**iAlertU: EMERGENCY RESPONSE APPLICATION TOOL WITH AN ANDROID-BASED GPS TECHNOLOGY TRACKING SYSTEM**

**AN UNDERGRADUATE RESEARCH PROPOSAL**

Presented to the Faculty of College of Arts, Science and Technology

**OCCIDENTAL MINDORO STATE COLLEGE**

Mamburao Campus

In Partial Fulfillment of the Requirements for the Degree

**BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**

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**CHAPTER I**

**BACKGROUND OF THE STUDY**

**Introduction**

An emergency is a circumstance that provides a direct threat to one's health, life, property, or the environment. Individual medical emergencies such as heart attacks, strokes, cardiac arrests, and trauma; natural disasters such as floods and earthquakes; violent crimes such as murder and criminal homicide; and motorcycle or vehicular accidents are examples of these situations. According to the Bureau of Fire Protection's Physical Report of Operations 2020, the bureau received 15,825 emergency calls and reacted to 15,195 occurrences worldwide, however only 74.36% of them were responded to within seven minutes. Early response is achievable in metropolitan areas due to the availability of an emergency hotline and favorable location. With the advancement of technology, traditional ways of emergency response can be improved (Caliston, Tabia 2022).

According to the Municipal Disaster Risk Reduction and Management Office (MDRRMO) and Bureau of Fire Protection (BFP) in the municipality of Mamburao, Occidental Mindoro, the most common emergency they responded to is vehicular accidents. The MDRRMO, BFP, PNP, PDRRMO and PCG emergency response procedure started with an emergency call received through mobile phone, telephone and frequency radio, nature of the accidents. Emergency contact numbers are absolutely necessary to remember because many unexpected situations arise. The traditional way in Mamburao, Occidental Mindoro in terms of emergency response is affected by the delay of receiving emergency situations. Usually, when an accident happened, the victim or bystander used to call to the barangay officials before they contact the respective departments to take an action. There are circumstances that the number of victim and the need of help is not specified clearly. Due to the lack of information and delay of receiving emergency situations, the response on emergencies of the department is not on time, and will affect the victim extremely.

In response to encountered challenges, the researchers have introduced a study titled “iAlertU: An Emergency Response Application Utilizing Android-Based GPS Technology Tracking System.” The primary objective of this research endeavor is the conceptualization and development of an emergency response application tailored to address the pertinent challenges faced by key organizations, namely the Municipal Risk Reduction and Management Office (MDRRMO), Bureau of Fire Protection (BFP), Philippine National Police (PNP), Philippine Coast Guard (PCG), and Provincial Disaster Risk Reduction and Management Office (PDRRMO). The proposed application is meticulously crafted to ensure inclusivity, catering to a wide spectrum of users, including individuals with disabilities or those possessing limited technological accessibility. Its fundamental functionality revolves around enabling swift, effective emergency response measures. This is achieved through the direct transmission of notifications to the respective departments, initiated by the end user, who could either be the distressed individual or a concerned citizen. This immediate alert is facilitated by a dedicated emergency button, seamlessly triggering an urgent response at the precise geographical location where the incident is unfolding. Leveraging the strides made in mobile technology, the application aligns with the growing trend of emergency response applications, which empower users to swiftly alert emergency responders, convey their precise location, and establish a vital connection with the appropriate emergency services. By harnessing these innovative technological capabilities, the iAlertU application not only holds the potential to significantly reduce response times but also has the capacity to play a pivotal role in potentially saving lives during critical emergency situations.

**Objective of the Study**

This Study aims to develop an Android Based Emergency Tracking System thru GPS.

Specifically, the study aimed:

1. To develop an application and system with the following features:
   1. To develop a user-friendly interface that is easy to navigate in high-stress situations;
   2. To verify user’s account with use of one-time password (OTP);
   3. To implement GPS tracking technology to accurately locate the user and emergency responders, reducing response time;
   4. To provide real-time updates to users and emergency responders during emergency situations;
   5. To provide an attachment photo for actual incidents;
   6. To determine the number of victims;
   7. To specify the type of emergency;
   8. To provide a call option for those who doesn`t have internet connection;
   9. To provide location and the closest landmark; and,
   10. To allow admin (Municipal Disaster Risk Reduction and Management Office) to send a report to Philippine National Police (PNP), Bureau of Fire Protection (BFP), Philippine Coast Guard (PCG) and Provincial Disaster Risk Reduction and Management Office (PDRRMO).
2. To create a System with the use of the following applications:
   1. Android Studio;
   2. VS Code;
   3. PHP;
   4. XAMPP MySQL;
   5. Adobe XD
3. To test and improve the system
4. To evaluate the system based on criteria from ISO 25010 with the following criteria: Functional suitability, Reliability, Performance efficiency, Usability, Security, Compatibility, Maintainability and Portability.
5. To provide user manual.

**Significance of the Study**

**Municipal Disaster Risk Reduction and Management Office.** This study will benefit the (MDRRMO) as an admin in terms of accessing the system and receiving notifications when there is an emergency. The major goal of the MDRRMO is to guarantee the successful and efficient implementation of civil protection programs through an integrated, multi-sectoral, and community-based strategy and methods for the protection and preservation of life, property, and the environment**.**

**Philippine National Police.** This study will benefit the Department of (PNP) Philippine National Police by informing and notifying them of an emergency including theft, rape, robbery, serious injury, murder, homicide, motorcycle, kidnapping, and motor vehicle kidnapping.

