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Emergency Number Services Rescue Mobile App in Sta. Cruz, Laguna

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Abstract: This paper aimed to support and help people who are experiencing emergencies, mishaps, crimes, vehicle problems, or disasters in Sta. Cruz, Laguna. With this, an Emergency Number Services Rescue Mobile App in Sta. Cruz, Laguna was devised, developed, and evaluated. This app provides different emergency units where people can send emergency message information, GPS location, and direct calls where users or victims encounter an emergency, crime, vehicle problem, or disaster situation. Respondents from Sta. Cruz Laguna using stratified random sampling was utilized. The use of the descriptive method of research was identified in the study. Questionnaires, formal interviews, observation, library resources, and Internet resources were used for data gathering. The emergency application was assessed by the respondents through software evaluation using ISO/IEC 25010:2011, which got an overall weighted mean of 3.79 with an interpretation of "*Agree*."

Keywords: Emergency Number Services, response, mobile app, rescue number, Laguna

1. Introduction

During an emergency, actions and responses taken in the initial seconds and minutes are critical. These life-threatening events may happen anytime and anywhere. Awareness and preparedness can save lives. A call for assistance to the public emergency and rescue services is of great help to address different emergencies and avoid grave problems. Environmental emergencies, such as disasters, vehicle problems, crime, *etc.*, are incidents or events that threaten public safety, health, and welfare. These emergencies need emergency responses. Emergency responses bring emergencies under control by reducing the grave effect of the mishap in the area. When unpredictable events happened, the concerned citizens didn't know whom to call or where to escort the victim. They must immediately ask for help using the most convenient and accessible tool to save lives.

Nowadays, almost everyone has an Android phone. These phones have lots of features, capabilities, and benefits. Also, these phones can track mobile users' locations. Many mobile applications have been

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invented and they are beneficial in disaster response [20]. Some applications can be used for tracking emergency stations. More so, there are applications used to assess damage or destruction. Using the smartphone in disaster management is beneficial to emergency units [3]. Technology improves the emergency system. It also expands the awareness and involvement of the stakeholders in emergencies. The help desks of the emergency stations must be established for the public because accidents may happen anywhere [21].

These days, mobile devices are tools to access information and aid in decision-making. More so, it is significant to have the not obsolete details, particularly in times of crisis. To devise a mobile app to rescue citizens in times of difficulty is the main rationale of this endeavor. The researchers developed this app for fast communication in case of emergency situations. This mobile application is a two-way communication process; it can help both the users and the emergency units communicate with each other.

A solution to emergency concerns has been provided using the Android phone application to locate the nearest police stations, fire stations, and hospitals. This innovation gives the community a platform for calling for rescue. This app can provide support for managing communications during an emergency in Sta. Cruz, Laguna.

2. Literature Review

To better understand the issues and write-ups that support the actual impact of the proposed study on its users, the researchers utilized related literature and studies.

As the largest and most expansive city in Metro Manila, Quezon City is densely populated and takes up one-third of the region's total land area. The city with the most residents boasts a rapidly increasing income and occupation for its people. The Philippines is vulnerable to numerous natural disasters, in addition to hurricanes and earthquakes, because of its location along the Pacific Ring of Fire and the path of the Typhoon Belt. These disasters include volcanic eruptions, landslides, and floods; occasionally, these catastrophes occur simultaneously or, even worse, all at once. To assist the residents of Quezon City, a disaster management system was established. The researchers called it "*AlertQC: A Web and Mobile Disaster Utility and Incident Report Management System for Quezon City Disaster Risk Reduction and Management Office*" [1].

"*A Health Perspective Smartphone Application for the Safety of Road Accident Victims*" [2] introduces the SOS (Save Our Souls) personal safety app for Android, which attempts to speed up emergency response times in the event of any traffic accident. A sophisticated technology that can alert for rapid rescue is currently needed due to the rise in traffic-related deaths and injuries in order to save valuable lives. Reduced rescue times will result from the use of smartphone onboard sensor data for vehicle accident detection and notification. The likelihood of survival will be significantly increased while saving time and resources for emergency services by providing extra geolocation data to the closest available emergency responder. Utilizing the user's pre-filled medical information will also assist clinicians in making the correct diagnoses, increasing the possibility of saving lives. This research attempts to increase road safety by utilizing modern cell phone features and three-axis accelerometer data. With a Google root map, the newly created Android application will recommend the closest hospital. In order to notify pre-filled emergency units like the police, hospital, and family members, the phone call facility for rescue is activated with automated and manual calling facilities. This work tested the functionality of the Android application and applied it, speeding up the recovery of accident victims.

