"HELP ME": AN EMERGENCY RESPONSE MOBILE APPLICATION

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Abstract

Emergency response is the phase of the disaster-management cycle that often attracts the most attention and resources. This project called "Help Me: An Emergency Response Mobile Application" provides a quick response to accidents by tracking the users' location during an emergency. The app features a red button to report emergencies, and notifications to automatically alarm the rescuer's phone. It also has features like a push notification alarm using Firebase, a video call using agora.io, and tracking the location of the accident through a leaflet map provider. A web-based command centre application provides monitoring and management of offices and users. This study is helpful to the Bureau of Fire Protection (BFP), Philippine National Police (PNP), Barangay Police, Barangay Captain, and Municipal Disaster Risk Reduction and Management Office (MDRRMO). The app is compatible with android phones.

Keywords: Android phones, Emergency response, Mobile application.

1. Introduction

An emergency is a situation that poses an immediate risk to health, life, property, or the environment [1]. These emergencies range from individual medical emergencies such as heart attacks, strokes, cardiac arrests, and trauma; natural disasters like floods and earthquakes; violent crimes like murder and criminal homicide; and motorcycle or vehicular accidents. According to the Bureau of Fire Protection's Physical Report of Operations 2020, the bureau received 15,825 emergency calls nationwide and responded to 15,195 incidents, but only 74.36% of these were responded to within seven minutes of the receipt of the call [2]. In urban areas, early response is possible because of the accessibility of an emergency hotline and favourable locality. Conventional methods of emergency response can be enhanced with the reinforcement of technology in rural areas, making emergency response fast and efficient.

In the interview conducted with the Bureau of Fire Protection in the Municipality of Dingle, they stressed that the most common emergency they respond to are vehicular accidents. The BFP emergency response procedures started with an emergency call received through a mobile phone, telephone, and frequency radio. nature of the accident. After verification, they will proceed to the area and Essential details of the accident will be verified, such as the exact location and the perform the necessary emergency response. The emergency response is delayed because of these processes and travel time constraints; thus, the researchers created the emergency response mobile application to address these issues. This mobile app provides a convenient way for government personnel to respond to accidents and other emergency incidents immediately.

1.1. Objectives of the study

This study aimed to develop "Help Me: An Emergency Response Mobile Application" and establish a system that would provide a quick response to emergencies. Specifically, it seeks to:

a. Create a mobile application that alerts the Philippine National Police (PNP), the Bureau of Fire Protection (BFP), the Barangay Tanod, and the Barangay Captain of an impending emergency.
b. Create a system that can track the users' location during an emergency.
c. Ensure that the system allows viewing the situation through a video call.
d. Use ISO 9126 to evaluate the system.
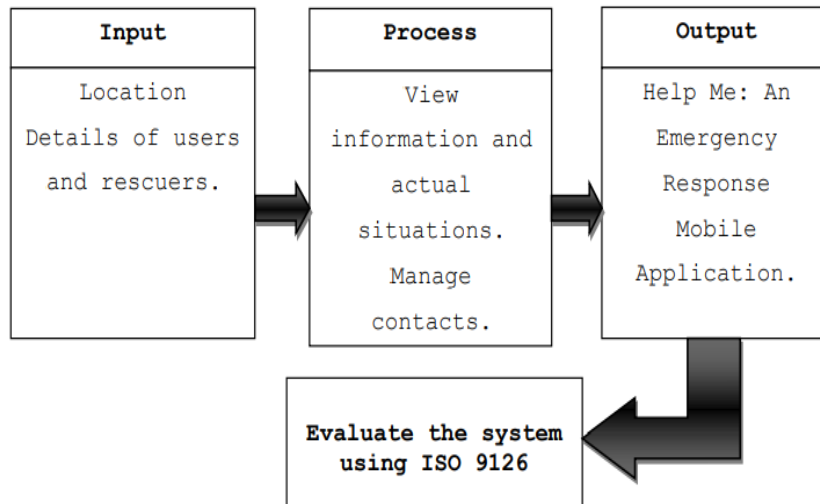
1.2. Conceptual framework

The input-process-output (IPO) model or input-process-output pattern is a widely used approach in system analysis and software engineering for describing the structure of an information processing program or other processes. Thus, the authors decided to use this model as shown in Fig. 1 to test the relationship among the variables used in this study.