**Bureau of Fire Protection.** The study will benefit the Department of Bureau of Fire Protection by allowing administrators to use the system and receive notifications when there is an emergency. The BFP is in charge of avoiding and controlling any destructive fires in buildings, residences, and other structures, woods, land transportation vehicles and equipment, ships or vessels attached or anchored at major seaports, and petroleum sector facilities

**Philippine Coast Guard**. This study will benefit the department of Philippine Coast Guard by informing and notifying them of an emergency including flooding, boat sinking, drowning and any accidents happens in water.

**Provincial Disaster Risk Reduction and Management Office.** This study will benefit the department of Provincial Disaster Risk Reduction and Management Office by informing and notifying them of an emergency.

**Community.** This Android based emergency tracking system thru GPS can help the community by using it. It can help having a security no matter where you are and they can help other people in case of emergency.

**Barangay.** The research reveals how an emergency response app can make a Barangay more effective in ensuring community safety and responding to emergencies. It's noteworthy that this improvement happens without the need for administrative control over the system, as the app directs emergency calls to the right authority.

**Future Researcher.** The result of this study will serve as a reference and guide for the future researcher that have the same purpose. They will utilize this as the basis for conceptualizing and creating a study, utilizing it as a template for subsequent research, as instructions for writing research studies, and to present some of the ideas covered in this study.

**Conceptual Framework**

Figure 1 illustrates the Input, Process, and Output (IPO) framework. The study draws upon knowledge from ten related areas, including emergency preparedness, mobile app design for emergencies, location-based applications, accident detection, GPS technology, fire emergency response, crime mapping apps, rural emergency response, Coast Guard mobile connectivity, and This discusses the input, process and Output of the iAlertU: Emergency Response Application Tool with an Android-Based GPS Technology Tracking System local and international emergency apps. For the software, we used tools like Android Studio, Visual Studio Code, PHP, XAMPP MySQL, and Adobe XD. In terms of hardware, smartphones and laptop or desktop computer are needed. The Agile model’s classification of process elements includes Planning, Designing, Develop, Testing Deployment, Review and Launch. A conceptual framework defines a structure within the design that is develop. It is a general representation that will be guided based on the system. This discusses the input, process and Output of the iAlertU: Emergency Response Application Tool with an Android-Based GPS Technology Tracking System**.**

**OUTPUT**

**iAlertU: EMERGENCY RESPONSE APPLICATION TOOL WITH AN ANDROID-BASED GPS TECHNOLOGY TRACKING SYSTEM**

**PROCESS**

**Agile Model**

1. Planning
2. Designing
3. Develop
4. Testing
5. Deployment
6. Review
7. Launch

**INPUT**

1. **Knowledge Requirements**
2. Emergency Preparedness and Disaster Response
3. Designing Mobile Application for Emergency Response
4. Location-Based Application for Emergency Situation
5. Accident Detection and Smart Rescue System
6. Global Positioning System
7. Fire Emergency Response
8. Crime Mapping Report Mobile Application
9. Emergency Response in Rural Area
10. Coast Guard extends Mobile Connectivity
11. Android Mobile Application: Tsunami Alert System
12. Local Using Emergency Application
13. Emergency Application at the Local Level
14. ISO 25010
15. **Software Requirements**
16. Android Studio
17. VS Code, PHP
18. XAMPP Server
19. Adobe XD
20. **Hardware Requirements**
21. Laptop/Desktop
22. Smartphones

Fig. 1 Research Paradigm

**Scope and Limitation of the Study**

This research project focuses on creating an Android app that uses GPS technology to assist various emergency response agencies like the police, disaster management teams, and firefighters. The main goal is to help them find people quickly during emergencies. The app will be user-friendly, even in high-stress situations. Users can send distress signals with a simple tap, and the app can also automatically alert the right people for help. During the testing phase, this app will only be available online, and the testing will be done in Mamburao, Occidental Mindoro. The Municipal Disaster Risk Reduction and Management Office (MDRRMO) and the Bureau of Fire Protection (BFP) will oversee its use.

One important thing to note is that this app will only work on Android phones with a certain amount of memory. It won't be used for generating reports; its main focus is on quickly getting help to those in need during emergencies.

**Operational definition of Terms**

**Adobe XD.** This application used to create and design a prototype of the proposed application and admin`s system.

**Global Positioning System (GPS).** Used as a tool to locate the user emergency responder, to reduce response time.

**ISO 2510.** It is used as a Standard, the characteristics and sub-characteristics provide consistent terminology for specifying, measuring and evaluating system and software product quality. They also provide a set of quality characteristics against which stated quality requirements can be compared for the completeness.

**Laptop.** It is a hardware requirement use for developing the mobile application system.

**OTP (One-time password).** Used to verify user’s account.

**CHAPTER II**

**REVIEW OF RELATED LITERATURE AND STUDIES**

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

**Emergency Preparedness and Disaster Response**

According to Bachmann, et al. (2015), the usage of cell phone applications has been on the upswing, gaining popularity among not only emergency responders and healthcare providers but also the general public. The market boasts an extensive array of medical applications designed for smartphones and tablet PCs, with new additions constantly emerging. These applications serve diverse purposes, from granting access to textbooks and guidelines to providing drug databases, medical calculators, and radiology images. However, the proliferation of disaster-related apps has created a challenge, making it increasingly challenging for both laypersons and responders to discern which applications are genuinely effective for their specific needs. In response to this issue, the researchers conducted a comprehensive systematic review of these applications.