Disasters are happening more frequently than ever before, yet there is never a reliable disaster management system to assist people in times of need. As a result, it's important to coordinate the rescue

and relief efforts of qualified professionals and members of the general population. In these circumstances, reducing response time is still crucial and is possible with better information management. Since the use of smartphones is growing significantly, a smartphone application for disaster management has been suggested, called Distress – An Application for Emergency Response and Disaster Management [3]. This paper examines the potential disaster management strategies. Following that, a prototype for disaster management is suggested, taking into account the benefits and drawbacks of the assessed systems as well as the elements of success for disaster management. It also offers areas for future studies, such as how to integrate applications with government agencies, hospitals, and other rescue teams.

Tuban and Perpinosa [4] highlighted that QuiCue is an app that can send SOS and Short Message Service (SMS) to the nearest emergency stations. To utilize this in Free Basics, transactions must be made offline. This app accurately tracks the whereabouts of the user when connected to networks and the Global Positioning System (GPS). When offline, SIM cards or the GPS installed will be used. Online and/or offline, the power of Dijkstra's algorithm can be used too. Even offline, they innovated a better algorithm to utilize this 10 times faster. Without hesitation, the application quickly locates and calculates the distance to the nearest station.

Experts from the Young Filipino Information Technology [5] presented an app named "*Pure Force Citizens App*," which gives access to a continuous recorded answering program for emergency concerns. The direction of President Rodrigo Duterte to have the details and announcements of the daily emergencies paved the way for the development of this app. The program pinpoints the exact location of the user. It has the 911 emergency bar, which is green in color. When the bar is pressed, the command center will receive a notification, and afterward, the citizen will receive a call from the dispatcher. Communication is two-way. Emergencies are being addressed through this app.

Hero Support is an easy and convenient application on the phone. The support was invented because, when Typhoon Yolanda devastated the country in 2014, different emergency numbers were given to the public. Emergency numbers depend on the location. The 117 hotlines were already established back then, but they were exclusively in Metro Manila. In addition, it catered to police services only and not medical or fire emergencies. Hero Support has its own speed dial and is used solely for calling. In order to use it, the user's location needs to be established first. This app automatically loads the nearest emergency stations. By pressing the call button, the user must select the type of emergency that applies to his or her situation. The app has only one (1) button for the user's convenience [6].

The Philippine National Police (PNP) established a telecommunications app named "*Itaga Mo Sa Bato App (PNP Reporting App)/Police Quick Response System*" [7]. This capacitates the country's help desk and can connect subscribers directly to the emergency hotline platforms. To use this app, the user needs to install it on a smartphone. It has two (2) available parts: the first part is used to send notifications via SMS, while the second authorizes them to call 911. If the victims have no chance to make a call to the emergency hotline 911, the Police Alert App button is an option. It alarms PNP personnel and signifies the nature of the event, the victim, and the location, as well as the details of reporters, the information of the emergency stations, and more significant data. The communication process allows the user to communicate directly with the authorized personnel for a rescue. To avoid power trips and malevolent reports from other citizens, there is the provision of an enrollment module. The system identified the reports from two (2) registered numbers, and the unregistered numbers need to be validated. To monitor the compliance of the concerned offices concerning the reports forwarded to them, the provision of a compliance monitoring module is also considered.

The Philippine Red Cross introduced an app entitled "*Hazard App*", which allows immediate access to the needed data in responding to the accident effects. This application permits users to prepare the

household for mishaps. Developed for the country's economic stability, the program presents rules and notifications for caution. The app informs the person to reduce danger in the surroundings, assess risks, prepare for an emergency, or act in accidents by learning training, preparing the family for risks, creating a communication plan, making a household evacuation plan, and preparing for early warning systems [8].