1.3. Scope and limitation of the study

The study is about a system that could enhance the ability of an organization to respond to an emergency. It has three useful features: alarm the phone of the

rescuers during an emergency, make a video call to verify the trouble that took place, and display the location using GPS of an emergency incident to the nearest emergency response station. This study will take place at the Municipality of Dingle, Iloilo, Philippines.

The video call feature of the mobile app requires internet connectivity or mobile internet data.

Input	**Process**	**Output**
Location Details of users and rescuers.	View information and actual situations. Manage contacts.	Help Me: An Emergency Response Mobile Application.

Evaluate the system using ISO 9126

**Fig. 1. The conceptual framework of "Help Me":
An Emergency Response Mobile Application.**

2. Review of Related Literature

This chapter presents the related literature and results of studies conducted that became the basis for the development of this study.

2.1. Designing mobile applications for emergency response: citizens acting as human sensors

Romano et al. [3] conducted a study on designing mobile applications for emergency response: citizens acting as human sensors. In this paper, they presented a practical application for identifying both limitations and standard features. They developed a design for effective and efficient mobile emergency notification applications. For this purpose, they have exploited the primary sensors of modern mobile devices and the users' aptitude for using them. The evaluation consisted of a practical and a theoretical part. The former part simulated traffic accidents as possible to a real scenario, with a victim lying on the ground near a car in the middle of a street. For the theoretical part, they asked some emergency experts to collect their opinions about the utility of the proposed solution. Results from this evaluation phase confirmed the positive impact of EN application on both operators' and citizens' perspectives. Moreover, they collected several findings useful for future design challenges in the same area.

2.2. Emergency management system using android application

Similar research was done by Jadhav et al. [4], emergency management system using android application. This study aims to provide emergency service at the accidental spot faced or witnessed by the user, using a single click of a button. Emergency service is provided to patients who have met with an accident in an unknown location through the GPS inbuilt, Inculcating cloud computing to manage and maintain the patient's medical records in the EMS server. This system also proposes exciting functionalities such as blood bank services, acknowledging relatives through message text, and doctor-provided prescriptions if the user faces uneasiness in health.

2.3. Sagip Pinoy: A web and mobile-based Philippine emergency quick response portal

Ramirez et al. [5] introduced their research Sagip Pinoy: a web and mobile-based Philippine emergency quick response portal. This study designed and developed an application that can locate the nearest emergency units. It can send location details to the emergency units and broadcast alarm to at least five nearest emergency teams. For the emergency units, they can locate the accident area; they can also send notifications to the victims that they have responded. The software used to develop were Notepad++, Bootstrap, Adobe Photoshop, PHP, HTML, and WampServer in web side, while Java Eclipse, Android API, SQLite. Integration testing, test plan, load testing and stress testing were used to test the reliability and acceptance of the study.

2.4. Mobile emergency response application using geolocation for command centers

De Guzman et al. [6] conducted a study on mobile emergency response application using geolocation for command centres. They introduced Mobile Emergency Response Application using Geolocation for Command Centres. It is a combination of a mobile and web application for responding to emergency requests for ambulance, fire truck and police by people in a certain area or city. The mobile application would detect user's current location through geolocation and send to the web application deployed in a command centre the name, age, mobile number, and location of the user for easily dispatching of emergency units.

2.5. Video calls from bystanders to dispatch centers- risk assessment of information security

Bolle et al. [7] conducted a study on video calls from lay bystanders to dispatch centres-risk assessment of information security. Video calls from mobile phones can improve communication during medical emergencies. Lay bystanders can be instructed and supervised by health professionals at Emergency Medical Communication Centres.

3. Methodology

This chapter presents the methods used in creating "Help Me: An Emergency Response Mobile Application," which includes the development process, the different diagrams, and the graphical user interface of the system.

3.1. Development methods

The design thinking process as shown in Fig. 2 is the program development method used in developing the "Help Me: An Emergency Response Mobile Application." It is a sequential design process, often used in software development.
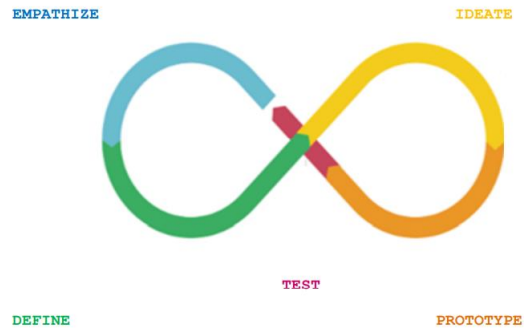

Fig. 2. The design thinking process.

