

## IOI Hair Salon Management System

Tan Pei Yu<sup>1</sup>, Hairulnizam Mahdin<sup>1\*</sup>

<sup>1</sup>Faculty of Computer Science and Information Technology,  
Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, MALAYSIA

DOI: <https://doi.org/10.30880/aitcs.2023.04.02.108>

Received 24 June 2023; Accepted 27 October 2023; Available online 30 November 2023

**Abstract:** A mobile-based IOI Hair Salon Management System is developed to assist the owner and staff to manage the business-related information systematically since the current business workflow is implemented manually. The owner manually calculates the business sales in a logbook that may cause calculation errors, the appointment details are recorded in a record book and the latest service information is updated offline. This system aims to improve business management efficiency and simplify the appointment booking process. The waterfall development-based methodology is used to conduct the project. This system is developed as an Android-based mobile application using Firebase along with the Flutter framework and Dart language. An intuitive and user-friendly system is built, which has a short learning curve for users to use. Based on the User Acceptance Testing (UAT), most users, including customers, hair stylists and the owner are very satisfied with user interfaces and features of the developed system.

**Keywords:** Mobile-based, Hair Salon, Management System

### 1. Introduction

IOI Hair Salon is an establishment that provides various hair services for its customers, including haircut, hair wash, hair colouring, hair rebonding, hair curling and keratin treatment that is currently located in Segamat, Johor. It was established in 2017 by Mrs. Tan Bee Yan, who is the owner and hair stylist of the hair salon.

The current workflow of IOI Hair Salon is implemented manually, with a paper-based system for recording business information. The owner manually calculates the business sales in a logbook. However, many calculation steps can easily lead to errors and inaccuracies in the numbers [1]. Additionally, the hair service information is updated manually. The owner updated the day-off notice manually by only posting the notice at the entrance of the hair salon, which may result in customers wasting their time after arriving at the hair salon. Moreover, the owner and her staff record the appointment information in a record book, which takes time to check the appointment details. Suppose a customer desires to change the appointment time, the owner and her staff are required to reschedule the appointment by checking the appointment time of other customers in order to avoid double bookings for different customers.

To address the issues stated above, a mobile-based IOI Hair Salon Management System has been designed and developed. This project aims:

- i. To design a user-friendly IOI Hair Salon Management System for managing business-related information.
- ii. To develop a mobile-based IOI Hair Salon Management System for target users.
- iii. To test the developed system functionality and usability.

Hence, an Android-based IOI Hair Salon Management System has been developed for target users, including customers, hair stylists and the owner who acts as an administrator of the hair salon. There are several modules in the system, such as registration module, login module, booking management module, profile management module, user management module, banner management module, hair services management module, notification management module and sales report generation module in order to improve the business management efficiency and simplify the appointment booking process.

The paper is organized as follows: Section 2 discusses a literature review of relevant studies. Next, Section 3 outlines the methodology used to develop the system, followed by Section 4, which describes the results and discussion related to the output of the developed system. Lastly, Section 5 discusses the conclusion and future improvements of the project.

## **2. Related Works**

### **2.1 Manual Management System of IOI Hair Salon**

A manual management system is a system that relies on manual workflow rather than computerisation or automation. Typically, processes or tasks are performed using paper-based documents and data will be stored in physical files rather than stored in a digital database in a manual management system. This management system is usually suitable for small organisations or businesses that do not require complex needs. Nevertheless, the manual management system is less productive, efficient and time-consuming than automated systems that probably can be prone to errors, especially for manual calculation [1].

The current workflow of IOI Hair Salon is manual and based on a paper-based system. This can lead to errors and inaccuracies in sales calculations and in updating hair service information. The owner of the hair salon manually updates the day-off notice by posting it only at the entrance of the salon. This can result in customers wasting time if they arrive at the salon when it is closed. Additionally, the appointment information is recorded in a record book, which makes it time-consuming to check for availability and reschedule appointments to avoid double bookings. Overall, this system can be improved by adopting a digital solution, which can automate many of these tasks and provide more accurate and efficient management of the salon's operations.

### **2.2 Study of Existing Related Systems**

There are three existing systems, including Timely Appointment Booking Software [2], MyCuts Salon Booking Software [3] as well as StyleSeat [4] are studied in order to gain a clear understanding of the features they offer and apply the benefits of the existing systems to the developed IOI Hair Salon Management System. The comparison of each specific feature between existing systems and the developed system is shown in Table 1.

**Table 1: Comparison between Existing Systems and Developed System**

Features / System	Timely Appointment Booking Software [2]	MyCuts Salon Booking Software [3]	StyleSeat [4]	Developed System
Android-based	✓	✓	✓	✓
iOS-based	✓	✓	✓	X
Free to use	X	X	X	✓
Simple and intuitive user interface	✓	✓	X	✓
Attractive user interface	✓	X	X	✓
Register and login	✓	✓	✓	✓
Logout	✓	✓	✓	✓
Appointment booking	✓	✓	✓	✓
Appointment management	✓	✓	✓	✓
User profile management	✓	✓	✓	✓
Service information management	✓	✓	✓	✓
Gallery	X	X	X	✓
Sales report generation	✓	✓	✓	✓

\* ✓ – Available, \* X – Not Available

In comparison to the three existing systems, the developed system is not compatible with iOS devices, but it contains additional features, such as being free to use and having a gallery for customers to view hair services offered by the hair salon with corresponding price lists.

### 3. Methodology/Framework

#### 3.1 Waterfall Model

The Software Development Life Cycle is officially abbreviated as SDLC, is a methodology for designing, constructing and maintaining an information system [5]. The waterfall life cycle is a linear and phased development model [6]. This indicates that each phase must be done in the given time before moving to the next phase.

One of the reasons for using the waterfall model is that this model is easy to understand and it is simple to carry out due to its sequential approach. Next, this model offers a structure to organise and control the development project to inexperienced teams. Details and errors of the design will be captured before developing the system and save time during the development process. Not only that, the system requirements need to be identified before programming begins since the waterfall model will minimise changes to the ongoing project's requirements [7]. The waterfall model has five phases, namely planning phase, analysis phase, design phase, implementation phase and testing phase.

In the planning phase, the project title, which is IOI Hair Salon Management System is figured out. A project proposal is prepared by identifying the problem statement, objectives, project scope, expected results and project significance that are related to the system. To ensure the project can be finished systematically, a Gantt chart is used as a guide to show the tasks that need to be completed on time. At the same time, the project title is researched and the similar existing systems are studied in order to make comparison with the developed system.

In the analysis phase, the information related to the IOI Hair Salon is gathered by conducting an interview with the owner of the hair salon to clearly understand and identify the requirements for the developed system. During the interview session, some issues, such as the manual management system and the booking process of the hair salon are figured out. The hardware requirement and software

requirement in developing the system are defined in this phase. Not only that, the functional requirement and non-functional requirement are also defined in this phase.

In the design phase, the Entity Relationship Diagram (ERD) of the developed system is constructed using Draw.io which is a free diagram design software. Moreover, various data dictionaries are created in the form of tables by referring to the ERD. User interfaces are designed in the form of wireframes using Draw.io to provide an overview of page layout and functionality.

In the implementation phase, the designed databases and wireframes in the previous phase are used as a guideline to develop the system. A mobile-based IOI Hair Salon Management System is created using Flutter framework and Dart client-side programming language on Visual Studio Code platform. The Firebase Authentication software development kit (SDK) is used to authenticate users with password and email addresses to know the identity of users and save users data securely in the cloud.