Jahdav *et al.* [9] proposed the "*Android-Based Emergency Alarm Message and Healthcare Management System*" that is developed using an Android-based phone. They also explained that Androids are the most commonly used gadgets in the population, anytime and anywhere. With the help of the GPS and Global System for Mobile (GSM) network, the system can exactly locate the users when they are in danger. When a doctor or one of the family members receives the alarm message as a form of notification, they can immediately take measures on how to protect the user. Thus, it can also manage the health information and record of the user and take an online medical to send their physical condition and status, after which the doctor can automatically send a prescription to the client or user. Last but not least, the system can somehow remind the user to take medications at the right time.

The "*Domain-Specific Search of Nearest Hospital and Healthcare Management System*" locates the closest hospital, connects its emergency ambulance system, and gets the emergency patient's electronic health record, which is crucial for pre-hospital care [10]. Through the Enterprise Messaging System (EMS) server, which continuously updates information on incoming patients to the hospital, the system locates the closest accessible specialty hospital. This helps to prevent serious issues and conditions.

Raut and Patil [11] explained in their study, "*Emergency Call and Location Tracking System with Enhanced Functionality for Android*," that they developed an emergency call system for the Android platform. The user can start utilizing the system right away by pressing the button and sending his latitude and longitude. The location will be displayed using GPS by using the area's name and a link to a map. The pre-registered phone numbers in the application will receive the location. In this recently presented and confirmed application, the custom message that was initially set in the application is attached to the longitude and latitude information that gives a general notion of the location of the mobile user's current position. The registered phone numbers are then sent this information. As a result, this recently added capability allows for locating the precise position of the individual in need. More so, it is beneficial in tracing the location of an occurrence easily at a later time.

The "*iSERVE: An Android-Based Artificial Intelligence Emergency CP (Crime Prevention) Response System Using GPS Tracker*" [12] is useful in emergencies within society such as fire, medical concerns, accidents, and also earthquakes, floods, and storms. The system enables the Android phone's GPS tracker at disaster times over any Internet connection or Wi-Fi (Wireless Fidelity). Anyone who is in an emergency can call the EMS. The GPS tracker is a requirement to utilize this as a client-server system. In addition, the server can respond quickly to the client's requests.

De Guzman and Ado [13] describe a combination of mobile and web applications for answering emergency calls for an ambulance, fire truck, and police in their paper, "*Mobile Emergency Response Application Using Geolocation for Command Centers*". This mobile application would use geolocation to determine the user's present location and communicate that information, along with the user's name, age, mobile number, and location, to a web application set up in a command center. This software was used to request assistance anywhere.

Anderson [14], being a campus safety advocate, explained that he wanted to help the Virginia Tech community be safe and informed. In this regard, he created the "*LifeSafe App*," which allows the school stakeholders to send instructions and reports to Virginia Tech Police, report the whereabouts to acquaintances, and view them on a map for safety purposes. The users will select one (1) of several

incidents to report. Users will forward the tip to the university police unit. They can also provide GPS locations for safety purposes. Also, the app allows users to find nearby emergency services.

The Filipinos can utilize the portal "*SagipPinoy: A Web and Mobile Philippine Emergency Response Portal*" when mishaps happen [15]. By just pressing the link, stations will be notified. This application is designed and developed to locate the nearest emergency units, send location details to emergency units (*i.e.*, to locate the accident area), and broadcast alarms to at least five nearest emergency teams. They can also send notifications to the victims that they are responding. Thus, emergency teams' quick response can save lives.