3.1.1. Empathize

The first phase of the design thinking process was to gain an empathic understanding of the problem that needed to be solved. The researchers interviewed the BFP regarding the frequent type of accident in the municipality and the areas prone to accidents and gathered ideas and insights into the features and design of the system. The target users of the study are the local government personnel or people assigned to respond to an emergency, such as Barangay Tanod, Barangay Captain, Bureau of Fire Protection, and Philippine National Police.

3.1.2. Define

In this phase, the researchers conducted brainstorming to acquire an understanding of the exact features of the system and how to develop an application that could notify someone immediately and help users respond to emergencies. "Help Me: An Emergency Response Mobile Application" is a system that can alarm, video call, and locate the area where the incident happened. Casualties or people around the area can call the emergency team to respond immediately to an accident. The main goal is to help and save lives [8-14].

3.1.3. Ideate

During this phase, the researchers finalized the features of the system. Features included were phone alarms, video calls, and locating the place where the accident happened [8-14].

3.1.4. Prototype

The developers created a software design using the Use Case Diagram, Entity Relationship Diagram, and Deployment Diagram. This is the phase where the development of the system commenced. This includes coding and testing.

Figure 3 shows the admin could view the location map, add updates, delete the user and rescuer, and manage the entire system.
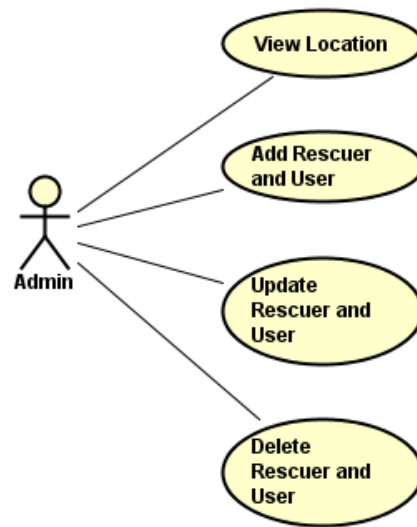

Fig. 3. The use case diagram of the admin.

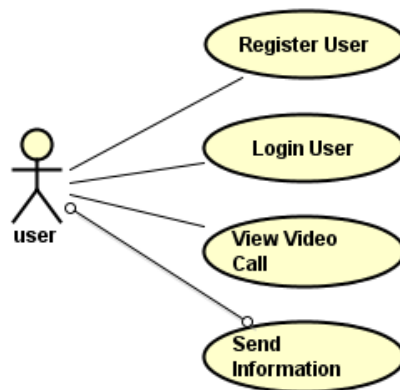Figure 4 shows the user could log in and register, view video calls, and send automatic information to the rescuer.

Fig. 4. The use case diagram of the user.

Figure 5 shows that the rescuer could video call, view location, and receive SMS from the user.
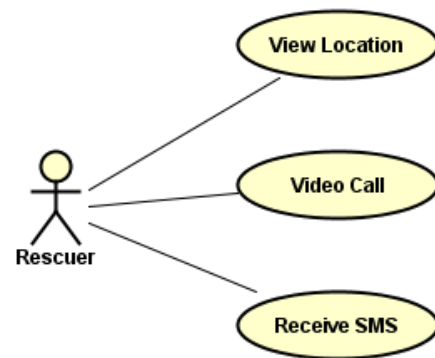
Fig. 5. The use case diagram of rescuer.

