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F2 Examination Hall Reservation Management System

Leng Hooi Qi[1], Noryusliza Abdullah[2*]

[1,2] *Fakulti Sains Komputer dan Teknologi Maklumat,*
Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, 86400, MALAYSIA

*Corresponding Author: yusliza@uthm.edu.my
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Abstract

The Universiti Tun Hussein Onn Malaysia (UTHM) faces challenges with manual hall booking management, which causes issues with accessibility, transparency and efficiency. This study introduces the F2 Examination Hall Reservation Management System, which aims to improve operational efficiency by automating the reservation process for UTHM staff and students through the Academic Management Office (PPA). The system is constructed using the Waterfall model as its primary methodology, integrating HTML, CSS, JavaScript, PHP and MySQL. The developer used tools like Visual Studio Code for coding and XAMPP for local hosting and testing to ensure efficient processes. Findings show that the reservation procedures have significantly improved. The study supports the system's wider adoption and potential improvements by highlighting its critical role in displacing manual techniques.

1. Introduction

Hall reservation management is critical at the University Tun Hussein Onn Malaysia (UTHM) for optimizing hall utilization, especially given the diverse range of activities taking place. Currently, the manual reservation process of the F2 Examination Hall poses difficulties in terms of accessibility, transparency and efficiency. Staff and students must endure a cumbersome process that involves physical visits or emails to check hall availability. Schedule conflicts and resource mismanagement arise from using Microsoft Excel for documentation, which adds to the complexity of operations due to the possibility of human mistakes. The absence of real-time synchronization exacerbates conflicts when multiple requests for the same hall occur simultaneously. Such inefficiencies risk disrupting university operations, necessitating rescheduled events and compromising hall utilization due to outdated or erroneous data. As such, a reservation system can eliminate the possibility of double bookings and significantly lessen the effort for staff members [1].

The primary objectives of this project are to design, develop and evaluate a web-based F2 Examination Hall Reservation Management System, streamlining the reservation process and ensuring comprehensive user accessibility. The project focuses on enhancing hall booking and data management at the F2 Examination Hall. The primary case study location is UTHM, where the current manual reservation system is in use. The system is developed mainly in English for wider accessibility. Insights will be gathered from UTHM's Academic Management Office (PPA). The system user list involved administrators and users. The system encompasses nine modules including user authentication and authorization, dashboard overview, real-time calendar, reservation management, hall management, user management, feedback, user manual and email notification. The proposed web-based solution seeks to transform the dynamics of F2 Examination Hall reservations at UTHM. It offers improved data accuracy, decreased human error rates and increased operational efficiency. The system has the potential to significantly boost facility utilization rates as a result of its customizable dual user interfaces for end-

user and administrator and real-time availability checks. Ultimately, this innovative approach is expected to deliver tangible benefits, including notable cost reductions and enhanced satisfaction among all stakeholders involved.

2. Related Work

2.1 Study of Current System in F2 Examination Hall

The current system for the booking of the F2 Examination Hall is managed manually by the administrative staff in the PPA. In the existing system, the applicants who want to book the F2 Examination Hall will need to check for the availability of the hall through the Microsoft Excel provided on the PPA's official website [2]. Applicants must download and print the reservation form on yellow paper from the website or pick it up in person from the PPA. Upon completion, the form must be sent to the PPA by applicants or their representatives. If the hall is available and the reservation is for examination purposes, the administrative staff will approve the request; otherwise, it will be rejected. Suppose the hall is available but the reservation is for other purposes such as events, exhibitions or talks, applicants must hand in the reservation form with the approval of the Dean or Office of Student Affairs (HEP) or UTHM Joint Curriculum Center and relevant attachments. The relevant offices will then be contacted by the administrative staff to request confirmation. The administrative staff will approve the request if the appropriate officials grant it. The administrative personnel will need to enter the reservation details into Microsoft Excel once the request has been authorised. Lastly, the administrative staff will provide the applicant with a copy of the reservation form and preserve another copy in the office as proof for both parties. Fig 1 shows the flow chart of the current system in the F2 Examination Hall.

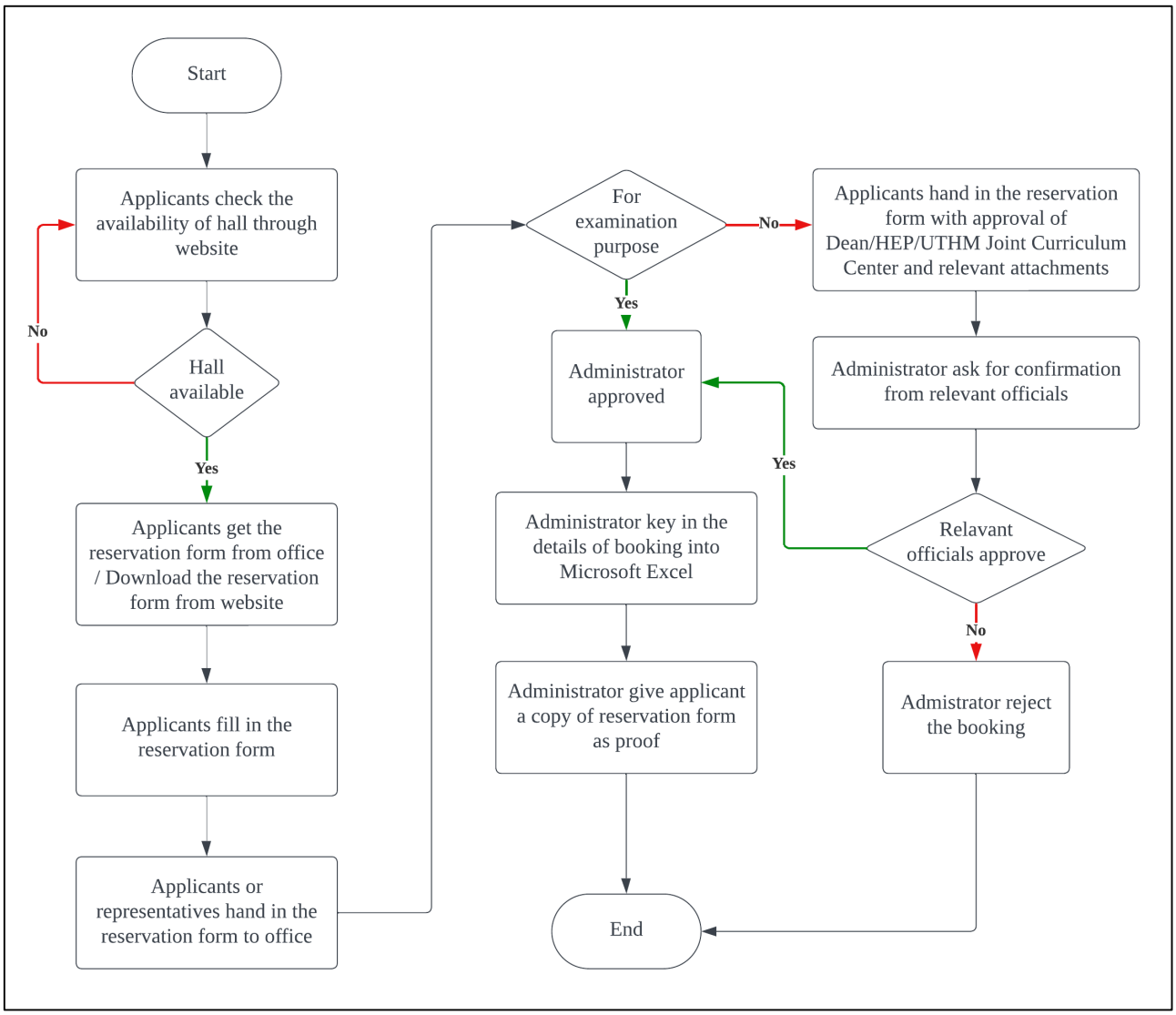

Fig 1. *Flow Chart of Current System in F2 Examination Hall*

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2.2 Study of Existing Related Systems

A comparative study was conducted on three related existing systems and the proposed system. The studied existing systems are the University Tun Hussein Onn Malaysia Equipment And Exercise Room Reservation System (STARS), MARA Technological University Booking System (BSU) and Facilities Booking University of Malaya Kuala Lumpur (UMPOINT). This comparison shows the advantages and limitations of each system. All of these will be taken into account to act as a reference for improving the proposed system.