To execute this review, an exhaustive search was performed within the Apple iTunes store, utilizing search terms derived from the PubMed Clinical Subject Headings Database. These search terms encompassed critical phrases such as "Crisis Readiness," "Crisis Responders," "Catastrophe," "Disaster Planning," "Disaster Medicine," "Bioterrorism," "Chemical Terrorism," "Hazardous Materials," and "Federal Emergency Management Agency (FEMA)." Following a meticulous screening process that eliminated irrelevant applications, a refined list of applications was curated and subsequently categorized based on their relevance to various user groups, including responders, the general public, or regional preparedness. These applications were then subject to a thorough evaluation, with rankings based on criteria such as user reviews on iTunes, overall value, relevance to the intended audience, and user interface.

The results of this comprehensive search initially unveiled a staggering 683 applications, which were subsequently whittled down to 219 based on their relevance to the field of interest. Following this categorization and ranking process, the most outstanding applications in each category emerged. Notable discoveries included the identification of:

* The Community Emergency Response Teams and FEMA as sources offering the most commendable applications tailored for Public Catastrophe Medical System responders.
* The Centers for Disease Control and Prevention (CDC) as a prime provider of high-quality applications addressing the needs of crisis responders across various fields.
* The National Library of Medicine's Remote Information System for Crisis Responders, known as Wiser, as an invaluable resource for hazardous materials responders.
* The American Red Cross as the primary source for the most valuable applications aimed at addressing the challenges posed by natural disasters.

**Designing Mobile Applications for Emergency Response: Citizens Acting as Human Sensors**

In the context of emergency response, the role of civilians as valuable contributors to emergency centers cannot be understated. When a crisis unfolds, civilians often serve as essential witnesses, providing real-time, comprehensive information about the situation. Advancements in technology have empowered individuals to swiftly and effortlessly collect rich data and transmit it through various communication channels. Modern mobile devices, equipped with a range of sensors such as GPS receivers, Wi-Fi, accelerometers, and cameras, effectively transform users into well-equipped human sensors. This has sparked growing interest among emergency response groups and small to medium-sized businesses in developing intelligent applications for reporting unusual events. In this research, a practical exploration of such applications is conducted, with the aim of uncovering constraints and common characteristics.

The primary objective of this paper is to present a compilation of insights into the development of effective and efficient mobile emergency notification applications. These insights are gleaned from a thorough review of significant contributions in this field, combined with the authors' firsthand experience in designing and assessing emergency management solutions. The research capitalizes on the inherent capabilities of contemporary mobile devices and users' proficiency in utilizing these features. The evaluation process is bifurcated into two key components: the practical aspect and the theoretical aspect.

In the practical segment, a meticulous simulation of a traffic collision scenario is conducted, striving for utmost accuracy. This scenario involves a victim positioned on the ground near a car in the center of a roadway. In the theoretical portion of the study, input is solicited from various emergency professionals to gauge the usability of the proposed solution. The outcomes of this evaluation phase affirm the positive impact of Emergency Notification (EN) applications on both emergency operators and citizens alike. Additionally, the developers of the application accumulate a wealth of findings, which are subsequently integrated into the final redesign of the proposed application. These findings serve as valuable insights that can inform and guide future design endeavors within the same domain (Roman et al., 2016).

**Location-Based Application for Emergency Situation**

According to Budi, et al. (2018), after someone has satisfied their physiological needs, they will strive to satisfy the next level of human needs, which are safety needs. Personal safety, the safety of their family members, or the safety of their belongings are examples of safety needs. There are various essential safety demands that they must meet in their everyday lives, such as protection from criminal threats and natural calamities. According to the most recent data, the number of criminalities increased from 2014 to 2016. According to statistics from the Central Bureau of Statistics, the number of events in 2016 was 357.197, up 1.2% over the previous year. Furthermore, the time interval between criminal acts has decreased from 1 minute 29 seconds the previous year to 1 minute 28 seconds. Similarly, the National Disaster Management Agency reported 2175 disasters in Indonesia from the beginning of the year through December 2017. These instances are said to have escalated from year to year. The occurrences resulted in 335 deaths, 969 injuries, and 3.22 million people suffering and being displaced. Meanwhile, it was reported that 31,746 homes were damaged, 347,813 homes got flooded, and thousands of health, education, and worship facilities were damaged. This implies that events like as crimes and natural disasters may endanger an individual's safety and cause them to become casualties.

Through its localization, personalization, and proximity features, a location-based application has the potential to significantly improve people's safety in everyday life. Examining user intent to use such an application remains intriguing, particularly in a developing nation like Indonesia, where the technology is still in its early stages of development. In a broader sense, it is still unclear if users want to utilize these sorts of applications owing to factors such as privacy concerns, trust, and fear of crime (Budi, et al. 2018).

Several previous studies on the phenomenon of LBS application adoption used the theory of acceptance model technology (TAM) to determine the factors influencing user intention to use the National Emergency Warning System (NEWS). NEWS is an Australian government-developed location-based mobile application that provides individuals with government information for emergencies studied location-based mobile applications given by insurance companies. The study sought to assess the impact of the user's faith in the insurance business that delivers the service via the application (Budi, et al. 2018).

