Online Criminal Reporting and Management System

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Online Criminal Reporting and Management System

A thesis submitted for the Degree of Master of Information Technology

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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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This is to certify that this thesis is based on the work of

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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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Abstract

This document describes the development of the Web Based online criminal reporting and management system. Main Objective of this project is to develop an online criminal reporting and management system which can be easily accessible to the police and general users at all the time. With this system can automate the existing manual system and fulfill the requirements of both police and general public. People can report complain online through this online system from anywhere at any time. It would help people to catching criminals immediately and punishing them as per the law. With this system police can store their valuable information for a longer period of time with easy accessing of them.

Online Criminal Reporting and Management system is the solution for both general public and police department. The system will help the police department to take action as quickly as possible and maintain the database effectively. This will not only make the work easy but also it will help the users to access many features like view reports, find missing persons, find most wanted persons etc. This system will give a perfect solution to the police for managing the crime in a better and a structured way. Another major advantage of this system is notify police officers about the criminal cases through emails. In this system all these activities (like registration of the complaint, updating information) are managed that saves time of police officers and people.

Three-tier architecture is used to develop "Online Criminal Reporting and Management System". For the front end developments used web technologies such as HTML, CSS, Bootstrap and JavaScript. For back end developments used PHP with code igniter framework. MySQL database is used as database management system. Since requirements are very clear and to develop the high quality product with the least cost and time waterfall model is used.

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List of Acronyms

- PHP Hypertext Preprocessor
- OIC Officer in Charge
- NIC National Identity Card
- MVC Model-view-controller
- HTML Hypertext Markup Language
- CSS Cascading Style Sheets
- GUI Graphical User Interface
- WAR Web Archive
- ER diagrams Entity Relationship Diagram

CHAPTER 1

INTRODUCTION

Online Criminal Reporting and Management System is a web based solution which was developed for manage criminal cases. With this system, both Police and General public can get lots of benefits. In Sri Lanka currently does not use any system for report and manage criminal cases. All the things are handled in manually. With this automated system both parties can overcome the current difficulties face due to the manual process.

System was developed as the web application. It can be easily use in mobile devices and desktop machines. System provides facility for report criminal cases in online. When reporting users can upload images and videos which are related to the incident. People can check missing persons details online using this system. This system is also show most wanted person details.

1.1. Motivation:

Police stations are the main organization to report complains against criminal cases. If someone wants to make a complain, he must go to the police station. Currently most Police stations does not have proper way to manage criminal cases. All complains are recorded in their entry book. This entry book can be damage or lost. Then all the information regarding criminal cases will be lost.

There is no centralized database to store criminal person details and criminal cases details. So there is no way to find one police station's criminal persons details and criminal cases details to another police station. It is very difficult to find the past criminal activities of the person. In addition to that people of the specific city are not aware about danger peoples in their city.

And also after make a complain, people need to go to the police station every time for checking the updates regarding their case. This is also time wasting of both general public and police officers. Many criminal cases are not recorded in the police books since the person who complained wants to hide the identity due to security reasons. So there is a need to hide the person's identity who reported the complain about the criminal cases.

Most of the time police officers are unable to reach the criminal location on time because they are unable to find exact location. Sometimes people tell the criminal location over the phone and it is very difficult to find the correct location with the information provided by them. So there is a need to find the correct location of the incident to reach there on time.

Automating the current manual system is an urgent requirement for the Police and general public to address all of these problems. Hence creating a web application would be the ideal solution to overcome the current difficulties people face due to the current manual process. Since this project is developed for Sri Lanka police no legal issues can occur and data in the application is not expose to the general public

1.2. Objectives:

Main objective was design and develop suitable and user-friendly online criminal reporting and management system for Sri Lanka Police. Followings were identified as the main project objectives

- 1. To allow people to report criminal cases with or without their identity. When reporting people can upload evidences such as images or videos.
- 2. To facilitate police officers to find the criminal location with google maps.
- 3. To help general public to find the current situation regarding their incidents
- 4. To help police stations to easily find all the crimes done by person with their NIC number.
- 5. To help police officers and general public to analyze criminal cases with various reports.
- 6. To help police officers to find digital evidences such as images or videos with the help of the people.
- To allow people to report criminal cases very quickly to the police stations without wasting time.

1.3. Background of the Study:

In the existing criminal cases management system used in the police stations, most of the operations are done manually like record complaints, taking actions against criminal cases, view criminal case status etc. This manual process need more man power to manage criminal cases. The existing system is time vesting and not effective. So with the existing system if some person wants to make a complain he must go to the police station. And also search the records regarding to the past criminal cases also lots of time consuming. In the current system used by the Sri Lanka police, all of the works is done on papers and it is very difficult to secure criminal cases data.

With the current process if anybody wants to make complain, he must go the police station and meet the relevant officer to make a complain. Initially police officer writes officer's details in the entry book. Then writes the complainer's details and finally write about the complaint details. Police station has one entry book for write all complains. Then Police OIC assign complains to police officers in the police station. Police officer write the complaint details in their book and go for the investigation. If police officer can resolve the problem, he gives solution and updates the entry book. If he is unable to resolve the problem, then it will hand over to the higher level officer. If he unable to resolve the problem, it will be submitted for court proceedings.

Online Criminal Reporting and Management System can resolve all the limitations of the existing manual process. The system provides proper security for crime data and reduces the manual work. The efficiency of the police function and the effectiveness of handle criminal cases will be increased.

1.4. Scope of the Project:

To define the scope of the project, main characteristics and features of the project was described below. There are four user levels in this system. Administrator, Police OIC, Police Officer and Citizen. Citizen can report about the criminal cases. All other levels are for manage the criminal cases.

Administrator of the system is responsible for manage police station details, manage police OIC details, manage complaint details, view complaint details, assign complaints to the police station and view reports.

Police OIC of the system is responsible for view complaints which ware assigned to police station, assign police officers to investigate complaints, view and update complaint status, view reports and enquiry which are relevant to the police station. Police officer of the system is responsible for view complains which are assigned to police officer, update the complaint status, view reports which are relevant to the police officer.

Public users are divided in to two parts registered user and un-registered user. Registered users can register in to the system and log in to the system with user name and password. They can add complaints and view complaint's status. Un-registered users can make complaints without login in to the system. They can't view complaint's status.

Automatically emails were generated when add complains, assign complains and complete the task. When users were adding the complaint they can mention the location with Google maps. It is useful for police officer to find the location. This system was developed as the web application. Users can use the system easily through their mobile devices.

Various types of reports were generated to analyse the criminal cases. Police officers can use these reports to minimize the criminal cases. Some of the them are: Criminal cases analysis report based on the area (or city), Criminal cases analysis report based on time period, Criminal cases analysis report based on type of the criminal case, Criminal cases details report for selected individuals, Reports for evaluate police officers using the criminal cases attended by them. Etc.

1.5. Feasibility Study

Feasibility study is done according to the below categories.

