

INF2001

Introduction to Software Engineering



Milestone 3: Design, Test Plan & Prototype

for

Workload Management System for Ferry Company

Prepared by

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1 Introduction

Due to globalisation in today's ever-evolving digital landscape, this project aims to develop a web-based workload management system tailored for ferry companies. The primary objective of this system is to establish a user-friendly platform that enhances the employee experience and significantly boosts operational efficiency. The four main positive impacts the project strives to achieve are: enhanced operational efficiency, improved work-life balance, transparency, and staff empowerment. In the following section, the product scope is further explored, and the related background literature and a document overview with its reference section are provided.

1.1 Product Scope

This product allows ferry company employees and IT administrators to effectively manage and handle job assignments, work hours, and job preferences. The key features of the product include:

- employee job visibility,
- availability notification,
- job assignment acknowledgement,
- manager's dashboard,
- workload overviews, and
- user-friendly web accessibility.

The ferry company managers can then efficiently allocate jobs and monitor the overall workload, while their employees can indicate their preferences and schedule preferences.

This product also creates a comprehensive Workforce Management (WFM) solution for the ferry company. The WFM system assists managers and administrators in making perceptive planning decisions by optimising task allocations while simultaneously giving crew employees a platform to indicate their working preferences and availability schedules.

Some advantages of the WFM could include: greater job satisfaction, a better work-life balance, fewer task disparities, and improved internal communication.

1.2 Related Background Literature

Ferry operators are significant players in global transportation, having moved at least 373 million ferries and contributing to a substantial USD\$60 billion GDP and 1.1 million jobs in 2019, according to Oxford Economics. Therefore, the efficient operation of these ferry services is crucial for tourism, regional development, and the local community's well-being. Hence, WFM systems play a vital role in helping operators ensure smooth ferry operations (Oxford Economics, 2019).

Ferry operators employ WFM systems for efficient, safe, and data-driven crew scheduling to allow streamlined allocation of resources. These systems act as the foundation and backbone of the ferry operations, as they aid in optimising the crew schedules by including elements like rest periods and skill sets to ensure that the ferry operators have adequate skilled crews on board for passengers' safety.

Key functionalities of WFM systems include:

- Tracking crew availability
- Identifying staffing shortages
- Managing crew leave and actions effectively
- Generating comprehensive reports on crew workload

Crew scheduling is essential in the maritime industry because seafaring is a demanding job. Seafarers work long and irregular hours, spend long periods away from home, and face bad weather conditions. These factors can lead to stress, fatigue, and other health problems (Dohrmann, Herttua, & Leppin, 2019). Hence, effective seafaring crew scheduling reduces problems by providing maritime workers with sufficient rest, improving safety through a consistent presence of qualified maritime workers onboard.

Insufficient maintenance planning can potentially lead to equipment failures, hull damage, and accidents. For example, an illustrative incident occurred in 2012 when the Costa Concordia capsized, resulting in 32 casualties due to inadequate hull maintenance (Schröder-Hinrichs, Hollnagel, & Baldauf, 2012). Hence, the use of the WFM system can be effective in minimising such incidents from happening again, as it can plan maintenance tasks, track progress, and generate detailed reports on costs and performance.

1.3 Intended Audience and Document Overview

This document is intended for the clients, professors of SIT overseeing the 'Introduction to Software Engineering module' and our team of developers and testers for this project.

This document provides a comprehensive overview of the Ferry Workload Management System (FWMS), highlighting the product and its features. The following section will cover the user interface of the FWMS. The document also presents the project estimation and plan taken to break down the tasks.

1.4 References and Acknowledgments

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2 Software Design

2.1 Architecture Design

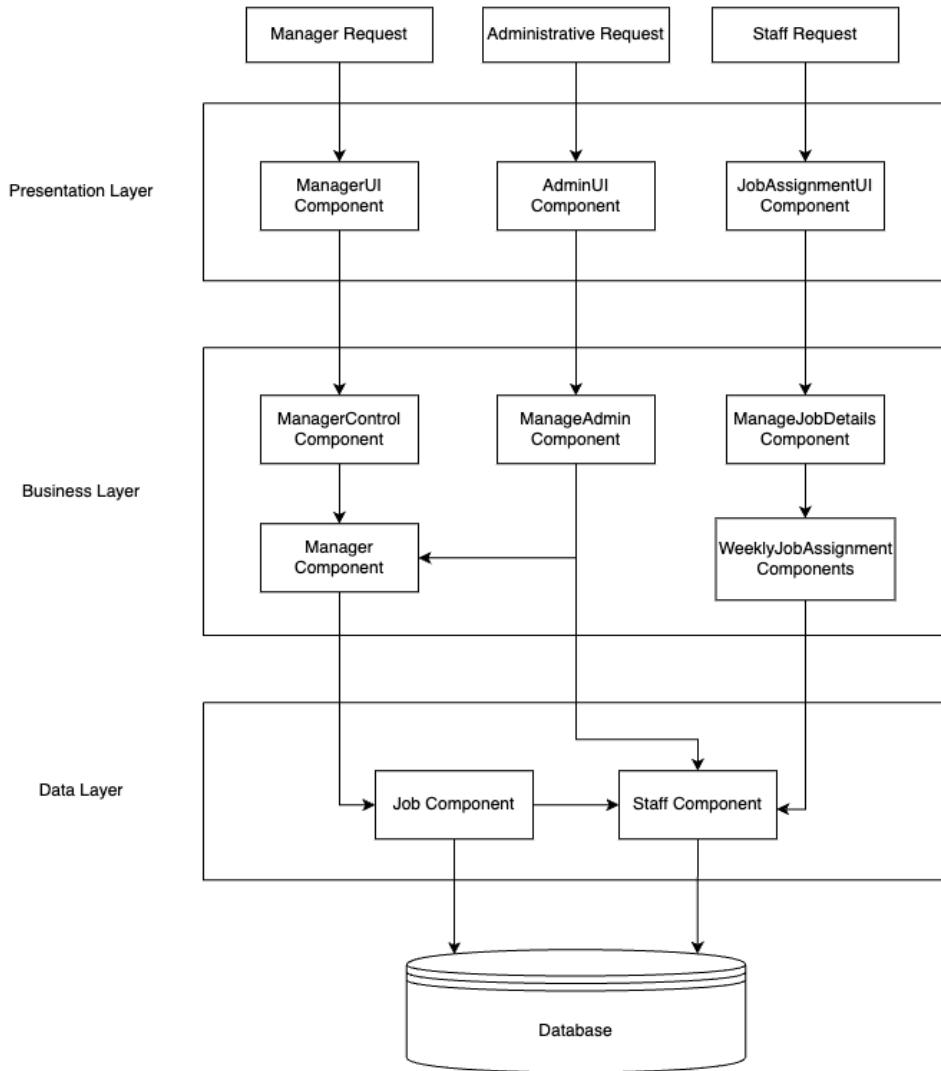


Figure 1.0 Hierarchical-Layered Software Architecture Diagram

Based on Figure 1.0, the Hierarchical-Layered Software Architecture was chosen as the project's architectural pattern. This choice is derived from the advantages that it brings to the design of the Ferry Workload Management System (FWMS). The Hierarchical-Layered Software Architecture acts as an organisational framework where it breaks down the system into various layers where each is assigned to specific responsibilities.

Hierarchical-Layered Software Architecture is reusable and modular which makes it easier to develop, test and maintain individual layers without compromising the integrity of the entire system. By using this architecture, FWMS is poised to efficiently manage user interactions, business logic, data handling and communication via well defined interfaces within each layer. The Hierarchical-Layered Software Architecture not only provides a robust foundation for the development of FWMS but also offers a systematic approach to understand and organise the interactions and functionalities within FWMS.

2.2 Detailed Design

For our software classes, the Observer design pattern and the Strategy design pattern are suggested for incorporation.

2.2.1 Behavioural Design Pattern - Observer Pattern

The Observer Pattern is a behavioral design pattern where an object, known as the subject, keeps a list of its dependents, known as observers, that must be told when the subject's state changes. When the subject's state changes, it alerts all of its observers, allowing them to react and update themselves as needed.