The present research explores the elements that impact the user's intention to utilize a location-based application/service for emergency management in Indonesia, based on the theoretical gap and suggestions offered by prior studies. To achieve an in-depth analysis of LBS application acceptance in Indonesia, the Unified Theory of Acceptance and Use of Technology (UTAUT) is coupled with numerous theories such as the concern for information privacy (CFIP) framework, trust theory, and fear of crime theory. Individual behavior is the unit of analysis in this study. The empirical findings of this study are intended to supplement previous research on this issue, notably by providing broader perspectives on the adoption phenomena in a developing nation (Budi, et al. 2018).

**Accident Detection and Smart Rescue System using Android Smartphone with Real-time Location Tracking**

According to Khan, et. al (2018)**,** traffic accidents kill a lot of people all around the world. The high number of deaths and injuries caused by road traffic accidents demonstrates the global problem of road safety. In many cases, family members or emergency services are not notified in a timely manner. This causes a delay in emergency service response time, which might result in a person's death or serious harm. The goal of this project is to shorten the response time of emergency services in circumstances such as traffic accidents or other crises such as fire, theft/robbery, and medical problems. Using a smartphone's onboard sensors to detect vehicular accidents and report them to the nearest available emergency responder, as well as providing real-time location tracking for responders and emergency victims, will drastically increase the chances of survival for emergency victims while also saving emergency services time and resources.

**Global Positioning system (GPS)**

Out-of-hospital cardiac arrest (OHCA) is a leading cause of sudden death in industrialized countries.In Denmark, public initiatives have increased awareness and early action during cardiac arrest, which may have contributed to the substantial increase in bystander cardiopulmonary resuscitation (CPR).2, 3 Also, the number of onsite available automated external defibrillators (AEDs) has grown and a national volunteer-based AED-network has been created to increase AED usage.2, 4 Still, survival remains low at about 10% after OHCA.2, 5, 6 In previous studies, bystander defibrillation before the arrival of the emergency medical service (EMS) has shown to increase survival up to 74%,7, 8, 9 but these studies were performed in selected high-risk public areas, making it difficult to extrapolate to real-life settings. . Further, about three-quarters of OHCAs occur in residential areas,6, 10 where CPR performance, defibrillation and survival are markedly lower compared with OHCAs in public areas.11 Recently, studies have examined the use of GPS or text-message based systems to alert volunteer first responders (VFRs)12, 13, 14 during suspected cardiac arrest. These studies, however, did not measure the number of on-site VFRs, response-times, nor did they demonstrate prognostic effects of the systems used. In 2012, on the island of Langeland, Denmark, a smartphone application was developed, which used global positioning system (GPS) to locate and dispatch VFRs to emergency sites along with standard EMS response. In each emergency call the selected VFRs were given one of three different tasks. Since 2012 a GPS-tracking system has been used on a rural island to activate VFRs during all emergency calls requesting an EMS. When activated, three VFRs were recruited and given distinct roles, including collection of the nearest automatic external defibrillator (AED). We retrospectively investigated EMS response data from April 2012 to December 2017. These were matched with VFR response times from the GPS-tracking system. The 30-day survival in OHCA patients was also assessed (Sarkisian, et al. 2019)

**Fire Emergency Response**

In accordance with the study conducted by Umar et al. (2020), fire possesses both destructive and constructive aspects. In the absence of proactive measures to prevent fire incidents, the repercussions can be severe when such incidents inevitably transpire. Consequently, there arises a pressing need for a prompt and efficient mechanism to report fire occurrences. With the increasing prevalence of cellphones in society, the public is now equipped with the capability to promptly report fire incidents, thereby ensuring swift response and effective incident management.

This study involves an assessment of the manual procedure employed for reporting fire outbreaks. Subsequently, it endeavors to introduce an automated solution called FEAP—a mobile application designed to enable the public to instantly alert nearby fire emergency units about potential fire incidents. The development of FEAP adheres to the Software Development Life Cycle (SDLC) stages and utilizes the Unified Modeling Language (UML) to illustrate the application's design perspective. For the purpose of database design, an Entity Relationship Diagram (ERD) is employed, and a rudimentary Graphical User Interface (GUI) prototype of the proposed application is crafted. The work presented herein serves as a tangible demonstration of the practical application of analytical and design methodologies in the realm of software development. By offering an effective means for reporting fire outbreaks, this software solution underscores its utility and significance in addressing a critical societal concern.

As stated by Nass et al.(2018), Rhineland-Palatinate, a German state, hosts an annual large-scale festival in the region that draws in excess of 200,000 attendees over a span of three days. During this event, attendees have the opportunity to sample local cuisine, purchase artisanal products, and enjoy performances by nationally renowned musicians. Now, consider a situation where a market stall situated at the heart of the festival grounds suddenly catches fire. In such an emergency, some festivalgoers in close proximity to the booth may resort to dialing the emergency number, as they might not readily locate members of the event's safety department. However, their ability to articulate the precise location of the incident may be hindered due to their unfamiliarity with the event site. Additionally, describing their surroundings accurately may pose a challenge. On the receiving end of these emergency calls, the command center personnel will strive to guide the callers through a series of questions to extract crucial information while simultaneously alerting security personnel and firefighters stationed at the festival venue. During this initial phase, the exact location of the incident remains unknown, and the provided scenario description may be somewhat vague. Within a matter of minutes, the volume of calls to the emergency number is expected to surge significantly. Meanwhile, the on-site firefighters will endeavor to reach the precise location of the incident and commence firefighting operations. However, due to the potential rapid spread of the fire, by the time they arrive, they may need to request additional firefighting personnel through the command center. The limitations of brief and intermittent radio communication further exacerbate the command center's lack of critical information regarding the emergency situation.

