

**NANYANG  
TECHNOLOGICAL  
UNIVERSITY**  

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**NEARBYOU: A CROWDSOURCED APP FOR  
FINDING THE BEST PLACES FOR PEACE AND QUIET**

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## **Abstract**

Mobile devices have grown tremendously in popularity over the years and have now become an essential part of our daily lives. These devices are being used to assist users in a variety of lifestyle aspects, especially navigation from one location to another. However, as a pedestrian walking a short distance to a nearby area that they may or may not be familiar with, many encountered several issues. The current location-based navigation applications were not relevant and unsuitable for assisting pedestrians in efficiently navigating.

The prime objective of this project is to introduce Nearbyyou, a mobile application developed with the Flutter framework based on Dart programming language. Nearbyyou aims to provide a platform for users to personalize, share, and guide or be guided with shortcut routes. This is to assist users in efficiently navigating to their destination and minimizing the time spent walking to a nearby area.

**Keywords:** Location-based application; Pedestrian; Navigation; Shortcut; Nearby; Routes

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# **1. Introduction**

## **1.1. Background**

Human mental health is just as important as physical health, and it affects many people today. According to the World Health Organisation (WHO), researchers have found that excessive noise exposure has a significant impact on the overall quality of life of humans. [1]

According to research, there are numerous factors that affect one's quality of life, one of which is noise. [2-4] Noise is defined as an unwanted and unpleasant sound that has always been a part of our lives and cannot be avoided. Noise is originated by objects that produce sounds, conversations between people and individuals, and the environment. [1, 5] Based on the studies conducted by the Gutenberg Health Study's research [6], it has been demonstrated that the amount of damaging noise caused by the environment influences mental health conditions such as depression and anxiety. [6-9]

In order to curb mental health conditions, finding an ideal place in a bustling city can pose a challenge, because each individual's threshold of noise and preferences are different and subjective. [10] Thus, our research focuses on the ability to find a quiet place based on each individual's preferences.

However, the main problem that is likely to surface while locating these locations can be a difficulty as the existing applications we use in our daily lives do not provide navigation for pedestrians who prefer to walk to their destination.

As a result, the goal of this project is to develop a platform that offers meaningful route information and strives to improve the efficiency of finding a nearby location using crowdsourced information.



## **1.2. Purpose**

As mobile devices evolve, it becomes a basic necessity in everyone's daily life where it made our lives easier and more convenient. Whereas, the purpose of this Final Year Project is to develop a crowdsourcing application that not only enables users to crowdsource quiet places, but also offers insightful shortcut routes to places shared by other users.

“Nearbyou” is intended to achieve the following objectives:

- Provide users with an interactive map that allows them to search for and view surrounding places that are created by other users
- Enable users to create and share personalized shortcut routes with the community

Following the completion of the “Nearbyou” application, it seeks to be informative and user-friendly to a wide range of audiences, ranging from teenagers to adults who own a smartphone with an Internet connection and location-based services.

## **1.3. Scope**

“Nearbyou” is comprised of two main components: a mobile client application and a coordinating server. The mobile client application will be developed with the Flutter framework, which is compatible with Android systems. Whereas, the backend management will be handled using Google Cloud Firestore. A cloud database that processes and manages all data collected from the client application.

## **1.4. Project Schedule**

This project mainly consists of 5 stages: planning, analysis, design, development and testing. Refer to Appendix A for the detailed project schedule.

## **2. Literature Reviews**

### **2.1. Existing Solutions**

There are several existing applications on the market that use a location-based crowdsourcing approach. Nearbyou now focuses on the context of Singapore, whereas this section provides an evaluation and comparison of Nearbyou and a few other solutions that are either for worldwide, international, or specifically for Singapore use.

#### **2.1.1. Hush City**

Hush City is a soundscape mobile application developed in the United States and is now utilized internationally. Hush City uses the soundscape crowdsourcing approach, which records sounds in landscapes and analyses and evaluates based on user preferences. It enables users to share quiet places and map locations depending on their sound level. The purpose of Hush City is to raise civic awareness of a sonic quality environment by having individuals contribute to and address the environmental quality of a specific quiet place. [11]. By observing Hush City, in general, it does not provide on-foot features. Instead, it mainly concentrates on crowdsourcing quiet locations.

#### **2.1.2. Google Maps**

Google Maps has been around since 2005 and is widely utilized around the world. It offers a wide range of features such as street view, real-time traffic updates, and route planning for travel by foot, car, and public transportation. [12] As a pedestrian, whether a local or a foreigner, Google Maps provides a route planning [13] or trip planner [14] feature that is primarily used to create travel itineraries utilizing one or more modes of transportation. Previously, Google Maps had a Google Map Maker program that allowed users to create and draw new features directly on the map, but it has since been discontinued. [15] Following the discontinuance, Google Local Guides were introduced. This program serves a similar purpose as Google Map Maker, which allows users to contribute to Google Maps by creating postings such as reviews, images, videos, and many others rather than adding directly to the map. [16]

Based on the observations made above and in Figure 1, Google Maps is generally appropriate for motorists on the road. The directions offered by Google Maps for all kinds of transportation were presented in terms of road names, road signs, the distance measured in meters, and visual guidance on the road. For instance, a pedestrian going to a neighbouring place is obliged to travel by road, and there is a possibility that walking pedestrians do not understand road directions or signs as proficient as motorists. The following figures are screenshots from Google Maps walking mode:

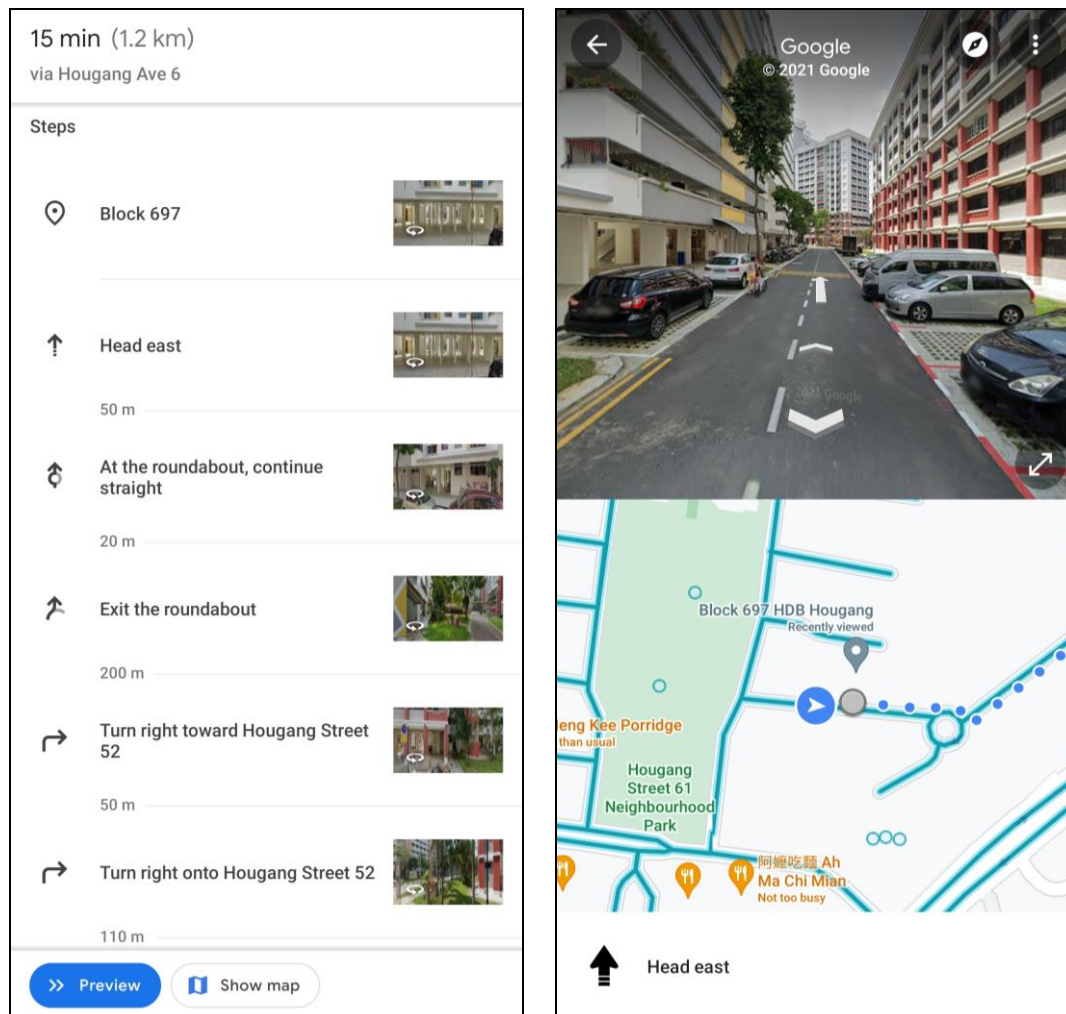


Figure 1: Google Maps

### 2.1.3. OneMap

OneMap is a mobile application developed by the Singapore Land Authority that focuses mostly on the Singapore map. It offers specialized location-based services as well as access to associated information such as buses, trains, nearby facilities, and live traffic information in Singapore. OneMap's directions are similar to those offered by other location-based applications, which are primarily suitable and easily understood by motorists on the road. [17]

## 2.2. Comparison

The following table shows the comparison between Nearbyyou and existing applications:

Features	Hush City	Google Maps	OneMap	Nearbyyou
Target Audience	International	Global	Singapore	Singapore
Map View and gestures	✓	✓	✓	✓
User current location access	✓	✓	✓	✓
Guided shortcut routes	✗	✗	✗	✓
Crowdsourcing routes	✗	✗	✗	✓
Other facilities (e.g. Transports, real-life updates, etc)	✗	✓	✓	✗

*Table 1: Comparison between existing solutions and Nearbyyou*

Please refer to the detailed walkthrough of Nearbyyou will be explained in Section 5.3 of this report.

## **3. Requirements Engineering**

### **3.1. Functional Requirements**

#### **3.1.1. Sign In**

- 3.1.1.1. The user must be able to login by their email address or Google sign-in
- 3.1.1.2. The system must be able to verify the email and password or Google account
- 3.1.1.3. The user must be able to verify email before signing in to Nearbyyou

#### **3.1.2. Sign Up**

- 3.1.2.1. The user must be able to input information for their account
- 3.1.2.2. The system must be able to verify information such as their email address and password
- 3.1.2.3. The system must be able to send a verification email to the email specified by the user
- 3.1.2.4. The user must be able to receive the email and verify themselves

#### **3.1.3. Get User Current Location**

- 3.1.3.1. The user must be able to click on my location button
- 3.1.3.2. The system must be able to prompt user to enable location by displaying a message
- 3.1.3.3. The user must be able to select to enable location or deny location
- 3.1.3.4. The system must be able to enable location and display user current location on the map as a marker and its relevant details

#### **3.1.4. Search Places**

- 3.1.4.1. The user must be able to input search keyword
- 3.1.4.2. The system must be able to autocomplete the keyword by displaying a list of suggestions for user to select

#### **3.1.5. View Place & Nearby Post Markers**

- 3.1.5.1. The user must be able to select a suggested location from search or from their current location or even tapping on the map manually
- 3.1.5.2. The system must be able to display the selected location made by the user as a marker on the map and displays place details and its relevant nearby markers

### **3.1.6. View Post & Markers Details**

- 3.1.6.1. The user must be able to tap on a marker on the map
- 3.1.6.2. The system must be able to display the relevant posts that contains the marker
- 3.1.6.3. The user must be able to click on posts and display relevant marker details

### **3.1.7. Create Shortcut Route Post**

- 3.1.7.1. The user must be able to search a location or straight away click to create an empty post
- 3.1.7.2. The system must be able to display searched location on the map or an empty map
- 3.1.7.3. The user must be able to add markers by tapping on the map
- 3.1.7.4. The system must be able to display markers on the map
- 3.1.7.5. The user must be able to add details to each markers by tapping on the marker
- 3.1.7.6. The system must be able to display options on what the user can do on this marker
- 3.1.7.7. The user confirms and submits the post
- 3.1.7.8. The system must be able to display message saying post created successfully

### **3.1.8. Update Profile**

- 3.1.8.1. The user must be able to view their profile and update profile information
- 3.1.8.2. The system must be able to display updated profile information and a list of route posts created by the user

