

ONLINE SERVICE SELLING SERVICE APPLICATION

BY

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ABSTRACT

Online service selling web application is a system that transforms the traditional to the modern approach to finding job, the traditional approach and recruitment method have a few disadvantages such as difficulty to find side job that meet their specific profession, struggling to bidding for project due to many competitors and the traditional recruitment method cannot be operated from anywhere due to geographical restrictions. This paper also discusses about 3 types of freelance marketplace and comparison of 3 similar system. The methodology use for the development is prototyping model. This model is used because the development process can be done quickly with a low cost, users can get quick feedback on their needs and improve them in the early stage of software development. Furthermore, the system was built using the latest technology trends, including React as the front-end framework and .Net Core as the back-end framework. This online service selling web application also features innovative functions such as real-time translation during video calls, which eliminates language barriers for people from different countries, and a timetable function for clients to view the freelancer's available time slots. Additionally, this dissertation provides a detailed analysis that can assist readers in building a similar system from scratch.

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LIST OF ABBREVIATIONS

CLR	Common Language Runtime
JVM	Java Virtual Machine
PHP	Hypertext Processor
HTML	Hypertext Markup Language
CSS	Cascading Style Sheets
MVVM	Model-View-View Model
MVC	Model-View-Controller
DOM	Document Object Model
API	Application Programming Interface
JSX	JavaScript XML
XML	Extensible Markup Language
XSS	Cross Site Scripting
CSRF	Cross Site Request Forgery
WebRTC	Web Real Time Communication
SEO	Search Engine Optimization
env	Environment

Chapter 1

Introduction

1.1 Background Information

Recently, internet usage and the user has overgrown compared to last decade in all countries worldwide. Over Billions of people are connected to the internet because the internet provides a faster way to access information. Besides that, the internet can perform specific tasks like advertising, social, and personal interactions [2]. This provides some industrial and some people to seek opportunities to expand their business online. Because the internet helps to improve process efficiency. Therefore, the internet makes it possible for employers in developing countries to provide job opportunities to those in un-developing countries like India, Bangladesh and Pakistan because of high unemployment rates.

In India, over a million Indians are age-eligible to join the job market. Additionally, the number of companies providing employment opportunities is insufficient due to increased job demands. This is why these countries are facing an unemployment crisis. Almost half of the graduates are unemployed and unable to find their career choice. The unemployment rate in India is 23.5% which means that 2 out of 10 Indians are jobless. Most of these unemployed are fresh graduates [5].

The traditional recruitment methods like newspapers, local paper advertisements, and local employment office postings might not be the right choice for them. Due to the large population, it might be difficult for them to look for the desired job position and get hired, because most lack working experience. As an illustration, if a degree graduate with no working experience shows up in the interview, the interviewer might be worried. Can they be good employees? Can they work under pressure? Can they admit their mistakes and bring a feasible solution? So, they must start their career somewhere. They need time to gain work experience to a certain level of competency.

1.2 Problem Statement and Motivation

First and foremost, the problem faced by candidates who use the traditional recruitment method for finding a job is it is not a good option for them to find a side job that meets their specific profession. As an illustration, a musician is looking for a side job for lyrics writing. It might be challenging to find a job that meets the specification of the traditional recruitment method. Most of the companies are looking for long-term employees because it is cost-effective. The company needs to spend money on interviews, employee training programs, unemployment costs and severance packages when it comes to employee turnover. Long-term employees could help the companies to reduce cost spent.

Moreover, for the traditional recruitment method, the employer or company will post a project using newspapers advertisements section or even social media, if the freelancer has interest on that project, they are required to contact the employer to bid on that project according to the requirement. And the employer will have a brief interview with you, if the employer thinks you are a suitable candidate for the project, they will hand this project to you. However, the disadvantage is it might be difficult for the freelancer due to a lot of competitors.

Lastly, the traditional recruitment system is considering an offline system which cannot be operated worldwide but only targets local business or service buyers due to the geographical restrictions. This is because the traditional way of recruitment normally requires the candidates to work in their own specific location. So, this might be difficult for the candidates who are looking for a side job and stay in a different geographical area. Hence, the online platform can be accessed through web applications that provide an alternative way for people who demand the service worldwide.

Due to the Covid-19 pandemic, unemployment rate has risen rapidly, fresher graduate unable to find their desire job, the impacts are more noticeable in countries with lower incomes. Many of them may face decades of hardship if nothing is done to address how the pandemic has impacted young people's career chances. Therefore, Online service selling web application is a useful application for users to gain extra income and try to reduce unemployment rate by providing job opportunity for fresh graduate.

1.3 Project Scope and Direction

Project scope is considered a part of project planning. It represents the system's boundaries and establishes responsibilities for tasks that need to be completed. The project scope is divided into the system's and the user's content.

1.3.1 Scope of users

This project focuses on developing a web application for customers and freelancers to purchase and sell services. In this web application, the user has three roles: admin, customer and freelancer. Users can register as a freelancer after completing the freelancer registration process. The required documents include a resume, proposal, and information such as freelancer expertise field, language level and LinkedIn URL. A complete profile can help customers to recognize freelancers.

Furthermore, the customers can post their new or incomplete projects, and freelancers interested in the project can bid for the project. Customers are required to make payments after they select a specific freelancer. After the customer approves the freelancer's work, the freelancer can request a withdrawal with the system admin. System admin roles in managing the website information such as managing users, approving cash withdrawals, and adding categories or language.

1.3.2 Scope of projects

Online service selling web applications have listed the modules and functionalities in the section below.

1. Authentication and authorization Module

The authentication module allows the users to register for a new account. If the user wishes to become a freelancer, they must reenter their password to confirm the action. Users cannot access the freelance and admin page because of the authorization. The web application also provides Password change features for users who forgot their passwords.

2. Freelancer Registration Module

The user must provide personal information and documents, including resume, professional field and project done. Customers can view the information provided in the user profile to recognize the freelancer better before hiring them.

3. Service Selling Module

Freelancers can access these features after completing their profile in the Freelancer Registration Module. Freelancer can sell their professional service by filling in the service detail, and the web application will display their service for the customer to purchase.

4. Live and video chat Module

Live and video chat service is a faster and more convenient way to answer customer questions immediately. Freelancers could reach customers and discuss details of the project without switching to another platform or media.

5. Project Posting Module

The customer could request a freelancer to help with their project by filling in the requirement in detail, such as the title, description, budget and attached document if needed.

6. Search and Filtering Module

The web application allows users to filter and search for the desired service and displays a new service list. The user could filter for the service based on budget, location, category, time and sub-category.

1.4 Project Objectives

The objectives of developing this project are:

1. To design a freelance marketplace web application that enables freelancers to sell their services and customers to propose their projects.
2. To provide chat and video call features for customers and freelancers to communicate about project details within the platform, while also eliminating language barriers through real-time translation.

3. To implement a content-based filtering recommendation system that predicts user preferences based on their previous purchases.

1.5 Impact, Significance and Contribution

Youth unemployment which represents the fresh graduate might get jobless due to stiff competition in business. As a result, a freelancing job is more desirable than a few years because it solves the poverty and employment less issue and provides extra income for individuals. Online services selling web applications benefit freelancers and clients because they solve the youth unemployment problem and provide extra income for individuals in low and middle-income countries, such as India, Malaysia and Bangladesh.

Additionally, the proposed system is distinctive compared to the current web application because it provides a combination of features not offered by the existing system, such as chat and video call, service recommender, and both customer and freelancer can purchase and buy services. Every process can be completed in a single application without switching platforms and user time to search for the desired service. These features can improve freelancer productivity in delivering their project.

Chapter 2

Literature Review

2.1 Type of Online base web selling system

First is the freelance bidding marketplace; on these websites, buyers and employers post their project, project requirements, deadlines, etc. The freelancer who has an interest in this project can bid for it. They can ask the employer about the details before bids for the specific project. In other words, they compete in their category of expertise around the world. The employer will go through the freelancer who bids for the project and have a simple interview with them. So, the freelancer will get paid after they complete the task assigned by the employer [7].

Furthermore, the freelance bidding marketplace can be divided to 2 marketplace model, the first one is niche freelance marketplace, niche marketplace offer client with freelancer with skill such as business consulting, finance, database, writing etc. This type of website typically will provide higher quality freelancer to offer customers with better experience, the freelance are required to evaluates by the websites before he can work with any client. As an illustration, in the website design marketplace, the websites will evaluate his/her previous project before admitting him.

Next, the second one is freelance contest marketplace, as an example, the buyer posts a lyric writing contest for RM400. The freelancer can register for this contest without bidding for the project. Then, they are required to submit the completed project before the deadline for the client to review and select. If the client is satisfied with the project, the payment is paid to the freelancer who completes the project. The digital stock marketplace allows sellers to sell digital goods, such as graphic templates, stock videos, stock photos, music tracks etc. The buyers need to make payment before purchasing any of the products. The advantage of this system is it provides a semi-active way of making money. Lastly, micro-jobs marketplace in these websites, the jobs are small and much simpler, which will take less time to accomplish with paid of very small fee. The service offered is simple jobs like installing software, websites design, logo design etc. These types of jobs do not require much energy and time and can be completed [7].

2.2 Traditional Approach to Freelance Job/Task Acquisition

The internet has changed the recruitment landscape. It also has completely changed the way of job search. With the rapid growth of the internet, traditional approaches such as newspaper, magazine advertisement, networking of people such as friends and colleagues. Play an important job for job searching.

2.2.1 Job Acquisition Techniques

2.2.1.1 Cold cover letter

A cold cover letter is an uninvited inquiry to an employee, worker regarding job opportunities, and this letter is typically written to hiring manager of the company for an unannounced job and the job might not be available yet [8].

Advantages of cold cover letter.

- Create job position that did not exist before
- Consider filling positions that are due to an upcoming promotion, transfer, termination or resignation
- Expand networking of people, forward your cold cover letter for more considerations

2.2.1.2 Classified Ads

It is no question that classified advertisements like newspapers are losing their competitive advantages in job searching, there are still local industries and new startup businesses still using classified ads. But also, not to forget that most countries are still built on the foundation of small business. One thing to keep in mind is small business may become tomorrow's big enterprise if the correct business strategy is applied [8].

2.3 Modern Approach to Freelance Job

Technology has changed the world in every segment, including the process for job searching, instead of spending a few hours flipping through classified ads. Job seekers are using modern approaches such as social media and job sites to narrow their search to organizations and industries. Technology not only made it easier for job seekers to find job advertisements, but also allowed them to start up as a freelancer.

2.4 Overview of Current System

Freelancer platform is a good option for seeking professional development opportunities, and it provides a good way to supplement the main income, letting you take up small projects to gain more working experience and enhance your skills. There is obvious that the number of freelancers is increasing because they discovered the benefits of professional freelancing.

2.4.1 Bark

Review on <https://www.bark.com/en/gb/>

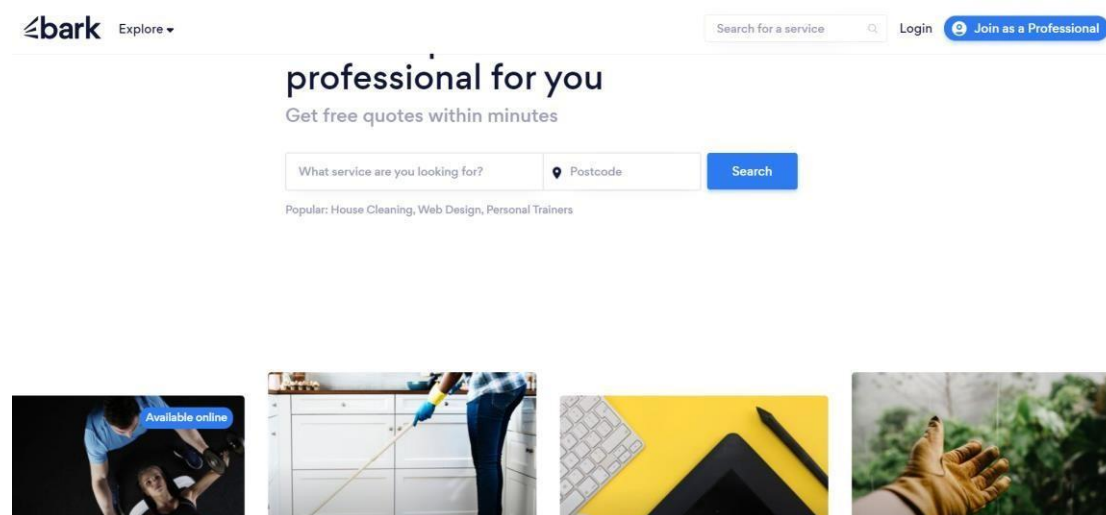


Figure 2.1 Landing page of bark website

Bark is a freelance platform which matches the customers with freelancer with the customer postcode. The platform provides over 800 services from 6 categories in countries such as United State, United Kingdom, Canada, Ireland, Australia etc. Bark websites offer job opportunity for freelancer to sell their service. On the other hand, users can search for the service inputting the service they are looking for, as the result system will match the freelancer with same geographical area with the user. Therefore, the system also provides a second option to the customer, the customer could answer several questions to find the tailored freelancer, customer can view detail of freelancer for free. Finally, they can see the contact information if they pay a small amount of fee.

However, Bark does not provide a list of freelancers from each category to review the details of freelancer. System matching idea is amazing, but this will spend more time than expected for a customer to looking for desire professional in a short time. Moreover, the customer must pay before they can access to the freelancer's information and contact such as

email and phone number, this will lead to disadvantages like make the communication between freelancer and customer more complicated, since the freelancer might forget to update their new contact on the website which make customer payment became meaningless and require more time to communicate with freelancer.

Strength	<ol style="list-style-type: none"> 1. User-friendly interface - By entering the service name and postcode, the customer can obtain their desired service.
Weakness	<ol style="list-style-type: none"> 1. Lack of live chat service - The system does not provide the chatting function between customer and freelancer but the freelancer's phone number and email. 2. No post project function for customer - Customer post service function is not provided, only freelancers may post services. Customers must explain their project details to freelancers. 3. Lack of freelancer details - The system does not provide freelance details such as qualification, education level and resume.

Table 2.1 Strengths and Weaknesses of Bark

2.4.2 Workana

Review On <https://www.workana.com/>

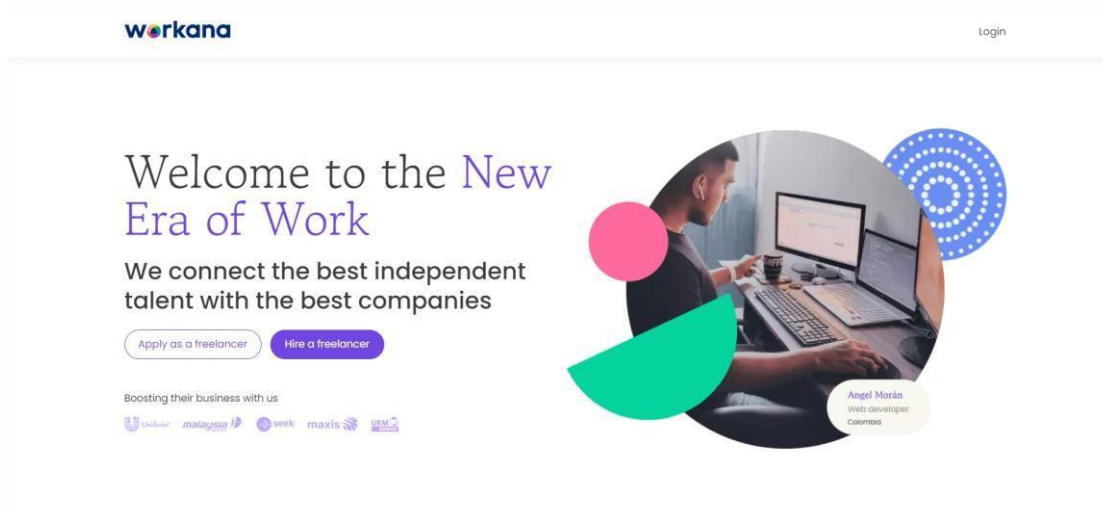


Figure 2.2 Landing page of Workana website

Workana is an online platform that is suitable for customers looking for remote talents all over the world. The website offers 8 categories of service which include website development, marketing and sales, design, and multimedia, writing and content, database and IT, Admin, and business Consulting. This website not only provides a platform for freelancers, but also allows the customers to quickly find and scale a remote team for the business. What is special about this website is the customers can hire multiple freelancers and integrate them as a team to work on the same project.

Strength	<ol style="list-style-type: none">1. Integration of freelancer – The customers can post a project to hire multiple freelancers who are interested in the project.2. Sorting and Filtering function – Customers can sort and filters freelancer’s information such as price, skill, and English level.
----------	--

Weakness	<ol style="list-style-type: none"> 1. Lack of freelancer details - The system does not provide freelancer detailed information such as demonstration project, education level, resume etc. 2. Lack of live chat service - The system does not provide the chatting function between customer and freelancer.
----------	--

Table 2.2 Strengths and Weaknesses of Workana

2.4.3 Seogigstore

Review On <https://seogigstore.com/>

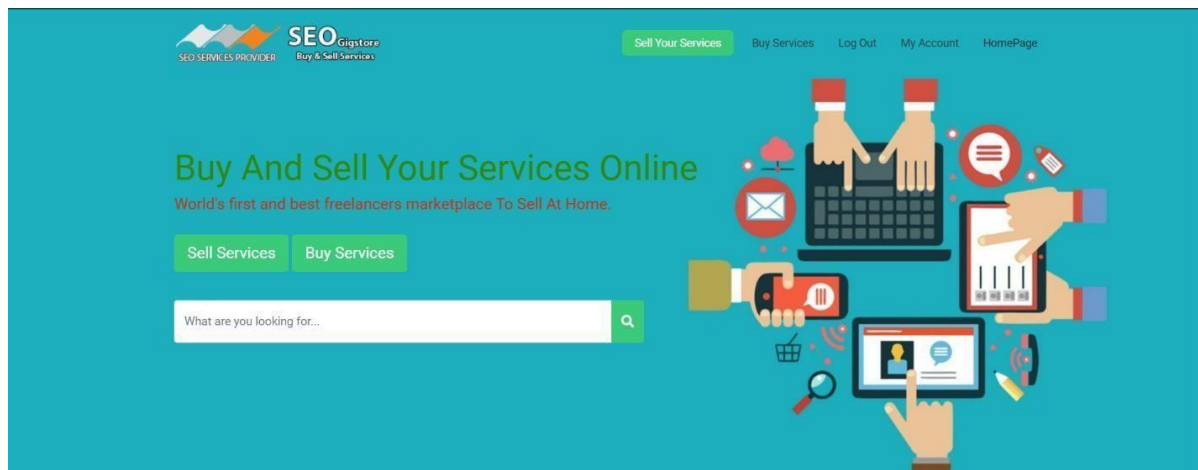


Figure 2.3 Landing page of Seogigstore website

SeoGigstore is a service selling website which allows the user to buy or sell specific services. SeoGigstore has divided the service to 8 categories, by using this website, user is able to select the from 8 categories which are business type, Design and graphics, Digital & online, Housework, Music and audio, programming, video production and writers and lecture, after that, user can apply filter and display the specific records and select the service they are looking for. Then, the user must choose the payment method, the website provides 3 payment methods which are E-Wallet and Cryptocurrency (Bitcoin, Ethereum, USD Coin and Dai) and debit card.

What made this website so special is it uses the Google maps API so the user can view the exact location of the service seller. The benefit of using this API is the location searches will be customized based on user behavior. As an illustration if the users are in United States. The system will provide a suggestion local seller for them. Alternatively, there is also limitation for SeoGigstore websites. First, the back to top feature is not available on the SeoGigstore website. So, users need to scroll up every time they want to go to the top of the website.

Strength	1) Multiple payment option - Provide multiple payment method for customer such as E-Wallet, cryptocurrency, and Credit/Debit card.
Weakness	<p>7. Ungregarious Authorization procedure – user can access to certain section of the page without the authentication.</p> <p>8. Single Language – The system only offers one language for users which only English is provided. This brings inconvenience to international users using foreign languages other than English that may cause bad user experience to users.</p>

Table 2.3 Strengths and Weaknesses of Seogigstore

Features	Bark	Workana	SeogigStore	Proposed System
Profile customisation	Yes	Yes	Yes	Yes
Chatting	No	No	Yes, with chat service only	Yes, with chat service and video call
Post a project	No	Yes	No	Yes
Find freelancer	Yes	Yes	Yes	Yes
Dissussion Forums	No	Yes	No	Yes
Report violation user	No	No	No	Yes

Progress DashBoard	No	Yes	Yes	Yes
Talent pools	No	Yes	No	Yes
Multiple language support	No	No	No	Yes
Recommendation System	No	No	No	Yes

Table 2.4 Comparison Between Existing system and Proposed System

2.5 Proposed Approach/Study

This paper will focus on developing an online service selling website. The website provides the users with ten categories of services available for purchase. To improve user experience and facilitate online purchase, chat and video call functions are implemented to maximize freelancer and customer productivity. The web application is implemented using 3 tier architectures. A presentation tier for the user interface is used for user interaction with the system, an application tier for implementing business logic, and the application tier allows users or freelancers to perform CRUD operations. And for the data tier is usually where the data is stored and managed. To be converted to information.

Firstly, the presentation tier of this project is implemented using React as the front-end framework and Ant-Design as a CSS framework. React has several advantages, such as it provides a faster rendering speed. This is because the build of React uses the programming concept name virtual DOM. Virtual DOM can be considered as a lightweight copy of DOM. By using the virtual DOM, the selected object can be changed without replacing the entire DOM. Next, the CSS framework use in this project will be Ant-Design. The main reason for using this as a CSS framework is because it is flexible and easy to use, and Ant-Design is entirely responsive. Ant- Design provided a set of high-level React Components that are ready to use, and it also perfectly fits with server-side technology and programming languages, such as ASP.NET Core and C#.

Moreover, Redux is used to assist the React application implementation. Redux is a JavaScript library for storing and managing the application state. Redux is a central location for storing states that must be used throughout the application. All states can be stored in a separate reducer from different folders and combined into a homeReducer, with rules to ensure that state can only be changed in a specific pattern. The main advantage of Redux is that the state passing process can be simplified because we need not pass the state through the component tree but can directly call the state from the store.

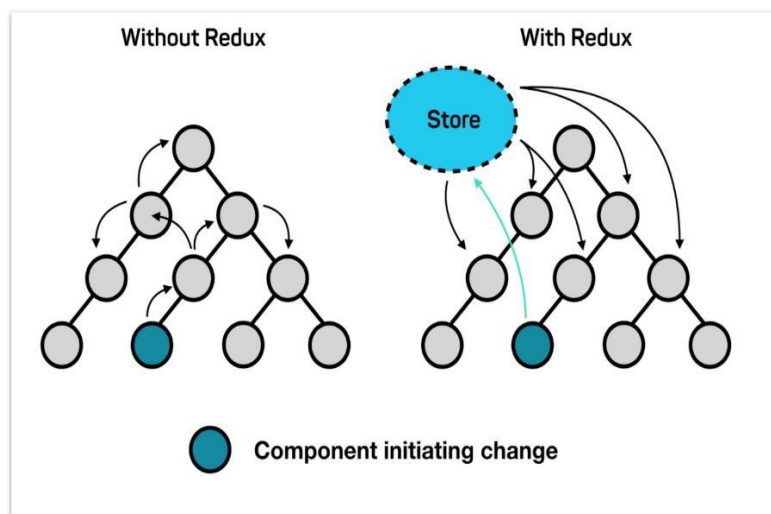


Figure 2.4 Redux share state between components

Next, the project is to implement web APIs in ASP.NET Core as the middle tier framework. ASP.NET Core brings several advantages such as improved performance, cross-platform support, lesser code and most importantly, easier maintenance. Moreover, APIs also provide developers with the capability to manage complex applications. The C# is used in developing the ASP.NET Core project with LINQ (Language Integrated Query) to retrieve data from different sources and databases. Lastly, the Microsoft SQL server is used as a database. The reason for using this database is it can integrate perfectly with ASP.NET Core with code first approach to build and design database entities and relationships.

