QuickReporter

(Incident Reporting System)

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2016mit055

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A dissertation submitted in partial fulfilment of the requirements
for the degree of
Master of Information Technology

Abstract

This Master's Thesis defines an implementation of an incident reporting web based and mobile application. Mainly QuickReporter is a piece of android application that has been built using ionic framework. AngularJS and JavaScript are used in developing the mobile application while PHP is used in implementing the web based system.

As the number of incidents in roads increasing day by day, yet the observer incidents do not have a helpful and productive technique to report them. This paper explores this gap, and the potential solution to fill it with the enabling of Mobile Web technologies. With the QuickReporter mobile application incidents that a person can face in road like a road traffic collision, witnessed an offence on the road, illegal thing happening etc. can be reported quickly with simple steps. The reported incidents will be assigned to a responsible user to take necessary actions and also the incident details and the related locations are plotted in a map. With a subjective evaluation shows this mobile application and the web based system provide solution to collect and monitor the incidents efficiently.

Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material Published or written by another person, except as acknowledged in the text.

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under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

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_____

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Acknowledgement

This dissertation arose as an effort of number of people whose contribution in assorted ways in the realization of this research deserves special mention. It is a pleasure to convey my gratitude to them all through this humble acknowledgment.

I gratefully acknowledge Dr K.L.Jayaratne, supervisor of the project, for his supervision, advice, and guidance from the very early stage of this project. Above all and the most needed, he provided me unflinching encouragement and support in various ways. His truly scientist intuition has made him as a constant oasis of ideas and passions in teaching, which exceptionally inspire and enrich our growth as students, and as professionals want to be. I am indebted to him more than he knows.

I would also acknowledge my parents and all the friends who provided their support in making this research a success.

Finally big thank to each and every person for the support and the assistance given to make this a success.

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Chapter 01

Introduction

1.1 Problem Domain

In Sri Lanka as there are less number of systems or methods to take a number of customer complaints stemming from the same incident, collect and monitor them and resolve the issue simultaneously in an efficient way.

With the QuickReporter mobile application incidents that a person can face in road like a road traffic collision, witnessed an offence on the road, illegal thing happening etc. can be reported quickly with simple steps. Reporter has to fill details such as type of the incident, description, photos and send it through the mobile application. All the reported details and the locations will be tracked using GPS. Though there is a hotline (119) to call and report an emergency there is no way to identify the identity and the location of the reported incident correctly. When an incident is reported the incident details are sent to web based system which is under the supervision of an admin. The incident details and the related locations are plotted in a map. And also the details of the nearest police station details also displayed. An admin of the web based system can verify or view the incident and take necessary actions. With the effectiveness, responsibility and quick response the QuickReporter app will be an ideal solution for Sri Lanka.

1.2 Motivation

In the current business context, human lifestyles have become more and more complex and complicated. People expect to have much easier, simple systems that they can use to achieve their lifestyle successful and effective. Therefore, for that purpose IT based solutions are now having a good approach.

Incidents occur in all over the place, yet the observer incidents do not have a helpful and productive technique to report them. The frequency of incidents that go unnoticed in Sri Lanka is on the rise as there is no organized way to report the parties that are responsible.

People do not have a medium where they can report incidents effectively specifically to authorities concerned. The specialists need solid approach to unmistakably characterize the occurrences since there is no legitimate occurrence revealing framework in Sri Lanka.

Currently the aggregate number of mobile users inside the nation is increasing. These signs demonstrate that incident reporting is an issue and there is a high potential for mobile application to report the incidents as they occur. Also there are a few occurrences, which happen and go unrecorded or even not announced on the grounds as mobile applications lacks for recording and reporting the road incidences to the appropriate authorities.

1.3 Aims and Objectives

The main point of this project is to build up an android mobile application and web based incident reporting application for the road mobile users to report the incidents. The primary aim is further identified as many objectives to fulfil, when completing this project.

Those objectives are as follows:

- Creating a user friendly mobile application for incident reporters.
- Responsible reporting.
- Able to view reported incident photos.
- Keep track of reporter or incident details.
- Easy access to reported information through web application.
- Inform to responsible authorities through web application.
- Navigation details to the incident place through mobile app.
- Summary of the incidents through reports and charts (By province, district, day, month and year.)
- Colour coded incident mapping according to the time of reporting.

1.4 Scope

Mobile application and the web application are designed in designing phase using HTML and CSS. MySQL will be used as the database to store reported information. In implementation of the mobile application AngularJS, JavaScript will be used as it is developed using ionic framework. The functions of the web based system and the APIs will be implemented using

PHP. Mobile application will deploy for android versions from four to above. The chart.js will be used for reports and chart developments. The web application will be available for 24 x 7.