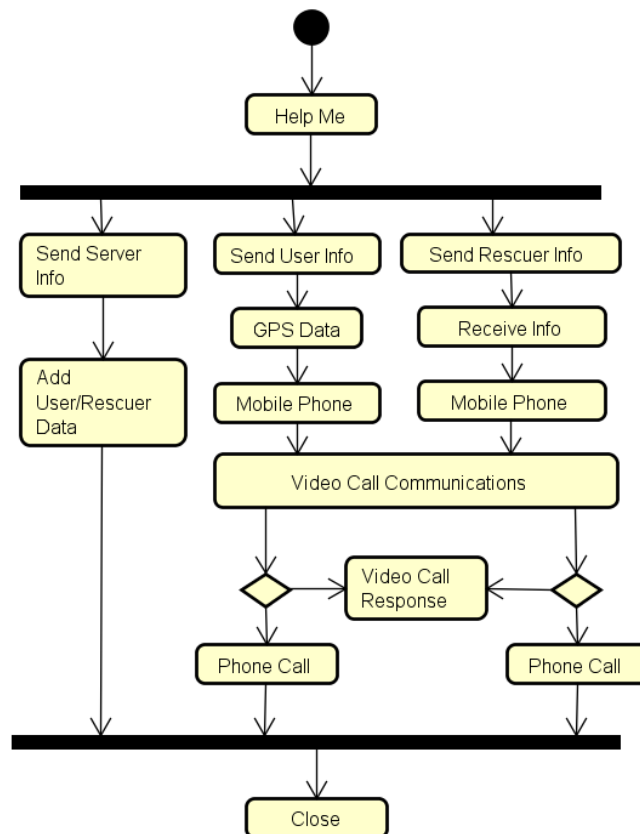Figure 6 shows the flow of the server application and its interaction with the app.

Fig. 6. The activity diagram of the system.

Figure 7 represents the deployment setup and component of the system; the server, rescuer, and user modules. The user module shows how the servers connect them through video calls using the internet; the rescuer module shows how to locate the user through a map and video call; the server module shows how it can manage everyone in the scene.
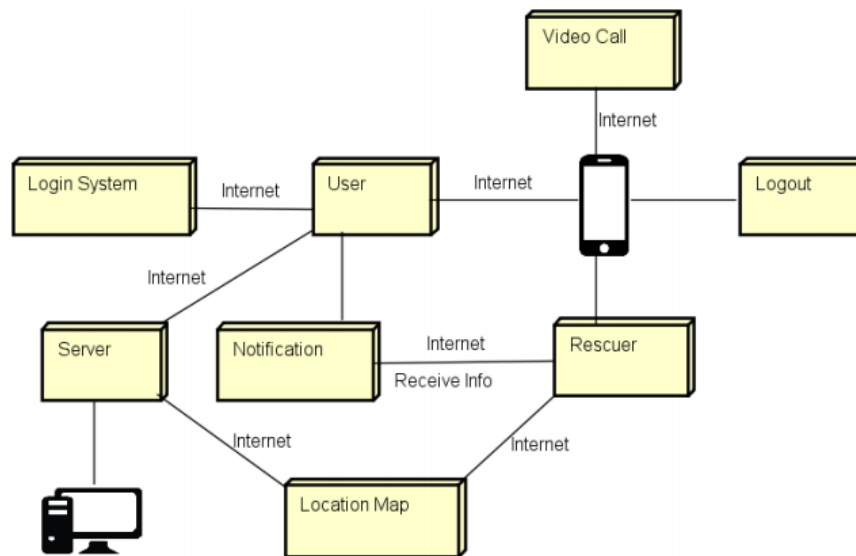

Fig. 7. The deployment diagram of the system.

3.1.5. Design specification

In designing the specification and requirements of the application, the developer used the Unified Modelling Language (UML) as a standard tool in modelling languages in the field of software engineering. UML includes different diagrams and graphical notations to create a visual model of the system.

3.1.6. Testing

This phase helped the researchers determine if the program was running smoothly and had met the goals and objectives of the study. The testing phase is necessary to finalize the system and ensure it is free from error.

3.2. System evaluation

The international standard ISO 9126 is used to evaluate the software. The objective of this is to assess some of the well-known human factors that can adversely affect the delivery and perception of a software development project. The researchers used this to enhance the system based on the following:

 a. Functionality - a set of attributes that bear on the existence of a group of functions and their specified properties. These functions are those that satisfy stated or implied needs.
 b. Reliability - a set of characteristics indicating a software's ability to maintain its level of performance over a specified time period.

c. Usability - a set of attributes bears on the effort needed, the individual assessment of such use, and a starting or implied set of users.

d. Maintainability - a set of attributes that bear on the effort needed to make specified modifications.

e. Portability - a set of attributes bear on the ability of software to be transferred from one environment to another.