STARS is a web-based platform designed by the University Tun Hussein Onn Malaysia for staff and students to reserve equipment and exercise rooms. The system offers various courts and spaces for sports like badminton, basketball, soccer, volleyball, Taekwondo and Ping Pong [3]. BSU is a web-based platform provided by the MARA Technological University to allow the university community and outsiders to make reservations for space, software and equipment [4]. The UMPOINT is a web-based platform prepared by the University of Malaya Kuala Lumpur to allow staff and students to make reservations for the university's space, accommodation and service [5].

Table 1 shows the comparison between the existing systems and the proposed system. It indicates that the F2 Examination Hall Reservation Management System offers more advantages than the three existing systems based on an evaluation of eleven features. Specifically, STARS is missing registration, breadcrumb, and payment features; BSU lacks user profile, payment, and notification features; UMPOINT lacks dashboard, breadcrumb, notification, and user manual features. In contrast, the proposed system only lacks a payment feature.

Table 1 *Comparison Between the Existing Systems and Proposed System*

Feature	STARS	BSU	UMPOINT	F2 Examination Hall Reservation Management System
Registration	×	✓	✓	✓
Login and Logout	✓	✓	✓	✓
Dashboard	✓	✓	×	✓
Breadcrumb	×	✓	×	✓
Space Reservation	✓	✓	✓	✓
Reservation Status	✓	✓	✓	✓
Real-Time Calendar	✓	✓	✓	✓
User Profile	✓	×	✓	✓
Payment	×	×	✓	×
Notification	✓	×	×	✓
User Manual	✓	✓	×	✓

3. Methodology/Framework

According to Yakovyna *et al.* [6], the methodology of software development is a system of principles, as well as a set of ideas, concepts, approaches, methods and tools that determine the style of software development.

3.1 Waterfall Model

The Waterfall Model serves as a structured, linear-sequential approach within the System Development Life Cycle (SDLC), delineated into five distinct phases: requirements specification, design, development, testing and maintenance as shown in Fig 2. This model offers clear milestones and deliverables at each stage, fostering a systematic progression that aids in streamlined project management. The Waterfall Model can be less flexible than other models, which could result in stakeholders' feedback being delayed until later stages of development even while its structured nature offers clarity and direction [7].

The fundamental phase is the requirement analysis phase, which employs rigorous data collection procedures. This phase entails interacting with key stakeholders which in this case is Mrs. Noorhafiza binti Ismail who works as an Assistant Senior Administrative Officer in the Academic Management Office Administration and Finance Unit to identify the specific user demands, system developer expectations and overall system requirements. Insights are obtained through approaches such as structured interviews to inform the future design and development processes. The gathered insights can be transformed into an operational design as the project proceeds forward into the design phase. This is where conceptual and structural designs are created, including elements like database schemas, system architectures and wireframes. As such, the Context Diagram

(CD), Data Flow Diagram (DFD) and Entity Relationship Diagram (ERD) will be created in the phase. The goal is to create a thorough framework that will direct the following phases of development and guarantee that the final product complies with the original specifications and stakeholder expectations.

As the system enters the implementation phase, it is modularized and unit tested using programming languages such as HTML, CSS, JavaScript, PHP, and MySQL. The subsequent testing phase includes alpha and beta testing to assure system stability, followed by the maintenance phase, which includes continuing support, bug patches and performance enhancements.

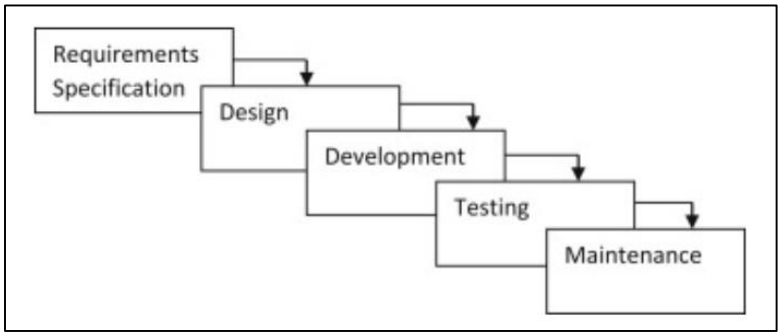

Fig 2. *Waterfall Model [6]*

3.2 System Development Workflow

The system development workflow provides an organized framework for ensuring the efficient delivery of high-quality systems while also serving as a roadmap for the entire process. The waterfall model consists of five distinct phases, each of which has particular tasks and outputs listed in Table 2.

Table 2 *Software Development Activities and Their Tasks*

Phase	Task	Output
Requirement Analysis	1. Identify project scope 2. Derive user requirements, system development requirements and system requirements 3. Set project timeline	• Project proposal • Problem identification and data collection through an interview • Gantt Chart
Design	1. Determine the input, output and data flow of the system 2. Design wireframe 3. Design database	• Context Diagram (CD), Data Flow Diagram (DFD) and Entity Relationship Diagram (ERD) • A wireframe design for the system interface • Database specification
Implementation	1. Develop the system modules interface 2. Database connection	• Proposed system
Testing	1. Perform integration testing for each module	• Test plan result
Maintenance	1. Operate and maintain the system in a production environment	• The system is always up and running

3.3 System Requirement Analysis

System requirement analysis is a crucial phase in the software development life cycle that evaluates a system's needs and limitations. Beginning with engaging stakeholders like end users, it gathers information on system functionality, performance goals, and constraints through methods like interviews and surveys [8].

3.3.1 Functional Requirement Analysis

Functional requirements are specifications which define the particular attributes and functionalities that the F2 Examination Hall Reservation Management System needs to have to meet user demands and accomplish its goals. These requirements define the system's intended behaviours and functionalities, describing how users will interact with it and what outcomes might be expected. It gives the developer a clear and quantifiable understanding of the anticipated functionalities, inputs, processes and outputs of the system, acting as a roadmap. Table 3 shows the functional requirement of the F2 Examination Hall Reservation Management System.

Table 3 *Functional Requirements*

Module	Functionality
Register	• Admin able to register a new account for both admin and user • User able to register a new account by providing the required information
Login and Logout	• Admin and user able to login their account using the correct username and password and logout from the account • Admin and user will receive an alert for any wrong input of username or password
Dashboard	• Admin and user able to view the maximum capacity of the top level and lower level of the F2 Examination Hall
Real-Time Calendar	• Admin and user can view the availability of remaining capacity for each date of the top level and lower level of the F2 Examination Hall
Reservation Management	• Admin able to approve, reject, delete and modify the reservation • User needs to agree with the reservation guidelines before making reservation • User can make a new reservation and view the list of bookings that have been made
Hall Management	• Admin can adjust the hall capacity and modify the remark for both the top and lower levels of the F2 Examination Hall
User Management	• Admin able to view, create, update and delete an admin or user account • User able to view and edit their profile information
Feedback	• Admin able to view the feedback list using table view and the feedback analysis using graph view • User able to provide feedback via the system
User Manual	• Admin can upload the user manual file into the system • Users can view the user manual
Notification	• User will receive email notification regarding the status of booking

3.3.2 Non-Functional Requirement Analysis

Non-functional requirements comprise the features and qualities that govern how a system should work rather than identifying specific functionality. Non-functional requirements provide the parameters that determine how the system should operate in specific scenarios. It is critical to establish non-functional criteria in a detailed and measurable manner to guarantee that the system satisfies stakeholder expectations and addresses their needs. Table 4 shows the non-functional requirement of the F2 Examination Hall Reservation Management System.

Table 4 *Non-Functional Requirements*

Requirement	Description
Operational	• The system should able to work on any web browser • The system should be able to operate with an internet connection
Performance	• The system should able to respond in less than three seconds • The system should have an uptime of at least 99%
Security	• The system should implement role-based access control to ensure that only authorized personnel can perform administrative functions

4. Result and Discussion

4.1 Data Flow Diagram (DFD)

A Data Flow Diagram (DFD) is a graphic representation that shows how data flows through a system and is processed. It is made up of external entities, data flows, data stores, and processes. Data stores illustrate where data is stored, data flows to demonstrate how data moves between components, and external entities represent entities outside the system interacting with it. Processes are the activities or procedures that convert input data into output data. It considers a system to be a function that converts inputs into desired outputs. DFD aims at capturing the transformations that occur within a system to the input data to produce the output data.

4.1.1 Context Diagram

A Context Diagram (CD) is a high-level visual representation that shows how a system interacts with other entities to give an overview of the system. The CD is the top-level DFD in every process model. It is a crucial tool for efficient communication and understanding in the early phases of project development because it provides a foundation for system analysis and design and aids stakeholders in understanding the boundaries and scope of the system while highlighting its external relationships. Fig 3 shows the Context Diagram.

