ONLINE BEAUTY & SPA APPOINTMENT BOOKING SYSTEM WITH PRODUCTS/SERVICES RECOMMENDATION

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ONLINE BEAUTY & SPA APPOINTMENT BOOKING SYSTEM WITH PRODUCTS/SERVICES RECOMMENDATION

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A project report submitted in partial fulfilment of the

requirements for the award of Bachelor of Science

(Honours) Software Engineering

Lee Kong Chian Faculty of Engineering and Science

Universiti Tunku Abdul Rahman

September 2022

DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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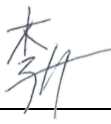
APPROVAL FOR SUBMISSION

I certify that this project report entitled **"ONLINE BEAUTY & SPA APPOINTMENT BOOKING SYSTEM WITH PRODUCTS/SERVICES RECOMMENDATION"** was prepared by **CHEAH HO CHING** has met the required standard for submission in partial fulfilment of the requirements for the award of Bachelor of Science (Hons) Software Engineering at Universiti Tunku Abdul Rahman.

Approved by,

Signature : 

Supervisor : LEE MING JIE

Date : 8/9/2022

ABSTRACT

In current day, online booking is becoming more prevalent, especially on the younger generation. Traditional booking methods such as by phone, text, email, or in-person has its problems such as long hold time, not enough time slot, waiting the booking by phone and more. The online beauty & spa booking system is designed to solve these problems. The three mains objective of the systems is to develop a booking system, recommendations system and perform systems testing. The methodology used to develop this system is feature driven development. The tools used in this system include modern web framework and tools such as Next.js, Express.js, MongoDB, Cypress, and hosting platform such as Vercel, Heroku and MongoDB Atlas. The main feature of the systems are login systems, product and services management, product and services recommendation, appointment booking functionality and appointments management. The system should be separate into two main pages for customer and administrator. Customer can use the developed web application for activities, such as buy beauty products and book for beauty & spa services, while administrator can perform operations, such as update product details and manage customer booking. Other than that, a recommendation system is implemented to enable the developed web application to suggest products and services to the customer. This recommendation system is a collaborative filtering-based system that is implemented using a Python library - Scikit-Learn. To validate the developed web application, an end-to-end testing framework – Cypress is used in this project. Briefly, an automated testing is setup using Cypress, and the testing results are recorded. Hosting is explored using multiple hosting services for the front-end, back-end and database and the web application is available on https://lily-beauty-spa-fe.vercel.app.

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1 INTRODUCTION

1.1 Introduction

In this era of smartphone and internet, online booking has become more and more common, for services such as cinema, train or airline booking. Though online booking has been common in everyday life, it's still uncommon for spa and beauty services, especially for small business owner.

A web based online booking can have multiple benefits for the spa and beauty owner. By automating the booking process, it makes to booking process for simpler and faster for both owner and client. The system can also suggest products and services based on sales statistics and client preferences. The system can also manage client feedback and recommendation.

1.2 Background of the problem

As online booking becoming more and more common in many services such as buying tickets for movies in cinema and booking train or plane ticket, many people expect and prefer online booking, especially for the more tech literal group. Traditional booking methods such as by phone, text, email, or in-person possess problems and may cause frustration for both the client and the owner. An automated process can make the booking process smother and more reliable than the more manual counterpart. Also, online booking can also provide revenue increase especially for small business.

1.3 Problem Statement

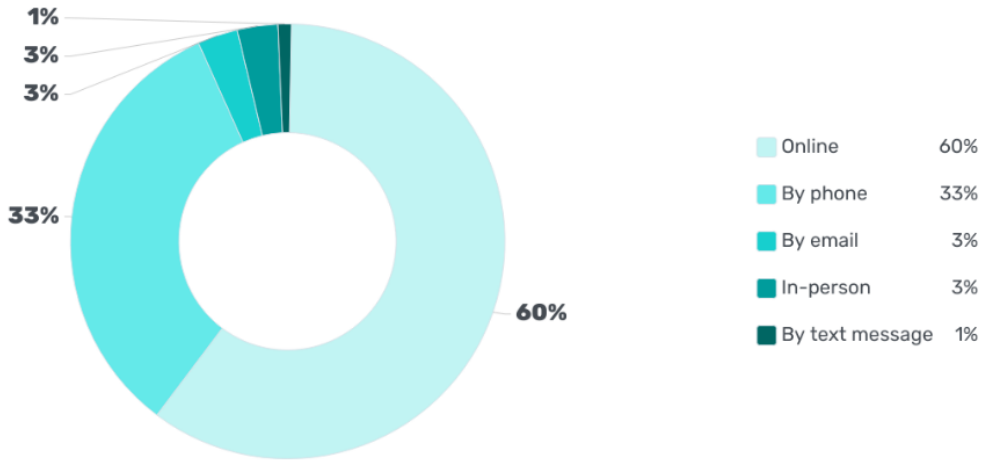

Figure 1.1 Appointment Booking methods (Hedges, 2021)

A survey on American consumer made by GetApp research (Hedges, 2021), one third of the consumer still make booking for their doctor, dentist, and beauty appointments by phone. Booking by phone have a history of causing frustration forced to wait on hold. Booking by phone also possess fundamental problems such as not knowing available time slots beforehand. The graph above show that business show adapts to online booking to cater the more prefer by consumer online booking methods.

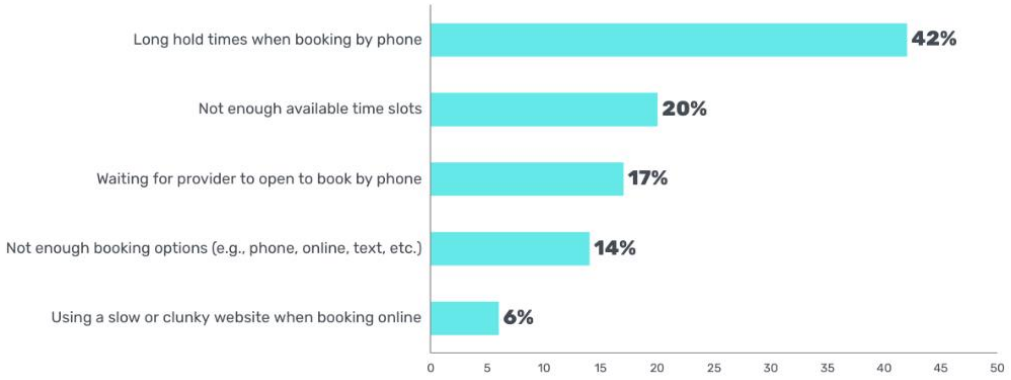

Figure 1.2 Problem faced when booking appointments (Hedges, 2021)

Figure above also shows weakness of traditional booking methods. It points out one of the main weaknesses of phone booking as long hold times.

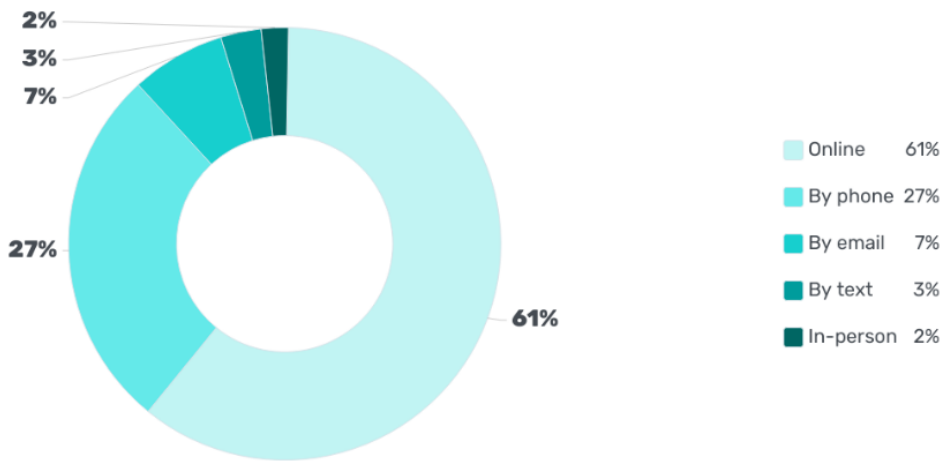

Figure 1.3 Preferred way of cancelling or rescheduling appointments (Hedges, 2021)

Figure above show the preferred way of cancel and rescheduling of appointments as online, while the least favourite as in-person. The reasons of online booking popularity can be the reschedule and cancellation can be done automatically without human intervention and can also be done anywhere.

On another study made by Housecall Pro (Page, 2019), on the pest control industry, owner experience increase in revenue by 120% after adopting online booking. Also, companies with two to nine employees experience a 37% increase in business while companies with more than ten employees experience 20% increase after adopting online booking. This show that business owner can be leave extra revenue on the table by not adopting online booking.

1.4 Project Objective

(i) To develop a web-based appointment booking system for beauty and spa services and products.

(ii) To implement a recommendation system into the proposed web application.

(iii) To conduct testing on the proposed web application.

1.5 Proposed Solution

The Booking system can automate the booking process and make the process easier and more manageable and less time consuming for the owner and customer. Using this system, the booking process should take less than 10 minutes to complete.

MERN is a popular tech stack for full stack web development which will be used in this project. It consists of 4 main technology that revolve around JavaScript. MongoDB for the database ExpressJS for the web framework that powered by NodeJS, a JavaScript runtime environment and ReactJS, a JavaScript library for building frontend user interface.

One of the main advantages of MERN stack is it is centred around JavaScript. You can get everything done using JavaScript only from frontend to backend. MERN stack also can handle project in any complexity, as it is very scalable. All the tools of MERN are very easy to use. MongoDB is a non-relational database which centred around ease of use for developer compared to traditional relational database. ExpressJS is one of the most popular web frameworks for NodeJS. React is also one of the most popular UI frameworks develop and used by Facebook to build some of the most popular website. All of the tech stack of MERN is very popular so it is heavily maintained, have a easy to understand documentation and a very active communities.

Using MERN mean using the current most popular tech stack, the project will be easy to be develops with big communities behind the technology and easily maintainable in the future.