In the testing phase, the functionalities of the developed system are tested using a test plan to identify bugs and define improvement areas. After that, the User Acceptance Testing (UAT) is carried out by the owner, hair stylists and customers of the hair salon to evaluate user interfaces and system functionalities of the developed system.

Each phase has its own tasks and outputs that need to be generated throughout the project development process, as shown in Table 2.

**Table 2: System Development Workflow of IOI Hair Salon Management System**

Phase	Task	Output
Planning	i. Propose the project title.	i. Project proposal.
	ii. Identify the project timeline, tasks and deliverables.	ii. Gantt chart.
	iii. Research on the project title.	iii. Literature review.
	iv. Study on similar existing systems.	iv. Comparison between existing systems and the proposed system.
Analysis	i. Conduct an interview with the owner.	i. User requirements.
	ii. Analyse the hardware and software requirements.	ii. Hardware and software requirements.
	iii. Define the function and non-functional requirements.	iii. Functional and non-functional requirements.
	iv. Visualise the system workflow.	iv. UML diagrams: use case diagram, sequence diagrams, activity diagrams and the class diagram.
Design	i. Design databases.	i. ERD and data dictionary.
	ii. Design wireframes.	ii. Wireframes.
Implementation	i. Develop system modules.	i. First version of the system.
	ii. Execute the developed system.	
Testing	i. Execute functional testing.	i. Test report.
	ii. Execute user acceptance testing.	ii. Find and fix bugs.
	iii. Determine improvement areas.	iii. Finalise the latest version of the system.

### 3.2 System Analysis and Design

This section describes the various components that are essential in the analysis and design phases, including functional requirements, non-functional requirements and Unified Modelling Language (UML) diagrams.

Functional requirements are used to define features that a system will offer in order to meet the user's needs. There are a total of three users in the developed system, which are customers, hair stylists and the administrator of IOI Hair Salon. Thus, functional requirements of the developed system are listed in Table 3.

**Table 3: Functional Requirements of IOI Hair Salon Management System**

Functional requirements	Descriptions
Register	<ul style="list-style-type: none"> <li>This function allows a new customer to register an account before accessing the system.</li> </ul>
Login	<ul style="list-style-type: none"> <li>This function allows customers, hair stylists and the administrator to login using a valid email address and password.</li> </ul>
Logout	<ul style="list-style-type: none"> <li>This function allows customers, hair stylists and the administrator to log out of their account after using the system.</li> </ul>
View hair services	<ul style="list-style-type: none"> <li>This function allows customers to view hair services provided by the hair salon.</li> </ul>
Book appointment	<ul style="list-style-type: none"> <li>This function allows customers to book appointments by choosing the specific hair services, hair stylists, date and time.</li> </ul>
Appointment Management	<ul style="list-style-type: none"> <li>This function allows hair stylists and the administrator to view, approve or reject the appointment.</li> </ul>
Profile Management	<ul style="list-style-type: none"> <li>This function allows customers, hair stylists and the administrator to update personal information and change passwords.</li> </ul>
User Management	<ul style="list-style-type: none"> <li>This function allows the administrator to view, insert, and update the user.</li> </ul>
Banner Management	<ul style="list-style-type: none"> <li>This function allows the administrator to view, insert, update and remove the banner.</li> </ul>
Notification Management	<ul style="list-style-type: none"> <li>This function allows the administrator to update the latest notification.</li> </ul>
Hair Services Management	<ul style="list-style-type: none"> <li>This function allows the administrator to view, insert, update and remove hair services.</li> </ul>
Sales Report Generation	<ul style="list-style-type: none"> <li>This function allows the administrator to generate the sales report.</li> </ul>

Non-functional requirements can be used to determine attributes of a system, which is considered as restrictions or constraints on a system design and attempt to improve the functionality. It specifies the quality attributes of a system, including security, performance, operational as well as cultural and political. Therefore, non-functional requirements of the developed system are listed in Table 4.

**Table 4: Non-functional Requirements of IOI Hair Salon Management System**

Non-functional requirements	Descriptions
Security	<ul style="list-style-type: none"> <li>User authentication is performed using a valid password and email address before accessing the system.</li> </ul>
Performance	<ul style="list-style-type: none"> <li>Except for scheduled maintenance, the system is available 24 hours a day, 365 days a year.</li> </ul>
Operational	<ul style="list-style-type: none"> <li>The system can run smoothly on Android mobile devices.</li> </ul>
Cultural and political	<ul style="list-style-type: none"> <li>The system operates in the English language.</li> </ul>

A use case diagram is a visual representation of a system's functional requirements and it can be used to understand how a system is intended to operate [8]. Each role of users of the developed system is depicted using a use case diagram as shown in Appendix A.

An Entity Relationship Diagram (ERD) is a diagram which is designed to represent the relationships and structure between various entities in a database. In the context of database design, an entity is often equivalent to a table in a database and each entity has a set of attributes. The connections between entities are used to describe how the entities are related to each other. Figure 1 shows the ERD of the developed system. Unfortunately, other diagrams, such as sequence diagrams and data dictionaries could not be included in this paper due to the limitation page number of the paper.

