DEVELOPMENT OF A MOBILE APPLICATION FOR EMERGENCY ALERT AND RESPONSE

A Thesis Presented to the Faculty

of the College of Science

Technological University of the Philippines

Ayala Blvd., Manila

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In Partial Fulfillment of the

Requirements for the Degree

Bachelor of Science in Information System

June 2024

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		Revision No.	00
	THESIS APPROVAL SHEET FOR THE UNDERGRADUATE PROGRAMS OF THE COS	Date	07012022
		Page	1 / 1

This thesis hereto entitled:

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ACKNOWLEDGEMENT

The researchers would like to express their deep and sincere gratitude to their research adviser, Dr. Francis A. Alfaro, Thesis Adviser, Professor Julius A. Sareno and to the Panelists, Professor Francis L. Dela Cruz, Professor Ariel L. Tomagan, Dr. Wellanie M. Molino, Professor May M. Garcia, Professor Fernando L. Renegado, and Professor Jan Eilbert L. Lee for providing us invaluable supervision and support during the course of our research study. We thank them for their patience and knowledge that they imparted unto us. It was a great privilege and honor to work and study under their guidance.

To their dearest parents for their love and undying support throughout the making of our research study as well as for their words of encouragement for making of our research study.

Above all, the researchers would like to give thanks to the Almighty God for the strength, guidance, knowledge, and wisdom.

ABSTRACT

This study aimed to develop an application for Emergency Alert Response System named RE-PORT. The research developed an automatic geolocation tracking emergency application with a click of a button. The methodology used is comprehensive analysis of related emergency platforms, together with surveys and interviews including but not limited to the police, firefighters, medical personnel and various LGO units. By following set criteria and standards of the ISO 25010, the researchers focused to meet needs and requirements for the system's success and potential advance developments. The result of the research expects to contribute to the future endeavor of research involving emergency alert response platforms. The developers constructed a user-friendly interface, ensuring the ease of use for the general public when widely deployed. Lastly, the ultimate goal of this research is to help lay the foundation in creating better emergency alert response application that transcends the primitive way of seeking help in times of dire needs and contingencies.

Keywords: Emergency, Response, Alert, geolocation, tracking, responders, help, assistance

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Chapter 1

THE PROBLEM AND ITS SETTING

Introduction

In the current fast-paced world where all people reside in, rapid breakthroughs on technology and decline in mass public awareness are in sync. This is due to the benefits bound by the innovations made by research and development. From the basic tools used to do everyday chores and tasks, to the infrastructure that produces the same results but better in quantity and sometimes quality, one can never say that advancements are irrelevant and useless. However, though people are presented with the comfort of thoughts of making things simpler and easier, this results in the neglect of certain processes' roots and origin.

From the early days before higher technology was made available, people did things step by step and sometimes with confusion. Instructions on cooking, repair, cleaning, as well as the ones from the workplaces such as offices where most tasks are done with computers, in workshops where majority of the tasks are done with tools and machinery and even simple stitching which was originally done by hand. Each thread on each hole poked through the fabric. This ran down from the easiest and simplest job to the most complex and daunting task. Not only that technology made people figure things out quickly and with precision, but it also led to further breakthroughs that made it possible to do things that were not imaginably possible before.

With this thought in mind, a team of researchers and developers came up with an idea to help with one of the crucial issues that goes around whenever a certain event occurs involving

urgency of assistance or respondents. This involves accidents, disasters or even as simple as calling an ambulance for a possible or current patient. Response on Emergency Portal or simply ―RE: PORT‖ is an application that offers substitution on an emergency alert system as opposed to dialing particular and individual numbers to report an incident. However progressive the program aspires to be, this, by no means intend to make dialing obsolete but rather, improve on the accuracy and responsiveness of report by taking advantage of the level of clarity of the information provided by the user towards the end-users.