- Report incidents in real time (Mobile)
- Reporter details and the place will be tracked using GPS. (Mobile)
- Incidents are managed by an admin. (Web Based System)
- Nearest police station displayed with respond to the incident. (Web Based System)
- Admin of the web based system can verify or view the incident and take necessary actions. (Web Based System)

1.5 Structure of the Report

This report contains four chapters in order to give a comprehension to technical and non-technical users about this web based and mobile reporting system.

Chapter 1: Introduction

The introduction section gives an outline of the whole project and provides an overview of the problem domain. The overall scope is very much defined through this chapter.

Chapter 2: Background

This section gives a summary of background information and the implementation. Furthermore, a basic survey of comparative frameworks, systems available and outline of the used implementation tools are explained.

Chapter 3: Methodology

This part contains fact gathering methods, functional and non-functional requirements, feasibility study, design strategies and tools, User Interface plan, database plan and so forth.

Chapter 4: Evaluation

This section incorporates evaluation scenarios, test plan, test cases, used questionnaires and testing work.

Chapter 5: Conclusion

This chapter conclude the work indicating a summary of the results of the project. It should also identify any highlight how improvements could be made through future work.

Chapter 02

Background

2.1 Introduction

Web based information systems are the systems that utilize web innovations to convey data and services as well as Mobile based information systems are the systems that deliver IT services to users through mobile devices. The GPS is a widespread and reachable positioning solution which is capable of determining 3D position, chronometry and measurement of velocity.

2.2 Implementation Background

Emergency never comes with prior intimation. In real world scenarios detecting such emergencies and reporting them is a real challenge.

With the popularity of mobile devices the data transmission and use of information resources is radically transformed. As the trend is of smartphones, mobiles, iPhones etc. it's very important for the mobile user to have the location based services. Location based service can be described as the services which uses the geographical location which is generated by the GPS.

The proposed system is a mobile application and a web based information system that handles the incident reporting and managing activities. This web based system will be hosted and the app will be available in the Play Store to download by the reporters. The internet connection is a must to the functioning of this system. The system will be available for 24 x 7.

First the reporter will be able to select the incident type that he /she going to report. The phone number and the location will be auto detected by the application and also has provided facility to manually set the location. When the camera button click the camera opens the application camera immediately to take a photo of the event. With QuickReporter application user is facilitates to upload maximum five images of the incident. After that all details are sending to a server.

In the web based system incidents are plotted according to the coordinates submitted by the reporter and display it in Google map. The incidents are marked with colour codes with the time period it reported. The incidents can be verified or cancelled by the admin. An incident, once confirmed, will be stored to the database as future reference in data gathering. The web screen facilitates various filters to take necessary views by responsive officers.

There are different technologies that are used to implement a web based solution and mobile application. Languages such as PHP, Java, Perl, Python, Ruby, and ASP.NET can be used in developing the web systems with the database technologies of MySQL, MS SQL, Oracle and PostgreSQL etc. For the mobile application Java, Objective C, JavaScript, Python, PHP etc. can be used with different frameworks like Android Studio, Ionic, Xamarin, PhoneGap, React etc.

For the proposed web system selected languages are HTML, CSS, and PHP as the programming languages and MySQL as the database. Incident reporting mobile application will be developed for android OS using ionic hybrid framework. HTML, CSS, AngularJS and JavaScript will be used to develop the app. App will deploy for android versions four to above.

2.3 Similar Systems

- Modelling of Traffic Accident Reporting System through UML Using GIS

A model was developed in Saudi Arabia as there is a is a tremendous demand from traffic authorities to develop a system that can helps to avoid the accident and keep the accident report data and also maintain the accident report data. This Model was named as the Traffic Accident Reporting System (TARS) [7].

Figure 2.3.1:Bar chart for Traffic Accident Reporting System

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- iReport: An Android-Based Real-time Incident Reporting App for PNP Urdaneta

The iReport is a mobile app developed for Philippine national police in Urdaneta City. It helps to get the location of the reporter including address, the geo-location latitude, and longitude and the phone number. The Camera Tab, when activated, opens the application camera immediately to take a photo of the event. The details are sending to a server. To easily identify the location of the incident, the server has the capability of plotting the coordinates submitted by the reporter and display it in Google map with the fastest route to respond. Thus, officers can respond to the incident faster knowing where it's exact location. An incident, once confirmed, will be stored to the database as future reference in data gathering. All confirmed incidents will be plotted to the confirmed incidents map for police officers to view where a certain incident happened mostly in a specific location within the city. The confirmed incidents map provides a legend with icons for a particular incident. Additionally, the officer can zoom in and out of the map maintaining the centred location of the incident. The officer can also use the built-in controls in Google map such as viewing the location as terrain and looking closer to the location by using the 360 Google Street View [8].