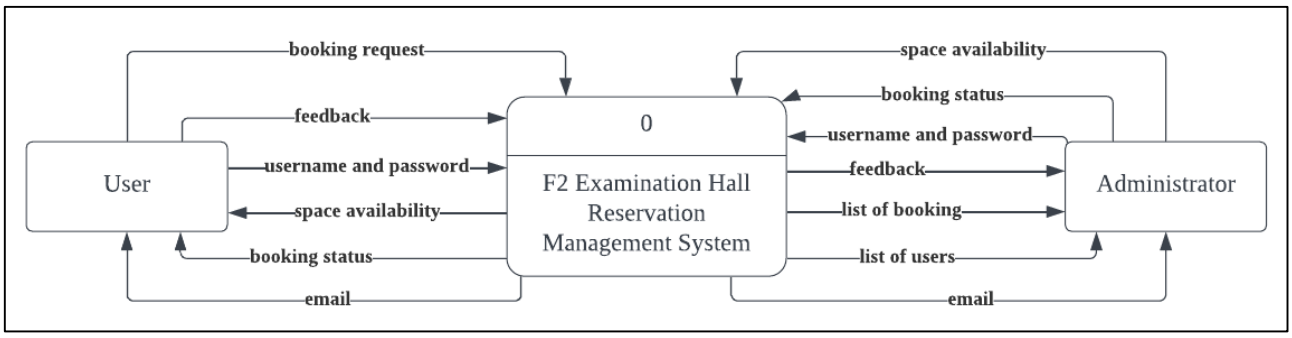

Fig 3. *Context Diagram*

4.1.2 Level 0 DFD

In level 0 DFD, the CD is expanded to provide a more detailed explanation of each process that involves data stores and external entities. Appendix A shows the level 0 DFD of the F2 Examination Hall Reservation Management System. There are seven level 0 processes involved in the F2 Examination Hall Reservation Management System, 1.0 Login / Update Account, 2.0 Manage Account Details, 3.0 Manage the Examination Hall, 4.0 Check Availability, 5.0 Make Reservation, 6.0 Manage the Reservation Request, 7.0 Manage Feedback and 8.0 Manage User Manual. There are two external entities involved in the system which are the administrator and user same as the Context Diagram. In addition, four data stores are involved in the system which are user, hall, feedback and user manual.

A flowchart provides a visual depiction of the web-based system's systematic flow and functionality. In the case of the F2 Examination Hall Reservation Management System, the flow chart illustrates the sequential steps and interactions within the system that enable efficient and organized reservation of examination halls. This visual assistance not only assists in understanding the system's architecture but also acts as a valuable tool for developers, administrators and users to appreciate the logical flow of actions and decision points, hence contributing to effective communication and system implementation. Appendix B and appendix C show the flowchart administrator and user respectively.

4.2 Database Design

Designing a reliable and efficient database is a vital component of developing a web-based system since it serves as the foundation for storing, managing, and retrieving data that is critical to the system's functionality.

4.2.1 Entity Relationship Diagram (ERD)

The Entity-Relationship Diagram (ERD) is an essential instrument in database architecture because it provides a visual representation of the relationships between entities in a system. An ERD illustrates the structure of a database visually by presenting entities as well as the links and interactions that exist between them. Entities are linked by relationships that specify how these entities interact and relate to each other. An ERD facilitates common understanding across stakeholders, including developers, database administrators and business analysts, by providing a clear and understandable means of communicating complex data models through the use of standardized symbols and terminology. Fig 4 shows the Entity Relationship Diagram of the F2 Examination Hall Reservation Management System.

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Fig 4. *Entity Relationship Diagram*

4.3 Implementation of Module

Robust security is crucial as the system handles the personal information of users that can defend against potential security threats, illegal access and data breaches. The security module implemented for the F2 Examination Hall Reservation Management System includes session management, password hashing and a strong password policy. Besides, the F2 Examination Hall Reservation Management System consists of several modules. The modules include user authentication and authorization, dashboard, real-time calendar, reservation management, hall management, user management, feedback, and user manual.

4.3.1 Authentication and Authorization Module

Fig 5 shows the interface of register page. New users are required to fill in their full name, email, contact number, username and password on the input fields. After all the input fields are filled, new users can click on the “Sign Up” button to register a new account.

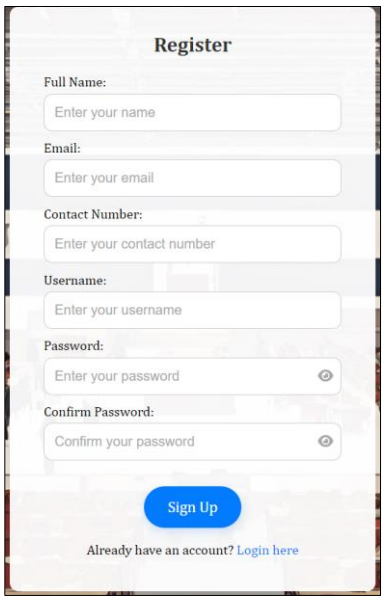

Fig 5. *Interface of Register Page*

Fig 6 shows the interface of login page. Users are required to enter their username and password and then click on the "Login" button to login to the system. Users will be able to login to the system if the username and password are correct, else the users will be alerted to reenter the correct data. If the users forget their account password, they can click on the forgot password link to retrieve their password. If he or she is a new user, then can click on "Create an account" to register a new account.

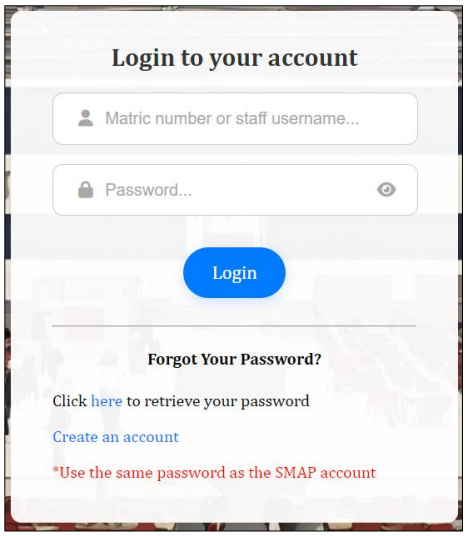

Fig 6. *Interface of Login Page*

4.3.2 Dashboard Module

Fig 7 shows the interface of dashboard page. Users can view the maximum capacity for both the top level and lower level of the F2 Examination Hall. Users also can navigate to make new reservations using the quick access provided.

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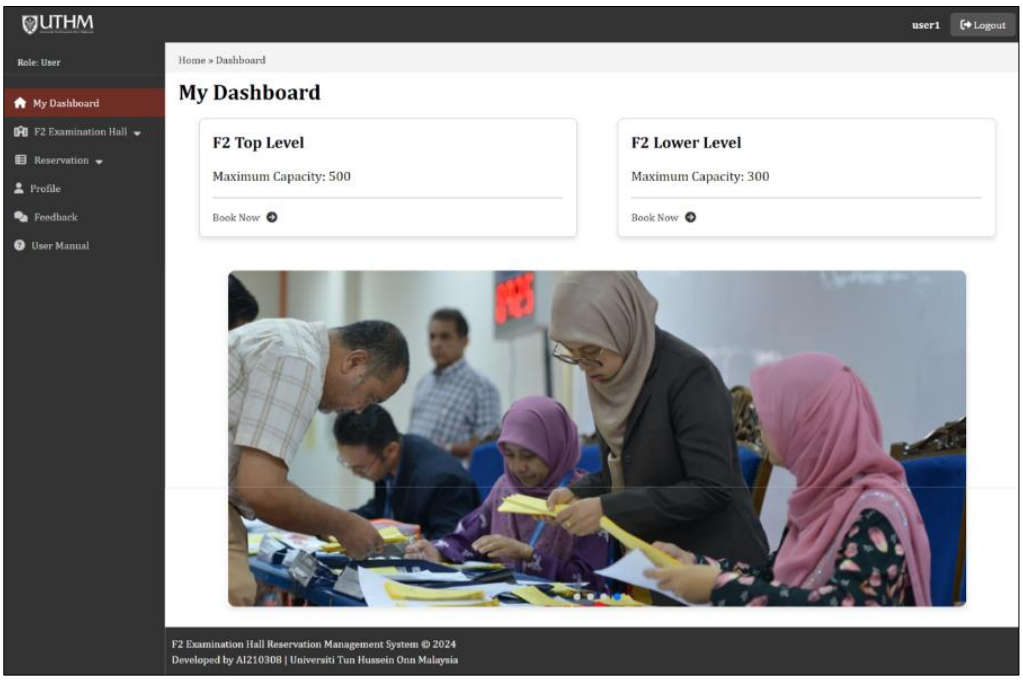

Fig 7. *Interface of Dashboard Page*

4.3.3 Real-Time Calendar Module

Fig 8 shows the interface of the F2 Examination Hall top level page. Users can view the real-time calendar that indicates the availability of reservations for each date for both the top level of the F2 Examination Hall. The yellow cell indicates that the date is the current date. Users can navigate to different months using the left or right arrow button. The button in green with "View" indicates that the date is still available for reservation, while the button in red with "Full" indicates that the date has been fully reserved. The real-time calendar for the lower level follows the same protocol as for the top level.