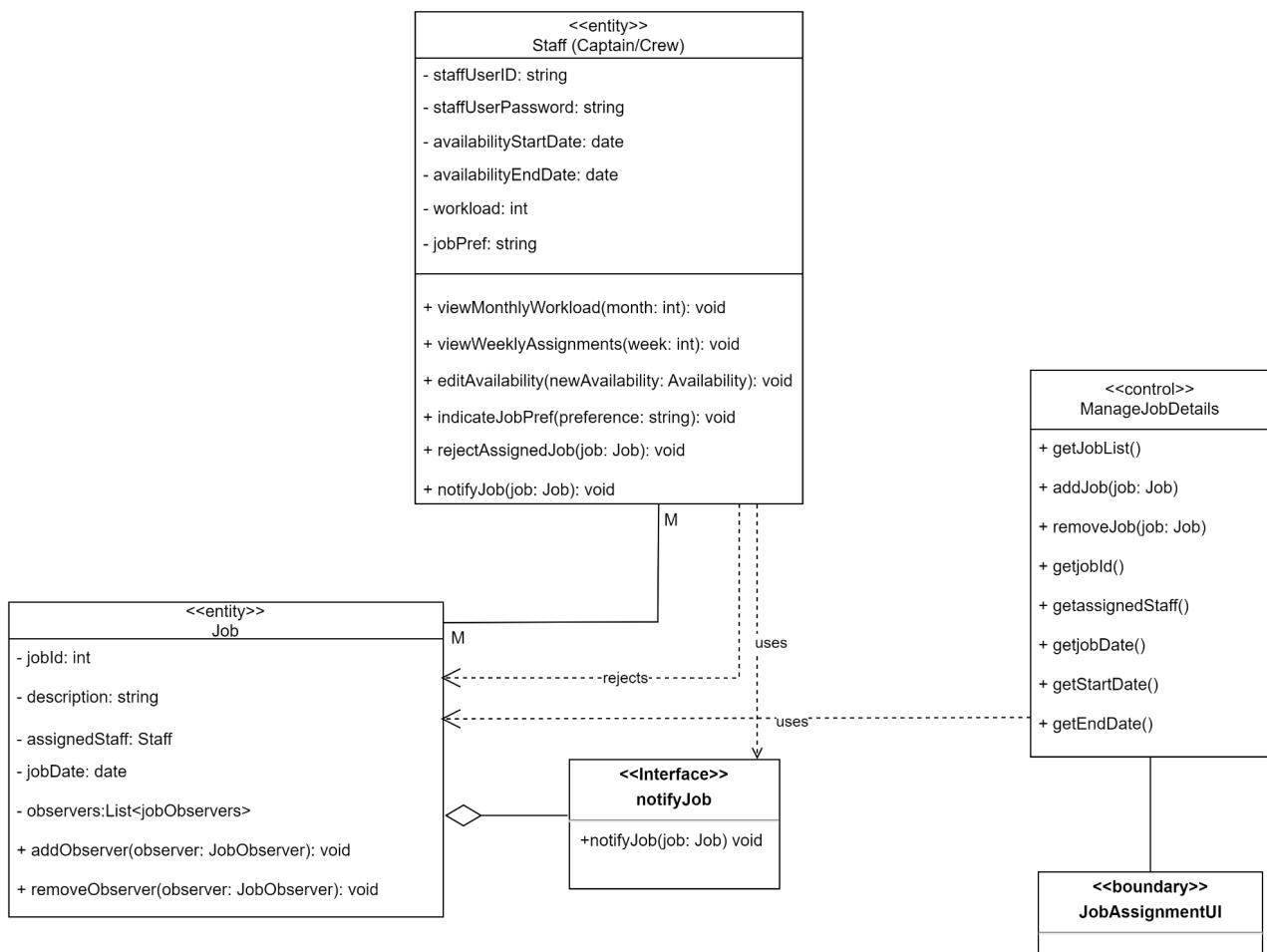


Figure 2.0 Observer Design Pattern

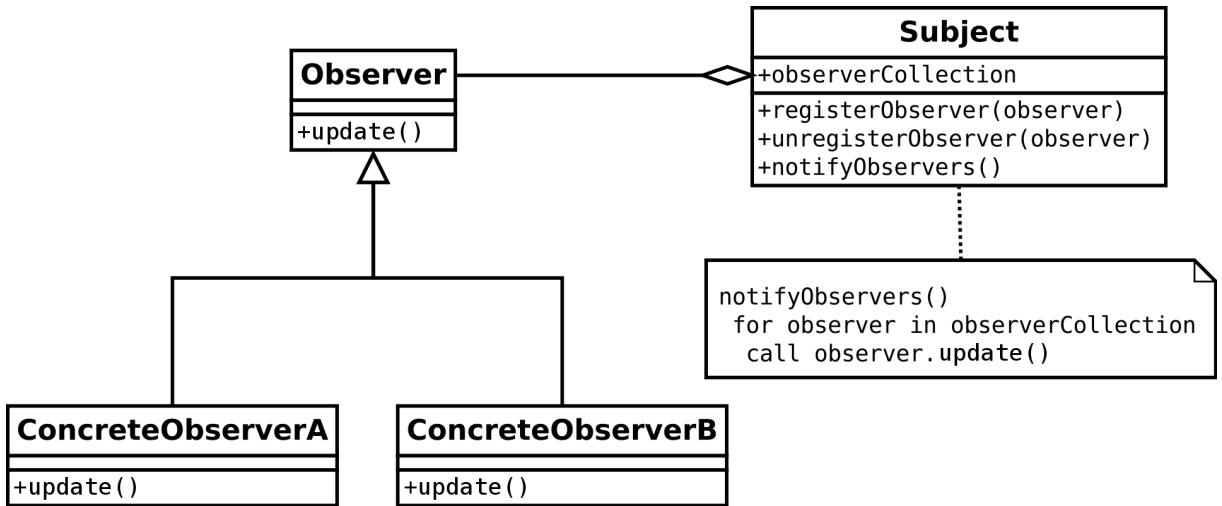


Figure 2.1 Observer Pattern Structure (Gregorybleiker, 2018)

The Observer Pattern can be used to handle real-time changes and notifications in the context of our Ferry Workload Management System (FWMS). For example, job assignments, availability, or workload overviews change, staff and managers must be informed as soon as possible. The Observer Pattern allows the system to manage these alerts in a decoupled and efficient manner, allowing different sections of the system to react dynamically to changes without being tightly tied.

2.2.2 Creational Design Pattern - Factory

The Factory Pattern is a design pattern for generating families of related or dependent objects without declaring their concrete classes. It enables a class to outsource the duty of object instantiation to its subclasses. In a nutshell, the Factory Pattern encapsulates object creation and provides a method for creating objects based on a common interface, allowing client programs to use the products without worrying about their unique implementations.

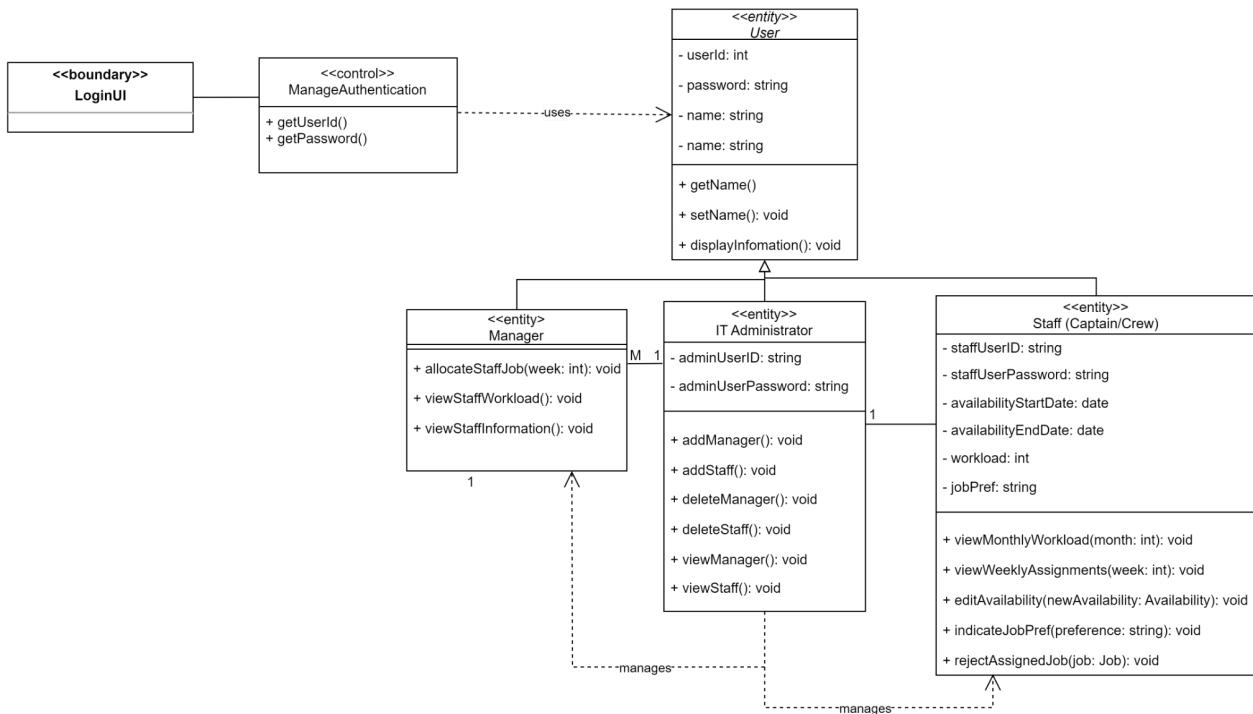


Figure 2.2 Factory Design Pattern

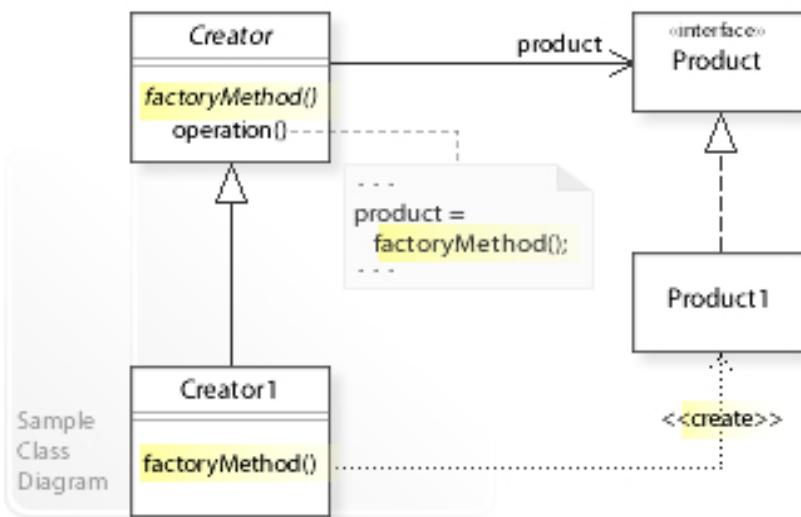


Figure 2.3 Factory Pattern Structure (Vanderjoe, 2016)

The Factory Pattern will enable the system to build scheduling methods matched to the ferry company preferences on the fly. This versatility is critical since ferry firms may favor various strategies such as a speedy, greedy algorithm or a balanced method. The Factory Pattern simplifies runtime switching between tactics by enclosing scheduling algorithm construction in discrete classes, allowing ferry firms' diverse crew scheduling preferences.

3 Testing

3.1 Black Box Testing

Use Case 6, Authenticate Users, is used for black box testing. Decision Table Testing technique is used for black box testing as the technique is a systematic approach where various input combinations and the respective system behavior are captured in a tabular form. The decision table helps to check all possible combinations of conditions for testing and testers can also identify missed conditions easily.