Against the backdrop of this theoretical gap and in light of insights drawn from prior research, the present study delves into the factors that influence an individual's inclination to utilize a location-based application or service for emergency management in Indonesia. To accomplish this objective, the study combines the Unified Theory of Acceptance and Use of Technology (UTAUT) with various established theories, including the Concern for Information Privacy (CFIP) framework, trust theory, and the fear of crime theory. This comprehensive approach aims to provide a nuanced examination of the acceptability of Location-Based Service (LBS) applications in the context of Indonesia's emergency management. In this investigation, the focal unit of analysis centers on individual behavior. The study's empirical findings are intended to enrich previous research in this domain, particularly by offering a broader perspective on the adoption dynamics within a developing country.

**Crime Mapping Report Mobile Application**

In recent years, the incidence of criminal activity in the Metro Manila area has exhibited a troubling upward trend. This situation presents an ongoing challenge for the Philippine National Police (PNP), primarily due to the prevalence of unreported crimes. Startlingly, reports from PNP NCPRO officials suggest that as much as 60% of criminal incidents remain undisclosed, compounding the already precarious state of peace and order in the country. With the ever-advancing technological landscape of the modern era, there arises an opportunity to address this issue more effectively. The rise of smartphones, equipped with various capabilities and functionalities, has opened up avenues for real-time reporting of criminal incidents. However, despite these technological advances, the implementation of Geographic Information System (GIS) through mobile applications remains relatively uncommon. Hence, the primary objective of this research paper is to develop a cutting-edge Android mobile application based on GIS technology. This application will empower individuals, particularly students, with the ability to promptly report crimes while providing crucial location-based information. It will serve as a vital tool to facilitate quick response and informed decision-making by both law enforcement agencies and the general public. The potential benefits of this project extend to various stakeholders within the Metro Manila community. Local law enforcement agencies stand to gain a valuable resource that enables them to enhance their crime-fighting capabilities and allocate resources more effectively. Simultaneously, residents and citizens will benefit from increased awareness and the ability to contribute to community safety by reporting crimes in real time. Notably, this initiative also seeks to protect a particularly vulnerable demographic group, namely students attending educational institutions in the "Ubelt" (University Belt) area. Historically, students in this region have often fallen victim to criminal activities. By empowering them with a user-friendly GIS-based mobile application, this project aims to create a safer environment for these students and enhance their overall security (Joan Ann W. Maghanoy, 2017).

**Emergency Assistance in Remote Regions**

According to Tobias et al (2017)**,** in substantial portions of our society, the demographic landscape of rural areas is experiencing a continuous transformation. This transformation is characterized by the movement of individuals either relocating to or gravitating toward larger urban centers, resulting in rural areas that are becoming increasingly sparsely populated. In these evolving rural regions, maintaining the same level of security and safety for the local population as observed in urban areas becomes a challenging proposition when relying on traditional resources such as fire and rescue services, police, and emergency medical services. Additionally, the evolving demographics in these areas give rise to distinctive needs within the local population, further complicating the requirements placed on emergency response organizations, as well as the associated information systems and other technological solutions

It is noteworthy that more than half of Sweden's vast geographic expanse can be classified as rural. This classification is based on criteria of low population density and the geographical remoteness of these areas, with travel times exceeding 45 minutes by car to reach a town with more than 3000 inhabitants. Acknowledging the unique challenges presented by these rural areas, the Swedish government has recognized the necessity of rethinking and adapting emergency response protocols to ensure a proper and effective response to crises in such regions. To address these challenges, the Swedish Ministry has entrusted the Swedish Civil Contingencies Agency (MSB) with the crucial task of devising trial activities in three specific counties. The primary focus of these initiatives lies in fostering innovative forms of collaboration among existing emergency response organizations. Furthermore, these efforts seek to incorporate new actors into the emergency response system, bringing fresh perspectives and resources to the table. As these new modes of collaboration emerge, they are expected to give rise to entirely new sets of questions and considerations related to responsibility, rights, and duties within the realm of emergency management. This transformational shift in approach represents an essential step in adapting to the evolving demographic landscape of rural areas, where traditional emergency response methods may no longer suffice to ensure the safety and security of the local population.

**The Coast Guard enhances its mobile connectivity infrastructure**

According to a report by Barnett, M. in 2020, the United States Coast Guard has implemented a cutting-edge approach to assist distressed mariners who find themselves in perilous situations up to 20 nautical miles offshore. This innovative strategy relies on the utilization of phone-tracking services facilitated through a specialized mobile application designed to mimic the functionality of a 911 emergency service. This transformative development, referred to as the "i911" app, has already made its mark in the Pacific Northwest and is poised for wider implementation across various Coast Guard districts throughout the country.

The concept behind this mobile application is rather ingenious. By harnessing the power of phone-tracking technology, the Coast Guard can swiftly and accurately locate vessels in distress, ultimately leading to more efficient and effective rescue operations. However, it's important to note that the use of this technology is strictly contingent upon the consent of the individuals involved, ensuring privacy and ethical considerations are upheld. One of the standout features of the "i911" app is its user-friendliness. Distressed mariners are not required to download any additional software or invest significant time and effort in configuring their devices. Instead, they simply need to respond to a text message sent by rescuers, which contains a link. By clicking on this link and subsequently granting permission to share their location data, mariners can enable the Coast Guard to initiate a rapid and precise rescue response. While the Coast Guard has lauded this software as "groundbreaking" in a press release, it's important to highlight that this technology is not entirely novel. Comparable tracking technology is already employed by law enforcement agencies and accessible to consumers through various applications and services. Nevertheless, the adoption of this technology by the Coast Guard represents a significant leap forward in modernizing an agency that has been grappling with the challenges posed by aging information technology systems.

