Shopify packs many features such as payment support, product management support, product sets, support for many different sales styles, and more. Especially, if the store owner sells online, Shopify supports the website's interface pages.

However, with the available interfaces, users cannot add editing or create filters on the search page. To be able to customize an interface to their liking, customers must learn about the Liquid language, as well as the languages to program apps for shopify, and find a way to rewrite the code to suit their interface. The problem requires creating an application so that the user can change the filters or the interface of their search page.

1.2 Objectives and scope of the graduation thesis

Currently, shopify does not have many installations for new registered users. One of the problems that caused the most trouble was shopify's basic search page. Although there are now a lot of applications or themes to change the interface or operating mechanism of the search page, a part of customers can't afford the price or don't know how to use it due to too many layers. and attributes. so this project will solve the problems mentioned above.

With this app, store owners can start editing and updating search page characteristics and SEO-related settings. then the buyer's website will be customized to the specifics of the buyer's With this app, store owners can start editing and updating search page characteristics and SEO-related settings. then the buyer's website will be customized to the specifics of the buyer's site.

In addition, the current solution is also giving some specific problems such as: many apps are too expensive, or the app uses many technologies that make users unable to access the application.

1.3 Research Objectives and Conceptual Framework

Based on the objectives of the presented topic, the "search page application - Shopify Ecommerce" system is developed on the web platform using the MVC model. With the use of this model, the separate components of the application will be clearly separated, which is convenient for the management, upgrade and maintenance of the application, and can help the application's processing flow to be clear.

Technologies that will be used in the system include:

1. Backend processing: laravel,postgresql,nginx.
2. Front-end processing: vue.js, HTML, CSS.

1.4 Contributions

This project has 3 main contributions:

1. Create a custom search page for customer.
2. Create a page that help merchant check sear term.
3. Help shopify customer have more choose for their search page.

1.5 Organization of Thesis

Based on the above challenges and issues, the following chapters will focus on problem solving and results, organized as follows:

Chapter 2 presents about surveying the types of lockers on the market to choose the most appropriate model, thereby building the system's operations and requirements.

From the identification of the necessary requirements in chapter 2, the technologies to be selected and used are summarized in the next chapter 3.

Chapter 4 presents project design options, briefly describes how the system works, design interfaces, databases, etc. The results achieved, test work, project implementation, etc also be briefly described

Chapter 5 will present the contribution, the process of making the thesis and the results achieved, including the difficulties encountered, how to overcome the problem.

Chapter 6 summarizes what has been learned through the project, what has been and has not been done, thereby giving conclusions and future development directions.

CHAPTER 2. LITERATURE REVIEW

2.1 E-commerce

Due to the field of information technology's quick development, together with the significant growth of services and utilities, particularly e commerce services, these services are proving to be beneficial to people and are steadily gaining popularity. become an essential human requirement.

2.1.1 What is E-commerce

E-commerce, often known as electronic commerce, is the exchange of goods and services as well as the sending of money and data through an electronic network, most commonly the internet. These business dealings can be either B2B (business-to-business), B2C (business-to-consumer), C2C (consumer-to-consumer), or C2B.

E-business and e-commerce are frequently used interchangeably. The transactional procedures that make up online retail shopping are also occasionally referred to as e-tail.

The widespread use of e-commerce sites like Amazon and eBay over the past 20 years has significantly boosted the growth of online retail. According to the U.S. Census Bureau, 5% of all retail purchases were made through e-commerce in 2011. With the onset of the COVID-19 pandemic in 2020, it had increased to more than 16% of retail sales.

2.1.2 Type of E-commerce

Business-to-business (B2B) e-commerce refers to the electronic exchange of products, services or information between businesses rather than between businesses and consumers. Examples include online directories and product and supply exchange websites that let businesses search for products, services and information and initiate transactions through e-procurement interfaces. A Forrester report published in 2018 predicted that by 2023, B2B e-commerce will reach $1.8 trillion dollars and account for 17% of U.S. B2B sales.

Business-to-consumer (B2C) is the retail part of e-commerce on the internet.It occurs when companies offer goods, services, or information to customers directly. The phrase gained popularity in the late 1990s dot-com boom, when online stores and sellers of goods were still a novelty.

Consumer-to-consumer (C2C) is a type of e-commerce in which consumers trade products, services and information with each other online.These transactions are often carried out through a third party that offers an internet platform for their execution.

Consumers offer their goods and services for sale to businesses online through a sort of e-commerce known as consumer-to-business (C2B). This goes against the conventional B2C business paradigm.

2.1.3 Advantages and disadvantages of e-commerce

E-commerce has many advantages, including round-the-clock accessibility, quick access, a wide range of products and services, ease of accessibility, and global reach.

1. Availability.E-commerce sites are accessible 24/7, allowing users to explore and shop at any time, with the exception of outages and scheduled maintenance. Brick-and-mortar stores frequently have set hours of operation and occasionally close completely.

2. Speed of access.While crowds can slow down customers in a physical store, e-commerce sites run rapidly due to considerations regarding computing and bandwidth on both the consumer device and the e-commerce site. The loading time of the product and shopping cart pages is under a second. An online purchase can be made in a few clicks and within five minutes.

3. Wide availability. "Earth's Biggest Bookstore" was Amazon's original tagline. It was able to make this assertion because it was an online store rather than a brick and mortar establishment that needed to stock every book on its shelves. With the use of e-commerce, businesses may provide a wide range of goods, which are subsequently sent from one or more warehouses when a customer makes a purchase. Customers will probably find what they're looking for more easily.

4. Easy accessibility. Customers looking in a real store could have trouble finding a specific item. Website users can instantly search for a product using the site's search feature and explore product category pages in real time.

5. International reach.Businesses with physical stores sell to clients who come into their locations. Businesses can sell to everyone who has access to the internet through e-commerce. E-commerce has the potential to increase a company's clientele.

6. Lower cost.Pure-play e-commerce companies do not have to pay rent, stock, or payroll costs associated with operating physical storefronts. However, they can be responsible for shipping and storage fees.

7. Personalization and product recommendations.A visitor's browsing, search,

and purchase history can be tracked on e-commerce websites. They can gather information about target markets and give customised product recommendations using this data. Examples are the "Frequently bought together" and "Customers who viewed this item also viewed" sections on Amazon product pages.

The alleged drawbacks of e-commerce include occasionally poor customer service, the inability for customers to physically touch or view a product before making a purchase, and the lengthy shipment wait times.

1. Limited customer service.Customers can ask a clerk, cashier, or store manager for assistance if they have a query or problem in a physical store. Customer service in an online store may be restricted: The website might only offer support during defined hours, and its online service options might be confusing to use or fail to address a particular query.
2. Limited product experience.Although looking at product photographs on a website can give you a good idea of what it is like, it's not the same as actually using the object, such as when you play a guitar, evaluate the picture quality of a television, or try on clothes. Online shoppers may wind up purchasing goods that fall short of their expectations and need to be returned. In some circumstances, the cost of shipping a returned item to the merchant is borne by the customer. The capacity of customers to inspect and test e-commerce goods is anticipated to improve with augmented reality technology.
3. Wait time.Customers purchase items in stores, pay for them, and then take them home. Customers who shop online must wait for the merchandise to be delivered to them. Shipping windows are getting smaller even while next-day and even same-day delivery are becoming more popular.
4. Security.Hackers with the right skills may make websites that look real and sell well-known products. Instead, the website either takes credit card information from customers or sends them bogus or copycat versions of such things. Even legitimate e-commerce websites have risks, particularly when customers save their credit card details with the merchant to facilitate future purchases. Threat actors might steal that credit card information if the retailer's website is breached. A retailer's reputation may be harmed as a result of a data breach.

2.1.4 E-commerce applications

Online marketing strategies are used by several retail e-commerce apps to entice users to the platform. Email, online shopping carts and catalogs, file transfer protocol, web services, and mobile applications are some of these.

Security is issue on which e-commerce enterprises are concentrating. When creating e-commerce systems and apps, developers and administrators should take into account consumer data privacy and security, data governance-related regulatory compliance demands, personally identifiable information privacy laws, and information protection measures. While some security protections are incorporated into an application's architecture, others need to be updated often to handle growing threats and discovered vulnerabilities.

2.2 Some typical successful e-commerce models in the world and Vietnam

1. Alibaba
2. Amazon
3. EBay
4. Walmart Marketplace
5. Newegg
6. Paypal
7. SlideShare
8. Lazada
9. Facebook

The following vendors provide e-commerce platform services for customers hosting their own online shop websites:

1. Magento
2. Shopify
3. Squarespace
4. BigCommerce
5. Ecwid
6. Salesforce Commerce Cloud (B2B and B2C options)
7. WooCommerce

2.3 SaaS and Shopify

2.3.1 SaaS Overview

Software as a Service is referred to as SaaS. It is simply a type of cloud computing. Software applications will be deployed on this cloud space. Instead of buying a license for the software, the user will buy a service that uses it.

In other words, a fixed piece of software will be made by the software seller. Afterward, this website platform's software will be maintained. Customers from all over the world can access that software online. The price is not paid all at once but rather on a regular basis (monthly, quarterly or annually).

The global adoption of cloud computing is making it one of the most cutting-edge 4.0 technology platforms. It predominates mostly in the technological sector. SaaS software services may have been used by you, but you didn't mind them. Google, Cloud, Dropbox, and Microsoft are a few examples.

2.3.2 Advantages of SaaS

1. Increase managerial and operating expenses.Businesses must make sure the infrastructure platforms are in place before installing traditional software. For instance, the computer must guarantee the setup, or the expenses of routine upkeep and upgrades. Alternatively, the entire computer must be reinstalled if it is broken or needs to be replaced. Businesses will maximize these costs with SaaS. Quick turnaround, affordable conversion, and excellent conversion possibility everywhere and anytime.

2. Constantly updated program with the newest features.Businesses don't require a maintenance team or a technical team on call when using internet-based software. This component will be the supplier's responsibility. Businesses will profit from the software's frequent updates and new feature additions.In contrast to customary installation programs. Install the updated version and pay an extra license price if you want to upgrade.

3. when there is internet, simple to use.SaaS applications are used with unique accounts for each user. You can utilize it somewhere except in the company, then. You can sign in and access it from anywhere, possibly with just a phone, and it has limitless functionality. This is a significant benefit of this program. It aids firms in addressing various operational requirements.

4. Integration with external applications capability.Software with traditional copyrights is frequently isolated and unconnected to external programs. For a business to manage and run efficiently, various links are required. Customer service and marketing, for instance, will get user feedback. However, the product division also requires this information to plan enhancements or develop fresh concepts for the product. The best option for corporate operations will be to integrate software so that both departments may view client feedback rather than having to transmit information back and forth.

5. Can expand without compromising current infrastructure.You can fully scale your SaaS cloud data as your business expands. can increase the number of existing accounts by more than n times without compromising the infrastructure or business data. This is a tremendous and useful advantage for growing enterprises.

2.3.3 Shopify overview

Shopify is a SaaS (Software as a Service) e-commerce system that enables you to build an online sales website with all of the capabilities of a shopping cart and checkout, order processing, omnichannel selling, and marketing automation.

2.3.4 Advantages and disadvantages of Shopify

Shopify is a modern and cutting-edge e-commerce platform with a number of distinguishing benefits over rivals, including:

1. If you have questions about using Shopify and the supporter hasn't gotten back to you right away, you may join their Shopify Vietnam community and post to discuss. Shopify also includes video tutorials on using Shopify categorized by level from basic to advanced.
2. There are numerous exquisite and expert website interfaces for sales.
3. Low cost.
4. Security updates that are perpetually made.
5. The UI is user-friendly, basic, and especially suitable for beginners.
6. Have dropshiping.

Along with the aforementioned benefits, Shopify sales are subject to a few restrictions. What are Shopify's drawbacks then?

1. Limited capabilities for major businesses
2. does not yet support domestic cards for Vietnam.

2.4 Technology employed and theoretical foundation

2.4.1 PHP language

A server-side programming language called PHP is used to create either static or dynamic webpages or online apps. PHP, which formerly stood for Personal Home Pages, is now known as Hypertext Pre-processor. Only servers with PHP installed can interpret PHP scripts. Only a web browser is needed on the client machines to view the PHP scripts. A PHP file has the ".php" suffix and contains PHP tags.

2.4.2 Advantage of PHP language

Despite having access to a variety of scripting languages, including CGI, ASP, JSP, and Perl, the majority of web developers favor PHP. This programming language is at the forefront of website creation for a number of reasons.

1. Simple and Easy to Learn. One of the simplest programming languages is PHP. PHP is less labor-intensive than other web languages in that it doesn't call for extensive manual study. The syntax in PHP is clear and orderly. Even command functions are simple to comprehend because they explicitly state to the developer what action is taken. As a result, the creation and optimization of the application is relatively simple for web developers.

2. Exceptionally Flexible. Whether a project is in progress or has been finished, PHP is incredibly adaptable. A scripting language's flexibility is essential since functionality might change at any time while a project is ongoing. The nicest thing about PHP is that it allows for changes to be made even after the project has begun, which helps to save time.

3. Easy compatibility and integration. With the vast majority of OS systems, PHP is compatible. It may easily be used with UNIX, Solaris, and Linux, among other platforms. Existing software doesn't need to be developed from scratch because it can easily be integrated with other technologies, like Java. This reduces waste and costs.

4. Performance Efficiency.PHP has the potential to be an effective language, depending on how the web developer programs. It may be used to create a huge number of apps and is scalable when used to write codes. It is the preferred programming language for websites with numerous web pages.

5. Cost-Efficient.PHP is totally free because it is an open-source web language. Buying pricey licenses or software doesn't cost anything. It functions well with a variety of databases, including MySQL, Apache, and PostgreSQL. Using PHP to create a website is inexpensive.