To create the decision table, the causes and effect for Use Case 6 (Authenticate Users) is used. The causes are "Correct Username" and "Correct User Password". The effects are "Successful Login" and "Fail to Login". The decision table is as follows:

Causes		Values	1	2	3	4
C1	Correct Username	Y/N	N	Y	N	Y
C2	Correct User Password	Y/N	N	N	Y	Y
Effects						
E1	Successful Login					X
E2	Fail to Login		X	X	X	

Causes		Values	1-2	3	4
C1	Correct Username	Y/N	-	N	Y
C2	Correct User Password	Y/N	N	Y	Y
Effects					
E1	Successful Login				X
E2	Fail to Login		X	X	

The rules implemented on the table is as follows

Rule 1: Both username and password were wrong. The user failed to log in.

Rule 2: Username and password were both correct. The user successfully logged in and directed to the landing page.

Rule 3: Username wrong, but the password correct. The user failed to log in.

Rule 4: Username correct, but the password wrong. The user failed to log in.

Based on the decision table, the following test cases were generated

1. Enter the wrong username and password and click on login. The expected result is that the user should get a fail to login message.
2. Enter the correct username and password and click on login. The expected result is that the user should be successfully logged in and directed to the landing page.
3. Enter the wrong username, but the correct password and click on login. The expected result is that the user should get a fail to login message.
4. Enter the correct username, but the wrong password and click on login. The expected result is that the user should get a fail to login message.

To conclude, Decision Table Testing technique is used to design the decision table black box testing for Use Case 6 (Authenticate Users). The decision table is created with 4 rules and 2 effects and based on the table, we generated four test cases.

3.2 White Box Testing

Pseudo Code for White-Box Testing of "Manage Staff Schedule" Use Case

```
# Import necessary libraries/modules for testing  
# Define test cases for the "Manage Staff Schedule" use case
```

```
def test_allocate_staff_workload():  
    # Prepare test data  
    manager = Manager()  
    staff_list = ["Staff1", "Staff2", "Staff3"]  
    selected_staff = manager.select_staff(staff_list)  
    workload_data = {  
        "Staff1": {"Monday": 4, "Tuesday": 3, "Wednesday": 2},  
        "Staff2": {"Monday": 3, "Tuesday": 4, "Wednesday": 2},  
        "Staff3": {"Monday": 2, "Tuesday": 2, "Wednesday": 3},  
    }  
  
    # Perform the test  
    result = manager.allocate_staff_workload(selected_staff, workload_data)  
  
    # Verify the test result  
    assert result == "Workload successfully allocated"  
  
def test_view_staff_availability():  
    # Prepare test data  
    manager = Manager()  
    staff_list = ["Staff1", "Staff2", "Staff3"]  
    selected_staff = manager.select_staff(staff_list)  
  
    # Perform the test  
    availability_data = manager.view_staff_availability(selected_staff)  
  
    # Verify the test result  
    assert availability_data is not None  
  
def test_system_errors():  
    # Prepare test data  
    manager = Manager()  
  
    # Perform the test  
    error_message = manager.handle_system_errors()  
  
    # Verify the test result  
    assert error_message == "System error occurred. Please try again."  
  
    # Execute the test cases  
test_allocate_staff_workload()  
test_view_staff_availability()  
test_system_errors()
```

Based on the pseudocode above, we have created the Control Flow Graph as shown:

<ol style="list-style-type: none"> 1. Allocate Staff Workload 2. Initialize a Manager instance. 3. Create a staff_list with names ["Staff1", "Staff2", "Staff3"]. 4. Call the select_staff method of the manager to get a selected_staff. 5. Create a workload_data dictionary representing staff workload for the test. 6. Call the allocate_staff_workload method of the manager with selected_staff and workload_data. 7. Capture the result. (staff allocated) 8. Assert that the result is equal to "Workload successfully allocated." 9. Call the view_staff_availability method of the new manager with selected_staff. 10. Capture the availability_data. 11. Assert that availability_data is not None. 12. Call the 'handle_system_errors' method of the manager. 13. Capture the error_message. 14. Assert that error_message is equal to "System error occurred. Please try again." 15. End execution 	<pre> graph TD 1((1)) --> 2((2)) 1 --> 12((12)) 2 --> 3((3)) 2 --> 12 3 --> 4((4)) 4 --> 5((5)) 4 --> 9((9)) 5 --> 6((6)) 6 --> 7((7)) 7 --> 8((8)) 9 --> 10((10)) 10 --> 11((11)) 11 --> 15((15)) 12 --> 13((13)) 13 --> 14((14)) 14 --> 15 </pre>
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The cyclometric complexity (M) is determined by the control flow graph and the various calculations derived from it. Firstly, the numbers of linearly independent paths in the diagram are calculated from the numbers of edges (E) and nodes (N) using the following formula:

$$M = E - N + 2P$$

$$\text{Number of edges (E)} = 16$$

$$\text{Number of nodes (N)} = 15$$

$$\text{Number of connected components (P)} = 1$$

$$M = 16 - 15 + 2(1)$$

$$M = 16 - 15 + 2$$

$$M = 3 \quad \therefore \text{There are 3 linearly independent paths.}$$

Basis Paths:

Path 1: 1, 2, 3, 4, 5, 6, 7, 8, 15

Path 2: 1, 2, 3, 4, 9, 10, 11, 15

Path 3: 1, 2, 12, 13, 14, 15

Test Cases:

Test Case Number	Path	Input	Expected Output
1	1, 2, 3, 4, 5, 6, 7, 8, 15	<ul style="list-style-type: none">• Manager instance• staff list• ‘select_staff’• workload data of each staff	The workload is successfully allocated, print “Workload successfully allocated”
2	1, 2, 3, 4, 9, 10, 11, 15	<ul style="list-style-type: none">• Manager instance• staff list• ‘select_staff’	Availability data is retrieved successfully, availability_data is not None
3	1, 2, 12, 13, 14, 15	<ul style="list-style-type: none">• Manager Instance	System error is successfully handled, if there is error error_message “System error occurred. Please try again.”

4 Project Prototype & Wireframes

Link to Figma Prototype: [Ferry Workload Management System](#)

The flow of the prototype progresses sequentially through the perspectives of the IT Admin, Manager and Staff. Starting from the IT Admin's point of view, followed by Manager's perspective and lastly to Staff's perspective. The prototype wireframe includes the login/logout pages, as well as all Use Cases encountered by each actor.

UC1: View Staff Certifications

UC2: Manage Staff Schedule

UC3: Manage Staff Accounts

UC4: Manage Individual Route Preference

UC5: Manage Individual Job Availability

UC6: Authenticate Users

UC6: AUTHENTICATE USERS

The wireframe displays four screens related to user authentication:

- IT Login:** Shows a login form with fields for "itadmin1" and a masked password, with a "Log In" button below.
- Manager Login:** Shows a login form with fields for "M123987" and a masked password, with a "Log In" button below.
- Staff Login:** Shows a login form with fields for "ST12390" and a masked password, with a "Log In" button below.
- Initial Login Prompt:** Shows a screen with the text "Set. Sail. Sea." and "This is a Ferry Workload Management System." It features a large red anchor icon on a yellow ring. A "Login" button is circled in red. A "Pick An Option" dropdown menu at the top right shows "IT Admin", "Manager", and "Staff", with "Manager" also circled in red. Red arrows point from the "Manager" option in the dropdown to the "Manager" and "Staff" login screens, and from the "Login" button on the initial screen to the "IT Admin" login screen.

Figure 3.0 Login prompt for IT Admin, Manager and Staff respectively

Figure 3.0 shows the login process of the 3 actors – IT, Manager and Staff. The welcome page has a dedicated IT Admin login prompt whereas the general staff and manager access the system through a shared login button. This is designed to have a secure user experience and ensures that regular users such as staff and managers can easily access their designated areas while the IT administrators have their own dedicated pathway to access to tools and functionalities that are tailored to their unique admin tasks. This offers a dedicated space for IT Admins to carry out their task and maintain the systems integrity.

Upon reaching the login page of the Ferry Management System, which is designed specifically for Managers and Staff. To access the system, users are required to key in their credentials that are provided by the IT Admin (Username and Password). If the user enters an incorrect username, password or both, an error message will pop out, indicating a failed login attempt. Therefore, requiring the user to re-enter their correct credentials. The error occurs when the entered information does not match with the database record, this prompts a failed login attempt. Depending on the details entered by the user, the page will redirect them to either the manager landing page or the staff landing page.

IT Admin Point of View

UC3: MANAGE STAFF ACCOUNTS

Image	ID	Name	Role
	M123987	ANG WOO KIAT, ANTHONY	Manager
	S112390	ANIQ HAQ BIN SADNI	Staff
	S212529	BENJAMIN LIU HAN MIN XI	Staff
	M251648	BISRI AHMAD BIN DAMAR	Manager
	M123654	CLEMENT NG JUN JIE	Manager
	S987456	DAMIAN TAN	Staff
	M456321	DURGESH RAJA S/O THANABALAN	Manager
	S741258	FUN JOE YI	Staff
	S852966	FUU YI XIAO BOB	Staff



Figure 4.0 IT Admin Landing Page

Figure 4.0 displays a comprehensive list of user profiles, which encompasses staff and managers' profile images, user IDs, names and the assigned roles for both managers and staff that are currently engaged in ferry operations. IT Admin has the authority to perform pivotal actions such as creating new user accounts and removing accounts of individuals who are no longer associated with the ferry operations.