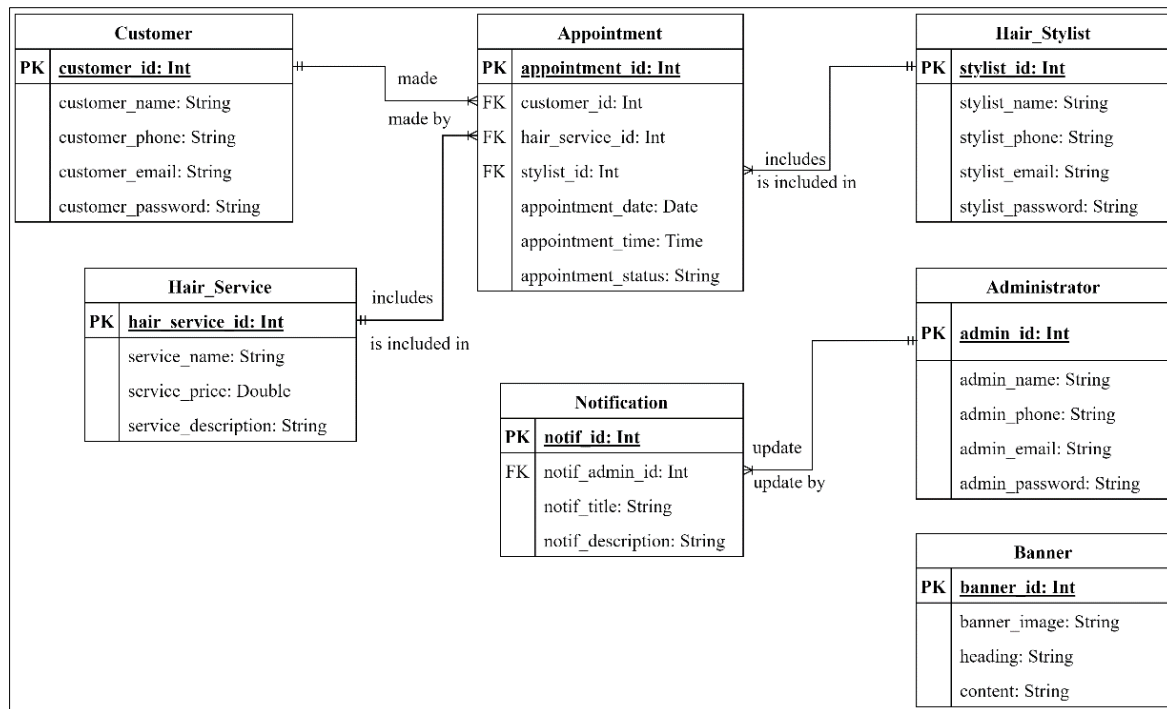


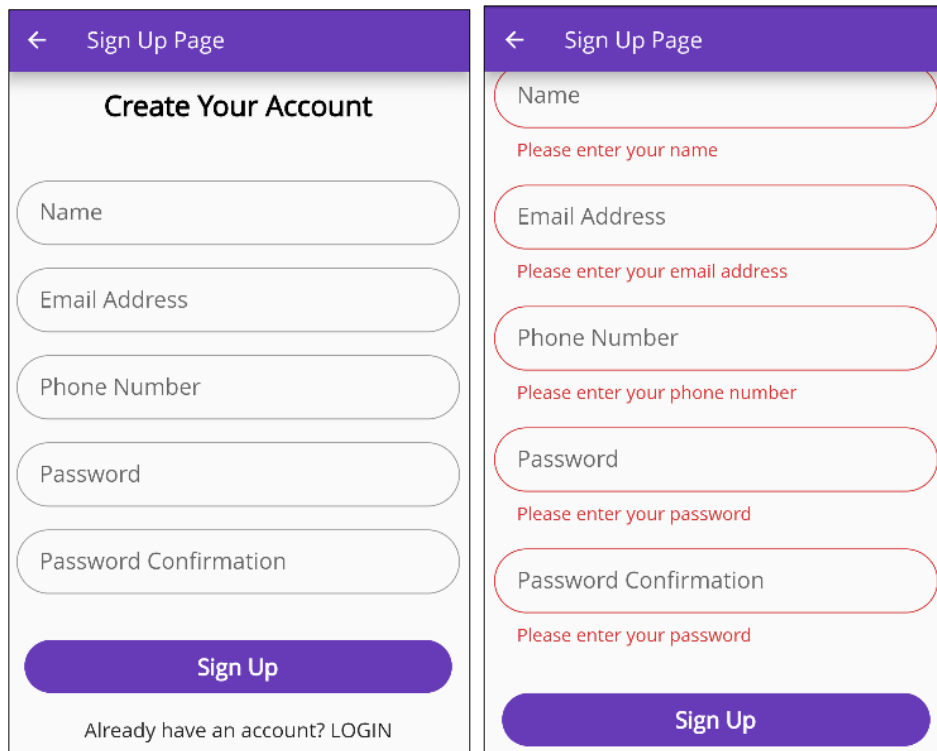
Figure 1: Entity Relationship Diagram of IOI Hair Salon Management System

#### 4. Results and Discussion

The mobile-based IOI Hair Salon Management System is developed using Dart language and Flutter framework on Visual Studio Code platform. The real-time database, the storage as well as the user authentication using email and password of the developed system are hosted on the Firebase platform, which provides cloud computing services. This section describes the system implementation and system testing. Each module of the developed system is based on three types of users, including customers, hair stylists and the owner who acts as the administrator of IOI Hair Salon.

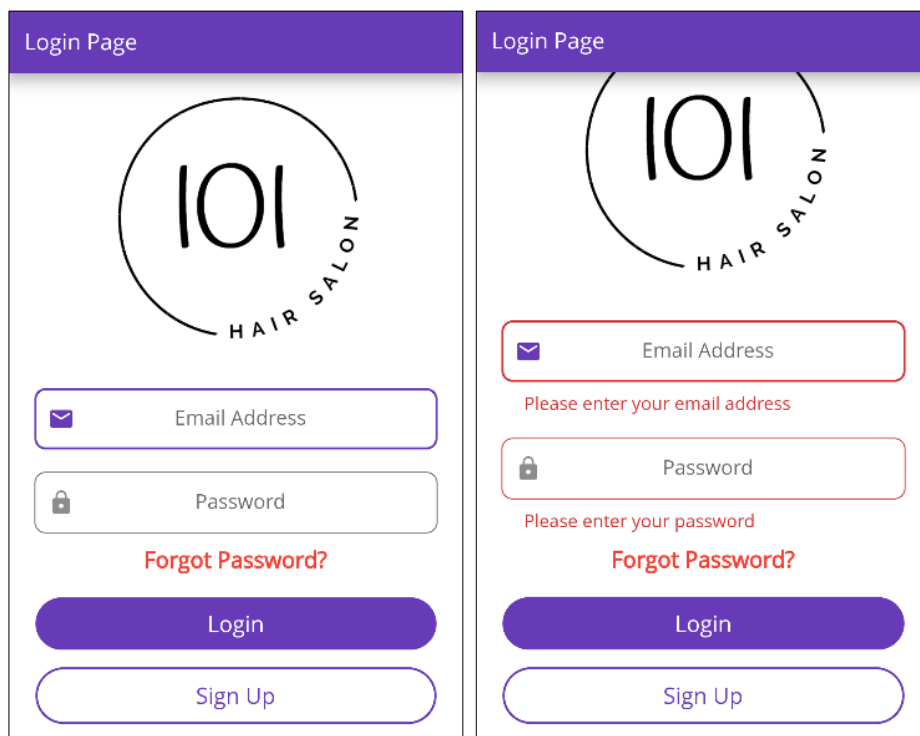
##### 4.1 System Implementation

The registration module allows a new customer to register an account before accessing the system. The customer is required to fill in the name, email address, phone number and password during the registration process. An alert message will be displayed when the input field is invalid or empty. Figure 2 shows the registration interface of the developed system.



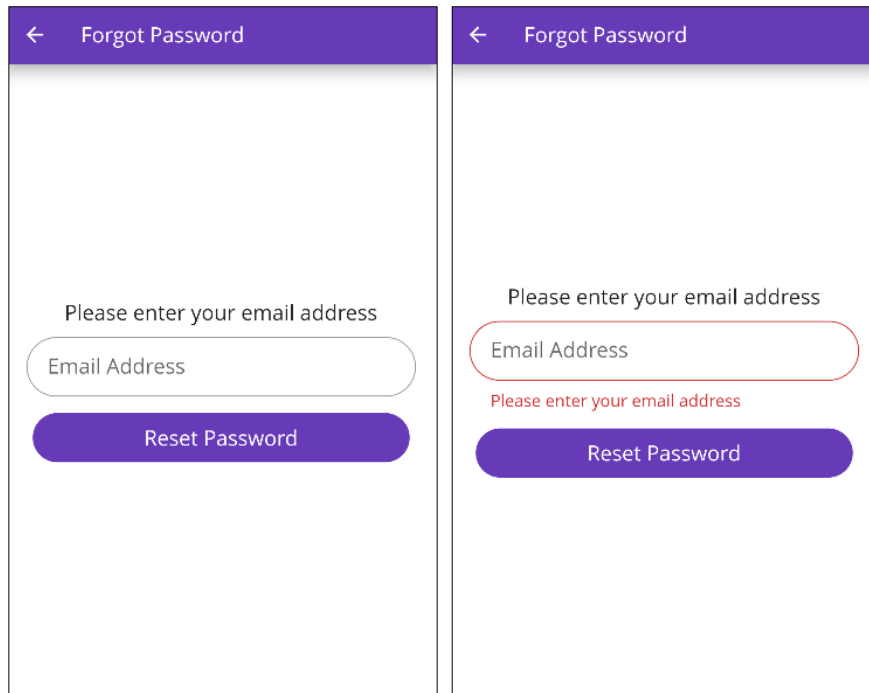
**Figure 2: Registration Interface for Customers**

All users, including the administrator, hair stylists and customers are allowed to login into the system by filling in a valid email address and password. An alert message will be displayed when the email address and the password are invalid or the input field is empty. Users are redirected to their respective home pages based on their user types after successful login. The login interface is illustrated in Figure 3.



