Software Requirements Specification

for

Report ITT

Version 1.2

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12/12/2021

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1 Introduction

1.1 Purpose

This document provides a description of the software requirements of the ReportITT application, a crowdsourced reporting system for utility companies. It consists of the System Overview, System Architecture, Data Design, Component Design and Human Interface Design.

1.2 Document Conventions/Glossary

API - Application Programming Interface

CSV - Comma Separated Values

GUI - Graphical User Interface

SMS – Short Message Service

TSTT - Telecommunications Services of Trinidad and Tobago

TTEC - Trinidad and Tobago Electricity Commission

WASA - Water and Sewerage Authority

1.3 Intended Audience and Reading Suggestions

This document is intended for project supervisors and developers. This document may be useful to operators of the software. Additionally, the document can be used to review specifications of the software for users.

1.4 Product Scope

The ReportITT web application would allow for timestamp, text, image, and GPS tagging of where a fault has occurred by multiple users. The solution also aims to provide statistical reports

of data such as resolve time, performance of each utility or service in resolving faults and quality metrics for assessing the performance of public utilities.

The goals of the product are:

1. To produce a GUI that does the following:
    - Visually show the location of where the fault has occurred.
    - Log the GPS coordinates of where the fault has occurred.
    - Indicates the time at which the fault report was logged.
    - Indicates the time at which the fault was resolved.
    - Allow for customer data, such as text and camera captured images, describing the problem.
2. To manage all fault data such that:
    - Statistical reports can be generally on a weekly, fortnight, monthly and yearly basis
    - The resolve time for each type of fault that was reported can be calculated
    - The performance of the utility companies can be assessed using quality indicators.
3. Automatically detect and discard false reports.

2 Overall Description

2.1 Product Perspective

Public utility companies in Trinidad and Tobago typically depend on customer reports to indicate and locate when and where a problem has occurred. In addition, utility companies do not share data with each other, which poses problems with respect to coordination of work and repair efforts. This typically results in excess downtimes, wasted resources, and frustrated customers.

ReportITT is a website designed to crowdsource trouble reports to utility companies in Trinidad and Tobago. Additionally, the application would facilitate the sharing of reported fault data amongst other utility companies, which would allow for better coordination amongst these utility companies. The ReportITT website would allow for both the public and utility companies to use the application, as well as generate statistical reports.

2.2 Product Functions

The product functions differ based on the user organisation. The intended organisations are Public, TTEC, WASA and TSTT. These users from these organisations are assigned the role of admin and have their organisations set based on their email domains. These email domains are used to determine the type of service provider that the admin belongs to.

For General users, the product functions are as follows:

- Connect to the online MySQL Database.
- Allow the user to log in or sign up.
- Allow for OTP verification on sign up.
- Allow users to create a report.
- Accept user input such as location, text, and images.

- Log the time a user creates a report.
- Load all reports onto the map GUI.
- Allow users to view reports.
- Allow users to upvote reports.
- Show the status of the report made (Acknowledged, In-Progress, Resolved).
- Produce email notifications when fault report status has been changed.
- Allow users to tag reports as false.

For TTEC Admin, WASA Admin and TSTT Admin users, the product functions are as follows:

- Connect to the online MySQL Database.
- Allow the user to log in or sign up.
- Assign roles to users based on their email domain.
- Restrict user action based on type of report. For example, if the report has to do with a TTEC fault, only the TTEC Admin can update the status of it.
- Allow users to view reports on the map.
- Control information flow and functionality depending on user role and organisation.
- Allow users to change and update the status of reports.
- Produce email notifications when a fault is reported to their utility company. For example, if a report is made on a broken electrical pole, only the TTEC Admin users would receive notifications.
- Allow users to produce statistical reports of faults reported to their utility company.

2.3 User Classes and Characteristics

The application has several use cases. Each case is represented diagrammatically below.

The general user case has basic access to reporting and viewing other reports made to the system. Additionally, they are a critical factor when discarding reports as the application relies on upvotes and tagging as false mechanisms to discard false reports.