Background of the Study

Emergency situations, such as natural disasters, accidents and medical emergencies reserve the right to be accommodated on the severity of its scenario. However vague the occurrence may be, it should be checked and noted upon report. The mere absence of reports alone poses a huge risk to public safety and impacts on the reliability of security and control within a specific region or nation. Traditional methods of circulating emergency alerts rely on sirens, radio, broadcasts, and phone notifications. Each containing limitations to the capabilities of retaining order while making or during the report of the incident. The advancement in mobile technologies helped in the creation of an informative bubble that easily disseminates data within a large margin of area. From local news, market status to the incident reports happening on and off the line. It made it possible for the adaptation of how handheld devices are used to revolutionize the way emergencies are called in, sent and received. The Philippines has a long history or numerous incidents ranging from lethal events to the most catastrophic events recorded.

Many cases are often overlooked for reasons of being unsolvable or simply not being given notice to the proper authorities. One major problem on the way reports is made is because of the

lack of timely incident reporting, which leads to a case being lately discovered causing response to fall behind. Witnesses take quite some time to alert the proper authorities due to several reasons, both personally and within the environment.

A common reason for long hold-ups in the report is the queue line and the automated messages in between holds to transfer you to the right department. A cardiac arrest can turn fatal for the person within eight minutes, and that would not even be enough for the queue line and automated message to finish, add up the response of the hospital and travel time of the ambulance back and forth.

One other major problem is that different regions in the Philippines do not have a uniform emergency hotline or contact. This removes the privilege of people living far in rural areas away from urban services to ask for help from local emergency centers. Luzon, Visayas and Mindanao cater to different cellular levels which already limits the probability of normal SMS and dial-ups reception to send an SOS. Aside from the lack of uniform hotlines, lack of central office for certain hotlines are also a factor for poor incident reporting.

Last on the list of problems this project aims to help with is the ease of making reports through the application. The majority of the population are hugely unaware of emergency hotlines created for particular incidents, especially younger generations that are uneducated of the emergency hotlines simply because it does not align with their interests. An incident happens and people usually know who to call but do not know how to reach out to that authority.

Objectives of the Study

The general objective of the study is to develop a mobile application for emergency alert and response that enhance the process of reporting emergencies, enabling quick and efficient response from responders to ensure timely assistance and better public safety.

Specifically, it aims to:

1. Design a mobile application emergency alert and response with the following features:
    a. User registration with personal details and log in securely.
    b. Encryption of user data to ensure privacy and security.
    c. One-tap button to send an emergency report.
    d. Attach photos for better situational awareness.
    e. GPS tracking to determine the user's location during an emergency.
    f. Integrated with emergency services police, fire department, medical services.
2. Develop the system that applies progressive mobile application with the following tools:
    a. PHP
    b. Xampp
    c. MySQL
    d. JavaScript
    e. Jquery
    f. Ajax
    g. HTML
    h. CSS
    i. Visual Studio Code
3. Test and improve the system in terms of accessibility, aesthetic, and engagement.
4. Evaluate the level of acceptability of the developed system based on the standards of ISO 25010.

Scope and Limitations of the Study

This study focused on the Emergency Alert that aims to gather different types of emergency responders which include but not limited to Police Departments, Fire Departments, Medical Department, Disaster Management, Local Government Units within Quiapo, Manila. It aimed to determine different Emergency Alerts when there is an incident, natural disaster, fire and any type of emergencies in Quiapo, Manila. The study is limited to Quiapo, Manila that is composed of different Emergency fields.

The system is specified to cover different kinds of emergency situations depending on the event occurring. It is equipped with an interface with a simple set of buttons made for the creation of the said reporting. The system follows a one-button policy to ensure that a report will be made faster than the traditional phone call report. The system will also be equipped with an autonomous geolocation tracking system for both the civilian users and admin users. At the moment, the system will only be tested in the entirely of Quiapo District for easier monitoring and maintenance during the initial stages of the deployment. This also allows the researchers to focus on the features bound by the program since the scope of the system's deployment would be smaller, allowing for limited data to be organized easier.

Significance of the Study

The study's significance can benefit several groups of people and organizations:

General Public: The study's findings and the development of the ―RE: PORT‖ application will benefit the public by improving the efficiency and effectiveness of reporting emergency situations.