1.5.1. Operational Feasibility:

Operational feasibility is used to measure of how well a proposed online criminal management and reporting system solves the problems. With the Online Criminal Reporting and Management system resolve most of the problems related to police officers and General public. Some of them are difficulty of find criminal location, Difficulty of find evidences regarding criminal cases, difficulty of find criminal person history etc. No need to keep many record books after implement this system. Save time of both parties. No need stationary items to recode user data. Only need Initial cost to implement the system. There is a reduction in cost and or an increase in benefits for Sri Lanka Police. There is no process change with the introduction of new system. By using this system police can continue their duties in effective and efficient way.

1.5.2 Technical Feasibility

This study is based on an outline design of system requirements, to determine whether the developer has the technical ability to handle and completion of the project. This is web based solution and any one can connect to the system remotely. For the development of the system used web technologies such as PHP, MySQL and Bootstrap. These technologies are commonly used for web development ant they are free and open source.

1.5.3 Legal Feasibility

It determines whether the proposed system conflicts with legal requirements. Since this system was developed for Sri Lanka Police there is no conflicts with legal requirements.

1.5.4. Economic Feasibility

Economic Feasibility is helps to measure the cost-effectiveness of a project. The proposed system has more benefits than the manual process. With the new system can reduce the paper works and save the time. Police has to expend for initial software implementation cost only. Cost of packaged hardware/software development is 100000 LKR. No need of alternative financing expenses.

1.5. Structure of the dissertation

The rest of this document is organized as follows.

1. Chapter 2: Background

This Chapter will contain an overview of the background and the literature review about similar systems and technologies carried out.

2. Chapter 3: Methodology

This chapter explains the requirement analysis and the planned design for the solution.

3. Chapter 4: Implementation

This chapter will describe the implementation details about the project.

4. Chapter 5: Evaluation

This chapter describe whether the project objectives were satisfied, and if not, the reasons for them.

5. Chapter 6: Conclusion

This chapter contains summary of the results of the project and the feature works.

CHAPTER 2 BACKGROUND

2.1. Introduction:

This chapter describes what kind of technologies can be used, what are the existing similar systems and how those were implemented. In addition to that this chapter will contains related technologies and related design strategies which can be used to develop "Online Criminal Reporting and Management System".

2.2. Requirement Analysis

By using "Online Criminal Reporting and Management System" both Police department and general public can get lots of advantages. General public can report criminal cases and police officers and administrator can manage criminal cases.

2.2.1 Functional Requirements

There are four types of users in the system. Administrator, Police OIC, Police Officer and Citizen (General public). Citizen can use the system with or without login into the system.

- Administrator: Use Cases of administrator are managing police station details, manage police OIC details, manage complaints, manage police officer details, assign complains, manage users and view reports.
- **Police OIC:** Use cases of police OIC are manage complaints, manage police officer details, assign complains, manage complaints view reports.
- **Police Officer:** Use cases of police officer are managing complaints, create crime records and view reports.
- Citizen: Use cases of citizen are creating complaints, view complaint status.

2.2.2 Non Functional Requirements

The non-functional requirements describe some of the qualitative attributes such as user-friendliness, reliability, security, scalability and performance of the system. These nonfunctional requirements are important for the increased user-acceptance of the system.

2.2.2.1. Usability Requirements

User interfaces were designed to make them user friendly. User interface were designed to minimize the effort for navigate between interfaces. Vertical scrolling is minimized in the interfaces. Clear error messages were provided and all error messages were clearly describing the reason for the error. Text presented on screens were clear and easily readable to the user. Used Bootstrap framework to make the website responsive. So change the appearance of the system according to the screen size.

2.2.2.2. Performance and Scalability Requirements

System provided enough response times for commonly used functions under both standard and peak conditions. System is designed to give results for a simple search operation within few seconds. Internet connection speed and computer or device speed also affect to the delay of the response time. To use the system user will not require to download any plug-ins or any other additional software.

2.2.2.3 Reliability Requirements

Reliability of the system can be defined as probability that a system will operate without failure for a number of uses (transactions) or for a specified period of time. System should run all the time without any failure. If the hardware operates without any failure, the availability of the system is100%.

2.2.2.4 Portability Requirements

Portability of software system is important for transferred from its current hardware or software platform to another hardware or software platform. Since the designed system is a web based solution it can run on Windows, Linux and Macintosh operating systems. System was designed to compatible with Microsoft Edge browser, Mozilla Firefox and Google Chrome browsers. This system can be run on the mobile devices

2.2.2.5 Security Requirements

Security requirement ensure that all data inside the database or its part will be protected against malware attacks or unauthorized access. In this system define the different login flows. So can protect the system data with unauthorized access. With the login flows unauthorized parties do not allow to view or alter data in the system.

2.2.2.6 Auditability Requirements

Auditability is the degree to which transactions can be traced, from originator to approver to final handover. Since this project is related to legal actions auditability is a mandatory requirement. When citizen report the criminal case user name, date, time and location details are store in the system. When case assign to the police officer, officer name, NIC No, date and time store in the system. In addition to that when case resolved by the police officer same details are logged in to the system. In the system all the actions were recorded with the user name, date and time.

2.3. Review of Similar Systems

Most of the criminal reporting systems are developed only as the web applications. Other applications not provided the feature of track the location with Google maps. This application provides the location tracking feature. This application provides five different user levels. Most of the applications provide two user levels only. Most of the applications are not provided the feature to upload the related images and videos. Following are some of the related projects to this application

2.3.1. Online Crime Reporting system developed by Skyfi Labs

Web based online crime reporting system developed using PHP. This application is developed to report the criminal cases that are happen in the city. It provides facility to send images or videos of criminal cases to the police station in the city. It additionally gives the details of missing people in the city and provide security tips for the awareness of the citizens.

For the front end development, they used HTML, CSS, JavaScript and Bootstrap to achieve responsiveness. Back end is developed using PHP and used MySQL for the database. For recognize the area and citizen, cookies and IP have been used. Clients can send images related to the criminal case and police have a database to store the details. Citizen data were kept in secure and citizens complain will be sent to the nearest police station. [1]

2.3.2. e-Cops: An Online Crime Reporting and Management System for Riyadh City.

This application is used for report criminal cases in Riyadh City in Saudi Arabia. With this application people can report criminal cases without their identity. This helps to minimize the gap between police officers and the individuals to send reports or send other required information regarding criminal cases. In addition to that this system is used by the people to make the complaints and is helpful to the police department to identifying the criminals. The main objective of this system is to improve the efficiency and effectiveness of interaction between the police department and general public. It is ideal solution to monitor and track the criminals around the city and also maintain a complete online record of crime related information. [2]

2.3.3. Online Crime Reporting and Management System using Data Mining

This system also developed to manage criminal cases which can be used to the general public and police department. The system provides information about the crime rates of a given area. This is useful for persons who are entering in to the places which is unvisited before. If the user enters to the high risk area, then he/she will be informed with an alert message. The user gets notified about the different crime rates in the area and provide the safest path to his destination. Also, the system registers the complaints from the people through online where people can upload videos and images of the criminal cases and it will be helpful for the police department for find criminals. [3]

2.3.4. Public Crime Reporting and Monitoring System Using GSM and GIS technologies

This system was developed for police of the Zambia. This application can be used to people to report criminal cases and allow the police stations to monitor them in real-time. This application consists of two parts; the Graphical User Interface(GUI) and mobile application (front end). Mobile app used to report criminal cases and backend application is used to monitor and work on the reported criminal cases. Front end is developed using android and backend is developed using PHP. Google API was used to find the criminal location. [4]

2.3.5. VicPD mobile app

This is mobile app developed for Victoria Police Department in Canada. This can be used to report criminal cases, provide useful tips for investigators, listen in to news about the crimes, offer tips to police without identity, receive missing child reports or check on stolen property. Users can see reports of crime in their geographic location by using crime maps. And also users can View and search for the latest images and videos regarding criminal cases. By using this app people can report traffic violations online. Police can take actions regarding criminal cases online by using this mobile app. [5]

2.4. Related Technologies

In this section described related technologies used to develop similar systems. Analyzing of related technologies is used to select best technologies for develop the proposed system. When develop the web application performance and security are very important. So need to select the technologies which can be used to achieve functional and non-functional requirements. Followings are some of the used related technologies.