2.3.1 General User (PUB-Class)

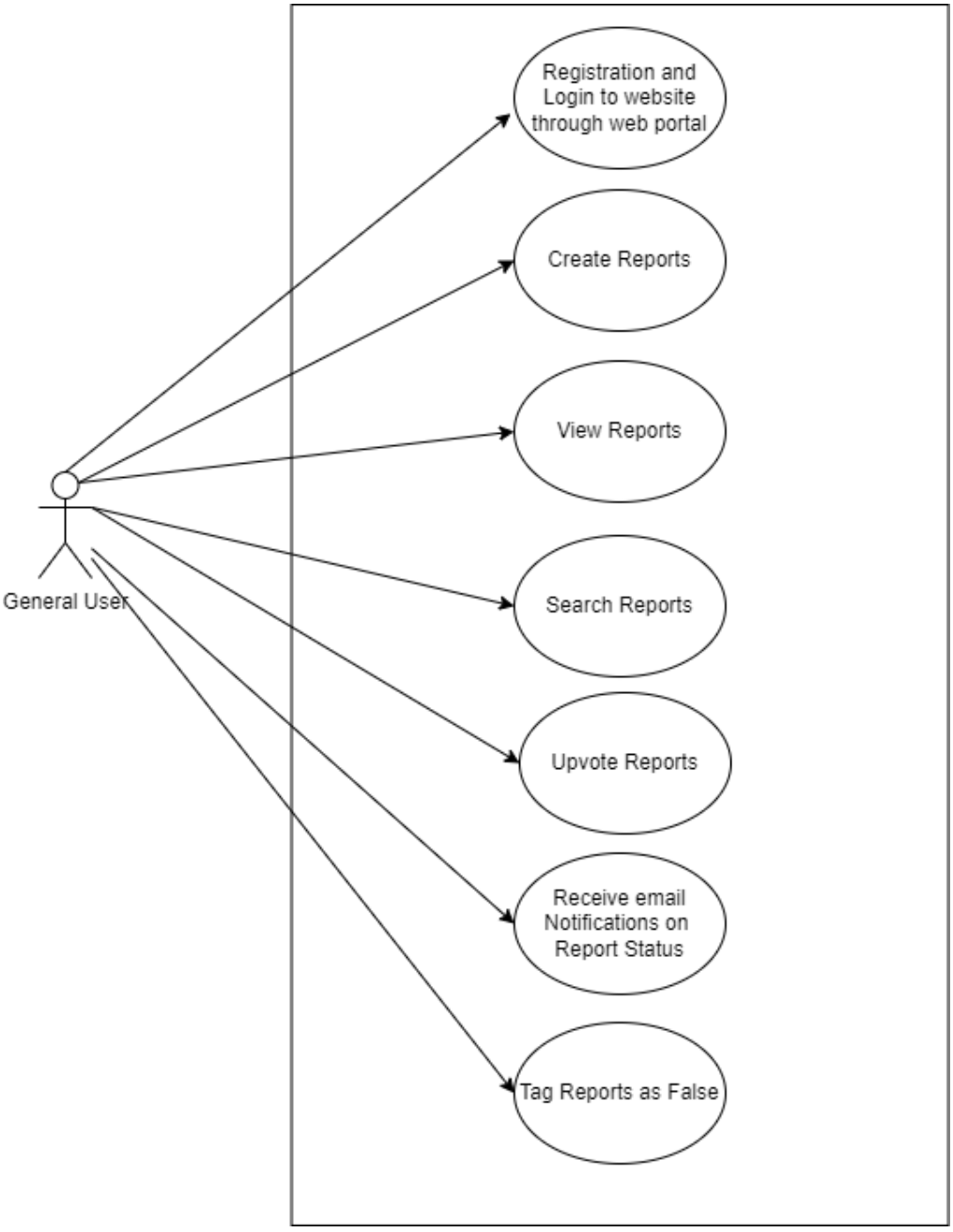

Figure 1 General User Use Case Diagram

2.3.2 Admin Users (SP-Class)

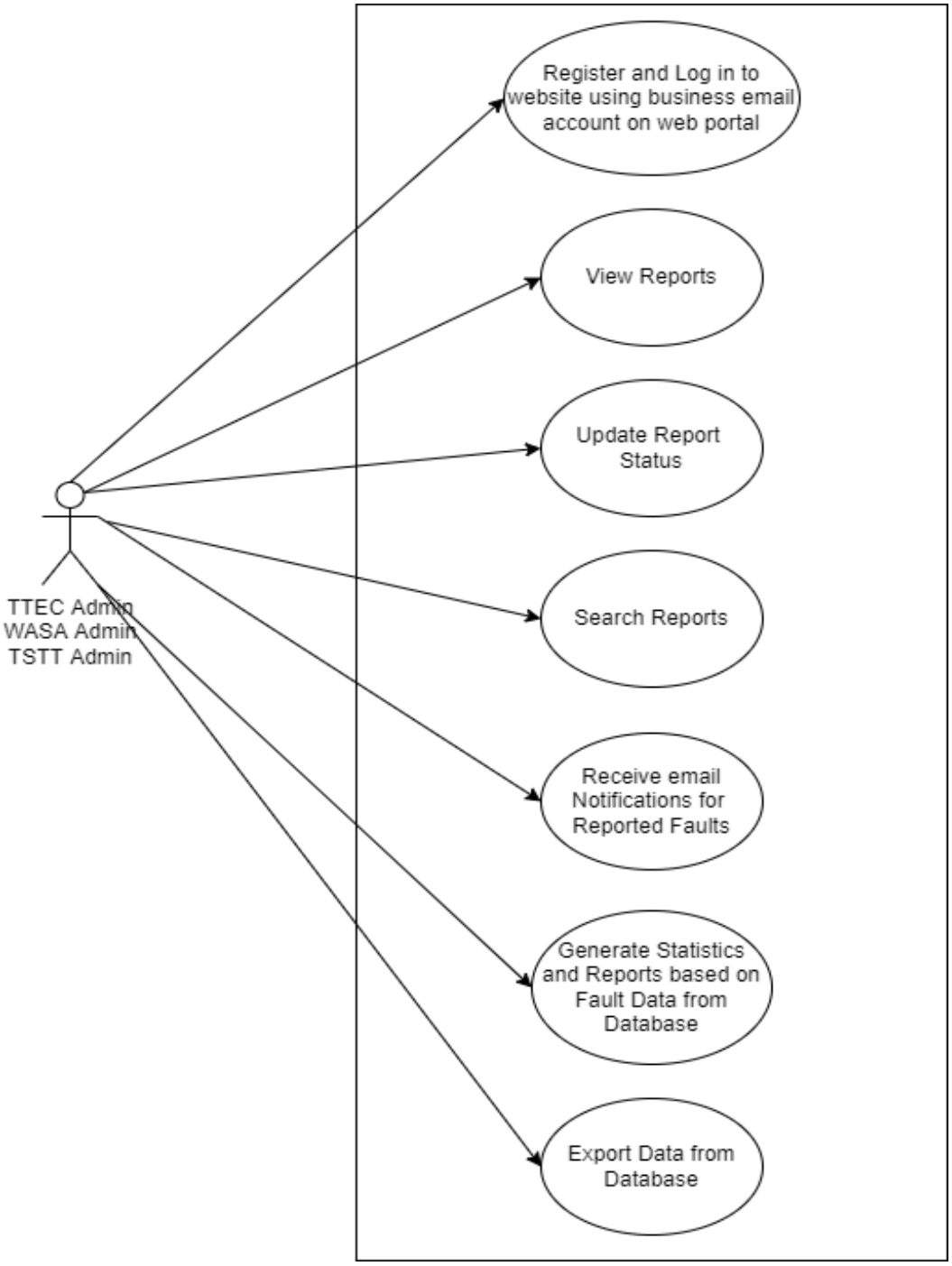

Figure 2 Admin Users Use Case Diagram. Note that the admin users are also service providers belonging to one of the organisations.

The TTEC Admin, TSTT Admin and WASA Admin users can only access and generate statistics on faults reported to their respective companies. Additionally, they can only modify report statuses of reports made to their respective companies.

2.3.3 System Developer (DEV)

The System Developer use case is used in development as well as maintenance and testing purposes.

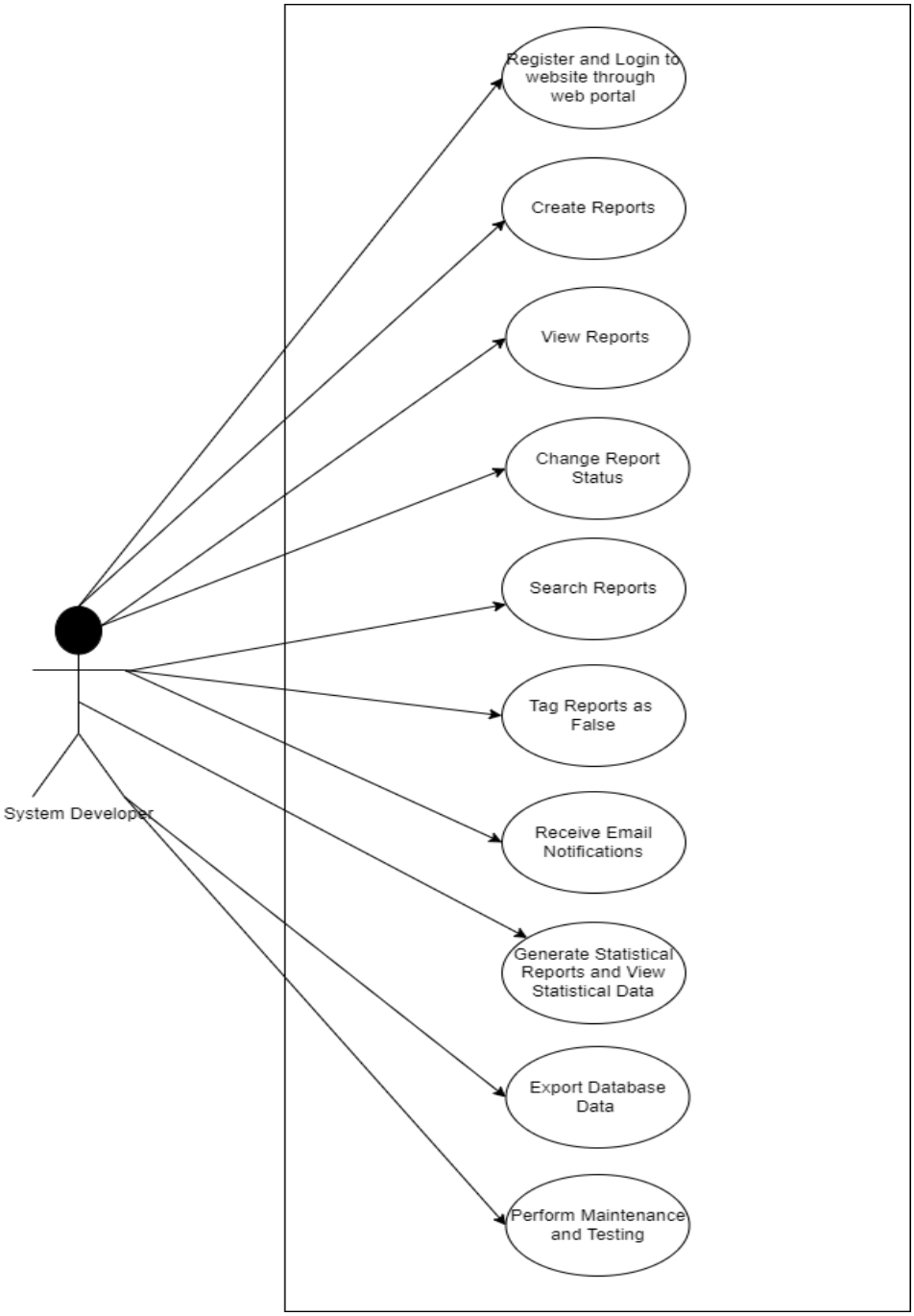

Figure 3 System Developer Use Case Diagram

2.4 Operating Environment

The website will run on web browsers and will be responsive to facilitate mobile phone users with compatible browsers. On smaller screen devices, interactions with the website are similar, except instead of a mouse input the website responds to touch input.

For the backend of the application, a MariaDB relational database would be used. The entire project would be built with the Laravel framework.

The application would also require access to the device's camera and location services and may use Wi-Fi or cellular data to provide functionality if the user is on mobile.

2.5 Design and Implementation Constraints

Factors that may limit the developer's options are:

1. The time allowed for developing the application. This would have influenced choices such as the backend and target platforms such that deadlines could be met.

3 External Interface Requirements

3.1 User Interfaces

3.1.1 Registration

This web page handles the user's login and registration credentials. The registration wireframe is shown in Figure 4. The Login Wireframe is similar, except with email and password fields.

After clicking the "Register" button and registration validation, the user is directed to the Phone Verification page (Figure 5).