6. Increases Control for Web Developer.PHP offers more control to the website developer than other programming languages. In contrast to other programming languages, PHP is not slowed down by lengthy, intricate scripts. The code only has to be a few lines long. Additionally, PHP permits tags, thus website developers can add and/or mix HTML elements to create incredibly dynamic content.

2.4.3 Laravel Overview

Taylor Otwell developed the free, open-source Laravel PHP Online Framework, which is built on the Symfony PHP Framework and designed for the creation of web applications with an MVC pattern architecture. The use of the module packaging system, package management (Composer), support for numerous relational database management systems (MySQL, MariaDB, SQLite, PostgreSQL,...), and application deployment and maintenance are only a few of Laravel's capabilities.

2.4.4 Advantage of Laravel

Following are 10 benefits of Laravel over competing frameworks.

1. The most recent PHP features
2. The MVC design pattern (Model - View - Controller)
3. Outstanding Authentication and Authorization System
4. Possesses a thorough and understandable documentation system
5. Massive community of supporters
6. Command line management tool integrated with artisan tool
7. To control PHP packages, use composer.
8. Managing Javascript packages and themes with npm
9. Supports Query Builder, Eloquent ORM, and Template Engine (Blade)
10. Support for flexible routing

2.4.5 vuejs language

A progressive JavaScript framework called Vue.js is used to create SPAs and UIs (User Interfaces) (Single-page Applications). The steep learning curve of this framework is well-known. With just an understanding of HTML, CSS, and JavaScript, we can start developing web applications using Vue.js because it is such an approachable and simple to learn toolkit. This framework's quick learning curve could be considered its trademark. It is a flexible framework that may be used to create large-scale web apps or as a library.

2.5 Usecase diagram

2.5.1 General use case diagram

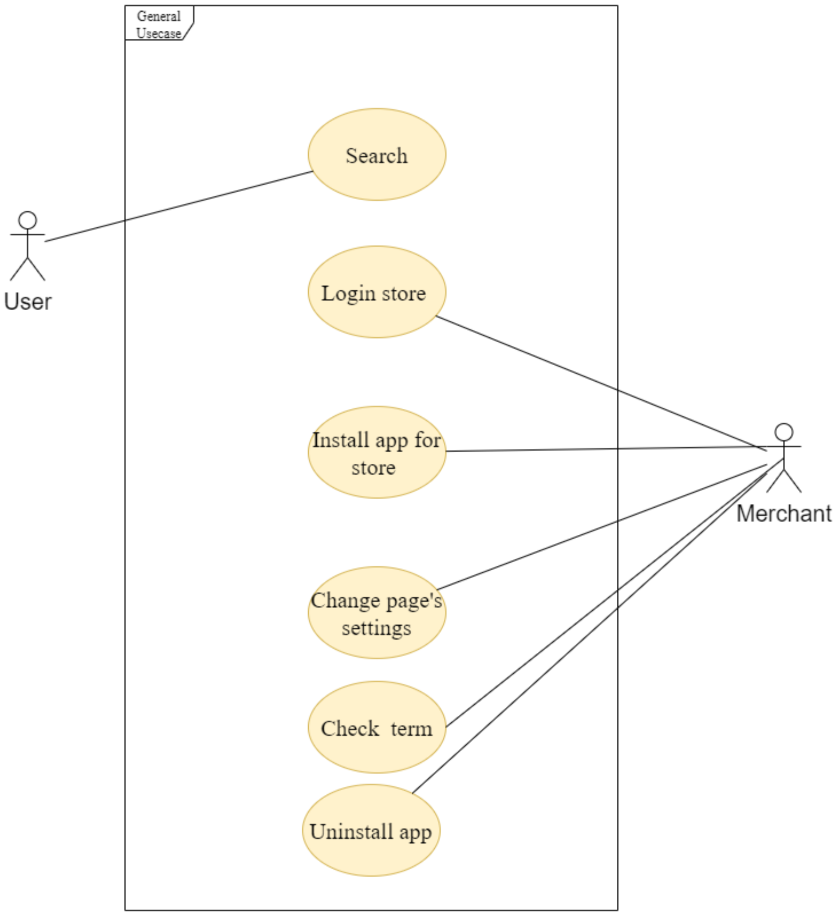


Figure 2.1: Use case diagram for "General use case diagram"

2.5.2 Detailed use case diagram for "Install and Uninstall app"

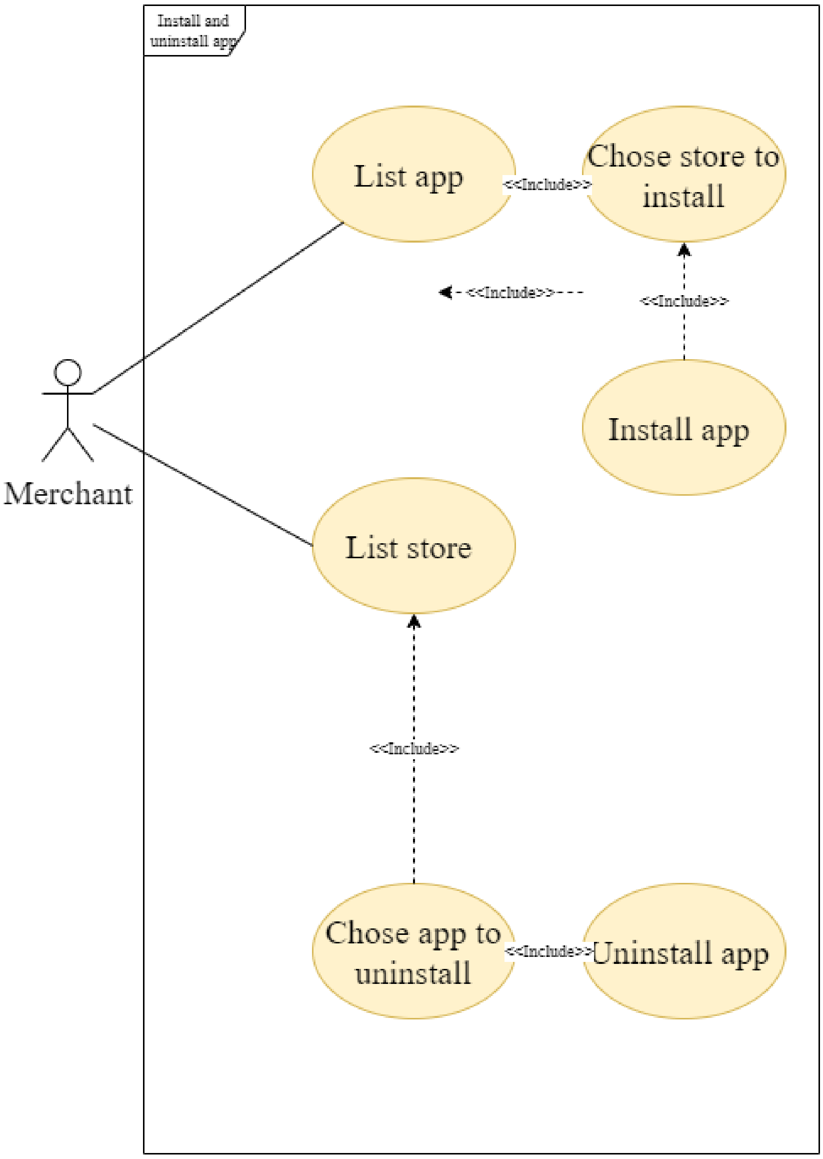


Figure 2.2: Use case diagram for "Install and Uninstall app"

The use case "Install and Uninstall app" is decomposed into smaller use case in Figure 2.2. Merchant can (i) view and search app, (ii) chose store to install, (iii) install, (iv) Uninstall .

2.5.3 Detailed use case diagram for "Search setting"

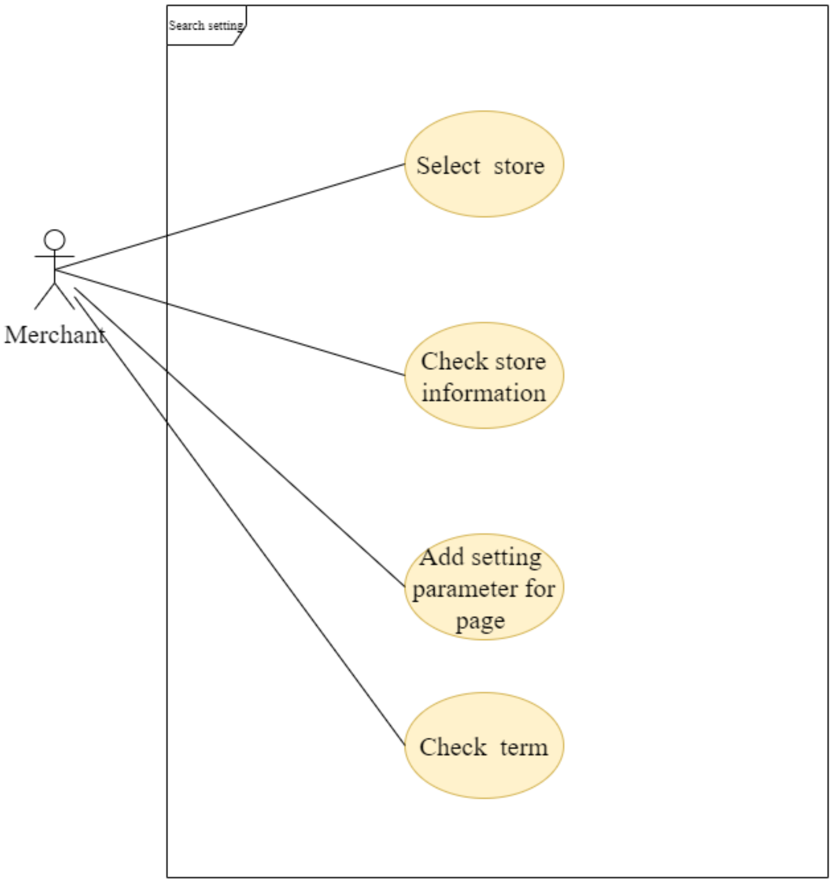


Figure 2.3: Use case diagram for "Search setting"

The use case "Search setting" is decomposed into smaller use case in Figure 2.3. Merchant can (i) select store, (ii) check store information, (iii) add setting parameter, (iv) check term .

2.5.4 Detailed use case diagram for "Search"

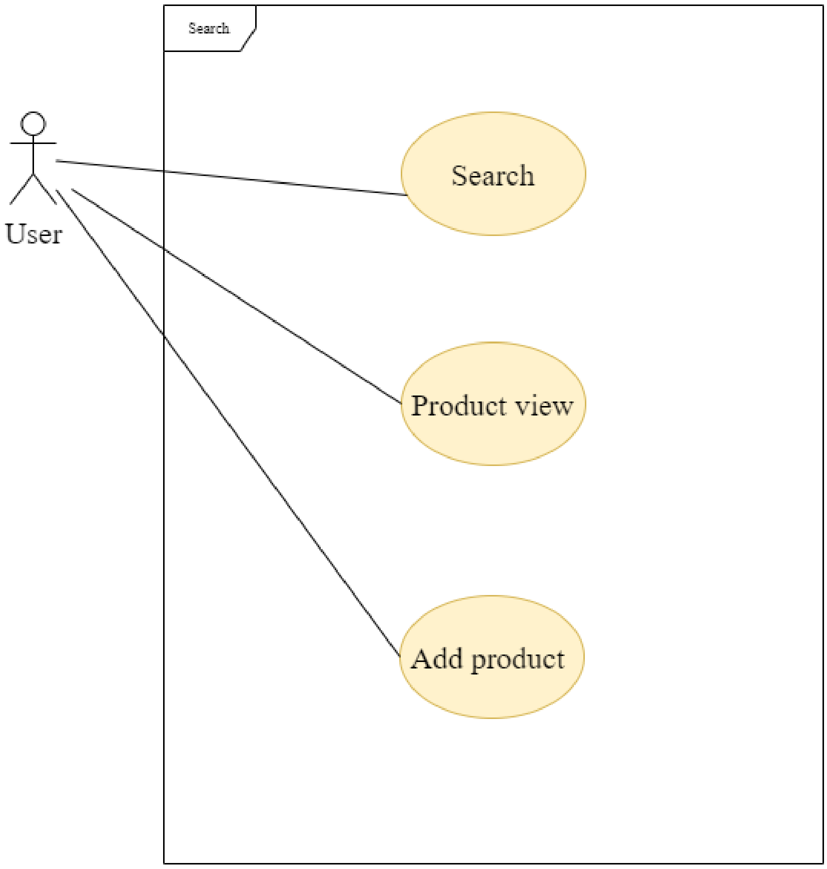


Figure 2.4: Use case diagram for "Search"

The use case "Search" is decomposed into smaller use case in Figure 2.4. Merchant can (i) search, (ii) check Product view, (iii) add product.