Java: Java is a commonly used Object Oriented, high level, robust and secure programming language. It can be used as a platform. Java can be used to develop Standalone Application, Web Applications, Enterprise Applications and Mobile Applications. Java provide strong support for web applications development and is commonly used at the server side. A Java web application is a collection of dynamic and static resources. A Java web application can be deployed as a WAR (Web Archive) file. Java is widely used for develop software applications because java is fast, secure, and reliable. It is commonly used for server side technologies like Glassfish, JBoss, Apache etc.

HTML: HTML stands for Hyper Text Markup Language. HTML is the standard and commonly used markup language for creating Web pages. HTML consists of different types of elements and these elements describes the structure of a Web page. HTML elements tell the browser how to display the content on the browser. Latest version of HTML is HTML 5.

CSS: CSS stands for Cascading Style Sheets. CSS is important for the appearance of the web pages because CSS determine how HTML elements are to be displayed on the screen. Appearance of multiple web pages can be controlled using single style sheet. CSS handles the look and feel part of a web page

JavaScript: JavaScript is commonly used programming language of the Web. JavaScript can be integrated with HTML and it is open source. JavaScript works in the client-side of the application and responsible for interact with the user and create dynamic web pages. JavaScript is a programming language with object-oriented capabilities. It is the language used to create and control dynamic website content. **Bootstrap**: Bootstrap is the most popular framework for developing responsive websites. It contains CSS and JavaScript-based design templates for develop interface components. Bootstrap 4 is the newest version and now it become an important tool for front-end developments. It enables developers to quickly build fully responsive websites with all components including Navigation bars, Dropdowns, Progress bars, images, menu items, paginations, tables etc.

MySQL: MySQL is an open-source relational database management system (RDBMS). It is reliable, fast, and easy to use. MySQL use standard SQL. MySQL can be used on a number of platforms. In MySQL database data are stored in tables. A table is consisting of columns and rows. MySQL works on many operating systems and can be used with many languages. MySQL works very quickly and works well even with large data sets.

PHP: PHP stands for Hypertext Preprocessor. It is a widely-used, open source scripting language developing web based software applications. PHP scripts are executed on the server. It allows to create dynamic and interactive web pages that interact with databases. PHP is a widely-used, free, and efficient server scripting language. PHP 7 is the latest stable release.

2.4. Related Design Strategies

To overcome the problem which described in the previous chapter, proposed system should be consists with data entry forms, collection of reports, inquiry module with data visualization, database management system to store required data, upload images and videos. Since this is a web based solution, web development technologies should be used.

2.5.1. Software Architectural Patterns

MVC Architecture: Model-View-Controller (MVC) is a design pattern that separates an application into the model, the view, and the controller. MVC is one of the most commonly used web application development framework.

Model: Responsible for maintaining data.

View: Responsible for displaying all or a portion of the data to the user.

Controller: Controls the interactions between the Model and View.

MVC separate the business logic from the presentation layer and supports separation of concerns. Nowadays, MVC architecture has become popular not only for designing web applications as well as mobile application developments. [6]

Three-tier Architecture: Three-tier architecture separates applications into three physical and logical tiers. Main advantage of three-tier architecture is that each tier runs on its own infrastructure. So it easy to develop each tier simultaneously by a separate development teams. It is helps to fast delivery of the products.

Presentation tier: User interfaces of the system and communication link for user to interact with the system.

Application tier: Business logics are implemented in application tier and also called as logic tier or middle tier.

Data tier: Information processed by the application is stored and managed in the data tier.

The three-tier architecture is used when an effective distributed client/server design is needed. This provides scalability, maintainability, reusability and flexibility. It also helps to hide the complexity from the user. These characteristics have made three-layer architecture become popular for develop web [7].

MVC architecture is selected to develop "Online Criminal Reporting and Management System".

2.5.2. Software Development Methodologies

There are several software development methodologies use to develop software systems. Some of them are; Waterfall Model, Agile Software Development Methodology, Rapid Application Development, Feature Driven Development, Scrum, Extreme Programming, DevOps deployment methodology etc.

Agile methodology is used to implement the system. Using agile methodology, I'll be able to find solutions to the problems occurring then and there during the life cycle. Since every iteration has its own testing phase, it allows me to implementing regression testing in every time new functions are released. Agile methodology promotes continuous iteration of development and testing throughout the software development lifecycle of the project which will aid me in providing a successful output in a short time period

Agile Software Development Methodology

Agile software development methodology is one of the simplest and effective processes to turn a business requirement into software solutions. The Agile process embraces change, accepting the idea that requirements will evolve throughout a project. It offers a professional approach to software development including human, organizational and technological aspects of software development processes. Agile Manifesto describes 12 principles of Agile Software development. [8]

The ultimate goal of agile software development is it delivers software faster, with greater quality and predictability, and greater aptitude to respond to change. Scrum and Kanban are most widely used agile development methodologies.

CHAPTER 3 DESIGN ARCHITECTURE

3.1. Introduction

This chapter describes technologies, methods and best practices that can be used to design an efficient and convenient "online criminal reporting and management system". Several types of diagrams such as use case diagrams, class diagrams, activity diagrams, sequence diagrams are used to describe the architectural design of the system. ER diagrams are used to describe the database structure. Technologies which are used to develop the system and design methodologies are described in this chapter. Architectural design of the system

3.2. System Architecture

Three-tier architecture is used to develop "Online Criminal Reporting and Management System". which involves a client tier (Tier 1), an application tier (Tier 2) and data storage tier (Tier 3). Client tier resides in a web browser and uses web technologies such as HTML, CSS, Bootstrap and JavaScript in order to provide an interactive user interfaces. PHP is used to develop application tier. Both client tier and application tier are runs on the XAMPP web server. MySQL database is used as the data storage tier. Once a user initiates a request through his/her browser, using the request-processing architecture web server will then communicate with the database server and send the appropriate response to the user's browser.



Figure 3.1: System Architecture

3.2.1. MVC Architecture

Code Igniter framework is used to develop the system. Code Igniter is based on the Model-View-Controller development pattern. MVC is a software approach that separates application logic from presentation.

- **Model** Deals with database and helps to retrieve, insert, and update information with the database.
- **View** Responsible for data presentation. A View will normally be a web page and used to present information to the user.
- **Controller** Coordinates the activities between the model and the view. It serves as an intermediary between the Model, and the View.