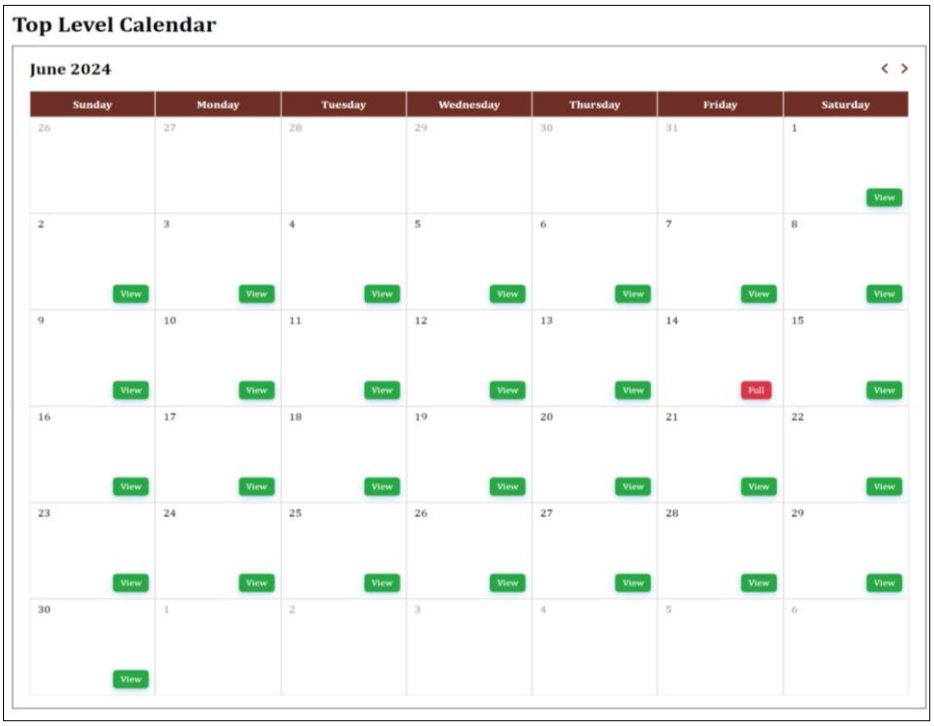

Fig 8. *Interface of F2 Examination Hall Top Level Page*

Fig 9 shows the interface of the F2 Examination Hall top level details page. Users can view the remaining capacity for each time slot from 07:00 to 23:30 on the selected date. Each time slot with half an hour interval.

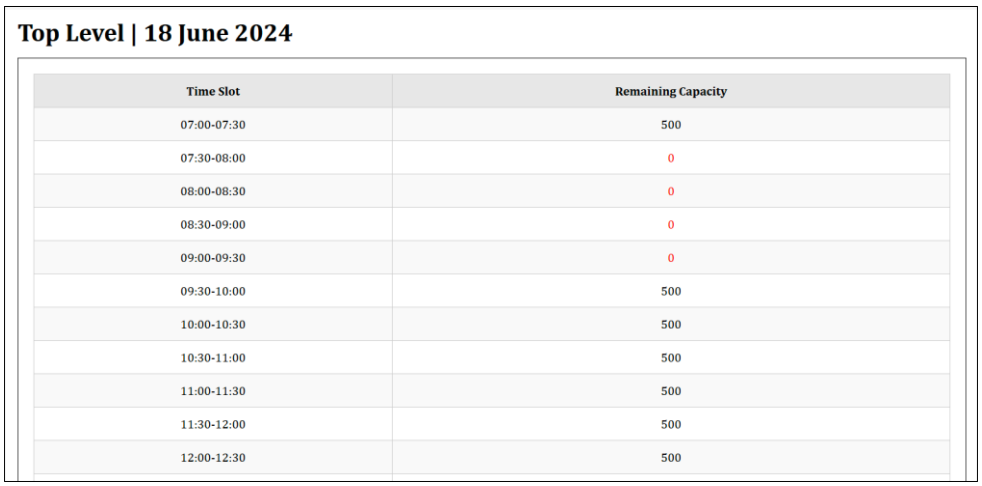

Fig 9. *Interface of F2 Examination Hall Top Level Details Page*

4.3.4 Reservation Management Module

Fig 10 shows the interface of the new booking page. Users are required to fill in all the related reservation details and click on the "Save" button to make the reservation. Users also can click on the "Reset" button to clear all the input fields at once.

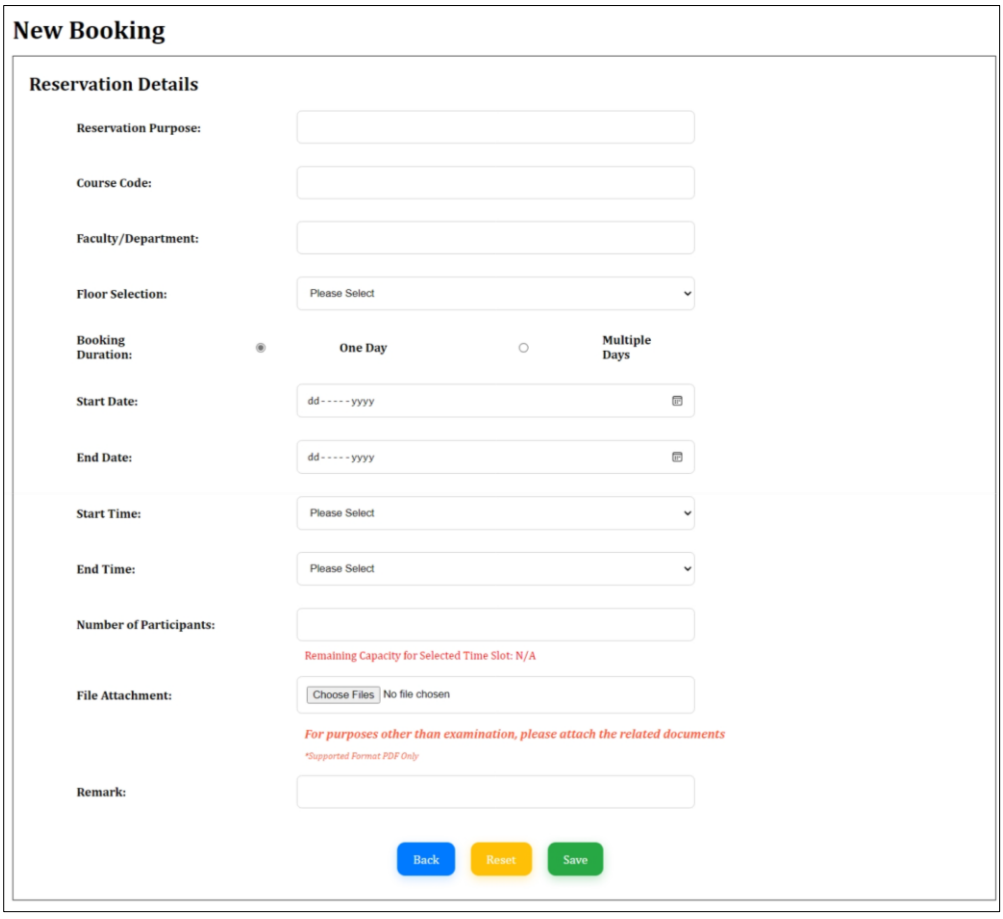

Fig 10. *Interface of New Booking Page*

Fig 11 shows the interface of the booking list page. Every reservation made by the users will be shown in the list. Users can review the reservation details and check their reservation status in this list. Users also can search for the event using the search function.