2.5.5 Business process

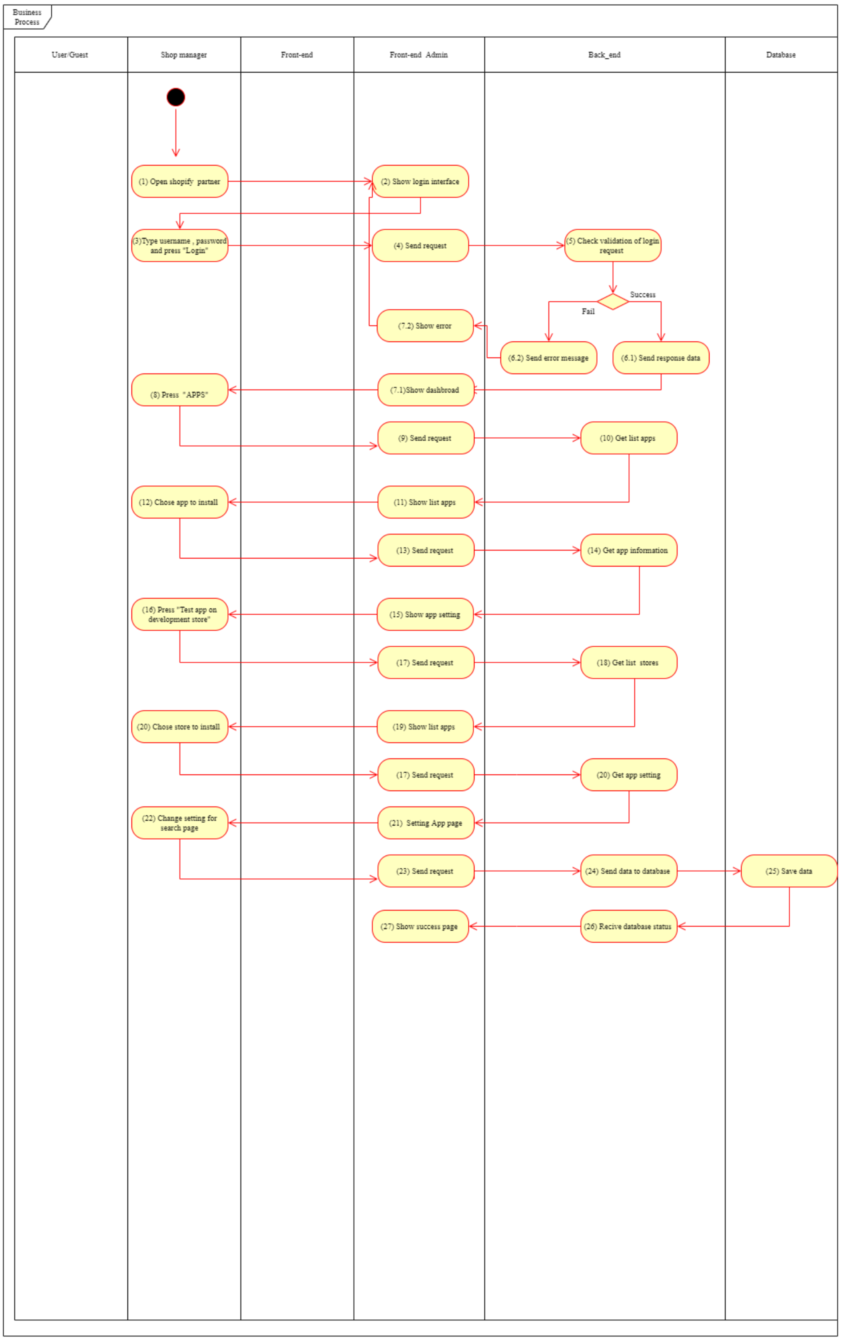


Figure 2.5: Business process

2.6 Non-functional requirements

Perfection of the interface. The interface needs to be complete, easy to use, fully functional. The management web interface as well as the android app do not need to be too picky, but still ensure aesthetics high performance. Also need to support different screens and devices with different configurations.

User-friendly. The application should limit errors as much as possible, in order to create a good experience for users.

High availability. Built-in features need to be practical, and actually solve certain problems. Avoid building unnecessary features, burdening the system without solving any problems.

Optimal algorithm. The system will later need to be maintained and upgraded to complete and add new features, so the code needs to be organized scientifically, avoiding confusing for the maintainers.

CHAPTER 3. METHODOLOGY

3.1 Front-end technologies

3.1.1 Vuejs

A versatile framework for creating user interfaces is called vue.js (original English: progressive). Vue was created from the bottom up to support and promote step-by-step application development, in contrast to monolithic frameworks. Users simply need to use the core library of Vue when creating the view layer; it is simple to learn and easy to incorporate into other projects or libraries. At the same time, Vue also readily satisfies the requirements of constructing single-page applications (SPA - Single-Page Applications) with significantly higher complexity when combined with contemporary approaches like SFC (single file components) and support libraries.

A JavaScript object called Virtual DOM in Vue represents the Document Object Model (DOM). Instead of directly updating the DOM, the application updates the Virtual DOM.Before talking about virtual DOM we need to understand DOM. For traditional web models, the interaction and interface processing mainly use pure JavaScript. These interactions will be performed on the DOM[1], accessing and manipulating structured HTML or XML documents. Figure 3.1 will displays the structure of HTML DOM.

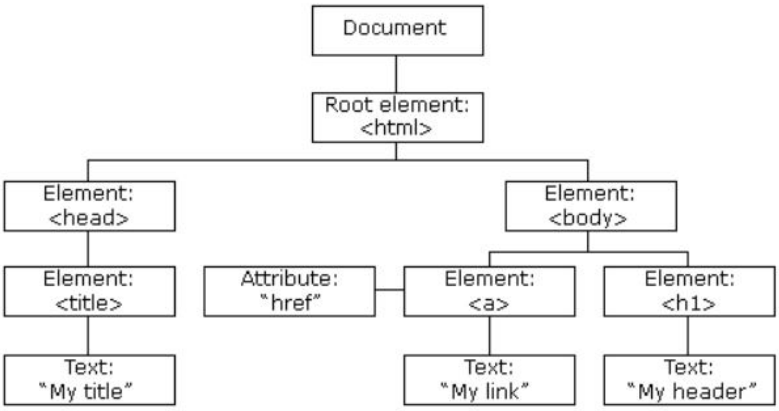


Figure 3.1: HTML DOM structure

With Vue 2.0, it all works in the Virtual DOM. Even the HTML that we write in the Vue Component's template will be compiled into the Virtual DOM when the component is rendered. In fact, Vue has an API compiler that converts HTML code into Virtual DOM automatically.As a result, it reduces the real DOM's high

[1] Document - Object - Model, defined by the World Wide Web Consortium - W3C

computational updating costs. The timing at which the Virtual DOM is rendered can be managed using Virtual DOM. Until you specify otherwise, virtual DOM will just keep the data in its current state without re-rendering. By reducing the amount of times the DOM needs to be updated, virtual DOM also gives you the option of improving the performance of your online applications.Figure 3.2 displays the flow in Vuejs.

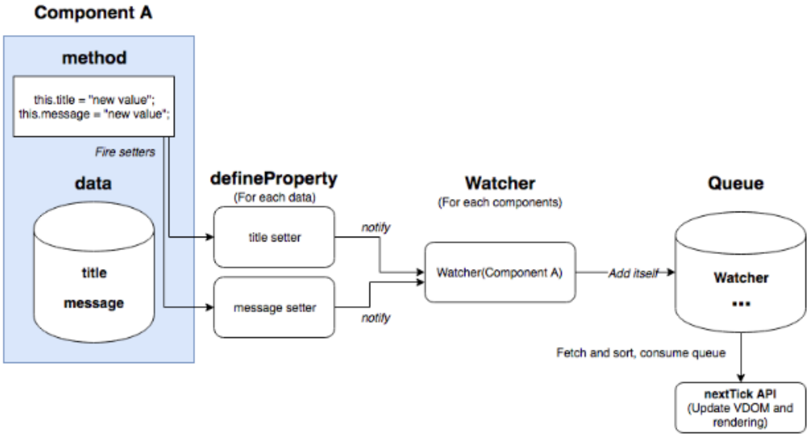


Figure 3.2: Virtual DOM structure

3.1.2 TypeScript

Microsoft created TypeScript, an open source scripting language that builds on JavaScript's basis and provides the capacity to work with static data types.

Applications that run on both the client-side (Angular2) and server-side can be created using TypeScript (NodeJS). TypeScript makes use of all the ECMAScript 2015 (ES6) features, including classes and modules. Prior to the creation of TypeScript, Google also created CoffeScript and Dart, libraries that supported the aforementioned ideas but made use of a whole different syntax. Thus, despite its later birth, TypeScript continues to get favorable reviews from programmers.

3.2 Back-end technologies

3.2.1 Laravel

Laravel is a free and open source PHP framework, built to support the development of software and applications, following the MVC[2] architecture. MVC is a computer's user interface creation template for its software architecture. The MVC system, which separates the user interface from the business concepts, is composed of three interconnected pieces. These are the three components:

1. Controller: Takes responsibility for receiving instruction requests from users

[2] Model-View-Controller, defined by the World Wide Web Consortium - W3C

and calling the correct methods to handle them.

2. Model: A component that contains all business logic, processing methods, database access, data describing objects such as classes, processing functions, etc.

3. View: Guaranteed to display information, interact with the user, where all GUI objects such as text boxes, images, etc.

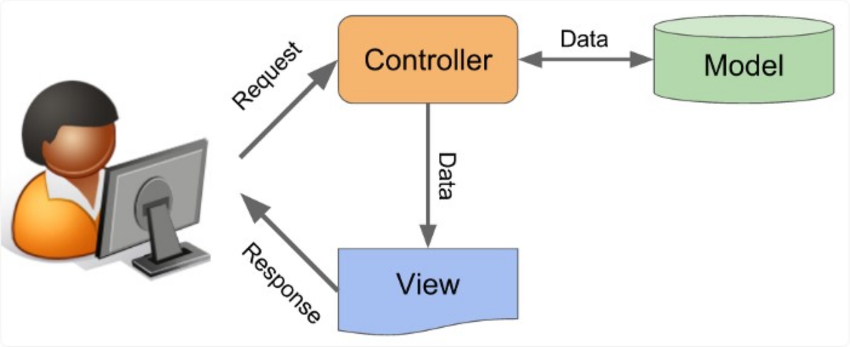


Figure 3.3: MVC structure

As a substitute for CodeIgniter, Taylor Otwell developed the initial iteration of Laravel in June 2011. Developers are helped by a variety of new features that are more effective and simple to use with this framework. Laravel has been updated to version 5.8 with several new features up to this point.

Advantage of laravel:

1. It's quick and simple.Since Laravel is the most popular PHP framework, most web developers are already familiar with it. There's also a wide selection of built-in templates, which makes development simpler and easier for developers. In light of this, a skilled Laravel developer might create a five- or six-page website in a day or two. Rapid development translates into cheaper expenses and faster outcomes for the company.

2. Security is key.The majority of organizations' top concern is security. Most websites may easily be configured with Laravel's strong security capabilities to improve security and defend against hackers and cybercriminals. Technically speaking, Laravel never stores any passwords in the database since it employs the Bcrypt hashing method. When compared to other PHP frameworks, Laravel also includes excellent user authentication and simple-to-create limited access capabilities. This safeguards the data of both you and your clients.

3. Better website performance.Laravel offers caching for your website out of the box, which is wonderful for accelerating the pace of your site, unlike many

other frameworks available. Other performance optimization strategies, such memory utilization reduction and database indexing, are made simple to apply by Laravel to further improve the efficiency of your website. If site speed and SEO friendliness are part of your needs, this makes Laravel an ideal alternative for your company.

4. Great for Traffic-Handling.The amount of visitors to your website will increase as your firm expands. Laravel-built websites may process requests significantly more quickly than those made using other frameworks. Because Laravel employs a special message queue structure, you may postpone doing some website operations, like sending emails, until later. Your website will be able to complete jobs more quickly if you have control over time-consuming processes. In addition to keeping your website's server in good shape, this can ultimately cut your hosting fees.
5. Really Flexible.Laravel offers the ability to create both a straightforward and expert B2B website and a full-featured eCommerce website. It has the capacity to design and support a number of complex features for your site, such password reset and encryption, because of the comprehensive pre-installed authorization libraries it contains. There are also a ton of third-party packages that you can utilize to provide your website a variety of features and functionality, including Socialite, which lets people to sign in to your site using their social network profiles if you decide to incorporate that feature.
6. Easy third-party integrations.Almost all websites require some kind of integration with a third-party program. This might be a tool your business utilizes for marketing or a payment system like Stripe or Paypal. Whatever the integration, Laravel's straightforward APIs for integration make connecting third-party programs simple. So Laravel is a good candidate whether your website has a payment system in place or an automated tool to handle your marketing.
7. Simple Website Maintenance.In general, Laravel-built websites are simple to update over time. So, let's say you want to add some new features to your site (which was already constructed using Laravel) after a few years. A new developer may easily continue where your previous developers left the site. It is incredibly simple to maintain a Laravel site over time because of its unique characteristics, such as clean code, MVC design (which separates functionality and presentation), and OOP concepts.
8. The cost of a Laravel Site.Laravel is an open-source framework in contrast to some other ones out there. This indicates that you can use it without paying

a dime for any project you want. Of course, there will be a fee for hiring a skilled Laravel developer to create your website (especially if you know very little about coding). A Laravel project might be more cost-effective in the long term since development expenses are further decreased and the time to construct and maintain is less than with certain competing frameworks.

3.2.2 API

A collection of specifications and protocols known as an API[3] are used to create and integrate application software. It's also referred to as a contract between a supplier of information and a user of that information, outlining the content that the consumer (the call) and the producer (the producer) are obligated to deliver (the response). For instance, the API architecture for a weather service would need the user to provide their zip code and the producer to respond with two parts: the high temperature and the low temperature.

APIs let your product or service communicate with other products and services without having to know how they're implemented.For making app development simpler, time and money may be saved. APIs provide you freedom, make design, administration, and usage simpler, and open up options for creativity when you're creating new tools and products—or managing ones that already exist.

With documentation that serves as a representation of a contract between parties, APIs are frequently compared to contracts: This is how party 2's program will react if party 1 submits a structured remote request.