Figure 2.3.2 : i-Report Interfaces

- Mobile Tracking Application for Locating Friends using LBS (Location Based Services)

A system was developed in India to facilitate mobile users in finding services available in specific location such as discovering the nearest restaurants or nearest hospital etc. The applications of this type are restricted for the service providers of mobile devices. The reason

for this is that they use mobile cells information for getting the mobile's location. Mobile phone tracking tracks the current position of a mobile phone even on the move. To locate the phone it must emit at least the roaming signal to contact the next nearby antenna tower.

The main aim of this work is to design and implement a client server system that helps users to locate their friends and family members through mobile. It tracks the user location information using GPS and sends a message to the user about his location. The user will be provided with an alert message about his friend's location when his friend is within a couple of meters to the user. The user can be navigated to his destination dynamically using this application. It also helps the user when he is new to some place by knowing his location on the spot. It reduces the task of searching the particular location manual search. Using GPS the user can know his present location coordinates and if the user moves to other location automatically the coordinates will update and changes the location information in user mobile device.

The client-side system is a MID let application which serves as an interface to feed in the contents and control instructions which is interpreted on the server and the appropriate action is taken. The MID let has the task of creating design page for Welcome Page, User Registration, User Login, Add Member, and Family/Friends Request [9].

Figure 2.3.3 : Methodology of the Mobile Tracking Application

- Development of a mobile application for recording and sharing road incidents data

This system which is developed for Kenya consists of a geodatabase of road incidents for the study area. A mobile application was also created and is used to report road incidents which are stored in the geodatabase. These incidents are displayed on a web map where these details can be viewed by any interested party. The collected roads incident data benefits the public as

well as other stakeholders such as the police workforce, the insurance industry, higher education institutions.

The user can either submit the road incident as a logged in user or as a guest user on the mobile phone. The functionality automatically attaches the GPS coordinates to the data so as to be able to tack the location the incident. The user can also upload an image of the incident either from the phone or take a new photo using the camera and finally submit the data. The Distress Call functionality allows the user to send an emergency alert at the touch of a button. For instance, in the case of a carjacking and there is not enough time to make a call. This functionality also captures your GPS location so that the location can be used for tracking purposes.

View and Track Reported Incidents is the main screen that allows users to view reported road incidents on the fly. The data is represented on Google maps. All the reported incidents are reported on this map. The other can also specify different filter criteria so as to view incidents that belong to a particular category [10].

Figure 2.3.4 : Interfaces of the application of recording and sharing road incidents data

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- MSR Mobile Application

Many cities use 311 systems to allow residents to report a range of nonemergency maintenance issues; the 311 phone number is designed to be the nonemergency counterpart to 911 dispatch systems. Although 311 systems are typically used by cities and counties, Utah DOT has customized a popular issue--reporting app (See Click Fix) for use at the state level. The Vermont Agency of Transportation (VTrans) is testing the app as well, and Massachusetts has used the See Click Fix platform to create a state wide 311 network serving more than 60 communities.

Caltrans' IT division created a demo mobile app a few years ago that had functionality similar to the 311 issue--reporting apps described below, including the ability to mark an issue location on a map via GPS and upload a photo of it. The app was designed to integrate with the department's Maintenance Service Request (MSR) system [11].

Figure 2.3.5 : MSR Mobile Application Interfaces

2.4 Alternative Technologies

There are several different alternative technologies for implementing the proposed mobile application and web based system. Here are only few of them which are on the lead and used by majority.

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  Python can be used to build server-side web applications. While a web framework is not required to build web apps, it's rare that developers would not use existing open source libraries to speed up their progress in getting their application working [13].

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Java is a general-purpose computer-programming language that is concurrent, class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible. It is Android smart phone applications and internet related developments widely nowadays.

Ruby

Developed in the year 1993, Ruby is a dynamic programming language that is used for the creation or programming of mobile apps and websites. The language successfully balances imperative programming with functional programming and is a highly scalable language. This open source platform is not only simple to understand but also easy to write.

Perl is a general-purpose programming language originally developed for text manipulation and now used for a wide range of tasks including system administration, web development, network programming, GUI development etc. [14].

Objective-C is the primary programming language you use when writing software for OS X and iOS. It's a superset of the C programming language and provides object-oriented capabilities and a dynamic runtime.