While the development for the product suggestion system is using machine learning with machine learning library with Python Scikit-Learn. Popular technique use in product suggestion system such as collaborative

filtering by predicting an item popularity using exiting users data and statistics and content-based filtering by clustering item with their similarity and promoting items which are similar.

1.6 Proposed Approach

The methodology that will be use in this project is Feature-driven development. Feature-driven development is one of the Agile methods for software development. The purpose of this methodology is that a working software will be delivered repeatedly in a timely manner, following the principle of the Agile Manifesto.

Feature list for Feature-driven development

(i) Login system for user and administrator
(ii) Allow product and services to be manage by administrator
(iii) Product and services recommendation functionality
(iv) Appointment booking functionality for client
(v) Appointment management for administrator
(vi) A list for showing user appointments

1.7 Scope

Using the booking system, client can make booking by accessing to the beauty and spa's booking website. Clients can choose the date and time, type of products or services and therapists. The system will automatically provide the available timeslot and services for the clients. The system also can make recommendation of products and services using data of popular products and services of the time and the client appointment records.

The appointments made can be managed by a system administrator. Appointments can be delayed or advanced, the therapist and services can also be changed. After the appointments detailed are changed, the client and therapist will receive a notification by the system.

Administrator can also maintain and update spa information. Information such as services or product availability can be updated whenever needed. Lastly, after each appointment, client able to navigate to their services history and give feedback or recommendation for each service.

2 LITERATURE REVIEW

2.1 Introduction

Literature reviews are done to study and prepare for the development of a booking system. My Literature Review are conducted on three different area of study, Feature-Driven Methodology, Online Booking System, and Recommendation systems. The studies will focus on Feature-Driven Methodology and its implementations, development process of the online booking systems and tools and challenges in implementation of a recommendation systems.

Table 2.1 Reference List

Reference list	In-Text Citation
1. Firdaus, A., Ghani, I. and Yasin, N.I.M., 2013. Developing secure websites using feature driven development (FDD): a case study. *Journal of Clean Energy Technologies*, *1*(4), pp.322-326. 2. Chowdhury, A.F. and Huda, M.N., 2011, December. Comparison between adaptive software development and feature driven development. In *Proceedings of 2011 International Conference on Computer Science and Network Technology* (Vol. 1, pp. 363-367). IEEE. 3. Singh, H., 2014. FDRD: Feature Driven Reuse Development Process Model. 4. Basir, N.F., Kasim, S., Hassan, R., Mahdin, H., Ramli, A., Fudzee, M.F.M. and Salamat, M.A., 2018. Sweet8bakery booking system. *Acta Electronica Malaysia*, *2*(2), pp.14-19.	1 (Firdaus, Ghani, and Yasin, 2013) 2 (Chowdhury, and Huda, ,2011) 3 (Singh, 2014) 4 (Basir, Kasim, Hassan, 2018.) 5 (Zongjiang, 2012) 6 (Hang, 2011) 7 (Priyanka, Tewari, and Barman, 2015) 8 (Abdulrahman, and Viktor, 2020)

5. Zongjiang, W., 2012. Railway online booking system design and implementation. *Physics Procedia*, *33*, pp.1217-1223.
6. Hang, B., 2011, July. Design and implementation of cinema online booking system. In *2011 International Symposium on Computer Science and Society* (pp. 196-199). IEEE.
7. Priyanka, K., Tewari, A.S. and Barman, A.G., 2015, April. Personalised book recommendation system based on opinion mining technique. In *2015 global conference on communication technologies (GCCT)* (pp. 285-289). IEEE.
8. Abdulrahman, R. and Viktor, H.L., 2020. Personalised Recommendation Systems and the Impact of COVID-19: Perspectives, Opportunities and Challenges. In *KDIR* (pp. 295-301).

2.2 Feature driven development

Table 2.2 Literature review: Feature-Driven Methodology

No	Article	Purpose	Major findings or contributions	Research methods, sample, and variables	Strengths and limitations	Significance and implication of research	How this research is linked to other studies reviewed
Theme/Area of studied: Feature-Driven Methodology							
1	(Firdaus, Ghani, and Yasin, 2013) Developing secure websites using feature driven development (FDD): a case study.	To investigate and prove whether Feature-Driven development can withstand both requirements change and software security.	Feature-Driven development can be managed analyzing and implementing some security principles, planning the correct tool, adding more iterations between Feature-Driven development phases, and using a mind map tool.	This case study was conducted in a class of third years undergraduate in one semester by adding security elements in the system while applying Feature-Driven development processes.	Performed by students with lesser experiences.	Proves that Feature-Driven development can produce secure website even with little secure software development experience.	Show how Feature-Driven development can be adapted by lesser experiences.

			Feature-Driven development needs to clearly define the process towards developing secure software.				
2	(Chowdhury, and Huda, ,2011)	To compare the strength and weakness of Adaptive Software Development and Feature Driven Development	When a coding standard is necessary during the software implementation phase, Feature Driven Development is preferable. While it is required to follow a predefined technique for requirement process Adaptive Software Development is better.	comparison between attributes of two agile software development methods related to Software Requirements and Software Construction and their sub attributes by classification with Not Satisfied, Partially Satisfied	Comparison with made with two IEEE's Software Engineering Body of Knowledge and Knowledge Areas. Only two agile methodology is compared.	Show the performance of Adaptive Software Development and Feature Driven Development and when it is preferable in different projects.	Compared and explain Adaptive Software Development and Feature Driven Development

				and Adequately Satisfied.			
3	(Singh, 2014)	Adopting reuse in Feature driven development to eliminate the limitation of limitation of agile process	Explanation on how to implement software reuse in Feature driven development.	Case study on Microchip Pvt. Ltd which integrating reuse and feature driven development to enhance the productivity and the quality of product.	Have case study to prove the effectiveness of adopting reuse in Feature driven development. Only one medium sized organization is involved in case study.	Show that Feature driven development can improve product quality and improvement can be made to Feature driven development.	Show how Feature driven development can be improve

On Feature-Driven, the article *Comparison between adaptive software development and feature driven development* by Chowdhury and Huda made comparison between the two methodologies. While the article *Developing secure websites using feature driven development (FDD): a case study by* Firdaus, Ghani, and Yasin discusses the process of group of students implementing feature driven development model into their system while *FDRD: Feature Driven Reuse Development Process Model* by Singh discuss about implementing software reuse into Feature driven development model.

Based on the review, it is decided that feature driven development is suitable for this project, since it does not follow a predefined technique on software requirement process, and it can provide benefit such as improved coding standard in software implementation phase. The activities of each phase in the feature driven development process are like the case study such as develop use case diagram develop an overall model phase, followed by constructing feature list in building a feature list phase, making a Gantt chart in plan by feature, developing prototype in design by feature phase and develop the system in build by feature phase. Reuse is also implemented into the system such as

2.3 Booking System

Table 2.3 Literature review: Online Booking System

No	Article	Purpose	Major findings or contributions	Research methods, sample, and variables	Strengths and limitations	Significance and implication of research	How this research is linked to other studies reviewed
Theme /Area of studied: Online Booking System							
1	(Basir, Kasim, Hassan, 2018.)	To show the process of developing a online booking system from literature review, methodology, requirement analysis to implementation and testing.	Explanation on each steps of the development process on developing the online booking system for bakery.	Case study on development of online booking system for Sweet8Bakery using waterfall methodology, Adobe Dreamweaver CS6, Xampp's web server and MySQL database	Have details explanation on each steps of development process. Using unfamiliar developments tools such as Adobe Dreamweaver CS6.	Show how to implements each step of development process on a online booking systems.	Details process for each stage of development for developing an online booking system

2	(Zongjiang, 2012)	To explain the system architecture, functions, and design of Railway Online Booking System in China	Explanation of system architecture and function of a railway online booking systems and how to design the system, database and logic model around it.	A design on booking system that are structured from data access layer to business logic layer and business exterior layer. Requirement and function such as customer registration, ticket cancellation, inquiries, online booking, online ticket refund.	Have process charts and tables on business process flow, entity relation diagram and database table structures. Have no evidence of being implemented in actual business scenario.	Show the business process flow and how to implement a system around a online booking systems.	Show design for Online Booking System for a railway systems

3	(Hang, 2011)	Explanation on the requirement, systema and database design on Implementation of Cinema Online Booking System	Explanation on the function requirements, analysis, and design process of implementation on cinema online booking systems.	A design on online booking system for cinema with functional requirements, entity relationship and data structure.	Have explanation on function requirements of a booking system on diagrams of	Show the basic requirements and design process of online booking system for cinema	Show requirement and structure for Cinema Online Booking System

On the Online Booking System, three different booking system is reviewed and *Sweet8bakery booking system* by Basir, Kasim and Hassan, *Railway online booking system design and implementation* by Zongjiang and *Design and implementation of cinema online booking system* by Hang. Bases on the review, basic functionality of booking system is learned such as methodology, requirements, system designs, database design and business logics.

Based on the review, some aspect of the booking systems is used in this project such as database design of customer, transaction and products and business logics such as reservation systems on booking process, payment, and order status.

2.4 Recommendation system

Table 2.4 Literature review: Recommendation system

No	Article	Purpose	Major findings or contributions	Research methods, sample, and variables	Strengths and limitations	Significance and implication of research	How this research is linked to other studies reviewed
Theme / Area of studied: Recommendation systems							
1	(Priyanka, Tewari, and Barman, 2015)	Explanation on a Recommendation system using classification and opinion mining technique.	Explanation on implementation of classification and opinion mining technique on Book Recommendation System.	Examples of Book Recommendation System using classification and opinion mining technique on user data to create recommendation	Contain equations, source code and explanation of algorithm	Show how to use classification and opinion mining technique on data to create a recommendation system.	Explanation of classification and opinion mining technique.