APIs facilitate communication between business and IT teams by making it easier for developers to incorporate new application components into an existing architecture. In reaction to constantly evolving digital markets where new rivals might completely transform an industry with a new app, business demands frequently change swiftly. Supporting the quick development and deployment of innovative services is crucial for remaining competitive. A recognizable method of accelerating development speed is cloud-native application development, which depends on linking a microservices application architecture through APIs.

Cloud-native app development makes it easier to link your own infrastructure, but APIs also let you share your data with clients and other outside users. Because they may streamline and broaden how you engage with your partners and perhaps monetize your data, public APIs have special business value (the Google Maps API is a popular example).Figure 3.4 displays how the API functions.

[3] API-Application Programming Interface , defined by the World Wide Web Consortium - W3C

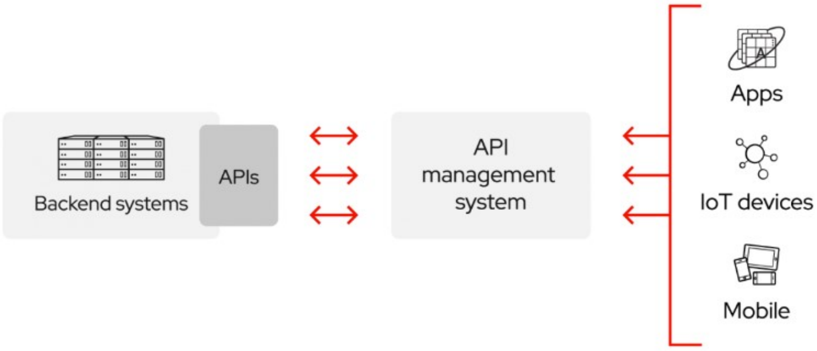


Figure 3.4: how the API functions

a, Rest API

An application programming interface (API) that adheres to the REST architectural standards and limitations used in client-server communication is known as a REST API (also known as a RESTful API). The acronym REST stands for REpresentational State Transfer, and Roy Fielding, a computer scientist, developed it.

A RESTful API transmits a representation of the resource's state to the requester or endpoint when a client request is made through it. One of various forms, including JSON (Javascript Object Notation), HTML, XLT, Python, PHP, or plain text, is used to send this information or representation through HTTP. Despite its name, JSON is the most widely used file format because it can be read by both people and machines and is language-independent.

Additionally, the HTTP methods of a RESTful API HTTP request since they contain data about the request's metadata, authorisation, unified resource identifier (URI), caching, cookies, and more. There are headers for requests and responses, and each one contains information about the HTTP connection and a status code.Instead of having to use one URL to process some user information, Rest will make HTTP requests like: GET, POST, DELETE,PUT to with any URL to be used. Figure 3.5 below shows how to divide the UI into components in React.

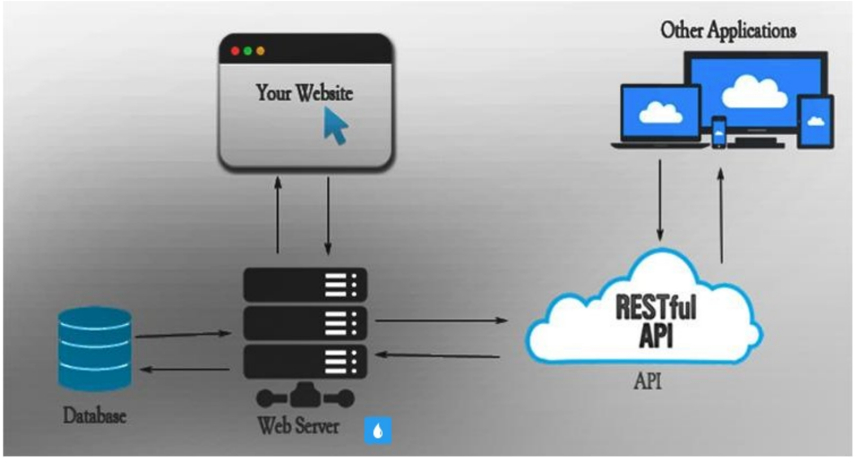


Figure 3.5: Restful API

3.2.3 PostgreSQL

The Faculty of Computing at the University of California in the United States created PostgreSQL, an object-relational database management system, based on Postgres version 4.2. Many later commercial data management system ideas were inspired by this application.

The operating system was initially intended to function on Unix-like systems. PostgreSQL was then modified to be adaptable and run on other systems, including Windows, Mac OS X, and Solaris, with many exceptional capabilities and characteristics.

PostgreSQL is free and open source, built according to the SQL99 standard. Users are free to use, edit and distribute PostgreSQL in various ways.

Figure 3.6: PostgreSQL

PostgreSQL provides users with many modern features, high stability, and great speed, which is why PostgreSQL became popular.the main uses of PostgreSQL:

1. Data type: primitives (integers, booleans, numbers, strings); structure (UUID, Range, Array, Date/time); Geometry; Custom; Document.

2. Data integrity: Word type constraints, Primary Keys, Foreign Keys, UNIQUE, NOT NULL, Recommendation Locks/ Advisory Locks, Function Locks/ Explicit Locks, etc.
3. Performance, convergence: multiple instances concurrency control (MVCC), table partitioning, parallel read queries, advanced cataloging, scheduling, complicated access optimizer, multi-column statistics, index-only scanning, transaction-transaction test format, and disaster recovery Replication, Score-ahead Logging (WAL), and Restore Score - Time, Table.
4. Security function: Security, authentication (SCRAM-SHA-256, SSPI, LDAP, GSSAPI, Certificate and others), strong access control system, column-row level security.
5. Scalability: stored methods, procedural languages (PL/PGSQL, Python, Perl, and many more), PostGIS, other threading or database connectivity with standard SQL interfaces, and many other extended features.
6. Text search: Full text search, system of international character sets (via ICU collations).
7. More features: Ability to manage the number of users working at the same time, suitable for production environments that manage multiple terabytes and petabytes.

CHAPTER 4. THEORETICAL ANALYSIS

4.1 Architecture design

4.1.1 Software architecture selection

The project uses the Client - Server architecture model, combined with interceptors to intercept and check the request before sending it to the server for processing to develop the project.

On the Client side, the view will be broken down into components, allowing for easy reuse and maintainability.

On the Server side, the code will be organized into controller, model and service, using Laravel Framework Core. The controller is responsible for receiving and processing data, while the management model handles the data. Service acts as an interceptor, intercepting and examining the request before confirming it is a valid request and submitting it to the controller for further processing.

The shop manager's flow of operations follows the following diagram:

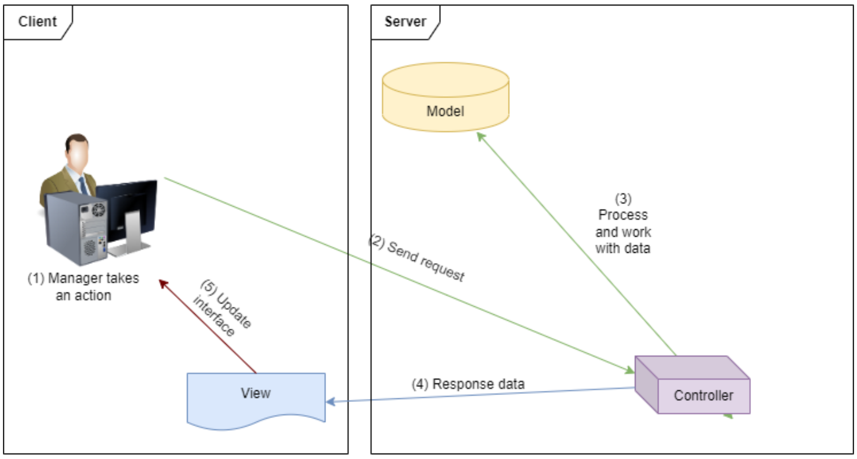


Figure 4.1: Shop Manager activity flow

The User's flow of operations follows the following diagram:

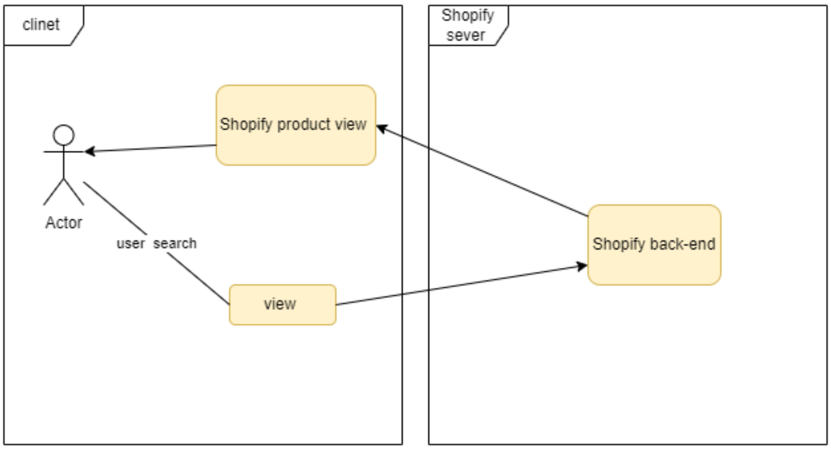


Figure 4.2: User activity flow

a, Model

Model contains data and calculations that handle the logic that the software is aiming for (business logic).Eloquent, an object-relational mapper (ORM) that makes working with your database fun, is a component of Laravel. Each database table in Eloquent has a matching "Model" that is used to communicate with the table. Eloquent models allow you to insert, edit, and remove records from the database table in addition to fetching them.

Model is created with the following classes:

Class name	Purpose
Auth	Storage roles of managers
User	Storage details of User
Search	Storage details of Search parameter
Tenm	Storage details about Search record

Table 4.1: List of models"

b, Controller

Controller is the place to receive requests and then process them and call models to get, create, update, or delete data. Finally, it will return the result to the client, which is the status code, message and response data. These operations are called API.

The following tables display list of API and intended use.

API for back-end:

Route	Function	Purpose
getConfig	GetAllConfig()	Get all config
postToken	PostToken()	post new token
gethge	getHGE()	Get data from hasura
putconfig	PutConfig()	Update config data
postlog	PostLog()	Post new log

Table 4.2: Back-end API

c, View

In this part, the application will have 2 main interfaces:

1. User interface. Interface that need to be built include:
   (a) **User's home page:** Main page of the shop.
   (b) **Search app for user page:**the page design from vuejs and typescript that allow merchent change the element.
2. Merchant interface.
   (a) **Login from URL:** Allow merchant use shop domain to login.
   (b) **Login from shopify:**Login in shopify.
   (c) **Setting page:** Allow merchent change variable for search page.
   (d) **Terms page:** Show all search terms that user have been use.

In the interface, there will be 2 main users, merchant and user. Here the merchant will be the one to decide what the user will see in the search page.

4.1.2 Overall design

a, Package diagram for server

The figure below will display the package diagram for server.

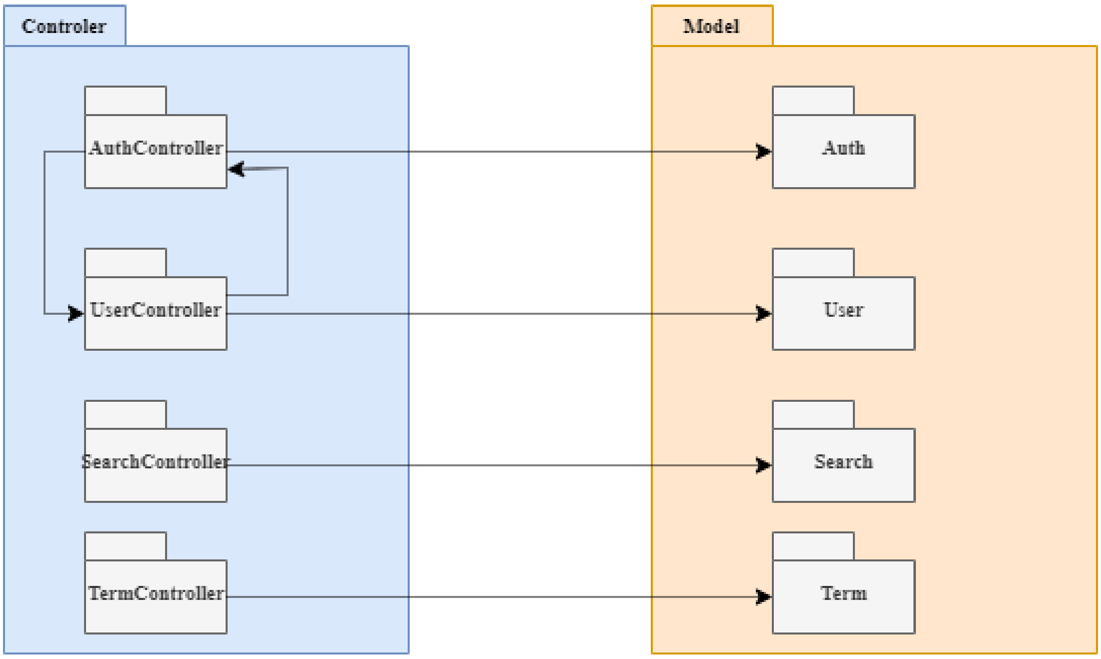


Figure 4.3: Package diagram for server side

Reference to **Fig. 4.3** above,Model takes the role of an interceptor, intercepting and checking the request before the controller continue to processing and handling to respond.

Package **Controller** takes care of receiving request data, first checking it using the service in **Service** package, then processing it in conjunction with getting or updating data by working with **Model** package, and returning results to the front-end.

The package **Model** represents the data in the table, connecting to the database so that the controller can perform query operations with the tables.

b, Package diagram for web client

The figure below will display package diagram for merchant view.