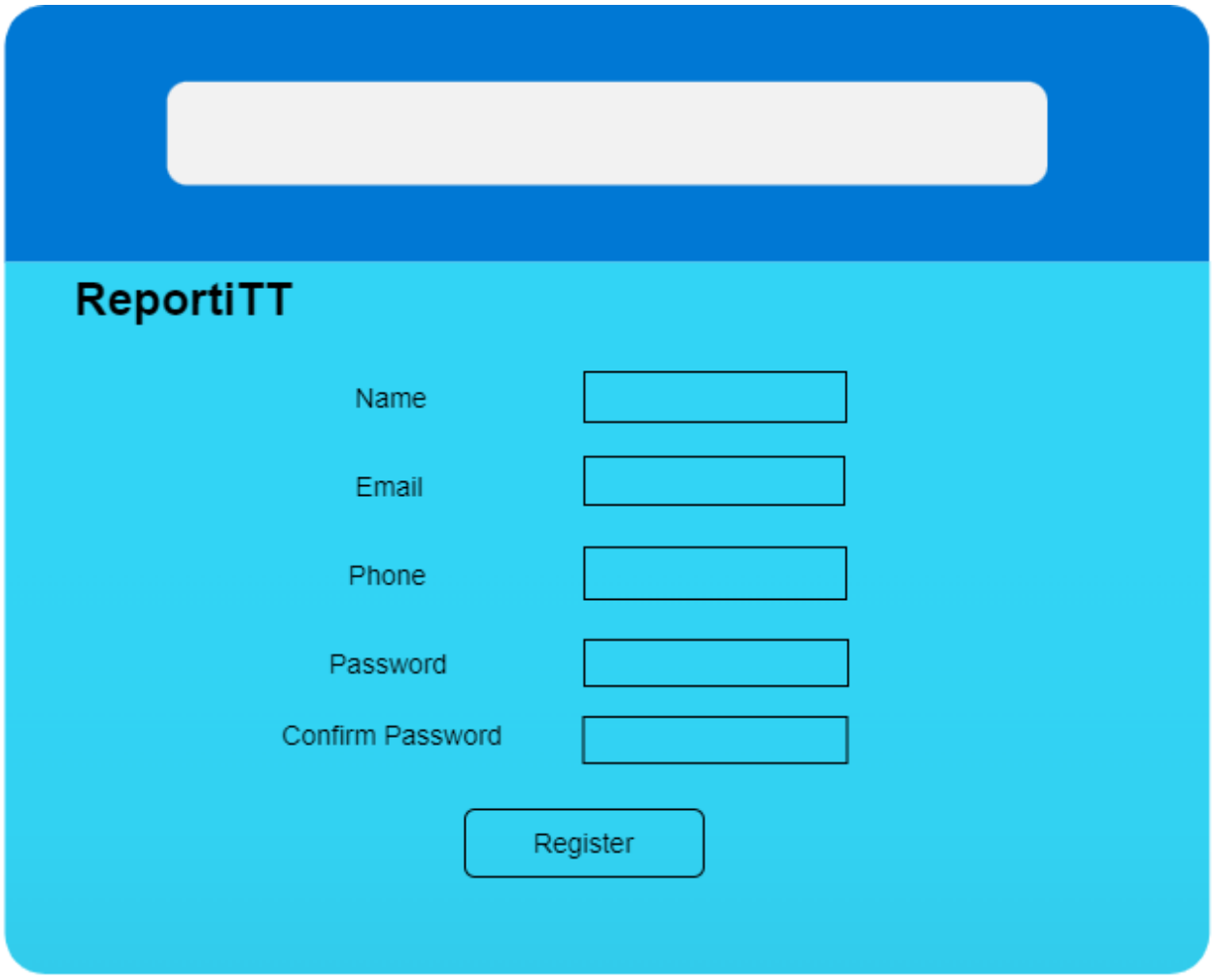

Figure 4 Register Wireframe

3.1.2 Phone Verification Page

This verification page is used to verify users by their phone numbers. Clicking “Resend Code” would reload the page and send a new code to the user’s mobile device via SMS.

After verifying the phone numbers, the users would be redirected to the Verify Email Page (Figure 6).

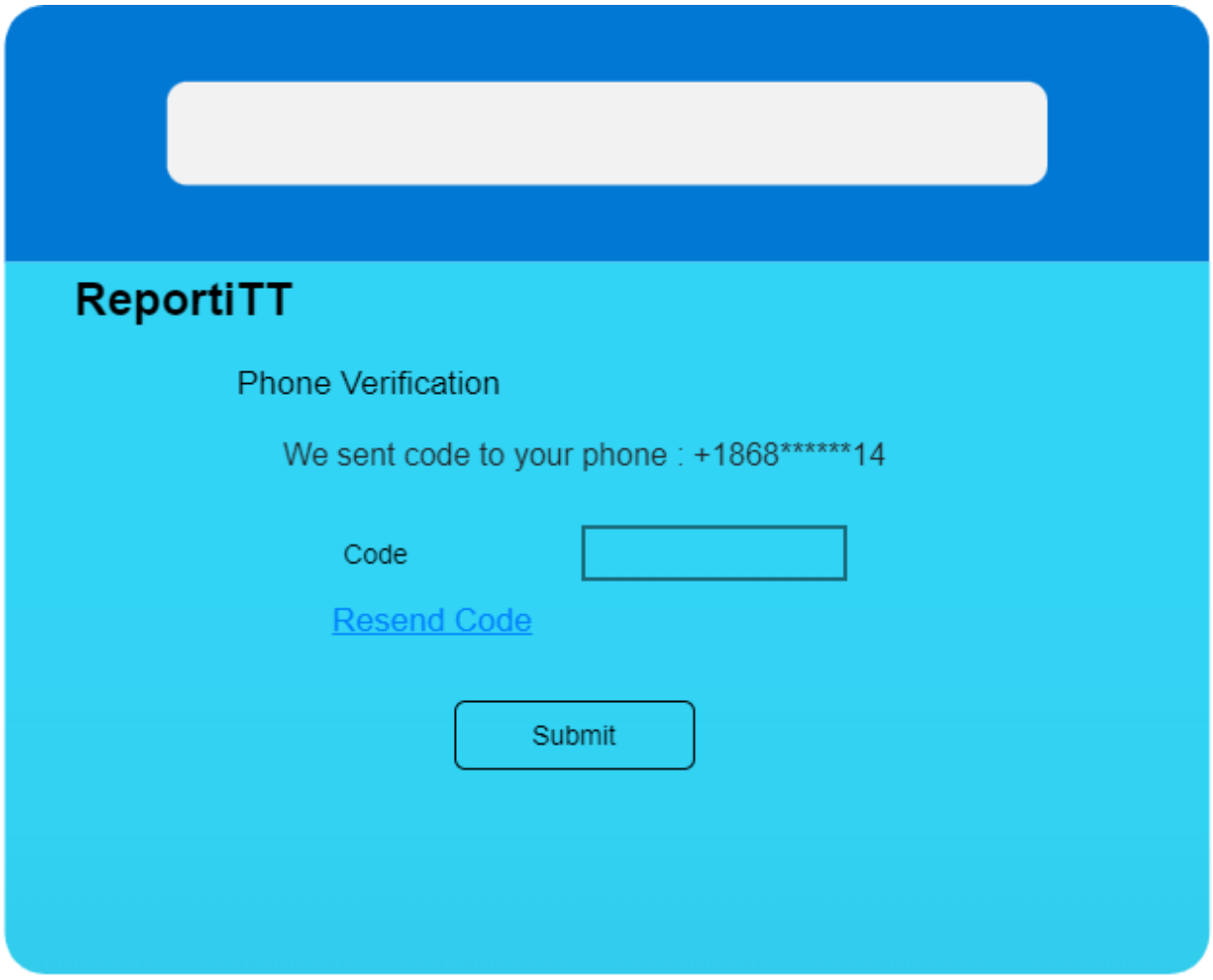

Figure 5 Phone Verification Wireframe

3.1.3 Email Verification

This page prompts the user to check their emails for a link which would verify their email address. Upon successful validation, the user will be redirected to the home page (Figure 7).

