Operation Monitoring System for Bureau of Fire Protection of Davao Oriental

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A BSIT Capstone Project Submitted to the Faculty of Computing, Data Sciences
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APPROVAL SHEET

This thesis project hereto attached entitled "**OPERATION MONITORING SYSTEM FOR BUREAU OF FIRE PROTECTION OF DAVAO ORIENTAL**", prepared and submitted by **ROLAND KENT P, DULIGUEZ, JOSHUA D. LOPEZ, AND LARRABEL A. MOCOY**, is hereby recommended for approval and acceptance.

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ABSTRACT

Roland Kent P. Duliguez, Joshua D. Lopez, Larrabel A. Mocoy. "OPERATION MONITORING SYSTEM FOR THE BUREAU OF FIRE PROTECTION OF DAVAO ORIENTAL". (BSIT Capstone Project). Davao Oriental State University. July 2023.

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The Bureau of Fire Protection is one of the vital frontliners which ensures that our community is fire disaster ready, resilient and aware. The study; Operation Monitoring System for the Bureau of Fire Protection of Davao Oriental, is a web-based system that aims to help the fire officers in-charge to monitor station personnel whereabouts as well as vehicle status on every station. The main objective of this study is to develop a web-based system to help Bureau of Fire Protection of Davao Oriental in monitoring their daily operations. In detail, the project aims to (1) enables dispatch personnels in indicating the operational status of vehicles per station; (2) provide attendance system for each station; (3) Show status of dispatched personnel responding to fires and emergencies; (4) show detailed information about a fire or emergency, the type, location, and its status; (5) provide a summary report of fire incidents and emergencies (6) and, show recent activities in every fire station. The waterfall methodology was utilized in this project. This project was carried out to assist the Bureau of Fire Protection in Davao Oriental in monitoring station activities and whereabouts. Moreover, this system will enable modifications such as requesting help from nearby municipal stations. The user evaluation was conducted with twenty (20) respondents to comply with ISO 25010 standard. Having two (2) types of end-users, the evaluation results were divided and the weighted mean were calculated respectively. Overall, the evaluation has resulted in a weighted mean of 4.43 which indicated that the web system performs at a satisfactory rate with regards to the evaluation indicators following the ISO 25010 standard.

Keywords: web-based system, monitoring, reports, status, whereabouts.

CHAPTER I

INTRODUCTION

1.1 Rationale of The Study

The Bureau of Fire Protection is an enforcement agency responsible for fire protection, fire safety inspection, rescue operations, and emergency responses nationwide.

All national government agencies are mandated by law to assist BFP or conduct inspections independently upon BFP officers or personnel request. Communication between branches of the Bureau of Fire Protection is of the utmost importance. Each department in the organization has to report to the head office and the regional office about the operational status of the workforce, vehicles, equipment, and other resources. The Bureau of Fire Protection currently uses various communication methods, such as radios and cellular phones, to keep track of the multiple resources available in a fire station. Using such methods of communication greatly helps the Bureau in its daily operations and makes the relaying of information much easier. (Bureau of Fire Protection, 2016)

The Bureau of Fire Protection (BFP) is an agency of the Department of the Interior and Local Government (DILG) responsible for implementing national policies related to Firefighting and fire prevention as well as the implementation of the Philippine Fire Code of the Philippines (RA,2008, p. 9514). Formerly known as the Integrated National Police Fire Service, all around the nation, municipal and city fire and emergency services are administered and managed by the BFP. The Constabulary Fire Protection Bureau and the PC-INP Office of Fire Protection Service are the predecessors of the BFP.

In accordance with the provisions of Republic Act 6975, which established the Department of Interior and Local Government, the agency was established on January 29, 1991. The management, administration, and implementation of fire and emergency services across the nation are now under the control of the Bureau. (Romero & Pineda, 2019)

The Bureau of Fire Protection Davao Oriental branch does not have a functioning monitoring system in place, the stations make use of said radios and cellular phones for the relaying of information. But the use of such methods has their limitations, dispatcher of each station will have to relay information about their available personnel and resources multiple times a day. With the changing shifts of bureau personnel and team leaders, as well as sudden repairs and maintenance of vehicles, status of dispatched personnel, status of fire incidents and location, cannot always be monitored by the bureau with the current way the firm relay's information. In response, the researchers developed an Operation Monitoring System intended to help the Bureau of Fire Protection of Davao Oriental with said issues.

1.2 Purpose and Project Description

The project was conducted to help the Bureau of Fire Protection in monitoring manpower, and resources through a system called Operation Monitoring System of the Bureau of Fire Protection. The system will enable the daily monitoring of fire stations within the province of Davao Oriental. The system will enable a more efficient way for Bureau personnel to conduct their daily duties.

The project will have the following capabilities:

1. Station personnel can access the system, can input the daily attendance and available personnel then indicate their status (on-duty or off-duty).

2. It contains information of the status of vehicles and resources in each fire station in Davao Oriental. indicating if vehicles are serviceable or needs repair and maintenance. Through this function, this will allow the station dispatcher or admin to notify other stations about their status.
3. The station personnel/admin can input into the system the location, type, and status of the incident. This will notify and inform other stations about the current incident and might as well allow them to respond if needed.
4. The web-based system allows the station admin to upload documentations as well as report about previous and recent incidents. A full report will be posted in the system for and will be available for the other stations to view.

1.3 The Objectives of the Project

The main objective of this study is to develop a web-based system to help Bureau of Fire Protection of Davao Oriental in monitoring their daily operations.

Specific Objectives of the project:

1.To design, develop, and implement a web-based system for monitoring the operation status of fire stations that will be capable of:

- Allows the fire officer in-charge in indicating the operational status of vehicles per station.
- Provide attendance system for BFP of Davao Oriental
- Show status of dispatched personnel responding to fires and emergencies.
- Show detailed information about a fire or emergency, the type, location, and its status.

2. To provide an efficient way for the Bureau of Fire Protection in gathering and relaying information.

- Generate and show after reports of fire incidents.
- Show recent activities in every fire station.

1.4 Significance of the Project

This study aims to provide the necessary application to Fire Stations around Davao Oriental, Philippines, to solve the problem of difficulty in spreading the information throughout the province. Specifically, this study would be beneficial for the following:

1. **The Bureau of Fire Protection** will benefit from this study since the stations could use the system to efficiently gather information from one station to all stations to execute their daily operations.
2. **Future Researchers** can use this research to develop a web-based operation monitoring system. This can also be used for different areas such as business operation monitoring and many others.

1.5 Scope and Limitations

The study includes testing and developing an effective web-based system that shall monitor the daily operation of the Bureau of Fire Protection in the province of Davao Oriental.

1.5.1 Scope of the Study

- The system allows the fire officer-in-charge on duty to access information on all the fire officers at the respective station, vehicle status, and other resources from different fire stations in Davao Oriental.
- The system will show detailed reports and information about the ongoing/previous fire or emergency.
- The system allows the fire officer admin to upload pictures for report documentation purposes

1.5.2 Limitations of the Study

- The system only gives access to fire stations within the province of Davao Oriental.
- The system does not support real-time incident update.
- The system only focuses on information sharing and not transactional.

1.6 Conceptual Framework

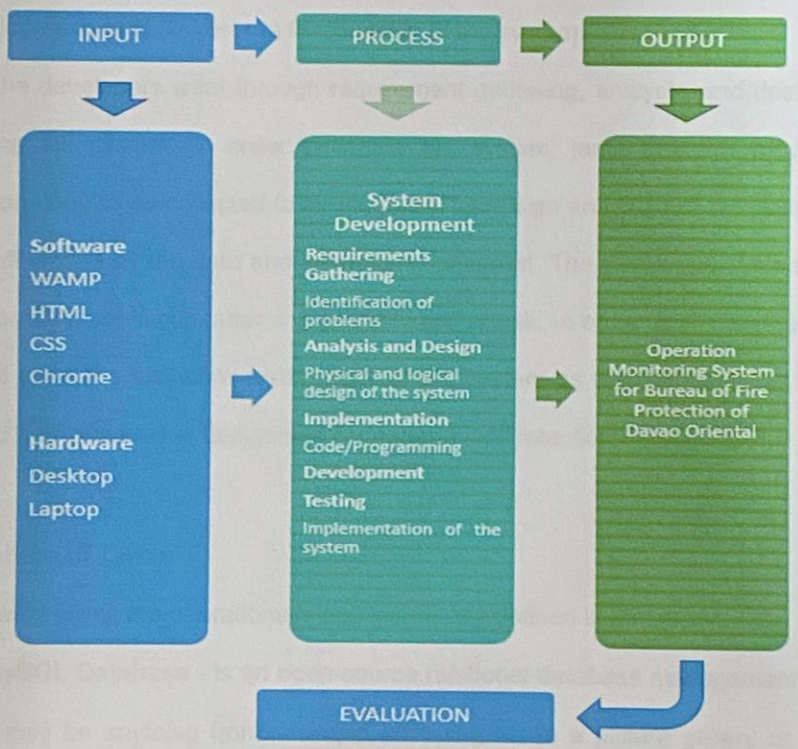

Figure 1.1 BFP-OMS Conceptual Framework

Figure 1.1 shows the conceptual framework with it, the concepts and development of the system, and the flow of user's data input, process, and output.

The developers will use the following inputs MySQL, Virtual Studio Code, and Google Chrome. Virtual Studio Code is one program that helped developers create the system; it quickly became one of the most widely used text editors. Multi-line editing, building systems for dozens of programming languages, regex find and replace, a Python API for designing plugins, and more are all included. MySQL is a database management system. To add, access, and process data stored in a computer database, the developers acquired the aid of the MySQL Server. The use of Google Chrome will also be needed by the developers in order to test the functionality of the system.

The developers went through requirement gathering, analysis, and design while developing the system. In order to create the system, large amounts of data and information need to be collected to be studied. The design and build of the system were greatly influenced by the data and information gathered. The developed system can be opened on a personal computer or android based phone. In order to access the system, users will need the exclusive website link of the system as well as the username and password only provided to designated Bureau of Fire Protection Personnel.

1.7 Definition of Terms

The following terms are operationally and technically defined in this study:

1. **MySQL Database** - is an open-source relational database management system. It may be anything from a simple shopping list to a picture gallery or the vast amounts of information in a corporate network. To add, access, and process data stored in a computer database. MySQL is a fast, easy-to-use RDBMS being used for many small and big businesses.(Malinowski et al., 2019)

2. **Web-based** - this is a categorization of the system that the proponents would construct in the study. A web browser is used to access this type of software over

the internet. This does not necessitate the user downloading, installing, or upgrading any software (Issues, 2023).

3. **OMS** – "OMS" stands for Operation Monitoring System; a platform that allows its users to track the whereabouts of a team, projects and other resources.

CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 Technical Background

The proponent had gathered all related research about the project and had brainstormed about what technologies will be used. As the project is still on going, the proponent will search for the tools and software that can help improve the development of the system. In developing the said system and to be able to have satisfying applications which will fit the objectives, the developers used the technological tools listed below.

2.1.1 Database MySQL

According to (Malinowski et al., 2019), MySQL is the most popular open-source SQL database management system developed, distributed, and supported by Oracle Corporation. MySQL is based on structured query language (SQL). MySQL was initially launched back in 1995. Since then, it has gone through a couple of changes in ownership before ending up at the Oracle Corporation in 2010. While Oracle is in charge now, MySQL is still open-source software, meaning users can freely use and modify it.