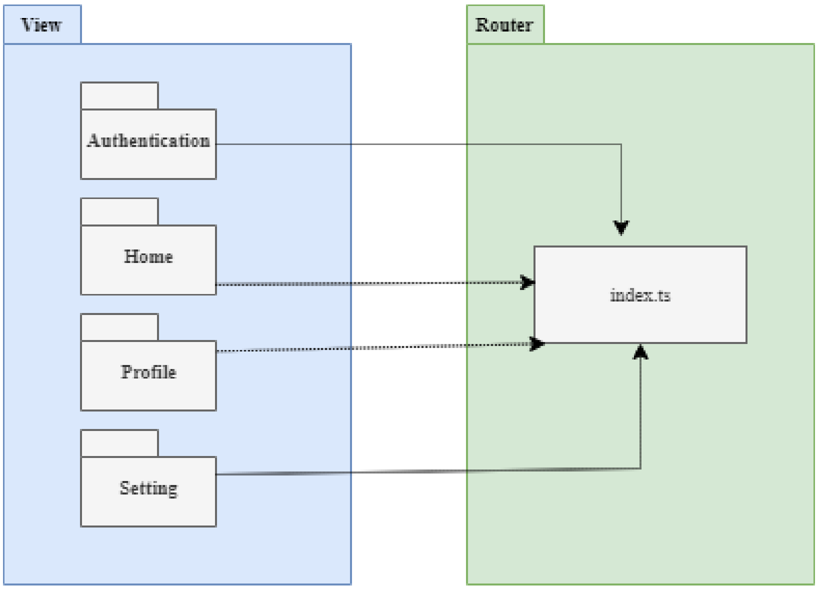


Figure 4.4: Package diagram for merchant view

Reference to **Fig. 4.4** above, package **Component** contains all the UI of the website. This package contains sub-packages, which contain components that have been classified into packages based on properties and functionality. Some components interact with each other, which will be present in next part. Components in this package use other packages to render the final interface. Component packages include:

- **Authentication:** Small components that check user data.
- **Home:** Welcome page.
- **Profile:** Show shop's information.
- **Setting:** From change elements of search page .
- **Index.ts:** Define static and dynamic routes with an intuitive and powerful syntax..

c, Package diagram for User view

The figure below will display package diagram for app client.

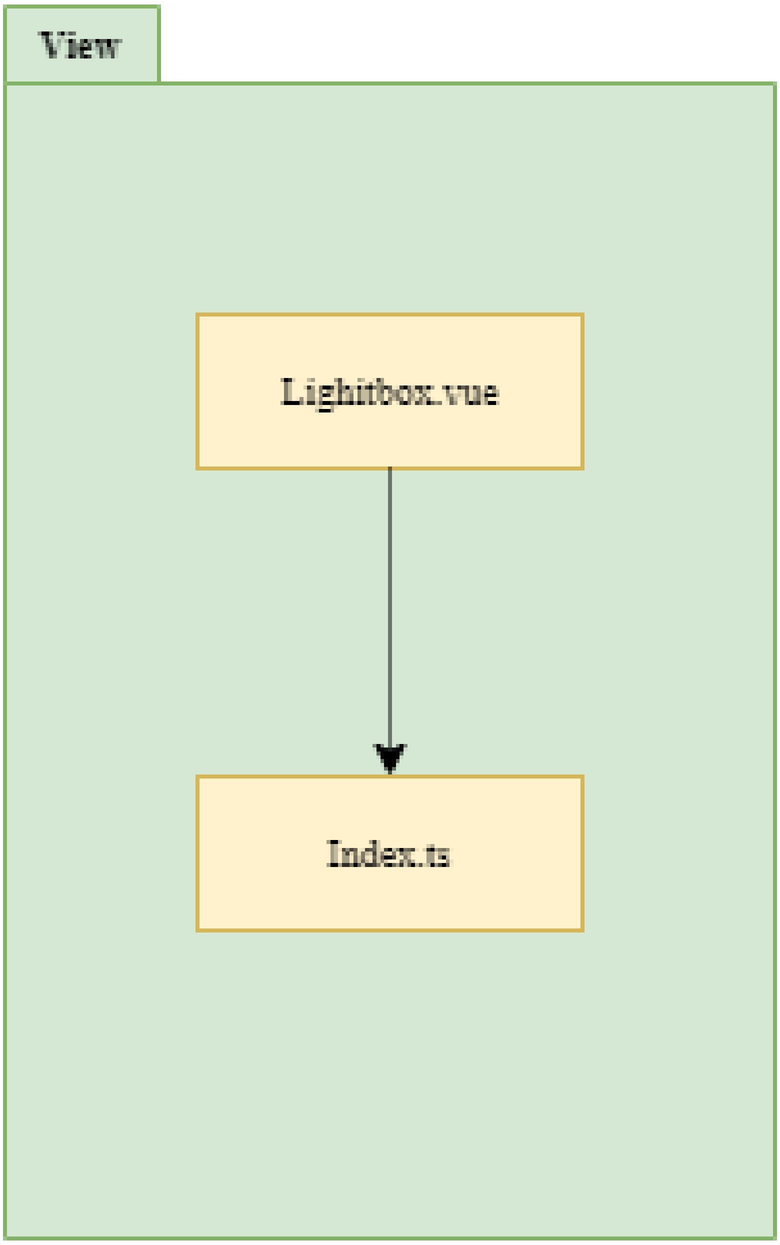


Figure 4.5: Package diagram for user view

This part is quite simple when there is only 1 file used to replace the search page after catching the click event on the search button.

4.1.3 Detailed package design

The diagram in **Fig. 4.6** below shows the detailed package design.

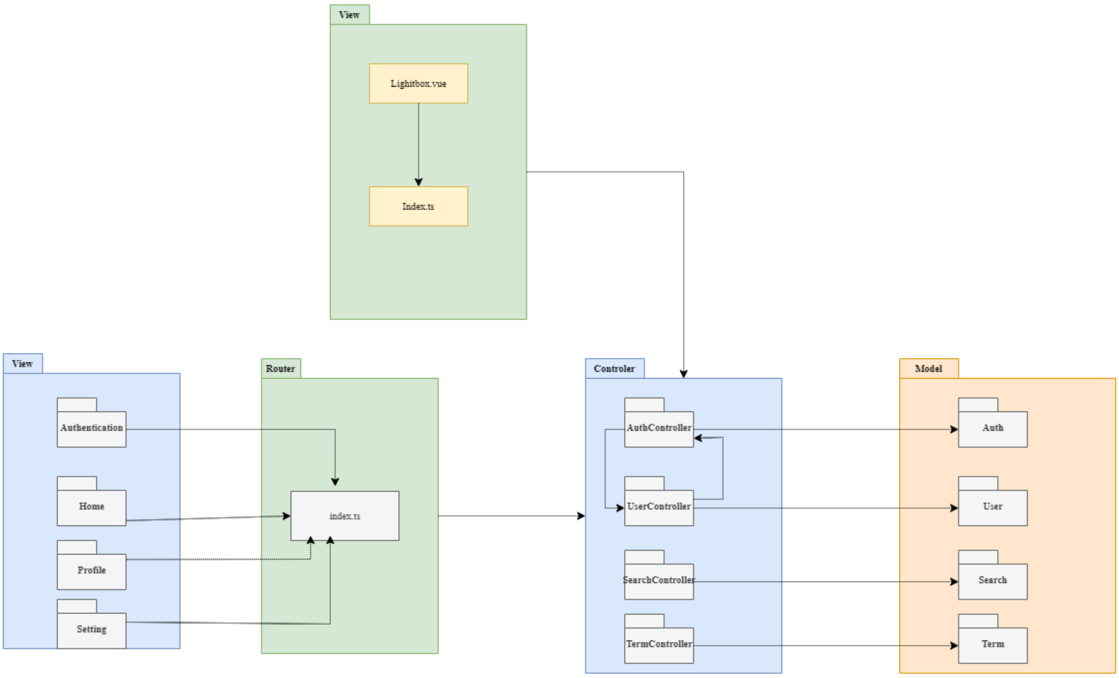


Figure 4.6: Detail package diagram

The activity flow will be carried out as per my concept. The program will first be installed into the store, following which it will proceed immediately to the page where the search page's parameters and the page where searches are stored may be edited. A successful save message appears after changing the parameter values and saving. The modified search page will show once we click the search button on the store's homepage.

4.1.4 User interface design

With desktop interface for web application, the system is capable of supporting screen sizes such as 1360x768 (HD screen), 1440x900 (Macbook screen), 1920x1200 (Full HD wide-screen).

a, Login interface for website

The login interface will be designed with the login form on the right. The left side will be the decoration, showing the organization's logo as well as the message or introduction of the organization, etc.

Fig. 4.7 illustrates the interface design of login for merchant function.

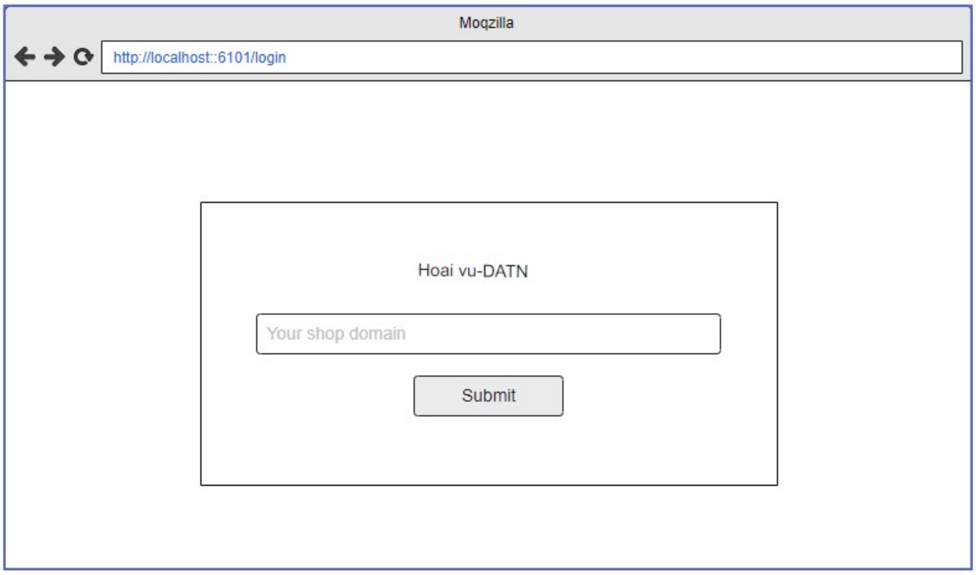


Figure 4.7: login for merchant function

b, Setting interface

This page will be divided into 1 main section, the left part will be tabs to select the page including setting page and term. on the right will be the display of the changeable elements of the search page.

Fig. 4.8 illustrates the interface design of setting page.

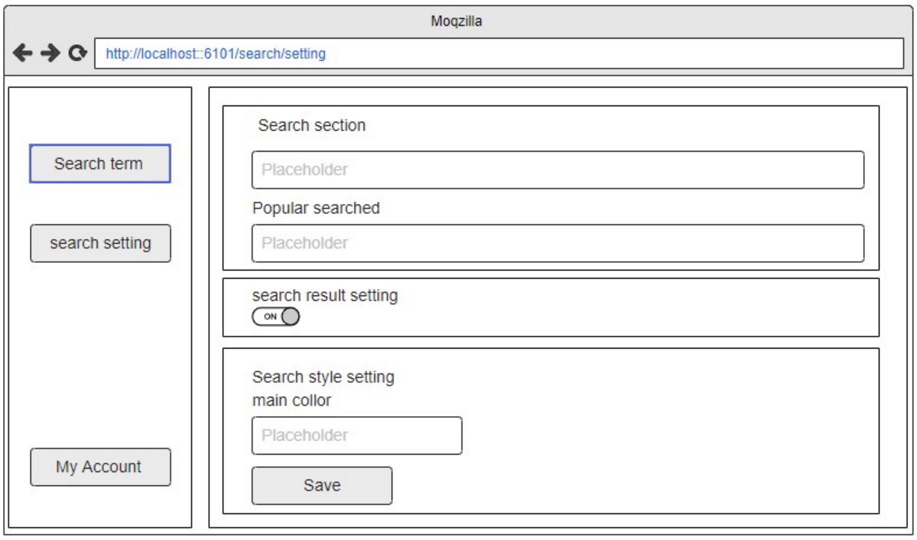


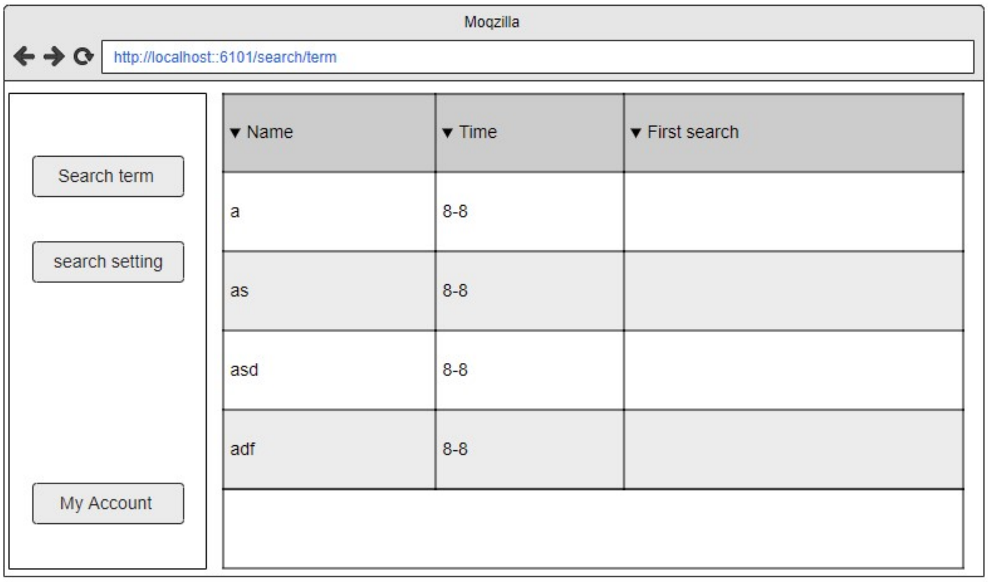
Figure 4.8: Design of setting page

c, Term interface

This page will be divided into 1 main section, the left part will be tabs to select the page including setting page and term. on the right will be the display of the data table of searches.