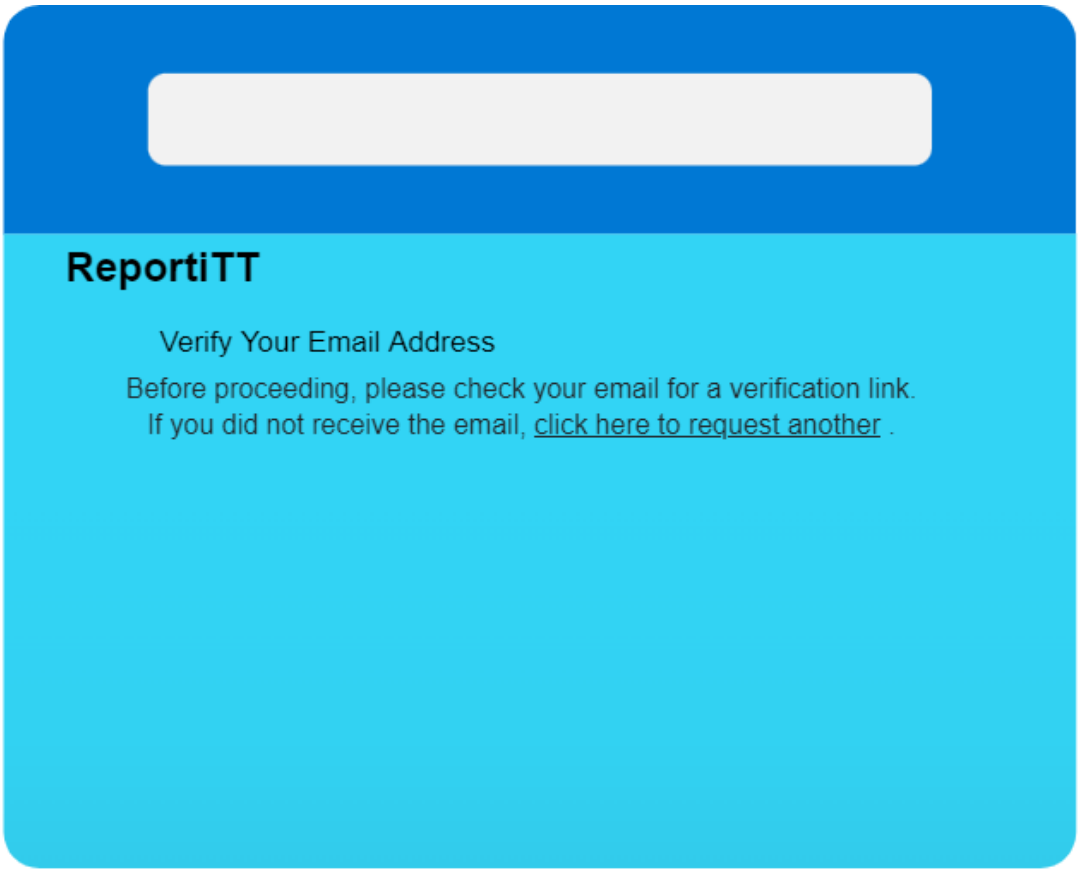

Figure 6 Email Address Verification Wireframe

3.1.4 Home Page

The Home screen or the consists of the map GUI with other user reports, indicated by markers on the map (Figure 7). In this wireframe, there are three report markers:

1. the light bulb marker, which represents a report made to TTEC.
2. the faucet marker, which represents a report made to WASA.
3. the telephone and internet marker, which represents a report made to TSTT.

There are other icons on the map such as the filter icon on the top right, which allows the user to filter the reports, and zoom controls on the top left, which allows the user to zoom into the map. Additionally, there is a navigation bar with options to navigate to the other web pages of the website. This navigation bar is present on all web pages. The other wireframes may have excluded it as the layout of page elements was more important than reproducing the navigation bar.

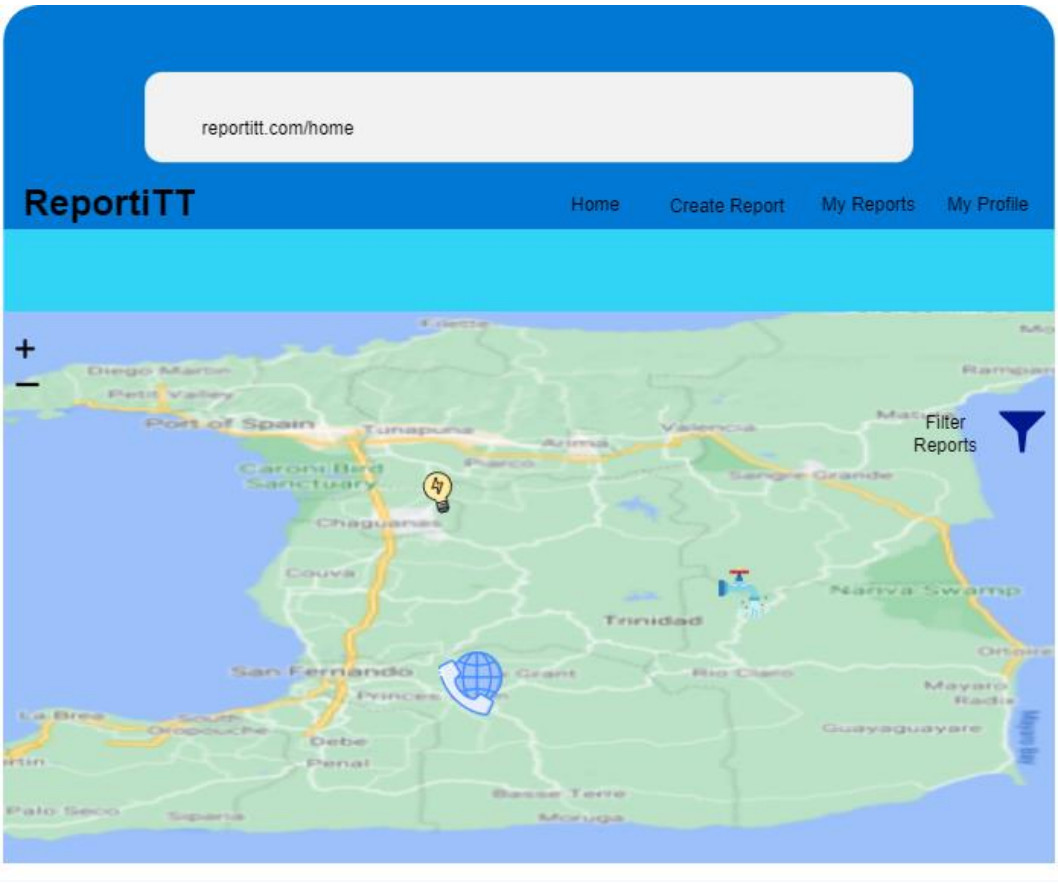

Figure 7 Home Page Wireframe

3.1.5 Adding Reports

Clicking the “Create Report” button on the navigation bar would redirect the user to a web page (Figure 8) with a form for creating a report. The form contains text fields such as “Service Provider”, “Type of Issue”, and “Issue Details”, along with a map for selecting the location of the fault. Additionally, there is a button that allows users to attach images to the form. Furthermore, the map on the form does not contain filters, however, contains zoom controls as well as a geolocation button which can be used to get the location of the user’s device. The map coordinates selected are displayed in the “Latitude” and “Longitude” text boxes below the map.

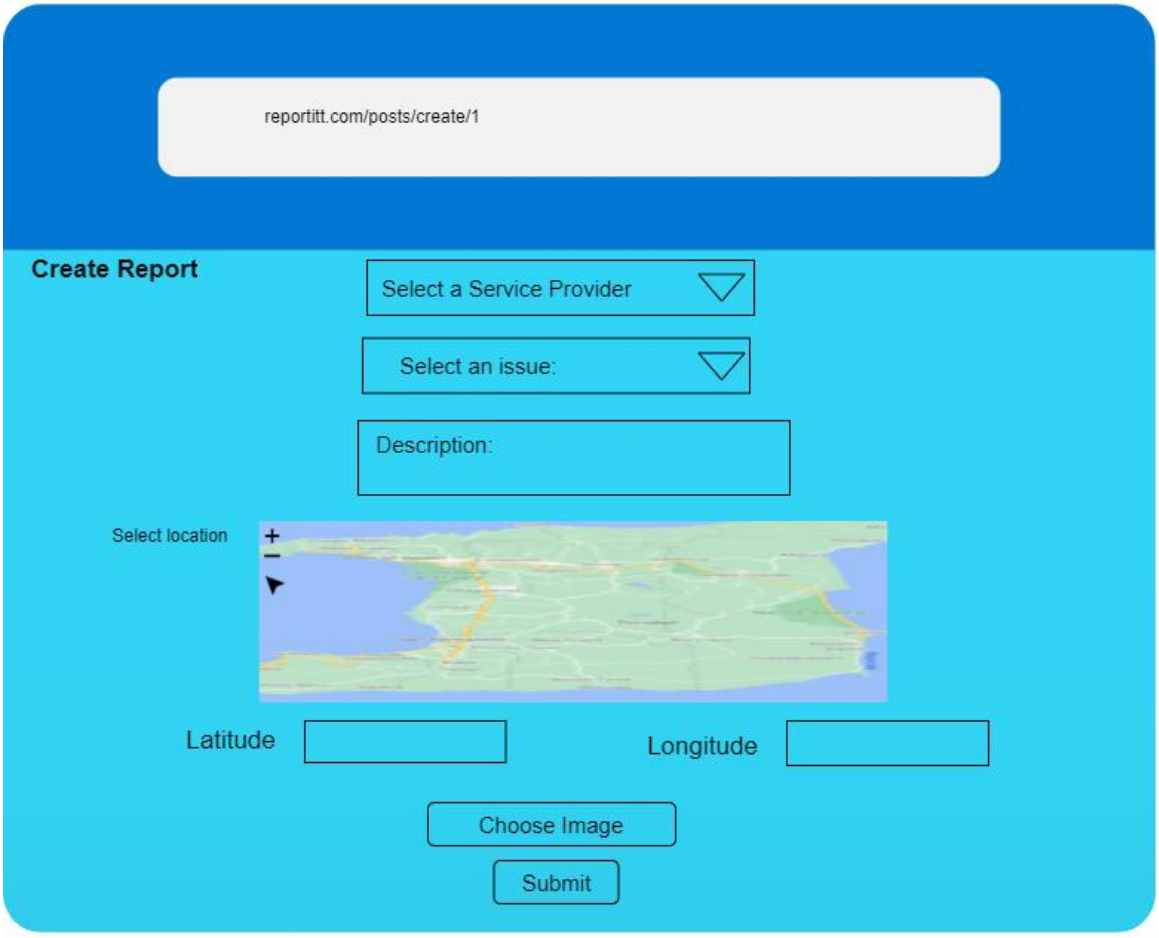

Figure 8 Create Report Page Wireframe

3.1.6 Viewing Reports

3.1.7 General Users

There are several ways a general user can view reports. Clicking “My Reports” on the navigation bar would take the user to a web page which displays their submitted reports in a table with search capabilities as well as sortable columns (Figure 9).