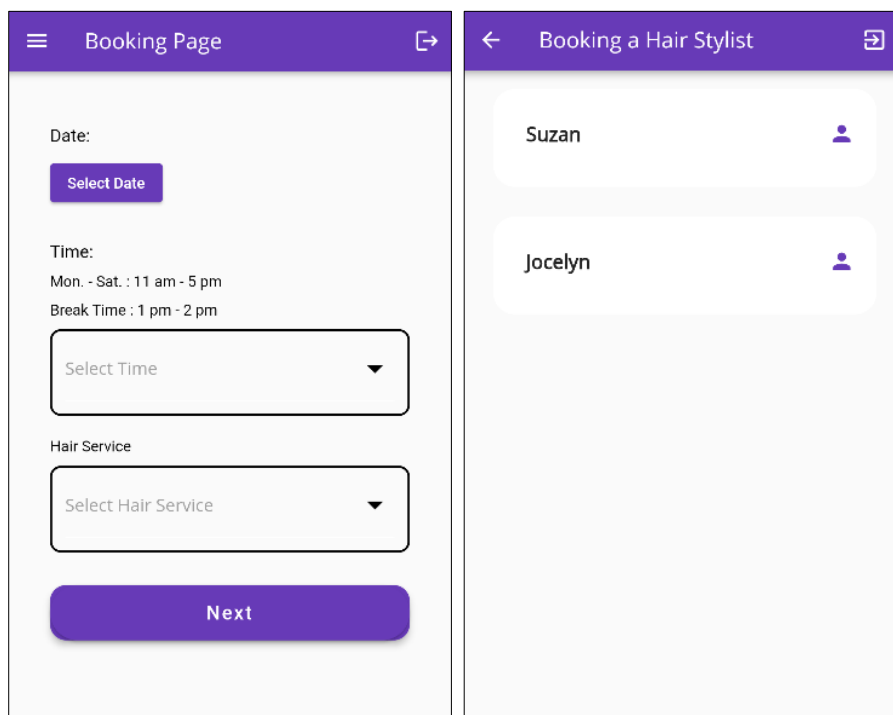
**Figure 3: Login Interface for All Users**

Users are allowed to reset their password by entering their email address in case they have forgotten their password or they want to change a new password. An alert message will be shown if the email address is invalid or the input field is empty. After that, a password reset email will be sent to users, enabling them to reset a new password. Figure 4 shows the reset password interface for all users.

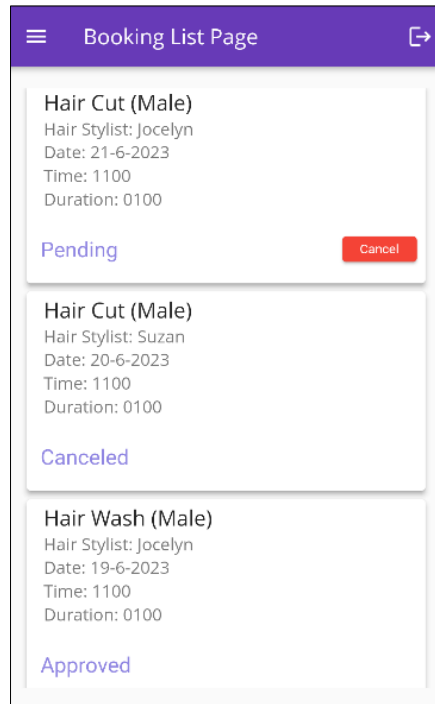


**Figure 4: Reset Password Interface for All Users**

In the booking management module, customers are able to book an appointment by selecting their desired date, time, hair service and hair stylist as illustrated in Figure 5. Not only that, customers can only cancel their bookings if the appointment is still in the pending status as depicted in Figure 6.

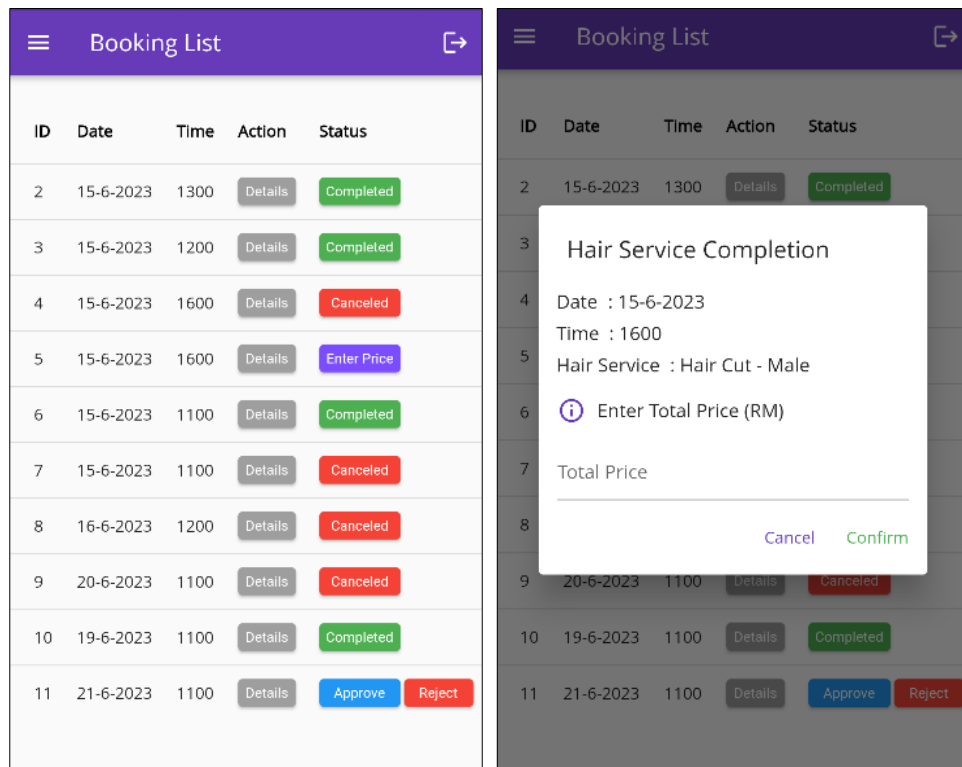


**Figure 5: Booking Interface for Customers**



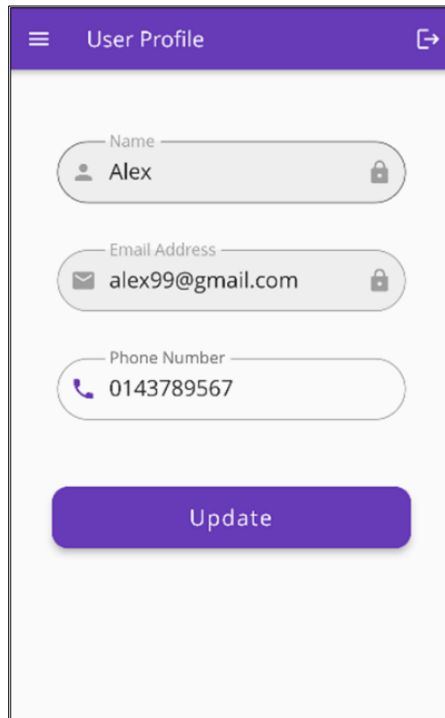
**Figure 6: Booking List Interface for Customers**

The hair stylist is responsible for approving or rejecting the appointment booking by their respective customers whereas the administrator has the permission to approve and reject the appointment booked by all customers. The hair stylist and the administrator are able to access booking details, including the selected hair service, date, time, duration and the hair stylist. They can enter the total price to record sales after the hair service is completed. Figure 7 illustrates the booking list interface for hair stylists and the administrator.