3. Methodology

The researchers employed developmental and descriptive methods of research. According to Richey [16], developmental research is defined as the systematic study of creating, producing, and assessing instructional procedures, products, and programs that must satisfy the requirements of internal consistency and effectiveness. The Software Development Life Cycle (SDLC), which outlines the procedures for developing the project, served as a reference for the researchers' developmental research. This study establishes a systematic approach to creating, developing, and assessing educational processes, products, and programs that must adhere to the system's security, maintainability, and portability requirements as well as its functional suitability, performance efficiency, compatibility, reliability, and usability requirements [17]. More so, this descriptive research was conducted as a survey investigation [18]. Interviews were conducted with emergency units like the Philippine National Police (PNP), the Bureau of Fire Protection (BFP), hospitals, and possible users or victims from Sta. Cruz Laguna to find out the total population of the study and calculate the statistical number of respondents through the use of stratified random sampling. A survey was also conducted in the municipality of Sta. Cruz in Laguna to determine the problems encountered during an emergency situation.

3.1 Research Instruments

Various research instruments were utilized, including interviews and survey questionnaires, for the acquisition of the data necessary to develop this study. The provision of an efficient course of action for data gathering used in the procedure was employed.

3.2 Analysis of Data

The challenges experienced in accidents or other difficulties in terms of Response, Communication, and Location yield some ideas for the researchers to devise and develop this Emergency App (EA) for the provision of a speedy connection between the persons involved and the emergency stations.

A theoretical and conceptual framework is utilized to identify and analyze the demands of devising the application. In addition, they set the required data concerning the respondents, locality, and the course of action that was being performed.

3.3 Requirements Documentation

This Android application named "*Emergency Number Services Rescue Mobile App in Sta. Cruz, Laguna*" aims to help the victims of emergencies. This app is composed of two (2) main units, namely: (a) the Message, and (b) the Call.

The first unit, the Message, will be used for forwarding concerns and their locations. It has an emergency service that is categorized by various emergency image buttons, including the Emergency

Stations button. The emergency station will receive the Emergency Message Information (EMI) message that contains the user's location.

The second unit, the Call, is used for calling the emergency station and is categorized by various emergency units. This gives more information about the inventory of emergency stations than a direct call.

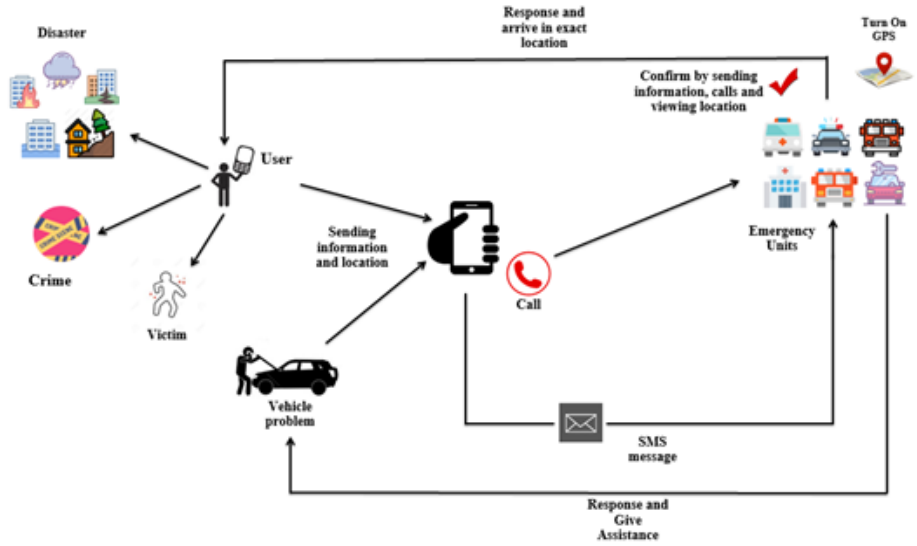

Figure 1. System Architecture

The system architecture can be seen in Figure 1. The Interface interacts with its Emergency App (EA). The EA accommodates various hotlines to send EMI messages and places and directs calls when he or she encounters unexpected events. More so, the emergency stations show the EMI, the place, and the direct call set by the user. Before the emergency station points to the location, GPS must be turned on first. Moreover, people who are transporting or moving can still ask for assistance and services.

3.4 Software Methodology

The SDLC method was used in establishing the system project plan. This method gave an overall list of processes and sub-processes required to devise the application. Through the seven (7) phases of planning, analysis, design, coding, testing, implementation, and maintenance [19], the application was developed.