## 3.2. Non-Functional Requirements

Category	Non-Functional Requirement Description
<b>Usability</b>	<ul style="list-style-type: none"> <li>Application must offer informative and concise feedback</li> <li>Application must strive for consistency</li> <li>Application must be user-friendly as potential stakeholders are generally wide age group</li> </ul>
<b>Availability</b>	<ul style="list-style-type: none"> <li>Application shall meet or exceed 99.99% uptime</li> </ul>
<b>Reliability</b>	<ul style="list-style-type: none"> <li>The application shall not fail on average more than once per week</li> </ul>
<b>Supportability</b>	<ul style="list-style-type: none"> <li>Application must be able to work with Android 5.0 or later operating system</li> </ul>
<b>Maintainability</b>	<ul style="list-style-type: none"> <li>Application must leave all database contents and personal settings unchanged when a new version is installed</li> </ul>

## 3.3. Use Case Model

### 3.3.1. Use Case Diagram

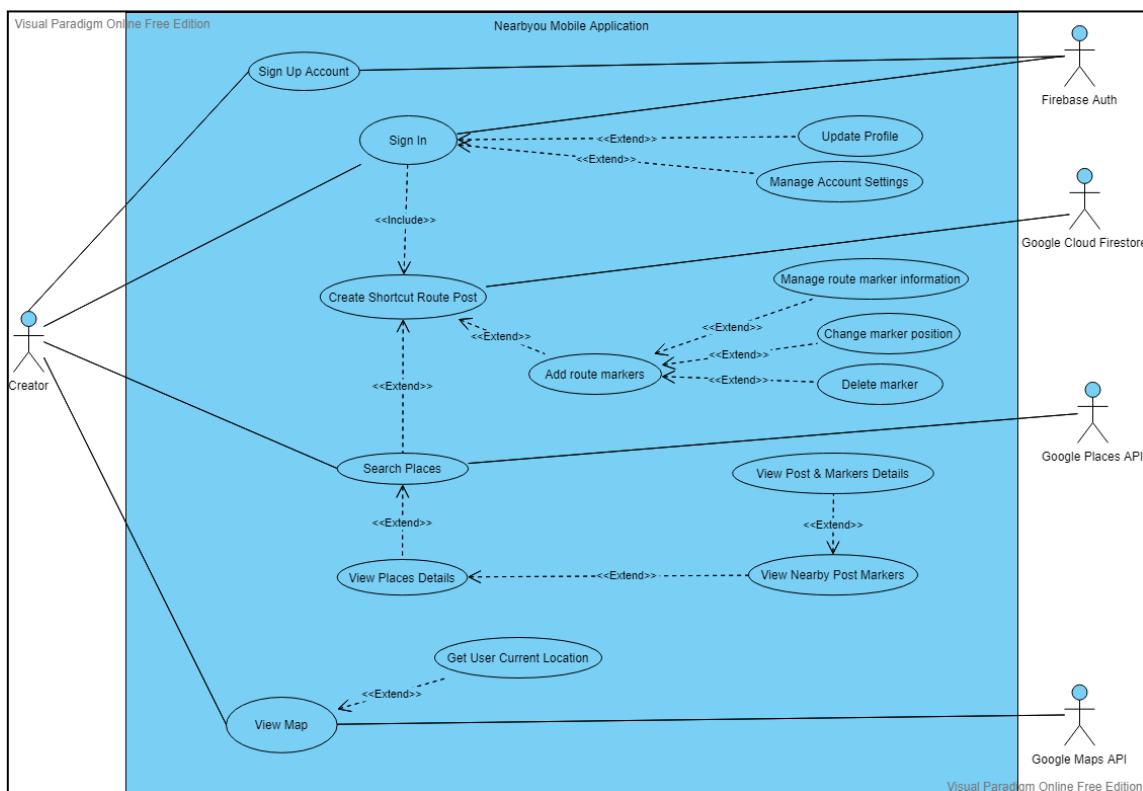


Figure 2: Use Case Diagram

### 3.3.2. Use Case Descriptions

Use Case ID:	NEARBYOU-01		
Use Case Name:	Sign In/Google Sign In		
Created By:	Gwyn Bong	Last Updated By:	Gwyn Bong
Date Created:	28 <sup>th</sup> May 2021	Date Last Updated:	11 <sup>th</sup> Sep 2021
Actor:	User		
Description:	Allows user to access their own Nearbyou account		
Preconditions:	User must have an account with Nearbyou or must have a Google account		
Postconditions:	User will be able to sign in with their Nearbyou account or using Google account to access the application		
Flow of Events:	<ol style="list-style-type: none"> <li>1. System display email address and password fields</li> <li>2. User enters email address and password and submits</li> <li>3. System verifies email address and password</li> <li>4. System displays Home screen upon successful login</li> </ol>		
Alternative Flows:	<ol style="list-style-type: none"> <li>2. Invalid email address and password               <ol style="list-style-type: none"> <li>2.1. System prompts user to re-enter email address and password by displaying error message “Email address or password cannot be found”</li> <li>2.2. Continue from step 2 of flow of events</li> </ol> </li> <li>3. Email verification failed               <ol style="list-style-type: none"> <li>3.1. System displays a dialog to prompt user to resend verification email or to dismiss or to verify email                   <ol style="list-style-type: none"> <li>3.1.1. User clicks on “Resend Verification Email”                       <ol style="list-style-type: none"> <li>3.1.1.1. System sends an email to the email user signed up with</li> <li>3.1.1.2. User verifies email address through the link in the email</li> <li>3.1.1.3. Continue from step 4 of flow of events</li> </ol> </li> <li>3.1.2. User clicks on “Dismiss”                       <ol style="list-style-type: none"> <li>3.1.2.1. System closes the dialog</li> </ol> </li> </ol> </li> </ol> </li> </ol>		



	3.1.2.2. User verifies email address through the link the email
	3.1.2.3. Continue from step 1 of flow of events
Exceptions:	N.A
Includes:	N.A

Use Case ID:	NEARBYOU-02		
Use Case Name:	Sign Up		
Created By:	Gwyn Bong	Last Updated By:	Gwyn Bong
Date Created:	28 <sup>th</sup> May 2021	Date Last Updated	11 <sup>th</sup> Sep 2021
Actor:	User		
Description:	Allows user to create a Nearbyou account		
Preconditions:	User must have Nearbyou application installed on their mobile devices		
Postconditions:	User account will be created		
Flow of Events:	<ol style="list-style-type: none"> <li>1. System display account input fields</li> <li>2. User enters account details and submits</li> <li>3. System verifies account details entered by the user and sends a verification email to the email address user signed up with</li> <li>4. System displays Login screen</li> </ol>		
Alternative Flows:	<ol style="list-style-type: none"> <li>1. Invalid or duplicated account <ol style="list-style-type: none"> <li>1.1. System displays “Existing Account found!”, prompting user to either sign in if they have an existing account or cancel to sign up with another email address <ol style="list-style-type: none"> <li>1.1.1. User selects sign in <ol style="list-style-type: none"> <li>1.1.1.1. System directs user to sign in screen</li> <li>1.1.1.2. Continue from use case NEARBYOU-01</li> </ol> </li> <li>1.1.2. User selects cancel <ol style="list-style-type: none"> <li>1.1.2.1. System closes pop-up dialog</li> <li>1.1.2.2. Continue from step 2 of flow of events</li> </ol> </li> </ol> </li> </ol> </li> </ol>		
Exceptions:	N.A		
Includes:	N.A		

Use Case ID:	NEARBYOU-03		
Use Case Name:	Get Current Location		
Created By:	Gwyn Bong	Last Updated By:	Gwyn Bong
Date Created:	31 <sup>st</sup> May 2021	Date Last Updated:	2 <sup>nd</sup> June 2021
Actor:	User, Google Maps API		
Description:	Displays user current location		
Preconditions:	User must enable their location settings		
Postconditions:	User current location displays on the map		
Flow of Events:	<ol style="list-style-type: none"> <li>1. System displays an empty map</li> <li>2. User select “My Location” button</li> <li>3. System prompts user to allow or deny location access</li> <li>4. User select allow location access</li> <li>5. System enables device location, retrieves user’s current location from Google Maps API and display as a marker on the map</li> </ol>		
Alternative Flows:	<ol style="list-style-type: none"> <li>4. User select deny location access               <ol style="list-style-type: none"> <li>4.1. System disables device location</li> <li>4.2. Continue from Step 1 of flow of events.</li> </ol> </li> </ol>		
Exceptions:	N.A		
Includes:	N.A		
Special Requirements:	N.A		
Assumptions:	N.A		

Use Case ID:	NEARBYOU-04		
Use Case Name:	Search Places and View Nearby Places		
Created By:	Gwyn Bong	Last Updated By:	Gwyn Bong
Date Created:	5 <sup>th</sup> June 2021	Date Last Updated:	16 <sup>th</sup> June 2021
Actor:	User, Google Places API		
Description:	This feature allows users to search a particular place they would like to visit and view surrounding places created by creators.		
Preconditions:	User must be to enter search keyword or tap on the map		
Postconditions:	Nearby places created by creators and selected place will display on the map		
Flow of Events:	<ol style="list-style-type: none"> <li>1. User enters keyword or location name on the search field</li> <li>2. System displays a list of locations retrieved from Google Places API that matches to the keyword entered</li> <li>3. User selects a location from the list</li> <li>4. System displays the selected location details, its marker and its nearby markers on the map</li> </ol>		
Alternative Flows:	N.A		
Exceptions:	N.A		
Includes:	N.A		

Use Case ID:	NEARBYOU-05		
Use Case Name:	Create Shortcut Route Post		
Created By:	Gwyn Bong	Last Updated By:	Gwyn Bong
Date Created:	20 <sup>th</sup> June 2021	Date Last Updated:	20 <sup>th</sup> June 2021
Actor:	User		
Description:	Create shortcut routes and share to the community		
Preconditions:	User must be signed in to Nearbyyou		
Postconditions:	User creates customised shortcut routes		
Flow of Events:	<ol style="list-style-type: none"> <li>1. User selects the create route post button</li> <li>2. System displays posting interface</li> <li>3. User enters post description, markers and its data, and submits</li> <li>4. System displays successful message</li> </ol>		
Alternative Flows:	<ol style="list-style-type: none"> <li>2. Empty fields               <ol style="list-style-type: none"> <li>2.1. System displays pop-up message to confirm with user on whether they want to continue to post with empty fields.                   <ol style="list-style-type: none"> <li>2.1.1. User selects post                       <ol style="list-style-type: none"> <li>2.1.1.1. System stores post</li> </ol> </li> <li>2.1.2. User selects cancel                       <ol style="list-style-type: none"> <li>2.1.2.1. Continue from Step 2 of flow of events</li> </ol> </li> </ol> </li> </ol> </li> </ol>		
Exceptions:	N.A		
Includes:	N.A		

Use Case ID:	NEARBYOU-06		
Use Case Name:	View Post and its Route Marker details		
Created By:	Gwyn Bong	Last Updated By:	Gwyn Bong
Date Created:	8 <sup>th</sup> August 2021	Date Last Updated:	15 <sup>th</sup> August 2021
Actor:	User		
Description:	User will see other creators' shortcut route posts upon searching		
Preconditions:	User must be to tap on the markers		
Postconditions:	System will display relevant marker and post details shared by creators		
Flow of Events:	<ol style="list-style-type: none"> <li>1. User enables location or searches a location or taps on the map</li> <li>2. System displays location as a marker on the map and its surrounding, relevant markers</li> <li>3. User selects any marker on the map</li> <li>4. System will display the markers details and the post related to it</li> <li>5. User selects to view post</li> <li>6. System will display the entire post and related markers to it</li> </ol>		
Alternative Flows:	N.A		
Exceptions:	N.A		
Includes:	N.A		

Use Case ID:	NEARBYOU-07		
Use Case Name:	Update Profile		
Created By:	Gwyn Bong	Last Updated By:	Gwyn Bong
Date Created:	28 <sup>th</sup> August 2021	Date Last Updated:	20 <sup>th</sup> Sep 2021
Actor:	User		
Description:	The profile represent each user's identity in the community		
Preconditions:	User must be signed in to Nearbyou		
Postconditions:	User will be able to update their profile information		
Flow of Events:	<ol style="list-style-type: none"> <li>1. User selects edit button on the Profile screen</li> <li>2. System display Edit Profile screen</li> <li>3. User enter their profile details and submits</li> <li>4. System verifies username</li> <li>5. System updates the profile and display accordingly upon returning to Profile screen</li> </ol>		
Alternative Flows:	<ol style="list-style-type: none"> <li>4. User enters empty username <ol style="list-style-type: none"> <li>4.1. System displays an error message that username cannot be empty</li> <li>4.2. Continue from step 3 of flow of events</li> </ol> </li> <li>4. User enters existing username <ol style="list-style-type: none"> <li>4.1. System display an error messages that username has been taken</li> <li>4.2. Continue from step 3 of flow of events</li> </ol> </li> </ol>		
Exceptions:	N.A		
Includes:	N.A		