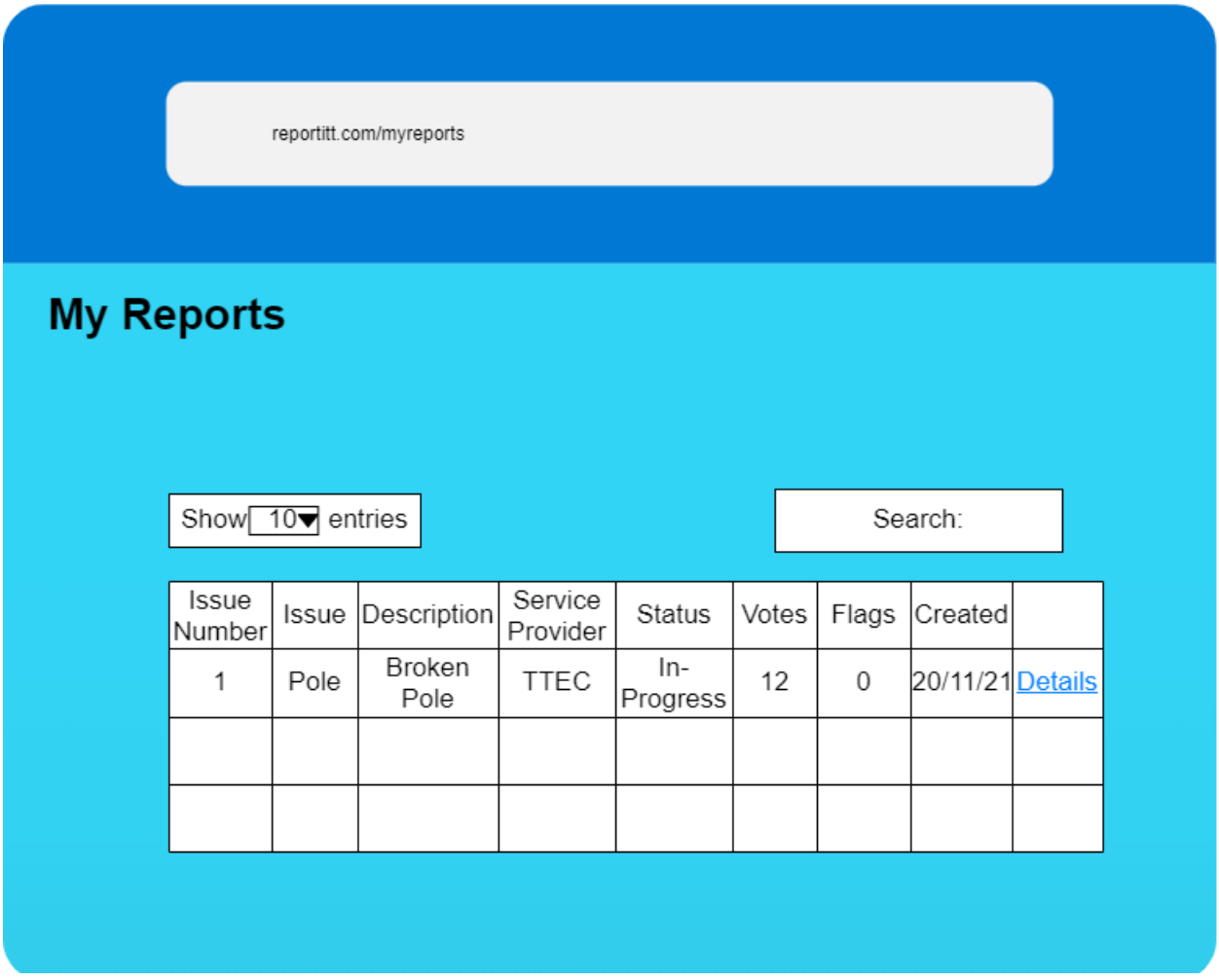

Figure 9 My Reports (General User) Wireframe

This page shows the summary of the reports submitted by the user. Additionally, users can view a summary of report details on map markers by clicking or tapping the map marker (Figure

10). Clicking on the “Details” link would direct a user to a web page containing the report page (Figure 11).

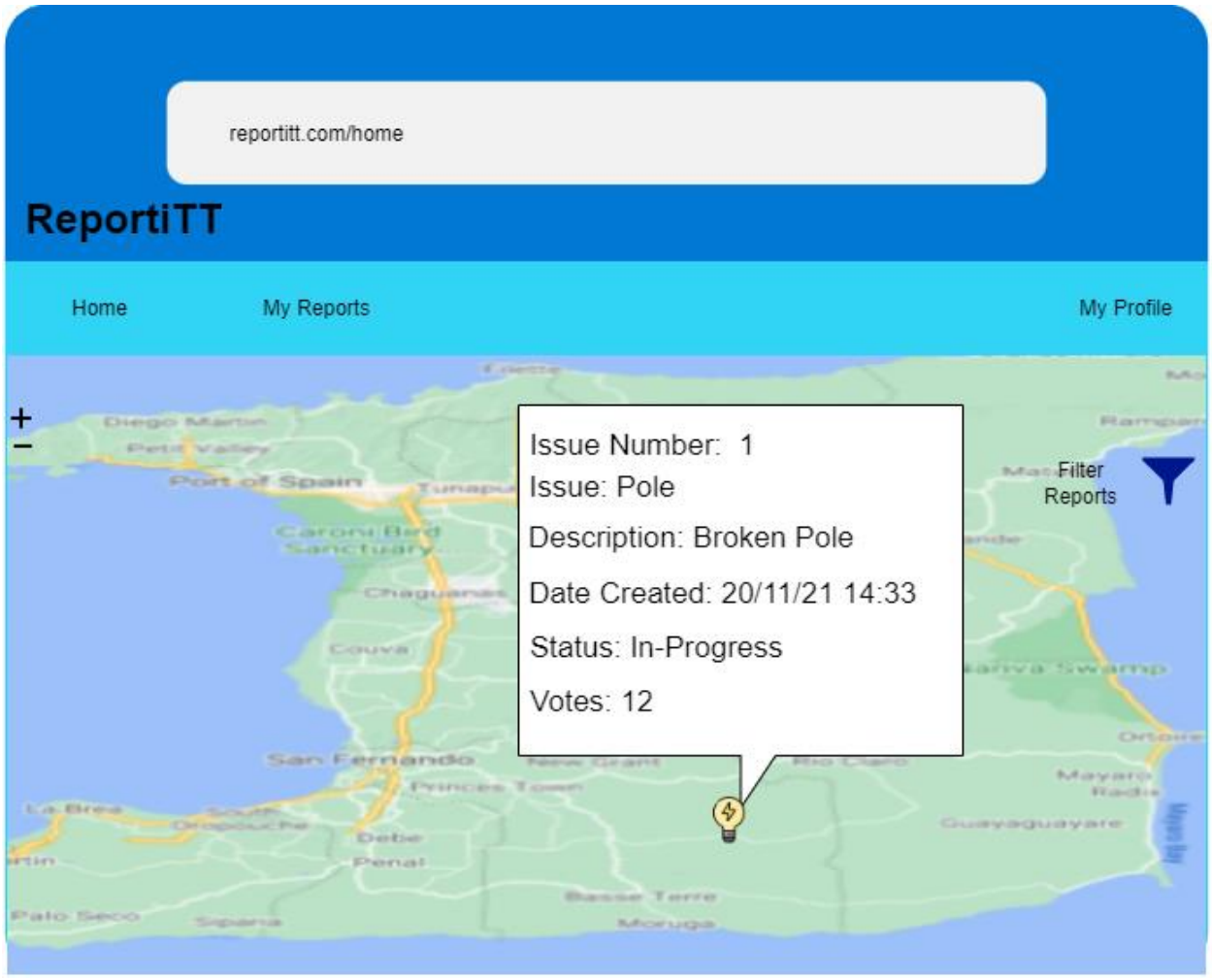

Figure 10 Report Summary on Map Marker Wireframe (All Users)

For the full report details, the users can double click or double tap on the map marker and would be redirected to a web page with the report details.