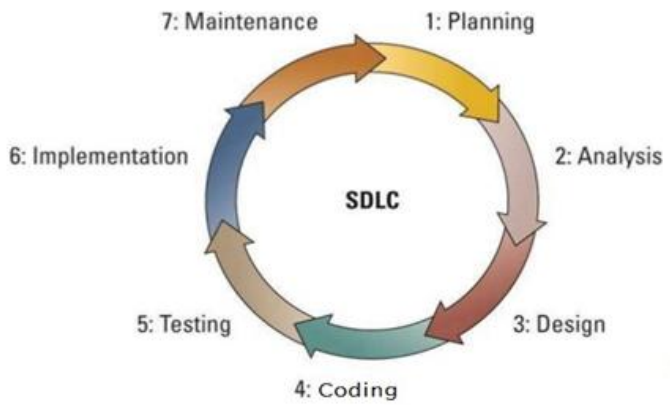

Figure 2. Software Development Life Cycle

The software methodology of the app can be gleaned from Figure 2. In the Planning phase, researchers determined the purposes of the study. In the Analysis phase, communication challenges were identified. In the Design and Coding phases, researchers incorporated the composition of the project. During the Testing phase, the administration was tested after the Android Package Kit (APK) had been built and installed on the Android phone to test the communication process with the GPS locator. In the Implementation phase, the installation of the application is done by researchers. Lastly, the Maintenance phase was employed to devise an app that meets the requirements or expectations.

4. Results and Discussion

The administration of a software tool using a software evaluation questionnaire was employed to determine the acceptability level of the application using the eight (8) criteria of ISO/IEC 25010 for the validity of the instrument for evaluation.

To have a clear data presentation, the responses' distribution was tabulated into several tables. Table 1 shows the results of each criterion used in the evaluation of the developed system. The researchers used the weighted mean formula to determine the descriptive equivalent of each dimension.

Table 1. Software Evaluation

Criterion	**Weighted Mean**	**Interpretation**
Functional Suitability	3.59	Agree
Performance Efficiency	3.34	Moderately Agree
Compatibility	3.73	Agree
Usability	3.55	Agree
Reliability	3.62	Agree
Security	4.08	Strongly Agree
Maintainability	4.39	Strongly Agree
Portability	4.05	Strongly Agree
Overall	**3.79**	**Agree**

The respondents' overall assessment of the app considering ISO/IEC 25010 is highlighted in Table 1. Efficiency got the verbal interpretation of Moderately Agree; Functional Suitability, Compatibility, Reliability, and Usability got the verbal interpretation of Agree; and Security, Maintainability, and Portability got Strongly Agree as the verbal interpretation. In totality, the application got an overall weighted mean of 3.79 with a verbal interpretation of "*Agree*". The app meets the respondents' expectations.

5. Conclusions and Recommendations

The following conclusions and suggestions were made based on the aforementioned results: (1) when reviewed by the respondents, the produced system is found to "*Agree*" in every aspect of the ISO/IEC

25010 model; (2) despite the results of the assessment, the developed system is beneficial to the locality of Sta. Cruz, Laguna, because it was evaluated using ISO/IEC 25010; and (3) based on the overall weighted mean, it is concluded that the utilization of this app can improve the emergency management system in the province of Laguna, particularly in Sta. Cruz, Laguna.

Evidence suggests that the use of the system developed by the researchers needs to be aligned with the municipality of Sta. Cruz Laguna plans and programs for implementation and testing. However, the data indicate that there is a need to include all emergency numbers to test the application smoothly. However, it is difficult to update all the contact numbers of emergency offices and units since they are not regulated by the municipality of Sta. Cruz, Laguna. However, is it remarkable that the use of the application on their mobile phones is highly essential to their lives? Steps should be taken to improve and better understand this new application.

In addition, the experts advise including extra features for an upcoming development: (1) improve and expand the scope of the emergency application to locate the nearest emergency units for immediate help; (2) improve the emergency application where the users can trigger the GPS location of the nearest emergency units; and lastly, (3) improve this emergency application that can run and install in the future versions of Android OS and capability of iOS phones.

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