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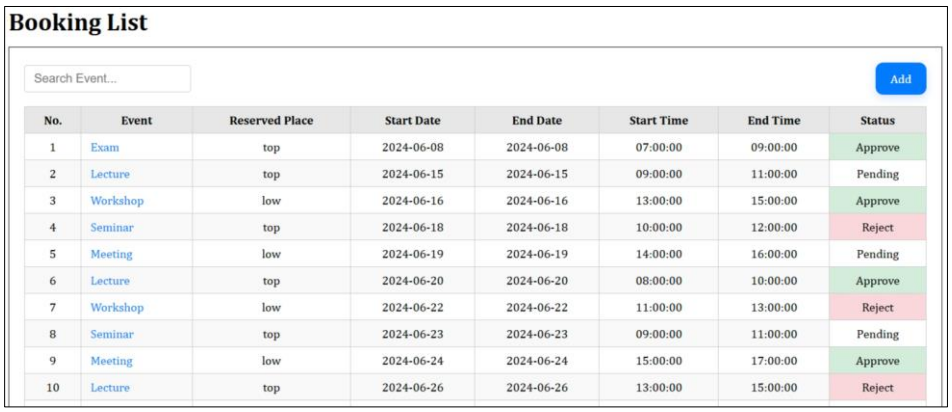

Fig 11. *Interface of Booking List Page*

Fig 12 shows the interface of the reservation page. Admin can view and update each reservation details. Admin can approve, reject or delete the reservation made by the users. After the admin updates the reservation status, the relevant email notification will be sent to the users as shown in Appendix D.

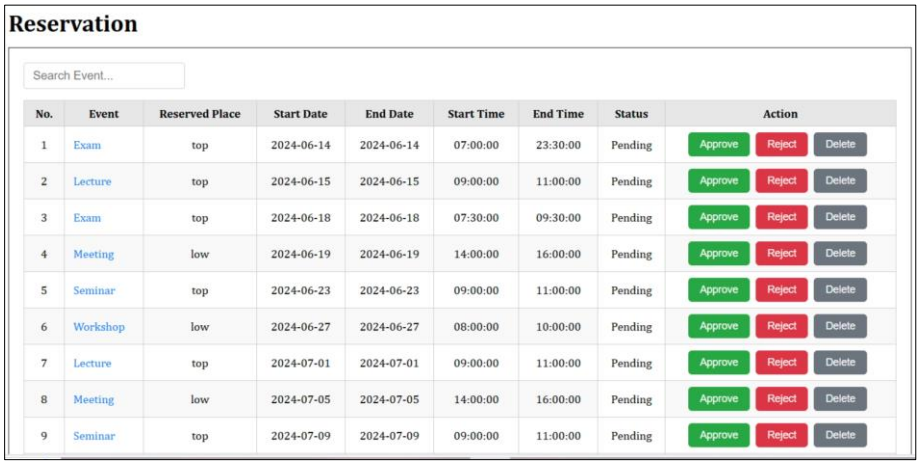

Fig 12. *Interface of Reservation Page*

4.3.5 Hall Management Module

Fig 13 shows the interface of the setting page. Admin able to update the hall capacity and remark for both the top level and lower level of the F2 Examination Hall.

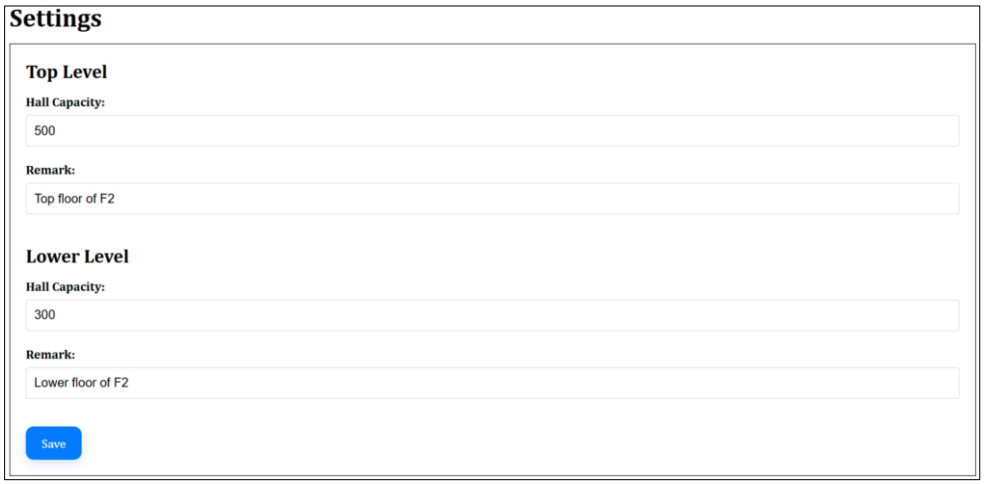

Fig 13. *Interface of Setting Page*

4.3.6 User Management Module

Fig 14 shows the interface of the administrator page. Admin able to view, create and update the administrator account information. Admin also can activate or deactivate the admin account. Admin also can search an admin account by using the search function provided.

Fig 14. *Interface of Administrator Page*

Fig 15 shows the interface of the profile page. Users can view and update their account profile details including full name, username, password, email and contact. Users can click on the "Save" button to update the profile details.

Fig 15. *Interface of Profile Page*

4.3.7 Feedback Module

Fig 16 shows the interface of the feedback page. Users can give feedback on the system from a few aspects including overall satisfaction, ease of use, functionality, and performance and comments using this feedback form.

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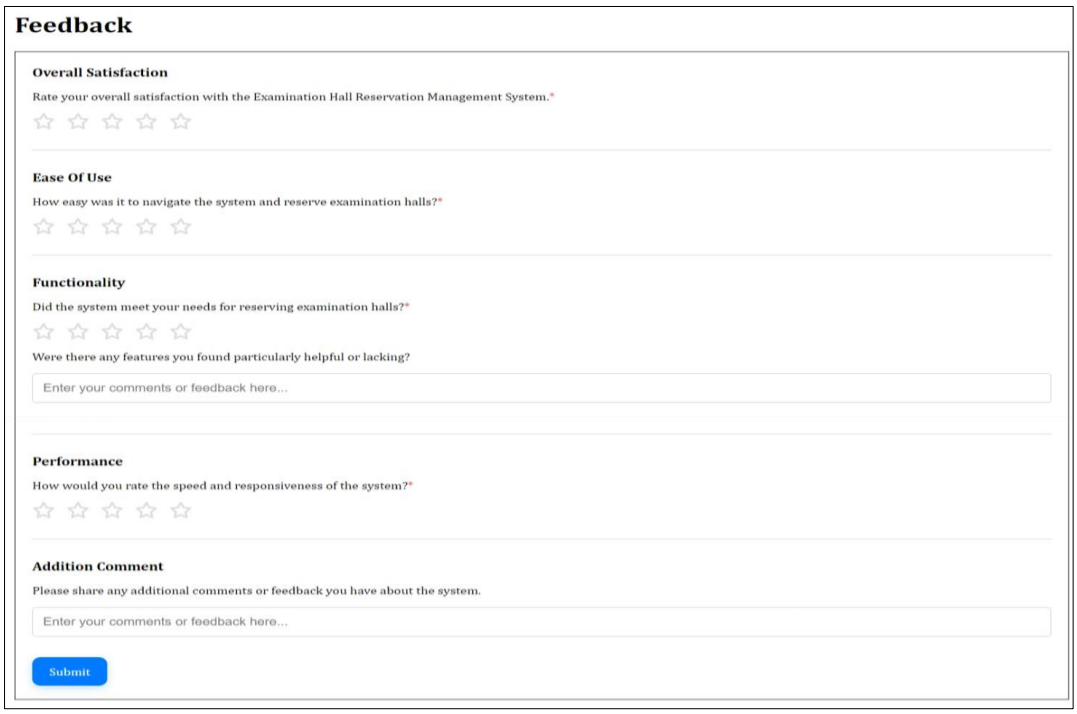

Fig 16. *Interface of Feedback Page*

Fig 17 shows the interface of the feedback table view page. Admin can view the list of user feedback regarding the system in table view form. Admin also can switch the analysis of feedback from table view to graph view. Admin can search the user by utilizing the search function provided.

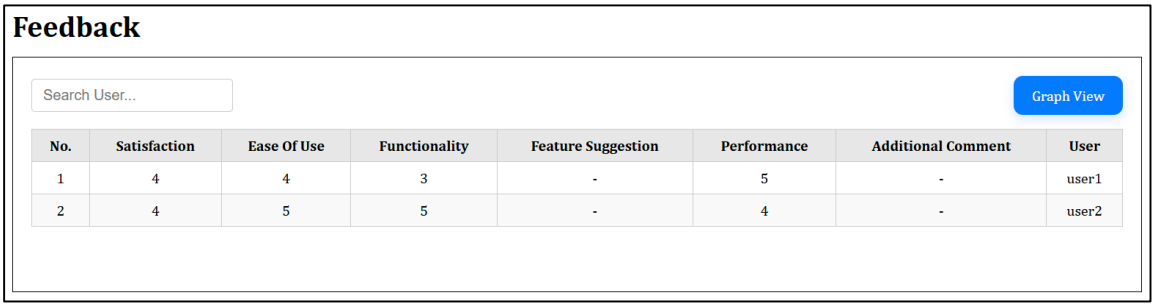

Fig 17. *Interface of Feedback Table View Page*

Fig 18 shows the interface of the feedback graph view page. Admin can view and print the analysis of feedback from users regarding the system in graph view form.