Below diagram shows how MVC framework works.



Figure 3.2: MVC Architecture

 Model is responsible for interacting with data sources. In This system model classes use to insert, update, retrieve information in to the tables in the database. In Code igniter, a model usually contains functions to insert, update and retrieve information. In Code Igniter Models are stored in the application/models directory.

- Controllers are listen to incoming requests from the users. It acts as the intermediate between model and the view. Business logics also implement in the controller. In this project data validations are done in the controllers. Once the model has processed the information and returned a response, the controller loads the appropriate view and passes in the data returned from the model to the view for display. In Code Igniter controllers stored in application/controllers directory.
- View is responsible for data present to the user. In this project views are containing HTML, CSS and JavaScript. Views separates presentation logic from the application logic. In Code Igniter use PHP tags inside HTML pages to display some data to the user. In Code Igniter, views are stored in application/views directory.

There are several benefits of using MVC architecture

- 1. Loose coupling components exist and function independently of each other.
- 2. Flexibility -can easily make changes to individual components
- 3. Increased productivity can separately work on the front end and back end since the system is loosely coupled.

3.2.2. Waterfall Model

Waterfall software process model has been used mainly for this software project, due to the inherent linear structure of it which is ideal for a milestone- and date-focused project such as this one. I have adopted the linear sequence life cycle of the waterfall model to its full effect when developing the "Online Criminal Reporting and Management System". As there were no ambiguous requirements from the business after finalizing the requirements in the initial stages, I was able to work sequentially as planned. This allowed me to use the waterfall model throughout the project without looking for another method.



Figure 3.3: Waterfall Model

3.2.3. Used Technologies

1. PHP with Code Igniter framework

I have used PHP with Code Igniter framework to develop "Online Criminal Reporting and Management" system. Code Igniter is a PHP MVC framework which can be used for developing web based software applications rapidly. Code Igniter provides set of libraries for connecting to the database and performing various operations like uploading files, sending emails, managing sessions and many more things.

2. JavaScript

JavaScript is often executed in a client's browser which means less load on the server with immediate feedback to the users. Moreover, it aided me in enhancing the user interface. Hence, I have used JavaScript during the development of Online Criminal Reporting and Management system. And also used JavaScript to validate the user inputs.

3. Bootstrap

The bootstrap is an Open Source Front-End development framework, which can be used for Web Application development. I have used Bootstrap mainly due to browser compatibility and mobile responsiveness. Since I have a plan to extend this to a mobile version, I have used Bootstrap which includes HTML and CSS based design templates which I used for buttons, forms. Etc. With the use of Bootstrap Grid System can be create layouts of the application rapidly. So that saves the time.

4. Sublime Text Code Editor

I have used 1. Sublime Text Code Editor as development tool to develop" Online Criminal Reporting and Management System". It's been very helpful to my development; the app provides a lot of useful features such as. Auto completion, Syntax Highlight, Code Folding, Powerful Search, Simultaneous Editing etc.

3.2.4. Database Design

Relational database is used for the "Online Criminal Reporting and Management System." So data in a database is organized into tables. Use SQL language to access the database. Used MySQL as the Relational Database Management System. MySQL is the most popular open source SQL database. It is typically used for web application development, and often accessed using PHP.

Below diagram demonstrate the Entity Relationship Diagram(ERD) which has been designed for "Online Criminal Reporting and Management System". Entity relationship diagram shows the relationship of each tables and their attributes stored in a specific database which shows the logical structure of the data. ERD is a blueprint of a database.



Figure 3.4: Entity Relationship Diagram

3.3.UML Diagrams

3.3.1. Class Diagram

A UML class diagram describe the set of classes and relationships between classes. Class diagram is a graphical notation used to construct and visualize object oriented systems. This will enhance the classes identified in the system, the interfaces, attributes and methods of each category, and the relationships between classes. Below diagram demonstrate class diagram designed for "Online Criminal Reporting and Management System".



Figure 3.5: Class Diagram

3.3.2. Use Case Diagrams

Use case diagram is a behavioral type UML diagram type and commonly used to analyze the systems. It enables users to identify the different types of roles in a system and how those roles interact with the system. Here I have created use case diagrams for each major modules of the project, which will provide more insight for the end-users. Below diagram show the high-level use case diagram for overall system.



Figure 3.6: High Level Use Case Diagram

3.3.2.1 Use Case Diagram – User Login

ID	1
Name	User Login
Description	All users with different authority level login into the system by enter
	user name and password or register as new user to the system.



Figure 3.7: Use Case Diagram for User Login

3.3.2.2 Use Case Diagram – Make Complain

ID	2
Name	Make Complain
Description	Citizen make complaints about crime with or without login into the
	system



Figure 3.8: Use Case Diagram for Make Complain

3.3.2.3 Use Case Diagram – Approve Complain Request

ID	3
Name	Approve Complain Request
Description	Administrator(Police Head Office) of the system can approve or
	reject the complaint request and assign to the relevant police station



Figure 3.9: Use Case Diagram for Approve Complain Request

3.3.2.4 Use Case Diagram	n – Assign (Complain	Request to	the Police Officer
--------------------------	--------------	----------	-------------------	--------------------

ID	4
Name	Assign Complaint Request to the Police Officer
Description	Police OIC assign complaint request to the police officer for
	investigations



Figure 3.10: Use Case Diagram for Assign Complain Request

3.3.2.5 Use Case Diagram – Finalize Complaint

ID	4
Name	Finalize Complaint
Description	After make investigations police officer close the complaint



Figure 3.11: Use Case Diagram for Finalize Complain Request

3.3.3. Activity Diagrams

Activity diagrams describe dynamic aspects of the system. Activity diagram is describing the flow from one activity to another activity. Here I have used it to describe operations of the system. The control flow is drawn here from one operation to another. Following are few activity diagrams related to the "Online Criminal Reporting and Management System."

3.3.3.1. Activity Diagram – User Login



Figure 3.12: Activity Diagram for User Login

3.3.3.2. Activity Diagram – Make Complaint



Figure 3.13: Activity Diagram for Make Complaint

3.3.3.3. Activity Diagram – Approve Complaint



Figure 3.14: Activity Diagram for Approve Complaint

3.3.4. Sequence Diagrams

Sequence Diagrams are interaction UML diagrams that shows how operations are carried out. They find the interaction between objects in the context of a collaboration. This is a type of communication diagram that highlights the time, messages sent and received by each program item.



3.3.4.1. Sequence Diagram – User Login

Figure 3.15: Sequence Diagram for User Login

3.3.4.2. Sequence Diagram – Add Complaint



Figure 3.16: Sequence Diagram for Add Complaint

CHAPTER 4

IMPLEMENTATION

In order to implement the "Online Criminal Reporting and Management System", many technologies, frameworks, libraries and third party software components were used. In this chapter briefly explain the implementation and functionality of them to develop the system.