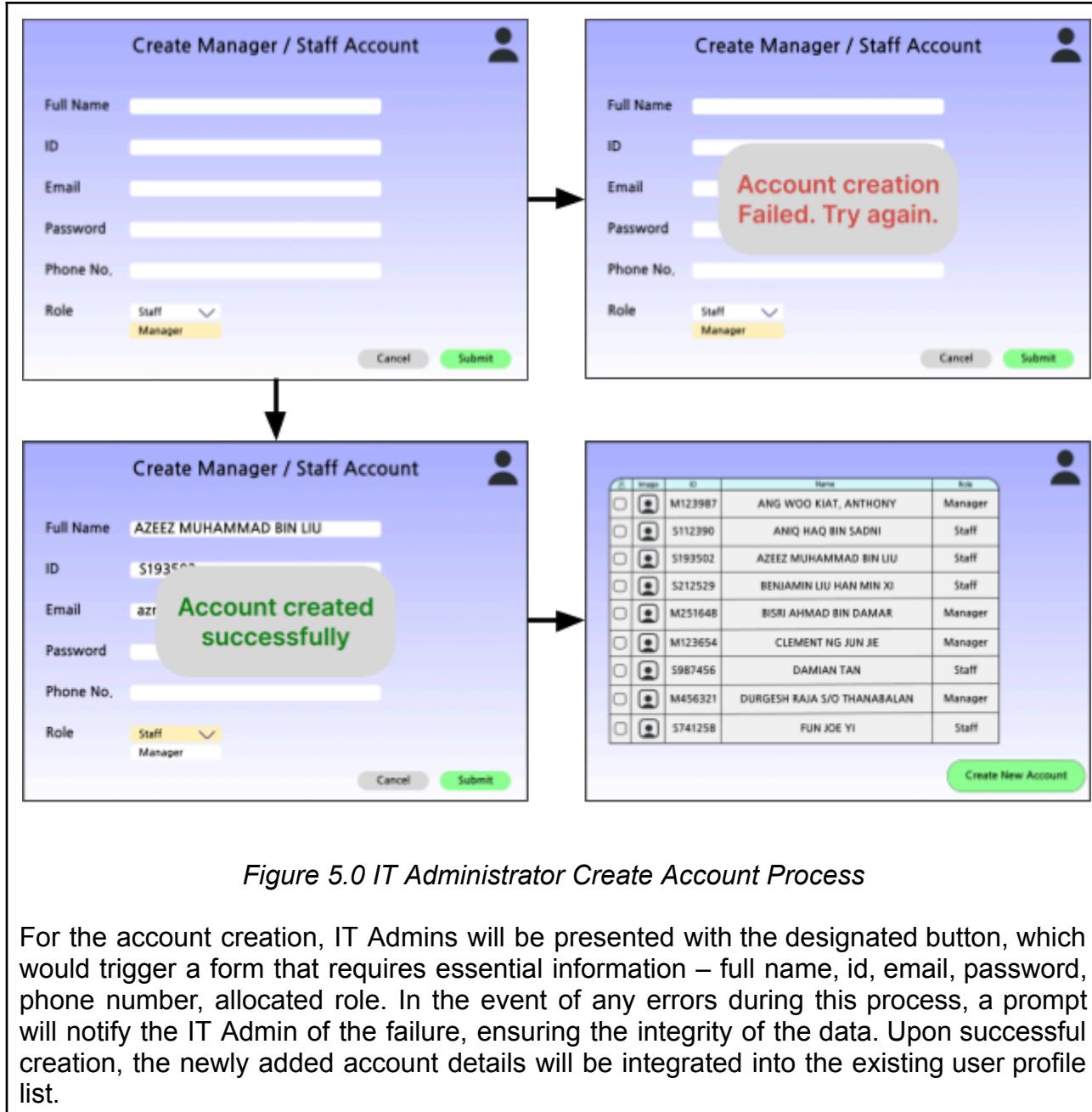


Figure 5.0 IT Administrator Create Account Process

For the account creation, IT Admins will be presented with the designated button, which would trigger a form that requires essential information – full name, id, email, password, phone number, allocated role. In the event of any errors during this process, a prompt will notify the IT Admin of the failure, ensuring the integrity of the data. Upon successful creation, the newly added account details will be integrated into the existing user profile list.

Test Plan & Prototype

The figure consists of three screenshots illustrating the IT Admin remove account process:

- Screenshot 1:** A list of user profiles. The table has columns for Image, ID, Name, and Role. One row, corresponding to user S193502, is highlighted in purple. A green "Create New Account" button is visible at the bottom right.
- Screenshot 2:** A confirmation dialog titled "Remove Account?". It lists the selected user (S193502) and other users. Below the list are two buttons: "Yes" (green) and "No" (red). A dropdown menu shows the roles: Manager, Staff, Manager, Manager, Staff, Manager, Manager, Staff. A green "Create New Account" button is at the bottom right.
- Screenshot 3:** The user profile list after the deletion. The row for user S193502 is now missing. A green "Create New Account" button is visible at the bottom right.

Figure 6.0 IT Admin remove account process

The removal of accounts requires IT Admin to select specific managers or staff by interacting with the checkboxes that are next to their profile images. Once confirming the deletion action, the selected user's information is promptly deleted from the system's database. This preserves the accuracy and relevance of the user profile list.

Manager's Point of View

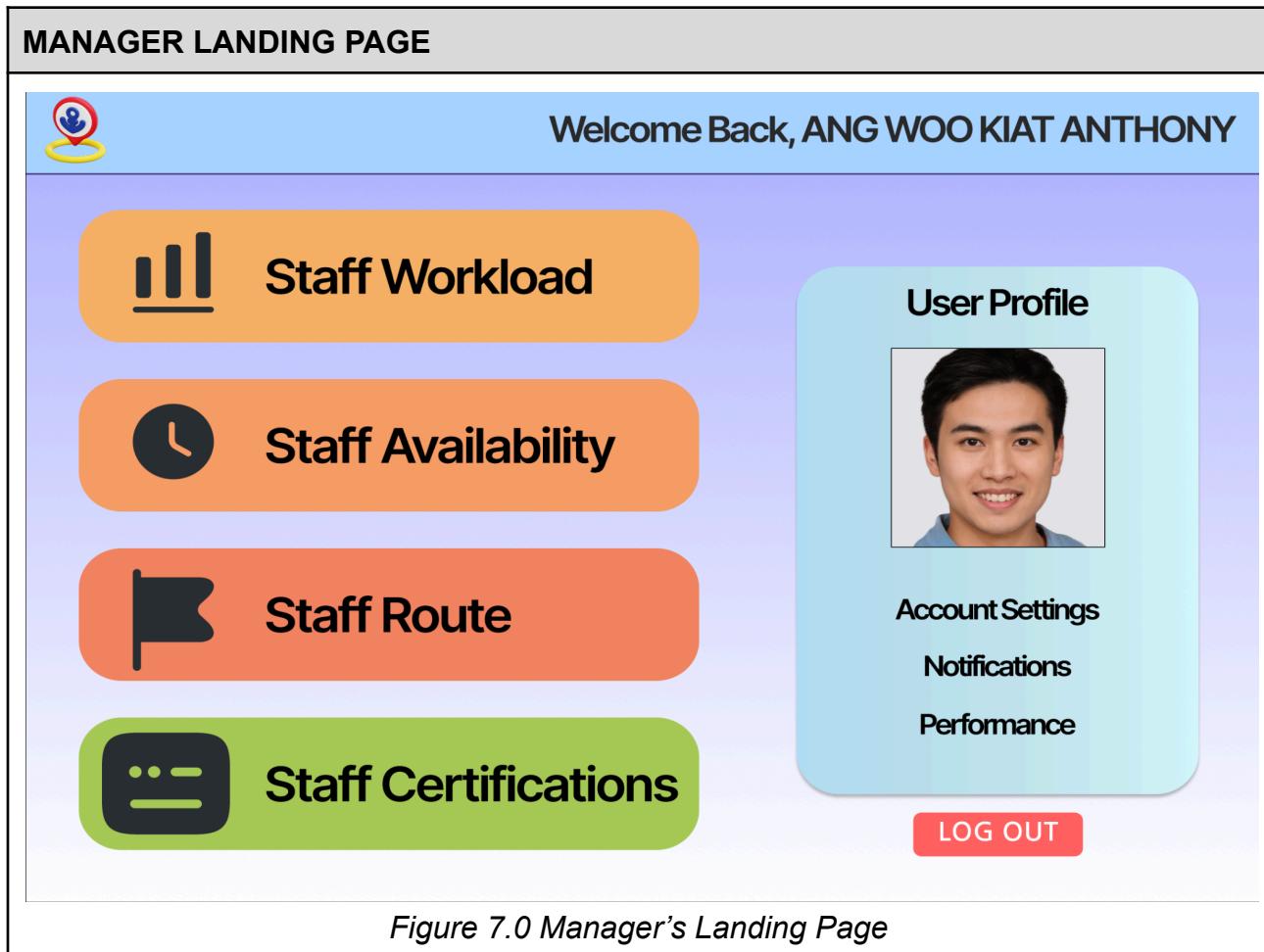


Figure 7.0 Manager's Landing Page

Figure 7.0 represents the landing page of a manager account. The landing page will display interactive buttons for the user to view their staff's workload, check for staff's availability, review assigned routes and validate and check staff's certifications. These buttons provide an intuitive and efficient way for the manager to access key functionalities. The design enhances productivity which allows managers to navigate and manage tasks easily, which contributes to a streamlined and effective workflow.

UC1: VIEW STAFF CERTIFICATIONS

STAFF CERTIFICATION

STAFF ID	STAFF NAME	EXPIRY DATE
S112390	ANIQ HAQ BIN SADNI	09/04/2025
S193502	AZEEZ MUHAMMAD BIN LIU	03/06/2026
S212529	BENJAMIN LIU HAN MIN XI	26/04/2024
S987456	DAMIAN TAN	10/11/2023
S741258	FUN JOE YI	12/12/2024
S963258	GAN JIA YU	05/10/2023
S357412	GORGON S/O KHAN	18/09/2030
S159874	HANIF BIN BAKAR	05/12/2027
S257369	HENRY LIU BAIZHU	13/11/2026
S336641	IPAN JASNI BIN GREY	15/10/2028
S369123	IP DAN HENG	22/02/2024
S846219	LUKE PEARCE	11/10/2023
S658214	MO ZUO RAN	16/04/2024

Reminder to all MANAGERS to check validity of Certificate of Competency (CoC) for all staffs.
Immediately request renewal of CoC when expiry date is red.