2	(Abdulrahman, and Viktor, 2020)	Explanation on the impact of Covid-19 on recommendation system.	Explanation of problems of Cold-start Users and Grey-sheep Users which covid introduced and how to overcome it.	Identifying and addressing Cold-start Users and Grey-sheep Users and implementation of Adaptive Machine Learning to solve the problems.	Contain relevancy to recent Covid-19 and its effect on data of Recommendation Systems. Only discuss two problem brought by Covid-19.	Show how to identify and solve Cold-start Users and Grey-sheep Users and how it affect machine learning algorithm.	Explanation of Cold-start Users and Grey-sheep Users

On this topic, 2 article that are reviewed are *Personalised book recommendation system based on opinion mining technique* by Priyanka, Tewari, and Barman *and Personalised Recommendation Systems and the Impact of COVID-19: Perspectives, Opportunities and Challenges* by Abdulrahman and Viktor

On Recommendation system, there are 2 approaches with opinion mining or classification. Opinion mining is determining the user preferences using reviews and performance on past transaction while classification is classified the user together with other users with similar interest. Classification technique is more suitable with system with less user personal transaction history, thus classification technique such as collaborative filtering is used in this project.

3 METHODOLOGY AND WORK PLAN

3.1 Introduction

The system will be developed using Feature-Driven Development and with the help of array of development tools that can handle development to deployment, following a strict work plan. The project is targeted to be completed in 11 weeks.

3.2 Methodology

Feature-Driven Development is part of Agile method for developing software. Feature-Driven Development focus on development of iterative and incremental, allow the project to deliver software result often, efficient, and reliable.

Feature-Driven Development have five main activities, starting with develop overall model, build feature list, plan by feature, follow by iterating design by feature and build by feature. At the beginning stage, research is conducted on subject of the project and an overall model is developed as a rough outline of the projects. Next, a feature list is produced, which are small targets or goals that can be delivered as a product. A plan is generated of each feature where task and resources are assigned. Next, each feature undergoes design and build, which feature are design on the framework or tools for developments and to be build using the design. The design and build steps are repeated until the project is completed.

3.3 Development tools

(i) MongoDB Compass

MongoDB Compass is the interactive tool to interact with MongoDB database with data visualization. It allows functions such as basic querying and develop aggregate pipeline. MongoDB Compass is a must need tool to interact and develop with a MongoDB Database.

(ii) Insomnia

Insomnia is an API client which allow REST request, like Postman. It is a free and open-source software used to test API.

Insomnia is chosen over Postman because Insomnia has a much simpler user interface and provide a better view on the API.

(iii) Next.JS

Next.js is a popular JavaScript framework for react, which can handle several server-side functions such as routing, API route and Image optimization. Next.js is used because of the functionalities it provides over basic React Application.

(iv) Express.JS

Express.JS is a popular web framework for building web application and APIs using Node.js. Express.JS provide basic function of a web framework such as routing, controller, and middleware. Express.JS is chosen because of the ease of use with using JavaScript language.

(v) Ant Design

Ant Design is a React UI library for building react app. Like bootstrap, it has library of prebuilt component for common web component such as button, table or form. Ant Design can simplify the frontend building process.

(vi) NextAuth.JS

NextAuth.JS is an authentication library for Next.js. It can handle authorization for different providers such as using credentials or Facebook or Google account login. NextAuth.JS is build specifically to support Next.js framework.

(vii) Mongoose

Mongoose is an object modelling for MongoDB in Node.js, which help to manage validation, casting and business logic for using MongoDB with JavaScript. Mongoose is the equivalent of Object–relational mapping of SQL database.

(viii) Scikit-Lean

Scikit-Learn is a popular machine learning library using Python. Using machine learning, a product suggestion engine can be developed by predicting user preferences with collected products and sales data. Example techniques are Collaborative filtering which are predicting an item popularity using other users rating with algorithm like Nearest Neighbours and Content-based filtering for clustering item with their similarity using Cosine Similarity.

(ix) MongoDB Atlas

MongoDB Atlas is a cloud database hosting platform for hosting MongoDB database on popular web services such as AWS, Azure, and Google Cloud across all regions. MongoDB Atlas have a free tier which are suitable for this project.

(x) Vercel

Vercel is a platform for hosting frontend frameworks, especially for React and Next.js. Vercel offer a easiest way to deploy Next.JS app and also have a free tier which are suitable for this project.

3.4 Work Plan

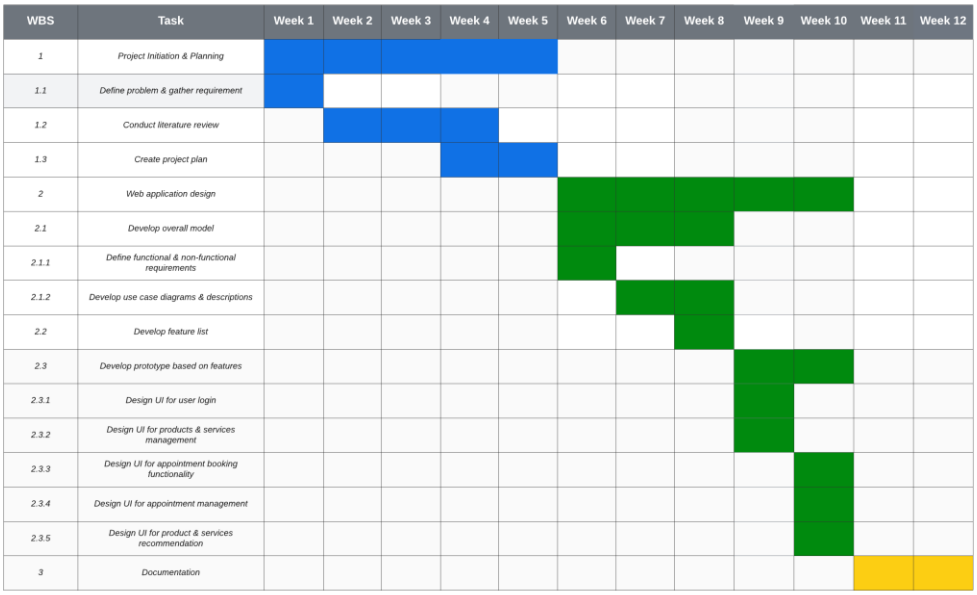

Figure 3.1 WBS Gantt chart for project phase 1 (FYP 1)

In here, the tasks for the project phase 1 are listed in the figure above. Based on the figure, the tasks are:

(i) Project initiation & planning: Gather the initial specification of the project such as problem statement and requirements, literature review and project plan. The task was carried out from week 1 to week 5

(ii) Web application design: Develop an initial design of the system such as functional requirement, develop feature list and prototype. The task was carried out from week 6 to week 10

(iii) Document: Completing the report on task carried out on phase 1. The task was carried out from week 11 to week 12

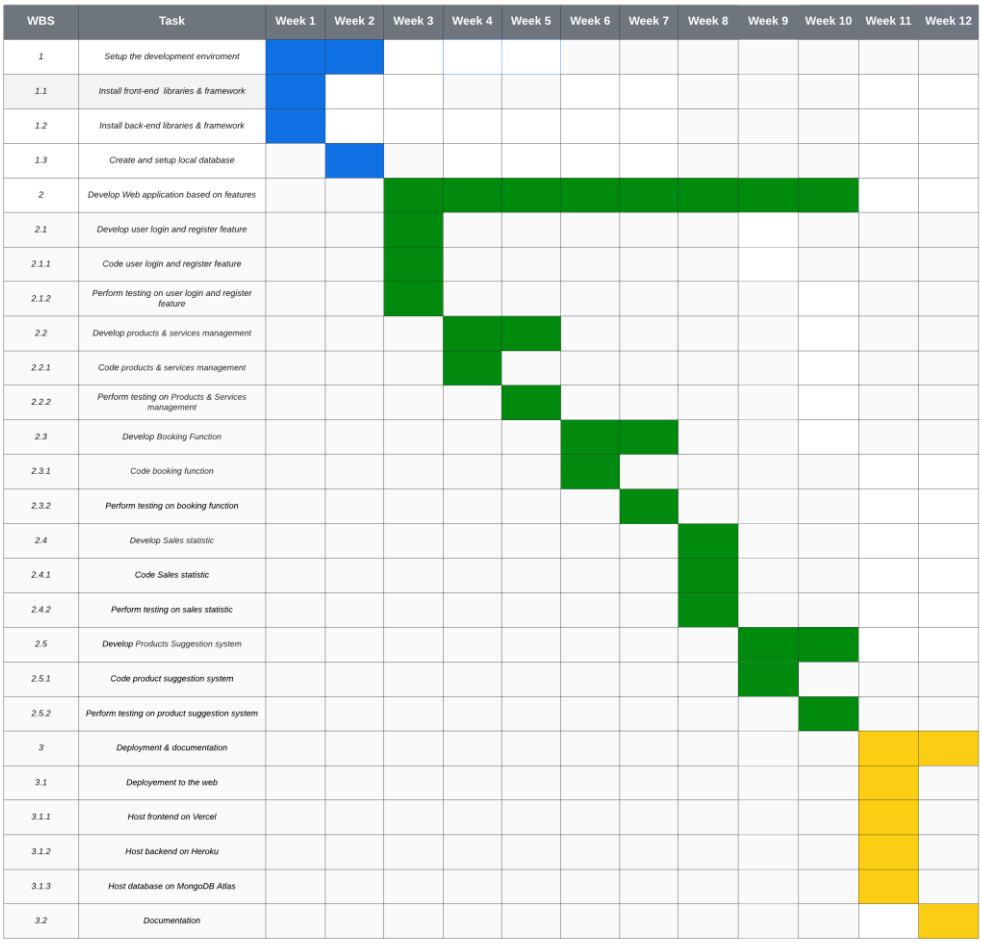

Figure 3.2 WBS Gantt chart for project phase 2 (FYP 2)

In here, the tasks for the project phase 2 are listed in the figure above. Based on the figure, the tasks are:

(i) Setup development environment: Setup the initial development environment to prepare for the development process in the next stage. The task was carried out from week 1 to week 2

(ii) Develop web application based on feature: Carried out the development on the web application feature by feature. The task was carried out from week 3 to week 10

(iii) Deployment and documentation: Deploy the completed web application to cloud hosting platform and complete the report on task carried out on phase 2. The task was carried out from week 11 to week 12

4 PROJECT SPECIFICATION

4.1 Introduction

The requirement is collected based on existing products and its documentation such as Easy Booking, an accommodation booking system for tourist (Hasan,2014). The requirement is adjusted to be more specific to this project which are for Spa and Beauty Booking.