2.1.2 VS code

Visual Studio is a Microsoft Integrated Development Environment (IDE) used to create GUI (Graphical User Interface), consoles, Web applications, web apps, mobile apps, cloud, and web services, among other things. This IDE can be used to create both managed code and native code. It uses Microsoft software development platforms such as Windows Store, Microsoft Silverlight, and Windows API. It is not a language-specific IDE because it can be used to write

code in C#, C++, VB (Visual Basic), Python, JavaScript, and various other languages. (Visual Studio 04, 2019).

2.1.3 XAMPP

XAMPP stands for extremely Accelerated Multi-Processing Packet Processing (A) Apache server, (M) MariaDB, (P) PHP, and (P) Perl. X stands for Cross-platform, (A) Apache server, (M) MariaDB, (P) PHP, and (P) Perl. "cross-platform" typically refers to the ability to run on any device, regardless of the operating system. XAMPP was created to make setting up and running a development server on the user's local machine as simple as possible. There are a lot of XAMPP-like applications out there, but XAMPP is one of the most well-known. XAMPP provides several practical applications besides Apache, MySQL, Python, and Perl, including the phpMyAdmin database management tool; as the server's home screen, XAMPP can even mount an administration site.(R.L. Martinez, 2014)

2.1.4 JQuery

JQuery is a JavaScript library that allows the user to "write less, do more." The goal of jQuery is to make using JavaScript on the user's website much easier. JQuery wraps several typical activities that require several lines of JavaScript code into methods that can be called with only a single line of code. A lot of the more difficult JavaScript aspects, like AJAX calls and DOM manipulation, are simplified by jQuery. (Denby, 2020)

2.1.5 MySQL Workbench

MySQL Workbench is a unified visual tool for database architects, developers, and DBAs. MySQL Workbench provides data modeling, SQL development, and comprehensive administration tools for server configuration,

user administration, backup, and much more. MySQL Workbench is available on Windows, Linux and Mac OS X.(Dave, 2014)

2.1.6 HTML 5

HTML5 is a markup language used to structure and present World Wide Web content. The fifth and final major HTML version is a World Wide Web Consortium recommendation. (Fodor,2012).

2.1.7 CSS 3

CSS3 is used with HTML to create and format content structure. It is responsible for colors, font properties, text alignments, background images, graphics, and tables. It provides the positioning of various elements with the values being fixed, absolute, and relative. (Fodor,2012).

2.1.8 Bootstrap 5

Bootstrap is a free, open-source CSS and JavaScript/jQuery code library for building dynamic websites and web apps. Bootstrap is a well-known front-end framework with a comprehensive set of predefined CSS codes. To create responsive web pages, Bootstrap employs a variety of classes.(Tutorials Point, 2017)

2.1.9 Google Chrome Browser

Google Chrome is a free web browser that may be used to access web pages. Google Chrome is a cross-platform browser that works on various PCs, mobile devices, and operating systems. (ComputerHope, 2021)

2.2 Related Literature

The Bureau of Fire Protection (BFP) is the government body in the Philippines responsible for the provision of fire services. It is under the jurisdiction of the Department of the Interior and local Government. The BFP is responsible for ensuring public safety through the prevention or suppression of all destructive fires on building, houses, and other similar structure, forests, and land transportation vehicles and equipment, ships/vessels docked at piers, wharves or anchored at major seaports, petroleum industry installations. It is also responsible for the enforcement of the Fire Code of the Philippines (PD 1185) and other related laws, conduct investigations involving fire incidents and causes thereof including the filing of appropriate complaints/ cases. Monitoring is therefore a vital process when running a project to ensure that it contributes to a real change for the "beneficiaries". Its aim is either to assess a project's progress and ensure it is on the right track to achieve the expected results, or to observe and understand discrepancies, difficulties or even new opportunities.(Bureau of Fire Protection, 2016)

Monitoring therefore helps us to decide what adjustments are needed to achieve the project's goals. Monitoring combines various methods that allow us to define the information we require, to gather it, analyze it and share it with the parties involved in the project so the right decisions can be made. This workflow drives the project, but it also feeds organizational learning, accountability and advocacy (Suparyanto, 2020).

According to (Leithwood, Aitken, & Janzti, 2001), a monitoring system is defined as a concise description of what should be (procedure) and a process to determine what is (procedural and status report). It is further explained that it is framework within which to select or define, interpret and use a wide array of indicators. On a similar ground, Fitz-Gibbon (1996) cites that monitoring is a way of examining quality or performance, largely by the use of indicators focused on outcomes.

However, by monitoring, it shall generally mean the use of performance indicators not only regularly collected but also being reported back to the units responsible. This definition often uses concepts such as performance, outcomes and feedback.

The employers also considered monitoring as systematic and regular procedure for the subject under study. It is not necessarily restricted to outcome variables, but can also involve contextual information and measures of inputs. There are certain factors to consider about the use of monitoring system. (Jansen, 1997) argues that a monitoring system can only be successful if it is tailor-made to the requirements of the organizational setting which is meant to function. (Greaney & Kellaghan, 1996)

This is probably a universally known fact that organizations differ in nature, goals, priorities, operations, processes and outcomes.

Monitoring system is naturally placed within the organizational structure and often within different segments of an organization depending on organizational objectives, goals and priorities. It enables decision makers to select, from several options, the package that will optimize over-all effectiveness of a training program. Users can readily determine whether training programs are achieving the rights purposes. Moreover, it equips them in detecting the types of changes the employers should make to improve course design, content and delivery. (Mason, 2018).

Each monitoring system must be tailor-made, designed for and in line with the project and adapted to its own specific context. Monitoring system for the effective instruction based on the semi-automatic evaluation of programs during programming classroom lectures, this study, the programmers developed a programming practice monitoring system to facilitate teachers to give appropriate instructions to students at the appropriate time during classroom lectures. The evaluation revealed that the system had a high accuracy in evaluating student programs. (Zhang, et al., 2007)

2.3 Related System

2.3.1 Hubstaff

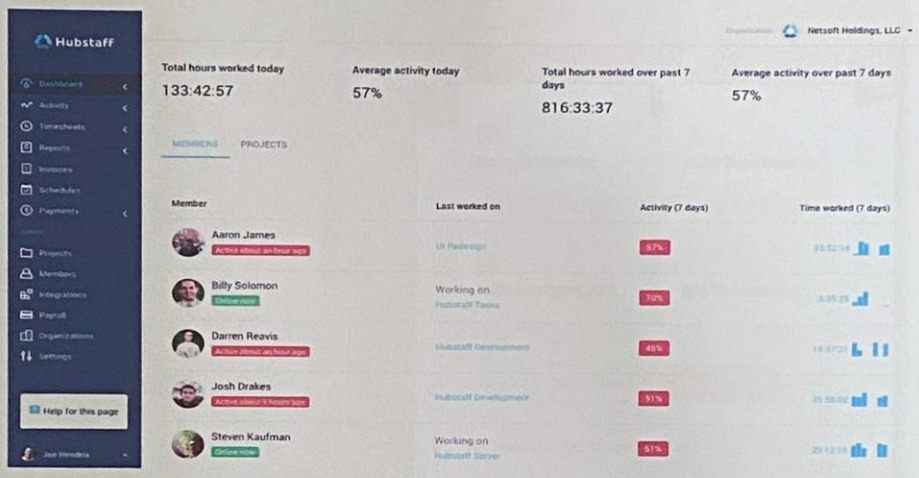

Figure 3.1 Hubstaff Dashboard

Hubstaff is a time tracking software that allows the admin user to monitor employee activities. Hubstaff allows employees to track time through its desktop app. Employees can choose when the user wants to record their timework hours. Hubstaff is a time tracking and workforce management platform that automates many aspects of running a growing business. Teams can track time to projects and to-dos using Hubstaff's desktop, web, or mobile applications. The users able to see how much time team spends on different tasks, plus productivity metrics like activity rates and app usage through Hubstaff's online dashboard. (Pietroluongo , 2021)

Most of these features are customizable on a per-user basis, hence it can create the team management tool the user needs. With Hubstaff, the user could get a clear picture of their team's performance based on actual data instead of guesses and rough estimates.

2.3.2 Teramind

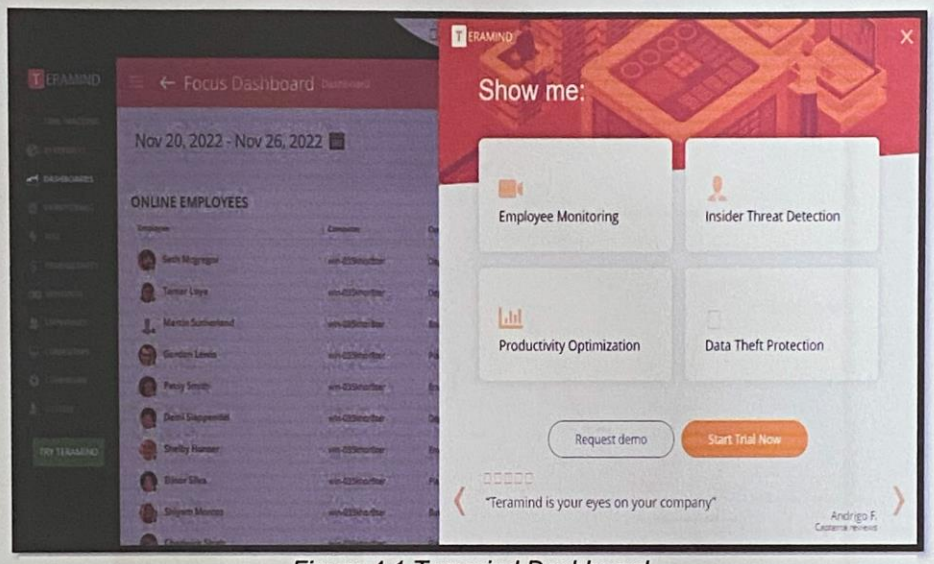

Figure 4.1 Teramind Dashboard

Teramind is an easy tool to install and use. We can configure the administrative dashboard to show the entire organization, a particular department, or an individual team to get at-a-glance reports and data visualizations on productivity or ISP metrics without much hassle. Then, managers can create reports and charts enabling us to identify suspicious activity, detect possible threats, and optimize productivity. Teramind provide employers with employee monitoring and analytics. When Teramind software is downloaded to employees' computer, it can measure not only time spent on activities, but it can also view employees' screen and keystrokes. (Bogdanovic, Sladojevic, Arsenovic, & Anderla, 2022)

2.3.3 Handdy

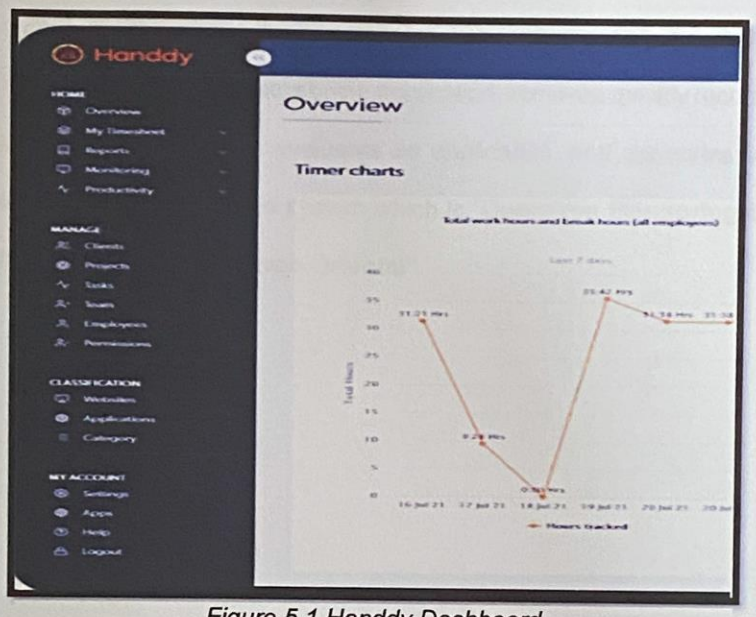

Figure 5.1 Handdy Dashboard

Handdy captures employee login/logout times, breaks taken, and can even schedule shift timings for every employee. Handdy also tracks time spent by the employees on clients, projects, tasks, and produces comprehensive employee timesheet reports. The main user can track all the employee's activity on their PC screen, websites the visits, the keystrokes, screenshots and more. With these, the employers can easily identify their star performers from the rest. (Handdy, 2012)

2.4 Synthesis

Through these different studies about web-based monitoring and evaluation system the proponent can have new or additional ideas about the developed system. It is a guideline on how to develop a better Web-based Operation Monitoring System and give satisfaction requirements of our developed system. There are many factors to consider in constructing monitoring system.