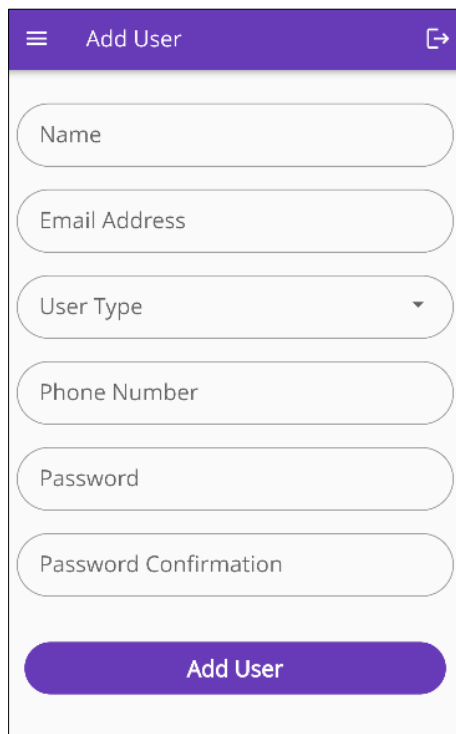
**Figure 7: Booking List Interface for Hair Stylists and the Administrator**

In the profile management module, all users are able to edit their user profile by updating their phone number. Figure 8 displays the user profile interface for all users.



**Figure 8: User Profile Interface for All Users**

The administrator can create a new user account for a customer or a hair stylist by filling in the name, email address, phone number, password as well as selecting the user's type as displayed in Figure 9.



**Figure 9: Add User Interface for the Administrator**

The administrator is able to view the list of registered customers and hair stylists, which shows their details, including name, email address and phone number. The administrator is responsible for updating the active or inactive status of hair stylists. The inactive account status is referred to as the resignation or retirement of the hair stylist. Additionally, the personal information, which is the phone number of the hair stylist can be edited by the administrator. Figure 10 shows the user management interface for the administrator.

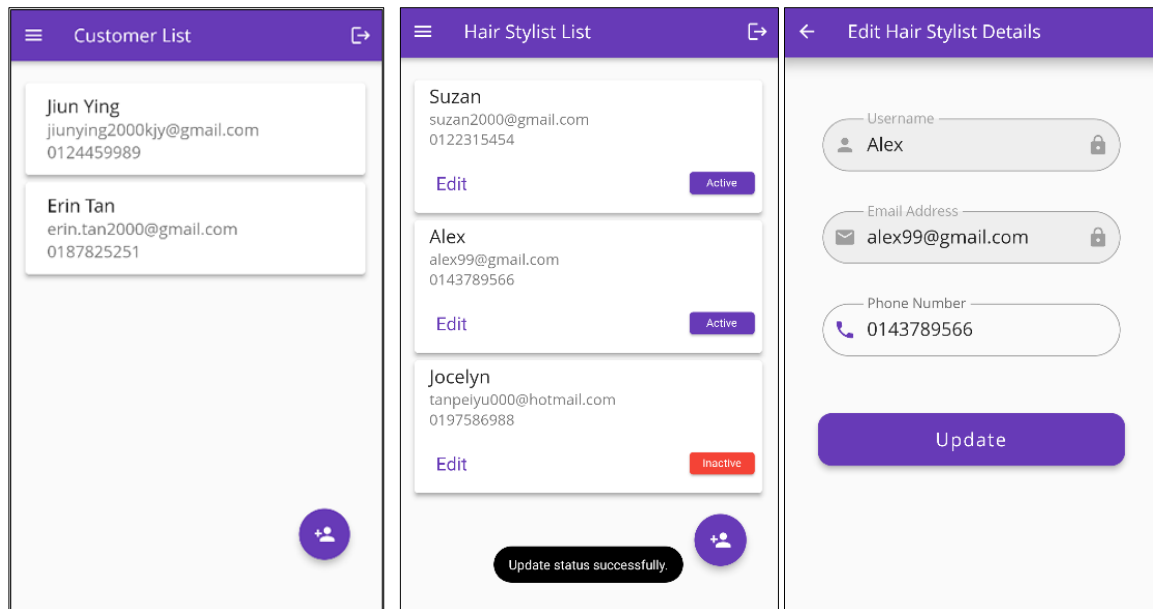


Figure 10: User Management Interface for the Administrator

In the banner management module, the administrator is able to add a new banner. Additionally, the administrator can view the list of banners and remove the banner if the specific hair service is no longer available. Figure 11 displays the banner management interface for the administrator.

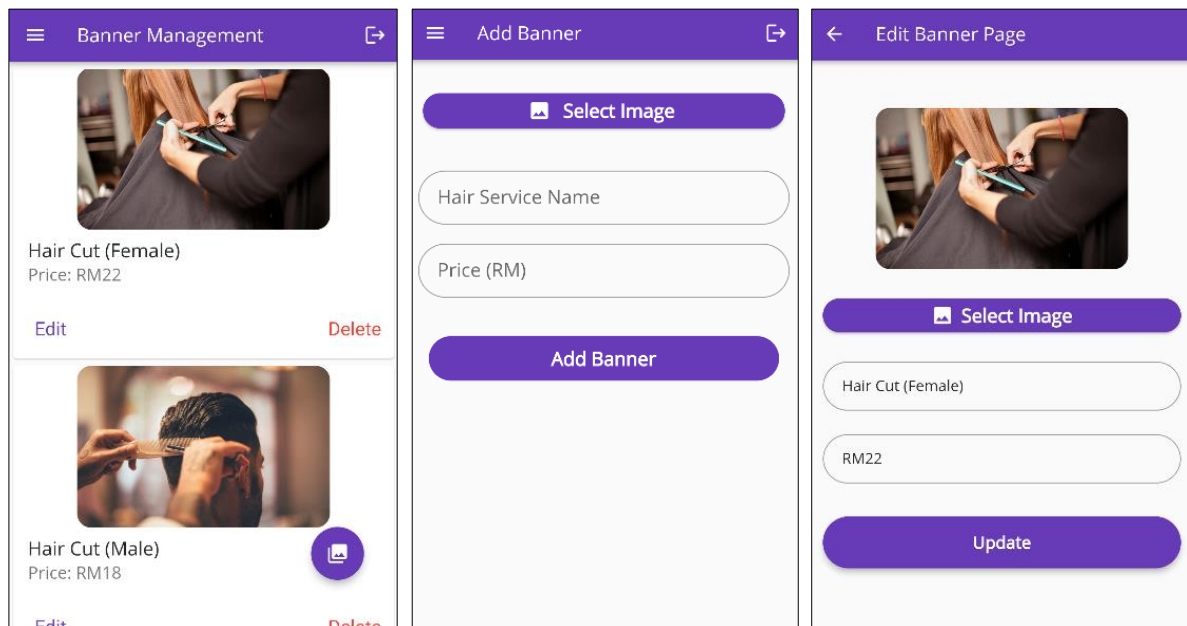
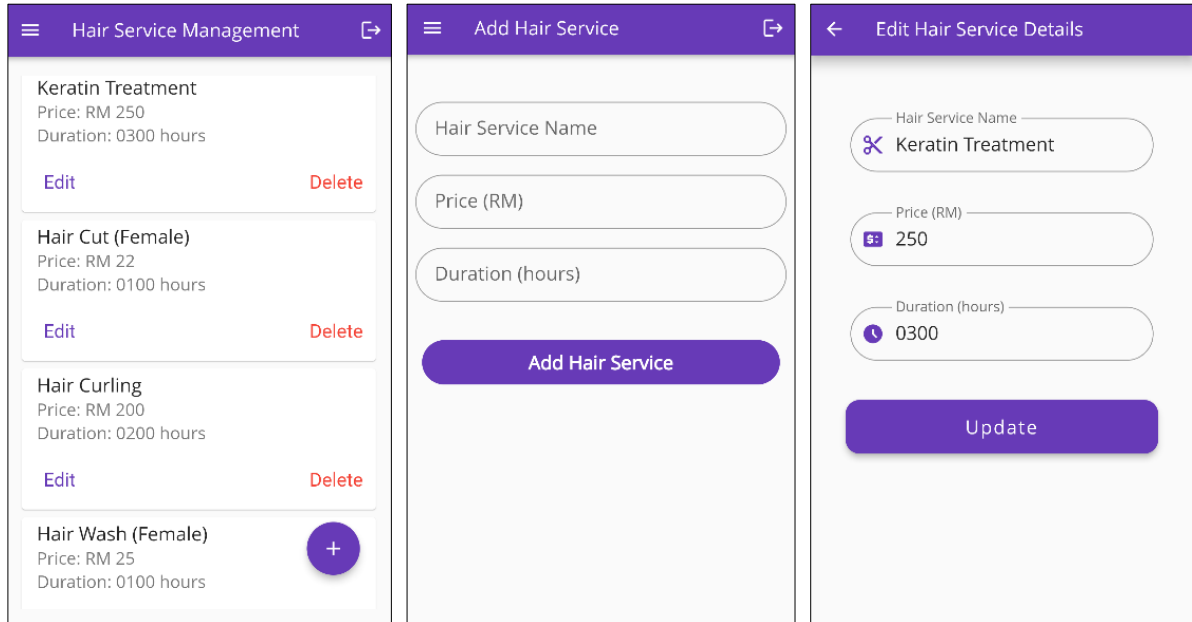