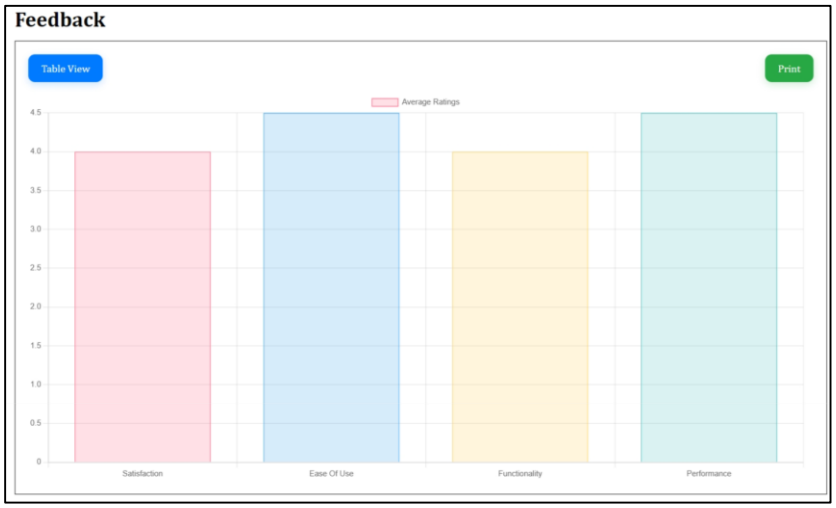

Fig 18. *Interface of Feedback Graph View Page*

4.3.8 User Manual Module

Fig 19 shows the interface of the user manual page. Admin can upload the new user manual file in PDF format. Admin can view the latest uploaded file details including filename, updated by admin ID, last updated and user view.

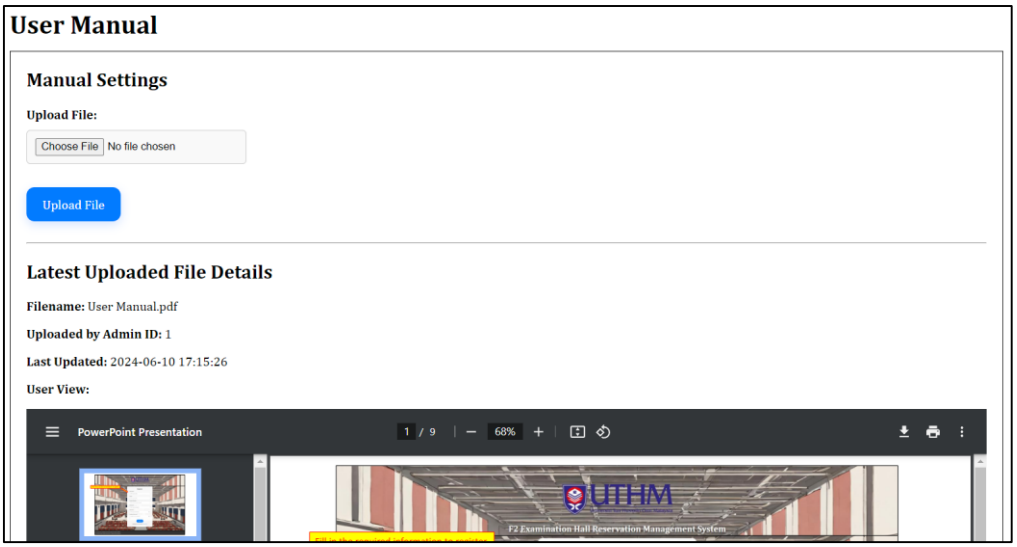

Fig 19. *Interface of User Manual Page*

4.4 Testing

4.4.1 Test Cases

Test cases play a crucial role in software testing by serving as a blueprint for verifying whether the implemented system meets the specified requirements. Test cases are directly derived from the requirements specification and are intended to cover as many situations and use cases as possible that the system may experience in the process of its operation. Table 5 shows the list of test cases for admin. All the test case results for admin are passed.

Table 5 *List of Test Cases for Admin*

No.	Test Cases	Expected Outcome	Result
A. Authentication and Authorization Module			
1.	Login with the correct username or password	Successfully login and redirect to index.php, else the alert should indicate invalid credentials	Passed
2.	Login with an inactive admin account	Alert should inform that the account is deactivated	Passed
B. Dashboard Module			
1.	Access dashboard page as admin	It should display admin-specific content	Passed
2.	View maximum capacity for top level lower level	Maximum capacity for top and lower levels should be displayed	Passed
3.	Navigate to manage reservations	Clicking on “Manage Now” should lead to reservation.php	Passed
C. Real-Time Calendar Module			
1.	View real-time calendar for top and lower level	Calendar should display availability of reservations for each date	Passed
2.	Navigate to different months	Clicking left or right arrow should navigate to previous or next month	Passed
3.	Verify the current date indicator	Yellow cell should indicate the current date	Passed
4.	Verify available reservation dates	Green button with “View” should indicate available dates for reservation	Passed
5.	Verify fully reserved dates	Red button with “Full” should indicate fully reserved	Passed

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Table 5 *List of Test Cases for Admin (cont)*

No.	Test Cases	Expected Outcome	Result
D. Reservation Management Module			
1.	View and update reservation details	Reservation details should be editable by the admin	Passed
2.	Approve a reservation	Reservation status should be updated to "Approved"	Passed
3.	Reject a reservation	Reservation status should be updated to "Rejected"	Passed
4.	Delete a reservation	Reservation should be removed from the list	Passed
E. Hall Management Module			
1.	Update hall capacity and remark for top level or lower level	Changes to hall capacity and remark should be saved successfully	Passed
F. User Management Module			
1.	View list of administrators or users	Table of administrators or users should be displayed	Passed
2.	Update administrators or users information	Changes to administrator or users details should be saved successfully	Passed
3.	Activate or deactivate admin or user account	Admin or user account should be activated or deactivated	Passed
4.	Ensure at least one active admin	Deactivation button should be disabled if only one active admin account exists	Passed
G. Feedback Module			
1.	View feedback table	Admin should be able to view feedback table	Passed
2.	Print the graph view PDF	The graph view should be able to print in PDF form	Passed
H. User Manual Module			
1.	Upload a new user manual in PDF format and view the PDF content	Admin should be able to upload and view new user manual PDF	Passed
2.	View the latest uploaded file details	Admin should be able to view details of the latest uploaded file	Passed
I. Notification Module			
1.	Send email notification	Admin should be able to send the email	Passed

Table 6 shows the list of test cases for users. All the test case results for the user are passed.

Table 6 *List of Test Cases for User*

No.	Test Cases	Expected Outcome	Result
A. Authentication and Authorization Module			
1.	Register with a unique username and email	Alert display success message and redirection to login page	Passed
2.	Attempt to register with existing username or email	Alert should prompt the user to use a different username or email address	Passed
3.	Login with the correct username or password	Successfully login and redirect to index.php, else the alert should indicate invalid credentials	Passed
4.	Login with an inactive user account	Alert should inform that the account is deactivated	Passed
B. Dashboard Module			
1.	Access dashboard page as user	Dashboard page should display user-specific content	Passed
2.	View maximum capacity for top level lower level	Maximum capacity for top and lower level should be displayed	Passed
3.	Navigate to make new booking	Clicking on “Book Now” should lead to newBooking.php	Passed

Table 6 *List of Test Cases for User (cont)*

No.	Test Cases	Expected Outcome	Result
C. Real-Time Calendar Module			
1.	View real-time calendar for top and lower level	Calendar should display availability of reservations for each date	Passed
2.	Navigate to different months	Clicking left or right arrow should navigate to previous or next month	Passed
3.	Verify current date indicator	Yellow cell should indicate the current date	Passed
4.	Verify available reservation dates	Green button with "View" should indicate available dates for reservation	Passed
5.	Verify fully reserved dates	Red button with “Full” should indicate fully reserved dates	Passed
D. Reservation Management Module			
1.	Fill all reservation details and click "Save"	Reservation should be successfully saved	Passed
2.	Click "Reset" button after filling input fields	All input fields should be cleared	Passed
3.	Review reservation details in the list	Reservation details should be visible for review	Passed
4.	Search for a specific event using search function	Matching events should be displayed based on search criteria	Passed
E. User Management Module			
1.	View user profile information	User profile details should be displayed	Passed
2.	Update user profile	Changes to user profile should be saved successfully	Passed
F. Feedback Module			
1.	Rate each aspect of the system in the feedback form	User should be able to rate each aspect of the system in the feedback form	Passed
2.	Provide comment	User should be able to provide comment	Passed
3.	Submit feedback	Feedback should be submitted successfully	Passed
G. User Manual Module			
1.	View uploaded PDF	User should be able to view the uploaded PDF file	Passed

5. Conclusion

The F2 Examination Hall Reservation Management System project intends to streamline examination hall booking and management using a complete web-based platform. The system's well-structured data model is demonstrated by the ERD, which clarifies the relationships between various entities, ensuring a coherent database architecture. Furthermore, The MySQL database, comprising six crucial tables, effectively supports data storage and retrieval, while comprehensive data dictionaries elucidate data attributes, types, and interrelationships for entities like admin and user. In addition, the user-centric interface design ensures an intuitive user experience across a range of tasks, from login and registration to feedback submission. Rigorous functional testing confirmed the system operates error-free, meeting all specified requirements and providing a reliable platform for UTHM students and staff to make hall reservations.