The study sought to develop a system for the Bureau of Fire Protection to help enhance the work output of its personnels. The system secures data and has a user-friendly interface. The system monitors status of the application, retrieves quickly records, updates automatically the application file, evaluates an application, and generates reports. We come up with the idea in making a system which is **"Operation Monitoring System for Bureau of Fire Protection of Davao Oriental"**.

CHAPTER III

METHODOLOGY

3.1 Software Methodology

3.1.1. Software Development Life Cycle

The suggested system's overall structure will be based on software development methodology. The researchers will use it as a roadmap to follow the entire software engineering process.

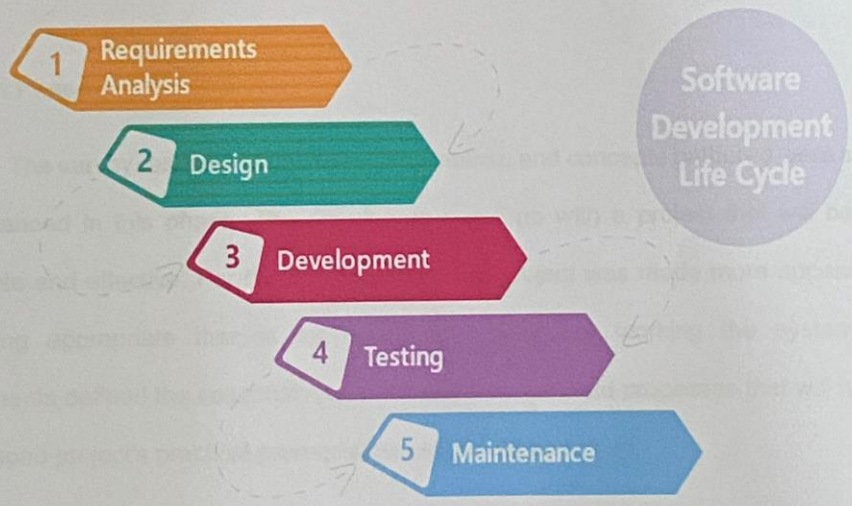

Figure 6.1 Waterfall Methodology (Svetlana Gordiyenko, 2014)

The proponents used the waterfall model shown in Figure 6.1 because waterfall works by having teams follow a set of steps and never moving on until the previous phase is finished. In its traditional form, the methodology leaves little room for unanticipated changes or revisions. Waterfall may be the best framework if the team is small and the projects are predictable.

It helps the researchers to have more time to focus on the code, and to have faster procedures. Also, it could quickly go back and forth to the phases that need some revision in terms of error or making changes.

Requirement Phase

In this phase, the developers had a sharing of ideas on what study to be conducted. The proponents have studied what are the needs to perform a fire officer registration system are. And also, the objective that has been made is the ideas from the Requirement Phase.

Design Phase

The survey results and interview, information, and concepts gathered were studied and planned in this phase. The developers came up with a project that will be more accurate and effective. For the design phase, the project was made more appealing by selecting appropriate themes for designing, coding, or working the system. The proponents defined the essential requirements, features, and processes that will fulfil the developed project's practical prerequisites, which will be set up.

Implementation Phase

After analyzing the design and the requirements, the developers implemented the project using the specific hardware and software requirements. Additionally, this part implies the beginning of creation. The implementation was likewise represented by installation and changes. The developers used several technologies in the development of the system such as jQuery, Bootstrap, JavaScript and Native PHP.

Verification Phase

The verification phase is the final phase of the software development life cycle (SDLC) and puts the project into production. After the developers test the system and the system passes each testing phase, the project is ready to deploy.

Maintenance Phase

This maintenance phase includes service and general mandatory refresh. This progression is when the end client can change the framework on the possibility that the clients wish to help implementation, including new features or meet additional necessities.

3.2 Requirements Analysis

3.2.1 Documentation of the Current System

The fastest mode of communication utilized by the Bureau of Fire Protection in Davao Oriental is radio communication when transmitting reports. However, the municipal stations also prioritize providing comprehensive and timely details of the incident, along with documentation of the recent activities.

3.3 Requirements Documentation

3.3.1 System Architecture

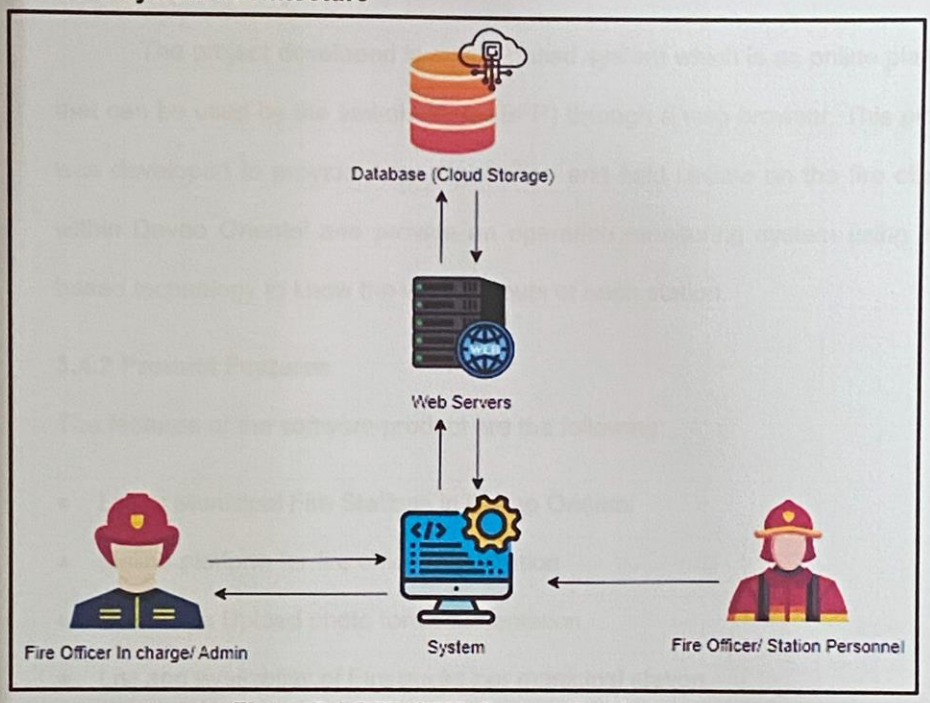

Figure 7.1 BFP-OMS System Architecture

The Operation Monitoring System (OMS) for the Bureau of Fire Protection in Davao Oriental is a web-based system for operation monitoring of the Fire officers on-duty in Davao Oriental. This system will provide information to its users about the recent and previous emergency activities held by each fire stations in each municipality. The system organizes a list of registered fire officers and list of the available fire trucks and nearby fire stations which will be used as reference hand in hand by each station. It comprises a Web server and a computer where the internet is used to access the system. The system has two kinds of users; 1. Admin Fire Officer which monitors the Web-Based registration for the databases and for the records of the registered fire officers and vehicle counts; 2. Fire station personnels for attendance and registration.

3.4 Requirements Specification

3.4.1 Product Perspective

The project developed is a web-based system which is an online platform that can be used by the stakeholders (BFP) through a web browser. This project was developed to provide easy registration and field update on the fire officers within Davao Oriental and provide an operation monitoring system using web-based technology to know the whereabouts of each station.

3.4.2 Product Features

The features of the software product are the following:

- List of Municipal Fire Stations in Davao Oriental
- Online platform for fire officer registration
- Users can Upload photo for documentation.
- List and availability of Fire trucks per municipal station.
- List and whereabouts of personnels on every fire station in Davao Oriental.
- Admin can request help from other municipal fire stations.

3.4.3 User Classes and Characteristics

There are two main users of this project, the admin/staff in the Bureau of Fire Protection which will manage and monitor the fire officers and vehicle status in each municipality fire stations and, the fire officers on-duty to login and logout daily for their attendance.

3.4.4 Operating Environments

The developers used different tools, platforms and technologies in the development of the system. The website can work on any web browser in different operating systems such as Windows OS and Android OS as long as the user has

an internet connection. However, the developers highly suggest the use of computer to access the website.

Software Specifications

The software specification used in the design and development of the system entitled as "BFP-OMS" is the following:

Operating System	Windows 10
Programming Languages	PHP, HTML, CSS, jQuery, Bootstrap
Integrated Development Environment (IDE)	Visual Studio Code
Graphic Design Tool	Adobe Photoshop CS6
Web Hosting Site	Digital Ocean Cloud Computing

Table 1.1 Software Specification

Hardware Specifications

The software specification needed to design and develop the developed system entitled as "BFP-OMS" is the following:

"OMS"	Operating System: Windows 7 or higher Memory: At least 2GB RAM Storage: At least 500MB disk storage

Table 2.1 Hardware Specification

3.4.5 Design and Implementation

The web application was available in browsers such as Mozilla Firefox and Internet Explorer, but Google Chrome was highly recommended as the best browser as its functionality performs well. For faster processing, the internet connection used to access the system should have a bandwidth of 1-2mbps or higher.

3.4.6 User Documentation

The developers will let the users test the website on how to use and operate it.

3.4.7 Other non-functional requirements

The developers provide specifications that will describe the system's operation capabilities that will enhance the functionality of the developed system.

Safety Requirements

The website provides back-up of the database file and copy of the system which will prevent data loss during the process. The information is safely stored in a database server provided by the web hosting site.

Security Requirements

The account information of the users is secured using a password encryption that will add security features in the system. The system also has session login and logout that will prevent users from accessing the web pages without account login.

3.4.8 Software Quality Attributes

Functional Suitability

The website will be able to show information and data needed for registration and operation monitoring of the fire officers without any delay. The system is able to meet BFP requirements for login, registration, displaying of information and data, integrating all of the modules needed in the system are working properly.

Reliability

The website performs all of its functions without any error or crash. The developed system has stable and consistent performance over time even if multiple records are stored in the system. The login and registration in the system is stable without delay, the list of fire officers, uploading of files has no delay.

Performance Efficiency

The website can handle the expected number of users and incident records. The login, registration, file uploader, and viewing respond quickly from user interaction. The website is responsive and performs efficiently. The system environment of the user can handle the memory usage and processing of the website.

Usability

The website is easy and user-friendly, the user interface is readable and clear to the user perspective. The website is accessible and usable to all users, it is easy to navigate and the user interface is visually pleasing to the user.

Maintainability

The website remains stable after the update and modification process of information. It meets the required adaptation on changes to the database. The update module is easy to test which meets the testability of the website.

Portability

The website can work on any operating system platform with web browser and internet connection. The website interface will look the same in any web browser types and versions. The user interface and functional features of the website is similar to any web browser versions.

Security

The website has the degree of data access appropriate to the types and levels of authorization. The website protects information and data of the users which considers confidentiality and ensures that data are only accessible to authorized personnels only.