Emergency Responders: Emergency responders, including police, fire departments, medical personnel, and disaster management units, will benefit from this study. The application is designed to connect with various emergency responders and organizations, which can help them respond more effectively to incidents and emergencies.

Local Government Units in Quiapo, Manila: Local government units will benefit from improved incident reporting and response capabilities, which can enhance public safety and security in the area.

Future Researchers: This study will provide a valuable foundation for future researchers and will offer insights into the development and implementation of emergency reporting systems, particularly in urban areas like Quiapo, Manila. Future researchers can build upon the findings and methodologies of this study to further enhance and customize emergency response solutions for other regions, potentially leading to innovations in emergency reporting and response technologies. The study will serve as a reference point for those interested in improving emergency services and public safety through technological advancements.

Chapter 2

CONCEPTUAL FRAMEWORK

This study explored the Enhanced Emergency Alert and Response (EAR) Mobile Application, a revolutionary tool designed to enhance emergency communication and response. The application uses mobile technology and real-time communication to efficiently distribute emergency alerts, enabling users to make informed decisions and take necessary actions during emergencies. The study aimed to revolutionize the way emergency warnings are transmitted and received, ensuring public safety during emergencies.

This chapter contains a review of literature and related studies on the topic of the study. It includes the conceptual model and the operational definition of term.

Review of Related Literature

This section presents key concepts and ideas relevant to the study. It includes discussions on disaster, emergency information system, among others.

In Search of the Bigger Picture: The Emergent Role of On-Line Photo Sharing in Times of Disaster

According to Lui et al. (2008), during moments of disaster, individuals frequently capture images to record and comprehend these occurrences. Sharing these photos serves informational, journalistic, and healing purposes. This practice has existed since the advent of cameras. Presently, with digital cameras and platforms for sharing images, the scope for distributing visual information has broadened.

As mobile and web technologies become increasingly prevalent, there's a noticeable emergence of comparable convergence behaviors in online spaces (Hughes, Palen, Sutton, Liu, and Vieweg, 2008). This trend suggests that people are adapting their habits and interactions in digital environments like how they converge and collaborate offline. This convergence is indicative of a growing integration of online tools and platforms into everyday life, blurring the lines between digital and physical experiences. It showcases a shift in how individuals engage with technology, fostering new modes of connectivity and interaction that mirror offline behaviors.

Social media technologies, encompassing mobile and web applications facilitating spontaneous communication, are increasingly challenging traditional distinctions between informal and formal crisis responses (Palen & Liu, 2007; Palen et al., 2007). They do so by fostering grassroots initiatives and enabling "citizen journalism," where individuals contribute to information reporting during crises (Gillmor, 2006). In times of disaster response and recovery, there's a notable inclination among people to utilize personal and collaborative media. This enables them to leverage their social connections and existing networks, utilizing their social capital to gain a better understanding of the situation (Farnham, Pedersen, & Kirkpatrick 2006). This utilization of social media goes beyond just communication; it serves as a valuable tool for leveraging collective resources and knowledge during crisis situations.

Collecting volunteered geographic information from the Global Navigation Satellite System (GNSS): experiences from the CAMALIOT project

See et al. (2016) explained how terms like citizen science, crowdsourcing, and volunteered geographic information (VGI) all revolve around gathering knowledge, often through data collection. Citizen science mainly originates from biodiversity and conservation, where

observations about species have been a significant contribution. Crowdsourcing, stemming from the business world, involves outsourcing tasks to a larger group, like the system Amazon's Mechanical Turk. VGI, coined by Goodchild (2007), focuses on geographical data, with OpenStreetMap as a prime example.