4.2 Requirement Specification

Functional Requirements

(i) Allow Users and Admins to register and login to an account.
(ii) Allow Admins to add, update and delete products and services.
(iii) Allow Admins to access current booked timeslots.
(iv) Allow Admins to obtain statistics on products and services sold.
(v) Allow Users to book services with timeslots.
(vi) Allow Users and Admins to browse all available products.
(vii) Provide products and services suggestion to the users.

Non-functional Requirements

(i) All account password and sensitive data should be encrypted in the database.

Password should be encrypted such as hashing using SHA-256 algorithm.

(ii) User interface should be easy to use and accessible.

User interface are clear and easy to be use by user of different age and skill group.

(iii) All booking and transaction done on the system should be kept tract.

A previous booking and services are kept and store in the database and can be easily used to display in a statistic.

4.3 Use case diagram

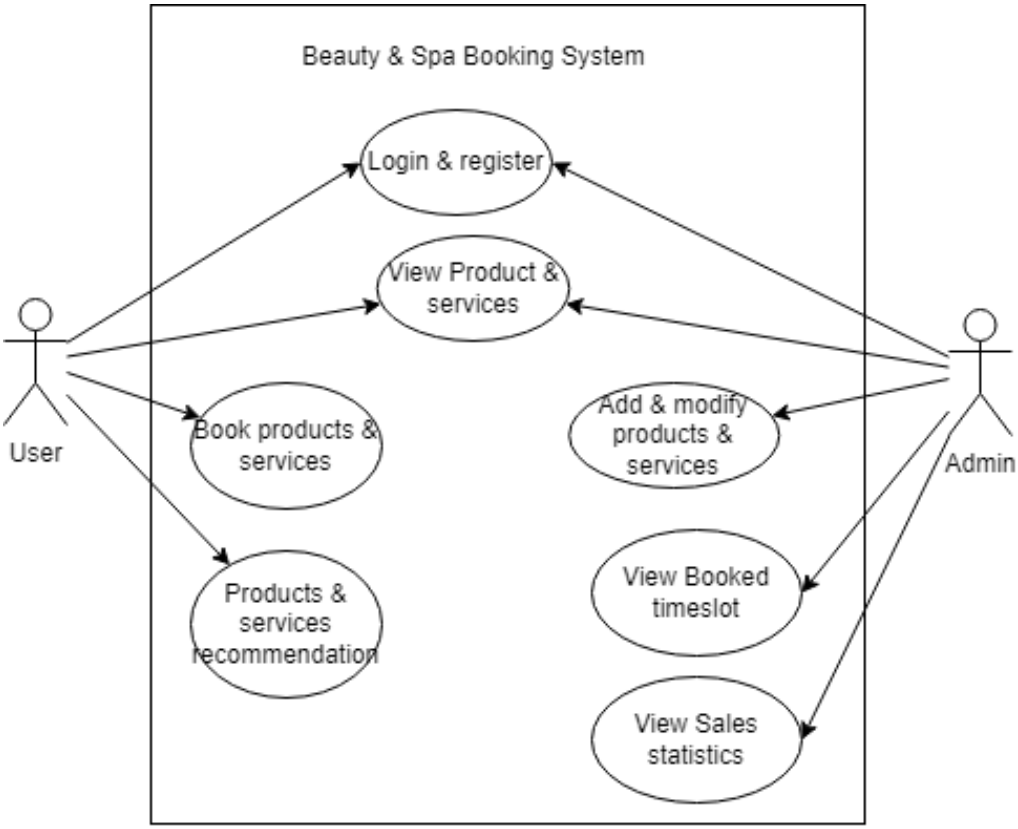

Figure 4.1 Use Case Diagram

4.4 Use Case description

Use Case Name: Login
Priority: High
Primary Business Actor: • User • Admin
Description: User and admins could register using credentials and password. Users and admins will be given privilege and restriction on which pages and actions each can access.
Typical Cause of Events: 1. User and admin go to the booking system main page. 2. User and admin redirected to the login page if not already logged in. 3. User and Admin need to enter the correct credentials. 4. After credentials is validated by the systems, the system redirect to user to the home page.
Conclusion: The system log in the users and admins.

Use Case Name: Register
Priority: High
Primary Business Actor: • User • Admin
Description: User and Admins can register new accounts using credentials.
Typical Cause of Events: 1. User and admins go to the register page to create new accounts. 2. The system returns a form which require users to input user's details. 3. User details submitted are validated by the system. 4. After system successfully validate the user details, a new account is created.
Conclusion: The system creates new account for the users and admins.

Use Case Name: View products and services
Priority: High
Primary Business Actor: • User • Admin
Description: All products are listed in the product page and should be easily sorted or search.
Typical Cause of Events: 1. Users and admins go to the product page. 2. The system returns a list of user products. 3. User and admins can sort and search the products.
Conclusion: The desire products is return to the user.

Use Case Name: Add & Modify Products
Priority: High
Primary Business Actor: • Medium
Description: Admins are allowed to add update and delete products and each detail, such as products names, description and price and services name, description, price, and duration.
Typical Cause of Events: 1. Admin go to the manage products page. 2. Admin can click on edit to edit or delete specific products. 3. Admin can also click on add products to add new products. 4. A modal is pop up by the system to allow user to complete the desired action
Conclusion: The products are successfully added or modify in the database.

Use Case Name: View Sales and Statistics
Priority: High
Primary Business Actor: • Medium
Description: Statistics such as graph should be shown on the sales of products and services on a certain timeslot.
Typical Cause of Events: 1. Admin go to the home page. 2. The sales statistics are display by the systems. 3. Admin can modify the statistics to change the timeframe or products.
Conclusion: The sales statistic is display to the admins.

Use Case Name: View booked timeslots
Priority: High
Primary Business Actor: • Admin
Description: The booked timeslots and their services of each employee should be visualized on a calendar or timetable for the admin.
Typical Cause of Events: 1. Admin go to the booking page. 2. The system displays a list with timeframe. 3. Admin can change confirm or cancel the booking.
Conclusion: Booked timeslots is displayed to the admins.

Use Case Name: Book Services
Priority: High
Primary Business Actor: • User
Description: Users could book a service based on employee and time available. Available timeslot should be automatically updated by the system.
Typical Cause of Events: 1. Users go the booking page. 2. User can make new booking by filing in detail on services, and timeslots. 3. The booking completed is reflected on the user's booking list.
Conclusion: Booking is completed by the user.

Use Case Name: Products and services suggestion
Priority: Medium
Primary Business Actor: • User
Description: Products and services should be suggested to the users on the home page based on user preferences and products popularity.
Typical Cause of Events: 1. Users go to homepage 2. The system will generate suggestion based on user previews purchase and sales trend. 3. The system will display the generated suggestion to the users.
Conclusion: Products and services suggestion is generated and displayed.

4.5 Feature list

After developing the overall model, a feature list is prepared for the prototype design and web application development. The feature list is as follows:

(i) Login system for user and administrator

(ii) Allow product and services to be manage by administrator

(iii) Product and services recommendation functionality

(iv) Appointment booking functionality for client

(v) Appointment management for administrator

(vi) A list for showing user appointments

4.6 Initial Prototype

A prototype is created using Figma and can be access at https://www.figma.com/file/7RIwxmuvxcPHoWXJ03WMPP/Booking-System?node-id=0%3A1.