Compatibility

The website can work on shared environment and resources then perform its required functions efficiently without detrimental impact on any product.

3.5 Developed Methodology

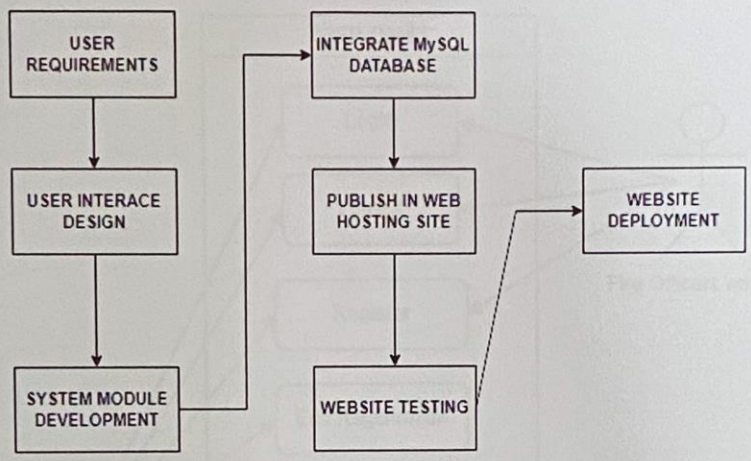

Figure 8.1 BFP-OMS Methodology

Figure 3.3 shows the developed methodology of the system which includes user requirements that includes the input and output data needed to process in the system and the data, and functions needed for fire officer registration and operation monitoring system. The next process is user interface design where the proponents will layout and design the front-end of the website. Third process is system module development where proponents will develop system modules for fire officers' registration and monitoring systems such as, user modules. Fourth process is to integrate a MySQL database where the proponents will design and develop a database for storing and fetching the information needed in the system. Sixth process is publishing the website in a web hosting site where the proponents will publish and upload the website on the internet. Seventh process is a website testing where the proponents will test all the functionality of the website and last process is website deployment where the proponents will deploy the website in the system environment of the stakeholders which is the BFP.

3.6 Design

3.6.1 Use Case Diagram

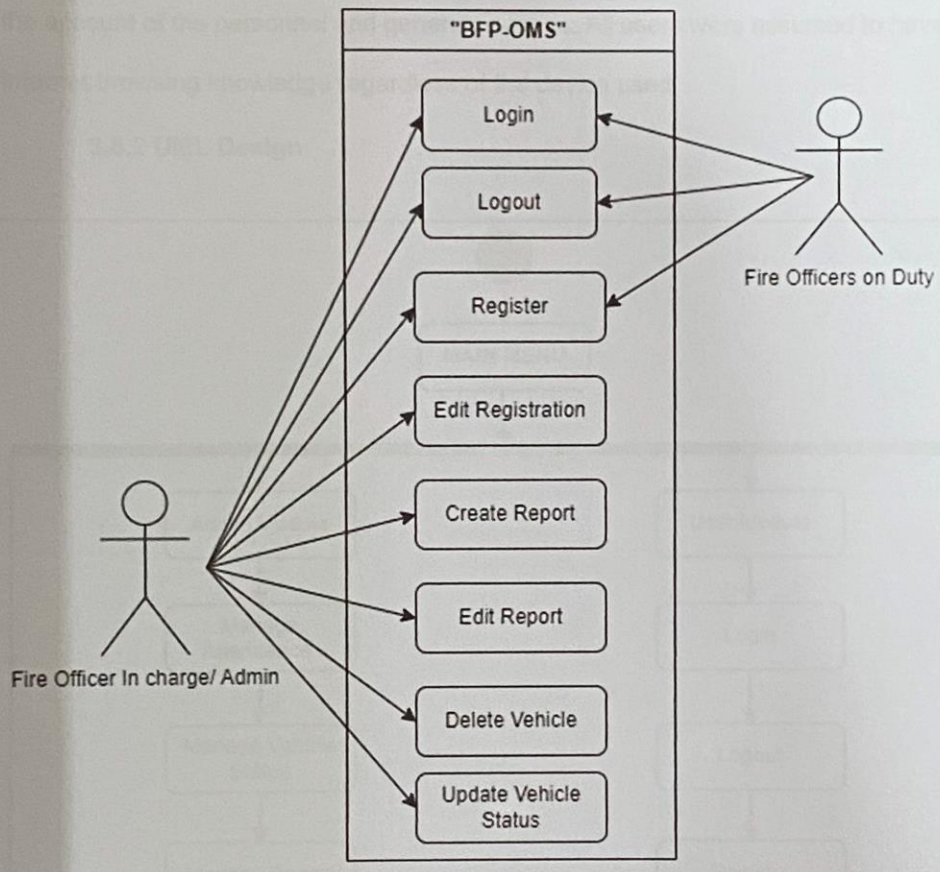

Figure 9.1 BFP-OMS Users Module

Presented in Figure 3.0.3 is the use case diagram of the system. This indicates the limitations of the system provided for the user. For the BFP-OMS website, there are two types of users: (1) the fire officer in charge, and (2) the fire officers on duty. There will be one assigned personnel that will serve as the admin or the fire officer in charge.

The admin can manage the overall user which includes the fire officers on duty on the specific municipal station. It is also possible for the administrator to update or delete the account of the personnel and generate reports. All users were assumed to have basic internet browsing knowledge regardless of the device used.

3.6.2 UML Design

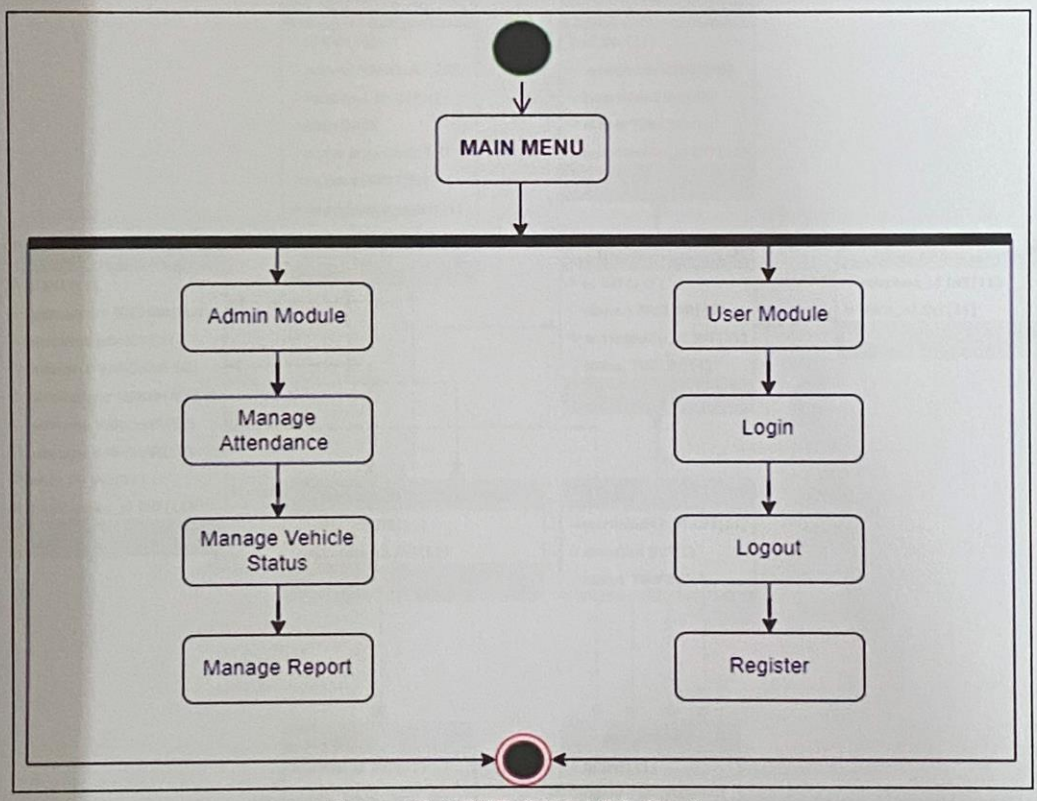

Figure 10.1 BFP-OMS UML Design

3.6.3 Entity Relationship Diagram

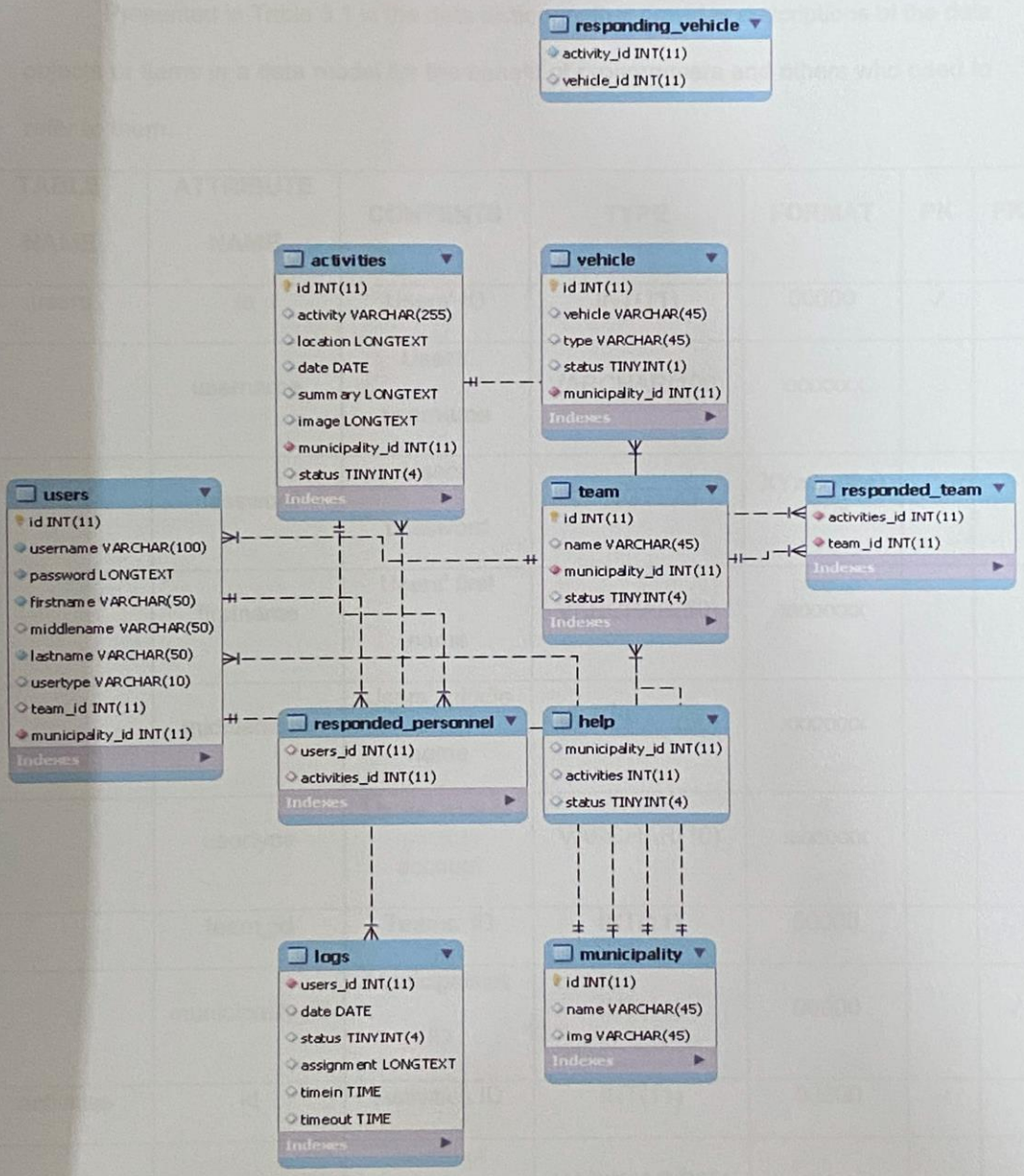

Figure 11.1 Entity Relationship Diagram of Operation Monitoring System for BFP Davao Oriental.