These terms (as well as many others like them; see, for example, see et al. Citation 2016; Eitzel et al. Citation2017) have subtle differences that partly stem from their respective domain origins, but what unites them are the participants—volunteers—and, more and more, the technology that makes participation possible, especially mobile devices. GNSS (Global Navigation Satellite System) receivers, which use code measurements (L-band pseudorange measurements) to at least four visible GNSS satellites, as well as other phone features like the camera (for taking geotagged and date/time stamped photographs) and gyroscope (for determining if the phone is tilted or moving) have made smartphones one of the most important tools for data collection by volunteers. More recently, Google made it possible to access the raw GNSS data in Android smartphones starting with Version 7.0 of the operating system (EGSA et al. Citation2017), and some models of Android-based smartphones have chipsets with dual-frequency GNSS receivers (Dabove and Pietra Citation2019). The integration of these two advancements has created opportunities for the utilization of IoT (Internet of Things) data in several novel applications. The raw GNSS data in this context should be interpreted as pseudorange (epoch-wise) carrier-phase and code measurements made between a single GNSS satellite and a GNSS receiver (smartphone). Consequently, the receiver gathers several observations depending on the visible set of GNSS satellites at each epoch, and the location is processed using these data. The number of GNSS constellations that are supported, the measurement environment—such as urban canyons or rural areas—the performance of the GNSS chipset and built-in antenna, and other

factors all affect how many observations are collected per epoch, sometimes reaching twenty or more. The ability to use carrier-phase observations to enhance smartphone positional accuracy from several meters to decimeters (Psychas et al. Citation 2019; Critchley-Marrows et al. Citation2020; Darugna et al. Citation 2021; Li et al. Citation 2022), detect spoofing and jamming (Miralles et al. Citation 2018), and use seismological applications for tsunami and earthquake detection (Fortunato, Ravanelli, & Mazzoni Citation 2019) are unquestionably beneficial uses of raw GNSS data. But they can also be applied to other kinds of scientific applications that go beyond navigation, like more accurate augmented reality (Fu, Khider, & van Diggelen Citation 2020).

Twitter Under Crisis: Can we trust what we RT?

Twitter, as highlighted by Mendoza et al. (2010), serves as a hub connecting millions of users, facilitating the exchange of concise messages called tweets across multiple channels such as email, SMS, smartphones, and web platforms. Its immediate nature proves invaluable for swiftly sharing breaking news directly from the source, particularly evident during crises like the impactful earthquake that struck Chile on February 27, 2010, causing widespread devastation.

This earthquake, one of the strongest ever recorded, triggered a tsunami and resulted in around 500 reported deaths and affected over 2 million people. Twitter played a crucial role in disseminating urgent information about the tsunami warnings, missing and deceased individuals, available services, road conditions, and more in the aftermath. Despite its usefulness, the platform also became a channel for spreading both accurate news and unfounded rumors during the crisis.

However, due to infrastructure issues and disrupted telecommunications, including intermittent internet connectivity in Chile for about 48 hours following the quake, the expected surge in tweet activity right after the disaster did not occur. The frequency of tweets originating

from Chile remained much lower than anticipated due to these circumstances, indicating a limitation in information flow during critical moments despite the platform's potential for rapid dissemination of information.

Citizen Communications in Crisis: Anticipating a Future of ICT-Supported Public Participation

According to Palen and Liu (2007), advancements in information and communication technologies (ICT) have notably transformed disaster response efforts. While traditional research efforts in HCI (Human-Computer Interaction) focused on formal emergency response activities like medical services, firefighting, rescue operations, and information systems modeling, unforeseen uses of ICT have emerged.

One significant shift is the heightened involvement of the public during disasters, a role long acknowledged by disaster sociologists but now amplified and more extensive than previously seen. This newfound involvement creates a large-scale cooperative activity among citizens, challenging our understanding of computer-mediated interactions.

The engagement of the public in disaster scenarios through internet and mobile communication has evolved into a form of citizen journalism, extensively covered by popular media. Events like the 2004 Indian Ocean Tsunami and the 2005 Hurricane Katrina saw widespread public response through blogs, photo/video sharing, and online platforms, facilitating offers of housing, employment, and emotional support.

This increased participation of citizens in disseminating information and providing aid during disasters not only reflects societal shifts but also poses a novel challenge for traditional

emergency response structures, highlighting the need to integrate these grassroots efforts into formal response strategies.