Figure 11: Banner Management Interface for the Administrator

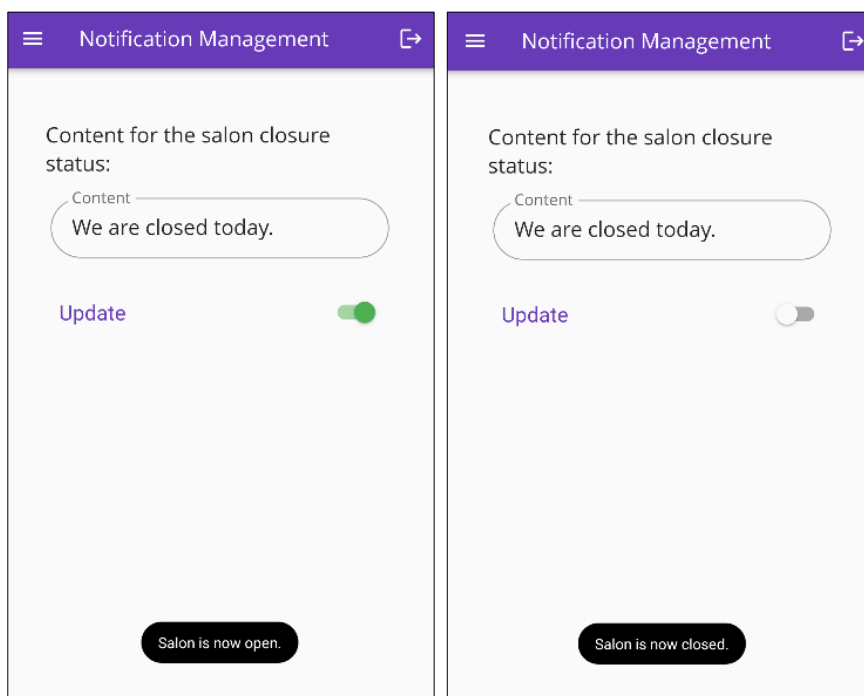
In the hair services management module, the administrator can add a new hair service by filling the hair service’s information, which are the name, price, and duration of the hair service. Moreover, the

administrator is responsible for managing hair services by performing create, read, update, delete (CRUD) operations. The administrator can view the details of hair services, including name, price and duration. Not only that, the administrator can edit the details of the hair service by updating the name, price and duration of the hair service. Figure 12 illustrates the hair services management interface for the administrator.



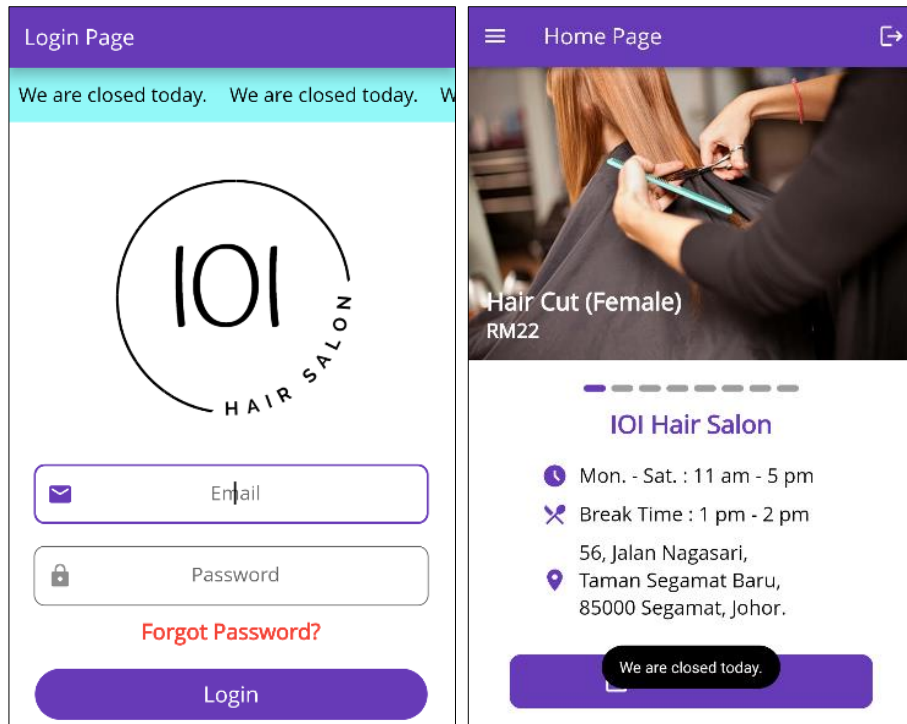
**Figure 12: Hair Services Management Interface for the Administrator**

In the notification management module, the administrator can set the status of the hair salon, whether it is open or closed. If the hair salon is closed, the administrator can update the latest closure information in order to inform customers. Figure 13 shows the notification management interface for the administrator.