2.6 Frontend frameworks for web development

2.6.1 Angular



Figure 2.5 Angular Logo

Angular is an open-source front-end framework developed by Google in the year 2010. Angular is considered a component-based framework and contains a rich development library. Angular adopts both one and two-way data binding to listen for events and share data. Angular use MVC architectural pattern. It can divide the file into multiple files, which are called chunks, reducing the loading time for HTML. The advantage of the Angular framework is that it provides multiple built-in functions for developers, so a third parties library is not needed. The drawback of Angular framework is obvious. Angular frameworks generate heavy-duty applications and systems due to the many built-in functions. Moreover, Angular is unsuitable for newbies because some concepts might confuse them.

2.6.2 ReactJs

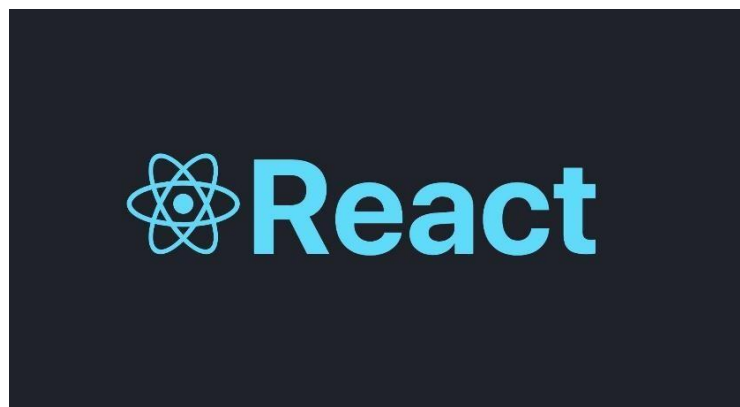


Figure 2.6 React Logo

React is a UI library to create a single-page application developed by Facebook with an MVVM architecture pattern. React is considered a JavaScript library but not a framework. The library is popular due to its component-based architecture. React project is not restricted to web applications, but can be used in mobile applications, Virtual Reality and Augmented Reality because React component is reusable and the logic behind the code is similar. React project is easily manageable because every component can be split into a small component. This makes the debugging and testing process easier. React is a one-way data binding library, which means UI element unable to change the components state without a third part library like Redux. React core concept is Virtual DOM, Virtual DOM can be considered as a lightweight copy of DOM, by using the virtual DOM, the selected object can change without replace the entire DOM, it compared with the previous DOM object, and if any difference is noticed, the difference part will be modified in DOM [12].

2.6.3 VueJs



Figure 2.7 Vue Logo

Vue is an MVVM JavaScript framework to design the single page application and user interface. Vue is exceptionally lightweight and quick. Thus, it can increase accessibility for users with slower connections and better performance for machines with limited resources. Vue utilizes component-based architecture, it also uses reusable components to reduce the development time. The disadvantages of Vuejs are the community is not as large as that of Angular and React and limited plugins available.

Features	Angular	React	Vue
Type	Framework	Library	Framework
Language	Typescript, HTML	JavaScript, JSX	HTML, JavaScript
DOM	Incremental DOM	Virtual DOM	Virtual DOM
Data binding	Two-way	One-way	Two-way
Framework size	Large	Small	Moderate
Learning Curve	Difficult	Moderate	Easy
Community size	Large	Large	Small
		✓	

Table 2.5 Comparison Between Frontend Development Frameworks

React is chosen as the Frontend Development Framework for this project because the Virtual DOM concept renders the changes component without rewriting the entire HTML. This ensures quick performance and renders the Pages much more quickly. Next, one-way data binding simplifies the debugging process and increases the stability of the code. Lastly, community size is essential, the developer can ask for help if they encounter some bug or error in their code, and it is a good choice for developers who build projects in short periods [11].

2.7 CSS Framework for frontend Development

Ant-Design



Figure 2.8 Ant Design Logo

Ant Design is a React UI library created by Alibaba, and the library provides many high-level components to develop the UI for the React application. It is straightforward because the official documentation provides multiple examples of each component. Therefore, the development time can be shortened. As an example, Ant-form provides a pre-written Onsubmit

function, which simplifies the process for POST/PUT request, so the custom prop like innerRef need not pass the props to redux thunk for Ajax request. Moreover, the disadvantage of Ant-Design is the components are difficult to customize, but if the developer can obtain the class name from the developer tools, then the customization will be easy.

React-Bootstrap

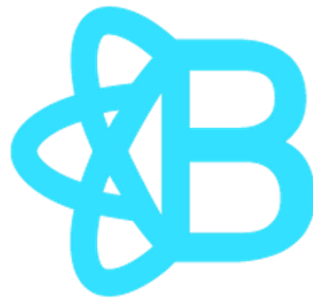


Figure 2.9 React-Bootstrap Logo

React Bootstrap is built with the most popular CSS framework, Bootstrap. React Bootstrap rebuilt the Bootstrap and JavaScript with React Component that works perfectly fine in JSX. JavaScript library like jQuery is removed for React Bootstrap because it is not needed for react application development. The advantage of React Bootstrap is that it provides components like containers, rows and columns to develop a fully responsive web application. The disadvantage of React-Bootstrap is it provides fewer components compared to Ant-Design.

React Suite



Figure 2.10 React Suite Logo

React Suite is a UI library for React components. The library provides vast React components, and the themes are customizable. React Suite is not recommended for beginners because the official website has extremely bad documentation and no example provided.

Features	Ant-Design	React Bootstrap	React Suite
Customizable	Moderate	Difficult	Easy
Responsive Design	Yes	Yes	No
High-Level component	Yes	No	No
Official Documentation	Good	Good	Poor
Components Amount	High	Low	High
	✓		

Table 2.5 Comparison Between CSS Frameworks

2.8 Web development platform

The developer had various programming languages to choose from for development. Thus, choosing the correct language and platform before the project starts is essential. Because selecting the correct language and platform not only can accelerate the development speed but also ensures system security.

2.8.1 PHP



Figure 2.11 PHP Logo

PHP is an open-source scripting language used for server-side scripting. PHP typically generates dynamic page content, encrypts and decrypts data, controls user output, etcetera. PHP tag can be directly embedded into an HTML document rather than using the function from an external file to perform the logic. Laravel is an open-source PHP web framework that provides an API framework for developers to build their Rest API with the MVC pattern architecture. One of the advantages of the Laravel framework is that it can save lots of development time since integration is at a quick rate. Additionally, if the developer encounters a problem, Laravel has a vast user community to provide technical support. The disadvantages of PHP are PHP frameworks must learn to use built-in PHP features to prevent creating additional code and it has poor quality for errors handling and lack of debugging tools.

2.8.2 Asp.Net Core



Figure 2.12 ASP.NET CORE Logo

ASP.NET Core is an open-source web framework developed by Microsoft. The framework is a combination of ASP.NET MVC and ASP.NET web API, rewritten by Microsoft. With ASP.NET Core, the developer can build web apps, services, and mobile application backends. It simplifies the cross-platform development integration and process. Visual Studio enables developers to create highly appealing applications with multiple technologies like Razor Pages, Blazor, Web API and MVC.

2.8.2.1 Advantages of Using ASP.NET Core

1. ASP.NET Core reduces the amount of code needed to build a complex and extensive application because it provides multiple rich libraries for high-level functions.
2. Web API support: The framework includes a simple Web API to integrate with Swagger. Documenting API applications as they are being developed is a good idea. It makes it easier for other developers to work with the project. Therefore, the developer does not need to download software like Postman for data mocking.
3. The page is continuously monitored by the web server. Suppose any memory leaks or endless loops are detected. It immediately destroys those activities.
4. Simplify the process for integration of Client-side frameworks like ReactJs and AngularJs. ASP.NET Core provides framework templates such as AngularJs, ReactJs, and React with Redux.
5. Reduce server setup time because ASP.NET Core can host on the IIS server.
6. Dependency injection in ASP.NET Core becomes extremely easy.

2.8.2.2 Disadvantages of using ASP.NET Core

1. Window-based Development Tools, Operating systems such as Linux cannot download visual studio for development. IDE like JetBrains Rider might be an alternative but require more time to configure and set up the project.
2. Costly compared to other options. The expenses like Visual Studio licenses and Microsoft SL licenses.

2.8.3 JSP



Figure 2.12 Java Logo

Jakarta Server Page, or JSP, is a technology used to build a dynamic web application based on XML and HTML. Aside from using the Java programming language, JSP is comparable to ASP and PHP. One advantage of JSP is that it can utilize all of Java Servlet's features because it is an extension of Java Servlet. Additionally, it can be combined with custom tags. The disadvantages of JSP are servlet makes it extremely difficult to track down errors in the code and requires more time for compilation compared to a server.

Features	PHP	ASP.NET Core	Java
Runtime environment	Zend Engine	CLR	JVM
Platform	Any	Any	Any
Local host servers	Apache	IIS	Tomcat
Tool and extension support	No	Yes	Yes
Object-oriented function	No	Yes	Yes
Debugging	Difficult	Easy	Easy
Execution time	Slow	Fast	Fast
Memory-consuming	High	Low	High
Code cleanness	No	Yes	Yes

		✓	
--	--	---	--

Table 2.7 Comparison Between Web Development Platforms

The table shows that every framework has unique strengths and weaknesses regarding functionality and performance. Hence, ASP.NET Core will be selected as a web development framework because it can speed up the development. ASP.NET Core is prebuilt with an IIS server, so the user can directly host a local host server without further setup and configuration. Moreover, ASP.NET Core and SQL server integration can be done with a few lines of code.

Chapter 3

System Methodology/Approach

3.1 Review of Software Development Methodologies

Waterfall Methodology

The Waterfall Model is a linear sequential life cycle model. There is no overlap between phases in a waterfall model, and each step must be finished before the subsequent stage can start. This implies that a development phase can only start after the previous one is finished. The waterfall model can be divided into six phases: Requirement analysis, system design, implementation, testing, deployment, and maintenance. project limitations are fully understood, and the waterfall model is the best option for projects with clear deliverables and schedules.

The Waterfall Method

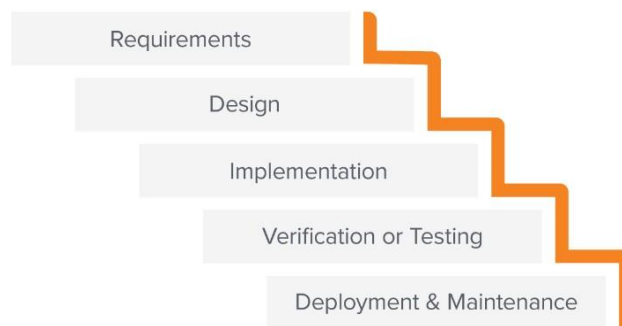


Figure 3.1 Waterfall model

Agile Methodology

Agile methodology is a model used for software development. The model focuses on delivering software quickly and ensuring quality. Agile methodology is used for short or medium-scale projects, and adaptability and flexibility are emphasized in this model. Continuous improvement at every stage and ongoing collaboration with stakeholders is required because this model's primary goal is customer satisfaction. Agile methodology divides a project into several phases: requirement gathering, analysis, design, development, testing, deployment and review from a customer. The development life cycle is iterative and typically iterates for one week to 1 month [14]. This methodology can be used for small and medium- sized projects and is flexible enough to support modifications, unlike the Waterfall Methodology, which requires one phase to be finished before moving on to the next phase. Since the project's outcome is unpredictable, its adaptability allows one to make a quick change before the completion of the project [9].

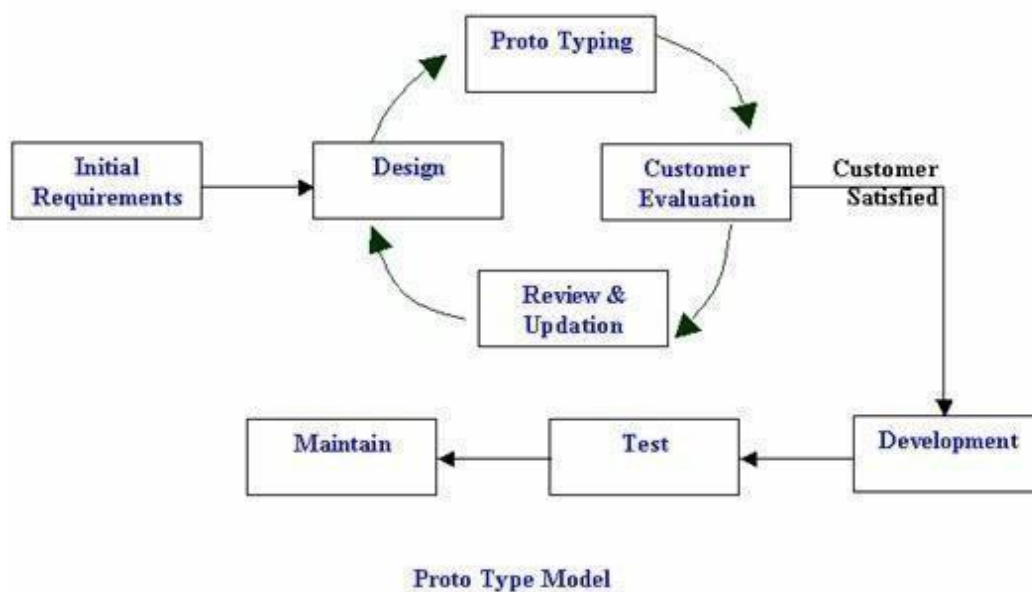


Figure 3.2 Agile model

Prototype Methodology

The prototyping model is a software development model where a prototype is created, tested, and improved until it is acceptable. This methodology can be divided into six stages of the System Development Lifecycle: Requirements gathering and analysis, design, building a prototype, Initial user evaluation, refining prototype, implementation, and maintenance. This methodology is used for the development because there is uncertainty, and the user need is unclear. And more importantly, the process of development can be done quickly with low cost, users can get quick feedback on their needs, and they can improve them in the early stage of software development. Making changes in the development life cycle early is very cost-effective, because there is no need to redesign and redo the system [10]. Prototyping models can develop a system in a short period of time compared with another models like waterfall model because in waterfall model, next phase will begin after the previous phase is completed.

Figure 3.3 The prototyping model



3.2 Comparison of Software Development Methodologies

Methodology	Waterfall Methodology	Prototype Methodology	Agile Methodology
Advantages	-Easy to monitor and manage -More suitable for the project with clear planning and structure.	-More flexible in design -Missing functionality can be detected easily -Make sure for customer satisfaction level	-Ensure the project is completed in a short period -The model allows fast problem finding and solving -
Disadvantages	-Require proper planning due to the difficulty of making changes after the project is finished. - More time are Required because each phase must be complete before the next phase starts.	-Costly compared to other methodology -Cause some problems due to the system being incomplete	-Limited documentation and lack of project detail -Not suitable for the long-term project
		✓	

Table 3.1 Comparison of Methodologies

Online service selling web applications is considered a medium-scale project, and the project has a short development cycle. After reviewing the methodologies, the prototyping methodology is chosen for this project. Moreover, the system requires a large amount of user interaction, so the prototype model is suitable for the project. The waterfall model is not ideal as the waterfall model requires detailed analysis, and changes might be complex when the project enters the next phase. The agile model is not selected as the final project can be different since the agile model focuses more on development than documentation, and the agile model's primary goal is more toward rapid production but not product quality.

3.3 Project Development Tools

ReactJs

React is a UI library to create a single-page application developed by Facebook with an MVVM architecture pattern. The library is popular due to its component-based architecture. React project is not restricted to web applications, but can be used in mobile applications, Virtual Reality and Augmented Reality because React component is reusable and the logic behind the code is similar. React project is easily manageable because every component can be split into small components. This makes the debugging and testing process easy. React core concept is Virtual DOM. Virtual DOM can be considered as a lightweight copy of DOM. The virtual DOM can change the selected object without replacing the entire DOM compared with the previous DOM object. The difference part will be modified in DOM if any difference is noticed.

Asp.Net Core

ASP.NET Core is an open-source web framework developed by Microsoft. The framework is a combination of ASP.NET MVC and ASP.NET web API, rewritten by Microsoft. With ASP.NET Core, the developer can build web apps, services, and mobile application backends. It simplifies the cross-platform development integration and process. Visual Studio enables developers to create highly appealing applications with multiple technologies like Razor Pages, Blazor, Web API, and MVC.

SignalR

SignalR is a real-time web technology developed by Microsoft that allows bi-directional communication between client and server in real-time. It enables web developers to create applications that have real-time functionality, such as chat applications, notifications, and collaborative apps.

One signal

One Signal is a service that makes push notifications possible while hiding information like the platform the device is using. Applications built on Out Systems can send and receive push alerts thanks to the One Signal plugin.

Stripe

Stripe is a third-party API that provides payment services for online transactions. Stripe provides multiple transaction methods such as PayPal, cryptocurrencies, Visa and MasterCard.

Microsoft cognitive service – speech Api

Microsoft Speech Translation is a cloud-based service provided by Microsoft that allows developers to integrate real-time speech translation into their applications. It uses state-of-the-art machine learning and deep neural network technologies to enable real-time translation of spoken language in various languages.

WebRTC

WebRTC is an open-source real time communication created by Google, WebRTC enables the web application to capture the video and audio streams without installing third party plugins or API. WebRTC will generate a peer-to-peer connection and it is the essential and only tool to create video conferencing.

3.4 Requirement specification

Requirements specification describes the intended use and setting for software being developed. The requirement specification clearly outlines the functions and performance standards for the project.

3.4.1 Functional Requirements

Functional requirements can also be seen as supporting statements for the services the system will provide and display how the system will function under various specific conditions and react to different inputs.

RequirementID	Requirement Statement	Must/Want
FR001	The web application allows users to register and log-in into their account before they can access some features of the application	Must
FR002	Users shall be able to register as a freelancer by submitting the required pieces of information and documents	Must

FR003	Freelancers shall be able to sell their services in any category, and customers shall be able to purchase their services via Visa Card, Freelancer will not get paid before customers approve their project submission.	Must
FR004	Customers shall be able to post their projects, and freelancers can bid on the project listed on the project listing page. Then customers browse through the freelancer list and select one freelancer who is suitable for the project	Must
FR005	The web application shall have a member subscription page for the customer. After subscription, members get a 10% discount for every service purchased.	Want
FR006	Customers and freelancers shall be able to use the chat and video call features to discuss the detail of the project	Want
FR007	Customers shall be able to search and filter the result based on keyword	Want
FR008	The web application shall allow the user to edit their profile information	Want

3.4.2 Non-Functional Requirements

Non-functional requirements are a group of specifications that outline the system's operational limitations and capabilities while attempting to enhance its functionality. These specifications define its function effectively, including speed, security, performance and data integrity.

Factor	Description
Security	<ol style="list-style-type: none">1. Account creation: The web application requires users to register an account before accessing some features of the application.2. Password protection: The web application has added salt to hashing for encrypting user passwords.3. JWT security: The web application has stored the JWT token in HTTP Only cookie instead of local storage and cookies to prevent XSS and CSRF attacks.
Compatibility	The web application is built for a web platform and operated on a browser.
Usability	<ol style="list-style-type: none">1. Navigation: Users can easily navigate through the pages. The system provides a clean and effective interface for the user.2. Features: The web application provides multiple built-in features such as chat/video calls and language switching functions.

<p>Localization</p>	<p>1. Languages: Users could select a language based on their preferences.</p> <p>2. Time zones: Service added time is based on user time zone.</p> <p>3. Currencies: The web application will display different currencies based on the user's country.</p>
<p>Availability</p>	<p>Users can access the application if there is an internet connection.</p>

3.5 Use Case Diagram



Figure 3.4 Top level use case diagram

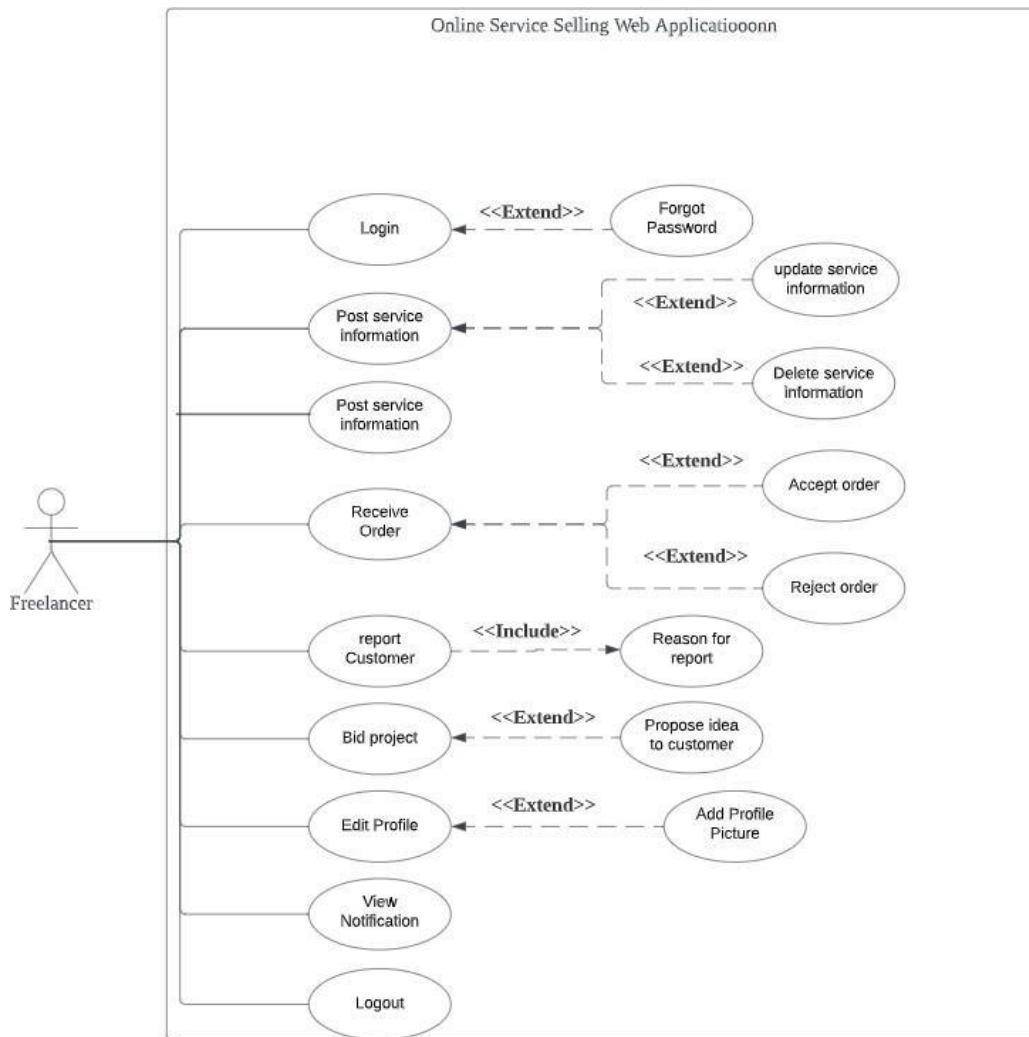


Figure 3.5 Use case diagram for Freelancer

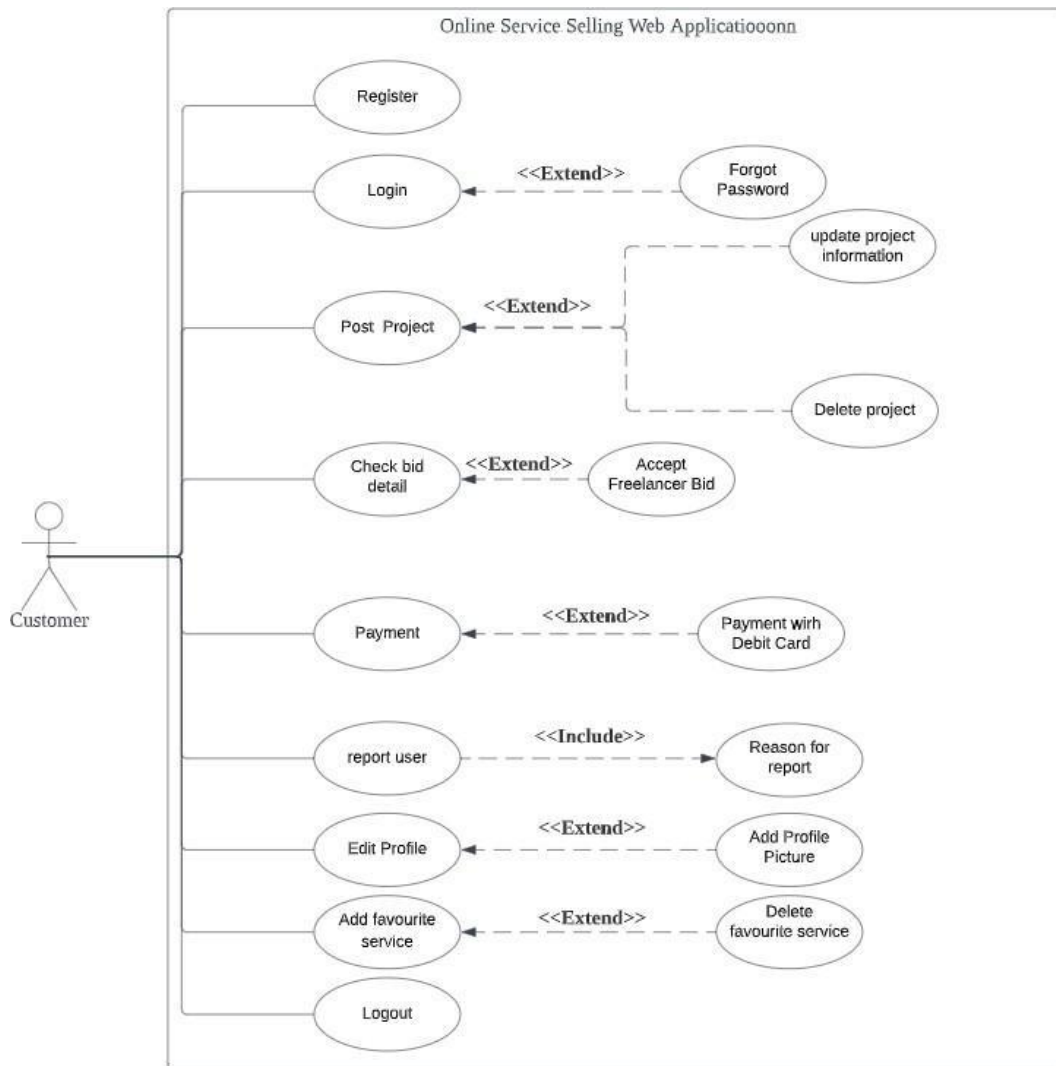


Figure 3.6 Use case diagram for customer

3.6 Use Case Description

Authentication and Authorization Modules

Use Case Name: Authentication	ID: UC01	Importance Level: High
Primary Actors: Customers, Freelancers	Use Case Type: Details, Essential	
Customers: The system requires clients to register and log in before posting projects and making service purchases.		
Freelancers: Freelancers must log in to the system to browse for available projects, submit bids on them, and obtain the project once the customer has accepted their request.		
Pre-conditions: The customers and freelancers had to register before performing log-in		
Post-conditions: The customers and freelancers can access more application features and pages		
Relationships: Association: Customers, Freelancers Include: N/A Extend: Forgot Password		
Primary flow: <ol style="list-style-type: none">1. Users browse the log-in page of this web application.2. Users enter their email and password, press “Enter”, or click on the log-in button.3. The system displays log-in success and redirects users to the website's landing page.		
Sub Flow: N/A		