4.1. Technologies Used

4.1.1. PHP with Codeigniter framework

For the developments of "Online Criminal Reporting and Management System" I have used PHP programming language with Codeigniter framework. Codeigniter is a most commonly used open-source framework for develop web applications. Codeigniter is a model, view, controller framework and very easy to use. With this framework can get more results with few lines of code. I have used Sublime text editor to develop the application. Sublime Text does a great job with appropriate color coding and syntax definitions and makes code extremely readable

Model View Controller architecture

I have used MVC (Model View Controller) architecture when developing the "Online Criminal Reporting and Management System". It allows me to separate inputs, outputs and processing of an application. The controller receives all requests for the application and then call the model to prepare the information required by the view. The view uses the data prepared by the controller to bring the final output.

Model: Models are in the models folder. Model interact with the database and doesn't know anything about views and controllers. Models helps to retrieve, insert, and update information with the database.



Figure 4.1: Models in the application

View: View are inside the views folder. View is a visual representation of the MVC architecture. View are used to display output to the user. It also takes requests from the user and pass to the controller.



Figure 4.2: Views in the application

Controller: Controllers are in the controllers folder. It acts as the intermediary between model and the view. All business logics are implemented in the controller.



Figure 4.3: Controllers in the application

4.1.2. Java scrips/JQuery

I have used Java scrips/JQuery during the developments of "Online Criminal Reporting and Management System". It helps me to develop rich interfaces, reduce the load on the server, validate some user inputs, load the google maps according to the user's current location, save and retrieve data to/from the database and many more things. Below screen shot provides a sample code of JavaScript which I have used to load google map according to the user's current location in the developed of "Online Criminal Reporting and Management System".

```
function showPosition(position) {
   var latitude = position.coords.latitude;
var longitude = position.coords.longitude;
   latitude = (Math.round(latitude * 100000) / 100000);
   longitude = (Math.round(longitude * 100000) / 100000);
    $("#longitude").val(longitude);
    $("#latitude").val(latitude);
function showMap(){
   var latitude = $("#latitude").val();
var longitude = $("#longitude").val();
   var center = new google.maps.LatLng(latitude,longitude);
var mapOptions = {
   zoom: 13,
   center: center,
   mapTypeId: google.maps.MapTypeId.ROADMAP
   map = new google.maps.Map(document.getElementById("map_canvas"), mapOptions);
   var marker = new google.maps.Marker({
   map: map,
   position: center,
```

Figure 4.4: Sample Java Script code

4.1.3. Bootstrap

I have used bootstrap to achieve browser compatibility and mobile responsiveness. Not only that I have used bootstrap to add data pickers, time pickers, models, alerts, tables, dropdowns and many more things. With the bootstrap can extend this web application to the mobile version. Following demonstrate browser compatibility and mobile responsiveness achieved with the use of bootstrap.

Crime Management Dashboard × +							0	-	0 ×
← → C ③ localhost/crime/dev/index.php/	dashboard						⊕ ☆	8 #	. :
Crime Management	DASHBOARD	USER 🔻	Complain 👻	POLICE STATION	MOST WANTED PERSONS	MISSING PERSONS	REPORT	5 ADM	IN 👻
							Friday, 16 J	uly, 2021	10:37:19
Dashboard									
💕 COMPLAINS									
New Complain									
Manage Complain									
Approve Complain									
Assign Complain									
•									
USER USER									
New User									
User Modification									
Approve User									
Assign User									
						Activate M	indows		
						Go to Settings	to activate	Windo	NS.
					, All and a second s	All RIGHTS RESERVED	🛛 Sri Lanka I	Police S	RI LANKA

Figure 4.5: Browser view of the application

C	rime Management 🛛 🚍
	Friday, 16 July, 2021 10:37:19
Dashboar	d
Sec.	DMPLAINS
	New Complain
	Manage Complain
	Approve Complain
	Assign Complain
🚨 US	SER
	New User
	User Modification
	Approve User
A	All RIGHTS RESERVED © Sri Lanka Police SRI LANKA

Figure 4.6: Mobile view of the application

4.2. Security Controls

In order to prevent unauthorized access to the to the "Online Criminal Reporting and Management System" implementation of security controls is very important. Some of the security controls are described in below.

Use password encryption

To avoid unauthorized access to the system sensitive data such as login password of users should be encrypted. **"password_hash()"** PHP Password Hashing Function is used to encrypt the login password. This function generates 60-character length encrypted password and this encrypted password is stored in the database.

4	←Ţ	→		\bigtriangledown	user_id	username	password	firstname	lastname	email
		🥜 Edit	📲 Сору	Delete	1	admin	\$2y\$10\$pscgpWchrrv92NDgjStEeOJS.4E2v3hCRgOAM4LfUYH	Administrator	Administrator	laknada.dinesh@gmail.cor
		🖉 Edit	Copy	Delete	2	oic	\$2y\$10\$L9h/CtEP5kQYITL4fKjXfeK3/o4eFfiXi7UJxi.qhGK	Saman	Kumara	laknada.dinesh@gmail.com
		🥜 Edit	📲 Сору	Delete	3	officer	\$2y\$10\$0hO6VXXbsLgGQUTD7j1pFeugGAojRqpHFgeNGaP96x6	Nimal	Kumara	laknada.dinesh@gmail.com
		🥜 Edit	📑 Copy	\ominus Delete	4	citizen	\$2y\$10\$80ZZWRjCJgnralhjbG2TjuBmeZTTrTX17ciaJW.Nim5	Amal	Kumara	laknada.dinesh@gmail.cor
		🥜 Edit	🚽 Сору	Delete	5	citizen2	\$2y\$10\$Arus.nFSdXHn5WDxI6H22u1zazMHUfRyUJTCFpMZd3k	Chandra	Kumara	changra@gmail.com

Figure 4.7: Encrypt login passwords

Track user actions

All the user actions with user action, login user, data and time are stored in the database tables. Every time a record is inserted, updated or deleted in a table above information are recoded in the database.

enter_user	enter_date	enter_time	approve_user	approve_date	approve_time	reject_user	reject_date	reject_time	reject_reason	delete_user
ADMIN	2021-06-20	22:33:40	0	0000-00-00	00:00:00	0	0000-00-00	00:00:00		
ADMIN	2021-06-20	22:36:37	ADMIN	2021-06-25	03:28:48	0	0000-00-00	00:00:00		
ADMIN	2021-06-20	22:36:40	0	0000-00-00	00:00:00	ADMIN	2021-06-25	03:34:05	Teat Reason	ADMIN
ADMIN	2021-06-20	22:36:43	ADMIN	2021-06-27	06:01:13	0	0000-00-00	00:00:00		
ADMIN	2021-06-20	22:45:59	0	0000-00-00	00:00:00	ADMIN	2021-06-27	06:01:36	Test Reect	ADMIN
ADMIN	2021-06-20	22:46:21	0	0000-00-00	00:00:00	0	0000-00-00	00:00:00		
ADMIN	2021-06-20	22:46:58	0	0000-00-00	00:00:00	0	000-00-00	00:00:00		
ADMIN	2021-06-21	20:48:52	0	0000-00-00	00:00:00	0	000-00-00	00:00:00		
CITIZEN	2021-06-25	12:10:01		0000-00-00	00:00:00		0000-00-00	00:00:00		
ADMIN	2021-06-27	06:00:50		0000-00-00	00:00:00		0000-00-00	00:00:00		
ADMIN	2021-07-01	12:48:37		0000-00-00	00:00:00		0000-00-00	00:00:00		