3.2.1. The respondents

Forty-three respondents were composed of users and rescuers, with eight Barangay Tanod, eight Barangay Captains, eight BFP, seven PNP, and three MDRRMO personnel using the purposive sampling technique.

3.2.2. Statistical data treatment

A mean was used for descriptive data analysis of the data gathered. The interpreted results shown in Table 1 were based on these categories:

Table 1. Data interpretation scale and description.

Scale	Description
4.51-5.00	Excellent
3.51-4.50	Very Good
2.51-3.50	Good
1.50-2.50	Fair
1.00-1.49	Poor

4. Results

The "Help Me: An Emergency Response Mobile Application" was designed and developed to provide a quick response to emergencies.

4.1. Objectives are met

4.1.1. Create a mobile application that alerts the Philippine National Police (PNP), the Bureau of Fire Protection (BFP), the Barangay Tanod, and the Barangay Captain of an impending emergency.

The system is compatible with Android phones with a minimum Android version of 4.0. In the study, the researchers installed the app on an Android phone with Android version 8.1.0. Figures 8 and 9 show how the system could directly notify the PNP, BFP, and the LGU-Barangay Officers assigned to respond to emergencies.

Figure 10 shows that the user can directly press the red button to report an emergency, and a notification is sent automatically to the rescuers' mobile phone. The user can make a video call when they have an internet connection or mobile data connection to the nearest emergency response unit.

Figure 11 shows the register and login form. In signing up, click "Sign Up" and fill in the form provided. To log in, fill in the login form and click "Log in".
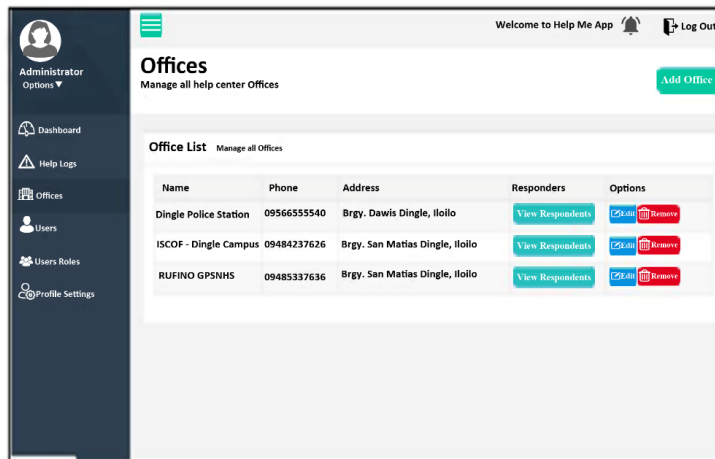
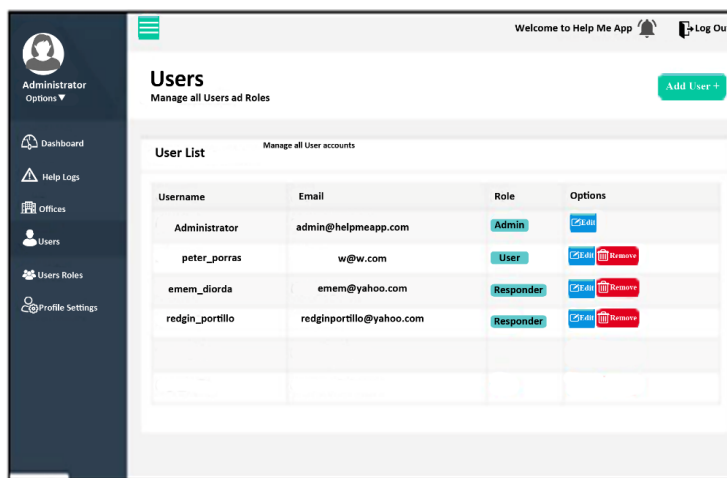**Fig. 8. Contact information of offices/stations and rescuers in the server.**