In fact, Admiral Karl Schultz, the highest-ranking officer in the Coast Guard, has openly acknowledged the precarious state of the agency's legacy IT systems, describing them as being on the "brink of catastrophic failure." Against this backdrop, the integration of the 911 emergency application, which allows Coast Guard fleets to access phone location data via a user-friendly web-based interface, signifies a pivotal shift toward a more technologically advanced and capable organization.

**Android Mobile Application: Tsunami Alert System**

According to the research conducted by Traya et al. in the year 2022, an Android-based Tsunami alarm system was developed with the specific intent of serving the Abuyog community. It is imperative that this system be installed by its intended users. Once registered, individuals within the system's purview receive push notifications and real-time tsunami alarm messages. Additionally, the system offers invaluable guidance by providing recommendations on a map, delineating secure higher ground locations to seek refuge from potential tsunami threats. Municipal Disaster Risk Reduction and Management Office (MDRRMO) in Abuyog had invested substantial efforts in issuing preemptive warnings and preparations to the local residents in anticipation of an imminent tsunami. Their commitment encompassed a comprehensive spectrum of measures, both proactive in nature, initiated before any crisis, and responsive actions to be taken during emergency situations. The overarching aim of this research undertaking was two-fold: firstly, to devise an enhanced and more operationally efficient system explicitly tailored to cater to the specific needs of the Abuyog populace, and secondly, to extend support to the Municipal Disaster Risk Reduction and Management Office of Abuyog in optimizing their disaster preparedness planning.

Furthermore, it is worth highlighting that this project conferred substantial benefits upon the residents of Abuyog, streamlining the efficient dissemination of critical information to all users who had duly registered with the system. The research methodology adopted in this study was characterized by an iterative approach, focused squarely on the preferences and requirements of the end-users. The system underwent multiple rounds of comprehensive evaluation and systematic refinements until it achieved alignment with the satisfaction parameters set forth by the clients. This assessment process engaged fifty (50) end users, whose collective appraisal resulted in a notably impressive average rating of 4.89 out of 5, signifying the highest attainable level of evaluation for assessing system performance and quality. This overwhelmingly positive feedback underscores the profound regard in which this system is held, as well as its substantial promise in the realm of catastrophe risk reduction. Ultimately, this technological innovation contributes significantly to the safety and well-being of the Abuyog community.

**Utilization of Emergency Application at the Local Level**

The Philippines is a nation blessed with stunning natural beauty, yet it is also a country frequently beleaguered by a diverse range of natural and man-made disasters. Despite its picturesque landscapes and vibrant culture, the Philippines is no stranger to the devastating impacts of calamities. While the government has made strides in establishing comprehensive plans for disaster mitigation and prevention, there often appears to be a gap in addressing the immediate needs of affected individuals when disaster inevitably strikes.

Beyond its emergency assistance functions, this application also harnesses the power of digital connectivity to foster a sense of community and collective responsibility in disaster management. One notable feature is the ability for users to notify others of impending dangers through channels like AppLERT and Facebook. This proactive approach to information sharing through crowd-sourcing serves a dual purpose. Firstly, it enables individuals to access real-time updates on evolving disaster situations, allowing them to make informed decisions to protect their safety. Secondly, it facilitates a collaborative effort among citizens to disseminate critical information and warn fellow community members, enhancing overall disaster resilience.

One of the standout aspects of this technological solution is its utilization of the mobile phone's built-in GPS functionality. By tapping into this feature, the application not only enables users to share their precise location with responders but also expedites the response time of the units dispatched for assistance. This integration of ICT and geospatial technology significantly enhances the efficiency and effectiveness of disaster response efforts. This initiative aligns with a broader global trend that recognizes the transformative potential of ICT in disaster management. By putting technology directly into the hands of the affected population, it empowers individuals to play a more active role in their own safety and resilience. It leverages the ubiquity of smartphones and the internet to create a network of information sharing and real-time communication that is invaluable in times of crisis (Fabito et al., 2016).

**Utilization of an Emergency Application on an International Scale**

In accordance with the research conducted by Hossian et al. (2018), the authors present a comprehensive examination encompassing the conceptualization, implementation, and evaluation of the Bangladesh Emergency Services (BES) mobile application. This application serves as a pivotal component in providing emergency services analogous to the 911 emergency hotline, specifically tailored to the context of Bangladesh. The collaborative partnership with A2I, a government agency, played a pivotal role in facilitating the nationwide rollout and deployment of the BES application. Up to the present time, a substantial cohort comprising 120,382 distinct users have undertaken the installation of the BES application, with 27,117 actively engaging with its functionalities for various purposes.