2.5 Pros and Cons of Alternative Technologies

Some pros and cons can be found when comparing to alternative technologies that can be used to the development of the web based systems and mobile based systems. The comparison is carried out according to the below facts.

- Efficiency of the language
- Available platforms and frameworks
- Community support

- How quick and ease the language was learnt
- Security

Table 2.5.1 : Table of Comparison of technologies

Language/Technology	Pros	Cons
• Python	• Easy to learn. • Clean, expressive. • Free availability. • Powerful. • Performs well across different platforms.	• No GUI. • Not secure. • Not secure. • Absence of commercial support.
• Java	• Portable. • Easy to learn. • Platform independent. • Open source, freely available.	• High storage capacity and uses more memory. • Less security. • Lack of dynamic language features. • Bugs in library implementations.
• Ruby	• Has a big development community. • Powerful. • Rapid development(reduced development time) • Easy to learn. • Framework has a simple structure.	• The performance is not fast as PHP. • Not so common. • More expensive. • Require more boot speed.
• Perl	• Multipurpose. • Versatile. • Quick running.	• Poor usability • Not portable. • Slow.
• Objective C	• Use for ios developments	• Complex • Use static libraries

This chapter summarises about the implementation background, similar systems to the proposed system, alternative technologies and pros and cons of alternative technologies that gives a clear idea about the background of the system.

Chapter 03

Methodology

3.1 Introduction

The Analysis chapter offers higher comprehension about the system along with the fact gathering techniques, functional and non-functional requirements etc. Analysis should be completed in an effective an efficient manner in order to achieve a better output. Design phase emphasis on the technical or implementation issues of the system. In the process of design, defining of inputs, outputs, modules, interfaces and other computer based components are carried out.

3.2 Feasibility Study for the Proposed System

A feasibility analysis was done for this proposed system, under following categories, so as to fulfil principles of business necessities [22].

3.2.1 Operational Feasibility

The operational feasibility refers to the measure of solving problems with the help of a new proposed system. It helps in taking advantage of the opportunities and fulfils the requirements as identified during the development of the project. This was carried out by analysing all system functionalities in order to find whether they meet and fulfil all requirements.

3.2.2 Market Feasibility

This is to estimate the probability that a product, service or customer experience strategy will succeed in the market. This may include factors such as customer needs, perceptions, demand, positioning and competition. Therefore the first version of the mobile application is done for android as it is the popular mobile operating system among most of the mobile users.

3.2.3 Economic Feasibility

This is also known as the cost-benefit analysis and it is used for evaluating the effectiveness of the proposed system. By having an online system to report and manage day to day incidents it will able to reduce time and effort.

3.3 Fact Gathering Techniques

Fact finding is a format process that uses techniques to collect/ gather information about system requirements, problems and preferences. Also known as information gathering. From the available fact gathering techniques, the following were used to collect information to develop the system.

- Online Questionnaires
- Observation of the existing applications
- Following of sample researches.

An Online questionnaire was prepared and obtained answers from the mobile users. An observation was done by installing various mobile applications in the play store to verify the facts and for additional comprehension of the system. Sample research materials were referred in order to complete the fact gathering part of analysis.

3.4 Requirement Analysis

Requirements convey the expectations of users from the software product. The requirements can be obvious or hidden, known or unknown, expected or unexpected from user's point of view. It can be further classified as functional requirements and non-functional requirements. Given below are summarised functional and non- functional requirements of the proposed "Quick Reporter" incident reporting system.

3.4.1 Functional Requirements

- Report incident using mobile application
- Get current location of the reporter using mobile application
- Upload incident images using camera or gallery
- View incidents using web application
- Confirm or delete incident using web application

- View Charts using web application

3.4.2 Non Functional Requirements

- Creating a user friendly mobile application
- Maintain accuracy of data
- Application availability 24 x 7 and reliability of the whole system.
- Responsiveness of the mobile and web application.

3.5 Design Methodology

Incremental waterfall methodology will be used to carry out this project. Advantages of using this methodology is some working functionality can be developed quickly and early in the life cycle. In this whole requirement is divided into various builds. During each iteration, the development module goes through the requirements, design, implementation and testing phases. Each subsequent release of the module adds function to the previous release. The process continues till the complete system is ready as per the requirement [23].

Figure 3.5.1 : Incremental waterfall methodology

Requirement Analysis phase

Here the requirements for the software are gathered and analysed. Iteration should eventually result in a requirements phase that produces a complete and final specification of requirements.

Design phase

In which a software solution to meet the requirements is designed. This may be a new design, or an extension of an earlier design.

Implementation phase

With inputs from the system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality.

Testing phases

All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.

Maintenance

Enhance the product some better versions are released.