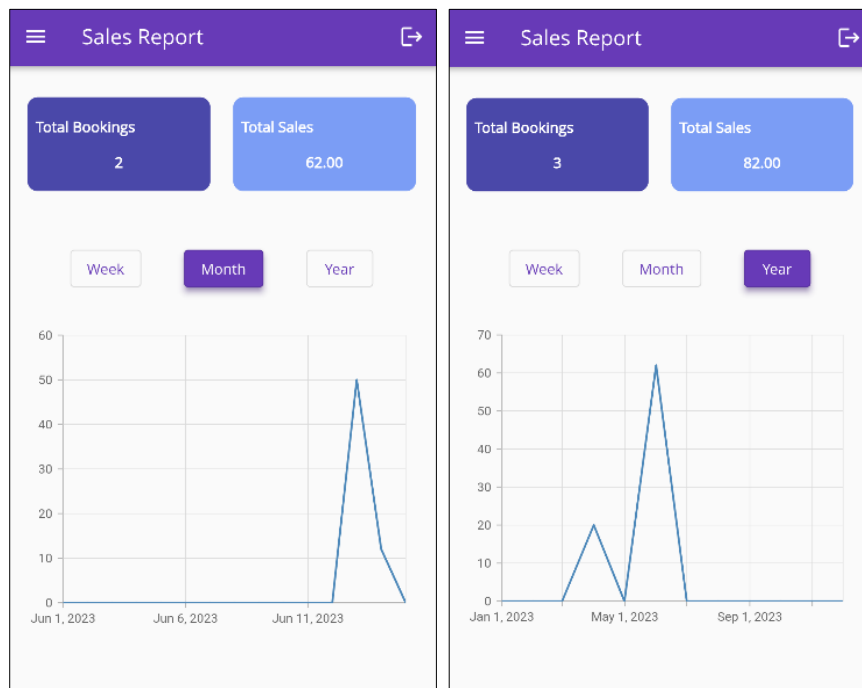
**Figure 13: Notification Management Interface for the Administrator**

In the notification management module, the customer is able to view the latest notification of IOI Hair Salon. For instance, the day-off notice can be updated and displayed on the login page and customer’s home page. Customers will not be able to book an appointment if the hair salon is closed. Figure 14 displays the closure status of the hair salon on the login page and home page.



**Figure 14: Closure Status of Hair Salon on Login Page and Home Page**

The sales report generation module allows the administrator to generate a weekly, monthly and annual sales report. Not only that, the administrator also can view the total number of bookings and total sales of the hair salon. Figure 15 shows the sales report generation interface for the administrator.



**Figure 15: Sales Report Generation Interface for the Administrator**

## 4.2 System Testing

System testing is a crucial step in the process of the system development to ensure that the development system works based on the specified functional and non-functional requirements. Test plan and User Acceptance Testing (UAT) are conducted during the testing phase.

### 4.2.1 Test Plan

A comprehensive test plan is created as a part of the functional testing of the mobile-based IOI Hair Salon Management System to ensure that each module offered by the developed system performs well and delivers expected results. Table 5 shows the test plan for customers, hair stylists and the administrator of IOI Hair Salon.

**Table 5: Results of Test Plan of IOI Hair Salon Management System**

Functions	Roles	Test Cases	Expected Result	Actual Result
Registration	Customers	Incomplete user input	An alert message is displayed when the input field is empty.	Pass
		Invalid user input	An alert message is displayed when the input field is invalid.	Pass
		Complete user input	A new account can be registered successfully.	Pass
Login	Customers, hair stylists, administrator	Incomplete user input	An alert message is displayed when the input field is empty.	Pass
		Complete user input with invalid email address or password	An alert message is displayed when the email address or password is invalid.	Pass
		Complete form with valid email address and password	Redirecting to the home page after successful login.	Pass
Reset Password	Customers, hair stylists, administrator	Incomplete email input	An alert message is displayed and the password cannot be reset.	Pass
		Invalid email input	An alert message is displayed and the password cannot be reset.	Pass
		Valid email input	Receiving a password reset link through email.	Pass
Dashboard	Administrator	View the information of the hair salon	Able to view the total number of bookings, sales, customers and hair stylists.	Pass
Booking Management	Customers, hair stylists, administrator	View the list of booking	Able to view the details of the booking list that shows the date, time, duration, hair service, hair services booked.	Pass
		View the status of appointment	Able to view the status of an appointment whether it is pending, completed or cancelled.	Pass
	Customers	Book a hair service's appointment	Able to book an appointment by selecting desired date, time, hair service and hair stylist.	Pass
Profile Management	Customers, hair stylists, administrator	Display the correct user profile information	The correct name, email address and phone number are displayed.	Pass
		Update the user profile information	Able to update the latest phone number.	Pass

**Table 5: (cont.)**

Functions	Roles	Test Cases	Expected Result	Actual Result
User Management	Administrator	View the list of customers	Able to view the customer list that shows the name, email address and phone number of the customer.	Pass
		View the list of hair stylist	Able to view the hair stylist list that displays the name, email address and phone number of the hair stylist.	Pass
		Update the profile of the hair stylist	Able to update the latest phone number of the hair stylist.	Pass
		Update the status of the hair stylist	Able to update the status of the hair stylist by selecting either active or inactive status.	Pass
		Insert a new user account	Able to add a new customer or hair stylist's account by filling in the name, email address, phone number and password.	Pass
Banner Management	Customers, administrator	View the banner	Able to view the banner of the hair services.	Pass
	Administrator	Insert a new information for the banner	Able to insert a new image, name and price of the hair service for the banner.	Pass
		Update the information of the banner	Able to update the latest image, name and price of the hair service.	Pass
		Remove the information of the banner	Able to remove the information of the banner.	Pass
Hair Service Management	Administrator	View the list of hair services	Able to view the hair service list that shows the name, price and duration of the hair service.	Pass
		Insert a new information of the hair service	Able to insert a new name, price and duration of the hair service.	Pass
		Update the information of hair services	Able to update the latest name, price and duration of the hair service.	Pass
		Remove the hair service	Able to remove the information of the hair service.	Pass
Notification Management	Customers	View the of the notification	Able to view the latest notification.	Pass
	Administrator	Update the content of the notification	Able to update the content of the notification which is displayed on the login page and home page.	Pass
Sales Report Generation	Administrator	Generate the sales report	Able to generate the weekly, monthly and annual sales report.	Pass

#### 4.2.2 User Acceptance Test

The User Acceptance Testing (UAT) is an essential process in developing a system before launching the final system to the public. UAT aims to ensure that the developed system is able to handle real-world tasks [9]. Thus, UAT is conducted to evaluate user interfaces and system functions of the developed IOI Hair Salon Management System by target users in order to ensure that the system meets user requirements.

Table 6 shows the result of user interfaces evaluation for all users, including seven customers, two hair stylists and one owner who acts as the administrator of the hair salon. On the other hand, system functionalities evaluation can be divided into three parts. Table 7 displays the result of system functionalities evaluation for the administrator, followed by Table 8, which shows the result of system functionalities evaluation for hair stylists and Table 9 shows the result of system functionalities evaluation for customers. Ranking 1 indicates highly unsatisfied while ranking 5 indicates highly satisfied.

Based on the result of user interfaces evaluation in Table 6, most users were satisfied with the user interface of the IOI Hair Salon Management System. A total of 90% users were highly satisfied that the font size of the system is readable. For the second-highest ranking, 80% of users were satisfied with the ease of use of the system and the design of the user interface.

**Table 6: Result of User Interfaces Evaluation for All Users**

No.	Features	Ranking					Total
		1	2	3	4	5	
i.	Easy to use				2	8	10
ii.	Readable font size				1	9	10
iii.	Clear and simplified navigation				3	7	10
iv.	Clear content layout				3	7	10
v.	User interface design				2	8	10

According to the result of system functionalities evaluation in Table 7, the administrator was highly satisfied with the function of login, reset password, dashboard, booking management, user management, banner management, hair services management, notification management. On the other hand, the administrator was satisfied with the profile management module and sales report generation module.