The system offers significant advantages over the previous manual process, including reduced administrative workload, faster processing times, minimized human errors, and enhanced data accuracy. User-friendly interfaces for administrators and users ensure efficient task performance, while a centralized database enhances data consistency and accuracy. Real-time insights into hall availability and usage patterns improve resource management and can lead to cost savings through optimized scheduling.

However, some limitations remain for this system. The real-time calendar does not display public holidays in Malaysia, potentially causing scheduling conflicts. Additionally, the reservation management interface cannot

segregate reservations by event type and lacks advanced filtering options, hindering efficient management of large volumes of reservations, especially during peak times.

Future enhancements should focus on integrating a comprehensive public holiday calendar to prevent scheduling conflicts and introducing advanced filtering options to improve reservation management. These upgrades will optimize hall utilization, enhance organization, and streamline the reservation process.

In summary, the F2 Examination Hall Reservation Management System meets its objectives and provides an effective platform for UTHM students and staff to make hall reservations. Although there is potential for enhancement, users benefit significantly from the system's existing functioning. Ongoing development and enhancements will ensure the system evolves to meet user demands and remains a valuable resource for UTHM stakeholders, reflecting a commitment to delivering a robust and user-friendly reservation platform.

Acknowledgement

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Leng Hooi Qi, Noryusliza Binti Abdullah;* ***data collection:*** *Leng Hooi Qi;* ***analysis and interpretation of results:*** *Leng Hooi Qi, Noryusliza Binti Abdullah;* ***draft manuscript preparation:*** *Leng Hooi Qi, Noryusliza Binti Abdullah. All authors reviewed the results and approved the final version of the manuscript.*

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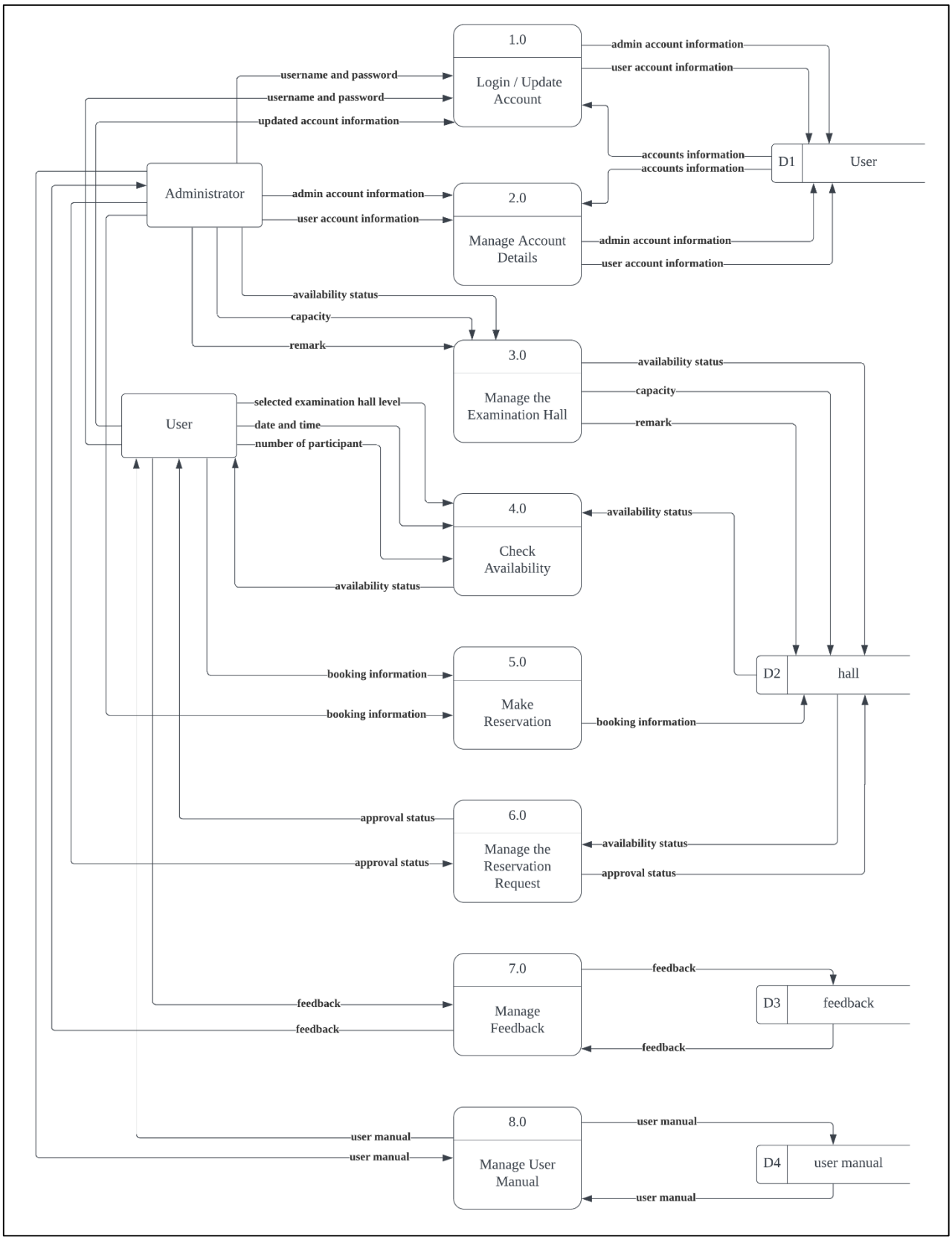
Appendix A: Data Flow Diagram Level 0