### 3.4. Class Diagram

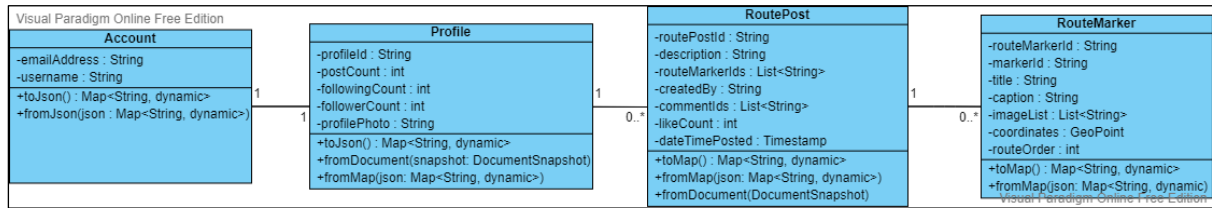


Figure 3: Class Diagram

### 3.5. Sequence Diagrams

#### 3.5.1. Sign In

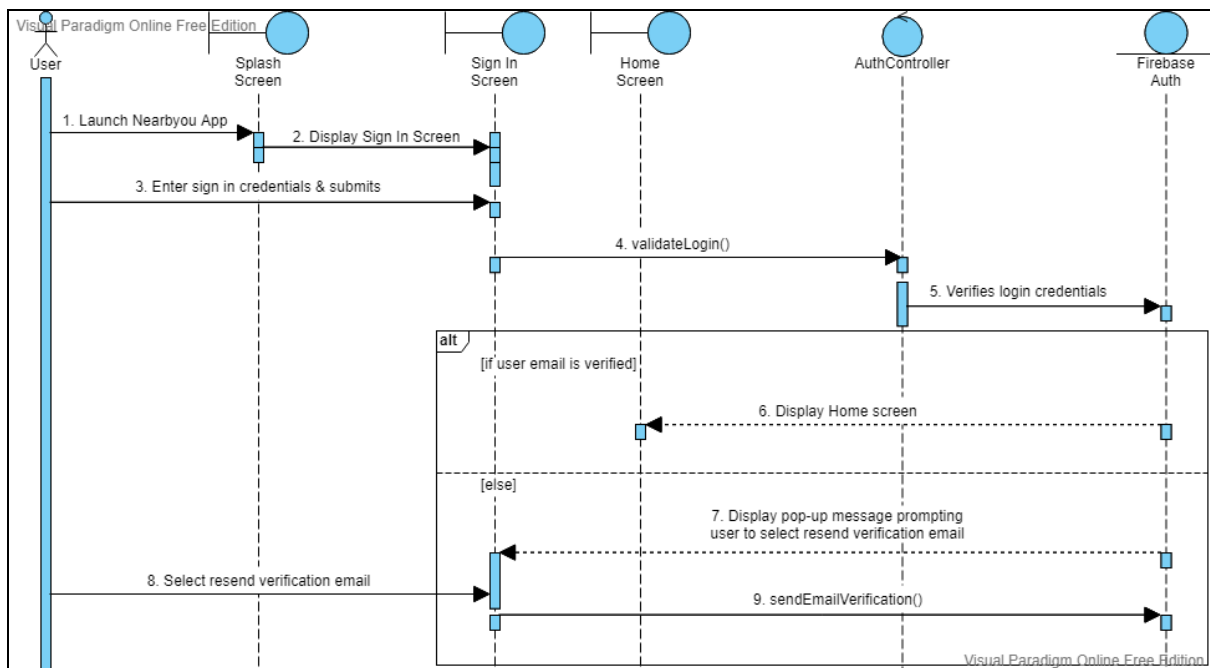


Figure 4: Sign In Sequence Diagram

### 3.5.2. Sign Up

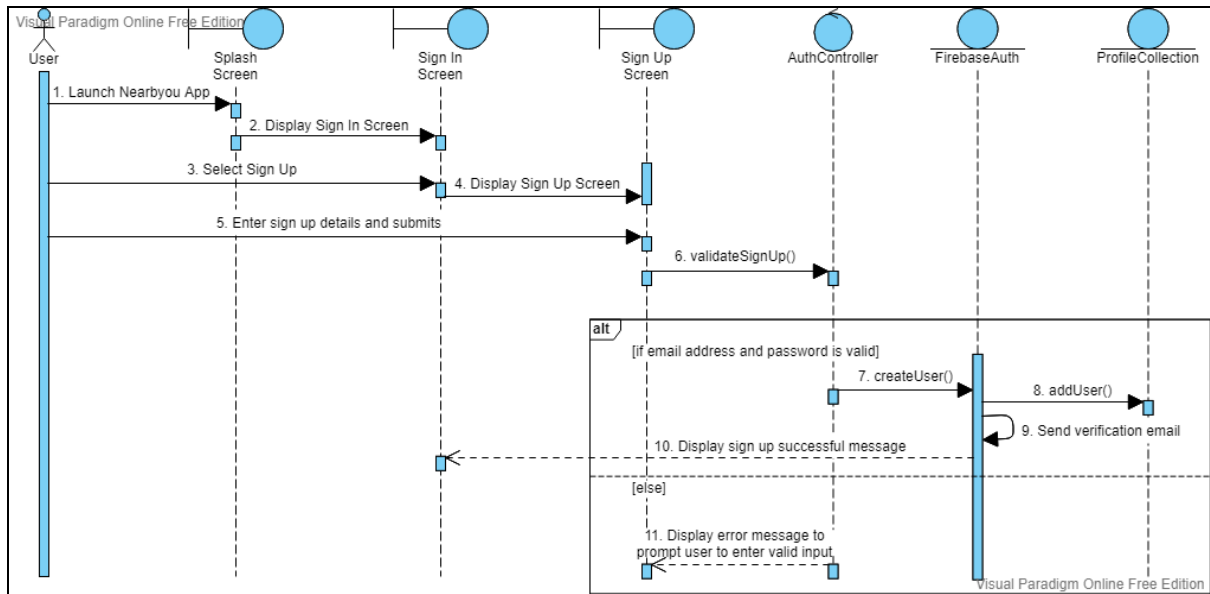


Figure 5: Sign Up Sequence Diagram

### 3.5.3. Search and View Nearby Places

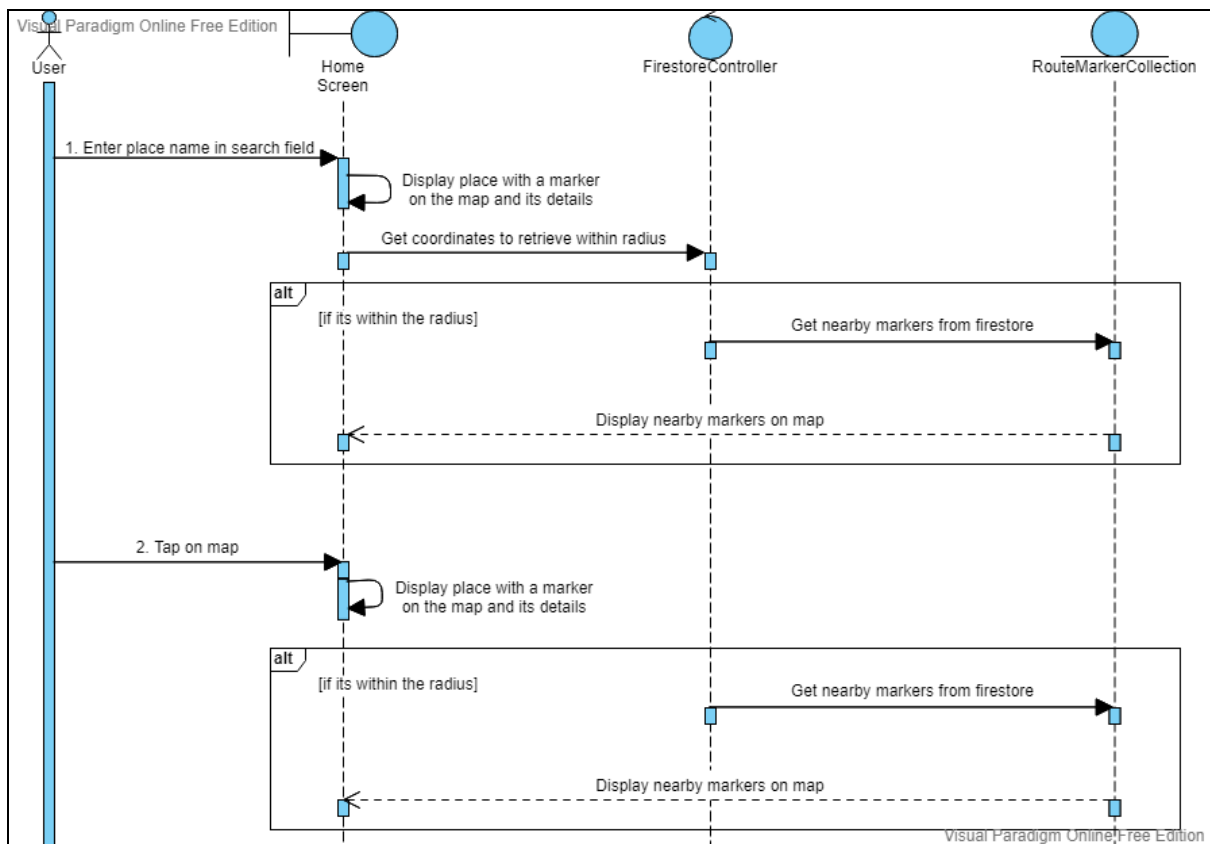


Figure 6: Search and View Nearby Places Sequence Diagram



### 3.5.4. View Post and Marker Details

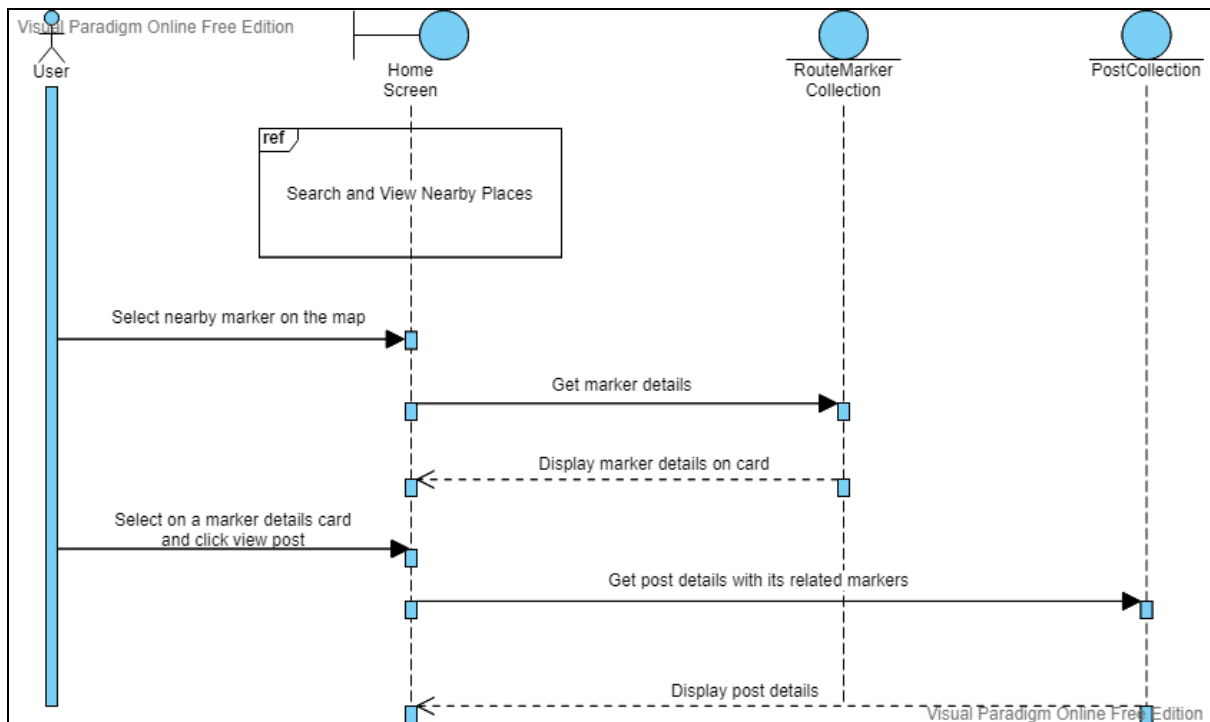


Figure 7: View Post and Marker Details Sequence Diagram

### 3.5.5. Edit Profile and View Posts

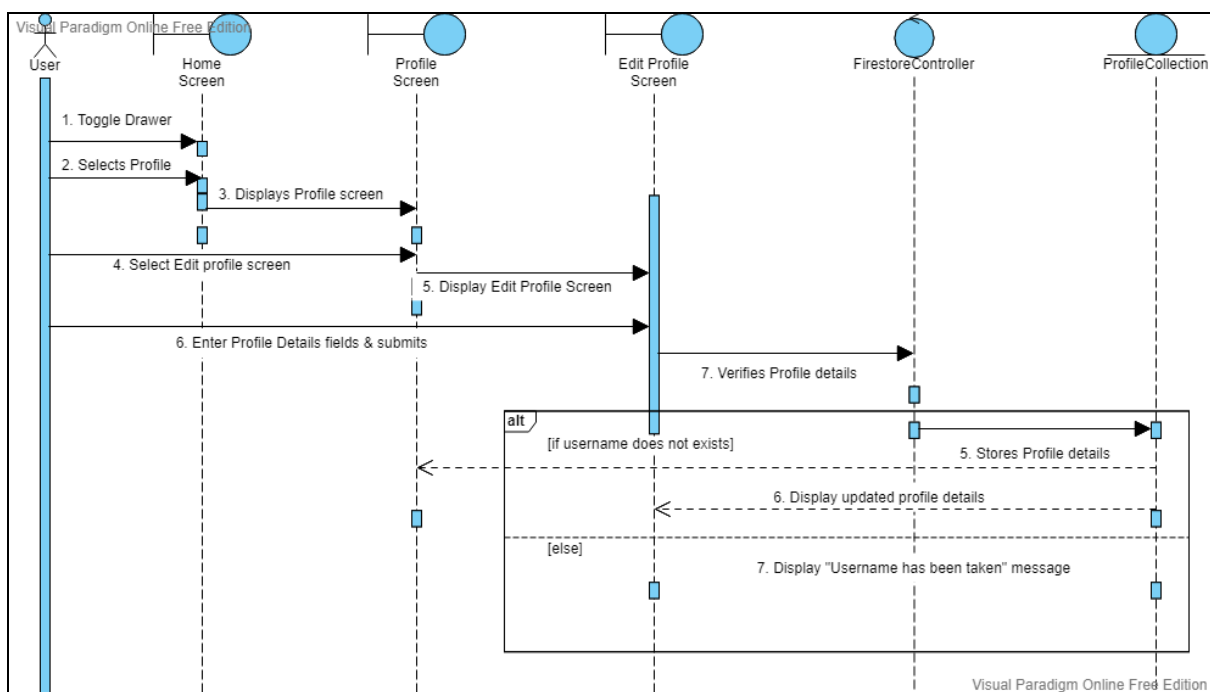


Figure 8: Edit Profile and View Posts Sequence Diagram

### 3.5.6. Create Shortcut Route Posts

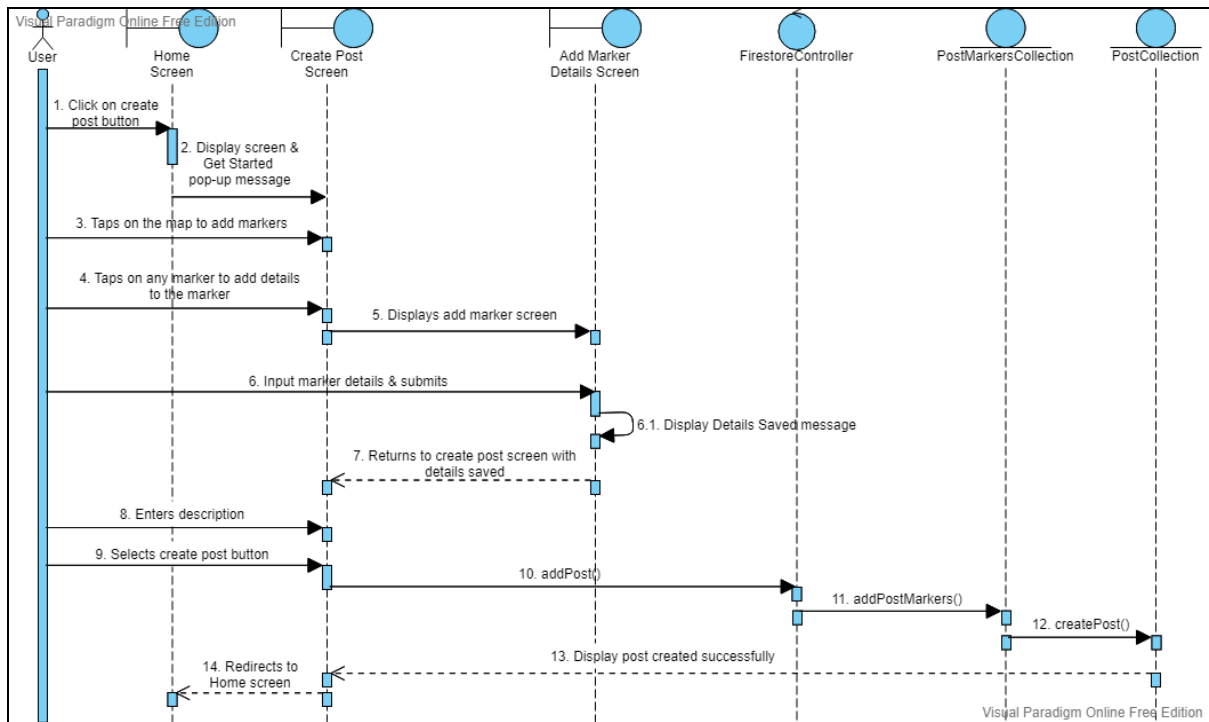


Figure 9: Create Shortcut Route Posts Sequence Diagram

## 4. Design

### 4.1. Design Considerations

The Nearbyou application user interface is specifically designed with respect to Shneiderman's 8 golden rules [18] for improving usability in mind. The following summarises the design decisions taken for the Nearbyou application in accordance with the 8 golden rules:

#### 4.1.1. Strive for consistency

The Nearbyou interface layout ensures that it is designed in a consistent manner. As a result, the application's general colour scheme was inspired by Miami Dolphins [19], as illustrated in Figure 10. The Nearbyou logo was then incorporated with the colour scheme and self-designed using an online tool called LogoMakr. [20] Each colour serves a certain purpose. For instance, the primary colour utilized in the application that represents Nearbyou's identity and highlights essential features is, orange.



Figure 10: Nearbyou Logo and Colour Scheme

In terms of navigating from screen to screen, the buttons on the left side of each app bar allow reversal of actions, as explained further in 4.1.5, while the buttons on the right-side handle most actions, such as editing, saving, posting, or a menu of actions.



Figure 11: Consistent App bar Design