Chatter on The Red:What Hazards Threat Reveals about theSocial Life of Microblogged Information

Microblogging represents a recent evolution in computer-mediated communication, which has roots in earlier chat applications from the internet's inception. These chat platforms have continuously provided rapid, casual, and synchronous communication channels. They've evolved across various platforms and adapted to accommodate diverse speaker-audience dynamics, supporting interactions from one-to-one to many-to-many connections. As more individuals establish their digital presence, these chat-based environments draw attention not just for their quick interactions but also for the unique information relationships they foster and how they adapt media to fit technological and social constraints.

This paper examines the utilization of Twitter, a popular microblogging platform, during the 2009 seasonal flood threat in the Red River Valley, spanning across US states and Canadian provinces. It explores the nature of computer-mediated communication (CMC) during a significant and potentially hazardous event impacting a large, populated area. The study aims to theorize the role of CMC-based chat in the era of social media or Web 2.0 and to understand the connection between chat platforms and mass emergency events. The goal is to gain insights into how these platforms might contribute to mitigating damages caused by hazards in the future through information and communication technology (ICT) (Starbird et al, 2010).

Vehicle Accident Emergency Alert System

Vehicle Accident Emergency Alert system aims to swiftly address accidents, potentially saving lives while minimizing costs. With the world's pace and population growth leading to increased vehicular traffic, road accidents claim approximately 1.35 million lives yearly, according to the World Health Organization.

This proposed system functions by detecting accidents through sensors like vibration or accelerometers within vehicles. Upon impact, these sensors relay signals to an Arduino controller. The system then utilizes GPS data to determine the accident's location, transmitting this information via a GSM module to an emergency center and notifying individuals listed in an emergency contact list via text message. This swift notification aids ambulances in reaching the accident site promptly, potentially minimizing response time and ensuring quicker medical assistance.

The system's potential extends to remote areas with less human activity, where prompt assistance might be more challenging to obtain. By providing accurate geographical coordinates through GPS, the system enables detailed location tracking, facilitating immediate communication with nearby hospitals, ambulances, police stations, and the victim's family members.

Design and Development of ER MineTracer: A Mobile Emergency Response Application for Mining Industry

According to Cano (2023), the twenty-first century is a time of massive innovation which brings significant contributions to many companies, especially for mining industries. Inevitably in any company, emergency which is an unanticipated and frequently hazardous circumstance can

arise at any point of time. Its first minutes are usually critical and so it needs a prompt response. Hence, requests for assistance from emergency teams should be unambiguous to help dispatchers send the right personnel and equipment.

Emergency response is about coordinating and directing resources to respond to various events and controlling the emergency. Among these are GPS technology for tracking rescuers and resources, translators for communication, and field examiners for damage assessment. Smartphones and web applications help improve the emergency system. Geolocation plots the user's location on a map and sends it to the command center. With the rapid growth of technology, particularly the proliferation of smartphones, there is a need to develop a system that would give employees an additional option or means to call for help.

The mining industry is inherently hazardous, and communications play a crucial role in enhancing worker safety and maximizing operational efficiency. With technological advancements, active surveillance and remote monitoring are now possible which helps provide better medical responses following significant incidents. Moreover, reliable communication systems reduce risks by providing constant two-way communication between miners and their support teams to monitor conditions and ensure a timely emergency response.

In the case of Taganito Mining Corporation (TMC) in Claver, Surigao del Norte, Philippines, a Walkie-Talkie two-way radio has been used by miners and the emergency response team for information access, but unfortunately, its performance is limited due to certain factors such as distance, location, etc. With this challenge, the researchers were prompted to conduct a study that would improve the information access by designing and developing an ER MineTracer

mobile emergency response application in order to revolutionize the way emergency services call for help, making it more efficient and reliable especially for employees in TMC.

According to Margaret Rouse's Theory, usability measures the user's potential to achieve their goals. In information technology, the term is frequently used to determine the usability of software applications. Usability testing is a fundamental concept in information technology and involves testing software products, interfaces, or technologies on end-users. Usability testing is necessary to develop strategies for determining how systems actually function once they have been delivered to customers. Usability testing is merely one of several general types of the software product and system testing. Usability testing, on the other hand, focuses on creating a positive environment for users, ensuring that critical information is not buried in a dashboard, and ensuring that using the product or system is a pleasurable and empowering experience.