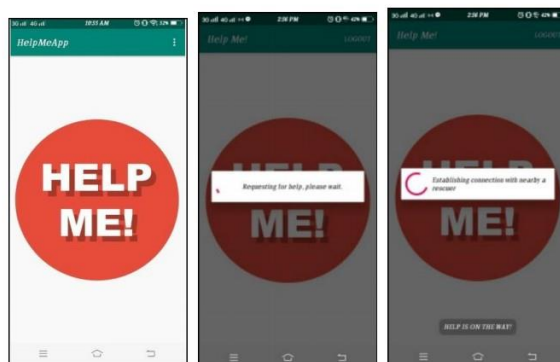**Fig. 9. Users personal and contact information in the server.**

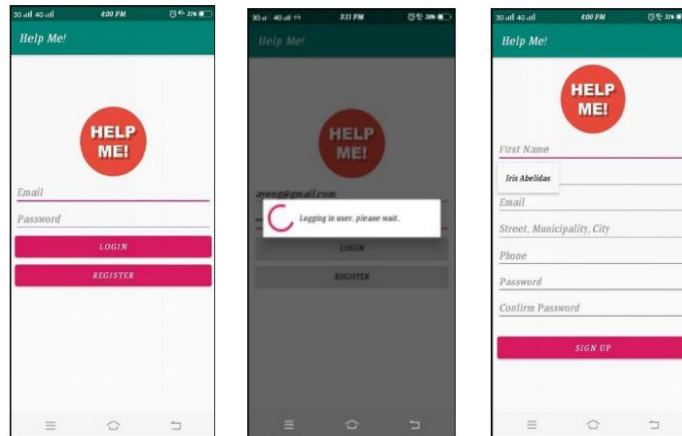**Fig. 10. Mobile application's emergency button interface.**

Fig. 11. Registration and login form for user and rescuer.

4.1.2. Create a system that can track the users' location during an emergency.

Figure 12 shows the list of emergency alerts in the form of notification colors. The red is the new alerts, while the green notifications are alerts that have been responded to accordingly. Upon receiving the alert, the rescuer will click the red button to display the emergency location provided by the users' mobile phone GPS. A map is included in the app for the rescue team or responders to locate the accident or emergency incident.
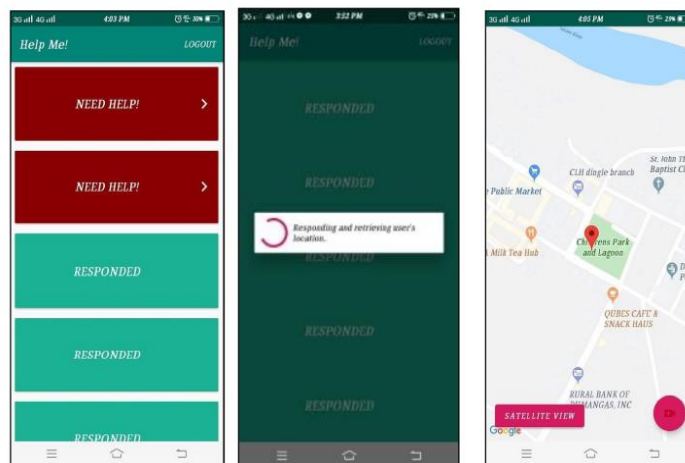

Fig. 12. List of alerts, and location map of the emergency incident.

4.1.3. Ensure that the system allows viewing the situation through a video call.

The mobile application has a video call feature, Fig. 13, used to verify the current situation of the emergency. A notification is displayed on the phone both when the phone is idle and when the app is active, as shown in Fig. 14.

Fig. 13. Testing of the video call feature of the mobile application.
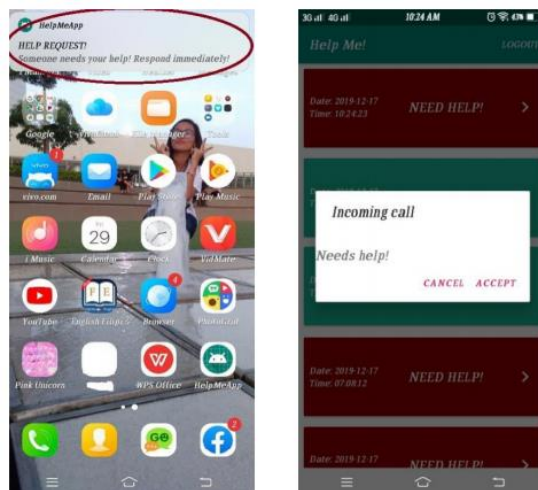
**Fig. 14. Notification display when the mobile phone is in
idle mode and when the "Help Me" application is opened.**

4.1.4. To evaluate the system using ISO 9126

The following are the evaluation results conducted among Barangay Tanod, fire officers of the BFP, PNP officers, and MRDDMO personnel on the use of the application.