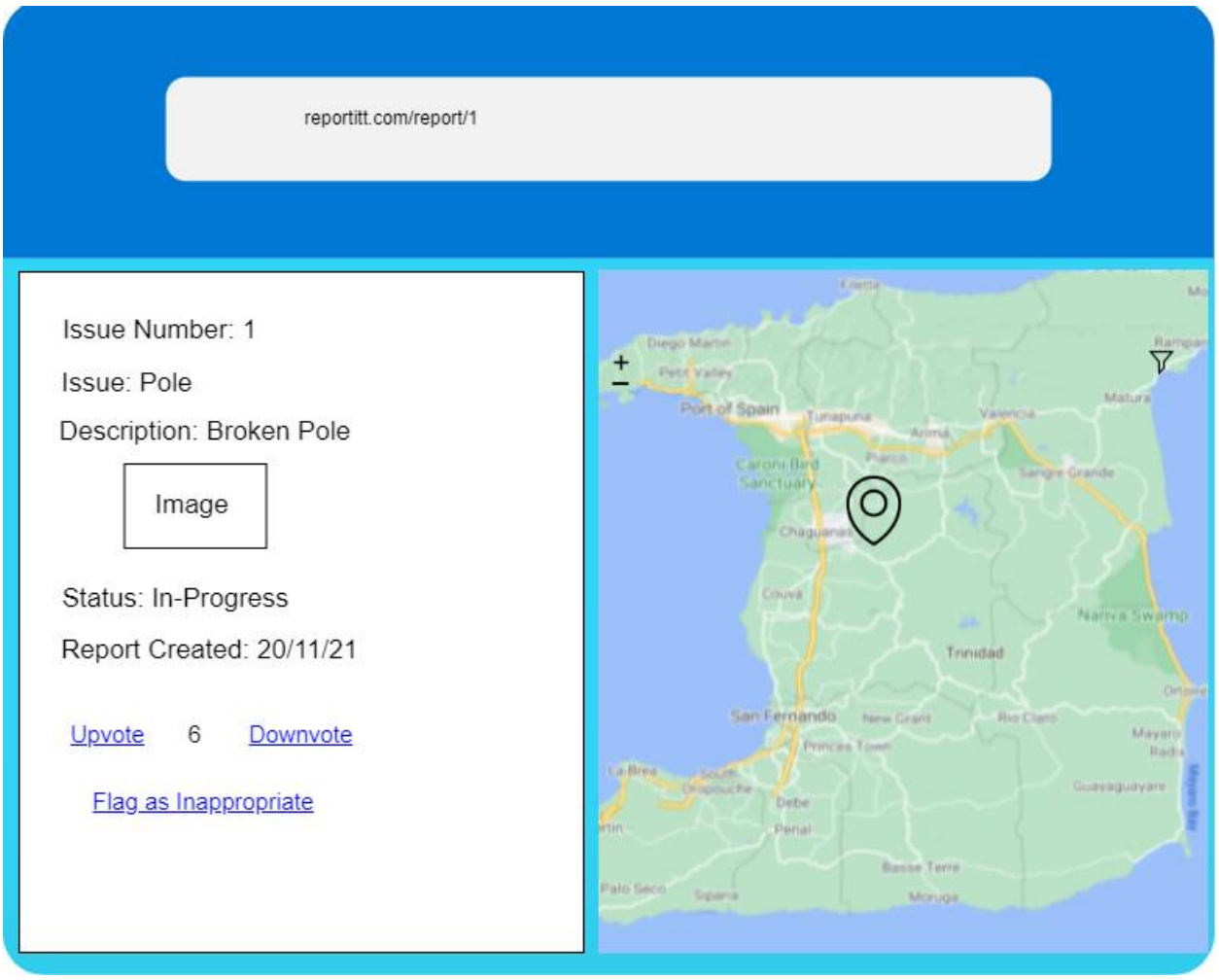

Figure 11 Full Report Details (General Users)

Service Providers and Admin Users

The service provider users can view the reports like general users; however, they can see more details than the general users. The details from the map marker are the same for service providers as it is for general users (figure 10).

The “My Reports” page for admin users contains an additional filter for setting a date range for the reports to be displayed (Figure 12). The filter applies a minimum date and maximum date filter to the table and displays the result accordingly. Additionally, the service provider users only see reports that have been created and submitted to their respective organisations.

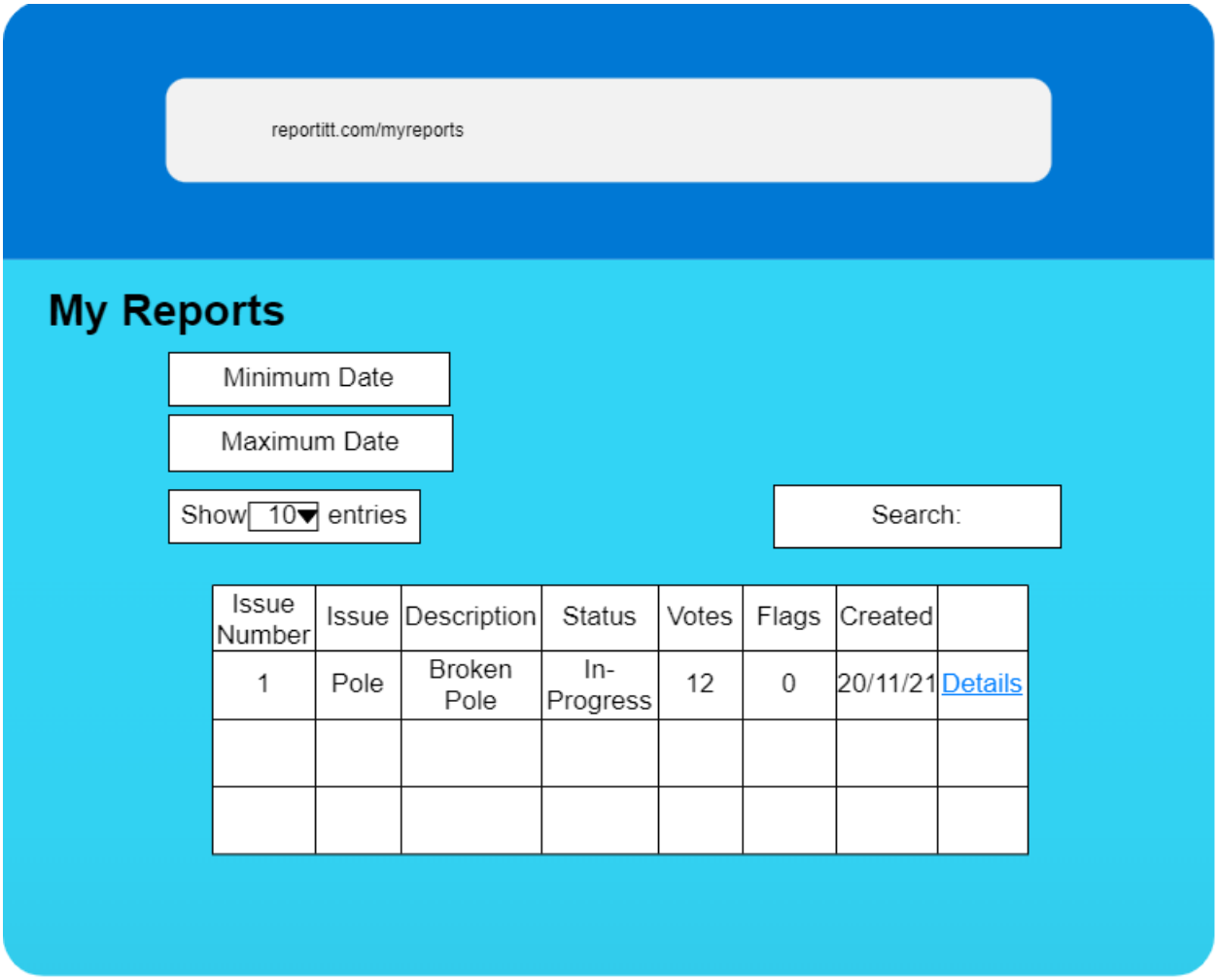

Figure 12 My Reports (Admin/Service Providers) Wireframe

When viewing specific reports, only administrators belonging to the organisation/service provider that the report is submitted to can make modifications on the report status as works are completed (Figure 13).