3.6.4 Data Dictionary

Presented in Table 3.1 is the data dictionary that provides descriptions of the data objects or items in a data model for the benefit of programmers and others who need to refer to them.

TABLE NAME	ATTRIBUTE NAME	CONTENTS	TYPE	FORMAT	PK	FK
users	id	Users' ID	INT(11)	00000	✓	
	username	Users' username	VARCHAR(100)	xxxxxxx		
	password	Users' password	LONGTEXT	XYz0xxXx0xX0x		
	firstname	Users' first name	VARCHAR(50)	xxxxxxx		
	middlename	Users' middle name	VARCHAR(50)	xxxxxxx		
	usertype	Users' type of account	VARCHAR(10)	xxxxxxx		
	team_id	Teams' ID	INT(11)	00000		
	municipality_id	Municipalities ID	INT(11)	00000		✓
activities	id	Activities ID	INT(11)	00000	✓	
	activity	Name of Activity	VARCHAR(255)	xxxxxx		
	location	Name of Location	LONGTEXT	xxxxxxx xxxx		

	date	Date of Activity	DATE	yyyy-mm-dd 00:00:00		
	summary	Summary of Activity	LONGTEXT	xxxxxxx xxxxx		
	image	Image of Activity	LONGTEXT	xxx.png		
	municipality_id	Municipalities ID	INT(11)	00000		✓
	status	Status of Activity	TINYINT(4)	xxxx		
vehicle	id	Vehicle ID	INT(11)	00000	✓	
	vehicle	Name of Vehicle	VARCHAR(45)	xxxxx		
	type	Type of Vehicle	VARCHAR(45)	xxxxx		
	status	Status of Vehicle	TINYINT(1)	0		
	municipality_id	Municipalities ID	INT(11)	00000		✓
team	id	ID of Team	INT(11)	0000	✓	
	name	Name of Team	VARCHAR(45)	xxxxxx		
	municipality_id	Municipalities ID	INT(11)	00000		✓
	status	Status of team	TINYINT(4)	0		
responded	activities_id	ID of activities	INT(11)	0000		✓

team						
	team_id	ID of Responding team	INT(11)	0000		✓
help	municipality_id	ID of helping municipality	INT(11)	0000		
	activities	ID number of activity responded	INT(11)	0000		
	status	status of response	TINYINT(4)	0		
responded_personnel	users_id	id number of personnels responded	INT(11)	0000		
	activities_id	Id of incident responded	INT(11)	0000		
logs	users_id	ID of users'	INT(11)	0000		✓
	date	Date of incident	DATE	yyyy-mm-dd 00:00:00		
	status	Status of responded incident	TINYINT(4)	0		
	assignment	Type of incident responded	LONGTEXT	xxxxxxxxxx xxxxxx		

	time in	Time personnel logged in	TIMESTAMP	yyyy-mm-dd 00:00:00		
	time out	Time personnel logged out	TIMESTAMP	yyyy-mm-dd 00:00:00		
municipality	id	ID of respective municipality	INT(11)	0000	✓	
	name	Name of Municipality	VARCHAR(45)	xxxxxx		
	img	Logo of Municipality	VARCHAR(45)	xxx.png		

3.6.5 GUI Design

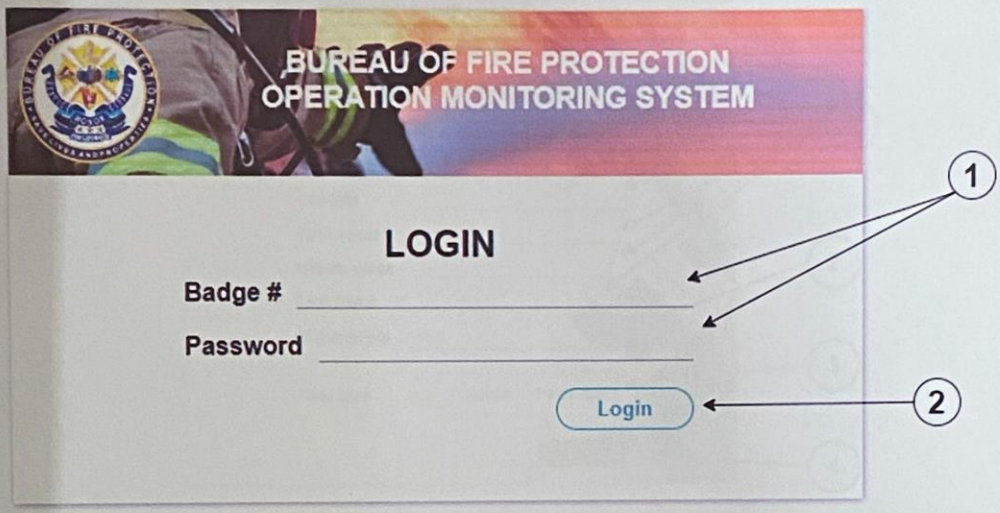

Figure 12.1 User's Login Page

No.	UI Components	Name	Description
1	Input	Input Fields	Allows the user to input their login information in the system
2	Button	Sign Up	Allows the user to register their information into the system

Table 3.1 User's Login Page

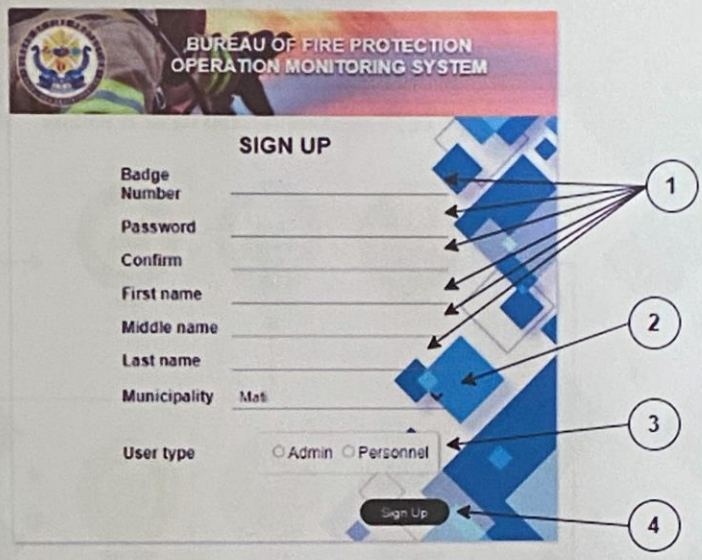

Figure 13.1 User's Registration Page

No.	UI Components	Name	Description
1	Input	Input Fields	Allows the fire officer to register their information in the system
2	Dropdown	Select Municipality	Allows the fire officer to select their respective municipality
3	Selection	Select Position	Allows the fire officer to select their position.
4	Button	Sign up	Allows the fire officer to submit their information to the system

Table 4.1 User's Registration Page

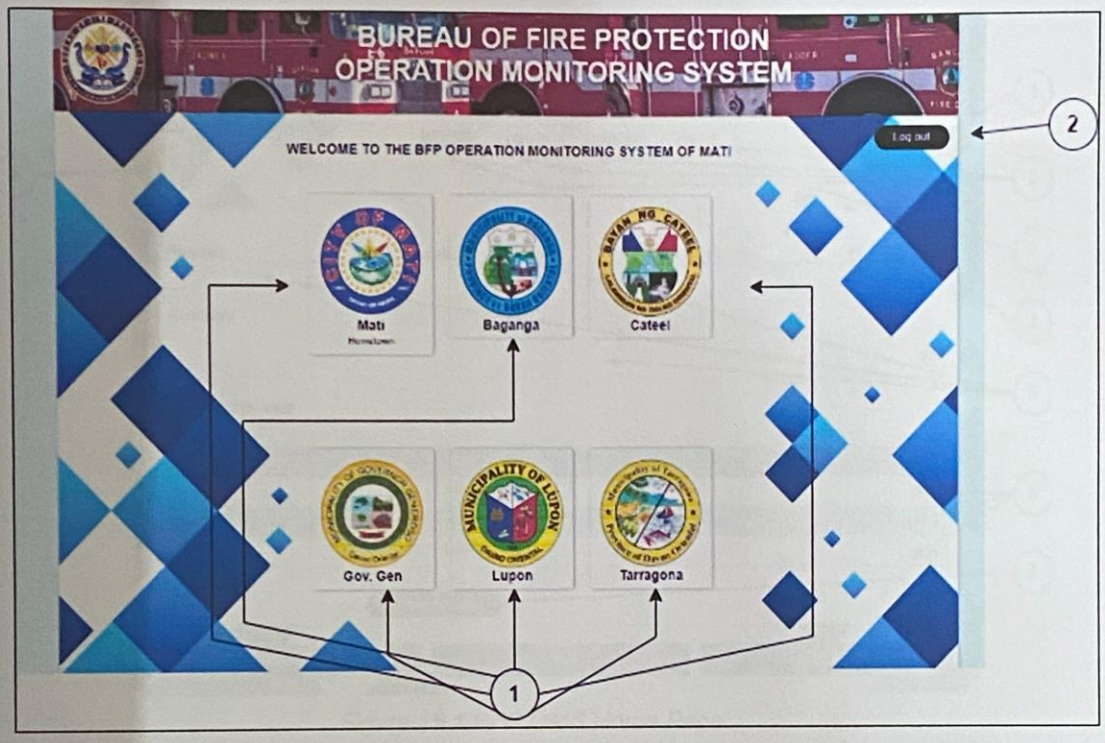

Figure 14.1 BFP-OMS Main Menu

No.	UI Components	Name	Description
1	Button	Municipality Icon	Allows the user to choose their respective municipality
2	Button	Sign Up	Allows the user to register their information into the system

Table 5.1 BFP-OMS Main Menu

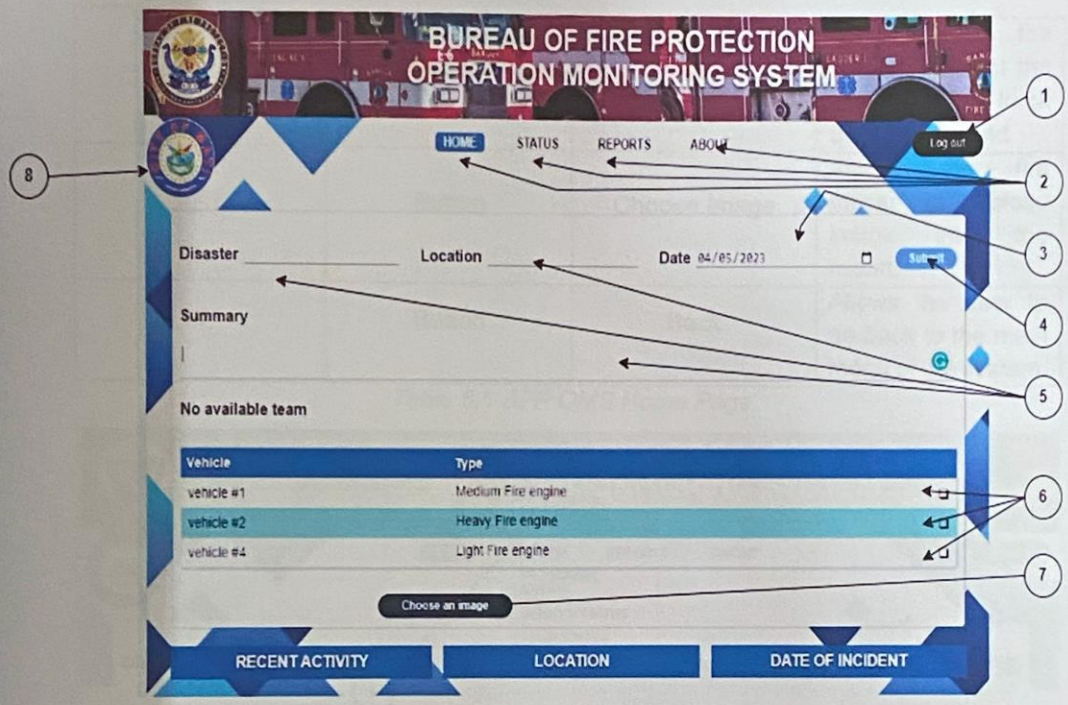

Figure 15.1 BFP OMS Home Page

No.	UI Components	Name	Description
1	Button	Logout	Allows the fire officer to logout from the system.
2	Navigation	Navigation Bar	Allows the fire officer to navigate the system.
3	Calendar	Date	Allows the fire officer to choose date.
4	Button	Submit	Allows the fire officer to Submit report to the system
5	Input	Input Fields	Allows the fire officer to input necessary information on creating report.