Freelancer Registration Modules

Use Case Name: Freelancer Registration	ID: UC02	Importance Level: High
Primary Actor: Freelancer	Use Case Type: Details, Essential	
Freelancer:		
Freelancers get verified by the web application by filling in personal information and submitting required documents, and only verified freelancers are allowed to sell services and participate in the project application		
Pre-conditions: Freelancers are required to enter their passwords to confirm their identity before proceeding to registration.		
Post-conditions: Freelancers are allowed to sell services and participate in the project application		
Relationships: Association: Freelancer Include: N/A Extend: N/A		
Primary flow: <ol style="list-style-type: none"> 1. Freelancers are required to log in with their email and password. 2. Freelancer presses become a freelancer button in the navigation bar. 3. Freelancers enter their passwords to confirm their actions. 4. Freelancers submit the required information and documents. 5. The system displays registration complete to inform the user about successful registration. 		
Sub Flow: N/A		

Sell Services Modules

Use Case Name: Sell services	ID: UC03	Importance Level: High
Primary Actor: Freelancer		Use Case Type: Details, Essential
<p>Freelancer:</p> <p>Freelancer provide their professional service from 8 categories for customer to make order.</p>		
<p>Pre-conditions:</p> <p>Freelancer must get verified before selling their services</p>		
<p>Post-conditions:</p> <p>The system will display the service detail in the find freelancer page</p>		
<p>Relationship:</p> <p>Association: Freelancer Include: N/A</p> <p>Extend: Update service, Delete service</p>		
<p>Primary flow:</p> <ol style="list-style-type: none"> 1. Freelancer enter their profile and click on “create new service.” 2. System redirect freelancer to sell service page 3. Freelancer require to fill in service title, description, category, budget, and image/video. 4. System will redirect freelancer to service list page. 		
<p>Sub Flows:</p> <ol style="list-style-type: none"> 1. Freelancer is allowed to remove the unwanted service in freelancer profile 2. Freelancer is allowed to update the service information 		
<p>Exceptional Flows:</p> <p>The system would alert the user if the validation failed.</p>		

Project Posting Module

Use Case Name: Project Posting	ID: UC04	Importance Level: High
Primary Actor: Freelancers, Customer		Use Case Type: Details, Essential
Customer: Customer posts their project, and they can view the project bidding status.		
Freelancers: Freelancers can browse through the project from the project list and bid for the project before the customer accepts their bid.		
Pre-condition: The projects posted by customer where the bidding session have not to end		
Post-condition: Available projects that are displayed in the project list.		
Relationship: Association: Freelancers, customer Include: N/A Extend: N/A		
Primary flow: 1.The freelancer can see the available project in the project list. 2.Freelancer click on “bid” button. 3.Customers browse through the list of freelancers who bid on their project. 4.Customer checks on their freelancer project before hiring the freelancer to work on their project.		
Sub Flow: N/A		

Searching and Filtering Modules

Use Case Name: Searching and Filtering	ID: UC05	Importance Level: Medium
Primary Actor: Customer	Use Case Type: Details, Essential	
<p>Customer:</p> <p>The customer is looking for a specific service based on location, budget, and delivery time.</p>		
<p>Pre-condition:</p> <p>Internet access must be provided for the device.</p>		
<p>Post-condition:</p> <p>The system will filter specific service for client based on their requirement</p>		
<p>Relationship:</p> <p>Association: Customer</p> <p>Include: N/A</p> <p>Extend: N/A</p>		
<p>Primary flow:</p> <ol style="list-style-type: none"> 1.Customer types of the service name in the search bar. 2.Customer presses “Enter” to search, and system will filter the service contain service name in search bar. 3.Customer could further filter by types of minimum and maximum budget for service 4. System displays the result for customer. 		
Sub Flow: N/A		

Profile Modules

Use Case Name: Profile	ID: UC06	Importance Level: Low
Primary Actor: Customer, Freelancer	Use Case Type: Details, Essential	
Customer: Customer wish to update their personal information such as username and profile picture		
Freelancer: Freelancer want to update their personal information's and documents		
Pre-condition: <ol style="list-style-type: none"> 1. Customers and Freelancers must log-in to their own account. 2. Internet access must be provided for the device. 		
Post-condition: Update is performed and the web application will display user latest information		
Relationship: Association: Customer, Freelancer Include: N/A Extend: update information, delete document		
Primary flow: <ol style="list-style-type: none"> 1. Users click on edit profile's button and will be redirect to profile edit page 2. Users click on update info/ delete button to update or delete selected information and documents. 3. Web application will alert success when the action is completed. 		
Sub flow: <ol style="list-style-type: none"> 1. Freelancer can delete unwanted documents. 2. User are allowed to update their information by clicking on specific button 		
Exceptional flow: The web application would alert user if the file uploaded did not match the specific format		

3.7 Low-Fidelity Prototype

The low-fidelity prototype is a rapid and straightforward physical representation of an idea, interface, process, or information structure designed to elicit immediate feedback and improve the final product. Additionally, this prototype enables prospective end users to recommend potential improvements and changes to the application's functionality.

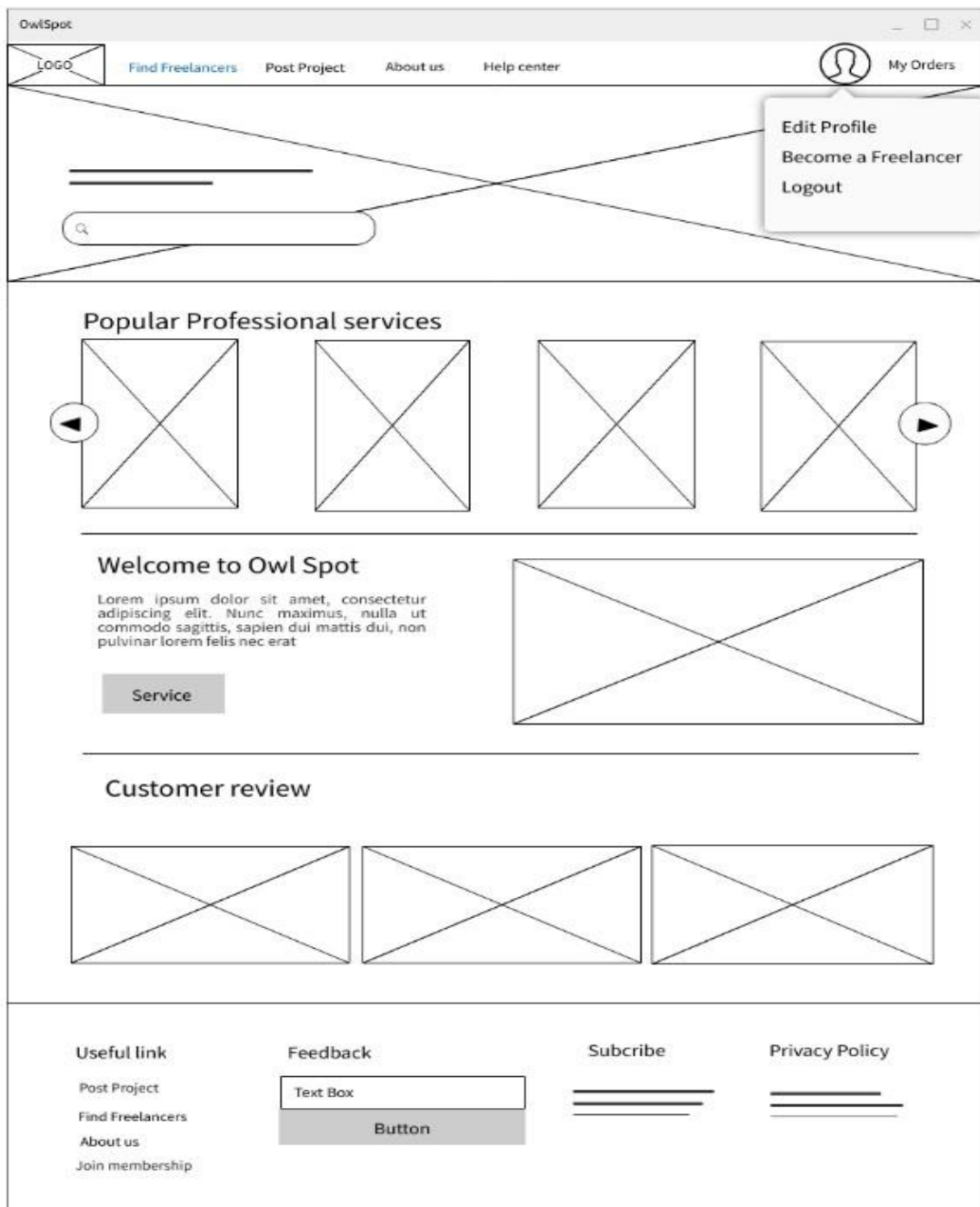


Figure 3.7 Prototype of Landing page

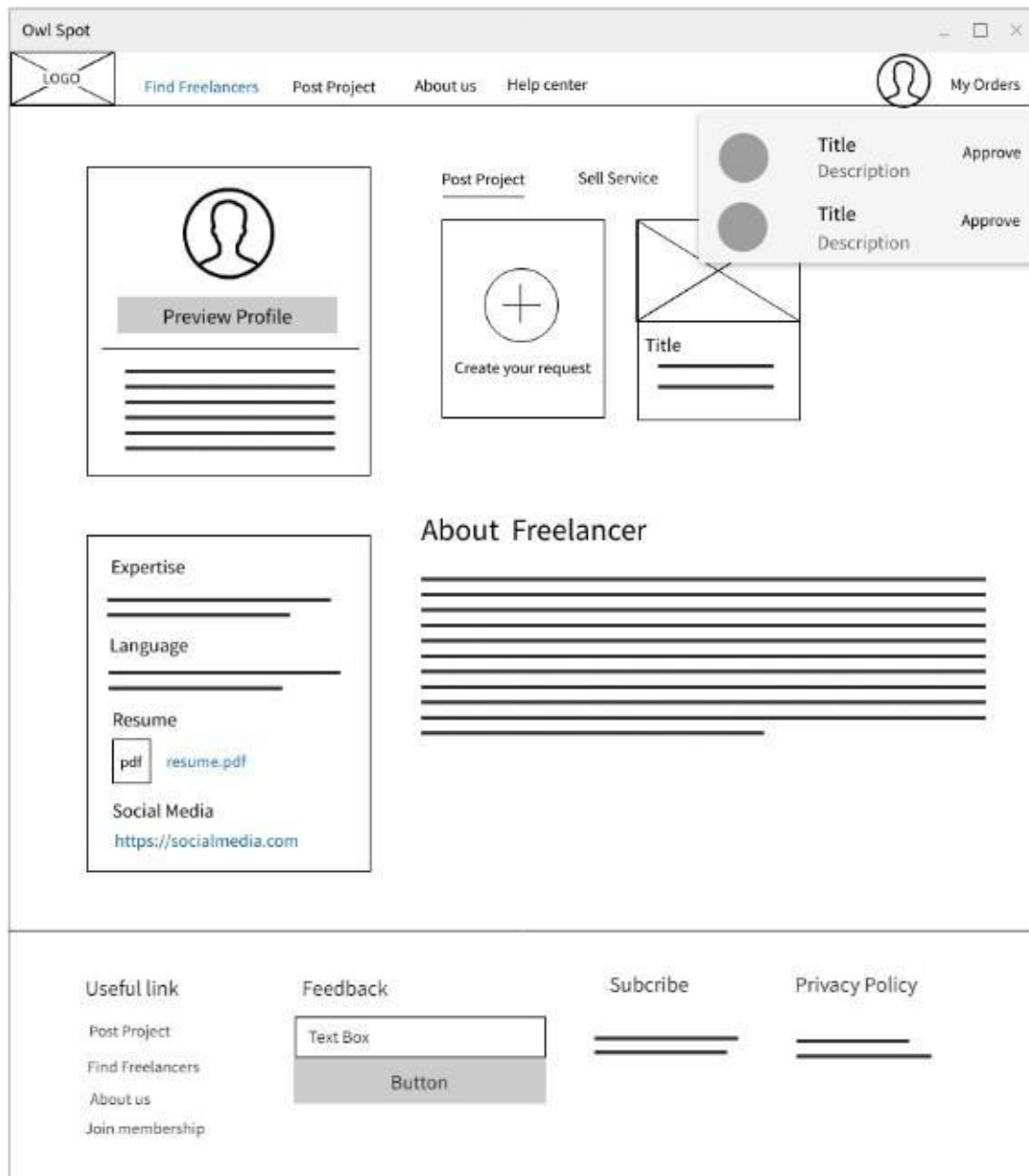


Figure 3.8 Prototype of User profile

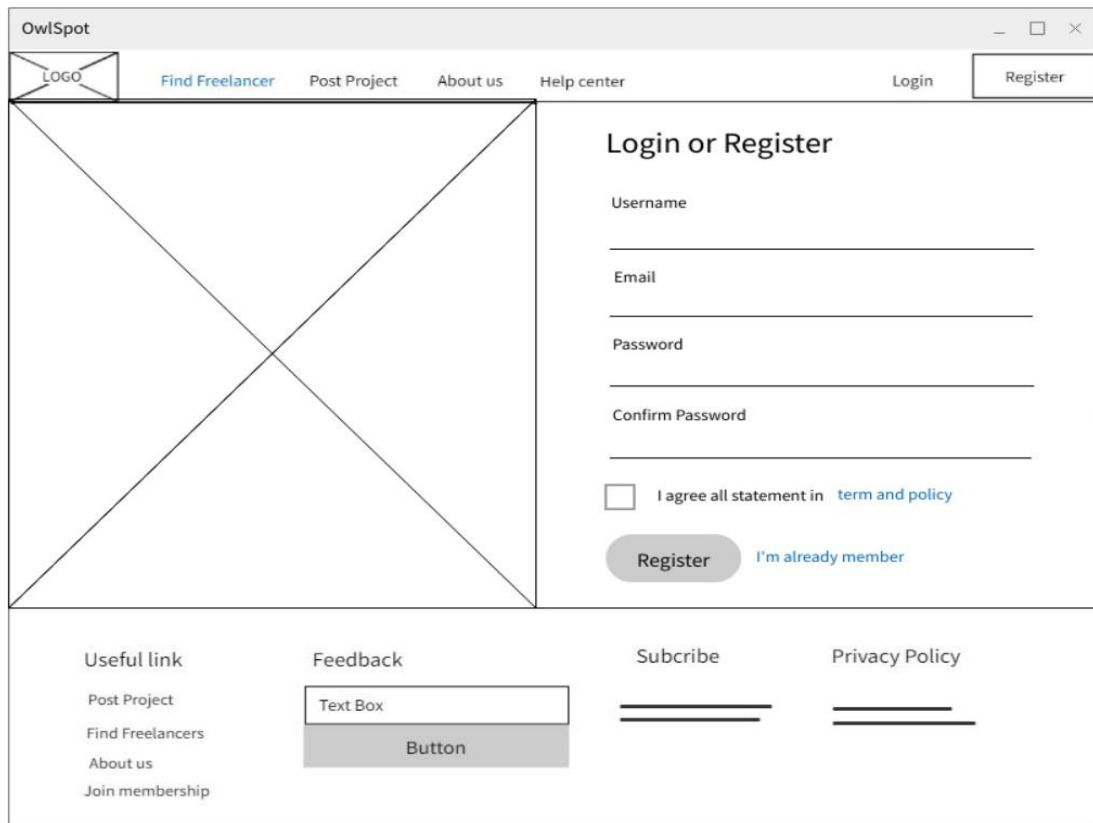


Figure 3.10 Prototype of sign-in page

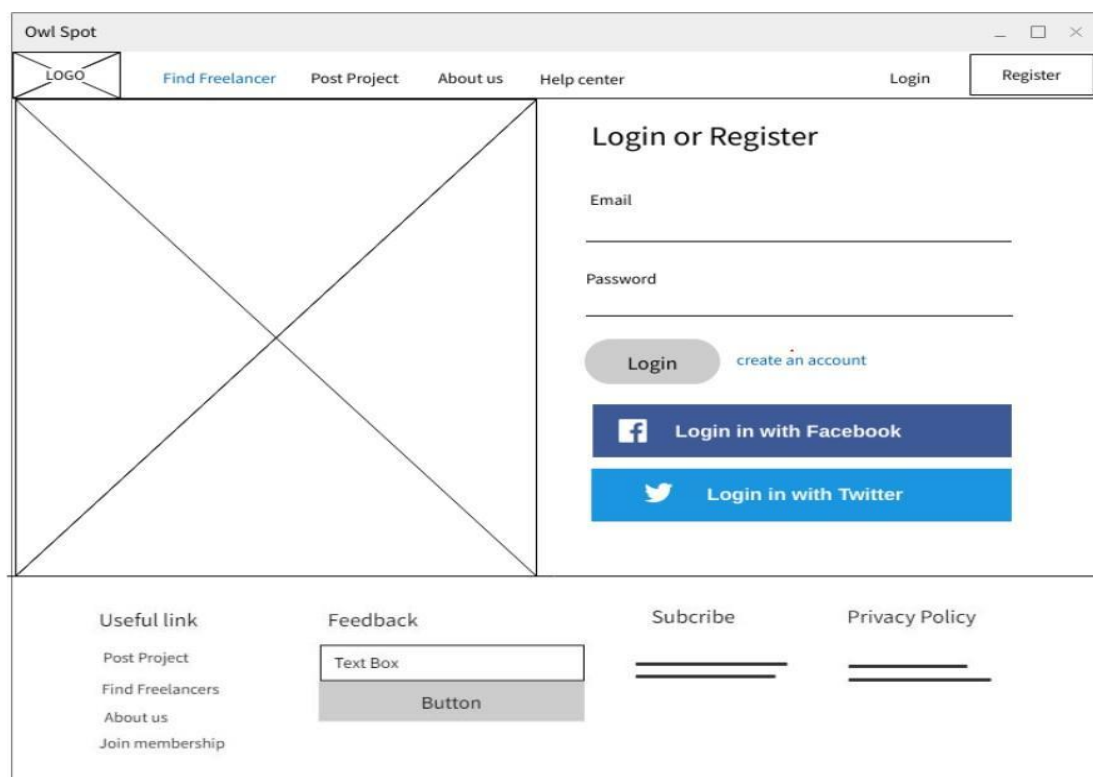


Figure 3.10 Prototype of sign-up page

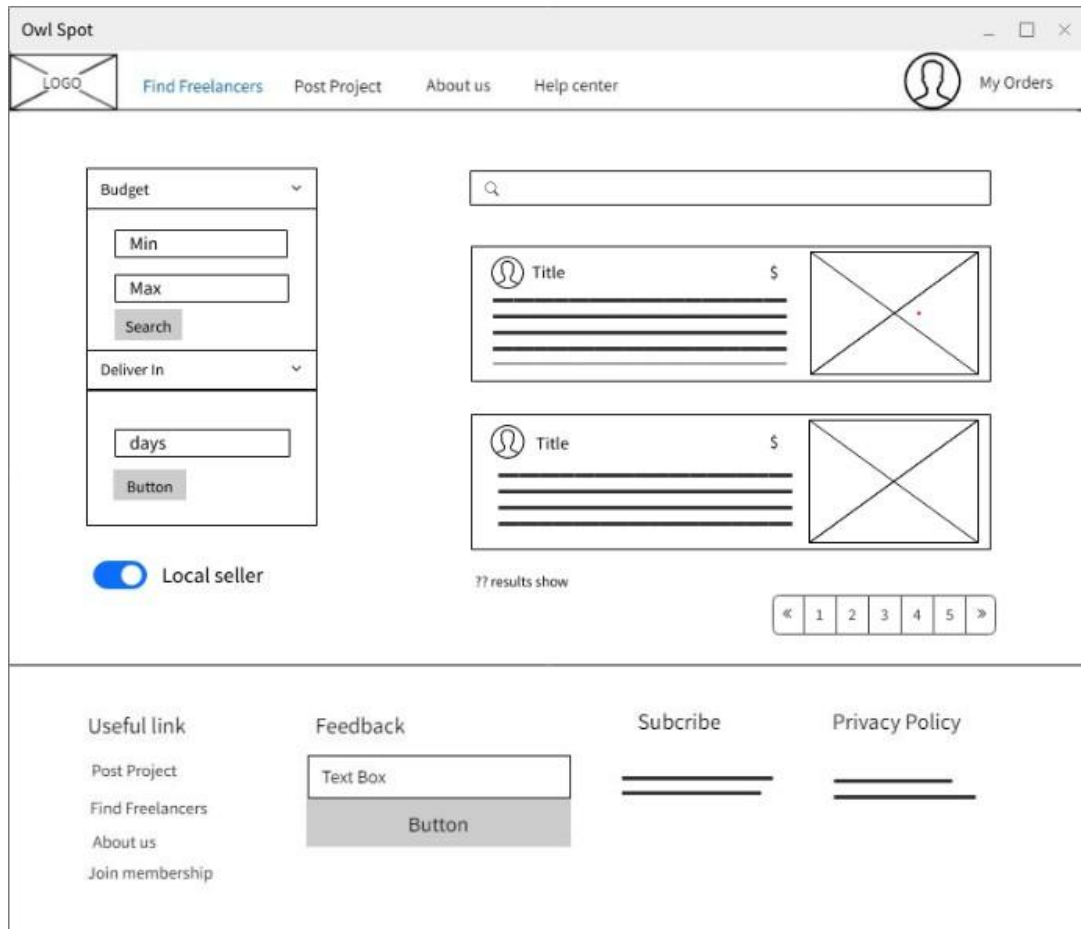


Figure 3.11 Prototype of find freelancer page

Owl Spot

LOGO Find Freelancers Post Project About us Help center My Orders

Freelancer Sell Service

*Title and Category: Title

Select Category Select SubCategory

*Service Description:

*Price: Price

*Deliver in:

Upload Picture or Video

Submit

Useful link

- Post Project
- Find Freelancers
- About us
- Join membership

Feedback

Text Box

Button

Subscribe

Privacy Policy

Figure 3.12 Prototype of Freelancer sell service

Owl Spot

LOGO Find Freelancers Post Project About us Help center My Orders

Post your Project

*Project Title:

*Project Description:

B I U Style - [] [] [] Normal - text - Size - A - A -

*Category:

*Budget:

*Deliver In:

Useful link

- Post Project
- Find Freelancers
- About us
- Join membership

Feedback

Subscribe

Privacy Policy

Figure 3.13 Prototype of Customer project posting

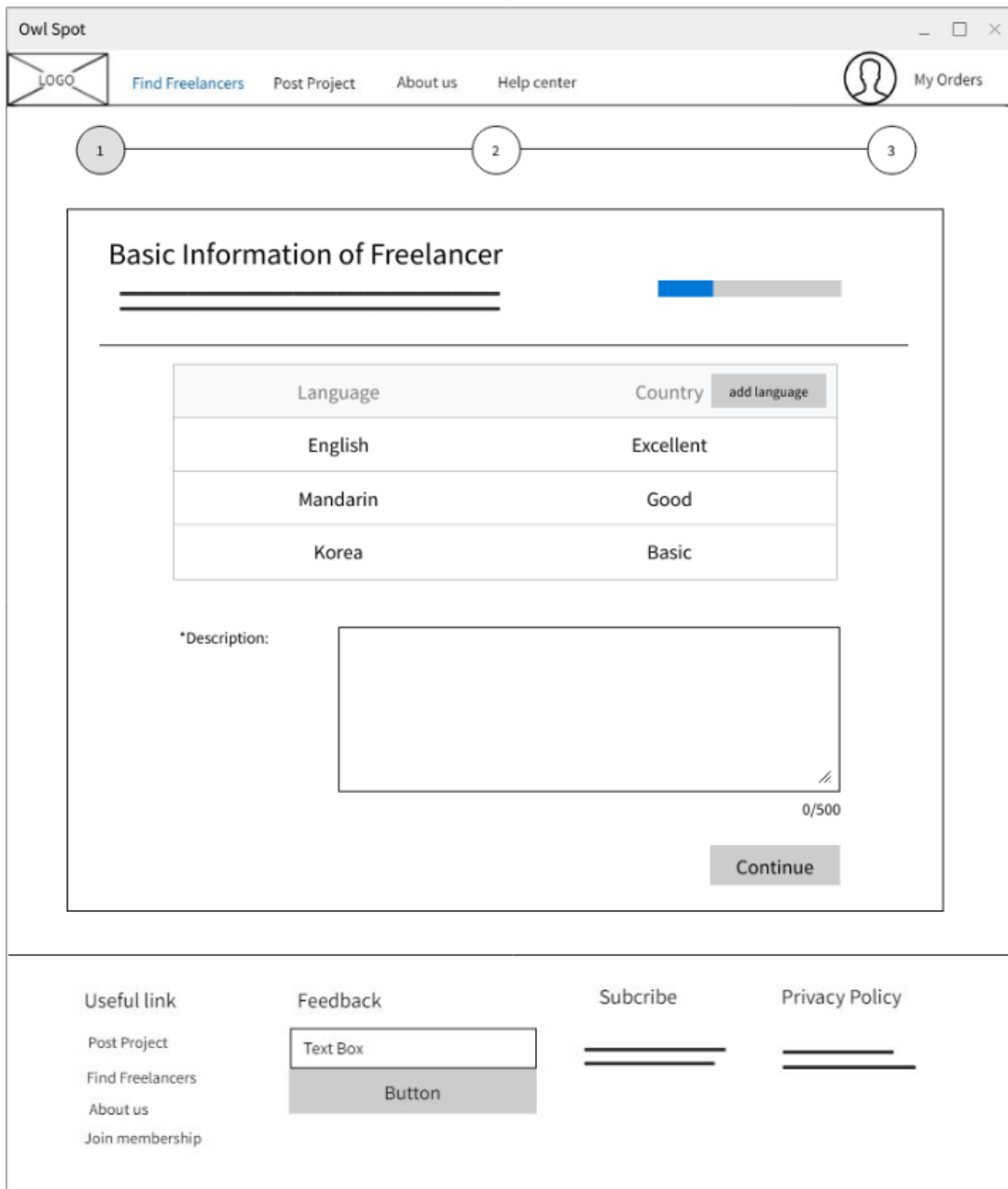


Figure 3.14 Prototype of Freelancer registration page 1

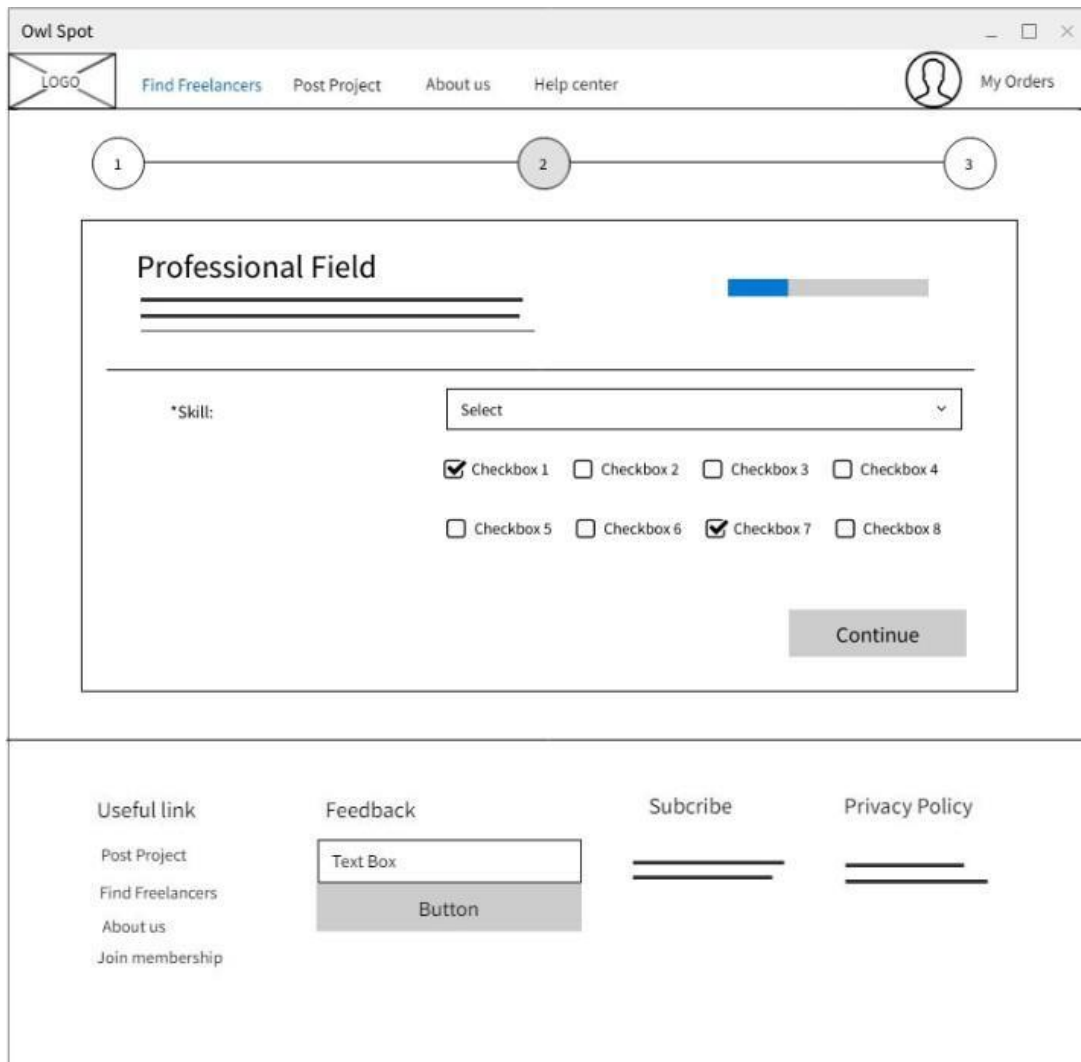


Figure 3.15 Prototype of Freelancer registration page 2

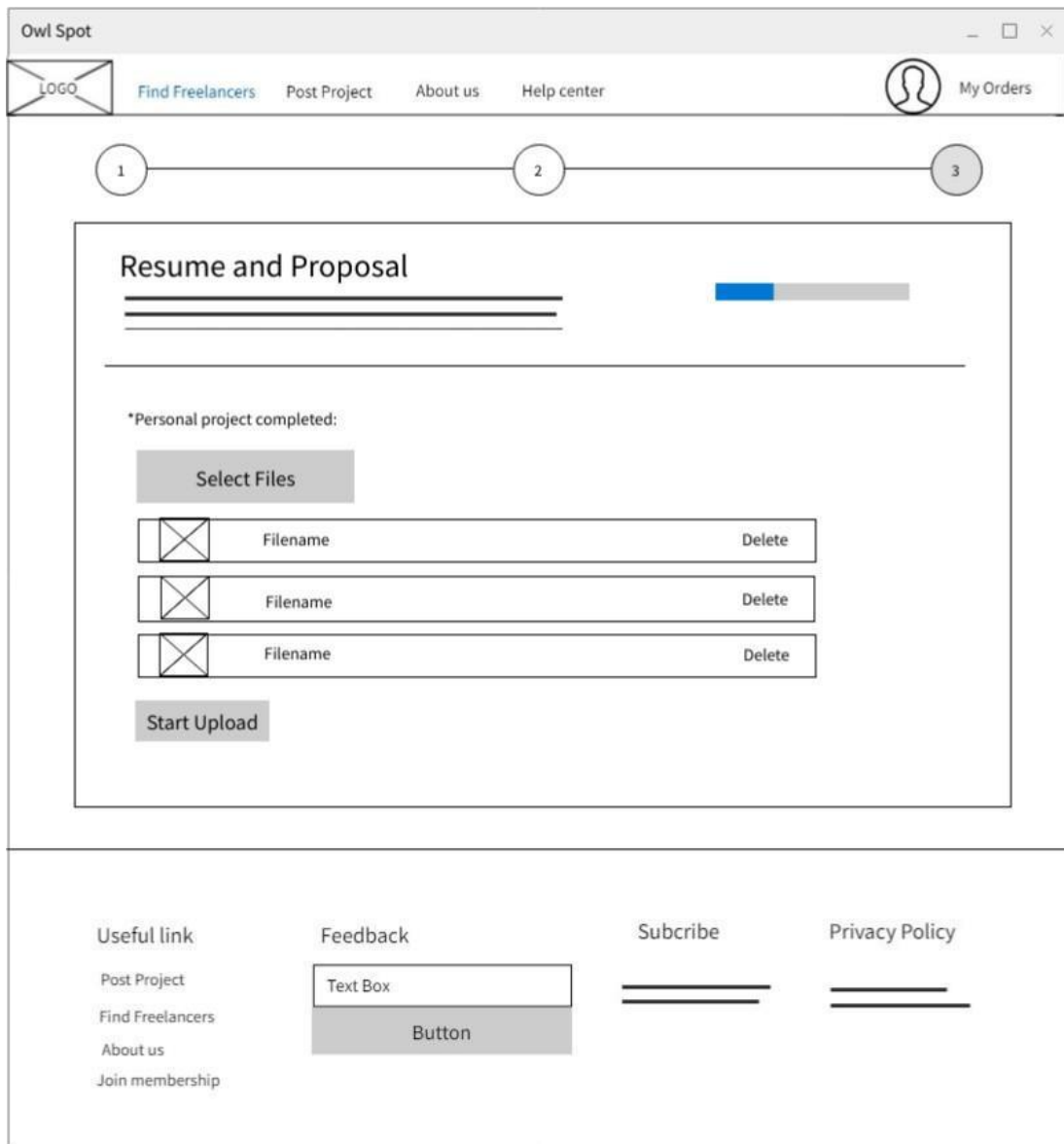


Figure 3.16 Prototype of Freelancer registration page 3

3.8 Class Diagram

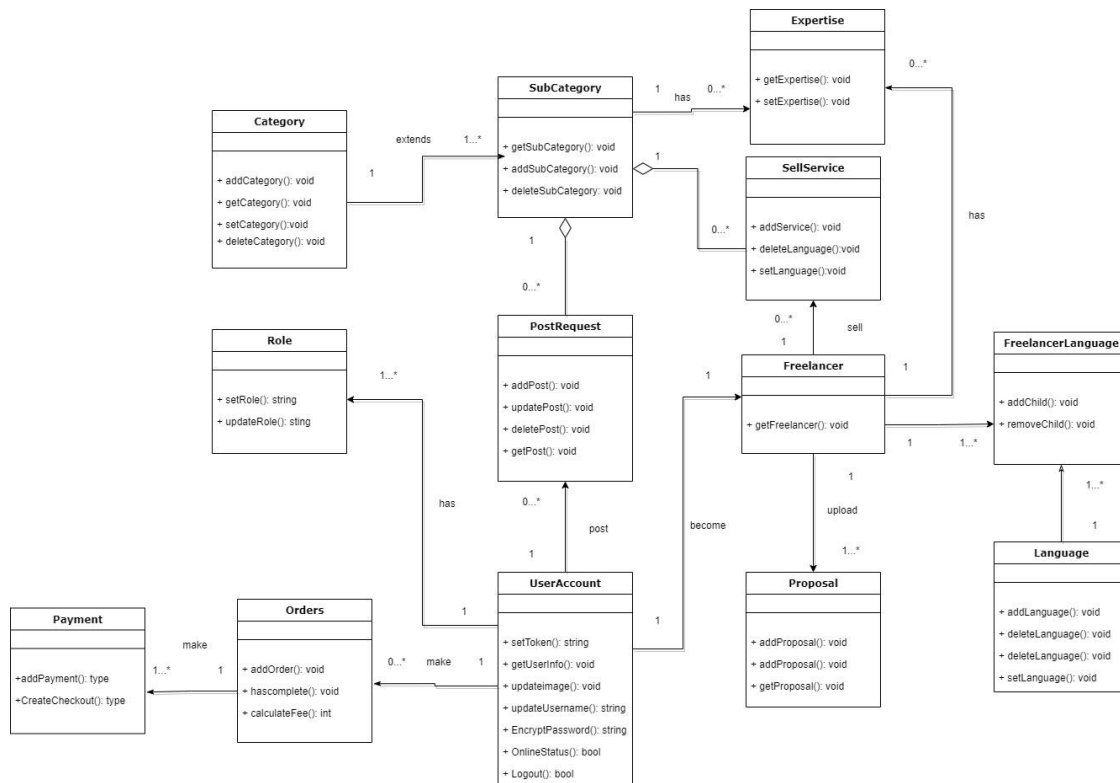


Figure 3.17 Class Diagram

3.9 Database Design

An Entity relationship model defines the database's structure with an Entity Relationship Diagram. In Entity Relationship Diagram, the relationship between entities is shown and can be used as a blueprint before developing an actual database.

Physical Entity Relationship Diagram

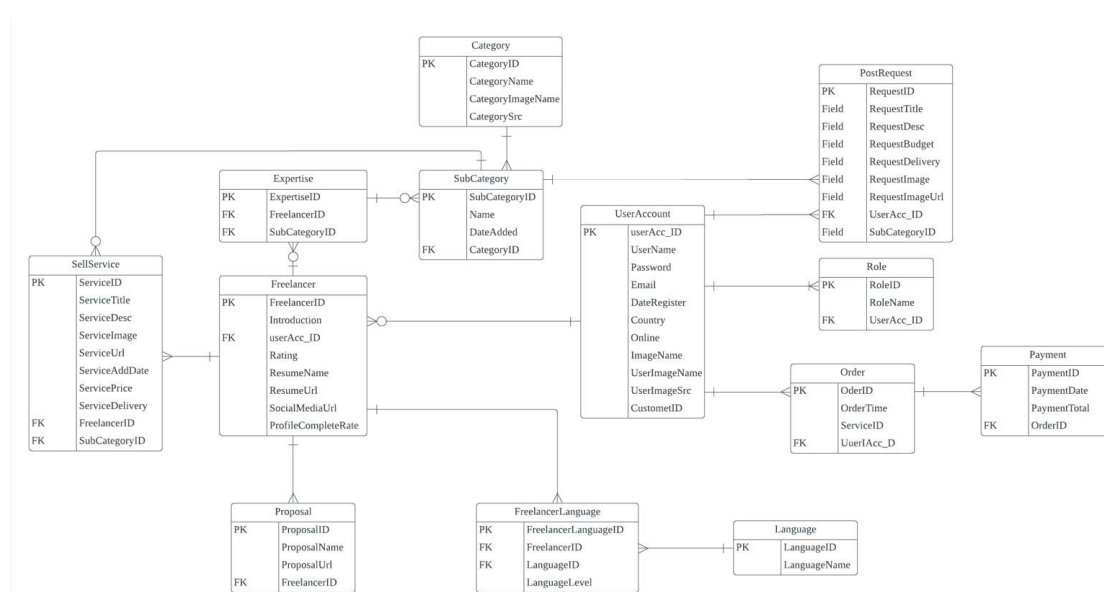


Figure 3.18 Physical Entity Relationship Diagram

Logical Entity Relationship Diagram

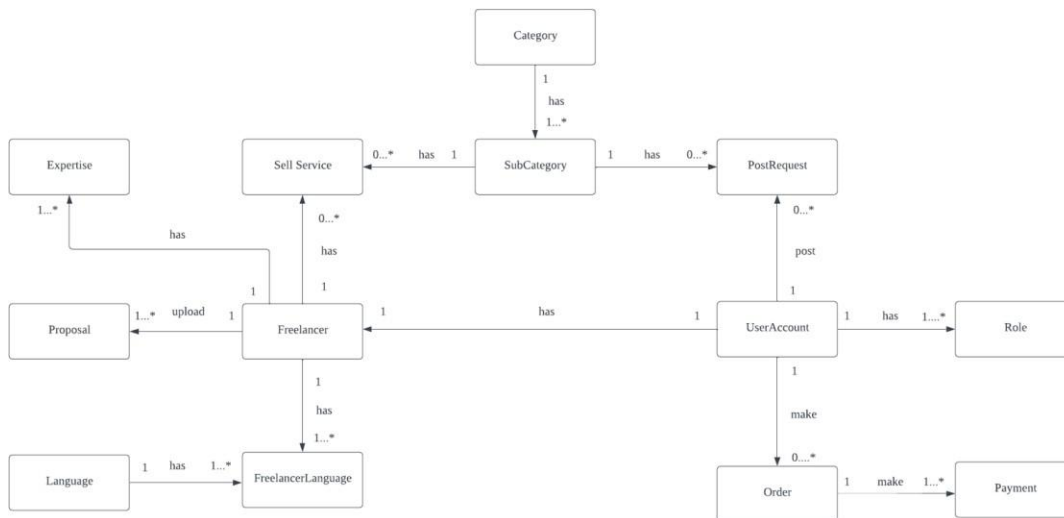


Figure 3.19 Logical Entity Relationship Diagram

3.10 Data Dictionary

Table Number	1		
Table Name	User Account		
Description	Stores user personal information		
Attribute	Data Type	P/F	FK Referenced Table
UserAcc_ID	Guid	P	-
UserName	nvarchar		-
Email	nvarchar		-
Password	nvarchar		-
DateRegister	datetime		-
Online	boolean		-
Country	nvarchar		-
UserImageName	nvarchar		-
UserImageSrc	nvarchar		-
CustomerID	nvarchar		-
Introduction	nvarchar		
Rating	Int		
ResumeName	nvarchar		

ResumeUrl	nvarchar		
SocialMediaUrl	nvarchar		
CompleteRate	Int		
UserAcc_ID	Guid	F	

Table 3.2 Data Dictionary for User Account Entity

Table Number	2		
Table Name	Proposal		
Description	Stores freelancer previously completed project		
Attribute	Data Type	P/F	FK Referenced Table
ProposalID	Guid	P	-
ProposalName	nvarchar		-
ProposalUrl	nvarchar		-
FreelancerID	nvarchar	F	Freelancer

Table 3.3 Data Dictionary for proposal Entity

Table Number	3		
Table Name	Language		
Description	Stores the languages for freelancer to complete their profile		
Attribute	Data Type	P/F	FK Referenced Table
LanguageID	int	P	-
LanguageName	nvarchar		-

Table 3.4 Data Dictionary for Language Entity

Table Number	4		
Table Name	FreelancerLanguage		
Description	Composite table that stores multiple freelancer languages		
Attribute	Data Type	P/F	FK Referenced Table
LanguageLevel	nvarchar		

FreelancerID	Int	F	Freelancer
LanguageID	int	F	Language

Table 3.5 Data Dictionary for Freelancer Language Entity

Table Number	5		
Table Name	Category		
Description	Stores the category provided in web application		
Attribute	Data Type	P/F	FK Referenced Table
CategoryID	int	P	-
CategoryName	nvarchar		-
CategoryImage	nvarchar		-
CategoryImageUrl	nvarchar		-

Table 3.6 Data Dictionary for Category Entity

Table Number	6		
Table Name	SubCategory		
Description	Stores the sub-category service under category		
Attribute	Data Type	P/F	FK Referenced Table
SubCategoryID	int	P	-
SubCategoryName	nvarchar		-
DateAdded	nvarchar		-
CategoryID	int	F	Category

Table 3.7 Data Dictionary for SubCategory Entity

Table Number	7		
Table Name	SellService		
Description	Stores the service provided by freelancer		
Attribute	Data Type	P/F	FK Referenced Table
ServiceID	int	P	-

ServiceTitle	nvarchar		-
ServiceDesc	nvarchar		-
ServiceImage	nvarchar		-
ServiceUrl	nvarchar		-
ServiceDate	datetime		-
ServicePrice	int		-
ServiceDelivery	int		-
FreelancerID	int	F	Freelancer
SubCategoryID	int	F	SubCategory

Table 3.8 Data Dictionary for SellService Entity

Table Number	8		
Table Name	PostRequest		
Description	Stores the project detail posted by customer		
Attribute	Data Type	P/F	FK Referenced Table
RequestID	int	P	-
RequestTitle	nvarchar		-
RequestDesc	nvarchar		-
RequestImage	nvarchar		-
RequestUrl	nvarchar		-
RequestDate	datetime		-
RequestBudget	int		-
RequestDelivery	int		-
UserAcc_ID	int	F	UserAccount
SubCategoryID	int	F	SubCategory

Table 3.9 Data Dictionary for PostRequest Entity

Table Number	9
Table Name	Orders
Description	Stores the order detail of customer

Attribute	Data Type	P/F	FK Referenced Table
OrderID	int	P	-
OrderTime	nvarchar		-
ServiceID	int	F	SellService
ProjectDeliver	boolean		-

Table 3.10 Data Dictionary for Orders Entity

Table Number	10		
Table Name	Payment		
Description	Stores the payment information		
Attribute	Data Type	P/F	FK Referenced Table
PaymentID	int	P	-
PaymentDate	nvarchar		-
PaymentTotal	int		-
OrderID	int	F	Orders

Table 3.11 Data Dictionary for Payment Entity

3.11 Timeline

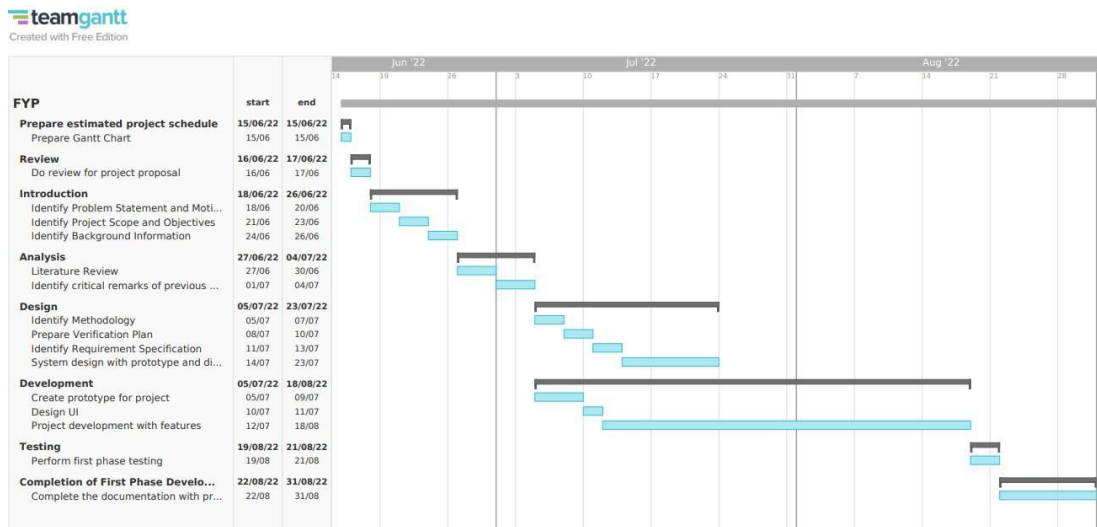


Figure 3.20 FYP1 Gantt Chart

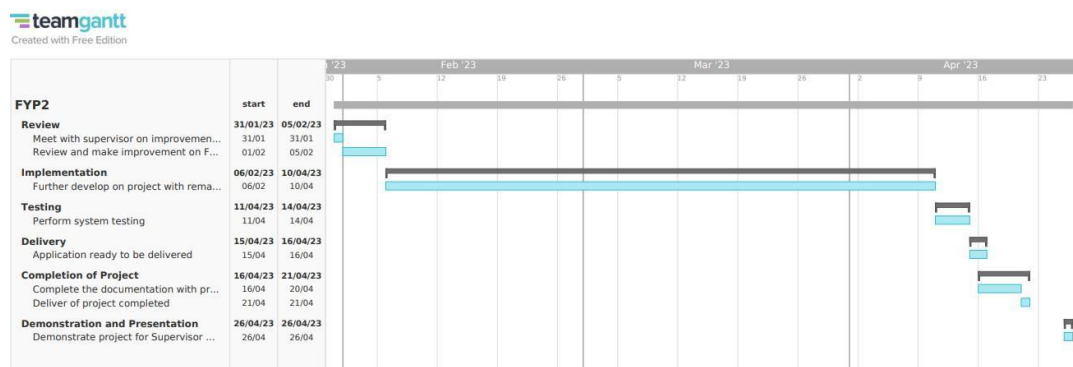


Figure 3.21 FYP2 Gantt Chart

The figure above represents the expected project timeline for developing an Online Service Selling Web Application. The project has followed the prototyping model phases, including requirements gathering, quick design, building a prototype, user evaluation and refining the prototype. FYP (Final Year Project) one focuses more on documentation and requirement gathering. For FYP2, there are several phases to complete which are implementation, testing and deployment.