Waterfall model will not suit as the requirements may change. Spiral Model is costly when compared. Agile development can be used, but as this is not a project done by a team, it is not practical. Rapid Application Development methodology is better for mostly short time process. Rational Unified Process is too complex for the proposed system, though they can be used as alternatives.

3.6 Alternative Design Methodologies

Table 3.6.1 : Table of comparison design methodologies

Model	Pros	Cons
Waterfall	- Easy to understand and implement - Widely known - Document driven - Identifies deliverables and milestones	- Does not match with the reality - Difficulty in risk management - Costly for small teams - Absence of an iterative nature
Spiral	- High risk analysis - Software is produced early at the life cycle - Better for large and mission critical projects	- Costly - Doesn't work on smaller projects - Project successes depend on the way of risk analysis

Agile	- Test based approach - Iterative - Incremental development is supported - Maintains simplicity	- Costly - Better in team projects - Lack of emphasis on documentation
Rapid Application Development	- High productivity - Iterative - Can be used at evolutionary requirements	- Suitable for projects requiring shorter development times - Costly
Rational Unified Process	- Accurate documentation - Integration throughout the life cycle of software development - Reusability of components	- Too complex - Need expertise

3.7 Design Strategy

The proposed system is implemented using the Object Oriented design concept. It works around the entities and their characteristics instead of functions involved in the software system. This design strategy focuses on entities and its characteristics. The whole concept of software solution revolves around the engaged entities.

The reasons to select object oriented designing over the other design strategies for the proposed system are,

- Reusable, maintainable and scalable
- Bottom up approach
- Have the features of abstraction, encapsulation, inheritance and polymorphism.

This is widely used newest design strategy. UML is the most popular method used in this concept of OOD. According to UML the following models were used for the designing phase.

- Use case diagram

- Class diagram

- Entity relationship diagram

There are some other alternative design strategies too.

3.7.1 High Level Use Case Diagram

User interface design (UI design) refers to the design of various types of software and hardware interfaces through which users interact with computers and other technologies. Following use case diagram covers the basic system functionalities and shows the interaction of use case along with the relationship such as include, extend generalization likewise [24].

Figure 3.7.1 : Use Case Diagram

3.7.2 Class Diagram

The Class Diagram is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among objects. The following diagram illustrates the class diagram for the "Quick Reporter" incident reporting system [25].

Figure 3.7.2 : Class Diagram

3.8 Comparison of Alternative Design Strategies

There are several alternative design strategies.

- Structured Design
- Function Oriented Design

Table 3.8.1 : Comparison of Alternative Design Strategies

Structured Design	Function Oriented Design
- Follow top-down approach program design. - Data and Functions don't tide with each other. - Large programs are divided smaller self-contained program segment known as functions. - Data moves openly around the system from function to function. - Functions are dependent so reusability is not possible.	- Consist of module definitions. - Top down approach. - Each function is described at large. - Higher level of abstraction. - Structural decomposition. - More expressive. - Lack of encapsulation.

3.9 Database Design

The main objectives of database designing are to produce logical and physical designs models of the proposed database system [26].

A well-structured database:
- Saves disk space by eliminating redundant data.
- Maintains data accuracy and integrity.
- Provides access to the data in useful ways.

Designing an efficient, useful database is a matter of following the proper process, including these phases:

1. Requirements analysis, or identifying the purpose of your database
2. Organizing data into tables
3. Specifying primary keys and analysing relationships
4. Normalizing to standardize the tables

Following briefly describes about the first three normal forms [27].

- First normal form (1NF) is a property of a relation in a relational database. A relation is in first normal form if and only if the domain of each attribute contains only atomic (indivisible) values, and the value of each attribute contains only a single value from that domain.

- A relation that is in first normal form (1NF) must meet additional criteria if it is to qualify for second normal form. Specifically: a relation is in 2NF if it is in 1NF and no non-prime attribute is dependent on any proper subset of any candidate key of the relation. A non-prime attribute of a relation is an attribute that is not a part of any candidate key of the relation.

- Third normal form (3NF) is a normal form that is used in normalizing a database design to reduce the duplication of data and ensure referential integrity by ensuring that the entity is in second normal form, and all the attributes in a table are determined only by the candidate keys of that relation and not by any non-prime attributes. 3NF was designed to improve database processing while minimizing storage costs.

3.9.1 Entity relationship Diagram.

An entity relationship diagram (ERD) shows the relationships of entity sets stored in a database. An entity in this context is an object, a component of data. An entity set is a collection of similar entities. These entities can have attributes that define its properties. By defining the entities, their attributes, and showing the relationships between them, an ER diagram illustrates the logical structure of databases.ER diagrams are used to sketch out the design of a database. Following is the ER diagram for the proposed System.