◀▶

Figure 8.0 Staff Certification Page

Figure 8.0 depicts the landing page where the managers can validate staffs' certification (certification of competency) and the process. The page will display a list of all the staffs' names, staff ID and the expiring date of their certifications. Staff whose certifications are near the expiry date will have its date coloured in red, prompting the managers to send a renewal request to the staff. To enhance managerial awareness, the reminder is set for the manager to constantly check the validity of CoC whenever the manager enters the Staff Certification page. This approach fosters a proactive management process and also aligns with the goal of maintaining a vigilant and compliant workforce.



STAFF CERTIFICATION

STAFF ID	STAFF NAME	EXPIRY DATE
S112390	ANIQ HAQ BIN SADNI	09/04/2025
S193502	AZEEZ MUHAMMAD BIN LIU	03/06/2026
S212529	BENJAMIN LIU HAN MIN XI	26/04/2024
S987456	DAMIAN TAN	10/11/2023
S741258	FUN JOE YI	12/12/2024
S963258	GAN JIA YU	05/10/2023
S357412	GORGON S/O KHAN	18/09/2030
S159874	HANIF BIN BAKAR	05/12/2027
S257369	HENRY LIU BAIZHU	13/11/2026
S336641	IPAN JASNI BIN GREY	15/10/2028
S369123	IP DAN HENG	22/02/2024
S846219	LUKE PEARCE	11/10/2023
S658214	MO ZUO RAN	16/04/2024

Reminder to all MANAGERS to check validity of Certificate of Competency (CoC) for all staffs.

Immediately request renewal of CoC when expiry date is red.

Inform S987456, DAMIAN TAN, to renew CoC.

OK



Figure 9.0 Manager prompt request for staff to renew certification

Upon selecting the user whose validation date is near the expiry date, a prompt will pop up which will notify the user that a renewal request will be dispatched to the selected staff. After the user confirms it by clicking the "Okay" button, the system will respectively send a renewal request to the designated staff.

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STAFF CERTIFICATION

STAFF ID	STAFF NAME	EXPIRY DATE
S112390	ANIQ HAQ BIN SADNI	09/04/2025
S193502	AZEEZ MUHAMMAD BIN LIU	03/06/2026
S212529	BENJAMIN LIU HAN MIN XI	26/04/2024
S987456	DAMIAN TAN	10/11/2023
S741258	FUN JOE YI	12/12/2024
S963258	GAN JIA YU	05/10/2023
S357412	GORGON S/O KHAN	18/09/2030
S159874	HANIF BIN BAKAR	05/12/2027
S257369	HENRY LIU BAIZHU	13/11/2026
S336641	IPAN JASNI BIN GREY	15/10/2028
S369123	IP DAN HENG	22/02/2024
S846219	LUKE PEARCE	11/10/2023
S658214	MO ZUO RAN	16/04/2024

Reminder to all MANAGERS to check validity of Certificate of Competency (CoC) for all staffs.

Immediately request renewal of CoC when expiry date is red.



Figure 10.0 Staff renewal in process

The colour of the date that is nearing the expiry date will turn from red to blue which provides a visual indicator that the renewal is in process. The colour shift acts as a real time status update, hence provides a clear visual cue that the certification is in progress. The overall process ensures effective communication between the managers and staff in regards to certification renewal, which provides a systematic and responsive certification management system.

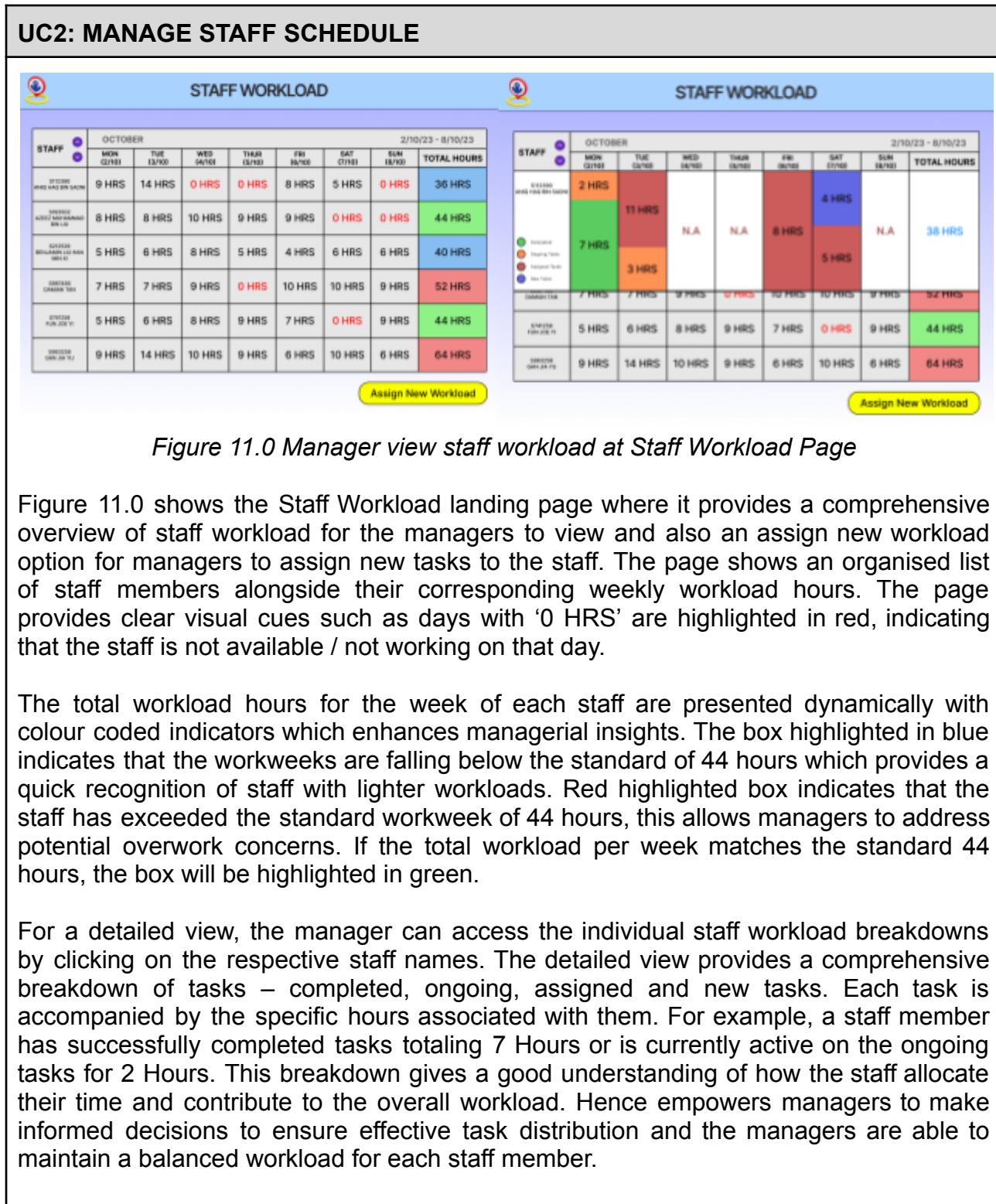


Figure 11.0 Manager view staff workload at Staff Workload Page

Figure 11.0 shows the Staff Workload landing page where it provides a comprehensive overview of staff workload for the managers to view and also an assign new workload option for managers to assign new tasks to the staff. The page shows an organised list of staff members alongside their corresponding weekly workload hours. The page provides clear visual cues such as days with '0 HRS' are highlighted in red, indicating that the staff is not available / not working on that day.

The total workload hours for the week of each staff are presented dynamically with colour coded indicators which enhances managerial insights. The box highlighted in blue indicates that the workweeks are falling below the standard of 44 hours which provides a quick recognition of staff with lighter workloads. Red highlighted box indicates that the staff has exceeded the standard workweek of 44 hours, this allows managers to address potential overwork concerns. If the total workload per week matches the standard 44 hours, the box will be highlighted in green.

For a detailed view, the manager can access the individual staff workload breakdowns by clicking on the respective staff names. The detailed view provides a comprehensive breakdown of tasks – completed, ongoing, assigned and new tasks. Each task is accompanied by the specific hours associated with them. For example, a staff member has successfully completed tasks totaling 7 Hours or is currently active on the ongoing tasks for 2 Hours. This breakdown gives a good understanding of how the staff allocate their time and contribute to the overall workload. Hence empowers managers to make informed decisions to ensure effective task distribution and the managers are able to maintain a balanced workload for each staff member.

Test Plan & Prototype

Figure 12.0 Manager assign new workload for staff

Figure 12.0 is the page where the manager can allocate new workloads for up to three staff members. To start the process, the manager is prompted to input specific details such as staff selection, date, day, tasks and hours assigned for the task. For the staff selection, a dropdown menu is initiated, allowing the manager to choose up to three staff members.

Once the required details are keyed in, the manager is prompted to click the “Update Workload” button. This triggers the system to save the newly entered data to the database. At the same time, it updates the chosen staff members with their new workload assignments and the changes are also reflected on the manager’s staff workload dashboard.

Figure 13.0 Manager view Staff Availability

The figure displays the Staff Availability page which serves as a dedicated space for the

managers to gain insights into the monthly availability of their staff. Managers are to choose up to 3 staff members from the 'Select Staff' drop down menu which allows managers to focus on the specific staff members.

Once the manager has selected the staff members, the manager initiates the availability retrieval process by clicking the 'View Availability' button. The system will promptly fetch and organise the availability data of the chosen staff and present it in a clear and accessible format for the manager.