3.12 System Architecture Diagram

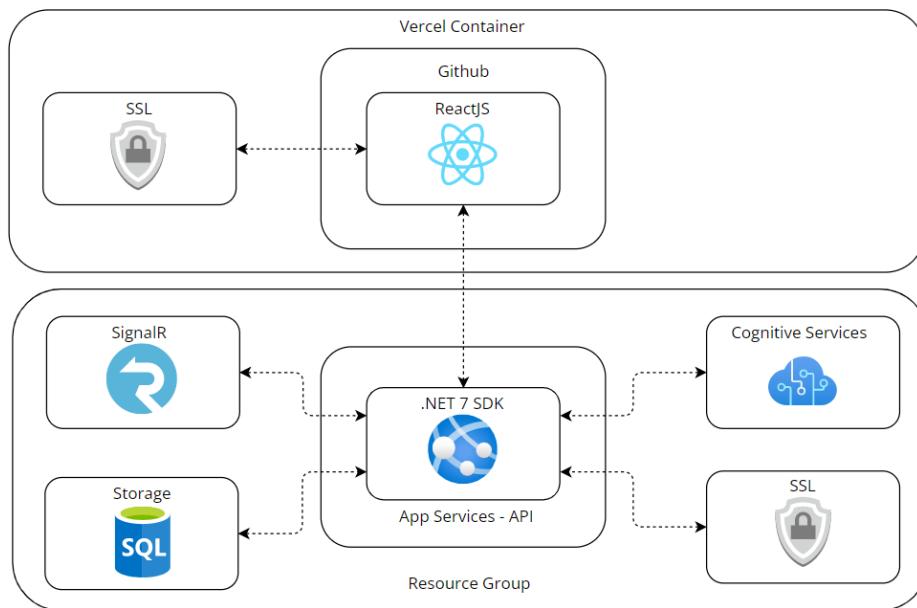
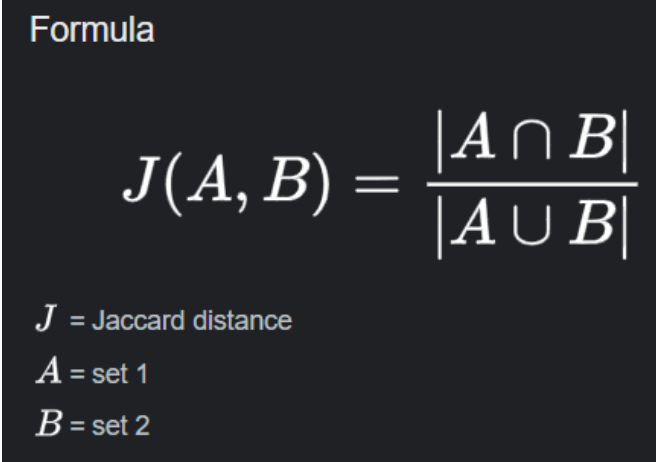


Figure 3.22 System Architecture Diagram

The architecture diagram illustrates the overall development of architecture. The React build folder is uploaded to GitHub for version control, and then deployed to Vercel. Whenever the GitHub folder is updated, Vercel automatically updates the files as well. In addition, the web API is connected to SignalR. Additionally, the web API is connected to Azure Database. This allows the web API to interact with data stored in a SQL database. Moreover, the web API also utilizes Cognitive Services. To ensure that all communication between the front-end and back-end is secure, both the client-side and server-side are protected with SSL encryption.

3.13 Recommendation System

The algorithm used for the recommendation system is Jaccard Similarity. This algorithm is helpful for the recommendation system when there are missing critical columns in the dataset, such as user purchase history, without the use purchase history, the prediction become inaccurate and meaningless. Jaccard Similarity is a measure of similarity between two sets, which makes it useful in situations where data is incomplete. It works by comparing the intersection and union of two sets, which allows it to identify similarities between items even when certain features are missing or unknown.



Formula

$$J(A, B) = \frac{|A \cap B|}{|A \cup B|}$$

J = Jaccard distance
 A = set 1
 B = set 2

Figure 3.23 Formula for Jaccard similarity

Chapter 4

System Design

4.1 System Block Diagram

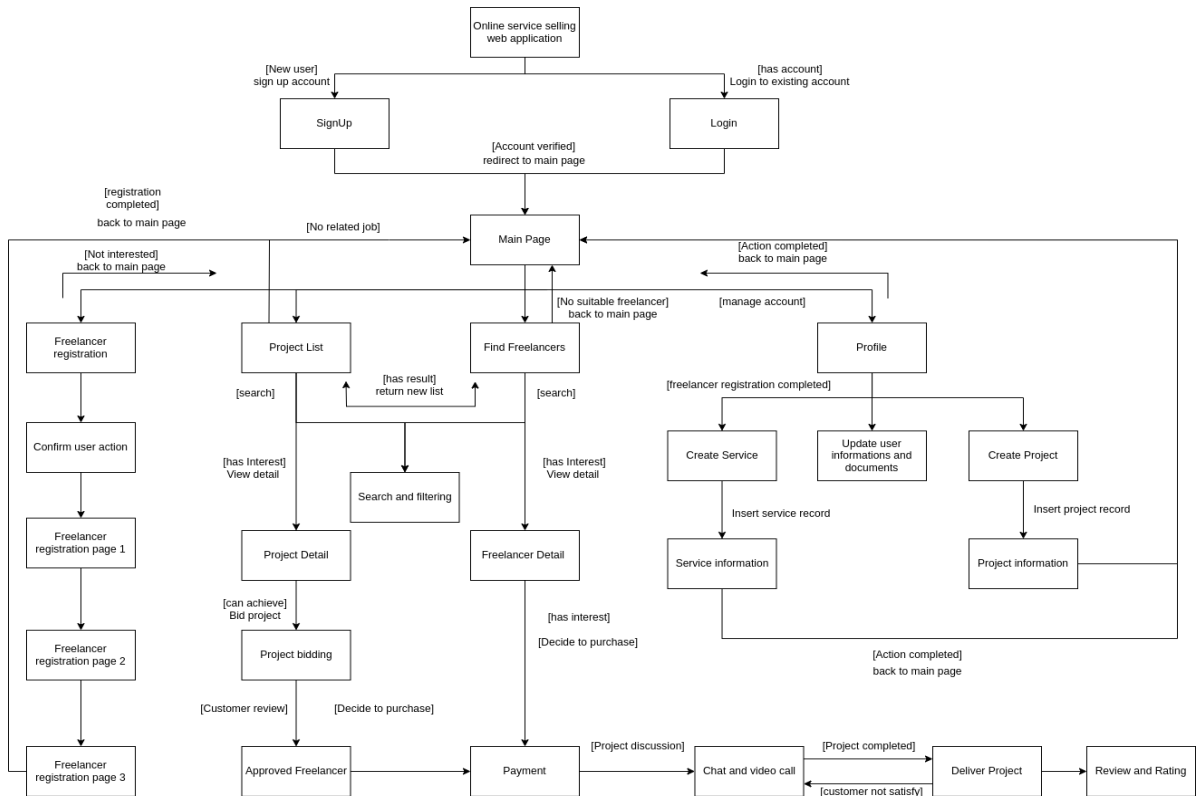


Figure 4.1 Block Diagram for Online service selling application

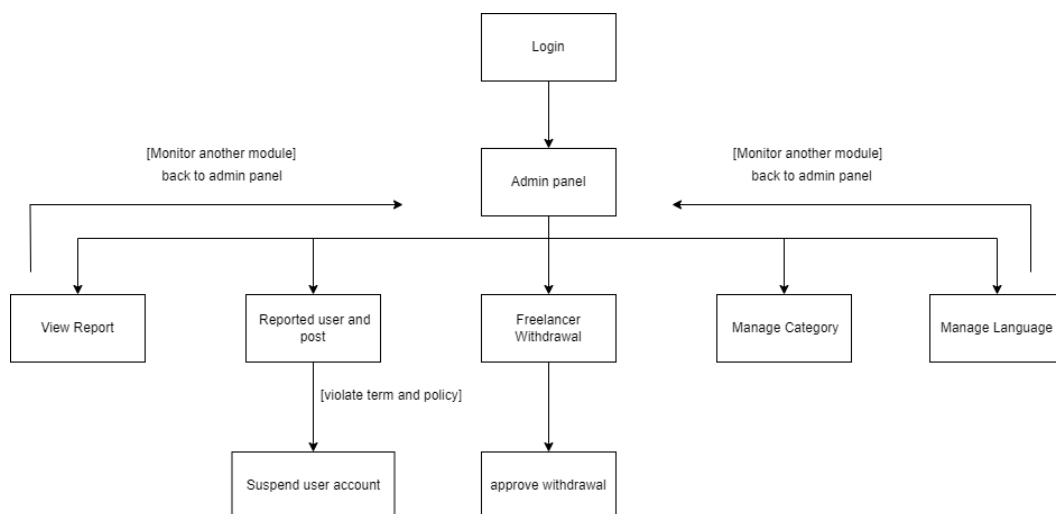


Figure 4.2 Block Diagram for admin panel

4.2 System Components Specification

Components	Description
User Signup	Users must input their email and password to create a new account if they want to access more application features. Validation will be performed on both the front and backend. User Country will be stored automatically based on their IP address.
User Login	The user can log in to their account on the login page after creating their account. The user needs to enter their email and password. After login successfully, user JWT will be set in the HTTP Only cookie and used in further authentication and requesting user information.
Main Page	The landing page of an online service selling web application. The landing page will display services provided by the website in 8 different categories. There are also some customer reviews and a list of services recommended.
User Profile	Users can manage their profile after they have created an account. The user profile displays basic information such as username, date registered and country name. Moreover, if users have registered as freelancers, freelancer information such as social media URL, language, resume and proposal file will be displayed in the section below user basic information.
Freelancer registration	Suppose the user is willing to sell their service or accept a project for extra income. In that case, the user can select the “Become a freelancer” button on the popover list by clicking the user avatar.

Confirm user action page	Users on this webpage must enter their password to confirm their actions or identity. After completing the user verification, the webpage redirects the user to freelancer registration page 1.
Freelancer registration page 1	Freelancer needs to select their well-known language from the language list. After selecting the language, users are required to select the language level, which includes basic, good, professional, and native. Next, freelancers must provide a detailed description of themselves.
Freelancer registration page 2	After completing the previous step, the freelancer must select their field of expertise in 8 different categories. Then, the freelancer can select the selected category's sub-category.
Freelancer registration page 3	The last step of registering as a freelancer is that users who wish to work as freelancers are required to submit their resume and project completed before they can sell services and accept customer projects.
Find Freelancer Page	This page displays available freelancer for the user to choose. The product is displayed in the list view and contains five freelancers on every page. The user can filter the product based on the minimum and maximum budget. After they click the search button, the new product list will rerender and filter out the product list that meets the user's requirement. Next, the user can search for the service name they want. Then the search will perform in the backend, and the product containing the user's name will rerender on the list views.

Freelancer detail page	After the user selects the service from the services list, the website redirects the user to the freelancer detail page, which displays the freelancer's service detail. If the user wants to purchase the selected freelancer to work for their project, they can click on the payment button.
Project List	The project listing page is like the find freelancer page, but the user changed to post their ongoing or new project. The List view will display not only the video and picture but also different types of files if the customer has uploaded them.
Project Detail	After freelancers select the project from the projects list, the website redirects users to the project detail page. Customer can explain their requirement and specification on the detail page. Moreover, if freelancers have an interest in the project, they can click on the "interest" button for the customer to select the most suitable freelancer for their project
Payment	After the user confirms hiring a freelancer, the checkout button will redirect the user to make a payment on the payment page. The payment page is entirely built with stripe API
Service Form	Freelancer can add their service detail in the service form if they want to sell their service to the public. They can further modify and remove their service info on the user profile page.
Project Form	Users can add their project details in the project form if they are looking for a freelancer to help. They can further modify and remove their project info on the user profile page.

Admin Panel	System admin can manage users and the system in the admin panel. The functionality provided in the admin panel includes view report, reported user and post, freelancer withdrawal, manage language, category, and sub-category.
View Report	System admin can manage the payment data stored in the database and calculate the monthly and yearly reports.
Reported user and post	The system admin could suspend the user account if they were found violating the platform rule, such as selling some illegal service and using an inappropriate profile picture.
Freelancer withdrawal	Freelancers can request to withdraw after customers have approved their work. Moreover, an admin fee will be charged for every withdrawal.
Manage Category and Sub-Category	System admin can manage Categories in the manage language page; admin can add, edit, and delete categories. If the category already exists, the admin can further add, edit, and delete the subcategory for the selected category.
Logout	Users can log out from the application after they have completed their tasks.

Chapter 5

System Implementation

5.1 Hardware Setup

Hardware	Specifications		Functionality
Laptop	Model	Dell Inspiron 7566	The laptop is used for the whole development process
	Processor	Intel Core i5-6300HQ	
	Operating System	Linux - Ubuntu	
	Graphic	NVIDIA GeForce GT960	
	Memory	8GB DDR4 RAM	
	Storage	1TB HDD 250GB SSD	

Linux is used as the main operating system for development, the Linux distro chosen is Ubuntu. The reason for choosing Linux is due to insufficient RAM, which can cause the development process to slow down and become unproductive. Linux consumed less RAM compared to Windows, which makes it a more efficient choice for development.

5.2 Software setup

Visual Studio Code

Visual Studio Code is a code editor used for frontend and backend development in this project. It is an open-source and cross-platform editor that supports a wide range of programming languages, including HTML, CSS, JavaScript, and many more.

Azure Data Studio

Azure Data Studio is a cross-platform desktop application that offers a modern user interface for SQL Server administration.

Postman

Postman is a popular and powerful collaboration platform for testing, developing, and managing APIs. It is a cross-platform desktop application that allows developers to simulate and debug APIs quickly and easily.

MockFlow

MockFlow is an online platform for creating wireframes, prototypes, and diagrams for web or mobile applications. It provides a user-friendly interface and multiple tools and features to simplify the design process.

Lucidchart

Lucidchart is an online platform for creating ERD (Entity Relationship Diagram) diagrams, flowcharts, and other visual representations of information.

5.3 Setting and Configuration

5.3.1 Front-End Development Setup and Configuration

This section will discuss the configuration of front-end development and necessary package for development.

Node Package Manager

The Node Package Manager version required in this project is at least fourteen or higher, the depreciated node version might cause compatibility issues and may cause multiple problems. NPM contains over 1.3 million packages for developers to install and use in their project.

Create react app

Create React App provides a starting point for a React project with a recommended folder structure, a basic application setup, and an easy-to-use development server. To create a react application, the command is shown as below:

```
lkeki@terminal:~$ npx create-react-app Expertion
```

Ant Design

The recommended version for Ant Design is version four Ant Design five remove css file by replacing it to writing CSS in JS, this method will slightly improve the performance and reduce the time spent to render the style, but this requires the developer to spend more time on writing CSS.

```
lkeki@terminal:~$ npm i antd@4.0.0
```

Axios

Axios is a JavaScript library that provides a simple way to make HTTP requests, such as GET, POST, PUT and DELETE. Any version of Axios is compatible with React.

```
lkeki@terminal:~$ npm i axios
```

Redux, Redux persist, React-Redux, Redux thunk

Redux provides a centralized store to manage the state of an application, Redux persist is an extension of Redux, Redux persist stores the state in local storage so every state could be memorized by browser. Lastly, Redux thunk acts as a middleware for both React and Redux, without redux-thunk, Redux and React unable to communication and transfer state with each other.

```
lkeki@terminal:~$ npm i redux redux-persist react-redux redux-thunk
```

React Router Dom

React Router Dom provides react application routing capabilities, React is a single page application, the only way to move it from one component to another component is to re-render the whole page by replacing one component with another. Version five is recommended in this project, because some useful hooks were removed in version six.

```
lkeki@terminal:~$ npm i react-router@5.2.0
```

Microsoft speech SDK and SignalR

Microsoft speech SDK is used to implement the real time translation feature. SignalR enables real time communication between two or multiple devices. The SignalR technology is used to implement the functionalities such as send message, video conferencing, and push notification. Microsoft has made it compatible with any version.

```
lkeki@terminal:~$ npm i @microsoft/signalr microsoft-cognitiveservices-speech-sdk-
```

Dexie

Dexie is an open-source library for working with IndexedDB, IndexedDB is a NoSQL database provided by modern browsers such as Chrome, Edge, Firefox etc. It is used to store the chat and user information for the chat modules.

```
lkeki@terminal:~$ npm i dexie
```

Simple Peer

Simple Peer provides peer-to-peer data and media streaming capabilities, simple peer is used with signalR to implement the video conferencing feature.

```
lkeki@terminal:~$ npm i simple-peer
```

Styled Components and Sass

CSS in JS is more recommend when working with modern framework such as React and Vue, Styled Components provide the developer to create their own component with CSS embedded. Sass is a CSS preprocessor, it can reduce the complexity of writing CSS

```
lkeki@terminal:~$ npm i styled-components sass
```

Animation Framework- Framer motion, React Reveal

Framer Motion is an animation library that provides a wide range of tools for creating complex animations and transitions, while react reveal is a lightweight library for creating reveal animation.

```
lkeki@terminal:~$ npm i framer-motion react-reveal
```

React Icons

React icons provide a rich icon library with more than 100 icons' packages.

```
lkeki@terminal:~$ npm i react-icons
```

React Interface Components

Multiple interface components are installed from npm packages to shorten the development period.

The packages include:

- React timetable event
- Slick carousel
- React datetime picker
- Emoji mart
- React draft wysiwyg
- Hamburger react

```
lkeki@terminal: $ npm i react-timetable-events react-time-picker hamburger-react slick-carousel emoji-mart react-draft-wysiwyg
```

DotEnv file

DotEnv file is used to store environment variables such as back-end Api URL. With the environment variable, the developer need not write the URL repeatability and can replace it with real URL when production is ready.

```
#REACT_APP_API="http://192.168.1.16:5000"  
REACT_APP_API="https://expertion.azurewebsites.net"
```

```
const checkReview = async (id) => {  
  await axios({  
    method: "GET",  
    url: process.env.REACT_APP_API + "/api/order/check/" + id,  
    withCredentials: true  
  })  
}
```

Figure 5.1 Example of Using env variable with axios to make HTTP request

5.3.2 Back-End Development Setup and Configuration

Create Dot Net Web API in visual studio code

Step1:

Download and install the Dot Net Core 7 SDK from Microsoft's official website. Dot Net with version seven and high is recommend because Microsoft's C# Developers had restructured the original code, and the performance of DotNet7 is the best compared to the previous version.

Step2:

Install the C# extension: Open VS Code and install the C# extension, which provides syntax highlighting, code completion, and debugging support for C# code.

Step3:

Open the command tab and select "Create a new .NET project". Alternatively, you can open a terminal window and run the command `Dot Net new web Api -o <project-name>` to create a new Web API project.

Identity Framework

Identity Framework in .NET Core is a complete solution for managing user authentication and authorization in web applications. It provides a set of tools and APIs that allow developers to easily add user authentication and authorization functionality to their applications.

```
> dotnet add package Microsoft.AspNetCore.Identity.EntityFrameworkCore --version 8.0.0-preview.1.23112.2
```

Microsoft Entity Framework Core and SQL Server

Microsoft Entity Framework Core is a popular framework that enables developers to work with databases using C# code instead of SQL queries. SQL Server is a relational database management system widely used for storing and managing data in various applications.

```
> dotnet add package Microsoft.EntityFrameworkCore.SqlServer --version 8.0.0-preview.1.23111.4
```

One Signal Api

One Signal Api makes it possible to push notifications to users even if they are not online.

```
> dotnet add package OneSignalApi --version 1.0.2
```

Stripe.net

Stripe provides the developer with the quickest way to implement the payment. It is always recommended to use the latest stripe Api to ensure that the payment processing is secure, efficient, and reliable. Stripe's API is well-documented and provides a wide range of features such as support for multiple payment methods, subscriptions, and complex billing scenarios such as refund, generate pdf etc.

```
> dotnet add package Stripe.net --version 41.10.0-beta.1
```

Time Zone Converter

In a Linux machine, the time zone may be different from that of a Windows machine due to differences in the way each operating system handles time zones. Linux uses the Time Zone Database, which is a public domain time zone database maintained by the Internet Assigned Numbers Authority [15]. But Windows uses the Time Zone API, a proprietary system developed by Microsoft.

```
> dotnet add package TimeZoneConverter --version 6.1.0
```

Dot Net Authentication JWT Bearer

Dot Net Authentication JWT Bearer is a middleware in the .NET Core authentication library that enables developers to use JWT for authenticating users in web applications. JWT is a type of token signed by a server and contains information about a user or client, such as their identity and permissions.

```
> dotnet add package Microsoft.AspNetCore.Authentication.JwtBearer --version 8.0.0-preview.1.23112.2
```

5.3.3 Database Setup and Configuration

Docker

Docker is an open-source platform that enables developers to create, deploy, and run applications in containers. Linux did not provide an alternative way to run SQL Server. So, the SQL Server is running on docker with Azure Data Studio.

Step 1:

Download and install Docker from the official website.

Step 2:

Open a terminal or command prompt and download the official SQL Server Docker image with following command:

```
lkeki@terminal:~$ docker pull mcr.microsoft.com/mssql/server
```

Step 3:

Run SQL Server Container to start a new SQL Server container, use the following command:

```
lkeki@terminal:~$ docker run -e "accept_Agreement" -e "SA_PASSWORD=<YourStrongPa  
ssword>" -p 1433:1433 --name sqlserver -d mcr.microsoft.com/mssql/server
```

The default username of the SQL server is sa and set your own password, and it is maps with port 1433.

Step 4:

Lastly, connect to SQL Server, once the container is running, connect to SQL Server from the tool like Azure Data Studio using the following connection string:

```
lkeki@terminal:~$ Server=localhost,1433;Database=<YourDatabase>;User Id=sa;Passw  
ord="Password"
```

Connect Dot Net Web API with Docker

Define the Connection Strings in Appsetting.json and connect to SQL server and identity framework.