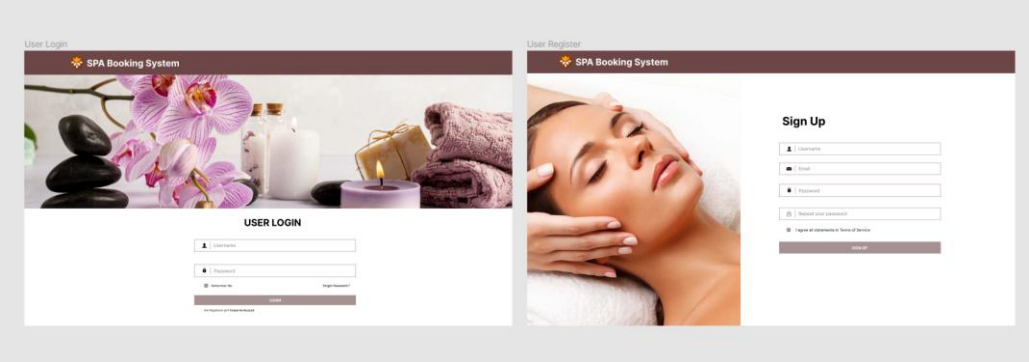

Figure 4.2 Login Register Page

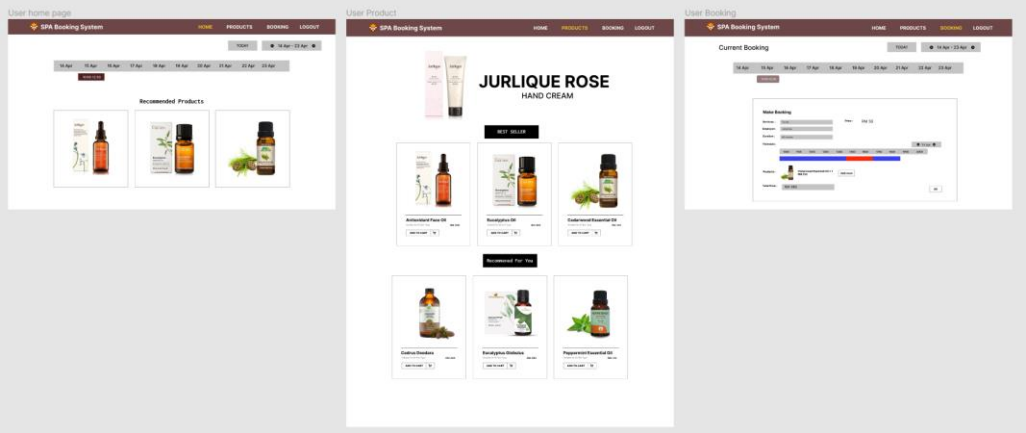

Figure 4.3 User Pages

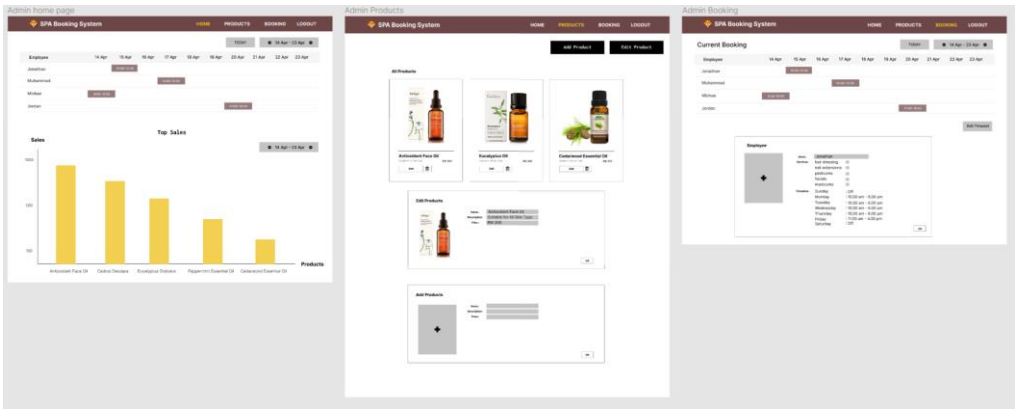

Figure 4.4 Admin Pages

5 SYSTEM DESIGN

https://docs.google.com/document/d/1V-FcVoyOAOvxVH_qhiGBln68f0BKtMfE/edit - heading=h.4f1mdlm

5.1 Introduction

The Beauty & Spa appointment booking system is split into three-part, frontend using Next.JS framework, backend using Express.js and database using MongoDB. There are 2 types of users, normal users, and admins, which can login using the same login page but can access different pages with different functionalities.

5.2 Login & Register

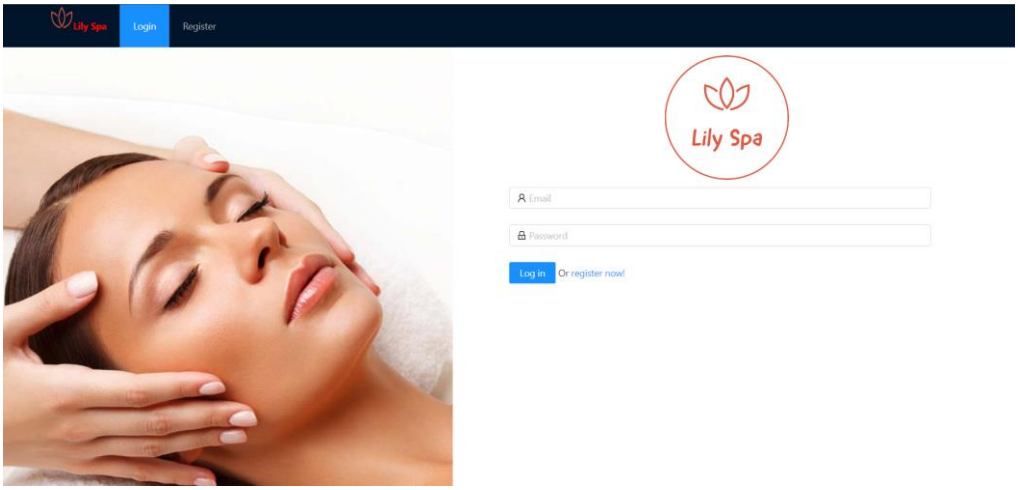

Figure 5.1 Login Page

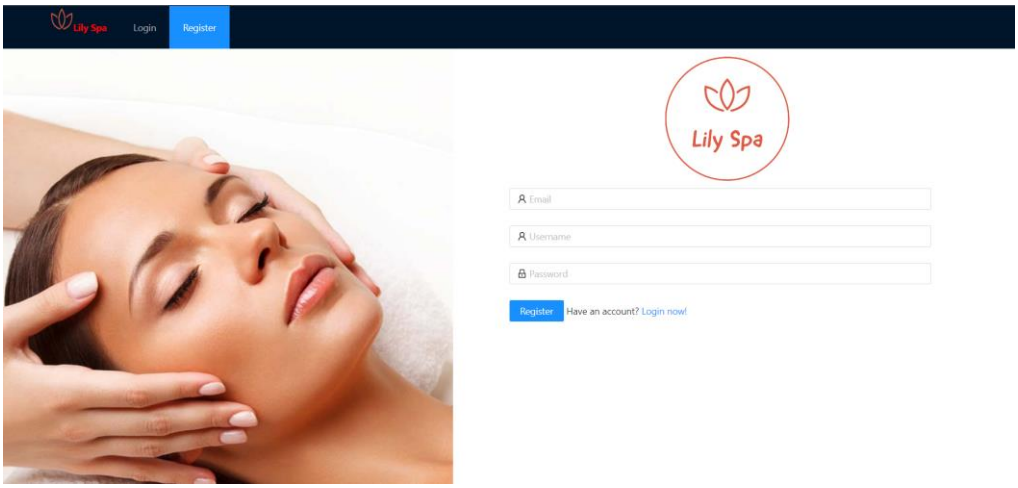

Figure 5.2 Register Page

The figure above shows the login and register page, used by both user and admins. User password is encrypted when stored into the database, based on figure below.


```
_id: ObjectId('631900b1644f90a74943c11e')
email: "testtest3@gmail.com"
username: "hoching"
password: "$2b$10$ZbB63aHBK7WFSHsVcq7f/eIUYf0FsadXcGpIN6XNAazk78kdZGBqC"
phone: "0165010188"
admin: false
```

```
_id: ObjectId('631905169db30bab9bc4427f')
email: "admin123@gmail.com"
username: "admin"
password: "$2b$10$wZe9dhIx9XM2npUpXCM05O4tfKPjFaPPeorzTc6gOpLIto9yLQMUu"
phone: "0165010188"
admin: true
```


Figure 5.3 User Collection

5.3 User Functionalities

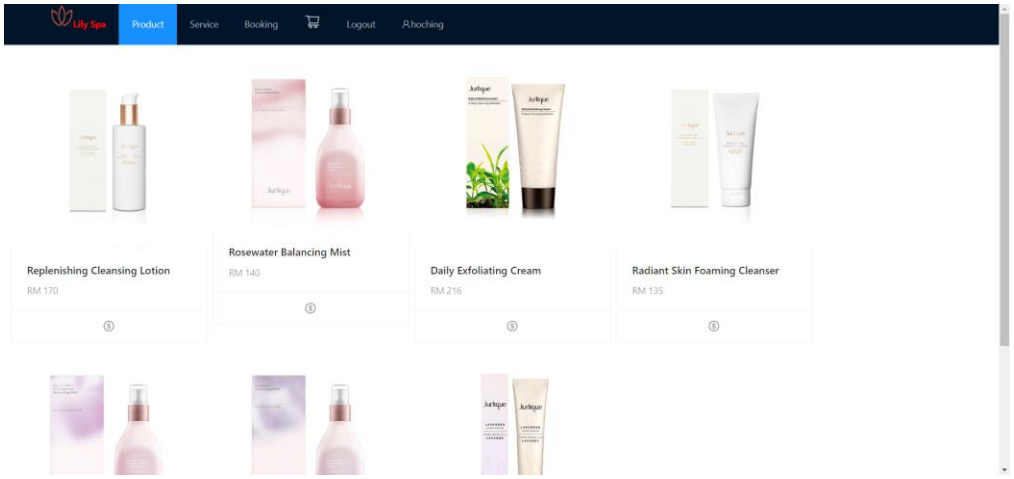

Figure 5.4 User Product

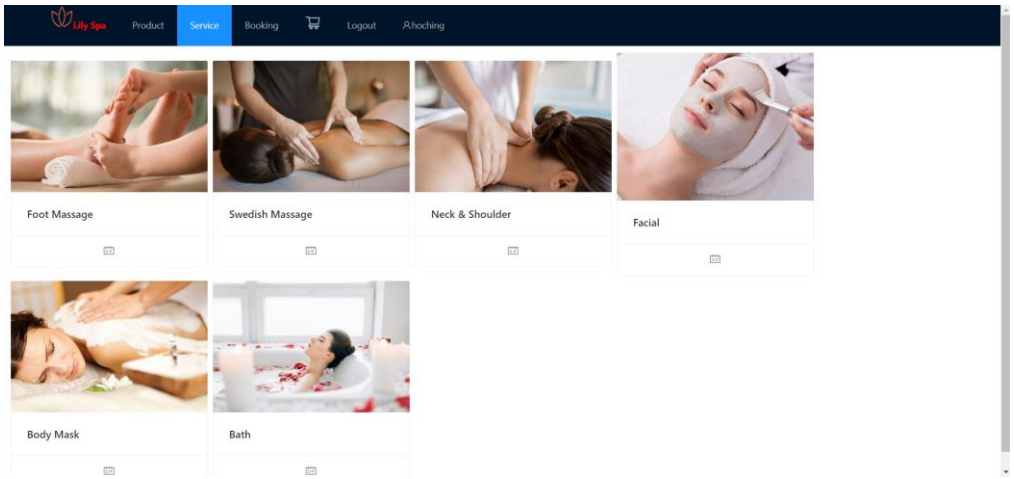

Figure 5.5 User Services

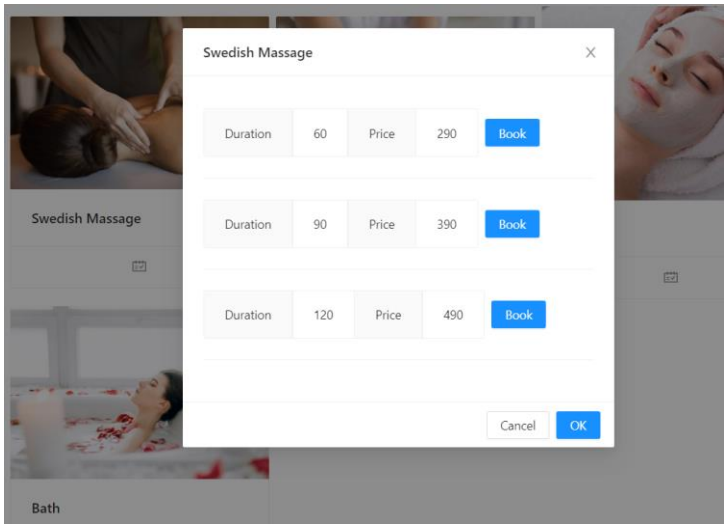

Figure 5.6 User Service Selection

Users can select product and select services. Services have different duration or types.