An exhaustive scrutiny of user feedback and performance assessment data was undertaken, drawing insights from diverse sources. These encompassed user ratings, reflecting a sizable sample of N=3,788, and detailed reviews, which amounted to N=1,231 entries, sourced from the Google Play Store. Furthermore, the study incorporated input from an online survey that garnered responses from N=137 participants and conducted face-to-face interviews involving N=10 participants. Collectively, the comprehensive analysis of these multifaceted data sources unequivocally confirmed the efficacy and functionality of the BES application as perceived by its users. At present, the BES application plays a pivotal role in the reporting and management of a spectrum of critical incidents, including aggressive behavior, street altercations, harassment complaints, fire-related emergencies, and the facilitation of locating nearby medical facilities for urgent medical situations.

The findings of this scholarly investigation cast illumination upon a series of pivotal factors that have a bearing on the triumphant implementation of mobile-based emergency services. Notably, the research underscores the paramount importance of establishing and fostering trust among users, alongside the inherent necessity of ensuring the scalability of the service to cater to a growing user base. Additionally, the research underscores the indispensability of an iterative and participatory design approach, ensuring that the application remains adaptable and efficacious in catering to the dynamic and evolving needs of its users. The implications of this scholarly endeavor are not confined to the borders of Bangladesh; rather, they offer substantive insights and serve as a source of inspiration for the development and deployment of mobile-based emergency applications in other developing nations where the establishment of 911-like emergency services may be nonexistent or underdeveloped. This study, through the dissemination of its experiences and outcomes, aspires to catalyze and inform the creation of analogous lifesaving solutions in regions where such services are critically needed.

**ISO 25010**

The study entitled “Development of Mobile Application for Incident Reporting” is an application aimed at reporting and responding to possible criminal incidents in the Filipino community. This includes his two main applications such as Crime Reporting, Crime Responder and Websites. A crime reporting application used by victims or witnesses to submit incident reports with photos. Photos will be forwarded to the nearest barangay or police station. A crime response application used by barangays or police officers for immediate response to notifications and specific reports. Accident Demographics website. The application is running on an Android smartphone with version 4.4 to 6.0 and connected to the internet. 30 participants including 10 end users, 5 police officers, 5 barangay officials, 7 IT teachers and 3 Android programmers were evaluated using the ISO 25010 model as an evaluation tool (Ignaco, M. 2019).

**CHAPTER III**

**METHODOLOGY**

This chapter presents the project design, project development model, operational and testing procedures, and the evaluation procedure of the study.

**Project Design**

Figure 2 below shows the structure of the mobile-based application. It shows the function of each button that the application has and how it will work to accomplish the task.

The first step is by registration of the user. Upon successful registration and admin validation, the user may now log in to his/her account. The main menu will display the logo of Municipal Disaster Risk Reduction and Management (MDRRMO and the Bureau of Fire Protection (BFP). Moreover, the “Side Panel” button will reveal several menus like “History”, “Settings”, “About”, and “Logout”.

The main function of the mobile-based application is to create a system that will help the community in terms of emergency situations by simply tapping the logos of Disaster Risk Reduction and Management (MDRRMO) and the Bureau of Fire Protection (BFP). The user will also be able to specify the number of victims and the situations before sending the report to the respective department.

On the other side is an admin account that has control of all the information. An admin account is responsible for receiving reports from the user and taking a quick action about the situation. The admin can monitor all the logs of the system and have the database of the system.

Figure 2 The Structure of An Android-Based GPS Tracking System

**Project Development**

Figure 2 below shows the structure of the mobile-based application. It shows the function of each button that the application has and how it will work to accomplish the task.

The first step is by registration of the user. Upon successful registration and admin validation, the user may now log in to his/her account. The main menu will display the logo of Municipal Disaster Risk Reduction and Management (MDRRMO and the Bureau of Fire Protection (BFP), along with the “Home”, “History”, “My Account”, “Notification”, and “Emergency Call” buttons.

The main function of the mobile-based application is to create a system that will help the community in terms of emergency situations by simply tapping the logos of Disaster Risk Reduction and Management (MDRRMO) and the Bureau of Fire Protection (BFP). The user will also be asked to specify the location, number of victims, type or classification of the accident, and attachment of the situations before sending the report to the respective department.

On the other side is an admin account has control of all the information. An admin account is responsible for receiving reports from the user and taking a quick action about the situation. The admin can monitor all the logs of the system and have the database of the system.

**Develop.** Based on the design phase, the coding will be done in this stage. In this process, the proponents will start giving functionalities to the system by applying source code for it to be useful to users and concerned offices.

**Testing.** In this stage, the built system must undergo different trials by running on different resolutions, different platforms and more testing for the developers to know what improvements are to be made.

**Deployment.** In this stage, the system will now be in trial for the proponents to know the side of the user. The proponents will select specific users to experience the use of the system.

**Review.** After the deployment of the system, there will be reviews from the selected users. These reviews will be considered by the proponents to redesign and redevelop the system.

**Launch.** After a series of testing, deployment and the proponent have considered all the reviews of the users and now updated, the system is now ready to use by the desired users.

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Figure 3. The System Development Life Cycle*.*

**Operational and Testing Procedures**

The following are the operational and testing procedures of the study.

**Operational procedures:**

**User’s Account**

1. Launch the iAlertU Application. The user will be asked to enter their mobile number to “Login” in the application.

2. Tap “Register” to register as a new user. The user will be asked to fill out the forms that contain personal information like name, gender, age, birthday, complete address, and mobile number. Tap the “Send Code” button to verify the mobile number that was inserted by the user.

3. After successful login in the application, the user will proceed to the main menu which is “Home” section. The user can simply tap the “MDRRMO Logo” and “BFP Logo” to send a report depending on their needs. After tapping “MDRRMO” logo the user will be asking to specify the type of accidents, number of victims, location and attachment photo of the incident.