6	Checkbox	Checkbox	Allows the fire officer to select the type of fire truck used to respond
7	Button	Choose Image	Allows the fire officer to upload image into the report.
8	Button	Back	Allows the user to go back to the main menu of the system.

Table 6.1 BFP OMS Home Page

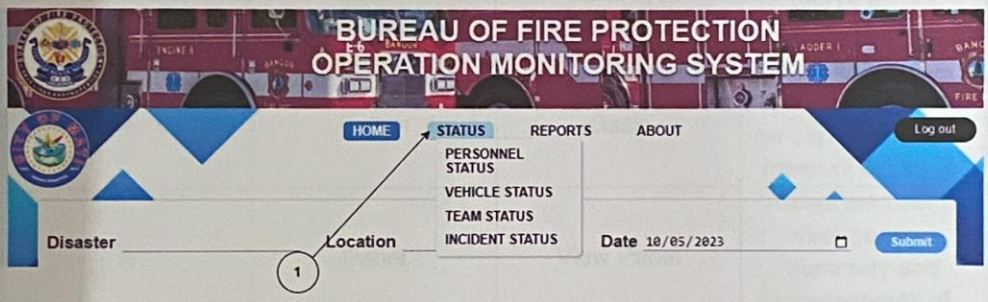

Figure 16.1 BFP-OMS Status Dropdown Navigation

No.	UI Components	Name	Description
1	Dropdown	Status	Allows the fire officer to track and view station whereabouts.

Table 7.1 BFP-OMS Status Dropdown Navigation

Figure 17.1 BFP-OMS Personnel Status Panel

No.	UI Components	Name	Description
1	Button	Report	Allows the user to view the recent activity of a specific personnel.
2	Button	Team	Allows the fire officer in-charge to add personnels to a specific team.
3	Button	Attendance	Allows the fire officer in-charge to add or delete attendance of personnels.
4	Button	Back	Allows the user to go back to the main menu of the page.
5	Panel	View Panel	Allows the user to view general summary and whereabouts of station personnels.

Table 8.1 Personnel Status Panel

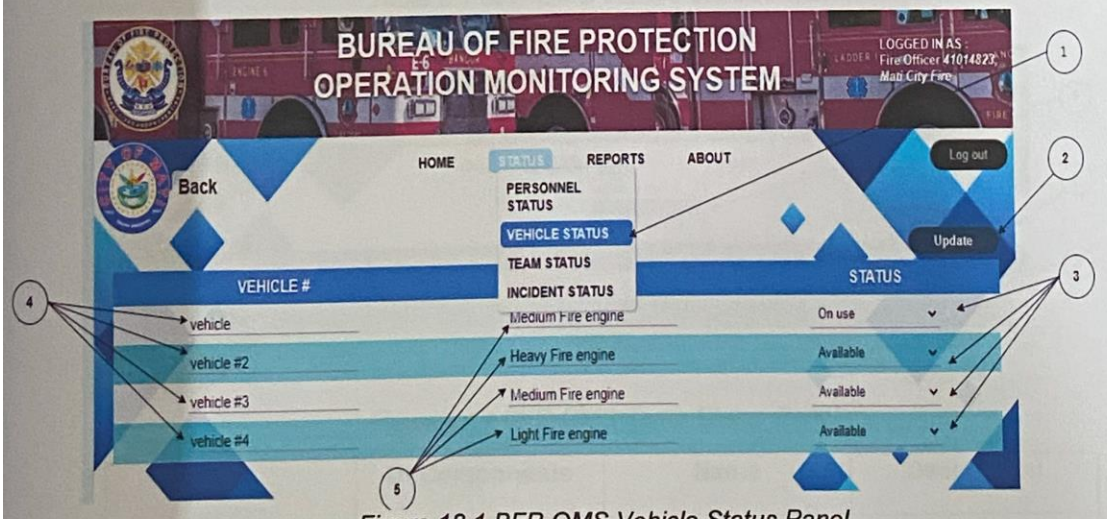

Figure 18.1 BFP-OMS Vehicle Status Panel

No.	UI Components	Name	Description
1	Dropdown Element	Vehicle Status	Allows the fire officer to access vehicle status panel.
2	Button	Update	Allows the fire officer in-charge to update all changes in the vehicle status.
3	Dropdown	Status	Allows the fire officer in-charge to toggle current vehicle serviceability.
4	Input	Vehicle	Allows the fire officer in-charge to modify vehicle names.
5	Input	Type	Allows the fire officer in-charge to modify vehicle types.

Table 9.1 BFP-OMS Vehicle Status Panel

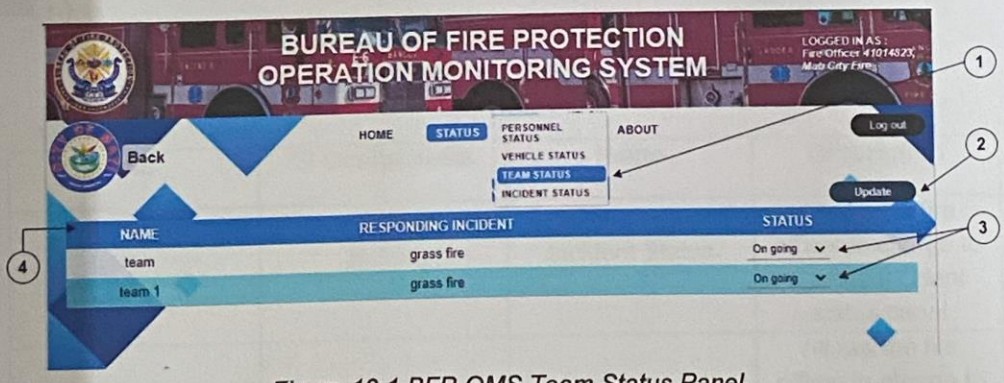

Figure 19.1 BFP-OMS Team Status Panel

No.	UI Components	Name	Description
1	Dropdown Element	Team Status	Allows the fire officer to access team status panel.

2	Button	Update	Allows the fire officer in-charge to update all changes in the team status.
3	Dropdown	Status	Allows the fire officer in-charge to toggle the whereabouts of every team
4	Viewing Panel	Panel	Allows the user to view general summary and whereabouts of every team.

Table 10.1 BFP-OMS Team Status Panel

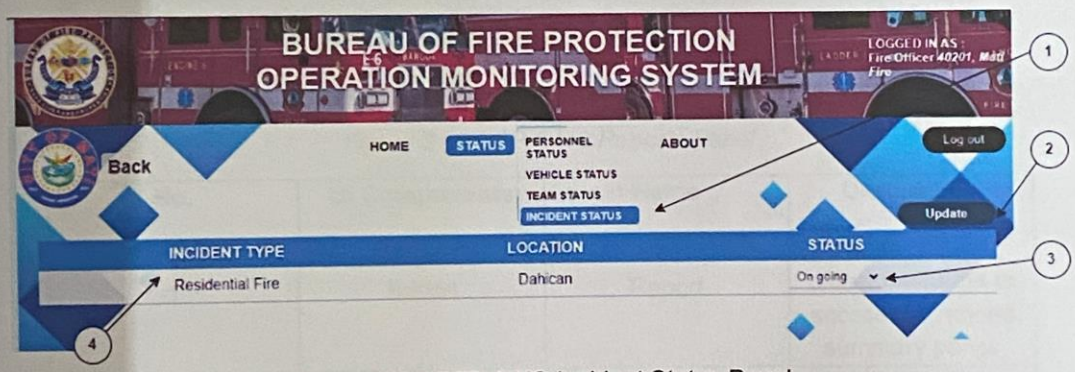

Figure 20.1 BFP-OMS Incident Status Panel

No.	UI Components	Name	Description
1	Button	Incident Status	Allows the fire officer in charge to access Incident status panel
2	Button	Update	Allows the fire officer in-charge to update ani changes done in the status of incident.
3	Dropdown	Status	Allows the fire officer in-charge to toggle the status of

			incident.
4	Panel	Incident Type	Allows the fire officer in-charge to identify the incident type responded.

Table 11.1 BFP-OMS Incident Status Panel

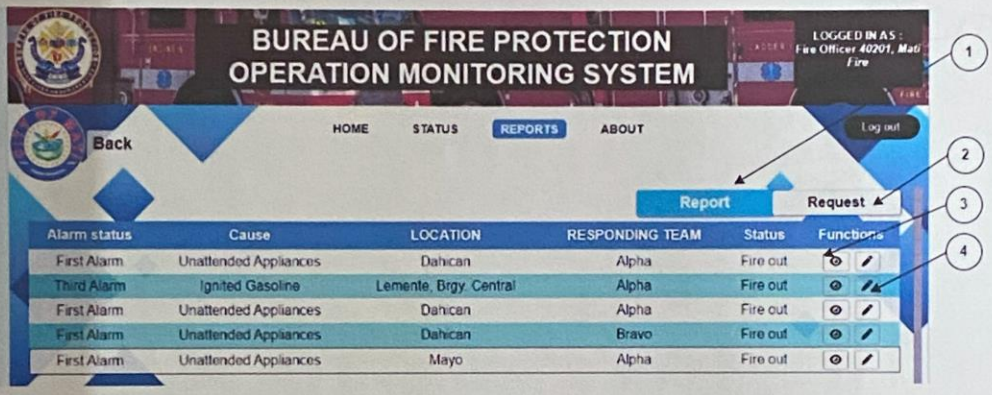

Figure 21.1 BFP-OMS Reports Panel

No.	UI Components	Name	Description
1	Button	Report	Allows the fire officer in-charge to access the reports summary panel.
2	Button	Request	Allows the fire officer in-charge to access the pending requests panel.
3	Button	View Icon	Allows the fire-officer in-charge to view the full the details of the selected report.
4	Button	Edit Icon	Allows the fire officer in-charge to edit the selected report.

Table 12.1 BFP-OMS Reports Panel

Figure 22.1 BFP-OMS About Panel

No.	UI Components	Name	Description
1	Button	Submit	Allows the fire officer in-charge to submit the changes on the input fields
2	Input	Input fields	Allows the fire officer in-charge to input information
3	Button	Choose an Image	Allows the fire officer in-charge to upload a photo from device

3.7 Development and Testing

3.7.1 Data Analysis Plan

The project which is the "BFP-OMS" website will be evaluated using ISO/IEC 25010 standard to determine if it complies the software standard. The analysis will depend on the evaluation of the BFP office admin/staff.