A. System performance in terms of functionality

Table 2 shows the result of the functionality of the "Help Me: An Emergency Response Mobile Application" as evaluated by the respondents.

The system has a grand mean of 3.86, or "Very Good," based on the evaluation of the users. In the area of functionality, the system got the highest mean score of 4.35 in Accuracy while the Compliance got the lowest rating of 3.37 among the

evaluators. In this study, the application proved that it could work easily on Android phones.

Table 2. Evaluation result as to the functionality of the system.

Functionality	Brgy. Tanod	BFP	PNP	MDRRMO	Mean	Description
Accuracy	3.86	4.5	4.71	4.33	4.35	Very Good
Compliance	3.5	3.88	3.43	2.67	3.37	Good
Interopera-bility	3.94	4.25	4.00	3.00	3.80	Very Good
Security	4.25	4.25	3.57	3.58	3.91	Very Good
Grand Mean					3.86	Very Good

B. System performance in terms of reliability

Table 3 shows the result of Reliability of the "Help Me": An Emergency Response Mobile Application as evaluated by the respondents.

The system got a grand mean of 3.70, or "Very Good," based on the users' evaluation. In the area of reliability, the system got the highest mean score of 3.82, in Fault Tolerance, while Recoverability got the lowest rating of 3.60 among the evaluators. In this study, the system has proven that the application can fix errors on time.

Table 3. Evaluation result as to the reliability of the system.

Reliability	Brgy. Tanod	BFP	PNP	MDRR MO	Mean	Description
Maturity	3.31	4.25	3.43	3.67	3.67	Very Good
Fault Tolerance	3.75	4.00	3.86	3.67	3.82	Very Good
Recoverability	3.88	3.63	3.57	3.33	3.60	Very Good
Grand Mean					3.70	Very Good

C. System performance in terms of usability

Table 4 shows the result of Usability of the "Help Me": An Emergency Response Mobile Application as evaluated by the respondents.

The system got a grand mean of 4.28, or "Very Good," based on the users' evaluation. In the area of Usability, the system got the highest mean score of 4.38 in Operability while the Attractiveness got the lowest rating of 4.19 among the evaluators. In this study, the system had proven that the user could handle the application comfortably.

Table 4. Evaluation result as to the usability of the system.

Usability	Brgy. Tanod	BFP	PNP	MDRR MO	Mean	Description
Understan-dability	4.31	4.25	4.14	4.33	4.26	Very Good
Learnability	4.38	4.38	4.00	4.33	4.27	Very Good
Operability	4.38	4.38	4.43	4.33	4.38	Very Good
Attractiveness	4.25	4.25	4.57	3.67	4.19	Very Good
Grand Mean					4.28	Very Good

D. System performance in terms of efficiency

Table 5 shows the result of Efficiency of the "Help Me": An Emergency Response Mobile Applications evaluated by the respondents.

The system has a grand mean of 4.21, or "Very Good," based on the evaluation of the users. In the area of Efficiency, the system got the same highest mean of 4.21 in Resource Behavior while the Time Behavior and Resource Utilization got the same lowest mean of 4.20 among the evaluators. In this study, the application was proven to respond quickly.

Table 5. Evaluation result as to the efficiency of the system.

Efficiency	Brgy. Tanod	BFP	PNP	MDRR MO	Mean	Description
Time Behavior	4.19	4.63	4.29	3.67	4.20	Very Good
Resource Behavior	4.13	4.88	4.14	3.67	4.21	Very Good
Resource Utilization	4.31	4.50	4.43	3.67	4.20	Very Good
Grand Mean					4.21	Very Good

E. System performance in terms of maintainability

Table 6 shows the result of Maintainability of the "Help Me": An Emergency Response Mobile Applications evaluated by the respondents.

The system got a grand mean of 3.81, or "Very Good," based on the users' evaluation. In the area of Maintainability, the system got the highest mean of 3.99 in Testing while the Analysability got the lowest rating of 3.70, among the evaluators. In this study, the system has proven that the application continues functioning even if changes are made.