This function designs to improve managerial efficiency by allowing them to quickly assess and plan based on real time availability status of their task.

The screenshot shows a user interface titled 'STAFF ROUTE'. At the top left is a logo consisting of a blue and yellow circular icon. Below the title is a dropdown menu labeled 'Date: 10 October 2023' with a downward arrow icon. The main area contains a table with seven rows, each representing a staff member. The columns are 'Staff ID/Name' and 'Assign Route'. The last row is highlighted with a pink background. A green 'Save Route' button is located at the bottom.

S112390 ANIQ HAQ BIN SADNI	Assign Route
S193502 AZEEZ MUHAMMAD BIN LIU	Assign Route
S212529 BENJAMIN LIU HAN MIN XI	Assign Route
S987456 DAMIAN TAN	Assign Route
S741258 FUN JOE YI	Assign Route
S963258 GAN JIA YU	Assign Route
S357412 GORONG S/O KHAN	HarbourFront Centre, Singapore & Batam Centre...

Save Route

Figure 14.0 Staff Route Page

Figure 14.0 displays the 'Staff Route' page where managers can efficiently allocate routes to staff members. To start the process, the managers can choose a specific date for which they wish to assign the routes. The dropdown menu labeled 'Assign Route' beside each staff member's name provides a smooth interface for managers to allocate the routes.

The screenshot shows a mobile application interface titled "STAFF ROUTE". At the top left is a logo of a person with a stethoscope. Below the title is a date selector box showing "Date: 10 October 2023" with a dropdown arrow. The main area displays a table of staff members and their assigned routes:

Staff ID	Staff Name	Assigned Route
S112390	ANIQ HAQ BIN SADNI	HarbourFront Centre, Singapore & Batam Centre, Indonesia
S193502	AZEEZ MUHAMMAD BIN LIU	HarbourFront Centre, Singapore & Sekupang, Indonesia
S212529	BENJAMIN LIU HAN MIN XI	HarbourFront Centre, Singapore & Tanah Merah, Singapore
S987456	DAMIAN TAN	Tanah Merah, Singapore & Bandar Bintan, Indonesia
S741258	FUN JOE YI	Assign Route
S963258	GAN JIA YU	Assign Route
S357412	GORGON S/O KHAN	HarbourFront Centre, Singapore & Batam Centre...

At the bottom is a green "Save Route" button.

Figure 15.0 Manager allocate routes to staff

Routes that are selected by the manager are highlighted in blue which shows a clear visibility of the assigned routes, whereas the routes highlighted in red indicate the staff members' route preferences, this offers managers valuable insights into staffs' individual preferences and considerations.

Once the manager has allocated the routes for the staff, they will be prompted to click the "Save Route" button. This will trigger the system to update the database with the newly assigned route data and at the same time communicate the updates to the respective staff members. This ensures that they are informed of any changes in their route assignments.

This feature fosters efficient communication and coordination within the workforce and at the same time enhances user experience by providing visual cues and dropdown menus which contributes to a more intuitive and effective allocation of staff routes.

Staff's Point Of View

STAFF LANDING PAGE

Welcome Back, ANIQ HAQ BIN SADNI

Random Work Insights: How can you cope being..

My Job Allocation

My Availability

User Profile

Account Settings

Notifications

Performance

LOG OUT

The landing page is designed to be user-friendly and informative. It features a welcome message at the top right. Below it is a photograph of a seafarer looking out at a ship from a window. A yellow banner with the text "Random Work Insights: How can you cope being.." is overlaid on the photo. Two main buttons are present: "My Job Allocation" (orange) and "My Availability" (green). To the right is a sidebar with "User Profile" and several navigation links: "Account Settings", "Notifications", and "Performance". At the bottom right is a red "LOG OUT" button.

Figure 16.0 Staff Landing Page

Figure 16.0 shows the staff's landing page that is thoughtfully designed to cater to the various needs and concerns of staff/seafarers during their maritime journey. The page consists of their job allocation and their availability. Additionally a newsletter section is incorporated, recognising the challenges faced by seafarers who are often away from home for long and irregular hours. The newsletter serves as a valuable tool to create a sense of connection and alleviate the challenges faced by seafarers as it is understood of the potential isolation and stressors associated with maritime work. The inclusion of job allocation allows staff to communicate their preferences. This contributes to a more personalised and accommodating work environment, and the availability section provides a comprehensive view of their job schedule. This promotes transparency and efficient communication within ferry operations.

UC4: MANAGE INDIVIDUAL ROUTE PREFERENCE

MY JOB ALLOCATION

#	Date	Route	Tasks	Status
1	2/10/23	HarbourFront Centre, Singapore & Batam Centre, Indonesia	On Voyage: Safety Monitoring, Navigation Assistance, Emergency Preparedness	Done
2	3/10/23	HarbourFront Centre, Singapore & Sekupang, Indonesia	Disembarkation: Clean & Maintenance, Cash Handling, Passenger Count, Closing Procedure	Ongoing

Current Job Allocations

My Workload

3/9/23 - 3/10/23

- Done
- Ongoing
- To Do
- Waiting

[My Routes](#)

[Assigned Jobs](#)

Figure 17.0 Staff's Job Allocation Page

Figure 17.0 depicts the staff's job allocation page which enables staff members to access information about their current job allocation and their workload. Furthermore, the page offers navigation options for staff to select their routes 'My Routes' and view their assigned jobs 'Assigned Jobs'.

Date	Route	Tasks	Accept / Decline
10/10/2023	HarbourFront Center, Singapore and Batam Centre, Indonesia	Pre-Departure & Boarding: Safety Checks, Ticketing Collection, Passenger Assistance	<input checked="" type="checkbox"/> <input type="checkbox"/>
11/10/2023	Tanah Merah, Singapore and Bandar Bintan, Indonesia	Pre-Departure & Boarding: Safety Checks, Ticketing Collection, Passenger Assistance	<input checked="" type="checkbox"/> <input type="checkbox"/>
12/10/2023	HarbourFront Center, Singapore and Sekupang, Indonesia	On Voyage: Safety Monitoring, Navigation Assistance, Emergency Preparedness	<input checked="" type="checkbox"/> <input type="checkbox"/>
13/10/2023	Tanah Merah, Singapore and Bandar Bintan, Indonesia	Disembarkation: Clean & Maintenance, Cash Handling, Passenger Count, Closing Procedure	<input checked="" type="checkbox"/> <input type="checkbox"/>
14/10/2023	HarbourFront Center, Singapore and Batam Centre, Indonesia	On Voyage: Safety Monitoring, Navigation Assistance, Emergency Preparedness	<input checked="" type="checkbox"/> <input type="checkbox"/>
15/10/2023	HarbourFront Center, Singapore and Tanah Merah, Singapore	Disembarkation: Clean & Maintenance, Cash Handling, Passenger Count, Closing Procedure	<input checked="" type="checkbox"/> <input type="checkbox"/>
16/10/2023	HarbourFront Center, Singapore and Sekupang, Indonesia	Pre-Departure & Boarding: Safety Checks, Ticketing Collection, Passenger Assistance	<input checked="" type="checkbox"/> <input type="checkbox"/>
20/10/2023	Tanah Merah, Singapore and Bandar Bintan, Indonesia	On Voyage: Safety Monitoring, Navigation Assistance, Emergency Preparedness	<input checked="" type="checkbox"/> <input type="checkbox"/>
24/10/2023	HarbourFront Center, Singapore and Batam Centre, Indonesia	Disembarkation: Clean & Maintenance, Cash Handling, Passenger Count, Closing Procedure	<input checked="" type="checkbox"/> <input type="checkbox"/>

Figure 18.0 Staff view assigned jobs to accept and decline

The figure above demonstrates the Assigned Jobs page for staff members to access information about their assigned tasks. The page consists of a comprehensive list of jobs that have been allocated to the staff by the manager. Each entry of the lists consists of the essential details such as the date of the job, the designated route and the tasks associated with the job. For each listed job, the staff members are also presented with the option to accept or decline the assigned job.

Once the staff makes a choice to either accept or decline the job, the system will promptly acknowledge the staff member's choice. In the scenario where the staff accepts the job, the system will update the staff member's dashboard to prominently display the details of the accepted job. And conversely, if the staff declines the assigned job, the system will remove that task hence not appear on the staff's member dashboard.

The image shows a mobile application interface titled "MY ROUTES". At the top left is a circular icon with a person silhouette and the text "go back to... MY JOB ALLOCATION". At the top right is a user profile icon. The main content area displays a weekly schedule from Monday to Sunday. Each day has a "Choose My Route" button with a checkmark icon. A large green "Save Routes" button is located at the bottom right.

Day (Date)	Action
Mon (23/10/23)	Choose My Route ✓
Tues (24/10/23)	Choose My Route ✓
Wed (25/10/23)	Choose My Route ✓
Thur (26/10/23)	Choose My Route ✓
Fri (27/10/23)	Choose My Route ✓
Sat (28/10/23)	Choose My Route ✓
Sun (29/10/23)	Choose My Route ✓

Save Routes

Figure 19.0 Staff's "My Routes" page

Figure 19.0 shows the 'My Routes' page, where staff members can indicate their route preferences. This allows staff members to actively participate in the scheduling process by choosing their routes that aligns with their preferences.

The screenshot shows a mobile application interface titled "MY ROUTES". At the top left is a circular icon with a person icon and the text "go back to... MY JOB ALLOCATION". At the top right is a user profile icon. The main content area displays a weekly schedule from Monday to Sunday. Each day has a "Choose My Route" button with a dropdown menu. The dropdown menus show the following routes:

Day	Route Selection
Mon (23/10/23)	Choose My Route
Tues (24/10/23)	HarbourFront Centre, Singapore & Batam Centre, Indonesia
Wed (25/10/23)	HarbourFront Centre, Singapore & Sekupang, Indonesia
Thur (26/10/23)	HarbourFront Centre, Singapore & Tanah Merah, Singapore
Fri (27/10/23)	Tanah Merah, Singapore & Bandar Bintan, Indonesia
Sat (28/10/23)	Not Applicable
Sun (29/10/23)	Choose My Route

A large green "Save Routes" button is located at the bottom right.