**Table 7: Result of System Functionalities Evaluation for the Administrator**

No.	Features	Ranking					Total
		1	2	3	4	5	
i.	Login					1	1
ii.	Reset password					1	1
iii.	Dashboard					1	1
iv.	Booking management					1	1
v.	Profile management				1		1
vi.	User management					1	1
vii.	Banner management					1	1
viii.	Hair services management					1	1
ix.	Notification management					1	1
x.	Sales report generation				1		1

According to the result of system functionalities evaluation in Table 8, all hair stylists were highly satisfied with the login function and reset password function. Besides, 50% of hair stylists were satisfied with the booking management function and profile management function.

**Table 8: Result of System Functionalities Evaluation for Hair Stylists**

No.	Features	Ranking					Total
		1	2	3	4	5	
i.	Login					2	2
ii.	Reset password					2	2
iii.	Booking management				1	1	2
iv.	Profile management				1	1	2

Based on the result of system functionalities evaluation in Table 9, all customers were highly satisfied with the login function. On the other hand, 85.72% customers were highly satisfied with the registration function and reset password function.

**Table 9: Result of System Functionalities Evaluation for Customers**

No.	Features	Ranking					Total
		1	2	3	4	5	
i.	Register an account				1	6	7
ii.	Login					7	7
iii.	Reset password				1	6	7
iv.	Book an appointment				2	5	7
v.	Update the profile information				2	5	7
vi.	View hair services				3	4	7
vii.	View the latest notification				2	5	7

## 5. Conclusion

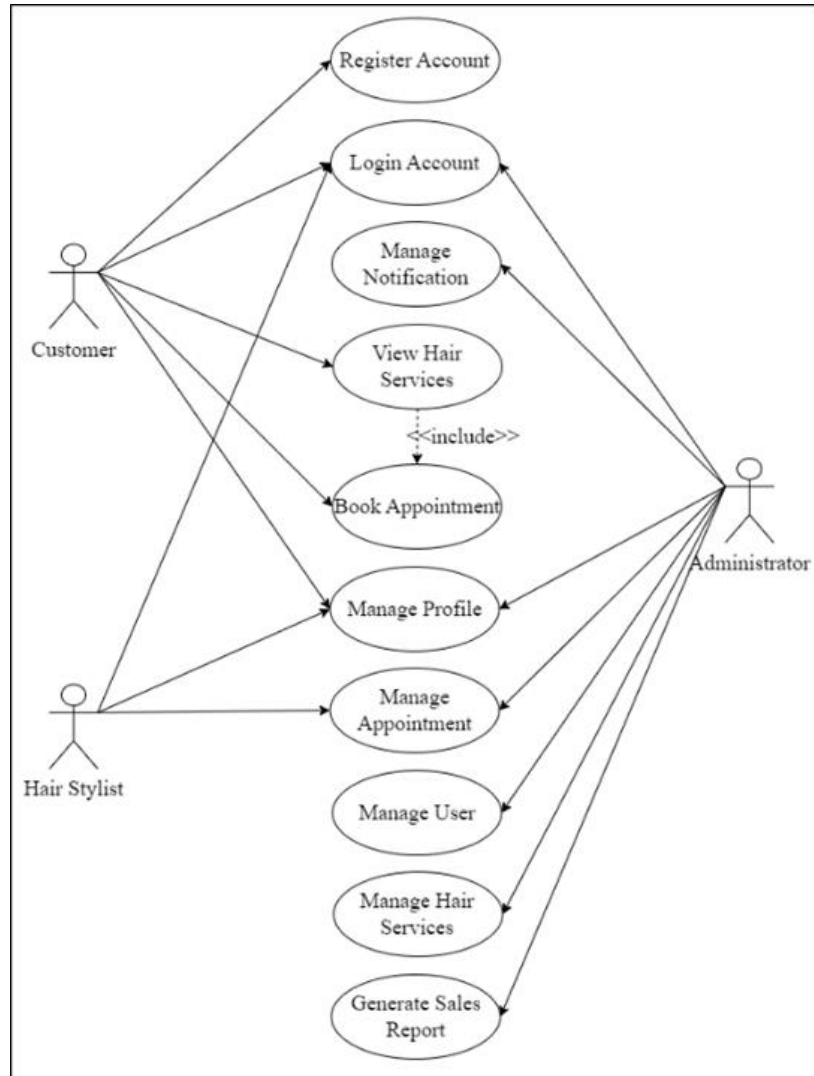
A mobile-based IOI Hair Salon Management System has been developed successfully to replace the manual workflow of the hair salon with a systematic workflow. Customers can make an appointment for hair services through the system. By doing so, they can go for hair services within the booking time without waiting in line. Not only that, customers only can book for available time slots. In this case, the appointment booking process is simplified and the workload of the owner and the staff can be reduced. This is because they do not need to manually reschedule the appointment to avoid double bookings. Furthermore, customers are able to view the latest notification through the system. For instance, they can check whether there is a day-off notice before going to the hair salon. The administrator is able to generate a weekly, monthly and annual sales report instead of calculating the total sales manually.

Even though the developed system has achieved its objectives, there are some recommendations and improvements can be made to enhance user satisfaction in the future. First, the system can be developed for the iOS platform to increase the potential customer reach. Besides, the system should provide a searching function to allow the administrator to easily view the list of customers, hair stylists and booking using keywords, rather than scrolling through extensive lists. Lastly, a rating function can be added for experienced customers to rate the hair service offered by the hair salon in order to gather valuable feedback for service improvement in the future.

## Acknowledgement

The authors would like to thank the Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia for its support.

## Appendix A



## References

- [1] O. Haas, M. Hutzler, T. H. Egginger, A. Maier, and E. Rothgang, "Automating Time-Consuming and Error-Prone Manual Nursing Management Documentation Processes," CIN: Computers, Informatics, Nursing, vol. Publish Ahead of Print, Jul. 2021, doi: 10.1097/cin.0000000000000790.
- [2] Timely, "Timely Appointment Booking Software | Join our community," 2023. <https://www.gettimely.com/> (accessed Jun. 23, 2023).
- [3] MyCuts, "Business Scheduling App | MyCuts Business Booking Software," 2023. <https://www.mycutsapp.com/> (accessed Jun. 23, 2023).
- [4] Styleseat, "Hair Appointments | Beauty Salons: Book Online | StyleSeat," 2023. <https://www.styleseat.com/m/> (accessed Jun. 23, 2023).

- [5] A. Alshamrani and A. Bahattab, "A Comparison Between Three SDLC Models Waterfall Model, Spiral Model, and Incremental/Iterative Model," 2015. [Online]. Available: [www.IJCSI.org](http://www.IJCSI.org)
- [6] W. van Casteren and W. van Casteren, "The Waterfall Model and the Agile Methodologies : A comparison by project characteristics The Waterfall Model and the Agile Methodologies : A comparison by project characteristics Academic Competences in the Bachelor 2 assignment: Write a scientific article on 2 Software Development Models," 2017, doi: 10.13140/RG.2.2.36825.72805.
- [7] "SYSTEMS ANALYSIS & DESIGN An Object-Oriented Approach with UML D E N N I S W I X O M T E G A R D E N." [Online]. Available: <http://store.visible.com/Wiley.aspx>.
- [8] R. Fauzan, D. Siahaan, S. Rochimah, and E. Triandini, "A Different Approach on Automated Use Case Diagram Semantic Assessment," *International Journal of Intelligent Engineering and Systems*, vol. 14, no. 1, p. 2021, doi: 10.22266/ijies2021.0228.46
- [9] A. S. Gillies, "What is User Acceptance Testing (UAT)? - SearchSoftwareQuality," 2022. <https://www.techtarget.com/searchsoftwarequality/definition/user-acceptance-testing-UAT> (accessed Jun. 23, 2023).