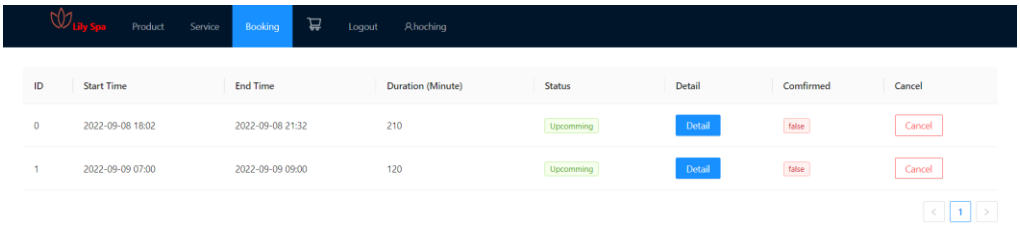

Figure 5.7 User Booking

Users can view previous and upcoming bookings. Users can view the confirmation of the booking or cancel booking.

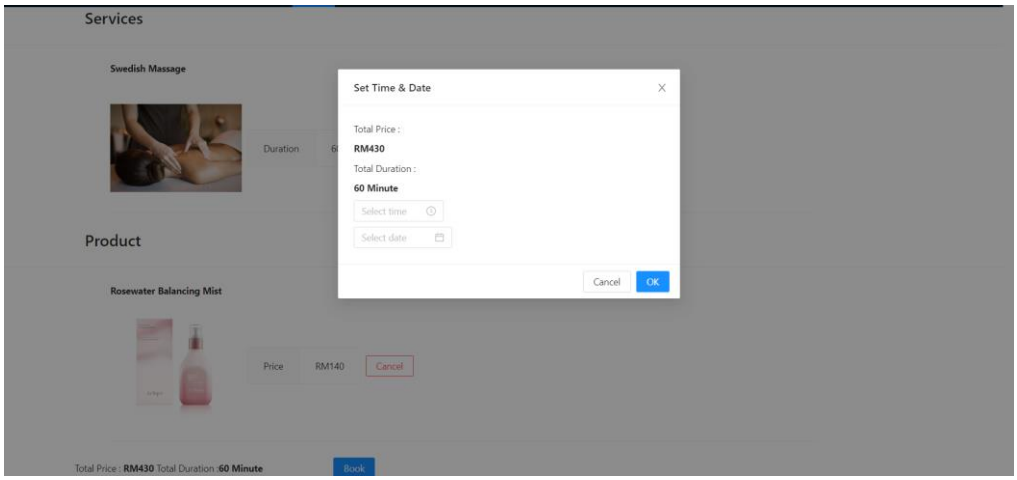

Figure 5.8 User Cart

User can view their cart with total booking duration and price, and also select the time and date for the booking.

5.4 Admin Functionalities

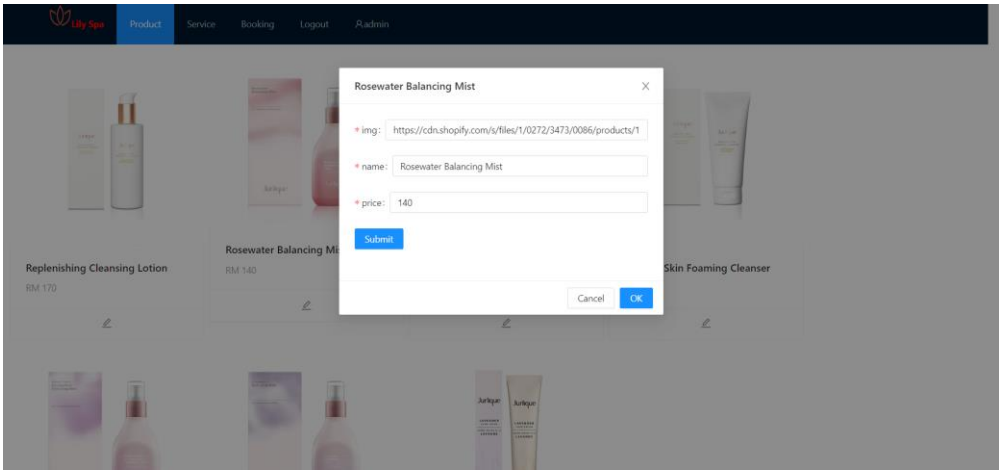

Figure 5.9 Admin Product

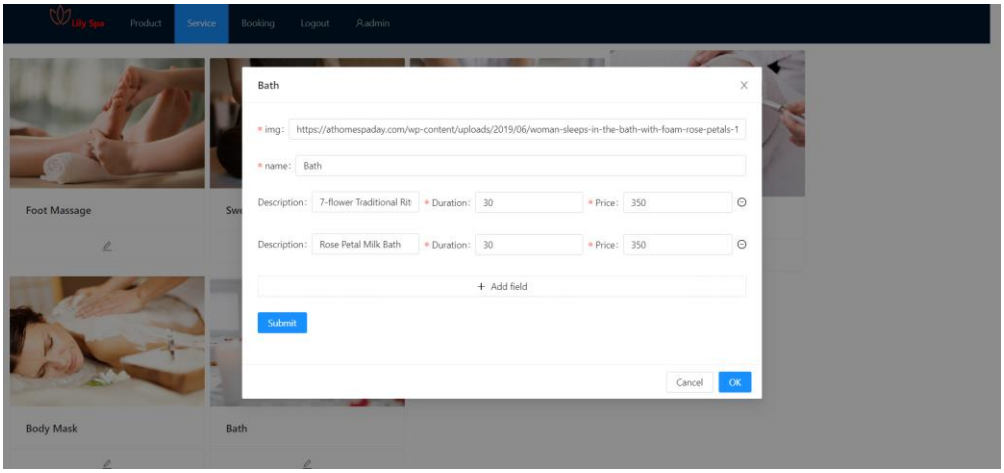

Figure 5.10 Admin Services

Figures above show admin's version of the product and services page. Admin able to edit product and services information instead of making purchases.

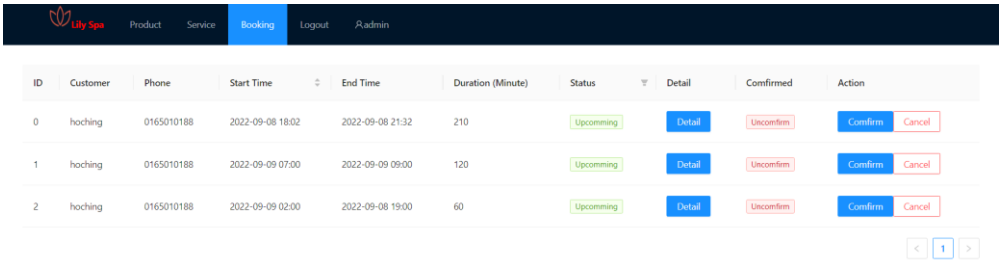

Figure 5.11 Admin Booking

The admin booking page allow admins to view all bookings with customer details and allow admins to confirm the booking.

5.5 Recommendation System

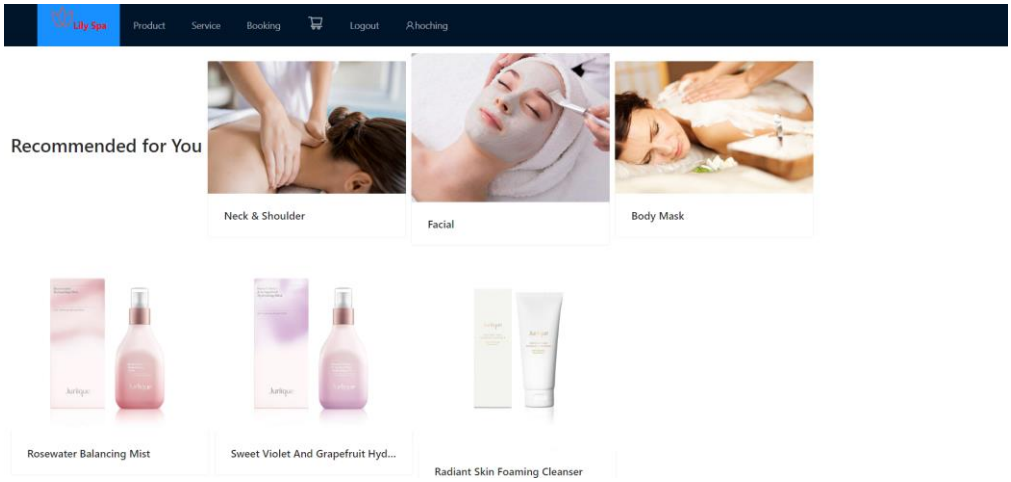

Figure 5.12 User recommendation

The above show the recommended product and services for users. The technique used to generate the recommendation is collaborative filtering, using the scikit-learn library's cosine similarity. Collaborative filtering is to generate recommendation based on users with similar preferences.

Using collaborative filtering, the backend can generate list of users and their recommendation list based on score of how likely the user will buy the product. The system will generate new recommendation for each user on every purchase.

6 SYSTEM TESTING

6.1 Introduction

The Testing is done using Cypress on the fronted. Cypress is an end-to-end testing library to test web application. Cypress will simulate user input and to get respond. Cypress able to determine a test suite is success or failed based on the respond from the web application.