Fig. 4.9 illustrates the interface design of term page .

A successful save message will be displayed by the program after making changes to the properties and tapping save.



▾ Name	▾ Time	▾ First search
a	8-8	
as	8-8	
asd	8-8	
adf	8-8	

Figure 4.9: Detail term page

d, Save setting page

A successful save message will be displayed by the program after making changes to the properties and tapping save.

Fig. 4.10 illustrates the interface design of Save setting page.

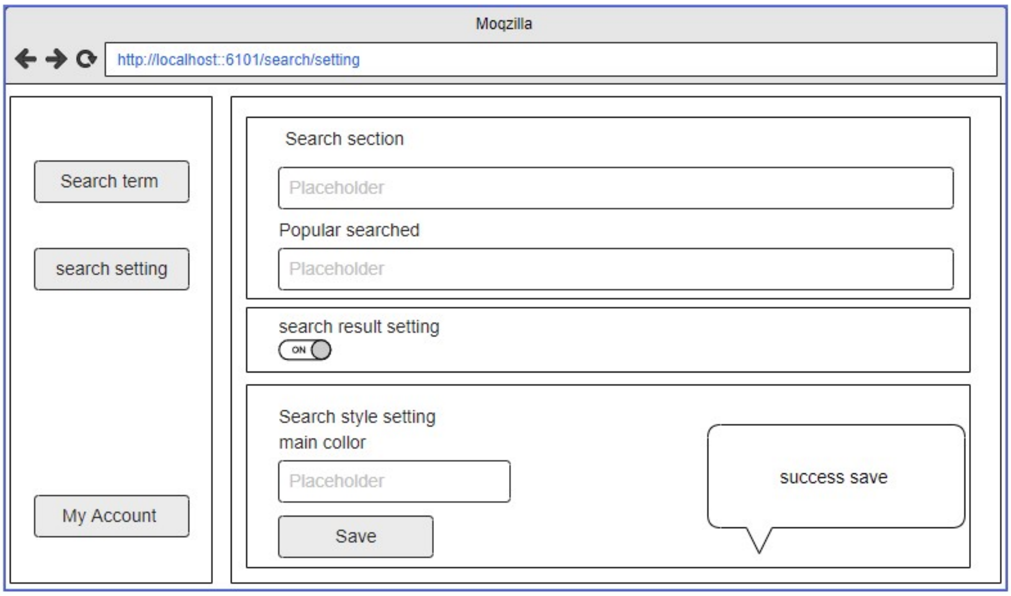


Figure 4.10: Detail save Save setting page

e, Design of search page

Fig. 4.11 illustrates the interface design of Design of search page.

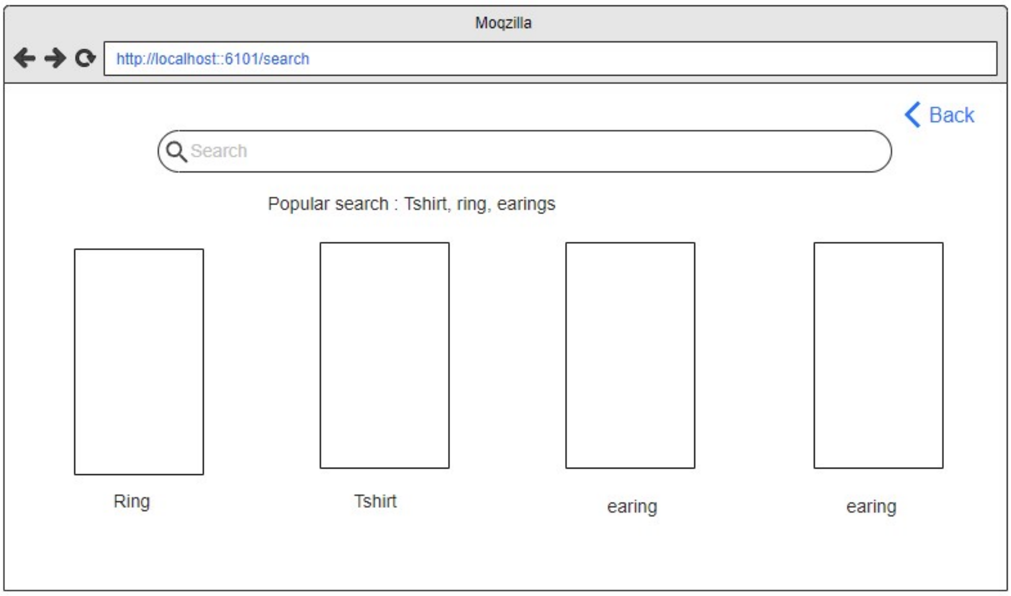

Moqzilla
http://localhost::6101/search
Back
Search
Popular search : Tshirt, ring, earings
Ring
Tshirt
earing
earing

Figure 4.11: Design of search page

f, Design of save button

There must be a separate page to extract the search button's event since Shopify's coed conversion procedure must convert vue files to html.

Fig. 4.12 illustrates the interface design of design of save button.

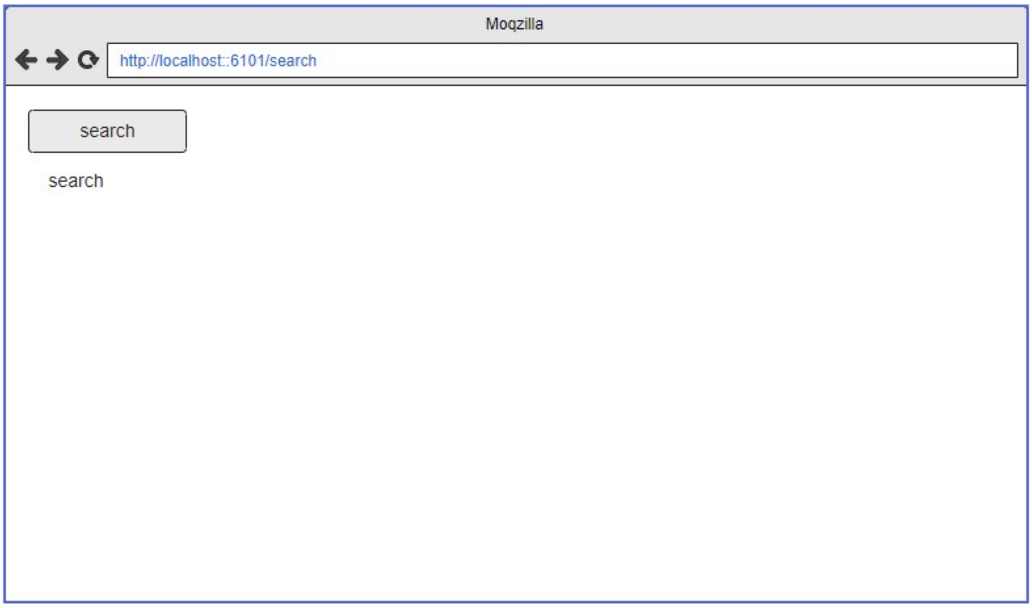


Figure 4.12: Design of save button

g, Design of database

There will be 3 primary tables in this database part, including user, term, and search setting. Users are managed via the user table. The term table is in charge of keeping track of the terms that the user has looked up. The store owner's data configured for his search bar will be saved in the search configuration panel.

Fig. 4.15 illustrates the interface design of design of database.

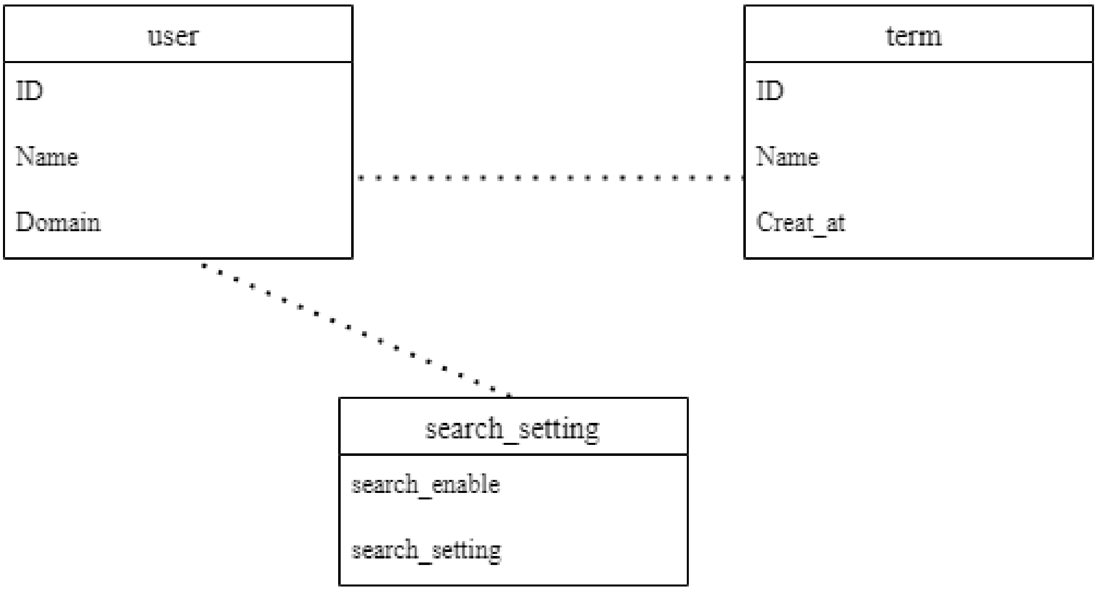


Figure 4.13: Design of database

4.1.5 The sequence diagrams

a, Save setting sequence diagrams

The sequence diagrams below illustrate the class design in more detail.

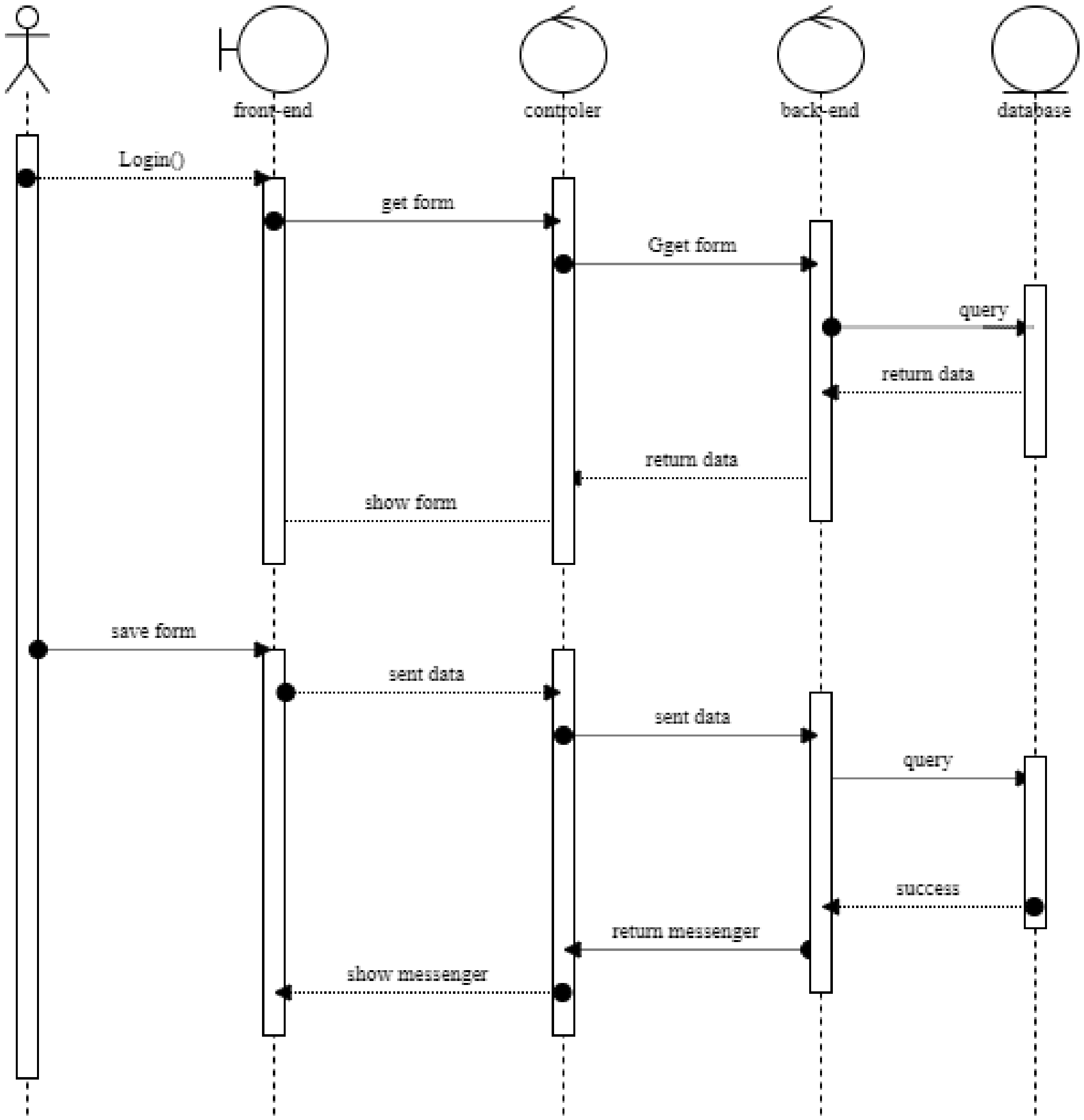


Figure 4.14: Save setting sequence diagrams

b, Check term sequence diagrams

The sequence diagrams below illustrate the class design in more detail.