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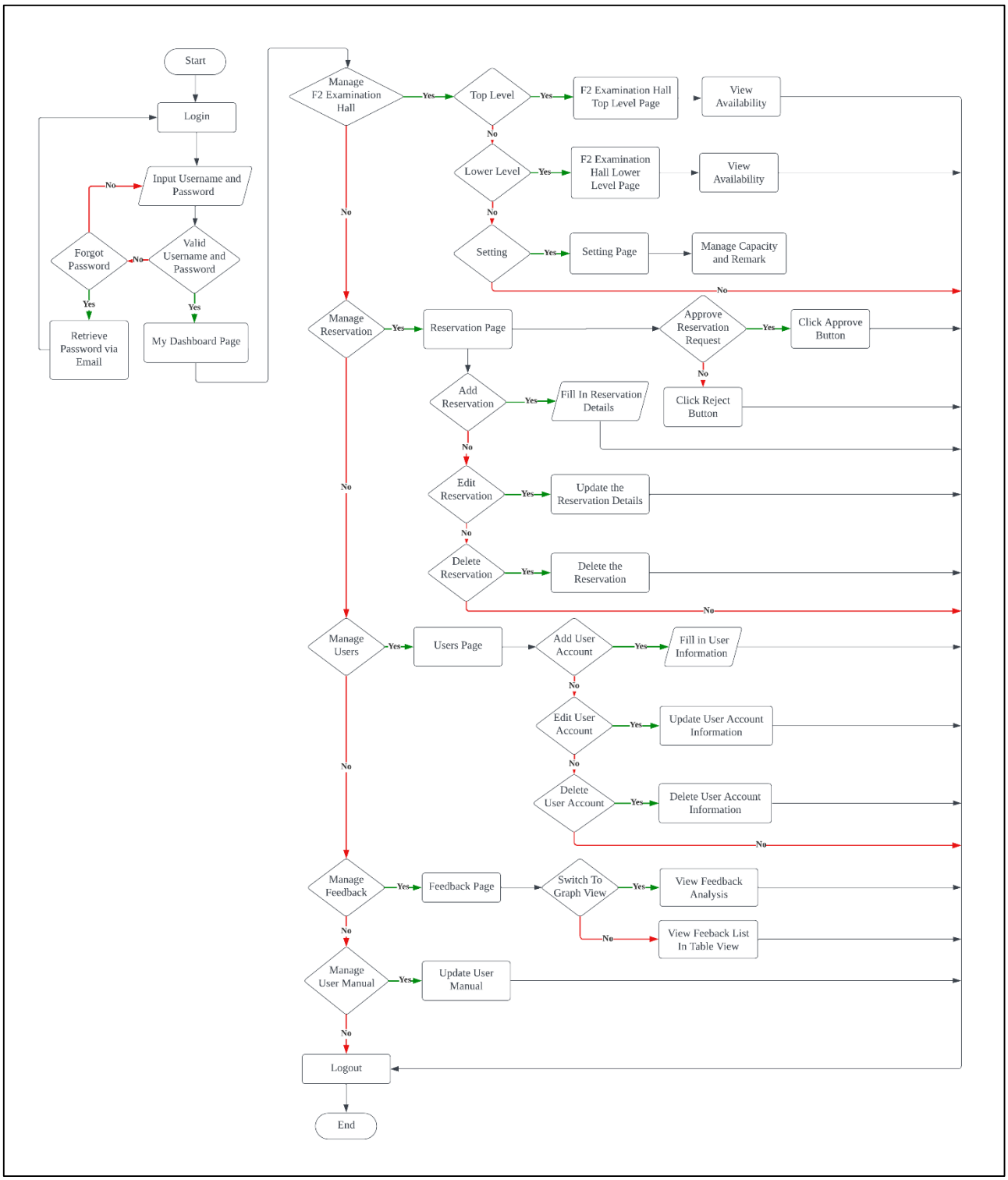
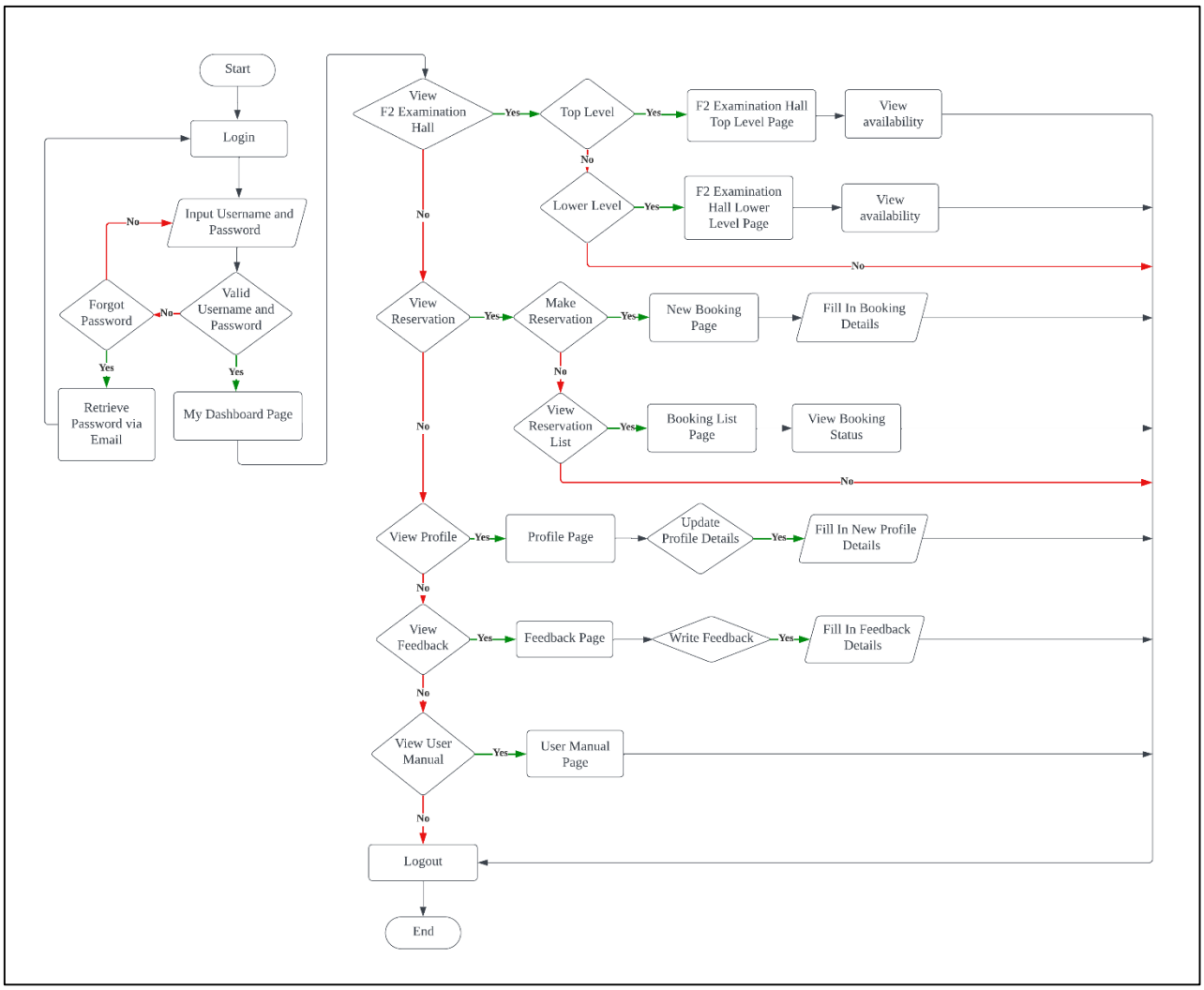
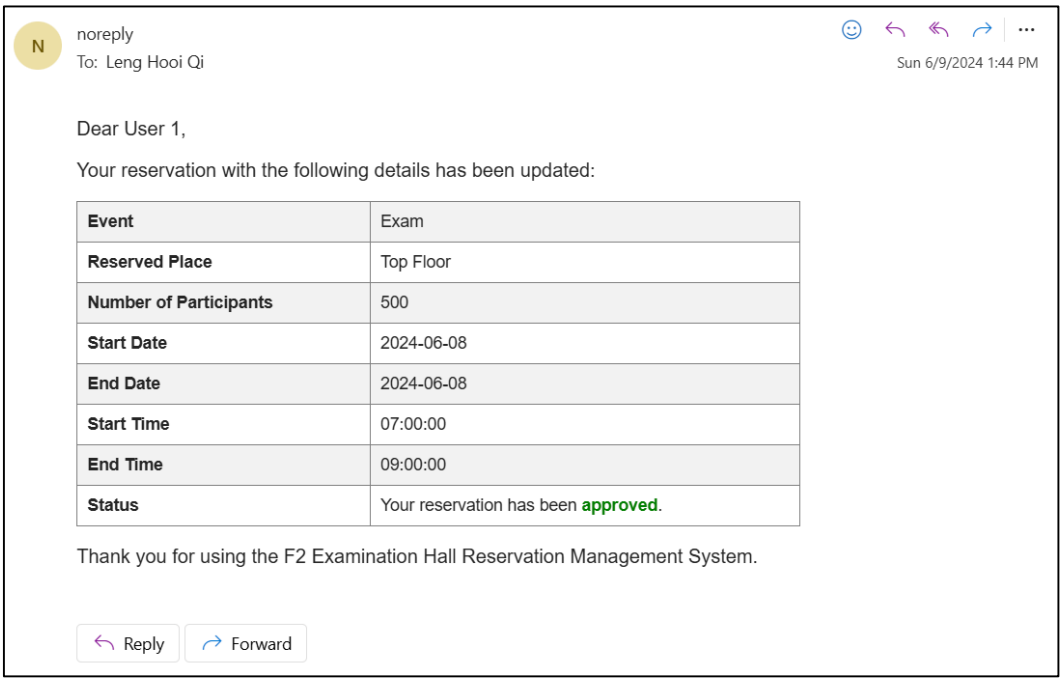
Appendix B: Flowchart of Administrator



Appendix C: Flowchart of User



Appendix D: Email Notification



N

noreply

To: Leng Hooi Qi

Sun 6/9/2024 1:44 PM

Dear User 1,

Your reservation with the following details has been updated:

Event	Exam
Reserved Place	Top Floor
Number of Participants	500
Start Date	2024-06-08
End Date	2024-06-08
Start Time	07:00:00
End Time	09:00:00
Status	Your reservation has been **approved**.

Thank you for using the F2 Examination Hall Reservation Management System.

Reply Forward