There are 5 main test or specs that are written for the automated testing:

(i) User Login
(ii) Add and cancel services from cart
(iii) Create user booking
(iv) Admin Login
(v) Modify Product

6.2 User Login Test

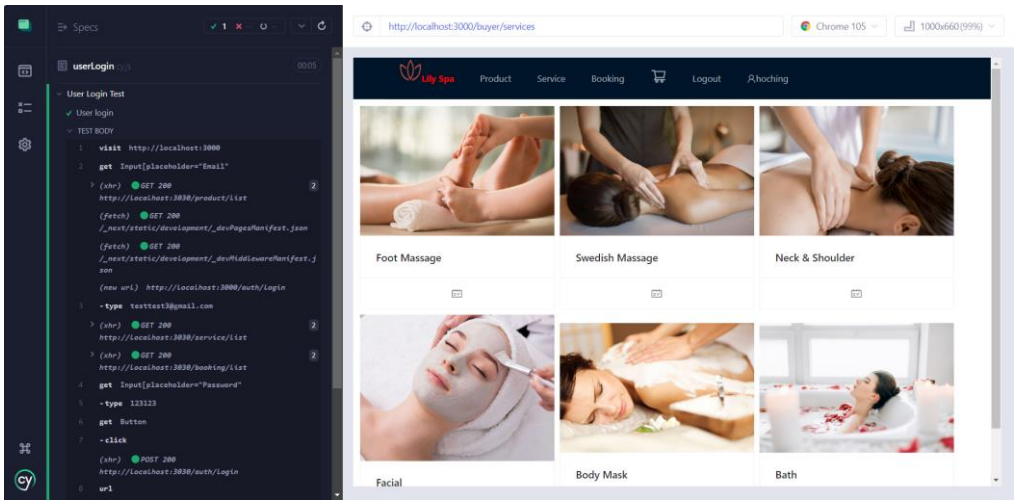

Figure 6.1 Cypress Login

Figures above show Cypress Login test. Cypress will simulate user login to input the username and password, then check the current URL to determine the application successfully have login and redirect to services page. The numbering shows the test instruction steps and executed by the test while the green line on the steps shows the test success. Table below shows the instruction written in the test script that are executed by Cypress:

Table 6.1 User Login

Step	Procedure	Result
1	Visit localhost:3000	Success
2	Get email input element	Success
3	Type in user email	Success
4	Get password input element	Success
5	Type in user password	Success
6	Get submit form button	Success
7	Click button	Success
8	Get current URL	Success
9	Check URL include '/services'	Success
10	Get current cookies	Success

6.3 User add and remove from cart.

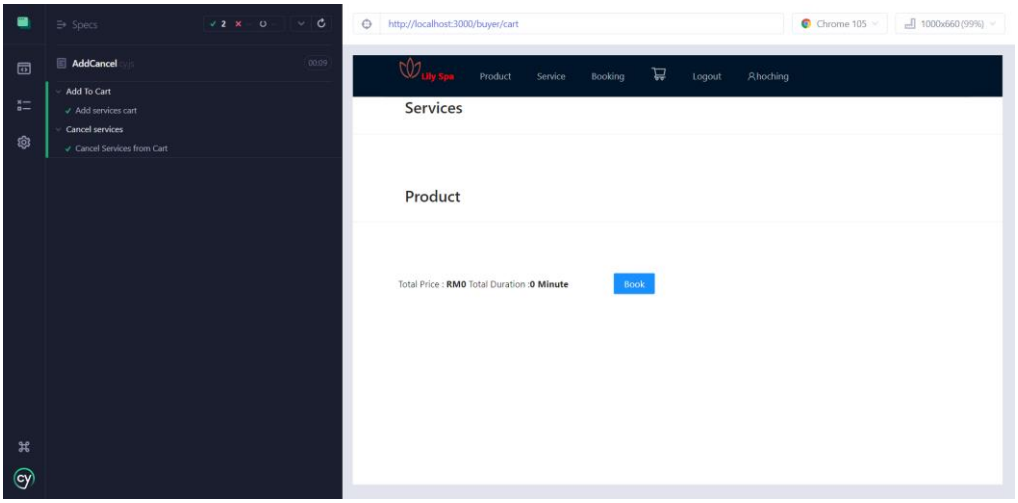

Figure 6.2 Cypress add and remove cart

The figures above show the test that simulate user add service to cart and remove the service from the cart. The test is broken into two parts, add to cart and cancel services. Before each test, a cookie is set which contain user information to simulate user login, which can be taken from the login test from the previous step. The test is successful shown by the green tick on the figure above. Tables below show the two different parts of the tests and its instruction:

Table 6.2 User add to cart

Step	Procedure	Result
1	Visit services page	Success
2	Get services detail button	Success
3	Press button	Success
4	Get book services button	Success
5	Click button	Success
6	Visit user cart page	Success

Table 6.3 User remove from cart

Step	Procedure	Result
1	Visit buyer cart page	Success
2	Wait 1.5 second	Success
3	Get cancel button	Success
4	Click button	Success

6.4 Create booking.

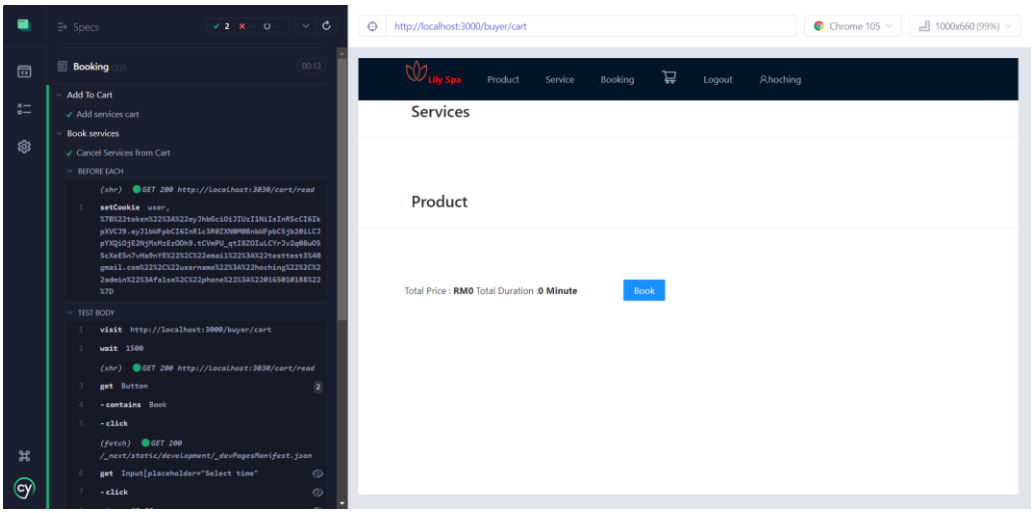

Figure 6.3 Cypress create booking

The figures above show the test simulate user create booking. It also has 2 parts, first one being add to cart like previous part while the second steps create booking by input time and date to confirm the booking.

Table 6.4 User add to cart

Step	Procedure	Result
1	Visit services page	Success
2	Get services detail button	Success
3	Press button	Success
4	Get book services button	Success
5	Click button	Success
6	Visit user cart page	Success

Table 6.5 User make booking

Step	Procedure	Result
1	Visit buyer cart page	Success
2	Wait 1.5 second	Success
3	Get button element	Success
4	Find button contain ‘book’	Success
5	Click button	Success
6	Get time input element	Success
7	Click input	Success
8	Type in time	Success
9	Get button element	Success
10	Get ‘ok’ button	Success
11	Click button	Success
12	Get date input	Success
13	Click input	Success
14	Type in date	Success
15	Press Enter key	Success
16	Get button element	Success
17	Get book button	Success
18	Click button	Success

6.5 Admin Login.

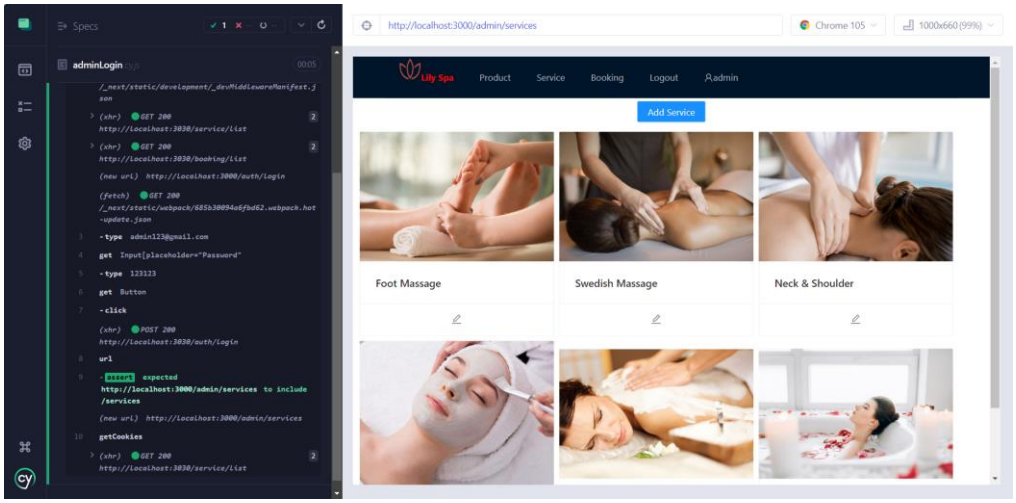

Figure 6.4 Cypress admin login

The figures above show the simulation of admin login. Admin login is like user login, but the login credential is changed to admin email and password.