In the evaluation of the BFP-OMS, the respondents adapted the questionnaire from the ISO/IEC 25010 Model. The approved questionnaire was administered to 20 respondents from BFP office admin, staff and fire officers in the City of Mati. After gathering the data, the proponents utilized the Weighted Arithmetic Mean in calculating the data.

The points that are used

Strongly Agree	5 Points
Agree	4 Points
Fair	3 Points
Disagree	2 Points
Strongly Disagree	1 Point

The following scale is used in interpreting the weighted mean

Table 3.7.1 Weighted Mean Scale

Range	Interpretation
4.51-5.00	Strongly Agree
3.51-4.50	Agree
2.51-3.50	Fair
1.51- 2.50	Disagree
1.50 below	Strongly Disagree

CHAPTER IV

RESULTS AND DISCUSSION

4.1 Achievement per Objective

Evaluation of the Web System

4.1.1 Development of BFP-OMS

Figure 4.1.1 "BFP- Davao Oriental Operation Monitoring System"

Dashboard for Municipality Selection

Figure 4.1.1 shows that the developers achieve the objective of the developed system which enables the fire officers to choose their respective municipality after the user login or signup to the system.

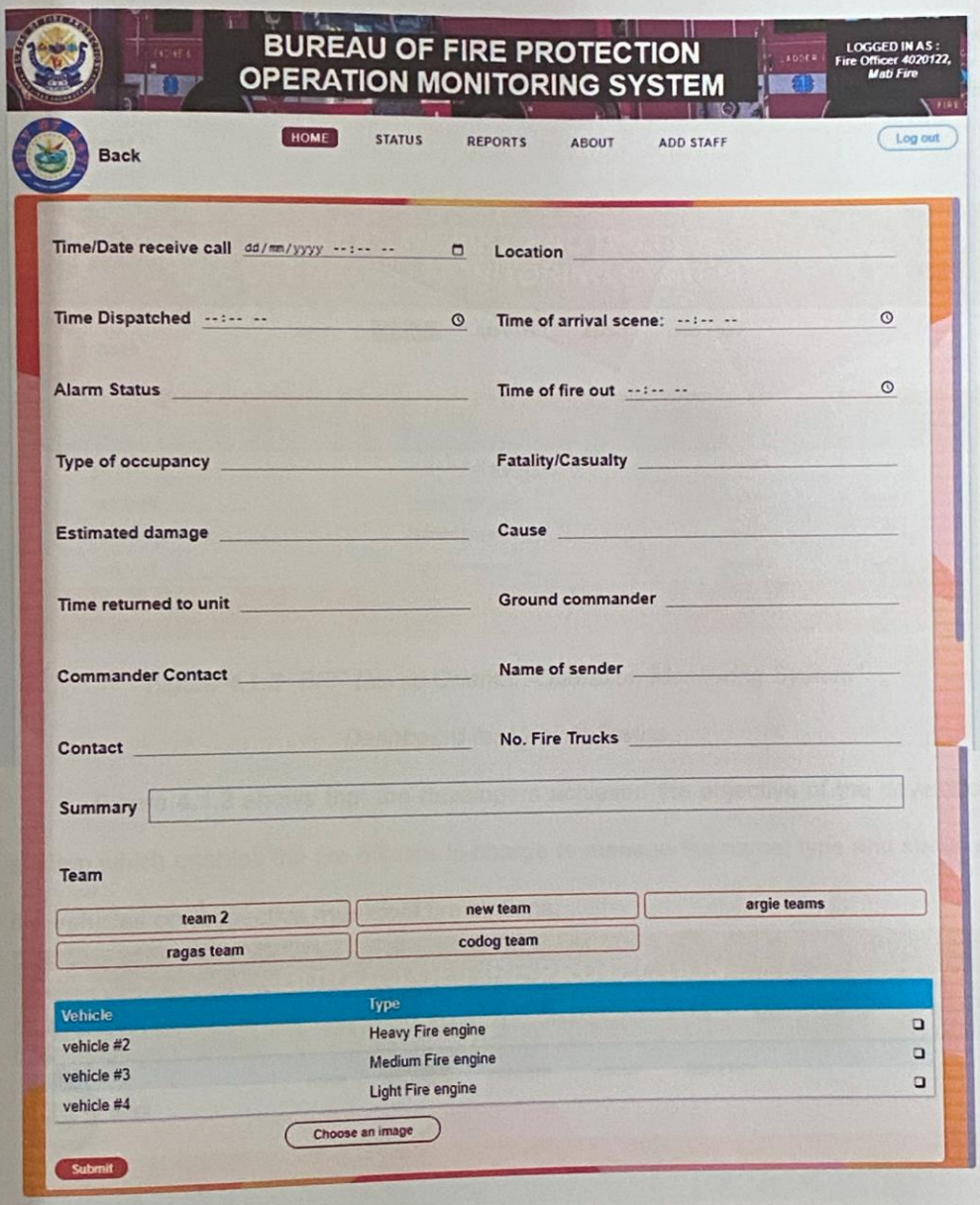

Figure 4.1.2 "BFP Davao Oriental -Operation Monitoring System"

Dashboard for Creating Report

Figure 4.1.2 shows that the developers achieved the objective of the developed system which enables the fire officers in-charge to create detailed report about a specific fire incident.

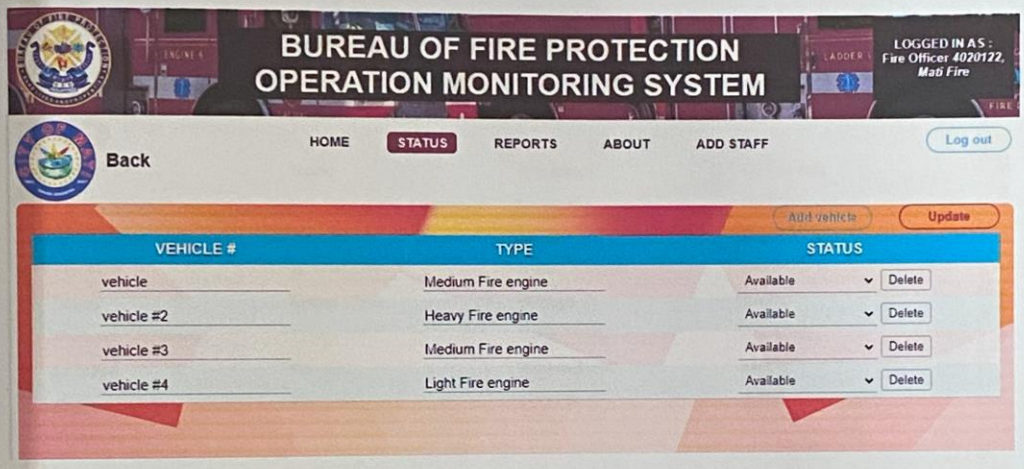

Figure 4.1.3 "BFP Davao Oriental -Operation Monitoring System"

Dashboard for Vehicle Status.

Figure 4.1.3 shows that the developers achieved the objective of the developed system which enables the fire officers in-charge to manage the name, type and status of fire vehicles on respective municipal fire stations.

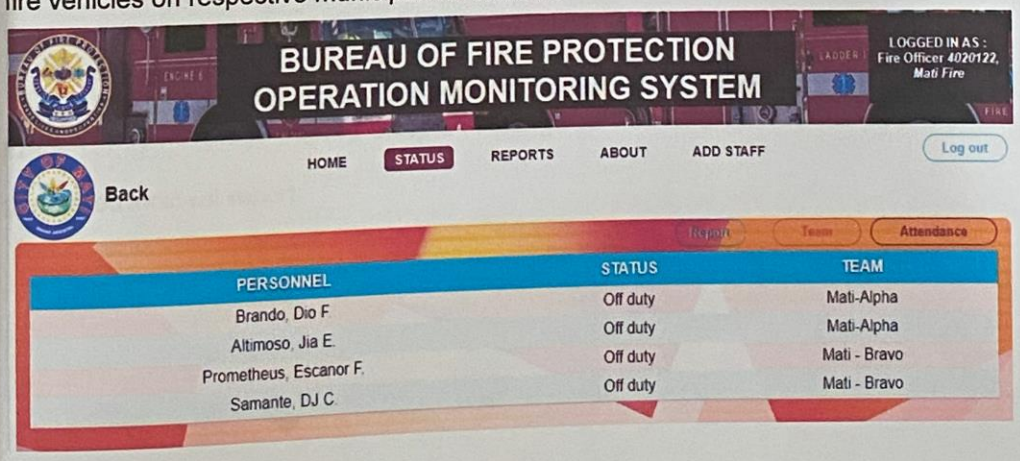

Figure 4.1.4 "BFP Davao Oriental -Operation Monitoring System"

Dashboard for Personnel Status.

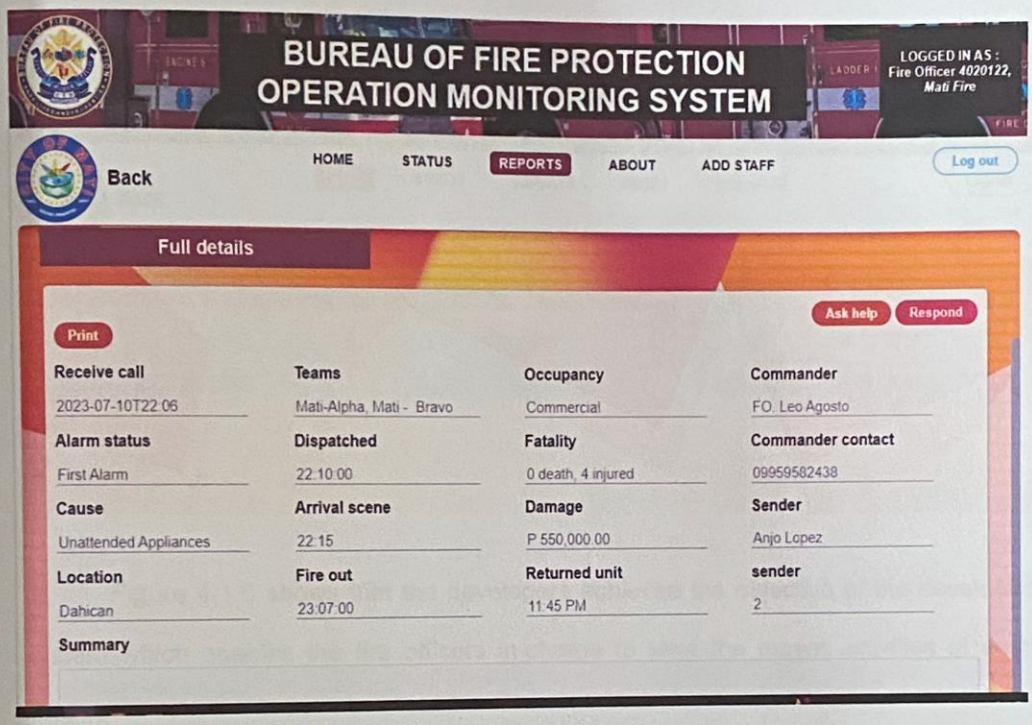

Figure 4.1.4 shows that the developers achieved the objective of the developed system which enables the fire officers in-charge to manage and keep track on whereabouts of station personnels.

Figure 4.1.5 shows that the developers achieved the objective of the developed system which enables the fire officers in-charge to view and edit the full details of the generated incident report.