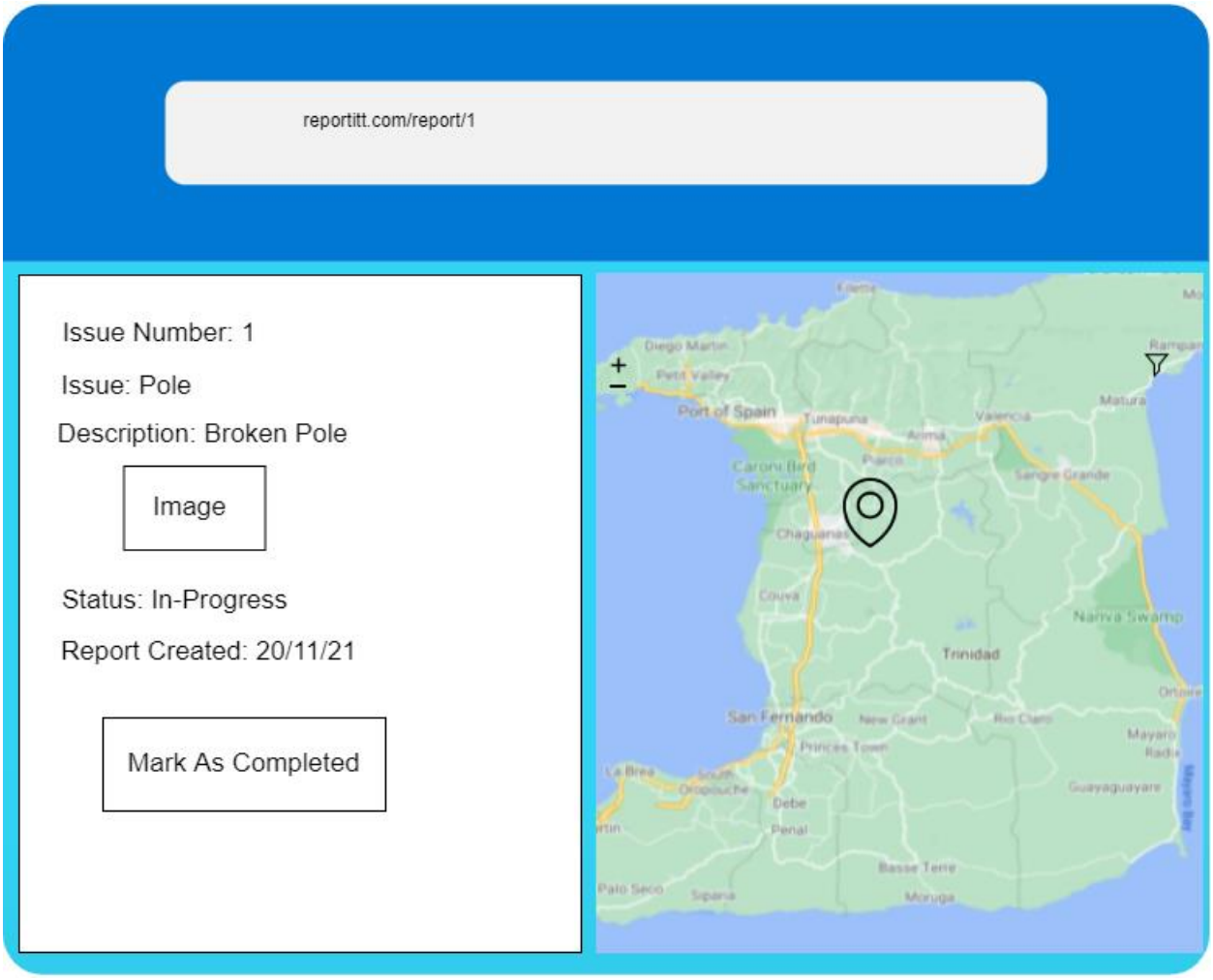

Figure 13 Full Report Details (Admin/Service Provider) Wireframe

3.1.8 Statistics

This tab is in the navigation bar, visible only to the service provider users. This tab displays statistics and graphs to the admin users (Figure 14).

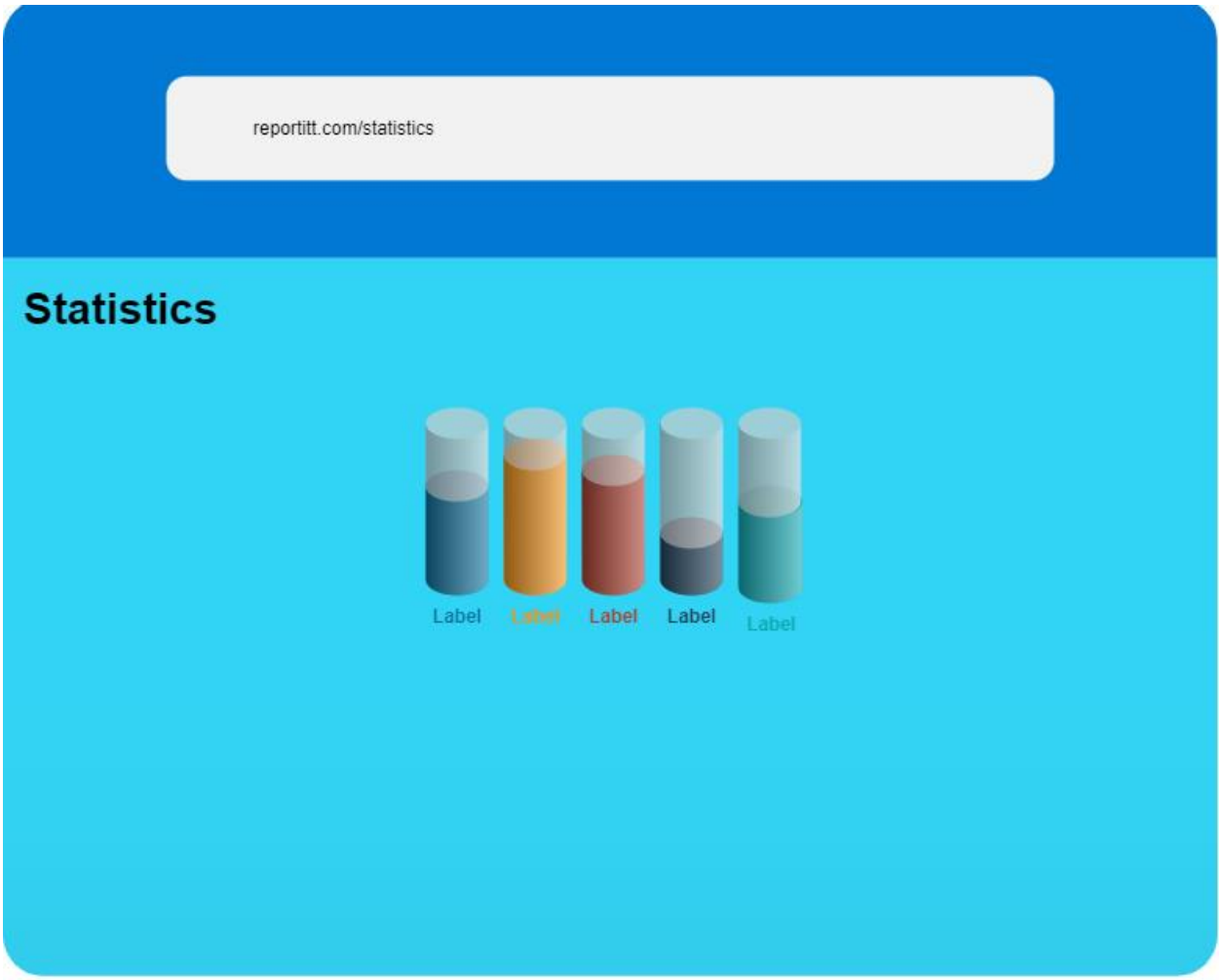

Figure 14 Statistics Wireframe

3.1.9 My Profile

This is available to all users as it may be necessary to change things like the email address and phone number of the user.