Figure 4.8: Track user actions

4.3. User Interfaces

User interfaces of the "Online Criminal Reporting and Management System" are developed using HTML, CSS, JavaScript, JQuery and bootstrap. User permission are kept in the database table and according to the values in the permission table user interfaces are customized.

id	roll_id	module_id	status	read_permission	write_permission	update_permission	delete_permission	approve_permission	assign_permission ▲ 1
21	2	7	1	1	0	0	0	0	0
20	2	6	1	1	0	0	0	0	0
17	2	3	1	1	0	0	0	0	0
14	4	7	1	1	0	0	0	0	0
13	4	6	1	1	0	0	0	0	0
12	4	5	1	1	1	1	1	0	0
11	4	4	1	1	0	0	0	0	0
10	4	3	1	1	0	0	0	0	0
9	4	2	1	1	1	1	1	0	0
8	4	1	1	1	0	0	0	0	0
2	1	2	1	1	1	1	1	1	1
19	2	5	1	1	1	1	1	1	1
18	2	4	1	1	1	1	1	1	1

Figure 4.9: Store user permissions in the database

This is the login screen of the system

		nagen	ienc
Login			
Username			
Password			
Create Acc	ount		Login

Figure 4.10: Login Screen

After user log in the system user dashboard is shown according to the user permissions. Links and menu items are provided to easy navigation through the web pages. Bootstrap is used to achieve browser compatibility and mobile responsiveness of the application.

$\leftarrow \ \rightarrow$	C 🛈 localhost/crime/dev/index.php/d	dashboard					@☆ 🕸 🗯 🛔
POLICE	Crime Management	DASHBOARD	USER 🔻	Complain 🔻	POLICE STATION	MOST WANTED PERSONS	MISSING PERSONS REPORTS ADMIN
							Coloradori 47 July 2024 044
							Saturday, 17 July, 2021 04:
Dash	board						
6	COMPLAINS						
	New Complain						
	Manage Complain						
	Approve Complain						
	Assign Complain						
2	USER						
	New User						
	Licer Medification						

Figure 4.11: User Dashboard

CHAPTER 5

TESTING AND EVALUATION

4.1. Introduction

System Testing is the way to assure the quality of the developed software solution. Before the developed "Online Criminal Reporting and Management" system deliver to the client, it is very important to testing the system in various ways. System testing ensure that how well the system performs under various situations without crashing. After implementation of the system it should be test evaluated by the user before it moves in to the live. This chapter will describe some of the testing scenarios which had been done in order to test and evaluate the "Online Criminal Reporting and Management" system.

4.2 System Testing

System testing is very important step to ensure that all functional and non-functional requirements are implemented in the system without issues. System testing can be done in the developments phase. In the development stage Unit testing can be done to check the functionality of each and every components of the system. In the unit testing each component has been separated and test with their inputs and outputs. When the unit testing actual results were compared with the expected results and fix the issues. Detailed test plan is attached to the appendix A.

During the testing phase I have used integration testing once I have complete the testing of individual units. It was useful to overall functionality of the system. In order to evaluate the system further I have tested the system for browser compatibility. By completing the browser compatibility testing I got more ideas to further optimizations about the system. Those are helpful to improve the quality of the product and user friendliness

4.3 System Evaluation

After implementation of the system, it was published on the test environment and allow users to test the system. I have tested the system with few of my friends and got their feedback to further improvements of the system. Many types of methods are available to evaluate the software systems. For evaluation of "Online Criminal Reporting and Management System", Criteria-based assessment was used. With that assessment I have evaluated the system for appearance, security, functionality and user-friendliness and usefulness.

Questioner is used to get the users feedback. Users can enter numbers from 1 to 5 based on the experience when they use the system. Five options available are:

- 1 Strongly Disagree
- 2 Disagree
- 3 Average
- 4 Agree
- 5 Strongly Agree

Below table shows the questioner given to the user for evaluate the system.

Evaluation Form of Online Criminal Reporting and Management System									
		1							
Are	you work in the police?								
If ye	es no of years' work in the police		-			1			
		Less than	1-5	years		More	e than	5	
		1 Year				years	5		
Svs	tem Evaluation								
Plea	se give marks for the below questions								
1 –	Strongly Disagree								
2 - 2	Disagree								
3 –	Average								
4 –	Agree								
5 –	Strongly Agree								
				1	2	3	4	5	
1	I can understand the main menu functions of	the system b	ŊУ						
	its name.								
2	Screen titles are well describe the functionali	ty							
3	Field names are meaningful								
4	Interfaces are clear and attractive								
5	Use proper font size in the system								
6	Easily navigate through the pages in the syste	em							
7	Can use system without user guide								
8	Error messages are meaningful								
9	Can satisfy the security provided by the syste	em							
10	System prevents me to do mistakes								
11	System provides dual control								
12	Response time is acceptable								
13	Useful and enough reports generate from the	system							
14	System able to perform its task successfully								
15	This system can be used to automate daily of	fice works							
16	This system help to reduce no of criminal cas	ses							
17	I like to work with the system								
18	This system is useful to general public								
Con	nments:								

Table	5.1:	System	Evaluation	1 Form
1 uoio	5.1.	by stem	L'uluulloi	I I OIIII

4.4 Analysis of Evaluation Results

Above questioner was given to the ten persons and collect their feedback about the system. Below table was designed to analyze the feedbacks and evaluate the results.

			A	ppea	ranc	e			S	ecuri	ty	Fun	ction	ality	١	Usab	ility	
Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
No																		
User 1	5	5	5	4	5	4	4	5	5	4	5	4	5	5	5	5	5	5
User 2	5	5	4	4	4	4	3	4	5	4	5	4	5	5	5	5	5	4
User 3	4	5	4	3	4	3	3	4	4	4	4	4	4	4	4	5	5	4
User 4	4	4	4	3	4	3	2	3	4	3	4	3	4	4	4	4	4	4
User 5	5	5	4	3	5	4	4	4	5	4	4	4	5	4	4	4	5	5
User 6	4	5	5	4	5	5	4	4	5	4	4	4	4	5	5	4	5	4
User 7	3	4	4	2	4	4	3	4	4	3	4	3	4	4	4	4	4	4
User 8	4	5	4	4	4	5	3	4	5	3	4	3	5	5	4	4	5	5
User 9	4	5	5	4	4	5	4	4	5	4	4	4	5	5	5	5	5	5
User 10	4	5	5	4	4	4	4	4	5	4	5	4	4	4	4	5	5	5
Average																		
per																		
Question	4.2	4.8	4.4	3.5	4.3	4.1	3.4	4	4.7	3.7	4.3	3.7	4.5	4.5	4.4	4.5	4.8	4.5
Average																		
per																		
Category				4.1					4	.17			4.23			4.5	55	

Table 5.2: Analysis of evaluation results

By analyzing the results can determine appearance, security, functionality and usability of the system. According to the results system is scored more than 4 for all categories. So can determine that system is able to achieve user satisfaction and ready to go live.