4. In the upper right side there is a “Notification Icon” that will serve as an inbox. Also, there is a “Call Icon” that can be use as an alternative option when the user doesn’t have internet connection but have prepaid load.

5. When the user taps the logo of “BFP” the user will be ask to specify the location, type of establishment and the color of smoke.

6. Tap “History” button to see recent reports that the user has made; Tap “View Report” to see the additional information about it. Use the “Search Button” to find information quickly.

7. Tap the “My Account” button to see the other option of the application like, “Edit Basic Information” “About” and “Developer”.

8. Tap the “Edit Basic Information” button to edit basic information.

9. Tap “About” button to know some information about the Municipal Disaster Risk Reduction and Management Office (MDRRMO).

10. Tap “Developers” button to know show the list of developers.

11. Tap the “Logout” to exit the application.

**Admin’s Account (MDRRMO)**

1. Launch the iAlertU Application. The admin will be asked to enter their username and password to “Login” in the application. The admin will be able to retrieve their account if they forgot password by clicking the “Forgot Password”.

2. After logging in, the “Dashboard” will be displayed containing the summary of the total reports, total population, Male and Female. Click the “Notification” icon to see newer reports. On the side panel, there will be menus like “Records”, “Archive”, “Settings”, “About”, and “Logout”.

3. When they received a report, the location will be displayed containing the map with the red ping of the location, name of reporter, type of accidents and the attachment photo of the incidents.

4. Click the “Receive” button to notify the user that they already received the report.

5. Click the “Records” to view the reports that the user has sent through the application, then click the “Show” icon to show information about the report. Click the “Archive Selected” button to archive the report, and the “Confirm” and “Cancel” buttons for confirmations of the action.

6. Click the “Archive” to view the archived reports or data. Click the “Restore” button to restore the data.

7. Click the “Settings” to edit an admin’s account. Click “Update” button to save the changes. The admin can add user or staff by clicking “Add User Button”.

8. Click “About” to know some information about the application and the developers.

9. Click the “Logout” to be logged out in the application.

**Admin’s Account (BFP)**

1. Launch the iAlertU Application. The admin will be asked to enter their username and password to “Login” in the application. The admin will be able to retrieve their account if they forgot password by clicking the “Forgot Password”.

2. After logging in, the “Dashboard” will be displayed containing the summary of the total reports, total population, Male and Female. Click the “Notification” icon to see newer reports. On the side panel, there will be menus like “Records”, “Archive”, “Settings”, “About”, and “Logout”.

3. When they received a report, the location will be displayed containing the map with the red ping of the location, name of reporter, closest landmark, type of establishment and the attachment photo of the incidents.

4. Click the “Receive” button to notify the user that they already received the report.

5. Click the “Records” to view the reports that the user has sent through the application, then click the “Show” icon to show information about the report. Click the “Archive Selected” button to archive the report, and the “Confirm” and “Cancel” buttons for confirmations of the action.

6. Click the “Archive” to view the archived reports or data. Click the “Restore” button to restore the data.

7. Click the “Settings” to edit an admin’s account. Click “Update” button to save the changes. The admin can add user or staff by clicking “Add User Button”.

8. Click “About” to know some information about the application and the developers.

9. Click the “Logout” to be logged out in the application.

**Testing procedures:**

1. Functionality testing to test whether the application performs as expected and in accordance

with the requirements specifications.

2. Compatibility testing to mobile devices, screen sizes, different mobile phone units, and Android OS version 5 and above.

3. Usability testing to ensure fast and easy-to-use for the users.

4. UI testing to ensure that the GUI meets the required specification.

5. Security testing to analyze risks, potential threats from viruses and unauthorized access to sensitive data.

6. Recovery testing to test the ability of the application to restore lost data from potential failure of software issues and hardware failures.

**Evaluation Procedures:**

The following steps will be used to evaluate the iAlertU application.

1. Preliminary Evaluation

a. Preliminary evaluation of the researcher on the expected output will be conducted.

2. Project Demonstration

a. The proponents will randomly select thirty-five (35) respondents from Occidental Mindoro State College and from different departments, ten(10) random students, five(5) random staff from MDRRMO, five(5) random staff from BFP, five(5) random staff from PDRRMO, five(5) random staff from PCG and five(5) random staff from PNP will be invited to evaluate the system using Google form as an evaluation tool.

b. The proponents will present the mobile-based application.

c. The researchers will ask the invited respondents to operate the application and observe the performance.

3. Final Evaluation

a. The evaluation instruments will be distributed among 25 respondents.

b. The researchers will ask the respondents to rate the system based on the criteria of the evaluation.　instrument and ask them to provide their comments, suggestions and recommendations using the five-point Likert scale presented in Table 1.

4. Statistical Treatment

a. The researchers will collect the graded evaluation instruments from the respondents.

b. The researchers will tabulate, calculate, and interpret the results from the graded evaluation instruments.

Table 1. Likert scale, descriptive rating, and range distribution.

|  |  |  |
| --- | --- | --- |
| **Scale** | **Descriptive Rating** | **Range Distribution** |
| 5 | Excellent | 4.51-5.00 |
| 4 | Very Good | 3.51-4.00 |
| 3 | Good | 2.51-3.00 |
| 2 | Fair | 1.51-2.00 |
| 1 | Poor | 0.50-1.00 |