Table 6. Evaluation result as to the maintainability of the system.

Maintaina-bility	Brgy. Tanod	BFP	PNP	MDRR MO	Mean	Description
Analysability	3.57	4.00	3.57	3.67	3.70	Very Good
Changeability	3.81	4.13	3.29	3.67	3.73	Very Good
Testing	4.13	4.63	3.86	3.33	3.99	Very Good
Grand Mean					3.81	Very Good

F. System performance in terms of portability

Table 7 shows the Portability result of the "Help Me": An Emergency Response Mobile Application as evaluated by the respondents.

The system got a grand mean of 4.03, or "Very Good," based on the users' evaluation. In the area of Portability, the system got the highest mean score of 4.43 in Install ability while Replaceability got the lowest rating of 3.78 among the evaluators. In this study, the system proved that the application was installed easily.

Table 7. Evaluation result as to the portability of the system.

Portability	Brgy. Tanod	BFP	PNP	MDRR MO	Mean	Description
Adaptability	3.86	4.38	4.29	3.00	3.88	Very Good
Installability	4.50	4.75	4.14	4.33	4.43	Very Good
Conformance	4.06	4.38	4.00	3.67	4.03	Very Good
Replaceability	3.88	4.38	3.86	3.00	3.78	Very Good
Grand Mean					4.03	Very Good

G. Over-all result of the system performance using ISO standard 9126

As shown in Table 8, the users of "Help Me": An Emergency Response Mobile Application rated the system in terms of functionality with a grand mean of 3.86 or very good, reliability with a grand mean of 3.70 or very good, usability with a grand mean of 4.28 or very good, efficiency with a grand mean of 4.21 or very good, maintainability with a grand mean of 3.81 or very good, and portability with a grand mean of 4.28 or excellent. The system got a total grand mean of 3.98, which is very good. The result of the evaluation implies that the overall result of the evaluation met the main objective of the study.

Table 8. Over-all result of the system performance

Characteristics	User Mean	Description
Functionality	3.86	Very Good
Reliability	3.70	Very Good
Usability	4.28	Very Good
Efficiency	4.21	Very Good
Maintainability	3.81	Very Good
Portability	4.03	Very Good
Grand Mean	**3.98**	**Very Good**

5. Summary, Conclusion, and Recommendation

In this chapter, the researchers summarized the details about the system, the researchers' conclusion, and the thoughts and recommendations of the researchers for this study.

5.1. Summary

This research project, named "Help Me": An Emergency Response Mobile Application, could provide a quick response to accidents by tracking the location of the users during an emergency. The application is easy to use. By clicking the red button, the app can report that there is an emergency, and a notification will be sent automatically to the rescuers' phone. It also features the ability to receive an alarm push notification through Firebase messaging, view the actual scenario through a video call by using Agora.io, and track the location of an accident through Leaflet Map Provider. The web-based application can add, edit, delete, and update

the offices and accounts of users. The researchers used the incremental model of software development in developing the system.

This application is compatible with Android phones. This study is helpful to the Bureau of Fire Protection (BFP), Philippine National Police (PNP), Barangay Tanod, and Barangay Captain because it can be used to notify them immediately. People or residents within the incident's vicinity can also use the application to inform their Barangay Tanods or Barangay Captains about the accident, or they may call the BFP and PNP immediately.

5.2. Conclusion

The researchers concluded that "Help Me": An Emergency Response Mobile Application is user-friendly and has essential usability of "Very Good" based on the overall evaluation. The evaluators would want to install or use the system in the Municipality of Dingle because it can greatly help in their quick response to an emergency. It can be accessed from any area if the users have internet or WIFI connection, but the system is only accessible to all users who are already logged in to the system as confirmed by the administrator.

5.3. Recommendation

The researchers recommend to future researchers who are interested in developing an emergency response application to include an offline feature using Short Messaging Services (SMS) notification for areas without internet access.

Acknowledgements

Abbreviations	
BFP	Bureau of Fire Protection
GPS	Global Positioning System
IPO	Input-Process-Output
ISO	International Standards Organization
MDRRMO	Municipal Disaster Risk Reduction and Management Office
PNP	Philippine National Police
SMS	Short Messaging Services
UML	Unified Modelling Language

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