Figure 3.9.1 : ER Diagram

3.10 User Interfaces Designing

The proposed system "Quick Reporter" should be able to use within less amount of time even by a medium level computer skilled person without more training. Therefore some of the main properties the user interfaces of this system should have are as follows [28].

- Being simple and user friendly.
- Being consistent
- Should provide feedback making error messages, warnings etc.
- Making interfaces more comprehensive to the users.
- Being attractive and using colours appropriately in order to manage user's pleasant view.

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Easy navigation through the screens "Quick Reporter" system consists of different interfaces with different functionalities. Few main interfaces out of them are shown below.

Web Interfaces

This is the Login page of the web application. Users of the system can be logged into the system by entering the unique username and password.

Figure 3.10.1: Web Application login

After loggedin to the system the user can be seen a dashboard.The menus are shown according to the user loggin by checking whether the logged user is a super user or a non-supre user.Summary of reported incident counts also displayed in the dashboard.

Figure 3.10.2 : Web application dashboard

Notifications related to the unconfirmed incidents are listed as notifications in the dashboard. If the logged user is not a super user they can only see the unconfirmed incidents that are assigned to them only.

Figure 3.10.3 : Web application notifications

The side menu of the dashboard is shown according to the user login type. If the user is a super user all the options can be viewed where non-super users are not allowed to add and update the system user details. And also only the incidents relevant to them only can be viewed.

Figure 3.10.4 : Web application side menu

The summary of all reported incidents are displayed in a map under the Incident Map option in the side menu.

Figure 3.10.5 : Reported incident summary

View user option under the User Management section allows viewing all the system users.

Figure 3.10.6 : View User Interface

The add user interface allow the super users to add more users to the system. When adding a new user relevant district also can be assigned from this interface.

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Figure 3.10.7: Add user interface

Update/Delete facilitate the supre users to update or delete the current users in the system.

Figure 3.10.8 : Update/Delete User

The Incident option list all the reported incidents to all super users and show only relevant incidents the non -super users according to the relevant districts they belong.

Figure 3.10.9 : All Incidents

View option in the incident list directs the user into a page with incident details. There the user can see the images of the incident, confirm, delete, assign, route to the incident place etc.

Figure 3.10.10 : Incident Details page

Chart option the menu allows to see all the details in the system as a summary .This allows user to select the date range accordingly.

Figure 3.10.11 : Charts page

Mobile Interfaces

The mobile application allows user to report an incident. It has three languages as English, Sinhala and Tamil .User can select the type of language before continuing. Incident type can be selected from the defined incident type list and user allows typing a description about the incident. The current location is taken after clicking the button and the address text box get filled accordingly. If the user need to change the location it is allowed to select the location manually through the map and the address get changed according to that. The auto filled

address text box can be edited according to the user preference. Then the name and the contact number can be typed and images of the incident can be uploaded through the camera or the gallery. After this the incident can be submit using a simple button click.

Figure 3.10.12: Mobile Application Interfaces

This chapter summarizes about the design and the analysis part covering the areas of feasibility study for the proposed system, fact gathering techniques used, requirement analysis done as functional and non-functional, design methodologies with alternative methodologies, design strategy used and the comparison with the other design strategies, database designing and user interface designing.

Chapter 04

Evaluation

4.1 Introduction

Although software does not age or become affected by surrounding conditions in the same direct way as hardware, there is each motivation to guarantee its quality and confirm that its commitment to execution of basic functionalities right.

Therefore testing is the process of evaluating a system or its component(s) with the intent to find whether it satisfies the specified requirements or not.

However, in Software Development Life Cycle (SDLC), testing can be started from the Requirements Gathering phase and continued till the software is out there in productions. It also depends on the development model that is being used.

The software testing process has a prescribed order in which things should be done. The following is a list of software testing categories arranged in chronological order.

Figure 4.1.1 : software testing process

- **Unit testing** - testing performed on each module or block of code during development.
- **Integration testing** - testing done before, during and after integration of a new module into the main software package. This involves testing of each individual code module.
- **System testing** - testing done on the completed software product before it is introduced to the market.
- **Acceptance testing** - beta testing of the product done by the actual end users.

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This chapter is dedicated to discuss on the evaluation of project with respect to the objectives as well as the data that is being used as assistance to the project [29].

4.2 Test Plan

Project was monitored on a regular basis during the course of the project life cycle, with the help of Gantt chart as well as meetings with supervisor. In the middle of the project life cycle period, using identified needs system was clearly defined as well as designed. The evaluation of the solution has been carefully planned and categorically assessed. It was done with the help of an evaluation plan. Evaluation plan address all the stages of the development life cycle of the project.