Table 6.6 Admin login

Step	Procedure	Result
1	Visit localhost:3000	Success
2	Get email input element	Success
3	Type in admin email	Success
4	Get password input element	Success
5	Type in admin password	Success
6	Get submit form button	Success
7	Click button	Success
8	Get current URL	Success
9	Check URL include ‘/services’	Success
10	Get current cookies	Success

6.6 Modify services.

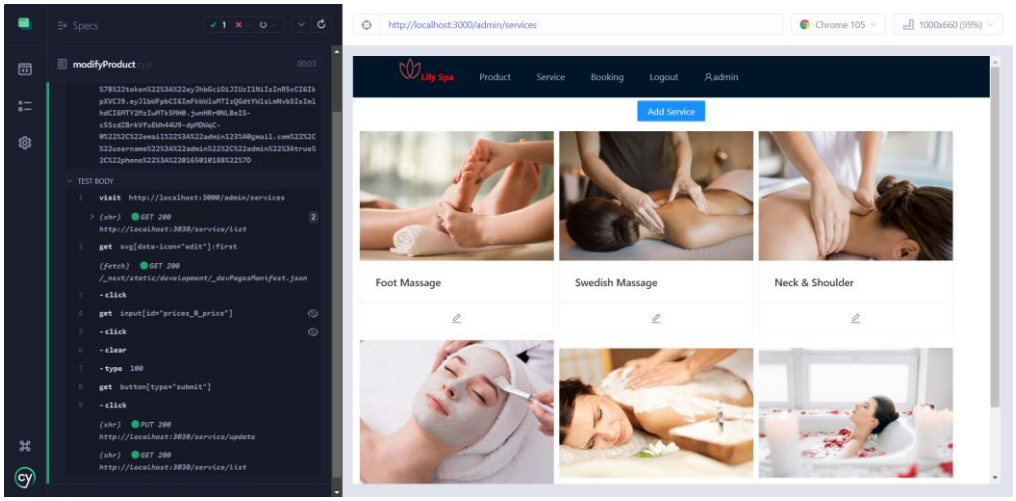

Figure 6.5 Cypress modify services

The figures above show the simulation modifying service details as administrator. This time, the cookie is set using admins credentials. The simulation will visit the admin/services page and update a service detail.

Table 6.7 Admin modify service

Step	Procedure	Result
1	Visit admin services page	Success
2	Get edit button	Success
3	Click button	Success
4	Get price input	Success
5	Click input	Success
6	Clear input	Success
7	Type in new price	Success
8	Get submit button	Success
9	Click button	Success

6.7 Test result

Table 6.8 Test result

Test	Description	Total Steps	Pass	Fail	Pass rate
1	User Login	10	10	0	100%
2	Cypress add and remove cart	6	6	0	100%
3	User remove from cart	4	4	0	100%
4	User add to cart	5	5	0	100%
5	User make booking	18	18	0	100%
6	Admin login	10	10	0	100%
7	Admin modify service	9	9	0	100%

As the result, all tests are run successfully without fails. With the successful testing, the web application is ready to be serve on the web. The test scripts can still be used in the future development, or whenever new feature or changes is made on the system.

7 WEB HOSTING

7.1 Introduction

The project is hosted and available to be access on https://lily-beauty-spa-fe.vercel.app. The project is hosted on three different platform as a service cloud service provider, MongoDB for database, Heroku for backend and Vercel for frontend. Different provider works best for different application in this project, each of them are easy is designed to host web application and lifetime free tier that does not require credit card or expire.

7.2 MongoDB Atlas

MongoDB Atlas provide easy hosting of MongoDB database on popular cloud provider such as AWS or Google Cloud, with different region. It allows developer to host and manage MongoDB with minimum configuration.

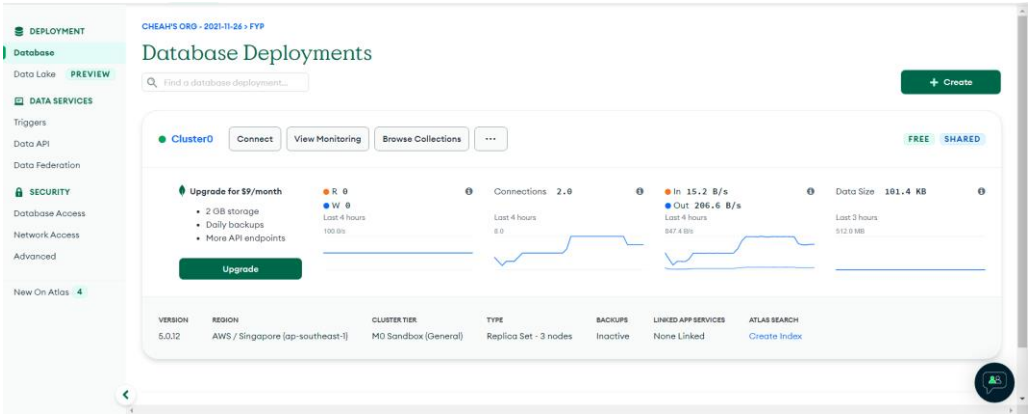

Figure 7.1 MongoDB Atlas

Configuration made on MongoDB Atlas is hosting on AWS Singapore free tier, creating a user for database access using username password and network access to allow all IP address to access the database. This is because the backend server that accessing the database hosted on Heroku does not have a static IP.

7.3 Heroku

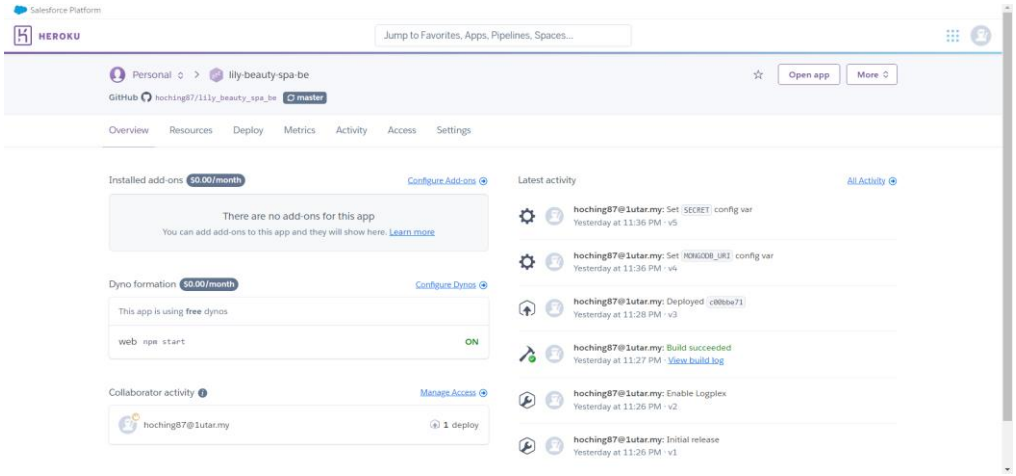

Figure 7.2 Heroku

Heroku is like MongoDB as platform as a service that help to host apps using popular frameworks or language to host on AWS. Heroku is used to host NodeJS Express application. Using Heroku, user can easily host by using GitHub and selecting the branch to host. Heroku will automatically update the application when new commit is added to the branch.

The configuration made in Heroku is to add a Python build pack for the recommendation system and adding environment variable.

7.4 Vercel

Vercel is also a platform as a service that provide hosting. Vercel is also the developer for Next.js, the frontend framework in this project. Vercel is the easiest platform to host Next,js application as it use GitHub and automatically build and host the Nextj.js application and returning a URL to the website.

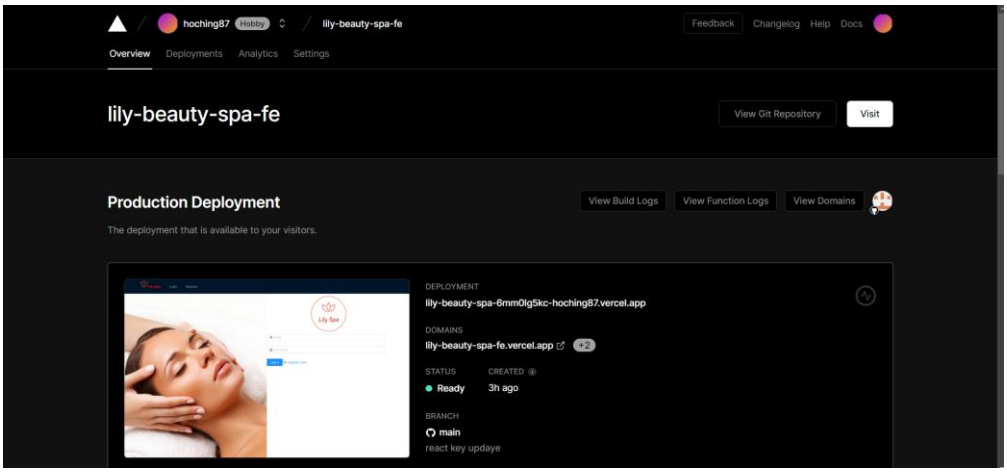

Figure 7.3 Vercel

8 CONCLUSION

8.1 Introduction

This project is developed to overcome the problem faced by traditional booking methods. The problems is identified and stated in the problems statement and can be overcome using the features of the completed booking systems.

Table 8.1 Problem Statement & Solution

Problem statement	Solution
Users prefer online booking more than traditional booking	The booking systems is build using web technology and is hosted on the web.
Long call time when booking	The booking process is done online using the system without wait time.
Waiting for provider to open to make booking	The website has 24-hour uptime and booking can be made anytime of the day.
Slow and chunky website	The website is build using modern framework and is performant.
Prefer online booking for booking cancelation	The cancellation process can be done using the booking systems.

Based on the problem statement, the objective is also identified and able to be achieved by the developed system

Table 8.2 Objective & Achieved by

Objective	Achieved by
To develop a web-based appointment booking system for beauty and spa services and products.	The web-based appointment booking system is developed with the all the functionality using modern web stack
To implement a recommendation system into the proposed web application.	A recommendation systems is developed using collaborative filtering technique and using Scikit-learn
To conduct testing on the proposed web application.	An automated end-to-end testing is setup using Cypress.

8.2 Limitation and improvement

There are several limitations identified when using the booking systems, and improvement can be made to the systems to improve the user experience and more functionality.

Table 8.3 Limitation & Improvement

Limitation	Improvement
User profile configuration – users are not able to change and update user info	A new page can be developed which allow user to change his own details and password.
Booking time visualization – Upcoming and passed booking are only shown in a list of booking with sort and filter functionality.	A timetable can be developed to show all the booking of the day in a more visual manner.
Booking automation – Booking is still needed to be confirm manually by administrator.	The system can add functionality to keep tract of staff and room availability to automate booking confirmation.

8.3 Conclusion

As the conclusion, the online spa and beauty system is complete, and the features are tested and functioning. The system can perform the functionality listed on the functional and non-functional requirements. The main function of the system such as login, register, schedule booking, cancel booking, purchase products, and recommendation for users. While for the admin, add, update, and delete products and services, cancel, or confirm bookings and sales statistics. The web application is also successfully hosted and available on https://lily-beauty-spa-fe.vercel.app.

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