Development and Application of a Smart Emergency Response Platform for Earthquake Disasters Based on Multi-Source Monitoring Data.

According to Dr. Wei Lei (2022), the "14th Five-Year Plan for National Emergency Response System," released in December 2021, prioritizes disaster prevention, mitigation, and relief efforts in China. Over recent years, frequent earthquakes and geological disasters have continuously jeopardized lives and property safety. During the "13th Five-Year Plan" period, there was a notable reduction in casualties, collapsed houses, and economic losses stemming from natural disasters compared to the "12th Five-Year Plan."

However, despite these improvements, China remains highly susceptible to various natural disasters, posing significant challenges to safety production and perpetuating multiple safety risks.

Dr. Lei emphasized that the rapid advancement in earth observation technology, alongside the advent of technologies like Cloud Computing, Internet of Things, Big Data, and Smart Cities, plays a crucial role in monitoring and assessing earthquake and geological hazards. To ensure swift monitoring, precise assessment, and effective decision-making during emergency responses to natural disasters, integrating these technologies becomes imperative.

The integration of technical methods is essential for coordinated monitoring and the development of three-dimensional rapid emergency response capabilities, spanning from the surface to near-Earth space. This approach is crucial not only for national security but also for aligning with major national strategies (DeVries et al., 2020; Xu et al., 2019).

China has already established service systems comprising space infrastructure, aerial remote sensing platforms, and ground monitoring networks. Moreover, the integration of Spatio-temporal Big Data (STBD) into social applications through intelligent processing and mining techniques has become indispensable (Li, 2016).

Dr. Lei highlighted the significance of linking STBD across time and space, enabling the convergence, integration, and dynamic visualization of urban multi-source data. Surveying and mapping data, essential for urban development, offer unique insights for urban management and disaster monitoring (Li, 2017; Zhu & Fu, 2017).

It is crucial to establish standardized storage, sharing, and utilization methods for surveying and mapping data while leveraging thematic maps to bolster information service systems for ecological environmental protection policies and measures.

This study underscored the urgent need to integrate and efficiently apply technical methods for integrated SAG coordinated monitoring, which can significantly enhance emergency response to geological and natural disasters (Abdalla & Esmail, 2018; Feng & Cui, 2021; Du et al., 2022).

Disaster Response Modeling Base on Landslide Early Warning Using Case Management Model and Notation

In the realm of emergency response to landslides, certain procedural aspects require detailed explication. However, conventional modeling methodologies often lack the necessary adaptability to effectively accommodate the dynamic nature of emergency response situations. While companies have traditionally relied on the Business Process Management Approach and Notation (BPMN) model for process modeling, it falls short in scenarios like emergency response to disasters like landslides as it primarily focuses on internal business process flows. Recognizing this limitation, the Case Management Model and Notation (CMMN), introduced by the Object Management Group (OMG) in 2013, was developed to complement BPMN, offering more flexible and unstructured approaches to handling urgent situations.

This study aimed to construct a CMMN model specifically tailored to a landslide emergency response scenario triggered by an Early Warning System (EWS) sensor alert. Qualitative data for this study was gathered through a literature review, interviews, and observational methods. Using the insights gleaned from this data, the researchers employed the CMMN modeling approach to create a model reflecting the emergency response situation. The researchers also analyzed the existing disaster management information system utilized by the Yogyakarta Special Region Disaster Management Agency (BPBD DIY) and utilized CMMN to explore opportunities for enhancing the current system. As a result, two CMMN models emerged:

one depicting the BPBD DIY disaster management information system and the other proposing recommendations for system enhancements based on the analysis.

This study's analysis of the current disaster management information system led to the formulation of recommendations for its improvement. Additionally, a prototype featuring these recommendations was developed and subsequently validated by specialists in natural disasters as part of the research process conducted by Ekamas et al (2022).