Figure 20.0 Choose My Route drop down options

The page is organised in a list of 7 days which provides a clear representation of the week. Beside each day consists an interactive dropdown button named 'Choose My Route'. The dropdown menu serves as a user-friendly interface where it shows the staff members the selection of the 4 routes alongside with an option labeled 'Not Applicable' for instances where the staff member is not available or on duty for that particular day.

The screenshot shows a mobile application interface titled "MY ROUTES". At the top left is a circular icon with a blue figure and a yellow ring, labeled "go back to...". To its right is the text "MY JOB ALLOCATION". On the top right is a black user profile icon. The main area displays a table with seven rows, each representing a day from Monday to Sunday. Each row has a date cell on the left and a dropdown menu cell on the right. The dropdown menus contain route preferences, and each has a checkmark icon at the end. The rows are color-coded: Mon (red), Tues (purple), Wed (orange), Thur (blue), Fri (grey), Sat (light grey), and Sun (light grey). A large green "Save Routes" button is located at the bottom right.

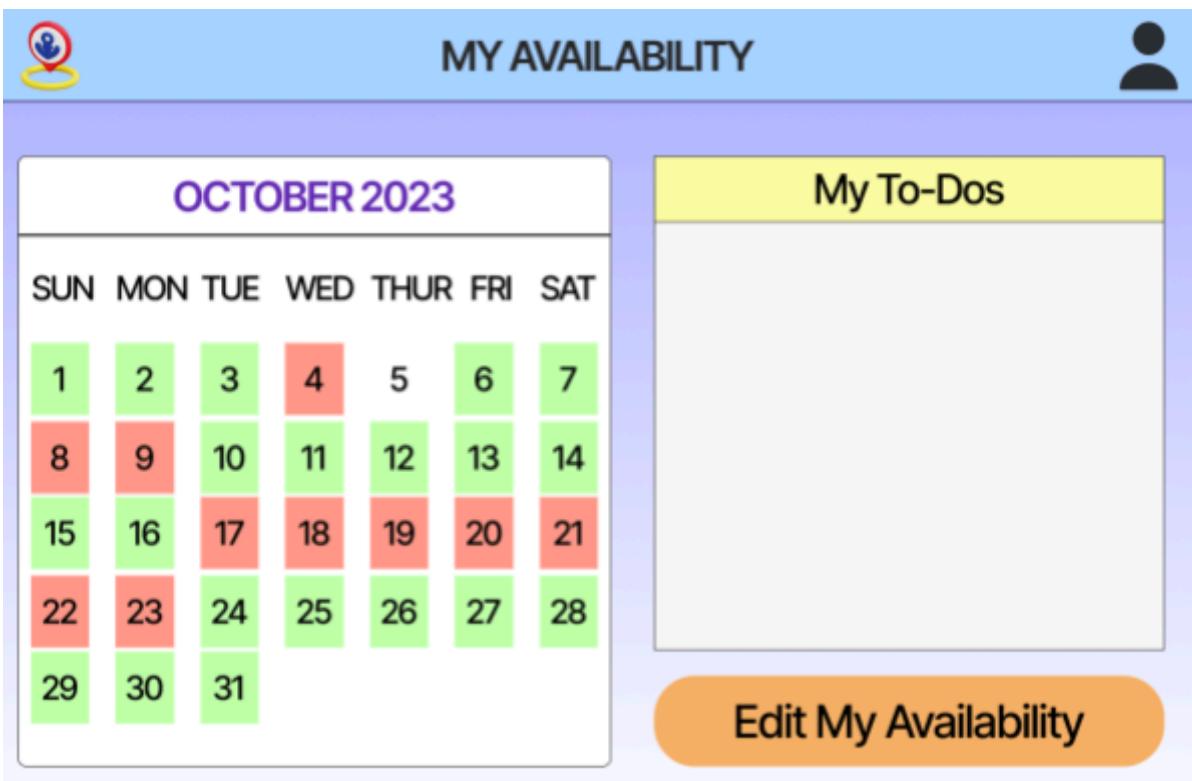
Day (Date)	Route Preference
Mon (23/10/23)	Not Applicable ✓
Tues (24/10/23)	HarbourFront Centre, Singapore & Batam Centre... ✓
Wed (25/10/23)	HarbourFront Centre, Singapore & Sekupang, Indo... ✓
Thur (26/10/23)	Tanah Merah, Singapore & Bandar Bintan, Indones... ✓
Fri (27/10/23)	Choose My Route ✓
Sat (28/10/23)	Choose My Route ✓
Sun (29/10/23)	Choose My Route ✓

Save Routes

Figure 21.0 Staff route preference chosen

Staff members can navigate the dropdown menu and make their selections to choose their preferred routes. Once selected and saved, the system saves the information which is reflected on the manager's Staff Route dashboard. This ensures that the managers have real time visibility into the individual route preferences of their staff members.

UC5: MANAGE INDIVIDUAL JOB AVAILABILITY



The image shows a mobile application interface titled 'MY AVAILABILITY'. At the top left is a user icon with a blue circle and a yellow outline. At the top right is a dark blue profile icon. The title 'MY AVAILABILITY' is centered at the top. Below the title is a purple header bar with the text 'OCTOBER 2023' in white. To the right of the date is a yellow box labeled 'My To-Dos' in black text. The main area is a light blue grid representing the month of October 2023. The days are color-coded: green for workdays (1, 2, 3, 5, 6, 7, 10, 12, 13, 14, 16, 18, 19, 20, 21, 24, 25, 26, 27, 28) and red for non-workdays (4, 8, 9, 15, 22, 23, 29, 30, 31). Below the grid is an orange button labeled 'Edit My Availability'.

OCTOBER 2023

SUN	MON	TUE	WED	THUR	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

My To-Dos

Edit My Availability

Figure 22.0 'My Availability' Main Page

This is the user's availability page where it serves as a comprehensive tool for staff members to manage their work schedules effectively. The page visually shows workdays and non-workdays by using a colour coded system (green for workdays, red for non-work days), this feature allows staff to quickly grasp their upcoming tasks. Based on the user interface, the users can seamlessly navigate through their tasks by looking through the "My To Dos" section, this fosters an organised and user friendly experience. Furthermore, the system allows users to modify their availability according to their preference or changes in circumstances.

The screenshot shows a user interface for managing availability. At the top, there's a blue header bar with a yellow anchor icon on the left and a black profile icon on the right. The title "EDIT MY AVAILABILITY" is centered in the header. Below the header is a purple navigation bar with the month "OCTOBER 2023" in the center. Underneath the navigation bar is a grid representing the month of October 2023, with days from 1 to 31. The days are color-coded: green for most days, red for specific dates (e.g., 4, 8, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30), and light gray for day 31. To the right of the calendar is a light blue box containing instructions under the heading "How To:":

1. Click the dates you wish to update
2. Click '+' to Add Availability
3. Click '-' to remove availability
4. Remember, if you don't attend on days available, you will face consequences.

At the bottom right of the light blue box is an orange rounded rectangle button labeled "OK".

Figure 23.0 Edit My Availability Page

When a user intends to change their availability, a designated button will initiate the process which would redirect them to a dedicated page for editing. Before proceeding to edit, a message outlining the steps involved in changing availability and a reminder of the associated consequences will be displayed. This acts as a dual purpose: fostering a sense of responsibility amongst staff members and also ensuring that they are fully informed about the potential impacts of their decisions.

The screenshot shows a user interface titled "EDIT MY AVAILABILITY". At the top left is a profile icon with a yellow location pin. At the top right is a user profile icon. The main area features a large calendar for "OCTOBER 2023" with days from 1 to 31. The days are color-coded: green for most days, red for specific dates (e.g., 4, 8, 10, 11, 12, 13, 14, 18, 19, 22, 23, 25, 26, 28), and light green for the last few days (29, 30, 31). To the right of the calendar is a sidebar titled "Edit Availability" containing two rows of date and status controls. The first row is for "1 October 2023" with a green "+" button and a red "-" button. The second row is for "5 October 2023" with a green "+" button and a red "-" button.

SUN	MON	TUE	WED	THUR	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Figure 24.0 Edit Availability Process

Once confirmed by the user, the system will facilitate the process of selecting specific dates for availability changes. Intuitive symbols like '+' indicate that the user is available, while '-' indicates that the user is unavailable. These symbols give a user-friendly way to show transitions from available to not available ('-') and vice versa ('+').