#### 4.1.2. Cater to universal usability

The application supports English as its universal language in order to serve a varied user base in Singapore. Furthermore, the application supports a number of touch gestures that are applied on the map. This is suitable for both new and experienced users.

### 4.1.3. Design dialogs to yield closure

When the user performs a specific action, dialogs will appear. For instance, if the user successfully creates a route post, a pop-up dialog box will appear when the route post is stored. The following figures show various examples of pop-up dialogs used in the application.

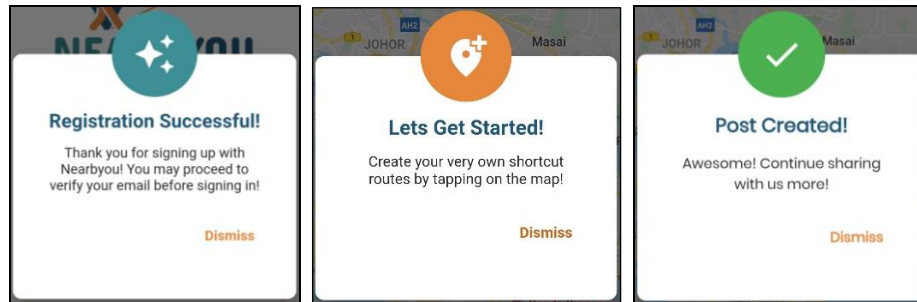


Figure 12: Pop-up Dialogs

### 4.1.4. Offer informative feedback

When the application identifies invalid or missing inputs, it offers informative feedback. This way, it informs users and prompts them to make corrections. Messages show at the bottom of the wrong input field when, for example, signing in or signing up.

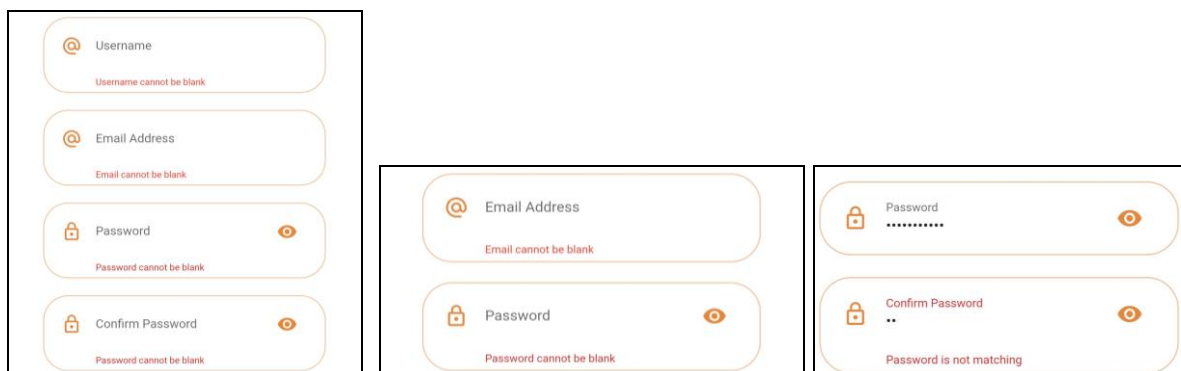


Figure 13: Feedback on input fields

#### 4.1.5. Permit easy reversal of actions

The application permits the ability to update and delete information. For example, after posting a route post, users can edit or delete it. This will provide users with a sense of relief if they accidentally post something they did not intend to share; a list of solutions will be shown to them to help them feel less anxious.

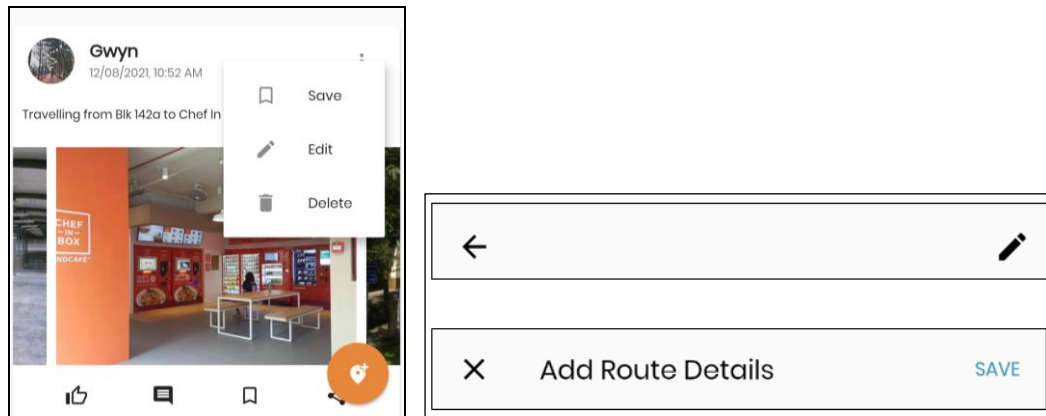


Figure 14: Edit, Update and Delete Post

#### 4.1.6. Support internal locus of control

Nearbyou users have complete control over the application's primary features. For instance, if a user creates a shortcut route post, they can select to post and continue the next time. This serves to reassure users and gives them the impression that they have control over what they can do.

#### 4.1.7. Reduce short term memory load

The Nearbyyou application is structured in such a manner that when users sign in, they are always presented with a map and the required buttons to search, navigate or submit a shortcut route post. Rather than designing bottom navigation, a drawer was used to categorize features that are not frequently accessed. This allows the user's attention to be focused on Nearbyyou's core feature, the map.