At very first stage by submitting written project proposal, requirements feasibility and clearness of problem domain, appropriateness of technologies and adequate resources were identified. The main evaluation of the system begins at the first phase of the project with the start of gathering data that is related to the domain. Since there can be many incident types to be considered, the domain was reduced to road incidents where the identification can be easily managed.

As there are different types of evaluations methods, user-based evaluation is considered in evaluating the system. In order to collect data for the evaluation process a representative sample has to be identified. This sample was focused on the sample incidents in the Colombo area. After completing the unit testing and integrating testing according to the test strategies, the whole system was tested. A questionnaire was made to collect further user feedback on the final outcome of the mobile application.

Through this testing procedures, it was able to find instances where inaccurate outputs that are generated and wrong functioning of some modules. They were subjected to testing again.

4.3 Test Cases and Test Results

Web application

Table 4.3.1 : Login

No	Test Case	Expected Output	Actual Output	Status
01	Wrong user name entered	Show error message	Show error message	Pass

No	Test Case	Expected Output	Actual Output	Status
02	Wrong password entered	Show error message	Show error message	Pass
03	Press Cancel Button	Cancel details filled	Cancel details filled	Pass
04	Identify username and password	Login success and show username on home page	Login success and show username on home page	Pass

Table 4.3.2 : Dash Board

No	Test Case	Expected Output	Actual Output	Status
01	Incident Submitted from mobile app	Show Count in new incidents box and total incidents box	Show Count in new incidents box and total incidents box	Pass
		Plot the incident in the map	Plot the incident in the map	Pass

Table 4.3.3 : Map page

No	Test Case	Expected Output	Actual Output	Status
01	Filter options all field filled	Filter and show results in the map	Filter and show results in the map	Pass
02	Filter options all field null	Show error message	Show error message	Pass

Table 4.3.4 : Incidents Page

No	Test Case	Expected Output	Actual Output	Status
01	Filter options all field filled	Filter and show results in the table	Filter and show results in the table	Pass
02	Filter options all field null	Show all results in the table	Show all results in the table	Pass
03	Click more option	Show particular incident details	Show particular incident details	Pass
04	Confirm individual incident	Update Button to confirmed	Update Button to confirmed	Pass

No	Test Case	Expected Output	Actual Output	Status
		Increase the confirmed count in dashboard	Increase the confirmed count in dashboard	Pass
05	Assign Incident	Assigned to related user	Assigned to related user	Pass
06	Cancel individual incident	Delete the incident from the table	Delete the incident from the table	Pass
		Update dashboard count boxes, charts and maps	Update dashboard count boxes, charts and maps	Pass

Table 4.3.5 : Chart Page

No	Test Case	Expected Output	Actual Output	Status
01	Filter options all field filled	Filter and show results in the chart	Filter and show results in the chart	Pass
02	Filter options all field null	Show error message	Show error message	Pass

Table 4.3.6 : User Management Page

No	Test Case	Expected Output	Actual Output	Status
01	Add User with all fields correct	Add user to the table	Add user to the table	Pass
02	Add User with fields incorrect	Show error message	Show error message	Pass
03	Edit User details	Update table	Update table	Pass
04	Delete User	Update table	Update table	Pass

Mobile application

Table 4.3.7 : Report Incident

No	Test Case	Expected Output	Actual Output	Status
01	Report incidents with all required fields	Show successful message and update web	Show successful message and update web	Pass

02	Report incidents with blank required fields	Show error message	Show error message	Pass
03	Get Current Location	Display Current location and the Google translated address	Display Current location and the Google translated address	Pass
05	Change Marker in the map	Change the address field accordingly.	Change the address field accordingly.	Pass
06	Upload images using camera	Take the image from the camera and display in mobile application	Take the image from the camera and display in mobile application	Pass
07	Upload images using gallery	Take the image from the gallery and display	Take the image from the gallery and display	Pass
08	Cancel images	Delete the image from the mobile application	Delete the image from the mobile application	Pass
09	Cancel Application	Get Back to the Loading Page	Get Back to the Loading Page	Pass

Table 4.3.8 : Map Page

No	Test Case	Expected Output	Actual Output	Status
01	View Reported Incidents	Show reported confirmed incidents in the map according to incident types	Show reported confirmed incidents in the map according to incident types	Pass

4.4 Evaluation Tools

The evaluation tool used for the mobile application is an evaluation form type questionnaire which was used to get the user feedback about the final system and to tune the system according to the feedback collected.