5 Project Management

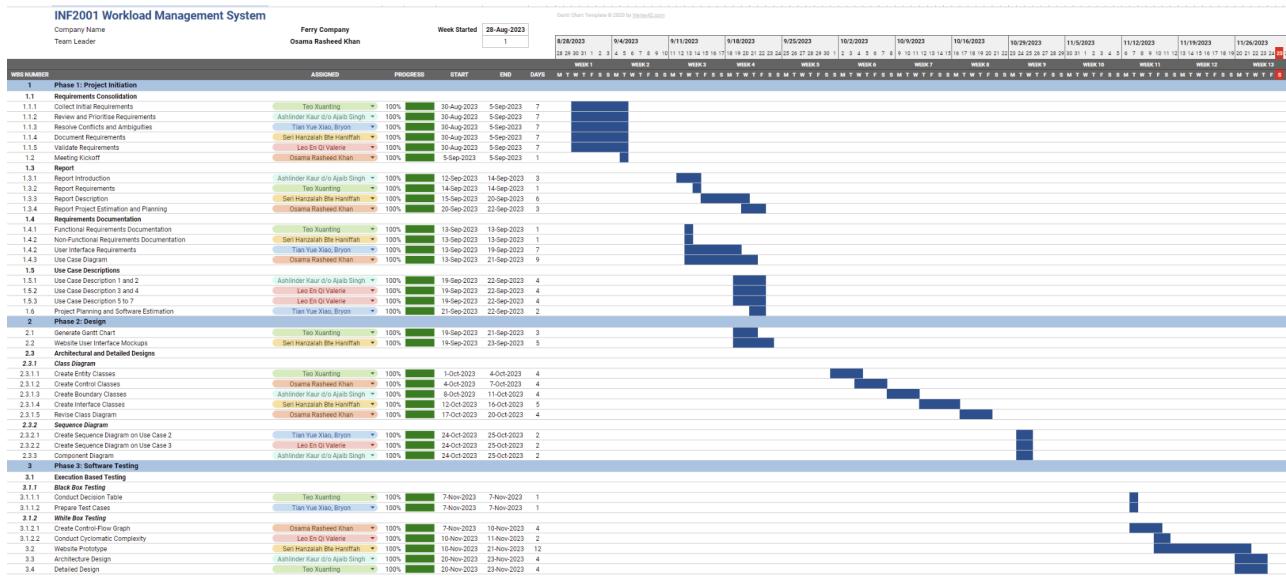


Figure 25.0 Updated Gantt Chart

6 Appendix – Use Case Descriptions

Use Case ID:	UC1
Use Case Name:	View Staff Certifications
Description:	This use case describes the process of the manager viewing the staff certifications. The manager can view certificates and inform staff to upload new certifications when existing certificates have expired.
Primary Actor:	Manager
Secondary Actor:	Database Server
Include Use Case(s):	Authenticate Users
Priority:	High
Preconditions:	Manager must be logged into the system.
Postconditions:	Manager shall be able to view staff certifications.
Main Success Scenarios:	<ol style="list-style-type: none">1. Manager navigates to the Staff Certifications page.2. System assigns the Database Server to fetch the information on certifications, displays the Staff Certifications page and shows the retrieved information of the staff and their respective certifications with expiry date.3. Manager to ensure all certifications are valid.
Alternative Scenarios:	<p>3a. Certifications are not valid. 3a1. Manager to inform staff to renew certifications and have the staff to update the new certifications into the system.</p>

Use Case ID:	UC2
Use Case Name:	Manage Staff Schedule
Description:	This use case allows manager to manage staff schedule with the following functionalities: <ol style="list-style-type: none">1. Allocate Staff Workload2. View Staff Availability<ol style="list-style-type: none">a. Staff Availabilityb. Staff Route Preferencec. Staff Workload
Primary Actor:	Manager
Secondary Actor:	Database Server
Include Use Case(s):	Authenticate Users
Priority:	High
Preconditions:	<ol style="list-style-type: none">1. Manager must have successfully logged into his/her account.2. System displays the Job Allocation page to the manager.
Postconditions:	<ol style="list-style-type: none">1. Manager shall be able to view staff workload, allocate staff workload and view staff availability.
Main Success Scenarios:	<p>Allocate Staff Workload</p> <ol style="list-style-type: none">1. Manager selects up to 3 staff from a dropdown list to view their job preference and availability.2. Manager to assign the staff their workload for the week by selecting the specific days and saving into the system.3. System assigns the Database Server to update the workload distribution and reflect the assigned workload for each staff. <p>View Staff Availability</p> <ol style="list-style-type: none">1. Manager selects up to 3 staff from a dropdown list to view their job availability.2. System assigns the Database Server to fetch and display the Staff Availability, Staff Route Preference and Staff Workload.
Alternative Scenarios:	<p>Allocate Staff Workload</p> <ol style="list-style-type: none">1a. Manager is unable to view Staff workload.<ol style="list-style-type: none">1a1. System displays an empty view as no workload may be assigned yet. <p>View Staff Availability</p> <ol style="list-style-type: none">1a. System does not display any page.<ol style="list-style-type: none">1a1. Manager shall try to refresh the page.

Use Case ID:	UC3
Use Case Name:	Manage Staff Accounts
Description:	This use case allows the IT Administrator to create or remove managers and staff from the system.
Primary Actor:	IT Administrator
Secondary Actor:	Database Server
Include Use Case(s):	Authenticate Users
Priority:	High
Preconditions:	<ol style="list-style-type: none">1. IT Administrator account must be logged into his/her account.2. System displays the administrator panel and displays the list of managers/staff to the IT Administrator.
Postconditions:	<ol style="list-style-type: none">1. New Manager/Staff will be able to access the system.2. Removed Manager/Staff will no longer be able to access the system.
Main Success Scenarios:	<p>Create Managers and Staff</p> <ol style="list-style-type: none">1. IT Administrator selects the “Create New Account” button.2. System displays a form for entering full name, username, password, email, mobile number, and role designation of the new manager/staff’s account.3. IT Administrator fills in the forms and clicks on the “Submit” button.4. System assigns the Database Server to create the new account, displays a list of managers/staff with a successful account creation message, and sends a welcome email containing login username and password to the new manager’s/staff’s email. <p>Remove Managers and Staff</p> <ol style="list-style-type: none">1. IT Administrator selects the manager/staff he/she wishes to remove with the “Remove Account” option.2. System prompts delete confirmation message.3. IT Administrator selects the delete confirmation button.4. System assigns the Database Server to remove manager/staff from the system, and it displays a list of managers/staff with a successful deletion message.
Alternative Scenarios:	<p>Create Managers and Staff</p> <ol style="list-style-type: none">4a. IT Administrator unable to create account due to incomplete form.<ol style="list-style-type: none">4a1. System prompts the IT Administrator to fill all information and resubmits the form.4b. IT Administrator cancels the operation for form filling of account creation.<ol style="list-style-type: none">4b1. System closes the form and no manager/staff account is created.

	<p>Remove Managers and Staff</p> <p>3a. IT Administrator cancels the operation to delete manager/staff account from the system.</p> <p>3a1. System closes the message, and no manager/account is to be deleted.</p>
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Use Case ID:	UC4
Use Case Name:	Manage Individual Route Preference
Description:	This use case allows staff to indicate route preference.
Primary Actor:	Staff (Captain/Crew)
Secondary Actor:	Database Server
Include Use Case(s):	Authenticate Users
Priority:	High
Preconditions:	<p>1. Staff must be successfully logged into his/her account.</p> <p>2. Staff is on the Job Allocation page to choose the route preference.</p>
Postconditions:	<p>1. Staff is able to submit the chosen route preference.</p> <p>2. Staff is able to view the allocated routes and individual preference.</p> <p>3. Staff can accept or reject the allocated routes.</p>
Main Success Scenarios:	<p>Add or edit individual route preference</p> <p>1. Staff indicates route preference for the week and submits into the system.</p> <p>2. System assigns the Database Server to save the route selection and prompts the success message to staff.</p> <p>View individual allocated and preferred route</p> <p>1. System assigns the Database Server to retrieve the information on the route allocated by the manager and displays to the staff.</p> <p>Accept or Reject allocated route</p> <p>1. System shows the staff their respective allocated route scheduled by the manager.</p> <p>2. Staff chooses to either select the accept or reject schedule button.</p> <p>3. System assigns the Database Server to process the staff's entry and displays their scheduled route.</p>
Alternative Scenarios:	<p>Add or edit individual route preference</p> <p>2a. Staff chooses route preference for the past week.</p> <p>2a1. System displays a message indicating that the route preference can only be chosen from the current week.</p> <p>2a2. Staff will be redirected to the current week for selection.</p> <p>2b. Staff selects an invalid route preference or input.</p> <p>2b1. System displays an error message.</p> <p>2b2. Staff will be prompted to select a valid route preference from</p>

	<p>the given options.</p> <p><u>View individual allocated and preferred route</u></p> <p>1a. System displays a blank page. 1a1. Staff to refresh the page.</p> <p><u>Accept or Reject allocated route</u></p> <p>2a. System experiencing a delay when assigning the Database Server to save the staff's entry, when the staff selects either the 'accept schedule' or 'reject schedule' button. 2a1. System will display a message saying that the acceptance or rejection process is still in pending and under processing 2a2. Staff is informed that they will get their confirmation of their acceptance / rejection once the processing is complete.</p>
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Use Case ID:	UC5
Use Case Name:	Manage Individual Job Availability
Description:	This use case allows staff to add or edit work availability for the month.
Primary Actor:	Staff (Captain/Crew)
Secondary Actor:	Database Server
Include Use Case(s):	Authenticate Users
Priority:	High
Preconditions:	1. Staff must be logged into their accounts. 2. Staff is on the Job Allocation page to manage their availability.
Postconditions:	Staff is able to view their indicated availability. If the staff is available on a particular day, the colour will be green and if the staff is unavailable, the colour will be red.
Main Success Scenarios:	1. Staff add or edit their work availability and enter into the system. 2. System assigns the Database Server to update their availability and displays the updated work availability to both the staff and manager.
Alternative Scenarios:	1a. System shows a blank screen. 1a1. Staff shall refresh the page.

Use Case ID:	UC6
Use Case Name:	Authenticate Users
Description:	This use case describes the process of the system users logging in to the system.
Primary Actor:	Manager, IT Administrator, Staff (Captain/Crew)
Secondary Actor:	Database Server
Priority:	High
Preconditions:	Staff attempts to log into their accounts.
Postconditions:	<ol style="list-style-type: none">1. Staff are authenticated and logged into the system.2. Staff will be directed to the landing page.
Main Success Scenarios:	<ol style="list-style-type: none">1. User (Manager, IT Administrator, Staff) enters their username and password to log into the system.2. System assigns the Database Server to check if the username and password information exists inside the database server. If the information exists and is correct, the system prompts successful login and directs the user to the landing page.
Alternative Scenarios:	<ol style="list-style-type: none">3a. System prompts log in failure message<ul style="list-style-type: none">3a1. System prompts the user to enter the correct username and password.