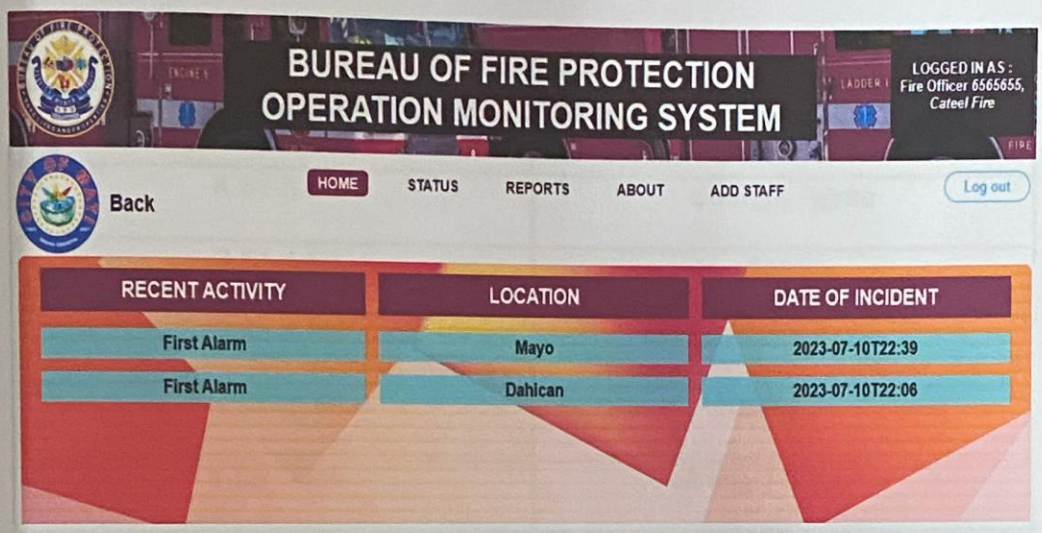

Figure 4.1.6 shows that the developers achieved the objective of the developed system which enables the fire officers in-charge to view the recent activities of each station.

4.2.1 Presentation

In evaluating the BFP-OMS, the respondents used the adapted Survey Form from ISO/IEC 25010 Standards. The approved survey was directed to 20 respondents that consisted the two types of end users which is the fire officer in-charge /admin and the BFP personnels. The fire officer in charge has 10 respondents and the BFP personnels has 10 respondents. After gathering data, the researchers utilized the Weighted Arithmetic Mean in calculating and analyzing the gathered data.

4.2.2 Analysis and Interpretation of Data

Range	Interpretation
4.51-5.00	Strongly Agree
3.51-4.50	Agree
2.51-3.50	Neutral
1.51- 2.50	Disagree
1.50 below	Strongly Disagree

Table 13.1 Weighted Mean Scale

Indicators	Respondents	Average Mean	Interpretation
Functional Suitability	20	4.38	Agree
Reliability	20	4.45	Agree
Usability	20	4.46	Agree
Performance Efficiency	20	4.39	Agree
Maintainability	20	4.43	Agree
Portability	20	4.37	Agree
Security	20	4.31	Agree
Compatibility	20	4.33	Agree
Overall	**20**	**4.43**	**Agree**

Table 14.1 Average Mean

Table 4.0.2 showed the average mean of the Functionality, Reliability, Usability, Maintainability, and Portability for tourism department and public respondent.

Indicator Functional Suitability has an average weighted mean of 4.38 interpreted as Agree. It means that the respondents agreed that the developed system works exactly how it should be in real-time, the developed system is able to show the data needed by the user, the developed system meets the user requirements, and the user interface of the developed system is able to support the user goals, tasks, activities such as login the user account, displaying of texts, or information. It means that the respondents agreed that the system is functional.

Indicator Reliability has an average weighted mean of 4.45 interpreted as Agree. It means that the respondents agreed that the developed system is performing its intended function without error or crash, the proposed system meets the requirement of user reliability, the developed system is responsive and the proposed system produce stable and consistent performance over time. It means that the respondents agreed that the system is reliable.

Indicator Usability has an average weighted mean of 4.46 interpreted as Strongly Agree. It means that the respondents strongly agreed that the developed system is easy and user-friendly, the developed system is accessible and usable to the end-user, the user interface of the developed system such as content, color, icons, images used are aesthetically pleasing to the user, and the user is able to read the text or information displayed clearly. It means that the respondents strongly agreed that the system is usable.

Indicator Performance Efficient has an average weighted mean of 4.39 interpreted as Strongly Agree. It means that the respondents strongly agreed that the developed system can handle the expected number of users, the developed system performs efficiently, and the web browser can handle the memory usage of the proposed system. It means that the respondents strongly agreed that the system is efficient.

Indicator Maintainability has an average weighted mean of 4.43 interpreted as Agree. It means that the respondents agreed that the developed system remain stable

after update or modification process, the developed system meets the required adaptation on changes to the database, the developed system meets the changing requirements and needs of the user, and the updated module is easy to test which meets the testability of the developed system. It means that the respondents agreed that the system is maintainable.

Indicator Portability has an average weighted mean of 4.37 interpreted as Agree. It means that the respondents agreed that the website looks the same in any browser types or browser version, the user interface and functional features of the system are similar to different web browser types and versions and the developed system is able to meet the portability requirement after testing the system. It means that the respondents agreed that the system is portable.

Indicator Security has an average weighted mean of 4.31 interpreted as Agree. It means that the respondents agreed that the website has the degree of data access appropriate to the types and levels of authorization. The website protects information and data of the users which considers confidentiality and ensures that data are only accessible to authorized personnels only.

Indicator Compatibility has an average weighted mean of 4.33 interpreted as Agree. It means that the respondents agreed that the website can work on shared environment and resources then perform its required functions efficiently without detrimental impact on any product.

Overall, the indicators above have an average weighted mean of 4.43 which fall on the scale of Agree. This means the respondents agreed that the BFP-OMS was Function Suitable, Reliable, Usable, Performance Efficient, Maintainable, Compatible, Portable, and Secure.

4.2.3 Implementation Plan

STRATEGY	ACTIVITY	PERSONS INVOLVED	DURATION
Approval from the selected user	Letter for the administrator	Researcher, User	1 day
Operating the System	Operation of the BFP-OMS	Researcher, User	30 minutes
Information Distribution	Manual, Web Application	Researchers, User	1 day

CHAPTER V

SUMMARY, CONCLUSION, RECOMMENDATION

5.1 Summary

The main objective of the researchers in this study was to design, develop, and implement a web-based system for registration and monitoring of fire officers. Through the use of the following web technologies such as HTML, CSS, JQuery, Bootstrap, and PHP. Tools such as Visual Studio Code and Canva Pro, the developers developed the system entitled "Operation Monitoring System for Bureau of Fire Protection of Davao Oriental". The developed system also provides some features/functionality for better performance which satisfies user requirements of a Web-Based Operation Monitoring System for the fire stations in Davao Oriental.

The end users of the system are only for the fire officer personnels across the fire stations around Davao Oriental. The admin personnel are allowed to access the web system with full control on managing the attendance, vehicle status, incident management and generating reports throughout the web-based system. The website was made for almost 5 months and in order to comply with the ISO standards, the developers conducted a survey evaluation to test the functional suitability, reliability, usability, compatibility, performance efficiency, security, maintainability and portability of the system.

The findings in the survey test over eight (8) quality characteristics of ISO/IEC 25010 which includes Functional Suitability with a mean of 4.38, Reliability with a mean of 4.45, Usability with a mean of 4.46, Performance Efficiency with a mean of 4.39, Maintainability with a mean of 4.43, Portability with a mean of 4.37, Security with a mean of 4.31, Compatibility with a mean of 4.33. Which has an average of 4.43, interpreted as

"Agree" for overall survey test mean. The results of the survey test show that the developed system performed better than the pre-existing system.

5.2 Conclusion

Based on the system that the developers conducted, it therefore concluded that the development of a Web-Based Operation Monitoring System for Bureau of Fire Protection in Davao Oriental was successfully developed using Visual Studio Code. The following modules are also successfully developed; Registration Module, Login Module, Personnel Module, Admin Module, Vehicle Module and Reports Module. The results of the evaluation show that the system is an effective operation monitoring system for the Bureau of Fire Protection in Davao Oriental. The presentation of the developed system was rated as "Agree" in the test survey result which means that the developed system met the quality factors in ISO/IEC 25010.

5.3 Recommendation

The developers made a recommendation to enhance the effectiveness and functionality of the developed system titled as "Operation Monitoring System for Bureau of Fire Protection of Davao Oriental". Based on the summary of findings and conclusion gathered the following recommendations are given by the respondents to improve and enhance the BFP-OMS:

- Integrate Announcement and Activity Calendar
- Add Fire Alert Levels and Mapping
- Integrate SMS or QR code modules to the system.
- Integrate Geographic Information System (GIS) for emergency responding.

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PERSONAL DATA

Date of Birth	**: April** 02, 2001
Age	: 22
Place of Birth	**: Mati City, Davao Oriental**
Sex	**: M**ale
Height	**: 5'8** Ft
Weight	: 85 kg
Civil Status	: Single
Nationality	: Filipino

SKILLS AND INTEREST

- ✓ Computer Literate
- ✓ Canva Expert
- ✓ Clerical and Administrative Practiced
- ✓ Entrepreneurship
- ✓ Team - Cooperative

EDUCATIONAL BACKGROUND

TERTIARY	**Davao Oriental State University** Guang-Guang, Dahican, City of Mati Batch 2022-2023
SECONDARY	**Davao Oriental Regional Science High School** Government Center, Dahican, Mati, Davao Oriental Batch 2018-2019 (With Honors) (Loyalty Awardee)

PRIMARY **Rabat Rocamora Mati Central SPED School**
Don Mariano Marcos Avenue, Mati, Davao Oriental
Batch 2012-2013

WORK EXPERIENCE

- ✓ On-the-Job Training Year 2023
- ✓ Real-estate Virtual Assistant 2021-2022
- ✓ SPES Beneficiary 2017-2019

REFERENCES

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PERSONAL DATA

Date of Birth	**: January 28**, 2001
Age	: 22
Place of Birth	**: Mati City, Davao Oriental**
Sex	**: M**ale
Height	**: 5'10** Ft
Weight	: 76 kg
Civil Status	: Single
Nationality	: Filipino

SKILLS AND INTEREST

- ✓ Computer Literate
- ✓ Clerical and Administrative Practiced
- ✓ Team - Cooperative

EDUCATIONAL BACKGROUND

TERTIARY	**Davao Oriental State University** Guang-Guang, Dahican, City of Mati Batch 2022-2023
SECONDARY	**Immaculate Heart of Mary Academy** Government Center, Dahican, Mati, Davao Oriental Batch 2018-2019 (With Honors) (Loyalty Awardee)
PRIMARY	**Immaculate Heart of Mary Academy** Don Mariano Marcos Avenue, Mati, Davao Oriental Batch 2012-2013

WORK EXPERIENCE

- ✓ On-the-Job Training Year 2023

REFERENCES

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PERSONAL DATA

Date of Birth	: July 22, 1999
Age	: 24
Place of Birth	: **Mati City, Davao Oriental**
Sex	: **Fem**ale
Height	: **5'7** Ft
Weight	: 57 kg
Civil Status	: Single
Nationality	: Filipino

SKILLS AND INTEREST

✓ Computer Literate

EDUCATIONAL BACKGROUND

TERTIARY	**Davao Oriental State University** Guang-guang, Dahican, City of Mati Batch 2022-2023
SECONDARY	**Manay National High School** San Ignacio, Manay, Davao Oriental Batch 2018-2019
PRIMARY	**Cateel Central Elementary School** Cateel, Davao Oriental Batch 2011-2012

WORK EXPERIENCE

- ✓ On-the-Job Training Year 2023

REFERENCES

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