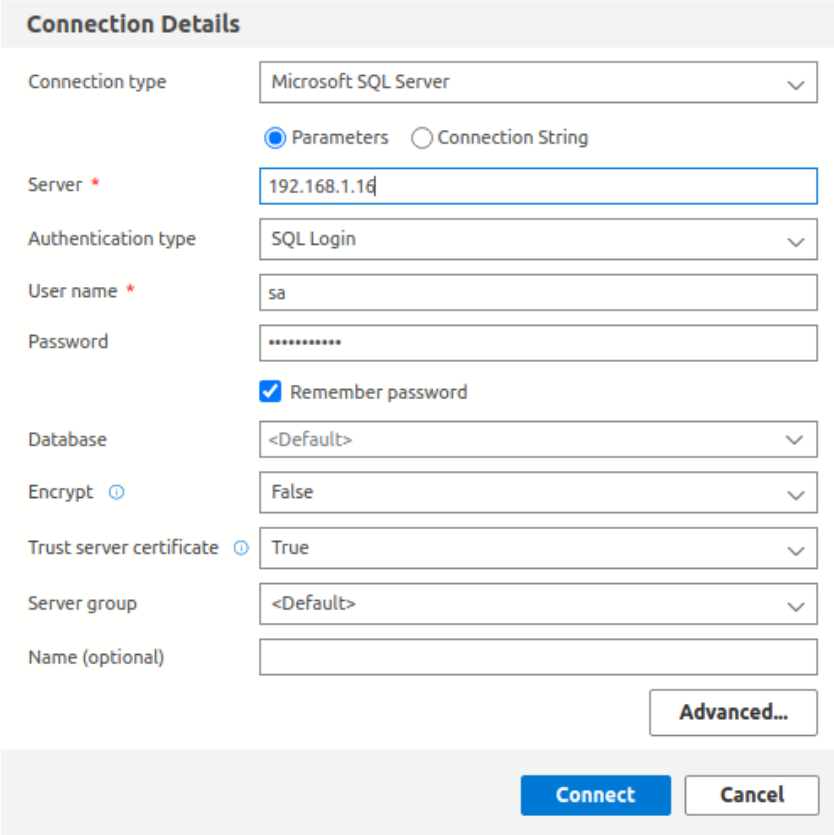
```
"ConnectionStrings": {  
  "TestDefaultConnection": "Server=192.168.1.16;Database=OwlSpot;User Id=sa;Password=02072015Aa.;TrustServerCertificate=True;  
  "DefaultConnection": "Server=tcp:expertion.database.windows.net,1433;Initial Catalog=Expertion;Persist Security Info=False;  
}
```

```
//Add Database  
var dbConnectionString = builder.Configuration.GetConnectionString("DefaultConnection");  
builder.Services.AddDbContext<DatabaseContext>(options => options.UseSqlServer(dbConnectionString));  
//override identity user Entity  
builder.Services.AddIdentity<UserAccount, IdentityRole>()  
    .AddEntityFrameworkStores<DatabaseContext>()  
    .AddDefaultTokenProviders();
```

Figure 5.2 Setup Database with Connection String

Azure Data Studio Setup

To specify the IP address of the local machine for the server, enter the appropriate IP address into the designated field.



The screenshot shows the 'Connection Details' dialog box in Azure Data Studio. It contains the following fields and options:

- Connection type: Microsoft SQL Server (dropdown)
- Parameters (selected) / Connection String (radio buttons)
- Server *: 192.168.1.16 (text input)
- Authentication type: SQL Login (dropdown)
- User name *: sa (text input)
- Password: [Redacted] (password input)
- Remember password: (checkbox)
- Database: <Default> (dropdown)
- Encrypt: False (dropdown)
- Trust server certificate: True (dropdown)
- Server group: <Default> (dropdown)
- Name (optional): [Empty] (text input)
- Advanced... (button)
- Connect (button)
- Cancel (button)

Figure 5.3 Connection Details for Azure Data Studio

Microsoft Cognitive Service - Translator

Copy and paste the key and point after creating the translator API from Azure



The screenshot shows the API Secret Key for the Translator API. It contains the following fields:

- KEY 1: [Redacted] (text input) with a copy icon
- KEY 2: [Redacted] (text input) with a copy icon
- Location/Region: southeastasia (text input) with a copy icon

Figure 5.4 API Secret Key for Translator API

5.4 System Operation

5.4.1 Client System Operation

User account creation

Step 1: Registration

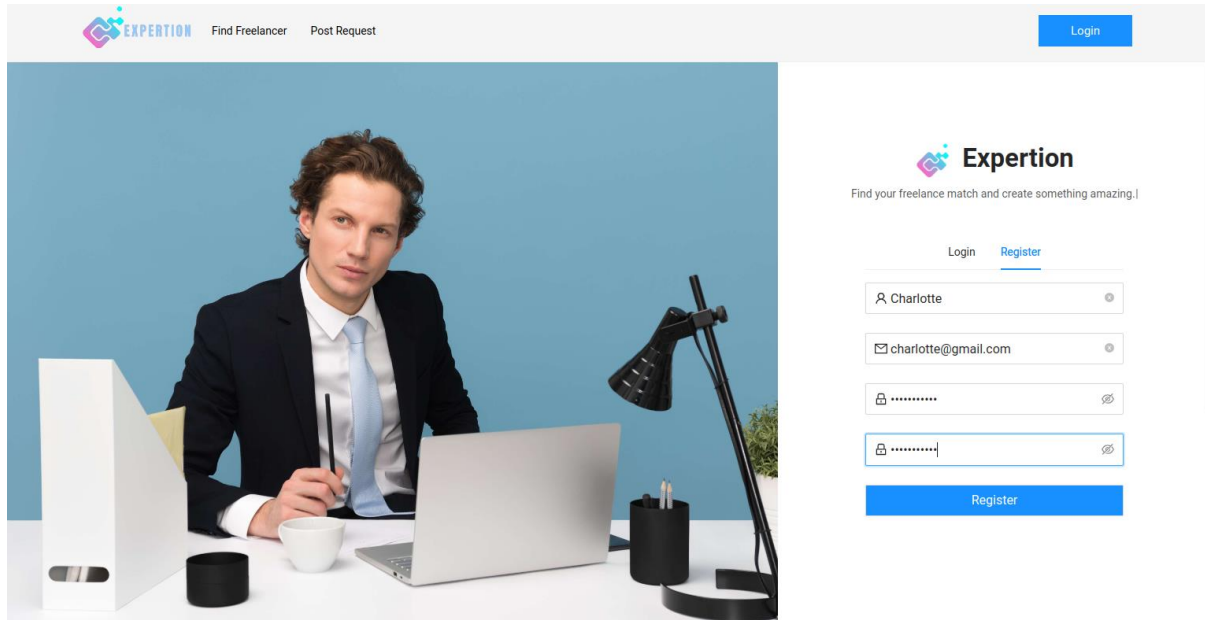


Figure 5.5 Sign-up Page

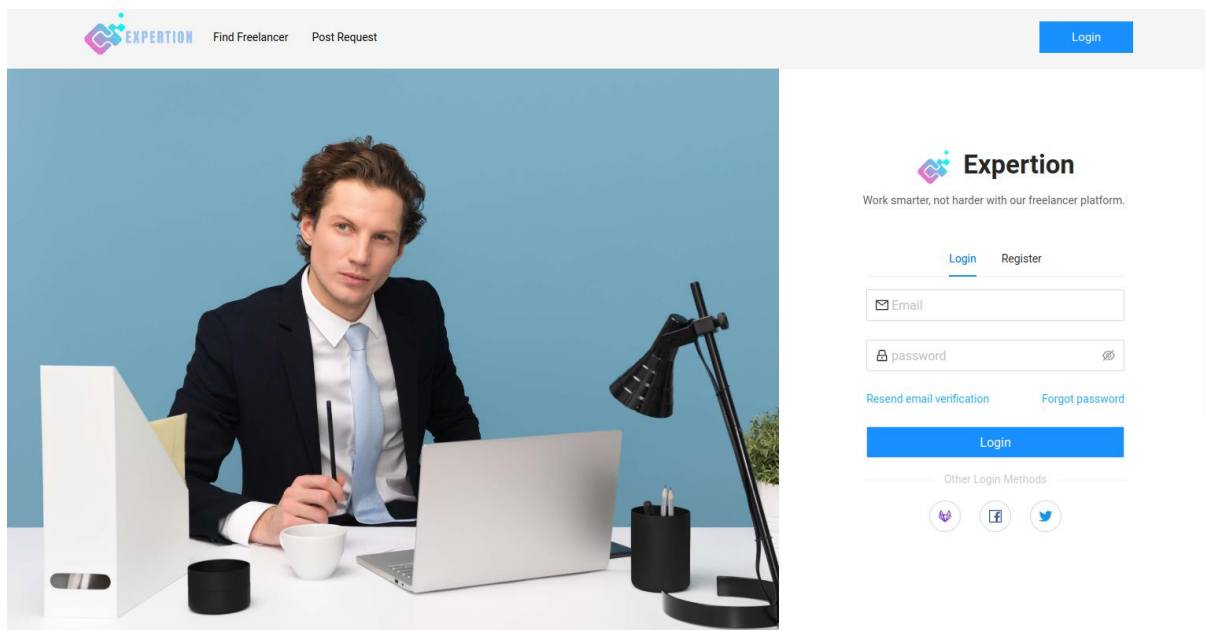


Figure 5.6 Login Page

The user could browse through the freelancers' list and detail page even if they did not register an account. If users decide to purchase a service, they must register an account on the sign-up page. Users can register a new account with a username, email, and password. Users must read the terms and policies of the website and check the "I agree with all the statements in terms of

service” button. Validation will be performed on both the front and backend. User country will be stored automatically in the backend based on their IP address. After registration is completed, the website redirects the user to the login page. User needs to log in with an email and password. Then, a JWT token includes userID, and roles will be set in HTTP Only Cookie for authorization and request current user information.

Step 2: Email verification

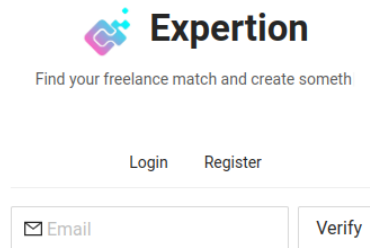


Figure 5.7 Resend Email Verification

After Registration, Mailgun's API sends an email verification URL to the user's mailbox. The account must be verified by clicking the URL before accessing the login feature. The users could request for resend the email verification if they did not receive the email.

Process for purchasing the service

Step 1: Advanced filtering and search

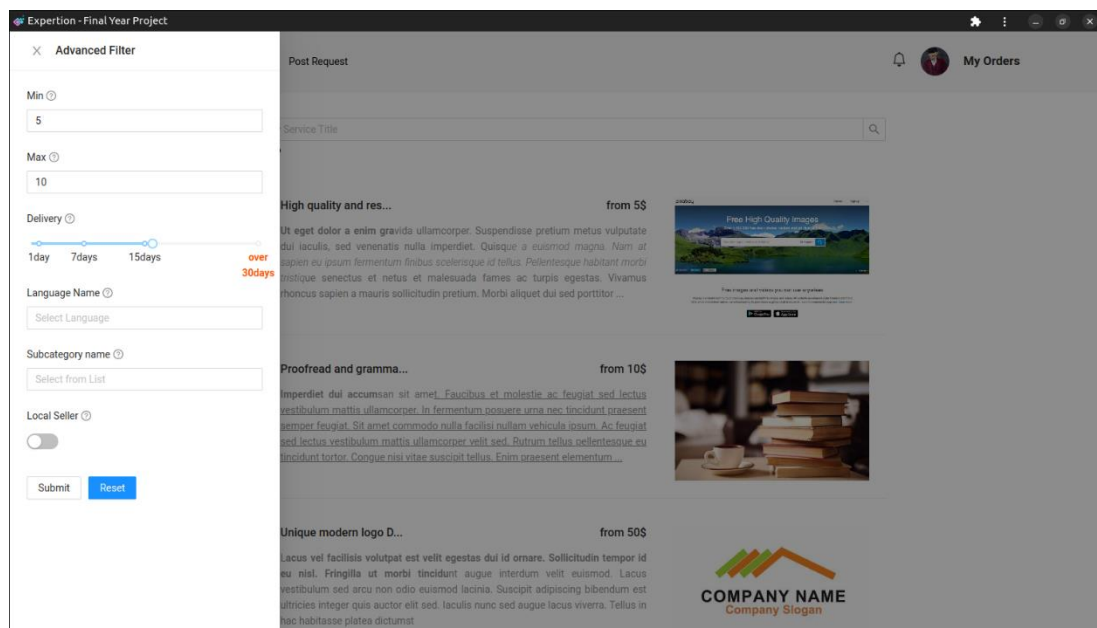


Figure 5.8 Advanced Filtering and Search in Service List

The user can access this page before logging in or registering a new account. The service is displayed in the list view and contains five services on every page. The advantage of the list view is the exact order and structure of every block on the page, which is especially helpful if the page has a lot of content. The pagination on the bottom right corner controls the process of splitting the contents of a website, so every click on the pagination will only display five products. This is one of the ways to improve website performance. Moreover, components will display the total result found on the bottom left of the list view. The advanced filtering function is provided, the users can filter the services based on price range, delivery time and sub-category name. If the user is looking for the local seller, they can switch on the button.

Step2: Select a package

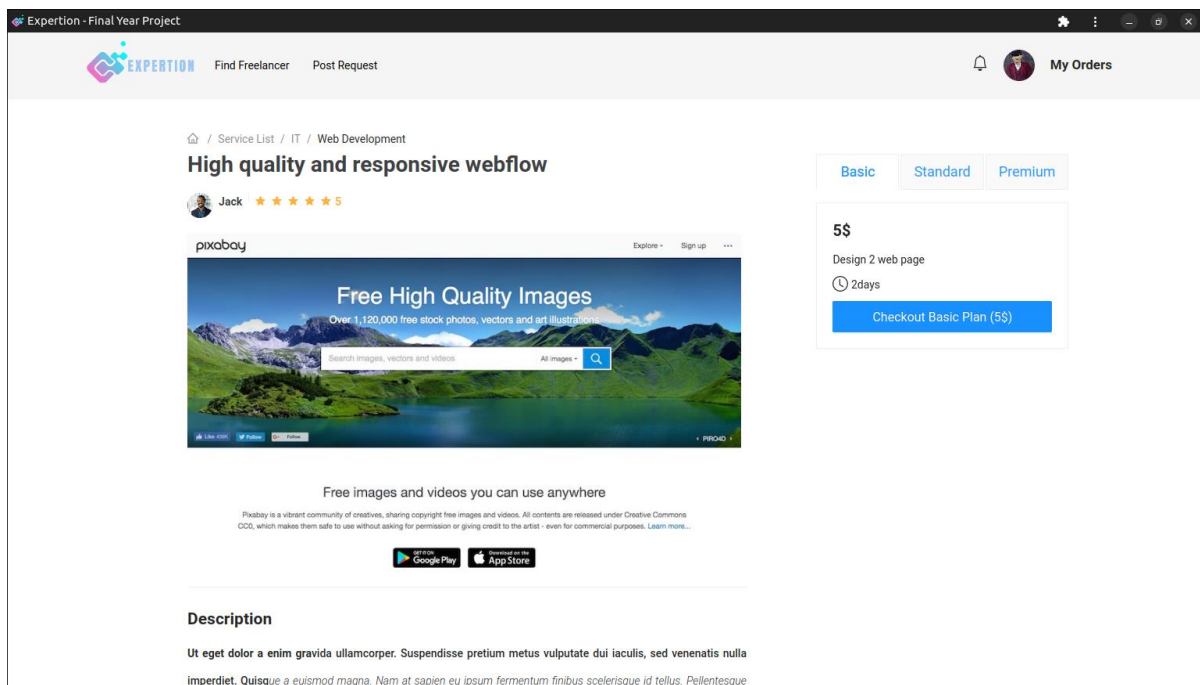


Figure 5.9 Service Detail Page

The freelancer detail page displays detailed information of the user-selected service. The details displayed include the freelancer's name, profile picture, rating, service image, service description and price. Based on the uploaded file format, the system will display a video player instead of an image if the user uploads a video. The user can check out if the service meets their requirements. There are 3 packages for users to purchase, which are basic, standard, and premium. Each of the packages provides different prices and service quantities.

Step 3: Proceed to payment

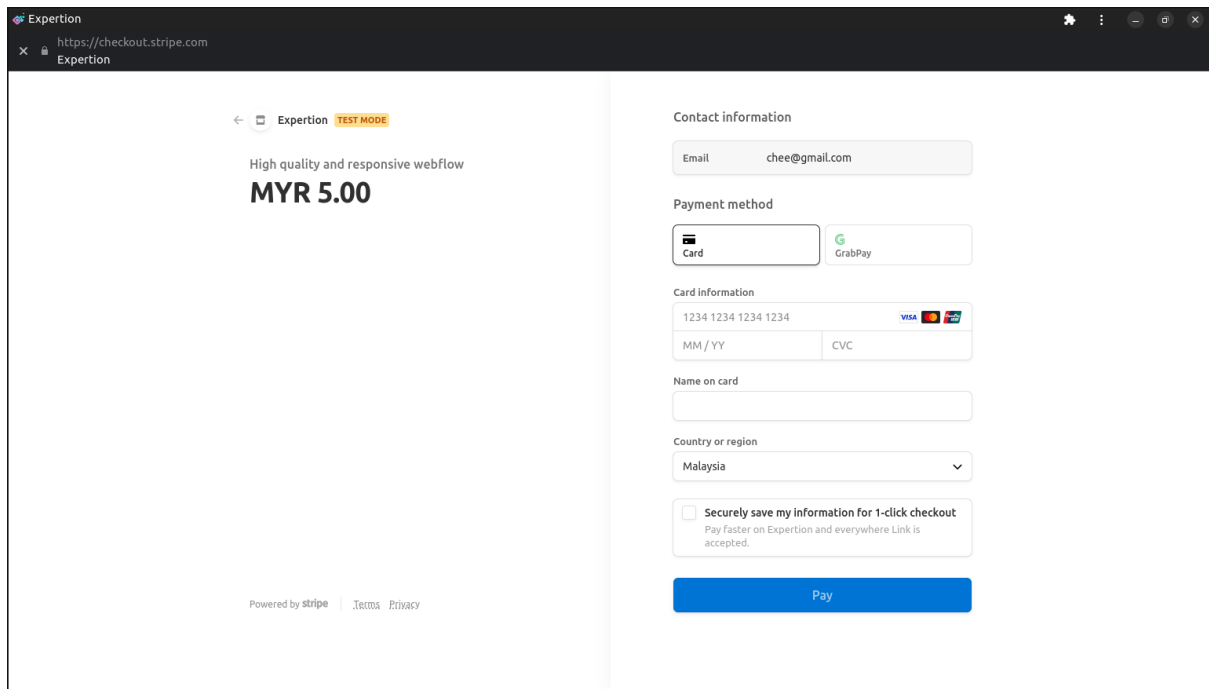


Figure 5.10 Stripe Payment Page

The website redirects the user to the payment page after clicking the checkout button. The page was built with stripe API because it is reliable and makes the payment process under a secure environment. There are 2 payment methods for users to choose from, which are Card or Grab pay.

Step 4: Waiting for the service and give review and rating

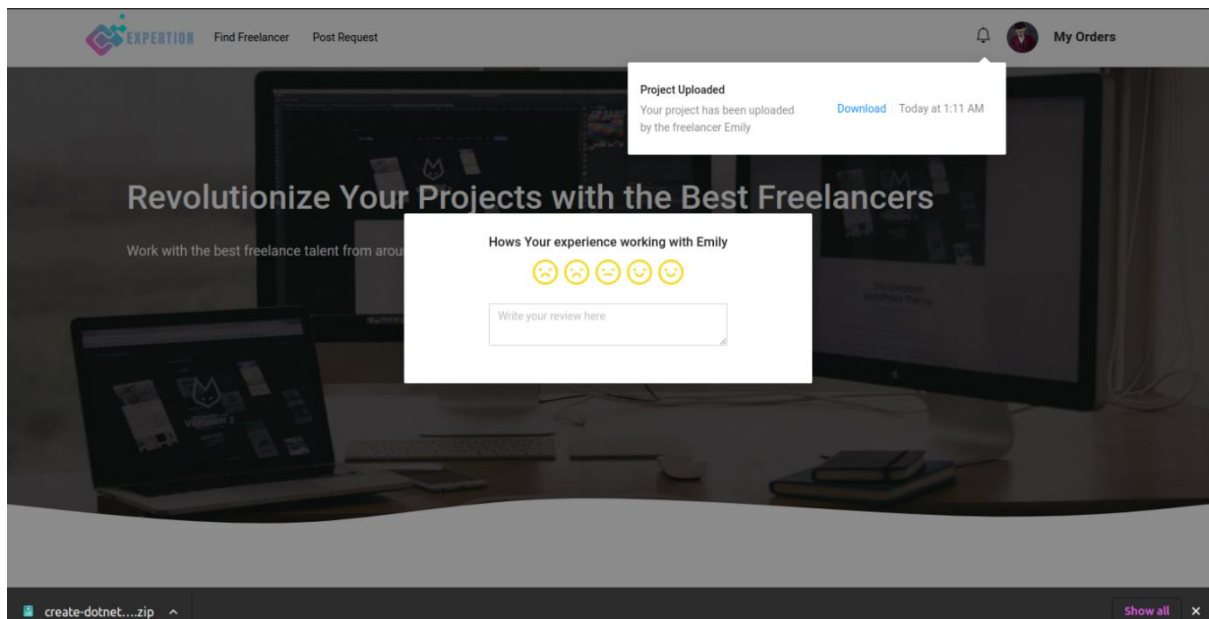


Figure 5.11 User Interface for Review and Rating

Clients will receive a notification after the freelancer uploads their project. If the client is not satisfied with the project, they can request revisions or modifications to be made by the freelancer.

5.4.2 Freelancer System Operation

Registration as Freelancer

Step 1: Basic Information

The screenshot shows the 'Basic Information of freelancer' registration page. At the top, there is a navigation bar with the 'EXPERTION' logo, 'Find Freelancer', and 'Post Request' links. On the right, there are icons for a notification bell, a user profile, and 'My Orders'. The main content area has a title 'Basic Information of freelancer' with a progress bar at 0%. Below the title is the instruction 'Fill up your information'. The form is divided into sections. The first section is 'Language (Optional)', which contains a table with two rows of data. The first row shows 'Chinese' as the language and 'Good' as the level, with a 'Delete' link. The second row shows 'Korean' as the language and 'Good' as the level, also with a 'Delete' link. To the right of the table is an 'Add Record' button. Below the table is a text area for 'Description' with the text 'Hello I'm Charlotte|' and a character count of '55 / 500'. At the bottom right of the form is a blue 'Continue' button.

Language	Level	
Chinese	Good	Delete
Korean	Good	Delete

Figure 5.12 Freelancer Registration page 1

The website will redirect users to the freelancer registration page if they wish to become freelancers. This page requires users to input their basic information, such as available language and user description. The user can add the language by clicking the add record button. Then the user must select their language level in 4 levels: basic, good, professional, and native. The add record button will disappear after the user has selected four languages. Next, the user must write the description to introduce themselves to the customer. The maximum word must not be more than 500.

Step 2: Professional field

The screenshot shows the 'Professional Field' step of the registration process. At the top, there is a navigation bar with the 'EXPERTION' logo, 'Find Freelancer', and 'Post Request' buttons. On the right, there are icons for a notification bell and a user profile labeled 'My Orders'. Below the navigation bar, a progress bar indicates the current step is '2 Professional Skill', with '1 Basic Information' and '3 Resume and Proposal' also visible. The main heading is 'Professional Field' with a 40% progress indicator. Below this, a prompt says 'Select your professional skill from these categories'. A dropdown menu labeled 'Skill:' is set to 'IT'. There are eight checkboxes for sub-categories: AI, PHP, Back-End Development, Data Analysis, ERD, Web Development, Full Stack Development, UI/UX Design, and Front-End Development. The 'Back-End Development', 'Web Development', 'Full Stack Development', and 'Front-End Development' checkboxes are checked. A blue 'Continue' button is at the bottom right.

Figure 5.13 Freelancer Registration Page 2

After the previous step is completed, the website will redirect the user to freelancer registration page two, and the progress bar will become 40%. Users need to select their skill from 8 categories. Then, the sub-category will display in the checkbox. The user can select a maximum of 4 sub-categories and these items will be displayed in the user profile to inform the user what their best skill and professional field is.