Figure 5.1: Analysis of evaluation results

CHAPTER 6

CONCLUTION

With the pleasure I was able to develop the "Online Criminal Reporting and Management System". The major challenge was stop the manual process and continue the same process with online system. According to the evaluation results system is in accepted level. At the beginning users get more time to familiar with the system and can't archive expected performance. With the time can expect the improvement of performance.

There are some enhancements to improve the system performance and usefulness of the system.

- It is better to having customized reporting module. Then user can get any kind of report without system change.
- Provide the dashboard with real time data. Then users can get overall idea about the criminal cases with less amount of time.
- If the system can give predictions about the criminal cases in the area using data mining it is very useful to minimize the criminal cases in future.
- If the system develops as the mobile application, it is very useful for general public to report criminal cases at the moment they see.

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Appendices

A. Test Cases

Some of the test cases used for testing "Online Criminal Reporting and Management System" are shown below.

• Test Cases for Login into System

Test	Test Case	Expected Result	Actual Result
Case Id			
T1.1	Log in to system with	Successfully login in to the	Same as expected
	correct username &	system and display dash	
	password	board.	
T1.2	Try to enter username with	Display error message	Same as expected
	more than 10 character.	"Invalid User Name"	
T1.3	User enter invalid username	Display error message	Same as expected
		"User does not exists"	
T1.4	User enter invalid password	Display error message	Same as expected.
		"Password is Incorrect"	
T1.5	Try to log in to system with	Display error message	Same as expected.
	empty user name.	"User Name is Required."	
T1.6	Try to log in to system with	Display error message	Same as expected.
	empty password.	"Password is Required."	
T1.7	Try to log in to system with	Display error message	Same as expected.
	empty user name and	"User Name and Password	
	password.	Required"	
T1.8	Try to log into system with	Display error message	Same as expected.
	not activated username	"User account is not	
		activated"	

Table A.1: Test Cases for User Login

• Test Cases for create new User

Test	Test Case	Expected Result	Actual Result
Case Id			
T2.1	Click on "Register User"	Display error messages near	Same as
	button without fill the details	the form fields	expected.
	in the form.		
T2.2	Try to register with existing	Display error message "User	Same as
	user name.	Name already exists."	expected.
T2.3	Try to register user with	Display error messages	Same as
	invalid email address or	according to the entered	expected.
	phone number.	invalid email address and/or	
		phone number	
T2.4	Try to register user with	Display error message "E-Mail	Same as
	already existing email	address already exists"	expected.
	address.		
T2.5	Try to register user with	Display error message "Phone	Same as
	already existing phone	number already exists"	expected.
	number		
T2.6	Try to register with user	Display error message "The	Same as
	name which has more than	User Name field cannot exceed	expected.
	10 characters	10 characters in length."	
T2.7	Try to register with different	Display error message "The	Same as
	password and confirm	Password Confirmation field	expected.
	password.	does not match the Password	
		field."	

Table A.2: Test Cases for Create New User

• Test cases for create complain

Test	Test Case	Expected Result	Actual Result
Case Id			
T3.1	Try to create complain without select criminal type	Display error message "Please select criminal type."	Same as expected.
T3.2	Try to create complain without select time	Display error message "The Criminal Time field is required"	Same as expected.
T3.3	Try to create complain without enter address	Display error message "The Address field is required"	Same as expected.
T3.4	Try to create complain without enter description	Display error message " The Description field is required"	Same as expected.
T3.5	Fill all required fields and click on "Save Data" button	Data successfully insert into the database and display success message as "Complain has been created successfully"	Same as expected.

Table A.3: Test Cases for Create Complain

• Test cases for assign complain by administrator

Test	Test Case	Expected Result	Actual Result
Case Id			
T4.1	Administrator clicks on the	Display records which are	Same as
	"Assign Complain" link.	not assigned to police	expected.
		station in the table	
T4.2	Administrator Clicks on the	Display popup with police	Same as
	"Assign" button related to the	station details	expected.
	particular record.		
T4.3	Administrator Click on "Assign"	Display error message	Same as
	button in the popup without select	"Please select police station.	expected.
	police station	"	
T4.4	Administrator Click on "Assign"	Data updated in the	Same as
	button in the popup after select	database and display	expected.
	police station	success message	

Table A.4: Test Cases for Assign Complain by Administrator

• Test cases for assign complain by police OIC

Test	Test Case	Expected Result	Actual Result
Case Id			
T5.1	Police OIC clicks on the "Assign Complain" link.	Display records which are related to the police station and not assigned to police officer in the table	Same as expected.
T5.2	Police OIC Clicks on the "Assign" button related to the particular record.	Display popup with police officer details	Same as expected.
T5.3	Police OIC Click on "Assign" button in the popup without select police station	Display error message "Please select police officer."	Same as expected.
T5.4	Police OIC Click on "Assign" button in the popup after select police station	Data updated in the database and display success message	Same as expected.

Table A.5: Test Cases for Assign Complain by Police OIC

Test	Test Case	Expected Result	Actual Result
Case Id			
T6.1	Administrator clicks on the	Display records which are	Same as
	"Approve Complain" link.	not approved with two	expected.
		buttons "Approve" and	
T ()			0
16.2	Administrator Clicks on the	Display popup with	Same as
	"Approve" button related to the	confirmation	expected.
	particular record.		
T6.3	Administrator Click on	Data updated in the	Same as
	"Approve" button in the popup.	database.	expected.
T6.4	Administrator Clicks on the	Display popup with text	Same as
	"Reject" button related to the	area to enter reject reason	expected.
	particular record.		
T6.5	Administrator Click on "Reject"	Display error message	Same as
	button in the popup without enter	"Reject reason is required".	expected.
	reject reason.		
T6.6	Administrator Click on "Reject"	Data updated in the	Same as
	button in the popup with reject	database.	expected.
	reason.		

• Test cases for approve complain by Administrator.

Table A.6: Test Cases for Approve Complain by Administrator

• Test cases for assign police officer/OIC to police station by Administrator

Test	Test Case	Expected Result	Actual Result
Case Id			
T7.1	Administrator clicks on the	Display records which are	Same as
	"Assign User" link.	not assigned to police	expected.
		station in the table	
T7.2	Administrator Clicks on the	Display popup with police	Same as
	"Assign Officer" button related to	station details	expected.
	the particular record.		
T7.3	Administrator Click on "Assign"	Display error message	Same as
	button in the popup without select	"Please select police	expected.
	police station	station".	
T7.4	Administrator Click on "Assign"	Data updated in the	Same as
	button in the popup after select	database and display	expected.
	police station	success message	
T7.5	Administrator Clicks on the	Display popup with police	Same as
	"Assign OIC" button related to	station details	expected.
	the particular record.		
T7.6	Administrator Click on "Assign"	Display error message	Same as
	button in the popup without select	"Please select police	expected.
	police station	station".	