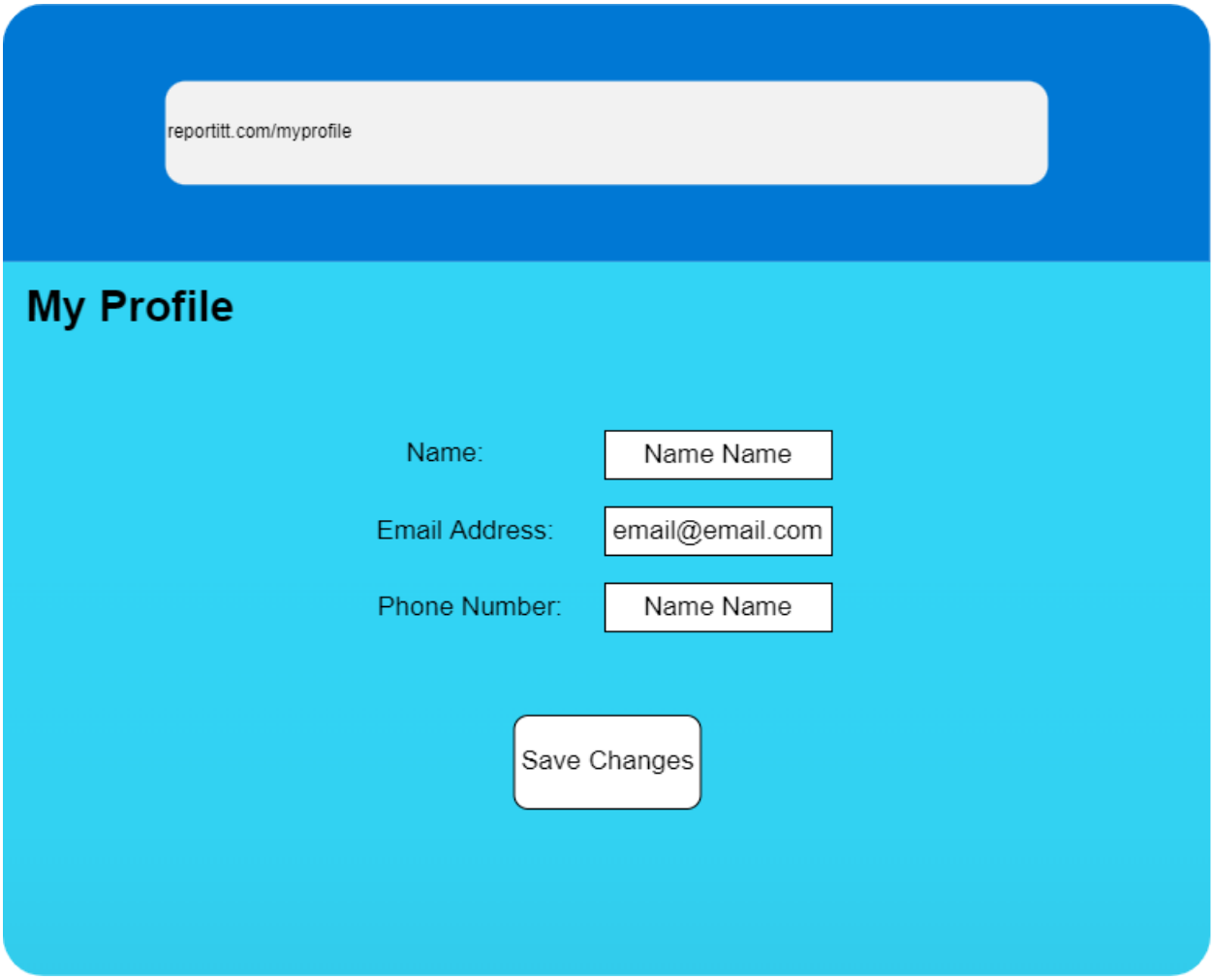

Figure 15 The Profile Edit Page Wireframe

3.2 Hardware Interfaces

The application requires the use of a web browser through a compatible device. These may include tablets, smartphones, and personal computers (desktops and laptops). The application would make use of the Wi-Fi and GPS chips on smartphones and handheld devices.

3.3 Software Interfaces

The web application requires a web browser to use. The web application shall support at least Google Chrome, Mozilla Firefox and Safari web browsers. The application shall be coded using

the Laravel framework. This framework also allows for the development of both frontend and backend. The frontend implementation would be achieved with HTML, CSS, JavaScript and the Laravel Blade Templating Engine. The backend would be implemented using PHP and Laravel's Eloquent, an object-relational mapper. This would allow the application to interact with the MariaDB database.

3.4 Communications Interfaces

The communication between the user and the application would be facilitated through the graphical user interface of the application. The communication between the client application and server would be handled by the object-relational mapper provided by the Laravel framework. The user's input would be uploaded over an internet connection, achieved through Wi-Fi, ethernet or mobile data.

4 System Features

4.1 Creating Reports

4.1.1 Description and Priority

This feature allows the user to create, and upload reports. This involves the GPS location, image, time logging and text entry of the user. This is a High Priority feature.

4.1.2 Stimulus/Response Sequences

To stimulate this behaviour, the user must tap on the "Add Report" button. This would present the user with a form to fill out with the report details. Depending on the fault type chosen, the user would be presented with different options on the drop-down menu to select. The inputs permitted are Location, Images and Text, with both Location and Text input being mandatory. On report submission, the database would be updated, and the map GUI would be refreshed.

4.1.3 Functional Requirements

Table 1 Functional Requirements Related to the Create Reports System Feature

Requirement Number	Description
REQ-1.0	The web application shall allow the users to input the utility company, type of fault, a description of the fault, the GPS location of the fault and images of the fault using the GUI on the screen of the device and the on-screen keyboard. Images of the fault may be input from the device's gallery or using the device's camera. Location data may be obtained from the device's GPS or through manual user input. This is a mandatory input.
REQ-1.1	The web application shall upload the report to the database when a user submits a report.
REQ-1.2	The web application shall log the time a report was made and upload it to the database.
REQ-1.3	The web application shall reload the map GUI to show the updated report markers.

REQ-1.4	The application shall notify Admin users when a fault report has been made using emails. Only the admins of the utility company which the fault was reported to would receive email notifications.

4.2 Viewing Reports

4.2.1 Description and Priority

This feature enables the user to view reports on the map GUI. This feature is High Priority.

4.2.2 Stimulus/Response Sequences

The user is presented with a user interface containing a map and markers indicating where a fault has occurred. The map markers are updated when a user uploads a report to the database. When a user selects the map marker, the report details are shown on an overlay.

4.2.3 Functional Requirements

Table 2 Functional Requirements Associated with Viewing Reports

Requirement Name	Description
REQ-2.1	The web application shall allow the users to view report markers on a map displayed on the GUI.
REQ-2.2	The web application shall allow users to view the details of the report such as the fault type, text description, images of the fault, time the fault was reported, upvotes on the fault and the status of the report through the GUI on their device browser.
REQ 2.3	The application shall allow users to search through reports which they have created. (This is for general users).

REQ 2.3	The application shall allow the service providers to filter received reports by date and search for reports using a date picker or search bar respectively. (This is for admin and service provider users).

4.3 Upvoting and Tagging Reports

4.3.1 Description and Priority

This feature involves the upvoting of reports. This is a high priority feature.

4.3.2 Stimulus/Response Sequences

When a user views a report, there would be GUI elements relating to upvotes and downvotes. Clicking the respective element may add or remove an upvote from the report.
Another GUI element in the shape of a flag would be displayed for tagging reports as false. clicking this element would allow the report to be flagged as false.

4.3.3 Functional Requirements

Requirement Name	Description
REQ-3.0	The web application shall allow users to upvote a report through the GUI.
REQ-3.1	The web application shall allow users to flag a report as false through the GUI.
REQ-3.2	The web application shall discard reports if their upvote count is less than 5 after 60 minutes the report was made and if it has been flagged as false 5 times.

4.4 Changing Report Status

4.4.1 Description and Priority

This feature is for Admin users, users with the roles “TTEC Admin”, “WASA Admin” or “TSTT Admin”. This feature involves the changing of the status of the report from “acknowledged” to “in-progress” or “resolved”. This is a high priority feature.

4.4.2 Stimulus/Response Sequences

To stimulate this feature, the user must be an admin and select the report from either the markers on the map or from the “My Reports” activity. The feature can be changed by selecting the status from the dropdown menu.

4.4.3 Functional Requirements

Table 3 Functional Requirements Associated with Changing Report Status Feature

Requirement Name	Description
REQ-4.0	The web application shall allow the admin user to change the status of the report by selecting from a dropdown menu.
REQ-4.1	The application shall notify the report creator when a fault status has been changed through email notifications.
REQ-4.2	The application shall notify Service Providers when a fault report has been submitted.

4.5 Generating Statistics and Exporting Data

4.5.1 Description and Priority

This feature is for admin users to generate statistics on a weekly, fortnightly, monthly, and yearly basis. This feature also includes the exporting of data from the database based on user selectable fields.

4.5.2 Stimulus/Response Sequences

The statistics will be generated when the user selects the statistics tab in the “My Reports” activity. The application would read from the database and generate statistics for resolve time, utility performance etc.
Additionally, clicking the “Export Data” button would prompt the user to select different fields to read from the database. This data would be read from the database and loaded into a csv file, which would be stored on the user’s device.

4.5.3 Functional Requirements

Table 4 Functional Requirements Associated with the Statistics and Exporting Data Feature

Requirement Name	Description
REQ-6.0	The web application shall generate weekly, fortnightly, monthly, and yearly reports after each respective period (one week, fortnight, month, and year) has passed. These reports shall be sent via Excel email attachments.
REQ-6.1	The web application shall provide cumulative statistics on various metrics on the statistics page.

5 Other Nonfunctional Requirements

5.1 Performance Requirements

The ReportITT application requires a device with a compatible web browser.

5.2 Safety Requirements

There are no concerns with loss, damage or harm that could result from the use of this product.

5.3 Security Requirements

The application allows users to log in using email accounts. The following table illustrates the security requirements.

Table 5 Security Requirements for the Application

Security Requirement Name	Description
SEC-1.0	The application shall authenticate users through their email addresses.
SEC-1.1	The application shall authenticate users with a verification code sent via SMS.

SEC-1.2	The application shall assign roles and organisations to users based on their email domains. The application shall assign “TTEC” and “Admin” to accounts made using the @ttec.co.tt email domain. The application shall assign “TSTT” and “Admin” to accounts made using the @tstt.co.tt email domain. The application shall assign “WASA” and “Admin” to accounts made using the @wasa.gov.tt email domain. For all other users, the application shall assign the organisation of “Public”.
SEC-1.3	The application shall only allow admins to delete or update the status of reports made to their corresponding organisation.
SEC-1.4	The application shall strip incoming requests of tags to protect against XSS
SEC-1.5	The application shall prevent users with unverified numbers from accessing website content.
SEC-1.6	The application shall prevent users with unverified email addresses from accessing website content.
SEC-1.7	The application shall prevent banned users from accessing website content.

5.4 Permissions Required

The application may request several permissions:

- to allow the use of the device’s camera
- to allow access to files and media
- to allow access to the device location.