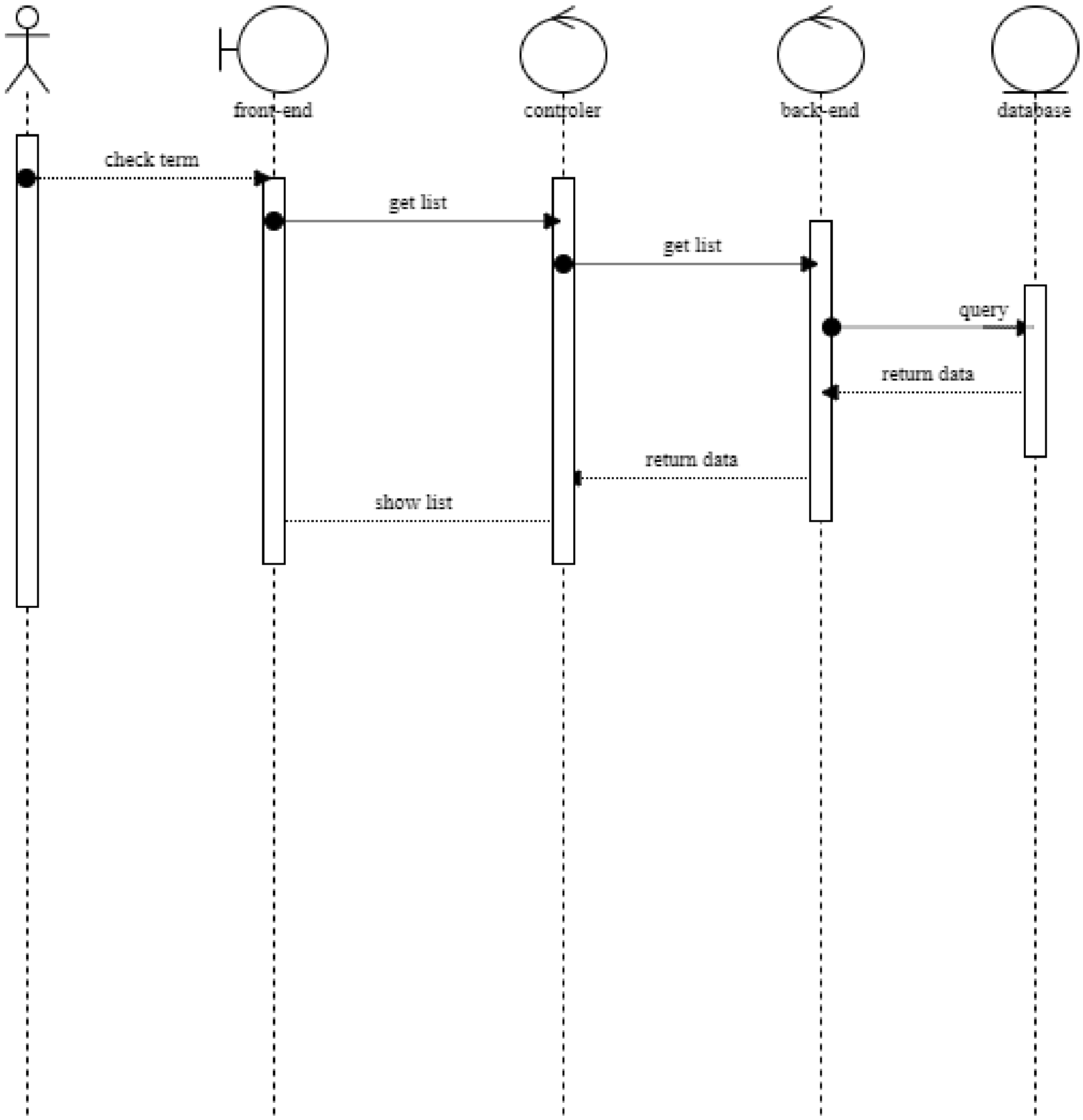


Figure 4.15: Check term sequence diagrams

4.2 Web Building

4.2.1 Libraries and Tools

Table 4.3 below will display list of libraries, tools, and API that I used to develop and maintain this project.

Purpose	Tool/Library/API	URL address
IDE for web front-end	Visual Studio Code	https://code.visualstudio.com
Front-end framework	Vuejs	https://vuejs.org
Web call API	REST API	https://developer.mozilla.org/ docs/Web/API/REST_API
Language for building android application	PHP	https://www.PHP.com
App call API	Retrofit	https://square.github.io/retrofit
IDE for back-end	Visual Studio	https://visualstudio.microsoft.c om
Back-end framework	Laravel Framework Core	https://docs.microsoft.com/ef/ core
Database	SQL Server	https://www.microsoft.com /sql-server
Database management	SSMS	https://docs.microsoft.com /sql/ssms
Test API	Postman	https://www.postman.com
Manipulated with json	Newtonsoft	https://www.newtonsoft.com/j son
Deploy server	digitalocean	https://cloud.digitalocean.com/
Draw diagram	draw.io	https://app.diagrams.net/

Table 4.3: List of used libraries and tools

4.2.2 Achievement

There will be 23 primary tables in this database part, including user, term, and search setting. Users are managed via the user table. The term table is in charge of keeping track of the terms that the user has looked up. The store owner’s data configured for his search bar will be saved in the search configuration panel.

Module	Lines of code	Packages	Classes
Back-end API	2891	12	10
Web front-end	1478	8	6

Table 4.4: Statistical information about the application

4.3 Testing

I installed my app for shops and built two stores on Shopify with enough inventory to test it. The final findings demonstrate that the program functions flawlessly and without any bugs.

Test details will be presented in the table

Task	Process	Expected result	Actual result	Conclusion
Save search setting	In web	Success	Success	Success
Check term	In web	Success	Success	Success
Search	In web	Success	Success	Success

Table 4.5: List of used libraries and tools

4.4 Deployment

The testing process of server is divided into two steps. The first step was to conduct a test using the student's computer as a server, with the help of Ngrok. Ngrok allows demo web projects to the internet without deploying, so it makes system testing more realistic than using localhost. The second step is to conduct the test with the lab's server. My back-end contri- bution will be merged with the back-end code available in the lab and tested. For android application, I export code to .apk file and install the app to my phone for the most authentic experience. The system application is also installed on a lab android device. Finally, proceed to connect, test both the android app and the management web and conduct the test.

CHAPTER 5. NUMERICAL RESULTS

This chapter will detail my contribution to the project, about problems need to be solved, approach, difficulties encountered, final solution, etc.

5.1 Increase the efficiency of shopify's search page

5.1.1 Problem

The two dominant players in the e-commerce industry, shopify and amazon, are now engaged in a vigorous battle for market share. While shopify allows store owners to utilize and build up their own stores on the shopify platform, amazon is an e-commerce site that allows consumers to post their purchases and sales immediately on amazon.com. In comparison to shopify, the ahnfg stores on Amazon have a lot of useful features already built in. However, shopify can adjust the features based on the shop. The search page on Shopify is one of them. Shopify's default search page is currently only partially supported. In contrast, it is challenging for new users to use Shopify's search page changing applications since they are too pricey and sophisticated.Shopify's default search page is currently only partially supported. On the other side, new Shopify customers find it challenging to obtain and utilize the search page changing applications since they are too pricey and complex. Therefore, the major objective of this project is to develop a straightforward search page that is more user-friendly than Shopify's default search page.

5.1.2 Requirement

The solution must first be financially feasible. The second is having strong connections to the present system. Next, check for space difficulties and try to conserve as much space as you can. Additionally, it must guarantee that the problem is manageable and convenient.

5.1.3 Approach

The approach given is,Using three stores as an example, you might deploy the app there and compare how well it performs based on how many searches are made using it and well it is integrated into the consumer search page.

5.1.4 Difficulties encountered

In this application, I'm primarily concerned with the back-end, where I obtain the data and adjust the search page's required settings. Therefore, the program will need to be divided into numerous separate parts. Additionally, Shopify supports a wide range of languages and programming languages. Consequently, working was not without its challenges.

Firstly,The choice and application of languages and techniques presented a significant challenge in finishing this project. Shopify may employ several different languages and methodologies, the most of which are foreign to me. I dedicated two months to learning everything there is to know about Shopify, including its apps, themes, languages, and usage options.

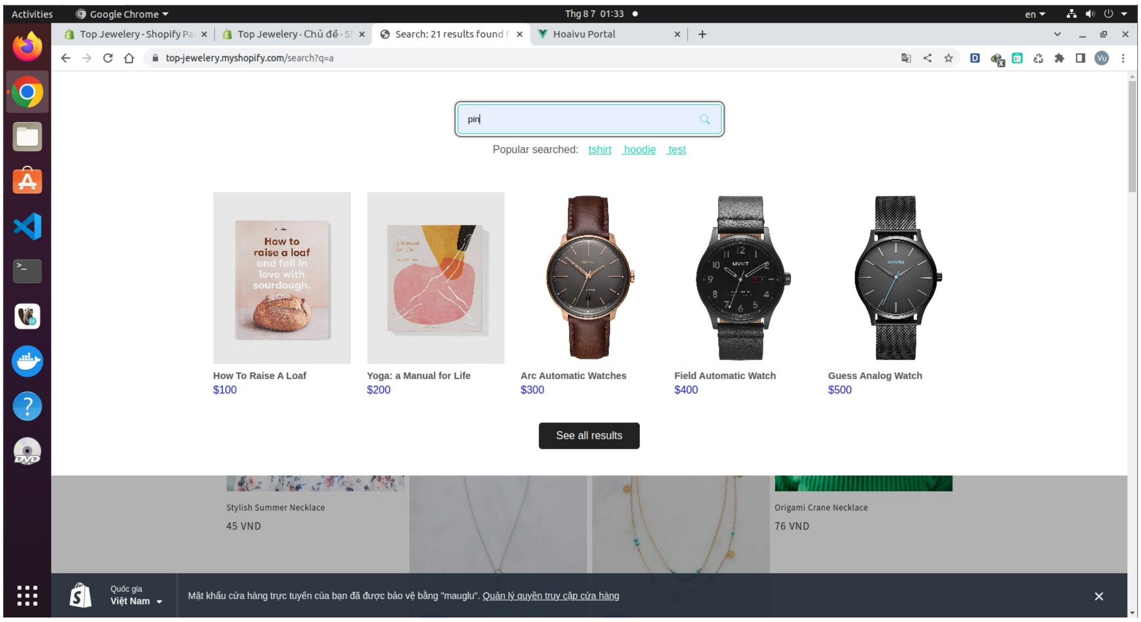
Secondly,the capacity to integrate methods and project components. After the procedures were chosen based on the criteria (simple, simple to learn, and simple to use), a significant issue—the adaptability between the parts—arose. When data is sent from the front end to the back end (post error), or when the back end saves data to the database, there are several problems that show up. The application's need to merge the admin page with the user's search page was the biggest issue. It took me a long time to figure out the address to replace and the event to use every time a user clicks on the search page because of the inconsistencies between the technologies.

Finally,Although this is not the most complete product and more features will need to be developed in the future, after the last three months, my application has been finished and is usable, and I have met the criteria I laid out at the project's commencement.

5.1.5 Final solution and result

Following the approach I outlined above,This software will add settings that the store owner can define to the search page of Shopify to make it easier to use, such as "most searched terms," "color direct the items," and "color price of the sought product." This allows the shop actively alter in accordance with the products it owns, making the monetization page more user-friendly and giving the business better access to techniques. SEO initiative.

Finally, I updated the search page in front-end. The result is shown in **Figure 5.1** below.



Mật khẩu cửa hàng trực tuyến của bạn đã được bảo vệ bằng "mauglu". Quản lý quyền truy cập cửa hàng

Figure 5.1: Search page

5.2 Manage settings for the search page

5.2.1 Problem

The program has to include an admin edit page so that the search page may be as user-friendly as feasible and can be altered in accordance with the store owner's sales plan.

5.2.2 Requirement

The requirement is,use shopify's available api to install apps based on shopify's available resources

5.2.3 Approach

We must separate the admin page into the admin front-end and the admin back-end in order to develop it. The information that has to be altered for the search page is on the front-end admin page. I decided to utilize vuejs for the front-end in order to reduce the amount of code and deliver the best speed. In addition, I choose the Laravel framework for my back-end in order to effectively employ the MVC approach. Following the shop owner's selection, the data to be installed for the search page is then transferred to the back-end and stored to the database before being retrieved and installed there.

5.2.4 Difficulties encountered

The admin page will be the primary component of this project as opposed to the search page. These are the challenges in this section: First off, there are issues with receiving and sending data between the front end and the back-end since the authentication components of Shopify and Laravel are not synced. As a result, while sending and receiving data between the back-end and front-end, The time it takes to send and receive data grows when more tokens are attached at the top.

Secondly,Given that it may reload instantly after saving the code, vuejs is a simple language to learn and use and has the capacity to minimize page refresh times as much as feasible. I took a lot of effort to identify and correct those problems because I don't know what caused them.

5.2.5 Final solution and result

Following the approach I outlined above,I've successfully created a front-end admin page with key features including web and Shopify logins, as well as the ability to update data in accordance with the store owner's preferences. **Figure 5.2** illustrates login page from URL.