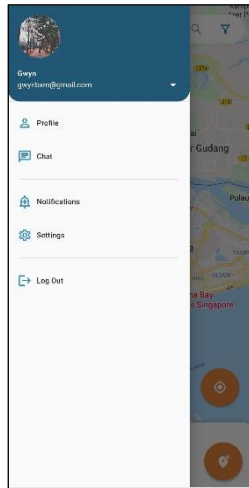


Figure 15: Navigation Drawer

#### 4.1.8. Prevent Errors

Warning notifications appear when something went wrong, such as a field being left empty or an existing account found from the email address the user was attempting to sign up with. These pop-up dialogs are implemented in such a way that when something goes wrong, users may take control of the situation and resolve the problem. Some of the examples are shown below.

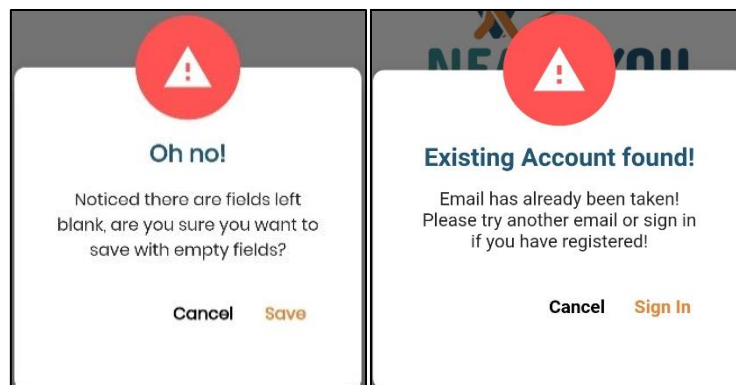


Figure 16: Warning Messages

## 4.2. Wireframe and Mock-up Designs

At the initial stage of the project, low-fidelity wireframes were sketched on paper to outline the overall flow and test the usability of the functions. The high-fidelity mock-ups are then constructed using Axure RP 9, a design tool, to create a realistic overview of how Nearbyyou is presented. For more details, please refer to Appendices B and C for the low-fidelity wireframes and high-fidelity mock-ups, respectively.

## 5. Implementation

### 5.1. System Overview



Figure 17: System Overview Diagram

The Nearbyyou client mobile application is implemented with the Flutter framework, which is based on the Dart programming language. Whereas, backend storage of Nearbyyou data is stored in Google Cloud Firestore.

#### 5.1.1. Flutter

The application will be implemented using the Flutter framework, which is based on the Dart programming language. The Flutter Software Development Kit (SDK) is created by Google [21] as a UI toolkit used to create and compile native applications across mobile, web and desktop applications in a single codebase.

### 5.1.2. Google Firebase

#### 5.1.2.1. Firebase Authentication

Google's Firebase [22] supports and handles multi-platform sign in choices like as email and password accounts, Google accounts, and other social media sign in alternatives. [23] This facilitates the creation of safe authentication and allows users to sign in to Nearby you using a variety of sign-in methods.

#### 5.1.2.2. Cloud Firestore

Google Firebase [22] provides two types of data storage: real-time firebase and cloud Firestore. Cloud Firestore, a NoSQL cloud database that maintains data synchronized across client applications, was chosen as Nearby you's backend storage. [24]

### 5.1.3. Google Cloud Platform

The Google Cloud Platform (GCP) is offered by Google that houses a range of cloud computing services that run on the same infrastructure. [25] The Nearby you application makes use of a few of the GCP APIs, including the Google Maps API and the Google Places API. When using the Nearby you application, these two APIs were used to access maps and discover locations.

## 5.2.Implementation Tools

Tool Name	Description	Version
Android Studio	A development environment used for implementation	v4.1.2
Android Emulator	An emulator used for testing of the application	API 29
Samsung Galaxy Note 9	An Android device used for testing of the application	Android 10
GitHub	Used to ensure version control of the application	Git 2.26.0

*Table 2: List of Implementation Tools*



### 5.3. Nearbyou Application

The Nearbyou application first launches the splash screen and then the sign-in screen. Users can sign in using a valid email address and password or with Google sign-in. Users who do not have an account can access the sign-up screen by clicking the button at the bottom of the sign-in screen.

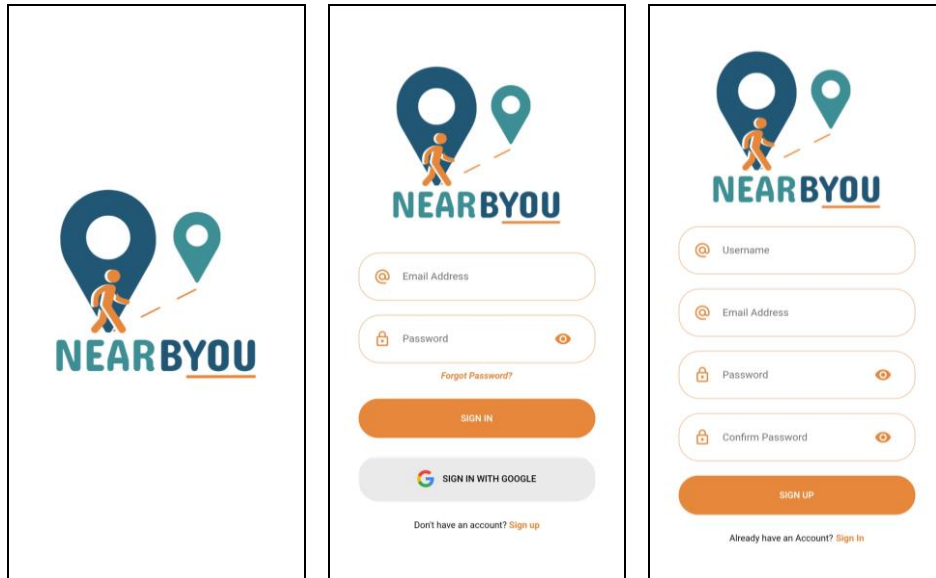


Figure 18: Splash and Authentication Screens

### 5.3.1. View Map & Current Location

The Home screen displays a map and a pop-up dialog prompting the user to enable their current location. When enabled, the map is updated with a red marker indicating the current user's position. This allows the user to choose whether or not to share their location.

At the bottom of the screen, a button labelled as “MyLocation” is always visible. This is for those who did not activate their location at the start but would wish to enable it afterward.

The sliding-up panel was built below the “MyLocation” button to show the add location button, the core function of Nearbyyou, which will be explained in 5.3.2. More information will be displayed on the sliding up panel each time a user searches or selects a place.

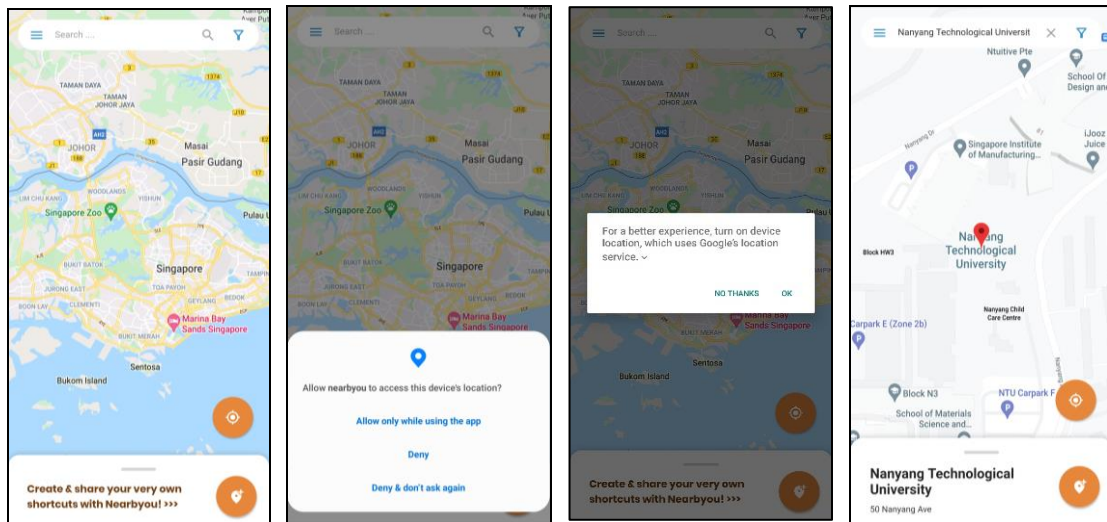


Figure 19: Home Screen and Current Location Access

### 5.3.2. Create Shortcut Route Post

By clicking the add location button on the Home screen, the user constructs a set of shortcut routes by tapping on the map. To add more details to each marker of a route, the user may click on each marker to add data such as images, captions explaining how to navigate to this area, modify specific marker details, alter its position, or delete the marker and its following details.

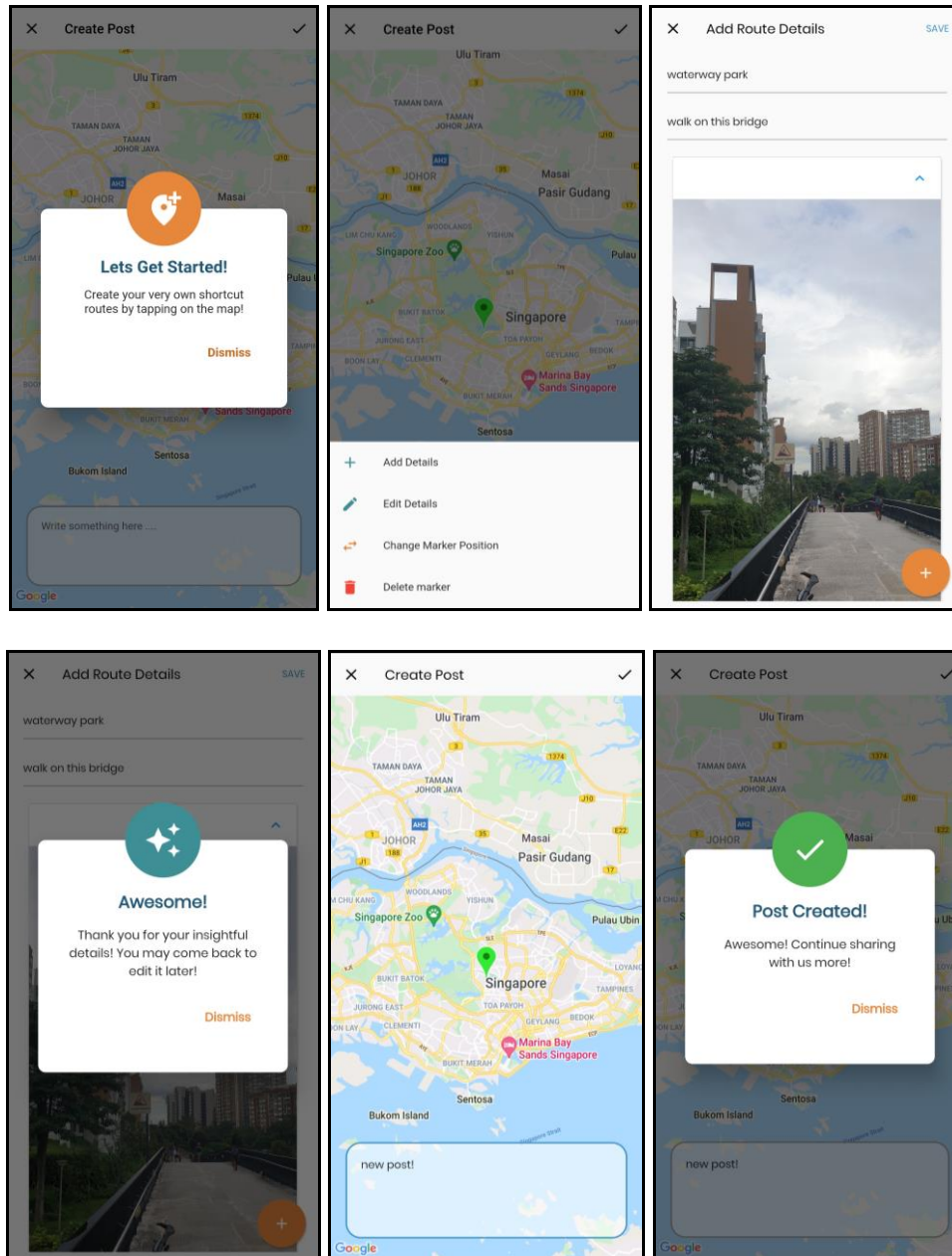


Figure 20: Create Shortcut Route Post Screen

### 5.3.3. Search Places & View Nearby Places

There are two methods for searching for places: one is to input the location into the search field, and the other is to touch on the marker. This was developed primarily to provide the user with alternatives on how they want to interact with the map. The search field has an auto-completion feature that takes in typed-in keywords and filters them accordingly. This enables users to select the desired location rather than typing out the full word. When searching for a place, it will display the place details as well as nearby markers made by creators.