Step 3: Upload Project

The screenshot shows the 'Resume and Proposal' step of the registration process. The navigation bar is similar to the previous step, but the progress bar now indicates the current step is '3 Resume and Proposal', with '1 Basic Information' and '2 Professional Skill' also visible. The main heading is 'Resume and Proposal' with a 70% progress indicator. Below this, a prompt says 'Upload your resume and proposal to let other know more about you'. There is a 'Project Done' section with a 'Select File' button. Below this, three file upload entries are shown: 'create-dotnet-devcert-main (4) (1).zip', 'file2.zip', and 'file3.zip'. Each entry has a file icon and a trash icon. A blue 'Start Upload' button is at the bottom left.

Figure 5.14 Freelancer Registration page 3

The website will redirect users to the freelancer registration page three after completing the previous step, and the progress bar will update to 70%. The user can upload a maximum of 3 previously done projects for customers to view the quality of the project before purchasing the freelancer's service. The user is then redirected to the website's homepage after completing the registration process. By selecting the Create Service button under User Profile, the freelancer can add their service.

Step 4: Add Timetable

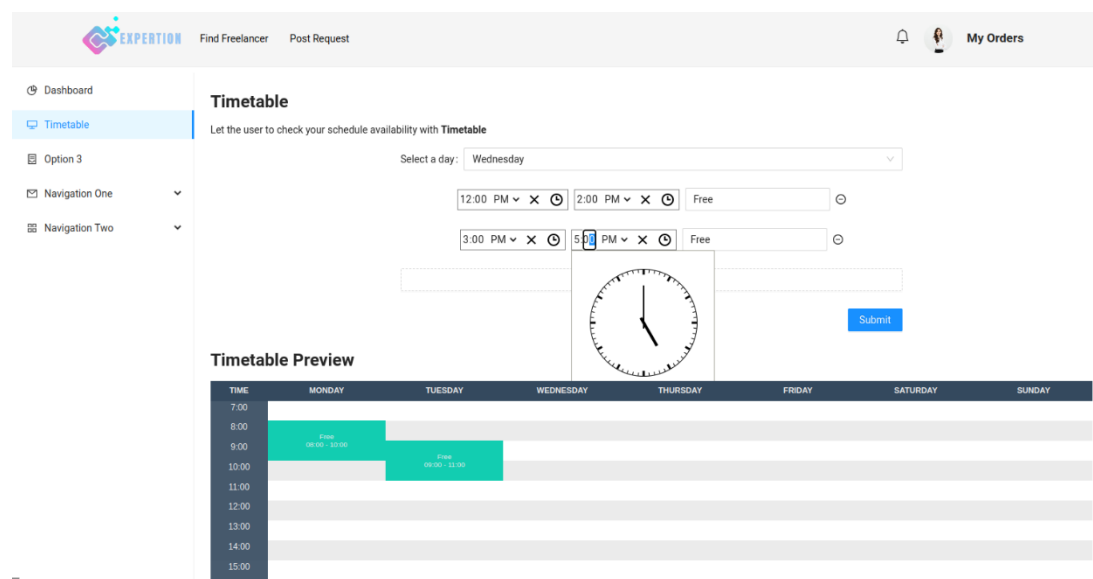
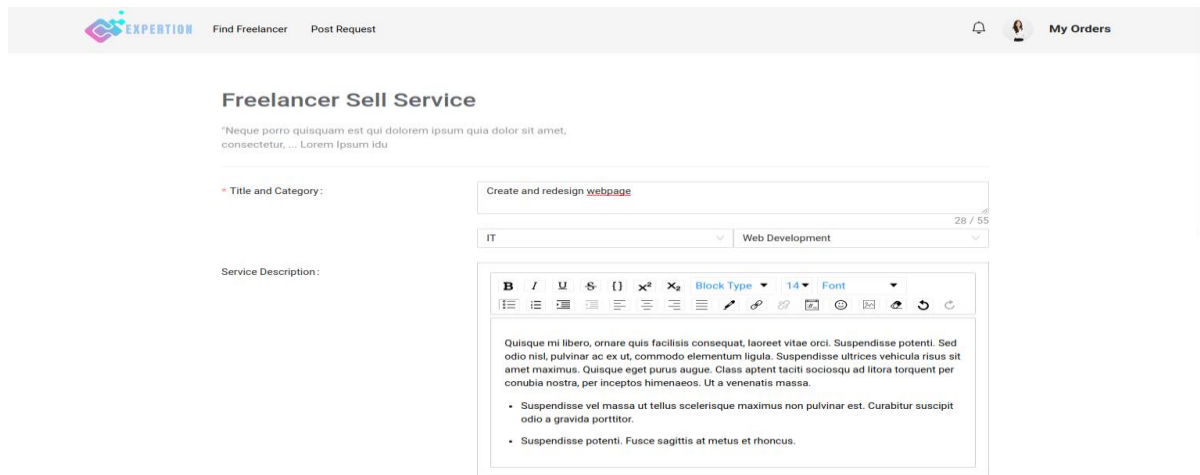


Figure 5.15 Add Timetable

Be sure to include a timetable so that users can see when the freelancer is available and schedule accordingly.

Process of Add Service

Step 1: Enter the Required Information for the designated field.

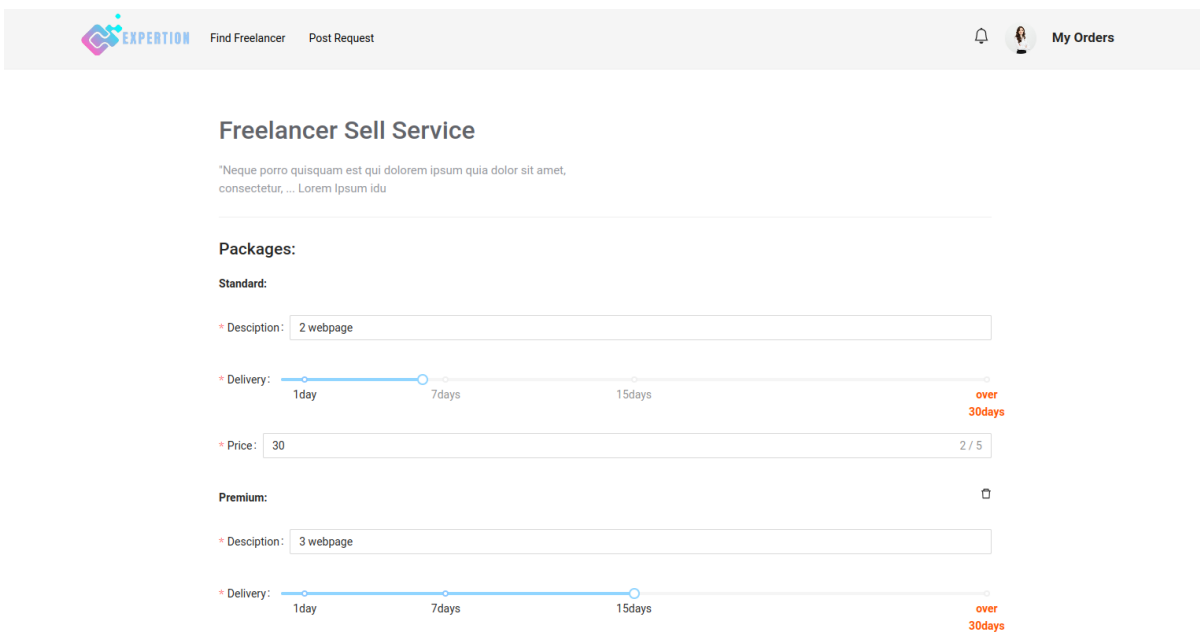


The screenshot shows the 'Freelancer Sell Service' page. At the top, there is a navigation bar with the EXPERTION logo, 'Find Freelancer', 'Post Request', a notification bell, a user profile icon, and 'My Orders'. The main heading is 'Freelancer Sell Service' with a placeholder text: '*Neque porro quisquam est qui dolorem ipsum quia dolor sit amet, consectetur, ... Lorem Ipsum idu'. Below this, there are two main sections: 'Title and Category' and 'Service Description'. The 'Title and Category' section has a text input field containing 'Create and redesign webpage' and a dropdown menu for 'Web Development'. The 'Service Description' section has a rich text editor with a toolbar and a text area containing placeholder text and a bulleted list.

Figure 5.16 Add Service Page

Fill in the designated field to let the client understand more about your service.

Step 2: Packages Description



The screenshot shows the 'Freelancer Sell Service' page with the 'Packages' section. The main heading is 'Freelancer Sell Service' with the same placeholder text as in Figure 5.16. Below the heading, there is a 'Packages:' section. The 'Standard:' package has a description input field containing '2 webpage', a delivery time slider set to 7 days, and a price input field containing '30'. The 'Premium:' package has a description input field containing '3 webpage' and a delivery time slider set to 15 days. Both sliders have markers for 1day, 7days, 15days, and over 30days.

Figure 5.17 Select Packages for Service

Consider adding package options for your clients to choose from, as this can be an effective promotional method. Offering different package levels, with varying levels of service or features.

Take Action After Client Made Payment

Step 1: Check pending request

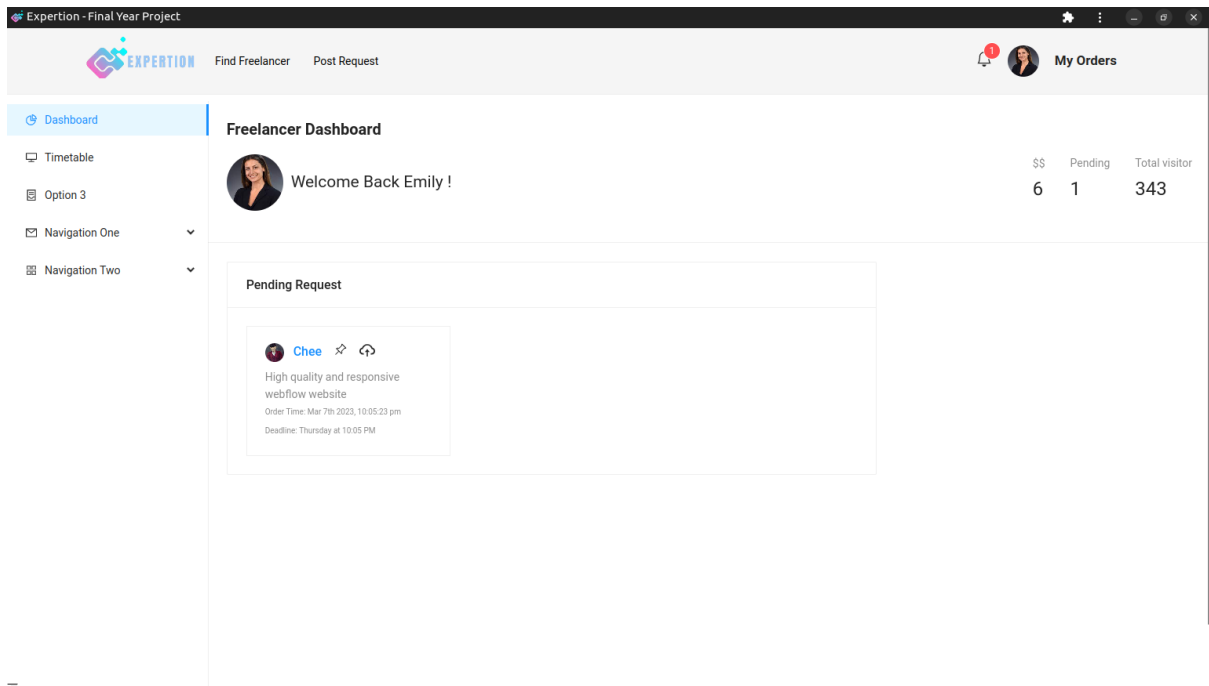


Figure 5.18 Freelancer Dashboard

A notification is sent to the freelancer's interface to inform them that someone is purchasing their service, and the request is displayed on the freelancer dashboard.

Step 2: Start discussion

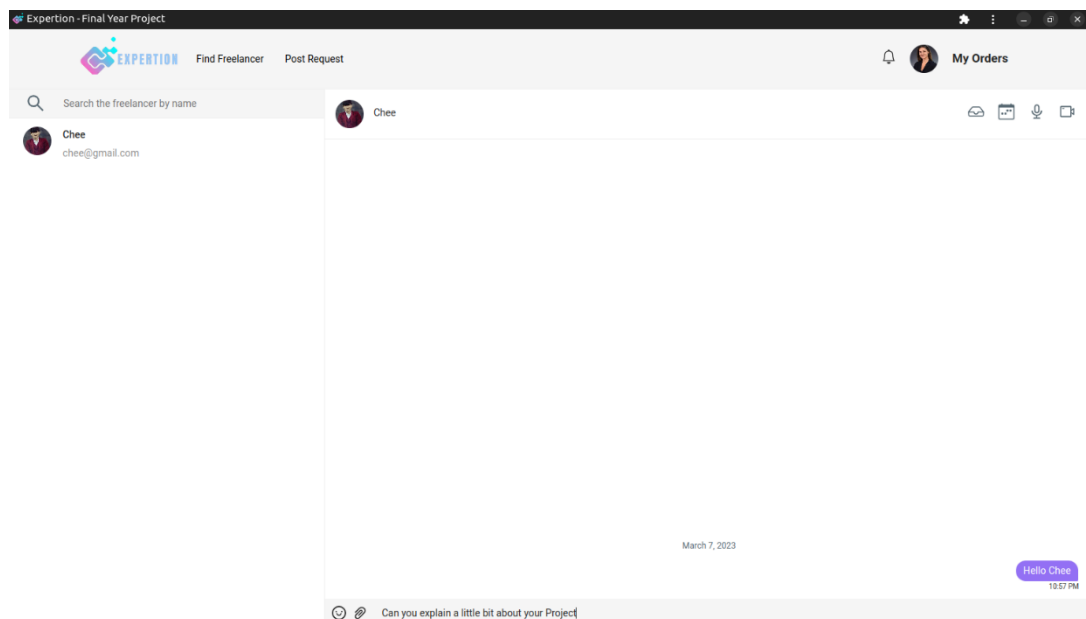


Figure 5.19 Chat Module

Freelancers can communicate with their clients using the chat platform provided. There are four icons in the top right corner, each representing a specific function: the current order, the freelancer's availability timetable, audio call, and video conferencing.

Step 3: Video conferencing

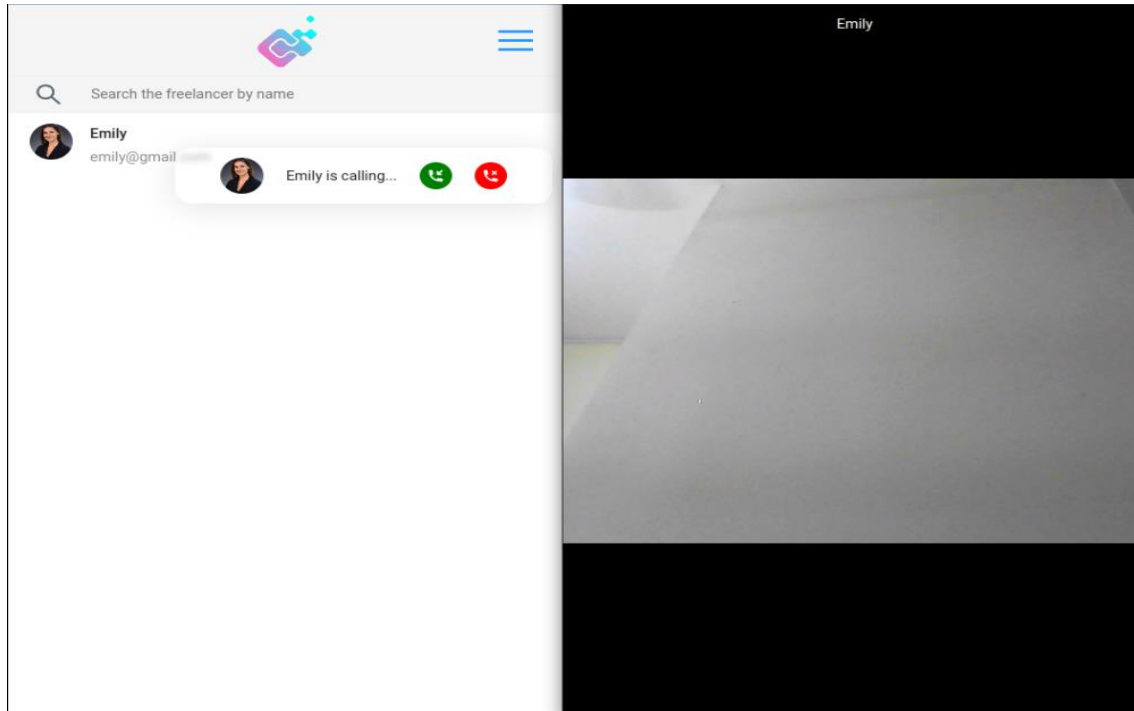


Figure 5.20 Video Call Features

Both freelancers and clients can request a video conference for detailed discussion of the project. When a video conference call is started, the caller will see a phone call interface on their screen. This interface will display information such as the caller's name and their profile picture. Additionally, if the user is not online, the website will alert and notify them.

Step 4: Real time translation

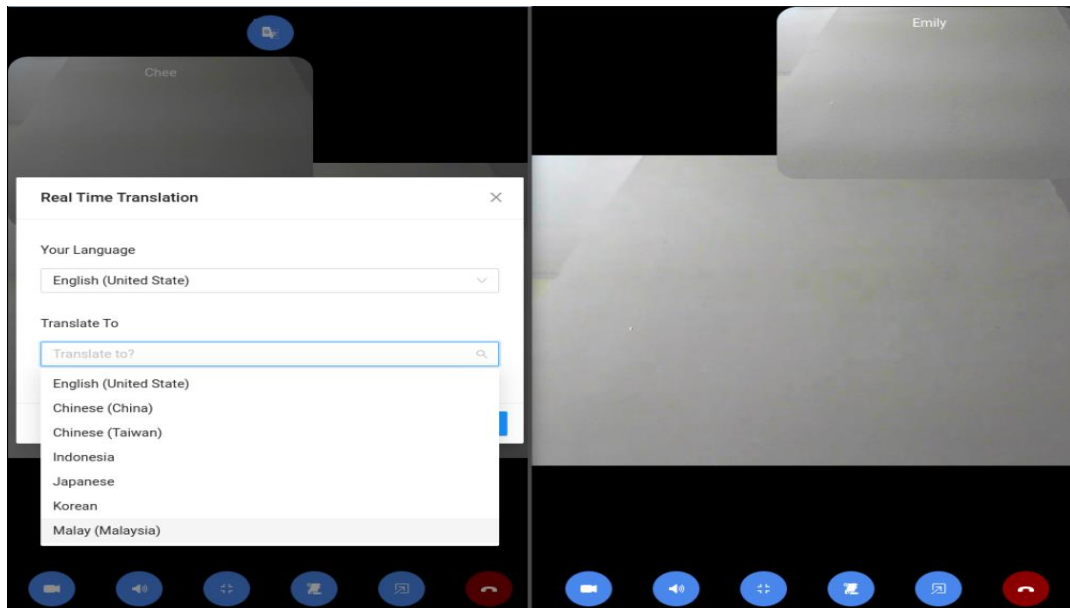


Figure 5.21 Real-Time Translation Feature

The website provides a real-time translation feature that enables freelancers and clients to communicate easily. This can eliminate the language barrier even if they are from different countries and speak different languages. There are five buttons on the bottom of the website, they are switching on/off video, switch on/off audio, minimize chat interface button, chat transcript for displaying the translated text, floating window by playing the other user as Picture in Picture and end meeting.

Step 5: Upload the file in zip format

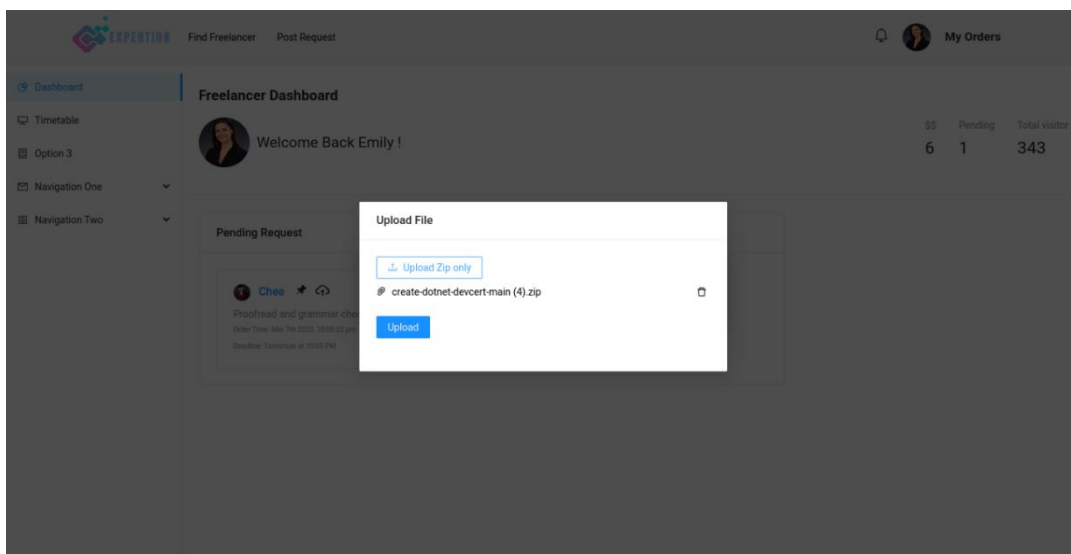


Figure 5.22 Deliver Client's Order

After completing the task, the freelancer can upload the finished project in their dashboard. However, it is important to note that only files in zip format can be uploaded.

5.5 Deployment

5.5.1 Front-End Deployment

Step 1: Build React Application

To produce a deployable version of a React application, open the source folder with the terminal and execute the command "npm run build" in the terminal. This command will compile and optimize the React application for users which is deployable on the server.

Step 2: Push to GitHub

Once the build process is complete, commit and push the compiled project to the remote repository on GitHub. This step will make maintenance extremely easy.

Step 3: Deployment and SEO

Login to Vercel with a GitHub account, import the React file to <https://vercel.com> and activate the deployment process. Upon activation, Vercel will handle all aspects of deployment, including configuration and scaling. Using Vercel Platform brings several advantages. First and foremost, the Vercel server is in multiple regions around the world, so the page loading speed is relatively fast, and the latency is low. Next, the developer pushes the file to GitHub. Vercel will compare the file automatically and redeploy our website, and this saves a lot of time. Lastly, it is completely free when you deploy the React app to Vercel and it will not impact the speed of the website.

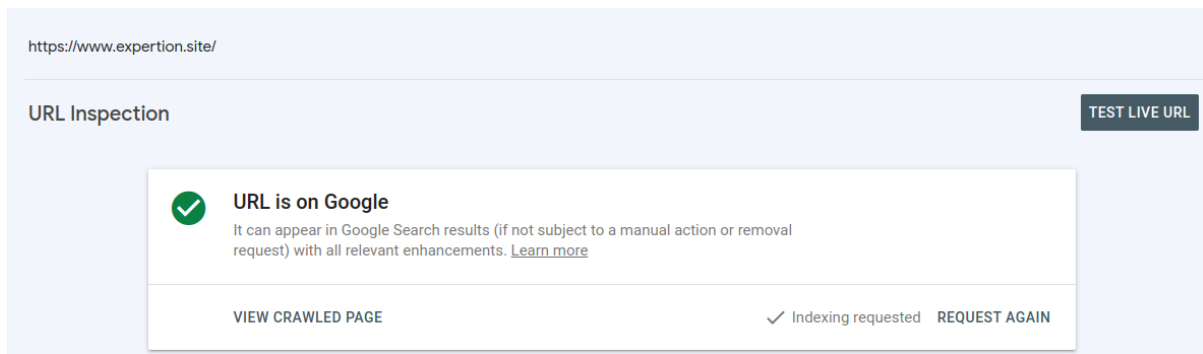
Step 4: Purchase domain name

It is important to purchase a domain name for the website, as this will provide a unique web address for users to access the application. In this project, the domain name is purchased from namecheap.com. After assigning the domain name, add the Vercel DNS to the Namecheap web server.