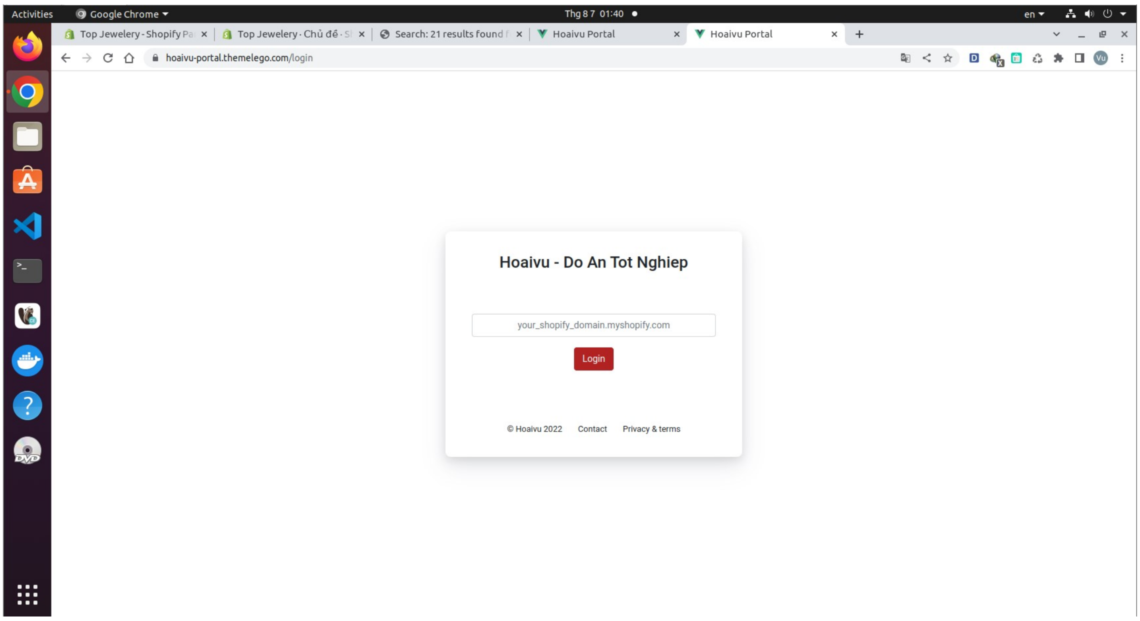
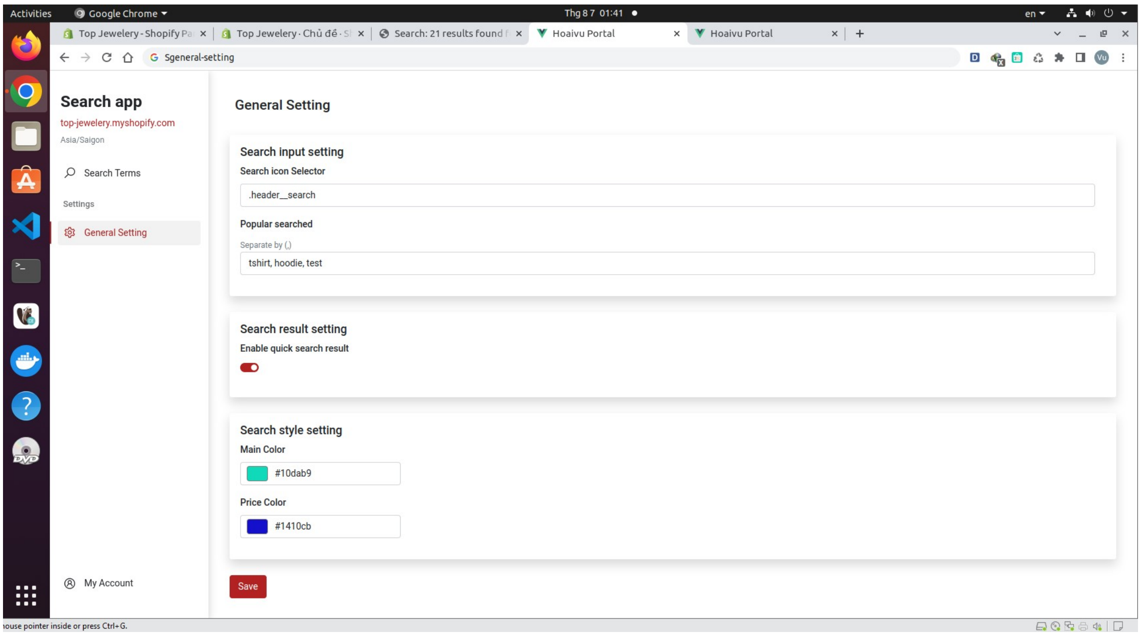

Activities
Google Chrome
Thg 8 7 01:40
Top Jewelery - Shopify Pa
Top Jewelery - Chủ đề - Sh
Search: 21 results found
Hoaivu Portal
Hoaivu Portal
hoaivu-portal.themelego.com/login
Hoaivu - Do An Tot Nghiep
your_shopify_domain.myshopify.com
Login
© Hoaivu 2022
Contact
Privacy & terms

Figure 5.2: Login page from URL

Figure 5.3 illustrates setting page.



General Setting

Search input setting

Search icon Selector: .header__search

Popular searched (Separate by (,)): tshirt, hoodie, test

Search result setting

Enable quick search result: ●

Search style setting

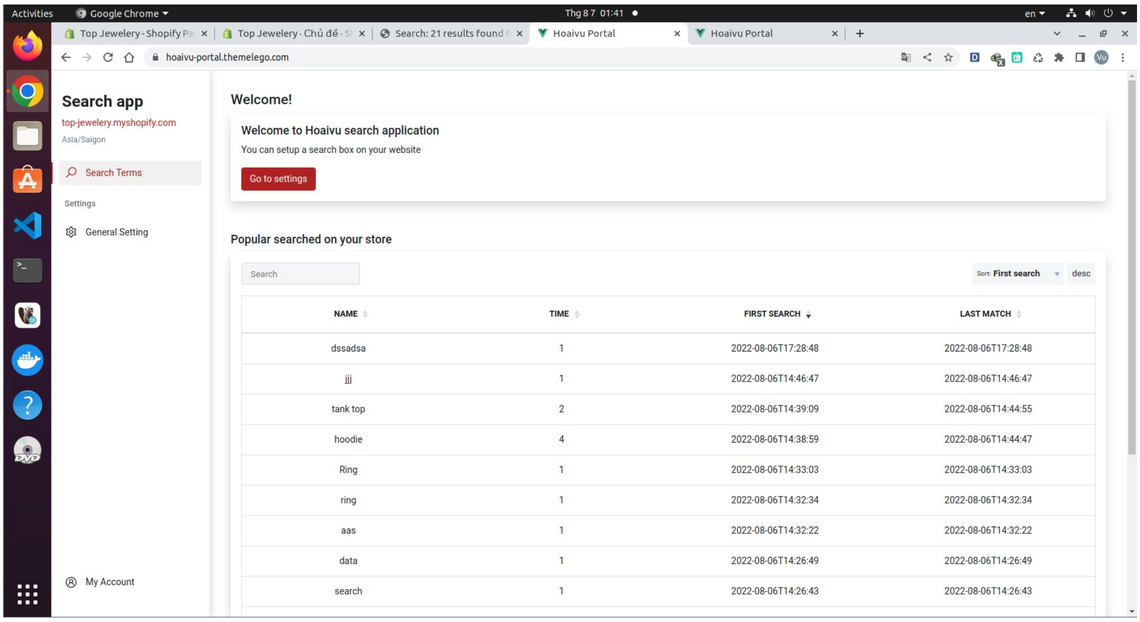
Main Color: 🟩 #10dab9

Price Color: 🟦 #1410cb

Save

Figure 5.3: Setting page

Figure 5.4 illustrates term page.



Welcome!

Welcome to Hoaivu search application

You can setup a search box on your website

Go to settings

Popular searched on your store

Search | Sort: First search | desc

NAME	TIME	FIRST SEARCH	LAST MATCH
dssadsa	1	2022-08-06T17:28:48	2022-08-06T17:28:48
jjj	1	2022-08-06T14:46:47	2022-08-06T14:46:47
tank top	2	2022-08-06T14:39:09	2022-08-06T14:44:55
hoodie	4	2022-08-06T14:38:59	2022-08-06T14:44:47
Ring	1	2022-08-06T14:33:03	2022-08-06T14:33:03
ring	1	2022-08-06T14:32:34	2022-08-06T14:32:34
aas	1	2022-08-06T14:32:22	2022-08-06T14:32:22
data	1	2022-08-06T14:26:49	2022-08-06T14:26:49
search	1	2022-08-06T14:26:43	2022-08-06T14:26:43

Figure 5.4: Term page

Figure 5.5 illustrates database.

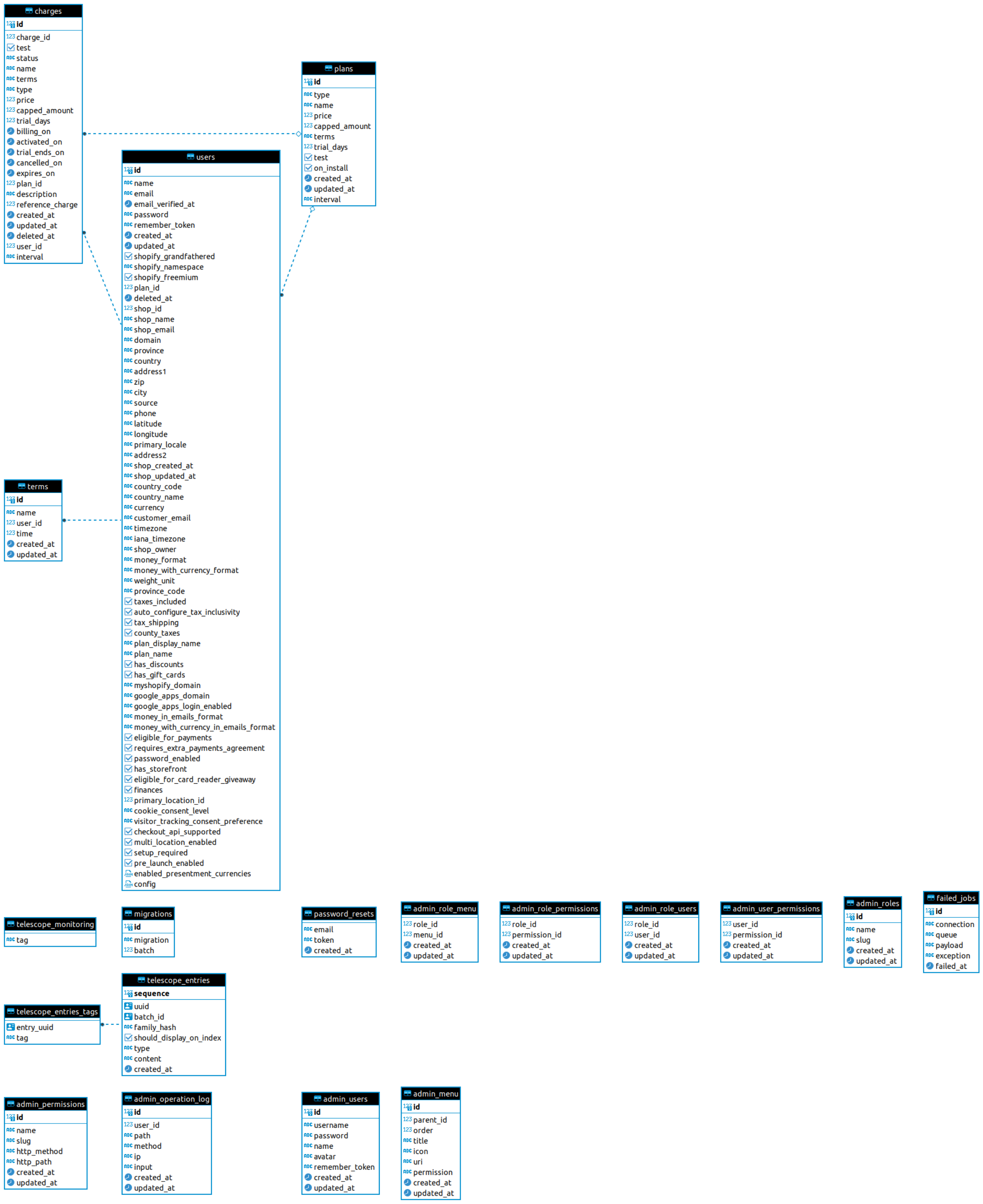


Figure 5.5: Term page

CHAPTER 6. CONCLUSIONS

6.1 Summary

In summary, the thesis has completed the set goal, which is to improve a few modules as well as build more functions to help the system operate with better performance.The program has aided in making the user search page more comprehensive, giving users more information they need, and assisting businesses in moving closer to online marketing strategies like SEO.

In addition, doing the assigned tasks also helps me a lot in improving my programming skills, learning new technologies, especially problem solving skills. I realized that a problem does not have only one solution, should not be stubbornly going in a predetermined direction. I need to be more flexible, map out possible directions and then choose the most suitable one. Exposure to a huge amount of code helps me to have a more open and confident attitude, so that I don't get overwhelmed by similar tasks in the future.

6.2 Suggestion for Future Works

Currently, although the system is working well, there are still some points that can be improved.First,To assist clients in finding the right goods as quickly as possible, the application needs to provide a number of additional search fields, such as price, address, color, ship, etc. Additional technology is required for the application, such as fuzzy search, synonym search, etc.

In addition, I need to work on a number of other things, like how I approach and learn new technology. the capacity to recognize issues and identify issues that require solving.

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APPENDIX