The red marker represents the place sought by the user, the orange marker represents the markers created by creators as described in 5.4.2, and the green marker is highlighted when the marker is selected.

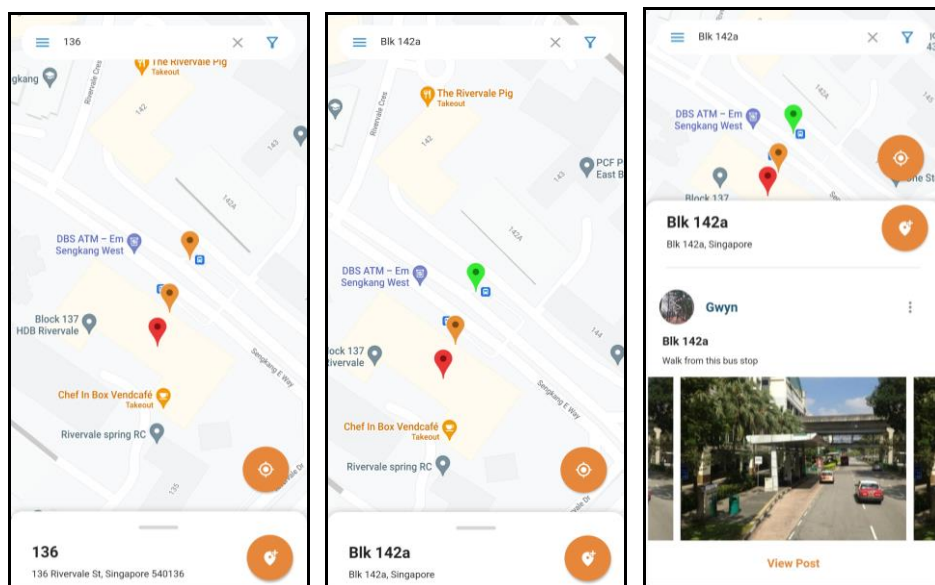


Figure 21: Search and View Nearby Places

### 5.3.4. View Route Posts and Edit Profile

The figure below shows the user postings as well as the person's profile information. The user will be able to see the posts that they have created. It also allows users to either edit the post with new information or delete it, depending on their preferences.

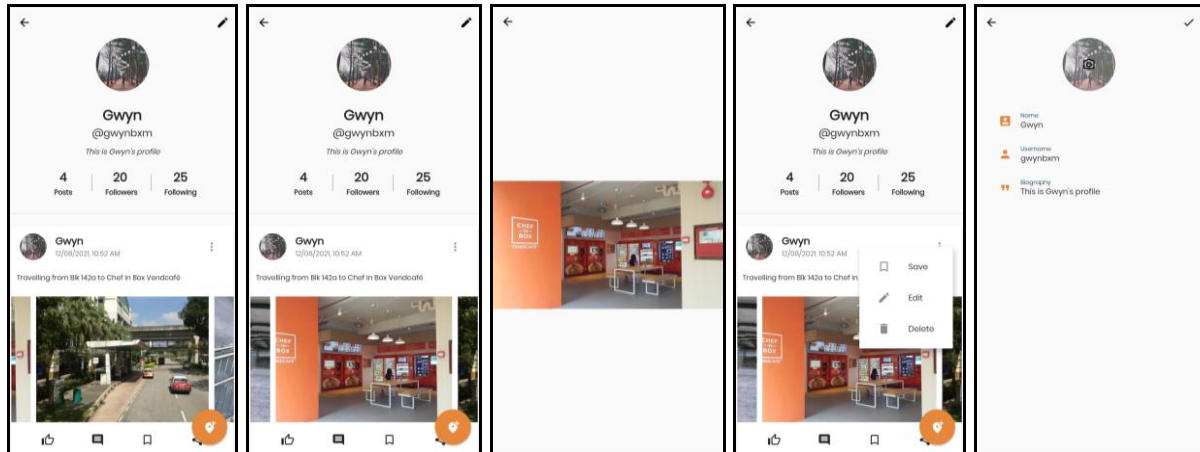


Figure 22: Edit Profile and View Posts

## 6. Testing

### 6.1.Black-Box Testing

Black-box testing [26] is a software testing technique that is used to test the application functionality from the perspective of an external or end-user. This determines how the system will respond to users' expected and unexpected actions. This test focuses on the input data that is loaded into the application as well as the desired output.

### 6.1.1. Sign Up

<b>Test Case No:</b>	<b>Test Title:</b>	User sign up using email address and password		
<b>N001</b>	<b>Test Priority:</b>	High		
<b>Preconditions:</b>	User have to own an account on Nearbyou application			
<b>Description:</b>	This test case consists of black-box testing for registering new Nearbyou account			
<b>Test Steps</b>	<b>Test Data</b>	<b>Expected Results</b>	<b>Actual Results</b>	<b>Status</b>
User enters all input fields with valid email address and password	Email address: <a href="mailto:gbxm.ntu@gmail.com">gbxm.ntu@gmail.com</a> Password: pTrW2_#wQn	System will display successful registration message and stores into database	Display pop-up dialog on successful registration of account and profile created in database	Pass
User enters all input fields with invalid or existing email address and valid password	Email address: <a href="mailto:gywnbxm@gmail.com">gywnbxm@gmail.com</a> Password: gPq8uO\$2H	System will display “existing account found” message and prompts user to sign in with the email or re-enter a new email address	Display pop-up dialog on existing account found and user selects either sign in or cancel pop-up dialog to re-enter a new email address	Pass
User enters invalid email address and password	Email address: Gblalala Password: what	System will display “email address and password is invalid” error message	Error message is shown on each field indicating that email address and password are invalid	Pass
User enters all input fields with valid email address and password but failed to confirm password	Email address: <a href="mailto:gbxm.ntu@gmail.com">gbxm.ntu@gmail.com</a> Password: pST0_\$mDpUk	Display error message showing password does not match	Error message is shown indicating that password does not match	Pass
User enters empty input	-	System will display error messages indicating that fields cannot be empty	Error messages are shown on each empty field that fields cannot be empty	Pass

### 6.1.2. Sign In

Test Case No: N002	Test Title:	User sign in using email address and password		
	Test Priority:	High		
Preconditions:	User have to install Nearbyou application			
Description:	This test case consists of black-box testing for authentication using email address and password			
Test Steps	Test Data	Expected Results	Actual Results	Status
User input a valid email address and password with email verified before	Email address: <a href="mailto:gwynbxm@gmail.com">gwynbxm@gmail.com</a> Password: pST0_\$mDpUk	System will direct user to home screen	Home screen is displayed	Pass
User input a valid email address and password without verifying email address before signing in	Email address: <a href="mailto:gbxm.ntu@gmail.com">gbxm.ntu@gmail.com</a> Password: pTrW2_#wQn	System will display a message to prompt user to verify email or they may choose to resend verification email	Pop-up dialog is displayed indicating that email has not been verified by the user. Prompts user to send another verification email or verify it before signing in again	Pass
User input an invalid email address and password	Email address: Gblalala Password: what	System will display “email address and password is invalid” error message	Error message is shown indicating that password does not match	Pass
User input empty email address and/or password	-	System will display error messages indicating that fields cannot be empty	Error messages are shown on each empty field that fields cannot be empty	Pass

### 6.1.3. Get Current Location

<b>Test Case No:</b> <b>N003</b>	<b>Test Title:</b>	User allowing or deny current location		
	<b>Test Priority:</b>	High		
<b>Preconditions:</b>	User have to sign in to Nearbyyou			
<b>Description:</b>	This test case consists of black-box testing on the user’s current location			
<b>Test Steps</b>	<b>Test Data</b>	<b>Expected Results</b>	<b>Actual Results</b>	<b>Status</b>
User allow location permission to access user device’s location upon signing in	Click “Allow only while using the app”	System will display user’s current location on the map as a marker	Map is displayed with user current location	Pass
User deny location permission upon signing in	Click “Deny while using the app”	System will display empty location with location disabled	Map is displayed with no markers and location is disabled	Pass
User clicks on MyLocation button to allow location permission to access user device’s location	Click “Allow only while using the app” or “Allow all the time”	System will adjust the camera and updates the map with the new user’s location	Map is displayed with updated current location each time user clicks on the button	Pass



#### 6.1.4. Create Shortcut Route Post

<b>Test Case No:</b>	<b>Test Title:</b>	User create a shortcut route post		
<b>N004</b>	<b>Test Priority:</b>	High		
<b>Preconditions:</b>	User have to sign in to Nearbyou application			
<b>Description:</b>	This test case consists of black-box testing for the creation of shortcut route post			
<b>Test Steps</b>	<b>Test Data</b>	<b>Expected Results</b>	<b>Actual Results</b>	<b>Status</b>
User enters empty description and add no markers	User input blank	System will store as new post but will show pop-up dialogs to ask user whether they confirm to post with empty fields	Pop-up dialog is displayed to warn user on the empty fields they are submitting and stores successfully after they confirm	Pass
User enters empty description and add a marker without no marker details	User input blank description and tap on map to add marker	System will store as new post but will show pop-up dialogs to ask user whether they confirm to post with empty fields	Pop-up dialog is displayed to warn user on the empty fields they are submitting and stores successfully after they confirm	Pass
User enters empty description and add a marker with marker details	User input blank description and tap on map to add marker and tap on the marker to add details	System will store as new post but will show pop-up dialogs to ask user whether they confirm to post with empty fields	Pop-up dialog is displayed to warn user on the empty fields they are submitting and stores successfully after they confirm	Pass
User enters description and add 2 markers, 1 with marker details, 1 without marker details	User input blank description and tap on map to add marker and tap on the marker to add details	System will store as new post but will show pop-up dialogs to ask user whether they confirm to post with empty fields	Pop-up dialog is displayed indicating post created successfully	Pass
User enters description and adds 2 or multiple markers with details	User input blank description and tap on map to add marker and tap on the markers to add details	System will store as new post but will show pop-up dialogs to ask user whether they confirm to post with empty fields	Pop-up dialog is displayed indicating post created successfully	Pass

### 6.1.5. Search Location

Test Case No: N005	Test Title:	User searches for a location		
	Test Priority:	High		
Preconditions:	User have to be signed in to Nearbyou			
Description:	This test case consists of the black box testing on the search function on a specific place name based on the place name or the location			
Test Steps	Test Data	Expected Results	Actual Results	Status
User inputs and search a location name	Keyword: “Hougang mall”	System will display the place on the search results that is has the place name “Hougang” or located at “Hougang”	A list of identical place names are displayed such as place name called “Hougang Mall”, and located at “Hougang Ave 10, Singapore”	Pass
User selects a place name on the search result list	Selects “Hougang 1”	System will display details of “Hougang 1” on the sliding up panel, a red marker placed on the map and nearby post markers are displayed on the map	Details, marker representation and nearby post markers are displayed on the sliding up panel	Pass

### 6.1.6. Edit Profile

Test Case No: N006	Test Title:	User updates their Nearbyou profile		
	Test Priority:	Low		
Preconditions:	User have to be signed in to Nearbyou application			
Description:	This test case consists of black-box testing for updating of user profile			
Test Steps	Test Data	Expected Results	Actual Results	Status
User input all fields	Name: Bong Username: bong Biography: Bong is unique	System will display profile successfully updated and redirects user to profile screen	Pop-up dialog is displayed indicating that profile is saved and updated and profile screen is displayed	Pass
User edit their profile information such as username	Username: gwynbxm	System will display “username has been taken” message	Error message is shown indicating username has been taken, prompting user to re-enter another username	Pass
User input empty username	-	System will display “username cannot be empty” message	Error message is shown indicating that username cannot be empty	Pass

## 6.2.White-Box Testing

White-box testing [27] is another software testing technique used to verify the application's underlying structure. While tracing through the code, this will identify potential design flaws. This test use control flow testing to identify all possible execution paths and generates path test cases by analyzing the control flow graph generated to represent the overall flow of the application.