Step 5: Indexing

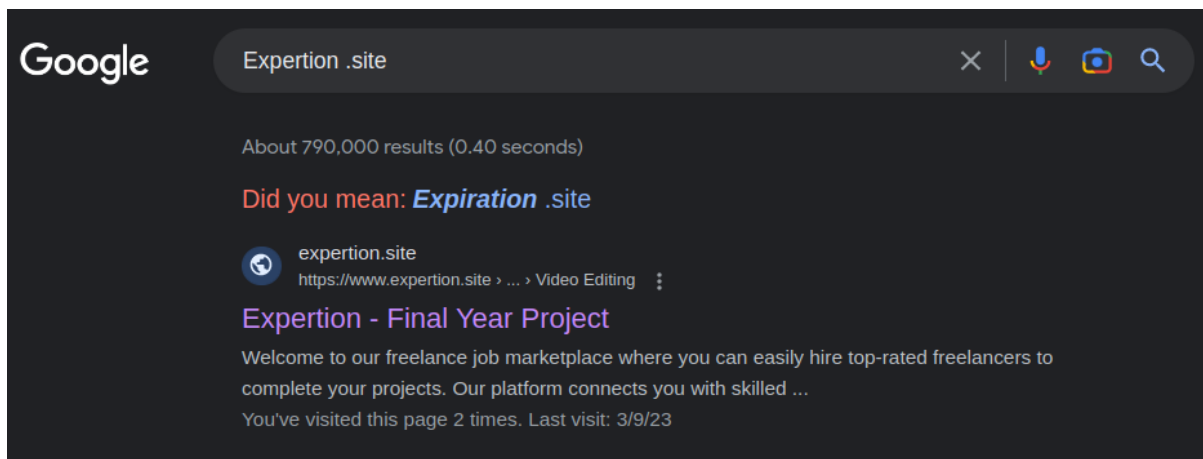
After deployment, it is important to ensure that the website is indexed by search engines such as Google. To request indexing in Google, login to Google Search Console and paste the given

meta tag to the existing HTML file and repeat step one and step two. After completing the previous step, click on the request indexing button and it will take a couple of days to index the web page.



Step 6: Search the Website

To ensure that a web page has been indexed by Google, search for the website using a search engine and verify that the webpage appears in the search results.



5..2 Database Deployment

Step 1: Create SQL Database

Create SQL Database ...

Microsoft

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * ⓘ

Resource group * ⓘ [Create new](#)

Database details

Enter required settings for this database, including picking a logical server and configuring the compute and storage resources

Database name * ✓

Server * ⓘ [Create new](#)

Step 2: Connection string

Copy and paste the connection string to the default connection at the appsetting.json file.

```
Server=tcp:expertion.database.windows.net,1433;Initial Catalog=Expertion;Persist Security Info=False;User ID=yang;Password={your_password};MultipleActiveResultSets=False;Encrypt=True;TrustServerCertificate=False;Connection Timeout=30;
```

Step 3: Add migration and update the database

open the terminal and execute the following command to add migration and update and database.

```
lkeki@terminal:~/server$ dotnet ef migrations add InitialCreate
```

```
lkeki@terminal:~/server$ dotnet ef database update
```

5.5.3 Back-End Deployment

Step 1: Create Azure Web App

Fill in and select the designated file with the API name, publish, runtime stack, operating system, and region.

Project Details

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * ⓘ

Resource Group * ⓘ [Create new](#)

Instance Details

Need a database? [Try the new Web + Database experience.](#) ↗

Name * .azurewebsites.net

Publish * Code Docker Container Static Web App


Runtime stack *

Operating System * Linux Windows

Region * ⓘ Not finding your App Service Plan? Try a different region or select your

Step 2: Add CORS policy

After creating the Web API, enable the CORS policy so the front-end could request the API from the back end.

 **CORS**

Cross-Origin Resource Sharing (CORS) allows JavaScript code running in a browser on an external host to interact with your backend. Specify the origins that should be allowed to make cross-origin calls (for example: <http://example.com:12345>). To allow all, use "*" and remove all other origins from the list. Slashes are not allowed as part of domain or after TLD. [Learn more](#)

Request Credentials

Enable Access-Control-Allow-Credentials ⓘ

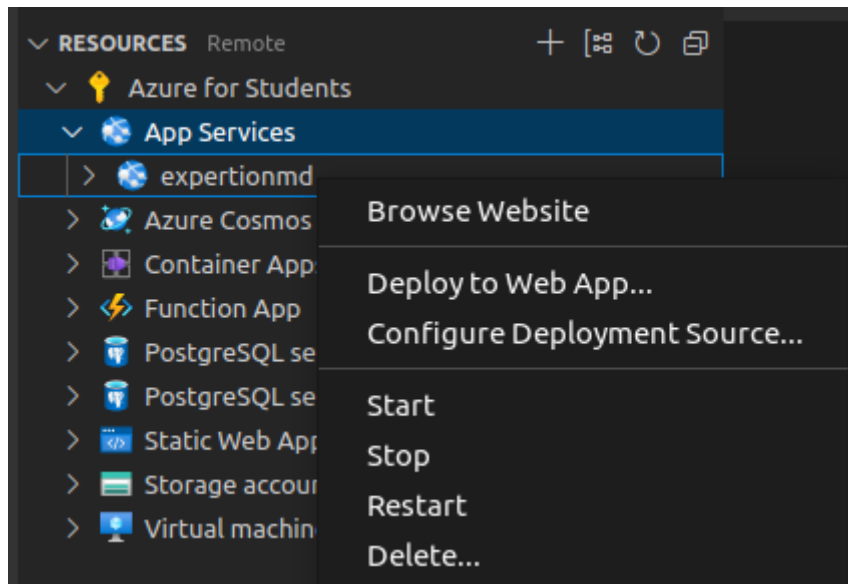
Allowed Origins

ⓘ

ⓘ

Step 3: Download Visual Studio Code extension.

Download the Azure Web Service extension from visual studio code, open the azure panel and search for the API created in the previous step, right click, and select deploy to web app.



5.6 Summary for Deployment

Deployment	Platform	Plan	Price
Front-End	Vercel	Free	Free
Back-End	Azure	Basic	14 USD/month
Database	Azure	Standard	14 USD/month
Translator	Azure	Free	Free

Chapter 6

System Evaluation and Discussion

6.1 System Testing and Performance Metrics

System Testing checks if an entire software system or application meets specific requirements and works as intended. This includes testing the whole system, not just individual parts, to ensure it meets user expectations. Performance Metrics help identify performance issues and can be used to compare against established standards. Examples of performance metrics include response time and resource utilization.

6.1.1 Compatibility Testing

Compatibility testing is a software testing method to ensure that the web application is compatible with browsers, hardware and operating systems. This test is important because users may access the application from different devices, platforms, and environments, and the web application must work correctly across all the platforms and hardware.

Browsers

		Edge	Opera	Chrome
No	Page Name	Status	Status	Status
1	Landing Page	Pass	Pass	Pass
2	Sell service	Pass	Pass	Pass
3	Post project	Pass	Pass	Pass
4	Profile	Pass	Pass	Pass
5	Freelancer registration	Pass	Pass	Pass
6	Freelancer dashboard	Pass	Pass	Pass
7	Admin dashboard	Pass	Pass	Pass
8	Service detail	Pass	Pass	Pass
9	Payment	Pass	Pass	Pass
10	User detail	Pass	Pass	Pass
11	Chat	Pass	Pass	Pass
12	Login and Register	Pass	Pass	Pass

Table 6.1 Compatibility Testing for Browser

Operating System

		Window 10	Ubuntu
No	Page Name	Status	Status
1	Landing Page	Pass	Pass

2	Sell service	Pass	Pass
3	Post project	Pass	Pass
4	Profile	Pass	Pass
5	Freelancer registration	Pass	Pass
6	Freelancer dashboard	Pass	Pass
7	Admin dashboard	Pass	Pass
8	Service detail	Pass	Pass
9	Payment	Pass	Pass
10	User detail	Pass	Pass
11	Chat	Pass	Pass
12	Login and Register	Pass	Pass

Table 6.1 Compatibility Testing for Operating System

Devices

		Laptop	Smart Phone
No	Page Name	Status	Status
1	Landing Page	Pass	Pass
2	Sell service	Pass	Pass
3	Post project	Pass	Pass
4	Profile	Pass	Pass
5	Freelancer registration	Pass	Fail
6	Freelancer dashboard	Pass	Fail
7	Admin dashboard	Pass	Pass
8	Service detail	Pass	Fail
9	Payment	Pass	Pass
10	User detail	Pass	Pass
11	Chat	Pass	Pass
12	Login and Register	Pass	Pass

Table 6.2 Compatibility Testing for Devices

Most of the failure is caused by the alignment issue, because responsive view is not completely implemented.

6.1.2 Performance Metric

Page load times

Key pages should load within 2-3 seconds on average, with a maximum of 5 seconds for more complex pages. The testing tool utilize is a browser developer tool.

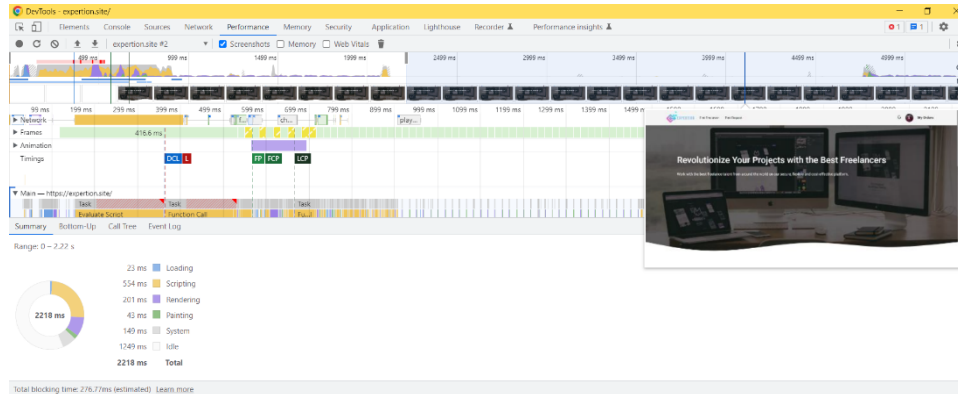


Figure 6.1 Performance Measurement with Chrome Developer Tool

		Page load times	Result
No	Page Name	Response time(millisecond)	Status
1	Landing Page	2218	Good
2	Sell service	826	Good
3	Post project	763	Good
4	Profile	952	Good
5	Freelancer registration	1945	Good
6	Freelancer dashboard	1378	Good
7	Admin dashboard	4628	Need Improvement
8	Service detail	1108	Good
9	Payment	6379	Poor
10	User detail	1097	Good
11	Chat	1035	Good
12	Login and Register	1113	Good

Table 6.3 Testing results for page load time

A possible reason why the payment page is exceeding the expected loading time could be due to the integration with Stripe API, which may take additional time to process payment requests and return a response to the website.

6.2 Black Box Testing

Authentication and Authorization Module

Summary	Pre-requisite	Test case	Expected results	Actual results	Result
Users try to log-in	User's account must exist	-User enters email and password. -user will be redirect to home page	Server will set HTTP Only cookie with secure enable in cookies storage, and redirect to home page	HTTP Only cookie is set and redirect to home page	Pass
User without full privileges (Customer)	-User's account must exist -Have the minimum privileges	-User enters password and email on the log-in page -user not able to view the page not belonging for their role	User will be redirect to the Unauthorized page when trying to access the page which requires privileges	either access granted or access denied with a redirection to the Unauthorized page and an appropriate error message.	Pass
Did not receive the email	User just register an account	Users click on register button or resend email verification	User will receive the email verification URL in their mailbox	The system sends an email containing the verification URL to the user's registered email address.	Pass

Service Selling Module

Summary	Pre-requisite	Test case	Expected results	Actual results	Result
View a valid list of services' detail	1. Any of the users	1. Select any service from the service list and be able to access the detail page	Display the service detail page without any error, including database error (500) and page not found (404)	The service detail page is displayed without errors, including 500 and 404 status codes.	Pass
Add service information to the service list	-User's account must exist -User's role must be a freelancer	-Can access to create service page in the user profile -The create service button is working	-Redirect freelancer to create service page -Every element and component on the page are displayed correctly	The freelancer is redirected to the create service page, and all elements are displayed correctly.	Pass
Update service information in user profile	-Service must exist -User's role must be a freelancer	Freelancer, click on the pen icon on the footer of the card	-A pop-up modal will appear with the initial values of the service card. -when the freelancer clicks on submit button, the service information	A pop-up modal appears with initial values on service card click, and after submitting, the card component rerenders with the updated	Pass

			will change, and the card component will re-render	service information.	
Delete service information in user profile	-Service must exist -User's role must be a freelancer	Freelancer click on the trash can icon on the footer of the card	Selected service is removed from the service list	The system removes the selected service from the service list, indicating that the service has been successfully deleted.	Pass

Project posting module

Summary	Pre-requisite	Test case	Expected results	Actual results	Result
View a valid list of projects' detail	1. Any of the users 2. Project must exist	Select any Project from the project list and be able to access the detail page	Display the project detail page without any error, including database error (500) and page not found (404)	The service detail page is displayed without errors, including 500 and 404 status codes.	Pass

Add project	1. User's account must exist	1. Access user profile and select create new project 2. Fill in the project information in the form provided. 3. Click submit to create new project	New project is successfully added and display in project page and user profile page	The freelancer is redirected to the create service page, and all elements are displayed correctly.	Pass
Delete project information in user profile	Project must exist	Customers click on the trash can icon on the footer of the card	Selected project is removed from the service list	The system removes the selected service from the service list, indicating that the service has been successfully deleted.	Pass
Update project information in user profile	Project must exist	Customer, click on the pen icon on the footer of the card	1.A pop-up modal will appear with the initial values of the project card. 2.when the customer clicks	A pop-up modal appears with initial values on service card click, and after submitting, the card	Pass

			on the submit button, the service information will change, and the card component will rerender	component rerenders with the updated service information.	
--	--	--	---	---	--

Profile Module

Summary	Prerequisite	Test case	Expected results	Actual results	Result
Update user profile image	The user's account must exist	1. Access the profile page. 2. Click on user profile Image 3. select a new image and click change	Selected Image change successfully	The selected image is changed successfully, indicating that the new image has been applied to the designated area.	Pass
Update freelancer detail information, including files, descriptions, languages and	1. User's account must exist 2. User's role must be a freelancer	1. Access profile page. 2. click update and a table with extra information will appear	Freelancer information updated successfully	The freelancer's information is updated successfully, indicating that the changes have been	Pass

proposals.				successfully applied.	
------------	--	--	--	-----------------------	--

Live and Video Call Module

Summary	Prerequisite	Test case	Expected results	Actual results	Result
Send message	Users have valid login credentials to access the chat and video call features.	Send a text message and an emoji in a chat.	The message and emoji are sent successfully and are visible to the recipient.	The message and emoji are sent successfully and are visible to the recipient.	Pass
Video conferencing	Users have valid login credentials to access the chat and video call features.	Initiate a video call and verify the audio and video quality.	The video call is established with good quality audio and video.	The video call is established there are no issues with the audio or video quality.	Pass
Real time translation	Users have valid login credentials to access the chat and video call features.	Select the input and output language	The text will be displayed in the transcript section when the user speaks.	The text successfully displays in the transcript section	Pass

6.3 API and SDK Documentation

Website URL: <https://expetion-swaggerapi-documentation.vercel.app>

The URL above represents the website containing API documentation utilized in the backend development of this project. The documentation lists parameters for each API and provides instructions on how to call them. There are total 75 API were used in the development of this project. The example below gives an explanation about how to read and understand the API documentation.

6.3.1 API Usage Explanation

apiLoginPost

The screenshot shows the Swagger API documentation for the `apiLoginPost` endpoint. The endpoint is a `POST` request to `/api/Login`. The documentation includes usage instructions for various SDKs (Curl, Java, Android, Obj-C, JavaScript, C#, PHP, Perl, Python) and a curl command example: `curl -X POST \n -H 'Content-Type: application/json;text/json,application/*+json' \n '/api/Login'`. The `Parameters` section shows a table with a `body` parameter, which is described as a JSON object with `email` and `password` fields, both of type `string`. The `Responses` section indicates a status of `200 - Success`. Red annotations highlight the endpoint path, the `body` parameter name, and the JSON structure in the description.

Name	Description
body	<pre>{\n email: string\n password: string\n}</pre>

Figure 6.2 Login API

The figure above displays the API and SDK documentation for the login API. The documentation displays the API information like login endpoint as well as providing usage instructions and SDK examples for various programming languages. The body indicates the request is sent in the request body. Other APIs may be sent in the form or query. As an Example, to consume this API, email and password is required to send in the JSON body and the server will respond status 200 if the API is called successfully. All the APIs follow these patterns, so please double confirm the name of the APIs before consuming the APIs.

6.3.2 Handle Static File in Web API

apiSellServicePost

POST

```
/api/SellService
```

Usage and SDK Samples

Curl Java Android Obj-C JavaScript C# PHP Perl Python

```
curl -X POST \
-H "Content-Type: multipart/form-data" \
"/api/SellService"
```

Parameters

Form parameters

Name	Description
files	byte[] (binary)
ServiceID	Integer (int32)
ServiceTitle	String
ServiceDesc	String

Parameter for upload static file

Figure 6.3 Handle static file

The figure above displays the parameters for uploading static files, which may differently depend on the scenario. These files can include audio, video, images, and compressed folders. Validation is performed both in the frontend and backend to ensure that the file is uploaded in the correct format.

6.4 Project Challenge

Throughout the implementation process, there are several challenges and problems faced. Firstly, more time is required for learning new IT tools and technology, such as Reactjs, .net core web API, SignalR, a real-time database framework. Integration between these technologies and web APIs might be challenging because advanced knowledge is needed in the integration process to avoid application crashes and compilation failure. Furthermore, due to missing critical columns in the dataset file, the recommendation system must change from collaborative filtering to content-based filtering.

6.5 Objective Evaluation

Objective	Evaluation	Achievement
To design a freelance marketplace web application that enables freelancers to sell their services and customers to propose their projects.	This objective has been met, as both user and freelancer are able to purchase and sell the service.	Achieved
To provide chat and video call features for customers and freelancers to communicate about project details within the platform, while also eliminating language barriers through real-time translation.	This objective has been met, as users are able to send messages and conduct video conferencing. Additionally, the real-time translation function is working without any errors	Achieved
To implement a content-based filtering recommendation system to predict user preference service.	This objective has been met, as the system will recommend the service to users based on their previous purchases.	Achieved

CHAPTER 7

CONCLUSION AND RECOMMENDATION

7.1 Conclusion

This chapter concludes the Online Service Selling web application. Online service selling web applications is developed to allow the user to work online, so they can gain extra income. Next, the platform user can post their project and look for freelancers to accept and work on it. Moreover, the web application is introduced with an authentication and authorization module, freelancer registration module, service selling module, chat and video call module, project posting module, and search and filtering module. Nevertheless, the report not only provides guidance for building the system from scratch, but also explains the planning, implementation, and deployment processes in a detailed and understandable manner.

7.2 Future Plan

Online service selling web applications is a huge project and needs a long period of time to fully develop. There are numerous ways to enhance the system. First and foremost, the chat module can be improved by adding an audio message function. With this feature, customers could send audio messages without needing to type out their message, providing a more convenient and efficient experience. Next, for the recommendation system, the Jaccard algorithm could be replaced with a machine learning model once enough user purchases data have been collected. Furthermore, identity service providers such as Google or Facebook could be added to the login page to provide users with a more convenient way to log in. Finally, some security improvements could be made to the web application.

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FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4S1	Study week no.:2
Student Name & ID: Chee Hao Yang & 19ACB00762	
Supervisor: Ts Sun Teik Heng @ San Teik Heng	
Project Title: Online service selling web application	

1. WORK DONE

Review Fyp1 report and code.

2. WORK TO BE DONE

Refine the timeline for Gantt Chart

3. PROBLEMS ENCOUNTERED

No issues were found while examining and making minor adjustments to the report.

4. SELF EVALUATION OF THE PROGRESS

More study on what should be done in FYP2.

SunTeikHeng

Supervisor's signature

haoyang

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4S1	Study week no.:4
Student Name & ID: Chee Hao Yang & 19ACB00762	
Supervisor: Ts Sun Teik Heng @ San Teik Heng	
Project Title: Online service selling web application	

1. WORK DONE

Copy the report from FYP1 to FYP2 template


2. WORK TO BE DONE

Research on WebRTC and Simple Peer

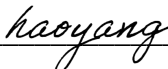
3. PROBLEMS ENCOUNTERED

- No problem was encountered during the development process.
- No problem was encountered during the report writing.

4. SELF EVALUATION OF THE PROGRESS



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Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4S1	Study week no.:6
Student Name & ID: Chee Hao Yang & 19ACB00762	
Supervisor: Ts Sun Teik Heng @ San Teik Heng	
Project Title: Online service selling web application	

1. WORK DONE

- Develop the chat module with WebRtc, SignalR and Simple Peer
- Research on the technology need for video conferencing


2. WORK TO BE DONE

Implement email confirmation with MailGun API

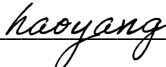
3. PROBLEMS ENCOUNTERED

- No problem was encountered during the development process.
- No problem was encountered during the report writing.

4. SELF EVALUATION OF THE PROGRESS



Supervisor's signature



Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4S1	Study week no.:8
Student Name & ID: Chee Hao Yang & 19ACB00762	
Supervisor: Ts Sun Teik Heng @ San Teik Heng	
Project Title: Online service selling web application	

1. WORK DONE

Meet supervisor to update the development progress

2. WORK TO BE DONE

Integrate all the API with .Net Core Web Api

Deploy web Api with Azure

3. PROBLEMS ENCOUNTERED

- No problem was encountered during the development process.
- No problem was encountered during the report writing.

4. SELF EVALUATION OF THE PROGRESS

SunTeikHeng

Supervisor's signature

haoyang

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4S1	Study week no.:10
Student Name & ID: Chee Hao Yang & 19ACB00762	
Supervisor: Ts Sun Teik Heng @ San Teik Heng	
Project Title: Online service selling web application	

1. WORK DONE


Complete the deployment process for frontend and backend

2. WORK TO BE DONE

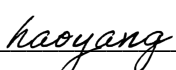
Complete the FYP2 report for Turnitin check

3. PROBLEMS ENCOUNTERED

4. SELF EVALUATION OF THE PROGRESS



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Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y4S1	Study week no.:12
Student Name & ID: Chee Hao Yang & 19ACB00762	
Supervisor: Ts Sun Teik Heng @ San Teik Heng	
Project Title: Online service selling web application	

1. WORK DONE


The report and development were completed without error

2. WORK TO BE DONE

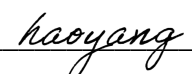
Rehearsal for presentation

3. PROBLEMS ENCOUNTERED

4. SELF EVALUATION OF THE PROGRESS



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Student's signature


POSTER

ONLINE SERVICE SELLING WEB APPLICATION

INTRODUCTION

- Provide alternative way for people who demand service in worldwide
- Freelancers have the unique ability to choose the clients they work
- Over 100 services provided from 8 categories

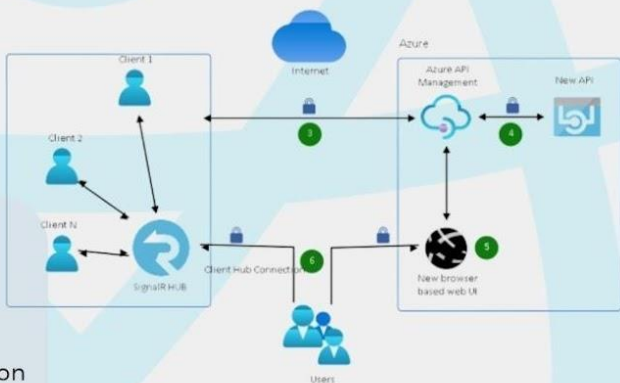
LITERATURE REVIEW



OBJECTIVES

- A freelance marketplace web application which enables freelancers to sell services and customers to propose projects.
- Chat and video call features to communicate between customers and freelancers about project details without switching platforms.
- A content-based filtering recommendation system to predict user preference service.

SYSTEM ARCHITECTURE




CONCLUSION

- Freelancer service selling
- Customer project posting
- Secure payment gateway
- Future Work: -Live video chat
-Service recommendation

Project Developer:
Chee Hao Yang
Bachelor of Information Systems (Hons)
Information System Engineering

Project Supervisor:
Ts Sun Teik Heng



PLAGIARISM CHECK RESULT

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Student Name	Chee Hao Yang
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