4.5   Evaluation Results

Following charts shows the evaluation results analysis of the feedback collected from the users, through the user evaluation forms about the system.

About twenty members with different android devices participated in filling the questionnaire provided and according to that, a summary about the system was extracted as follows. The users were asked to mark the ratings in the given questionnaire and those ratings were taken as the final output to charts. User Evaluation form is included in Appendix –A.

This first chart is about the distribution of smart phone types among the users. Therefore this used when designing the interfaces according to the screen sizes.

Figure 4.5.1 : Summary of models of smartphones

The summary of age groups that the mobile application is tested is showing by this graph.

Figure 4.5.2 : Summary of age group

How the familiarity of using the Smartphone is shown in the following chart. This was taken to consideration when designing the interfaces to increase the usability and the easiness.

Figure 4.5.3 : Summary of familiarity with using smart phones

The summary of the user friendliness of the QuickReporter mobile application is shown with the below chart.

Figure 4.5.4 : Summary of user friendliness of the mobile application

Summary of whether the mobile application crash or stuck was shown with the following chart when reporting the incident.

Figure 4.5.5 : Summary of whether the app crash, hang or freeze

Following chart shows the response time of the mobile application is fast or not.

Figure 4.5.6 : Summary of the response time of the app is fast or not

The most preferable type of uploading images to the mobile application is shown by the following chart.

Figure 4.5.7 : Summary of the type of uploading images

How much accurate the QuickReporter mobile application, when detecting the current location is summarized by the following chart.

Figure 4.5.8 : Summary of whether the app is accurate when detecting current location

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The following chart summarized whether the overall functionalities are up to a satisfied level or not with the user's mobile device type.

Figure 4.5.9 : Summary of whether the functionalities are working with the device type used

Summary of the ratings for the mobile application is given as below.

Figure 4.5.10: Summary of the ratings of the mobile application

In this chapter all the evaluation criteria of the system along with the results gained by evaluations are presented. The summary of feedbacks from questionnaire is presented as charts.

Next chapter will be focused on conclusion of the system based on the achieved objectives, problems encountered and limitations of the system. Also further expandability of the system is discussed.

Chapter 05

Conclusion

5.1 Overview

The lack of a supportive and beneficial procedure to report the incidents that come across in the road in Sri Lanka was the beginning of the development of this QuickReporter-Incident Reporting system which is a fresh start and a good solution.

This developed mobile application the user can report the incident while the reported incidents can be verified or viewed and take necessary actions using the developed web based system.

The reporting can be done quickly with simple steps. Reporter has to fill details such as type of the incident, description, attach photos (optional).All the reported details and the locations will be tracked using GPS. The incident details and the related locations are plotted in a map. The handling part of reported incidents is facilitated using the web system.

The new developed mobile and web saves the time of the users. Another special feature of these two is, even a person having less knowledge of IT can use this, because of its simplicity. The interfaces are designed attractively and simple in order to keep the user attract. As people do not have a medium where they can report incidents effectively specifically to authorities concerned this QuickReporter will be an ideal solution for Sri Lanka.

5.2 Critical Assessment of the Proposed System

This is performed at the System Level, where complete systems similar to the given product would be evaluated. The process may also be applied at the Functional Level, where individual critical functions would be evaluated.

This system is unique from already existing other similar applications, as it is developed as a solution to an existing problem domain in Sri Lanka. Quickreporter is a combination of mobile application and a web based application which is capable of decreasing the count of incidents that go unnoticed.

5.3 Lessons Learnt

By doing this project, learnt how to apply the theoretical knowledge practically what was gained over the past three years.

At the time of submitting the project proposal, a clear idea on the development of the system was not available. By gradually following the guidelines learnt how to overcome the weaknesses. Proper time management were achieved by following the schedule of the project. The implementation phase was the hardest phase of the project and it made to try out the languages like AngularJS, JavaScript and PHP etc. in deep. Writing the dissertation was another interesting part and it enhance the writing skills and furthermore.

5.4 Future Enhancements

Along with new technologies and requirements of the users the system could be improved with the following features.

- IOS Application
  Currently the mobile application is done for android users only. Deploy the application for IOS users.

- Google Play Store
  Publish the application in the Google Play store.

- Add more Incident Types
  Enhance the categorization in incident types by targeting more area other than road incidents.

- Add Specific Data Input Fields
  Instead of taking information by using default set of fields can take details by adding more specific fields according to the incident type.

- Get Support of the government
  Develop real time incident reporting system with support of government bodies.

- Add More Languages
  Develop the app in more user selectable languages.

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Appendix -A

Questionnaire used for evaluating mobile application.