### 6.2.1. Sign Up

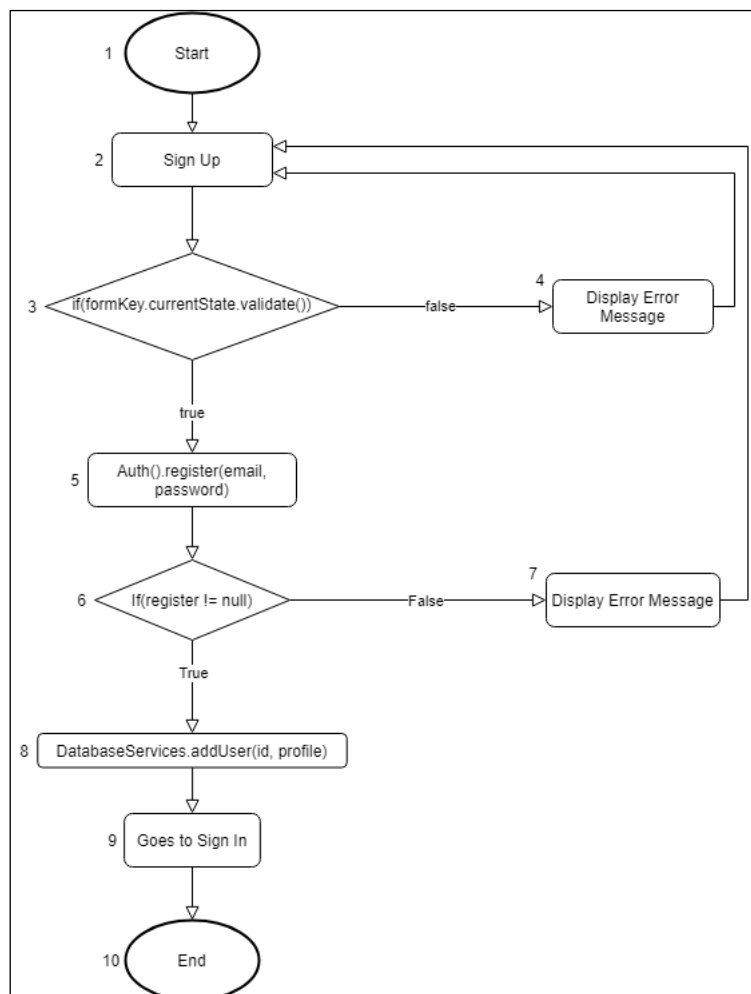


Figure 23: Sign Up Control Flow Diagram

Basic Path	Expected Result	Actual Result
1,2,3,5,6,8,9,10	User signed up successfully and proceeds to sign in screen.	Pass
1,2,3,4,2	Form unable to validate and error message is shown.	Pass
1,2,3,5,6,7,2	Form able to validate but authentication failed and error message is shown.	Pass

### 6.2.2. Sign In

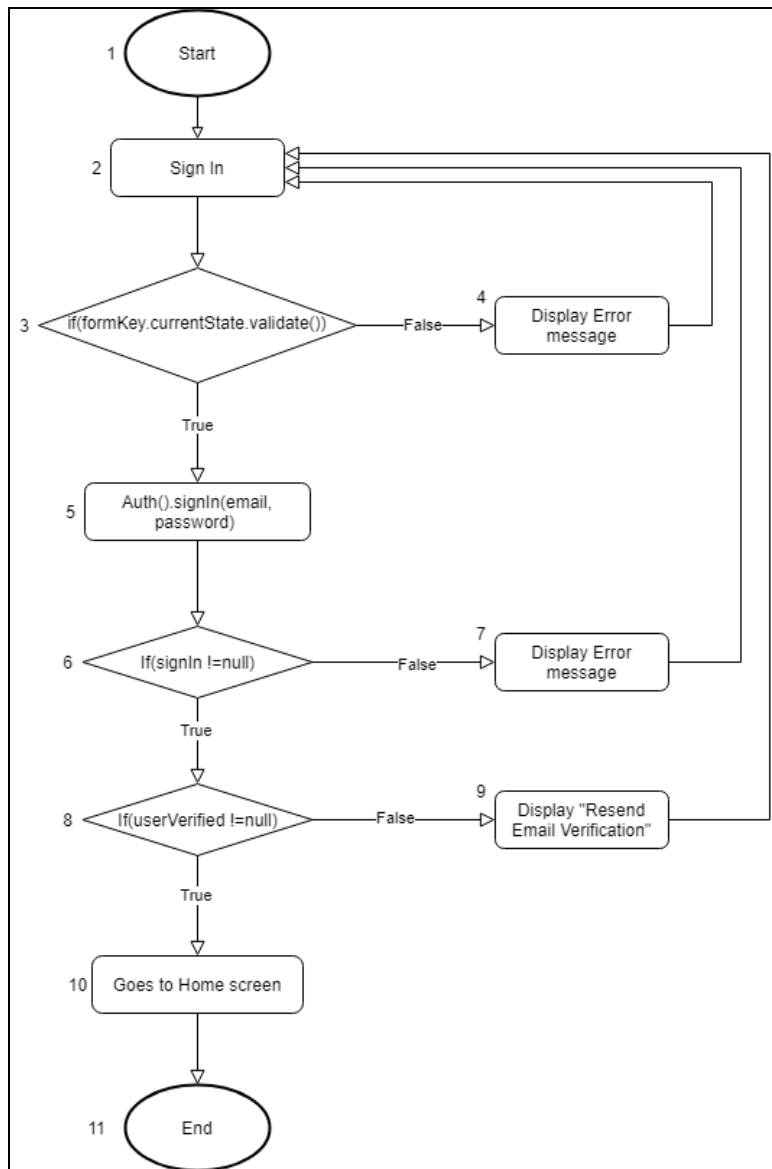


Figure 24: Sign In Control Flow Diagram

Basic Path	Expected Result	Actual Result
1,2,3,5,6,8,10,11	User signs in successfully and redirected to Home screen	Pass
1,2,3,4,2	Form unable to validate. Error message is shown.	Pass
1,2,3,5,6,7,2	Form able to validate but authentication failed. Error message is shown.	Pass
1,2,3,5,6,8,9,2	Form able to validate and authenticate but email address not verified. Message is shown.	Pass

## 6.2.4. Create Shortcut Route Post

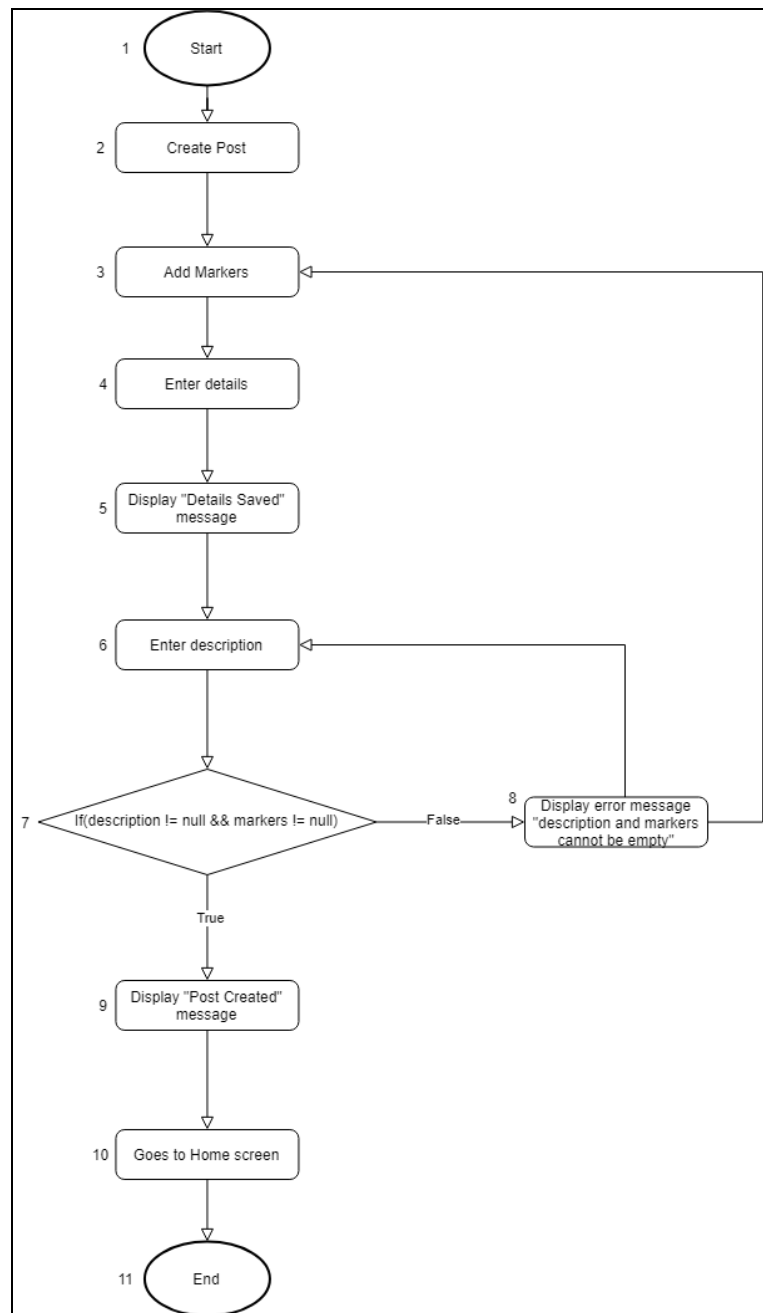


Figure 25: Create Shortcut Route Post Control Flow Diagram

Basic Path	Expected Result	Actual Result
1,2,3,4,5,6,7,9,10,11	Post created successfully and proceeds to home screen	Pass
1,2,3,4,5,6,7,8,6	Description was blank. Error message is shown.	Pass
1,2,3,4,5,6,7,8,3	Markers were not added. Error message is shown	Pass

## 6.2.5. Edit Profile

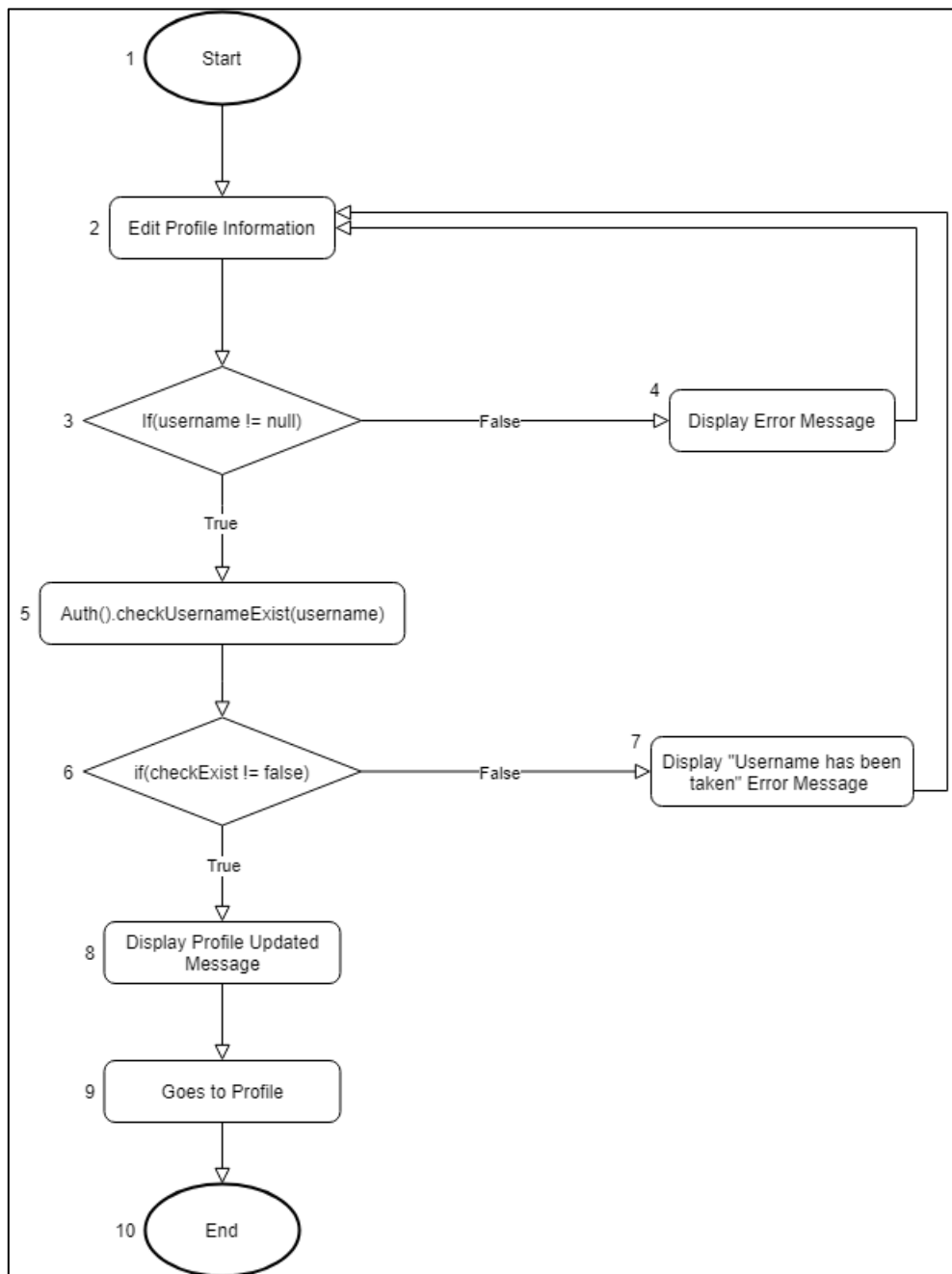


Figure 26: Edit Profile Control Flow Diagram

Basic Path	Expected Result	Actual Result
1,2,3,5,6,8,9,10	Profile updated successfully and proceeds back to profile screen.	Pass
1,2,3,4,2	Form is unable to validate and error message is shown	Pass
1,2,3,5,6,7,2	Form able to validate but checking of duplicated username found. Error message is shown.	Pass

## 7. Conclusion & Future Implementation

Many people are familiar with the term "shortcut", which implies "a route more direct than the one ordinarily take" as well as "a method or means of doing something more directly and quickly than and often not so thoroughly as by ordinary procedure". [28] In this project, the main contributing factors of shortcut routes are simple to understand, short and fast walking distance.