T7.7	Administrator select the police station which is already has police OIC.	Display error message "Already assign the OIC".	Same as expected
T7.8	Administrator Click on "Assign" button in the popup after select police station which does not assign the OIC	Data updated in the database and display success message	Same as expected

Table A.7: Test Cases for Assign OIC/Officer by Administrator

• Test cases for add police station by Administrator

Test	Test Case	Expected Result	Actual Result
Case Id			
T8.1	Click on "Add Police" button	Display error messages near	Same as
	without fill the details in the	the form fields	expected.
	form.		
T8.2	Try to add police station with	Display error message "Police	Same as
	existing police station name.	Station already exists."	expected.
T8.3	Try to register user with	Display error messages	Same as
	invalid email address or	according to the entered	expected.
	phone number.	invalid email address and/or	
		phone number	
T8.4	Try to add police station with	Display error message "E-Mail	Same as
	already existing email	address already exists"	expected.
	address.		_
T8.5	Try to add police station with	Display error message "Phone	Same as
	already existing phone	number already exists"	expected.
	number		_
T8.6	Try to add police station with	Display error message "The	Same as
	user name which has more	User Name field cannot exceed	expected.
	than 10 characters	10 characters in length."	_
T8.7	Click on "Add Police" button	Police station details inserted	Same as
	after fill details in the form	to the database and display	expected.
	correctly.	success message.	-

Table A.8: Test Cases for Add Police Station by Administrator

B. MIS Reports

In the Online "Criminal Management and Reporting System" provides facility to generate several MIS reports. These reports are helps to analyse the criminal cases based on several criteria. If Administrator takes the option, all the cases related to all the police stations are shown. If Police Officer or OIC takes the option, all the cases related to all assigned police stations are shown. If citizen takes the option, all the cases which are made by that person are shown. Some of the reports generated by the "Online Criminal Reporting and Management System" are shown below.

• Display Criminal Cases for the selected time period

User must select the "From Date" and "To Date" from the provided calendar options and click on the "View Report" button to generate the report.

Crime	Managem	ent da	Shboard l	JSER 👻 Complain 🔻	POLICE 🔻	MOST WANTED PERSO	NS MISSING PERS	ions reports -	ADMIN 🔻	
Complains - Date Range Report										
Please Select Date Range										
From Date: * 2021-09-11 2021-09-11										
						View Report				
Copy Exce	l CSV PDF						Se	Search:		
REFERENCE NO	TYPE 🔶	DATE 🔶	TIME 🗍	ADDRESS	$\stackrel{\mathbb{A}}{\forall}$		STATUS 👙	POLICE STATION	POLICE 0FFICER	
102	Traffic Offences	2021-09-02	08:44:00	No 01, Main Street, Col	ombo	Car Accident	Resolved			
103	Murder	2021-09-04	12:39:00	No 01, main Street, Ka	indy	Merder	In-Progress	Pettah	Nimal Kumara	
104	Robbery	2021-09-09	12:35:00	No 01, Main Street, Colo	mbo 01	Stolen house	Court Action	Pettah	Nimal Kumara	
105	Theft	2021-09-17	06:53:00	No 01, Main Street, Colo	mbo 01	Map Test	Pending			
Showing 11 to 1	Showing 11 to 14 of 14 entries Activate Windows Previous Settings to Activate Windows.									

Figure B.1: Display Criminal Cases According to Time Duration

• Display Criminal Cases for the selected police station

User must select the "District" and "Police Station" from the provided drop downs and clicks on the "View Report" button to generate the report.

🐨 Crime	Manager	nent 🛛	DASHBOARD	USER 🔻	Complain 🔻	POLICE 🔻	MOST WANTED PERSON	5 MISSING PERS	ons reports -	ADMIN 👻
Complains - Police Station Report										
Plassa Salast polis	o station									
Please Select polic	e station									
Police Station:*		Pettah	Pettah				•			
							View Report			
									L	
REFERENCE A NO	TYPE 🍦	DATE 👙	TIME 👙		ADDRESS	*		STATUS 🍦	POLICE STATION	POLICE OFFICER
78	Murder	2021-06-20	02:03:00		Teat		Test	Court Action	Pettah	Saman Kumara
79	Robbery	2021-06-20	02:06:00		Test		Test	Resolved	Pettah	
80	Robbery	2021-06-20	02:06:00		Test		Test	In-Progress	Pettah	
81	Robbery	2021-06-20	02:06:00		Test		Test	Pending	Pettah	
103	Murder	2021-09-04	12:39:00	No 0	1, main Street, Kano	У	Merder	In-Progress	Pettah	Nimal Kumara
104	Robbery	2021-09-09	12:35:00	No 01, M	Main Street, Colomb	o 01	Stolen house	Court Action	Pettah Activate Wi	Nimal Kumara
Showing 1 to 6 o	f 6 entries								Go prévious is	to activateNéXiedov
								All	RIGHTS RESERVED © S	ri Lanka Police SRI I

Figure B.2: Display Criminal Cases According to Police Station

• Display Criminal Cases for the selected criminal Type

User must select the "Criminal Type" from the provided drop downs and clicks on the "View Report" button to generate the report.

ase Select (rimina	l Туре								
iminal Type: *				Murder	Murder		•			
							View Report			
Сору	Excel	CSV	PD	F					earch:	
REFERENCE	NÔ	TYPE	÷	DATE 👙	TIME 🍦	ADDRESS	DESCRIPTION	STATUS 🍦	POLICE STATION	POLICE OFFICER
78		Murder		2021-06-20	02:03:00	Teat	Test	Court Action	Pettah	Saman Kumara
85		Murder		2021-06-21	00:17:00	Test	Test	Pending		
87		Murder		2021-06-27	09:29:00	Teat Addtess	Test Address	Pending		
103		Murder		2021-09-04	12:39:00	No 01, main Street, Kandy	Merder	In-Progress	Pettah	Nimal Kumara
ihowing 1 to	o 4 of 4	entries							Previous	1 Next
									Activate Wi	ndows

Figure B.3: Display Criminal Cases According to Criminal Type

• Display Criminal Cases for the selected Status.

User must select the "Status" from the provided drop downs and clicks on the "View Report" button to generate the report.

Type of Status: Resolves

In-Progress

Pending

Court Action

🐨 Crime	Managen	nent or	ASHBOARD	USER 🔻	Complain 🔻	Police 🔻	MOST WANTED PERSONS	MISSING PERSO	ons reports -	ADMIN 🔻	
										2021-09-11 0	8:34
Complains - S	tatus Report										
Please Select Crimin	nal Status										
Criminal Status: *		In-Progr	ess In-Progress				•				
							View Report				
Copy Excel	CSV PD	F						Sea	arch:		*
REFERENCE NO	TYPE 🗍	DATE 🔶	TIME 👙		ADDRESS	\$		STATUS 👙	POLICE STATION		
80	Robbery	2021-06-20	02:06:00		Test		Test	In-Progress	Pettah		
83	Rape	2021-06-30	16:31:00		Test Update		Test Update	In-Progress			
103	Murder	2021-09-04	12:39:00	No 01	, main Street, Kandy		Merder	In-Progress	Pettah	Nimal Kumara	
Showing 1 to 3 of	3 entries			,					Ac liverieus Go to Settings	ndbws Next to activate Windo	WS.
								All	RIGHTS RESERVED © S	ri Lanka Police SRI I	ANKA

Figure B.4: Display Criminal Cases According to Status