As a result, Nearbyyou was established to provide alternatives for pedestrians by crowdsourcing routes designed by creators. Creators were given full control of contributing innovative, customized, and insightful routes that make navigating less complicated than normal with the aid of the community. It also enhances the efficiency and reduces the amount of time spent locating a location since Nearbyyou provides clear directions and information for consumers to follow.

Therefore, the application implemented supports pedestrians or travellers with walking navigation difficulties. Finally, the following are some future implementation that might be added to the project:

1. Due to the limitations of iOS technical tools needed for development, Nearbyyou is now only available for Android users. Thus, future development on this project may include extending its capabilities to iOS users to reach a larger audience.
2. To aid in day-to-day activities and more advanced navigation, this project may incorporate functionalities such as encouraging creators to recommend transportation modes or other amenities required for locating a location. Nearbyyou now locates only nearby places whereas, but by adding these capabilities, this application may be used for a broader range of purposes.
3. Nearbyyou is now focused on the context of the Singapore map and individuals who live in or visit Singapore. Hence, another potential future implementation could be to expand to the global audience, so that both locals and international visitors to the country can contribute shortcut routes to the Nearbyyou community. This approach provides assistance to foreigners who may be unfamiliar with navigating the country.



## References

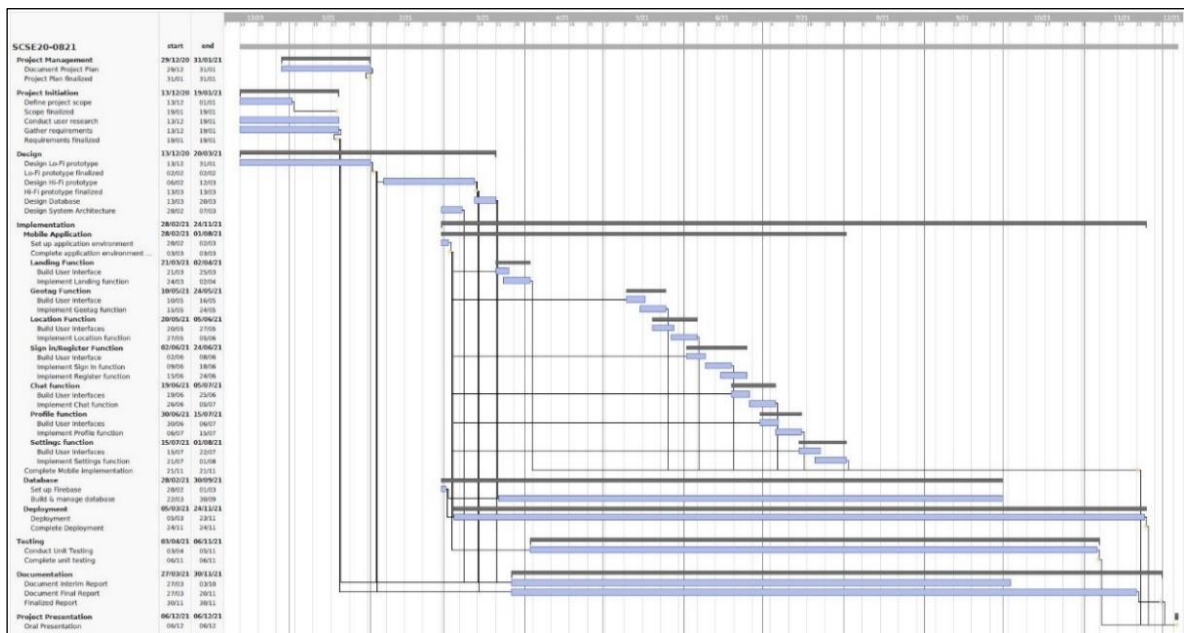
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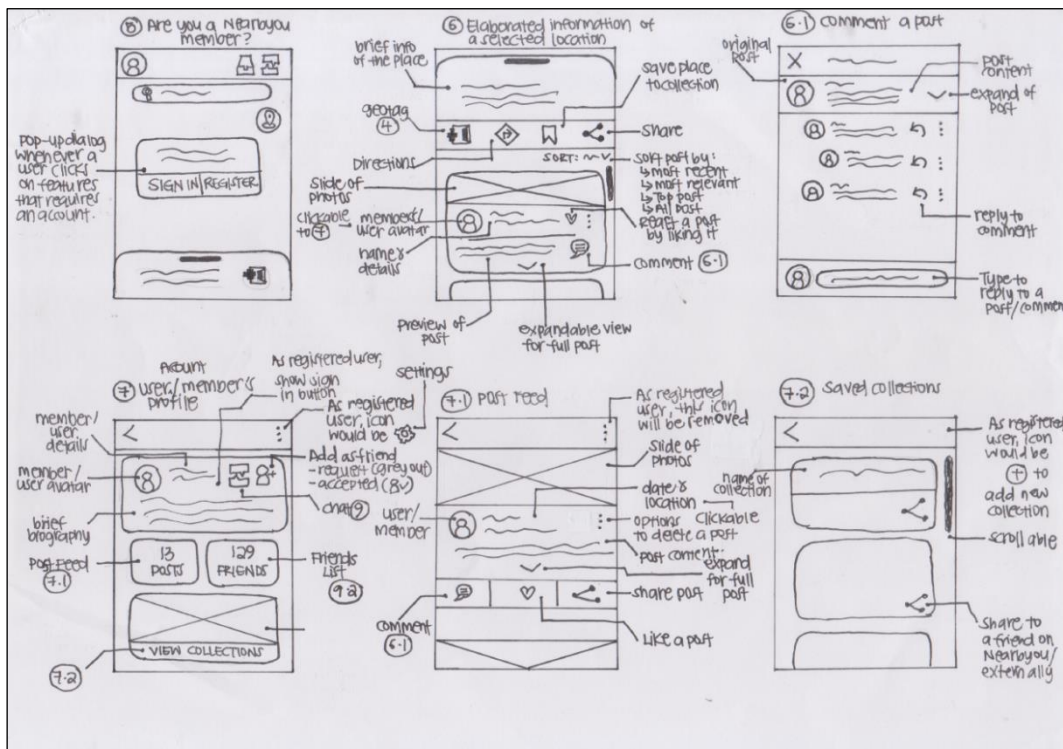
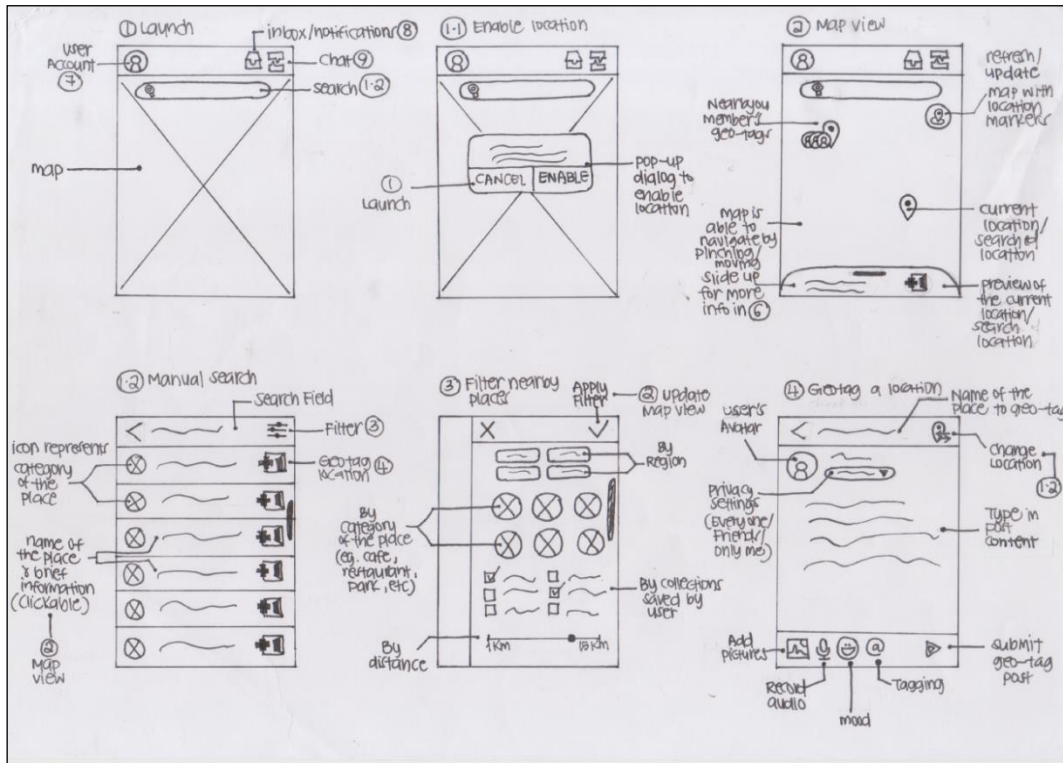
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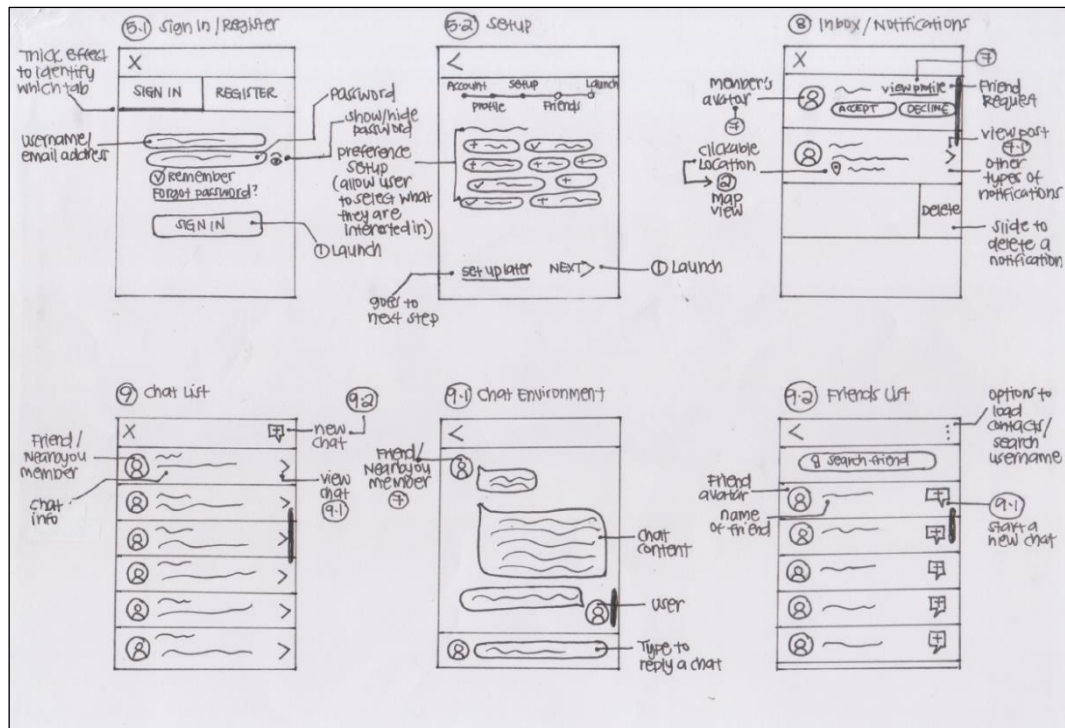
# Appendix

## Appendix A – Project Schedule



## Appendix B – Lo-Fidelity Wireframe







## Appendix C – High-Fidelity Mock-Ups