HERO: Hybrid Effortless Resilient Operation Stations for Flash Flood Early Warning Systems

Wannachai et al. (2022) stated that the study presents a novel idea known as "HERO stations," which are intended to function as resilient, hybrid operation stations inside of flash flood early warning systems. The modular design approach used in the construction of these HERO stations allows for simple customization and maintenance, as well as adaptable performance in a range of environmental conditions. They retain high data sensing accuracy and a long operational lifespan. One notable feature is their capability to seamlessly transition between centralized and decentralized communication modes. In the centralized mode, these stations relay sensing data to a central server database, where water level information is displayed on a dedicated website. This enables village leaders to make informed decisions regarding flood preparedness based on the available data. In the decentralized mode, HERO stations directly communicate with one another via SMS, independently assessing flash flood situations and disseminating warning messages directly to village leaders. Currently deployed in northern Thailand, these stations differ from typical telemetry stations focused on monitoring water resource changes, primarily due to their

emphasis on resilience in flash flood early warning systems and their ability to adapt communication modes in case of internet connectivity issues.

Unlike other telemetry stations primarily reliant on stable GSM communication and internet networks, the HERO telemetry stations specifically cater to rural flood risk areas with unstable GSM coverage and lacking Wi-Fi availability. They prioritize practical maintenance for villagers and employ a modular design architecture. The research's key contributions lie in its innovative modular telemetry station design, an adaptive operational algorithm, and the development of communication mode switching between centralized and decentralized modes. Implemented in Thailand, the flash flood early warning system utilizing HERO stations has already demonstrated practical applications for flood risk areas. Additionally, the adaptive operation algorithm within HERO stations could potentially extend to other disaster early warning systems like tsunamis, volcanic eruptions, and wildfires. Furthermore, the modular design concept can be extended to enhance sensor node development.

In terms of structure, the paper is divided into several sections. It begins by outlining the flash flood early warning system and hydrological principles, followed by the detailed introduction of the HERO station design. The study also presents simulation configurations and results. The conclusion section summarizes the key findings and implications of this research.

United States Federal Emergency Management Agency regional clustering by disaster exposure: a new paradigm for disaster response

Margus (2023) highlighted the increasing global focus on bolstering disaster response systems due to urbanization and climate change. Nations like China and India have established dedicated agencies like the Ministry of Emergency Management and the National Disaster

Management Authority, respectively, to ensure swift and effective disaster responses. The European Union also operates a Civil Protection Mechanism, fostering joint responses among member states in times of crisis.

In the United States, despite its abundant resources, it has encountered numerous historical and contemporary disasters of varying magnitude and types, spanning from hurricanes to wildfires across diverse geographical regions. While FEMA was instituted in 1979 to coordinate federal resources during disasters surpassing local capacities, its structure, divided into ten regions, might not fully consider regional vulnerabilities and exposures adequately.

The study aimed to propose a method for clustering U.S. states, districts, and territories into regions based on historical disaster occurrences. This proposal seeks to contrast the suggested regional assignments with FEMA's existing ten regions, aiming for a more optimized and responsive disaster management structure.

Designing an Emergency Information System for an Emergency Information System for Catastrophic Natural Situations

Many catastrophic events, such as earthquakes, floods, and fires, have occurred in recent years, causing the creation of Emergency Information Systems, which attempt to alert the public and authorities of an imminent emergency scenario. The loss of communication networks is a key concern that arises while dealing with such disasters. However, such a loss might be balanced by a competent emergency information system that is available and well-operated in the event of an emergency.

The technology that may be used to create an Emergency Information System should compensate for system stability in the event of a disaster. This might be accomplished using a variety of methods. Tarchi et al. (2009) introduced a mobile network-based emergency information system that integrates into the communication infrastructure. Bai et al. (2010) presented an integrated communication system made up of heterogeneous wireless networks pointing upward; in remote places, a satellite gate is required to connect to the satellite mobile network.

Lien et al. (2009) developed an ad-hoc network-based emergency information system (MANET). According to Choi and Lee (2008), satellite communication networks are regarded as the finest method for radio transmission of emergency material. According to Bartel et al. (2009), an emergency information system should be part of an integrated information system (EMIS) that includes dynamic GIS databases so that emergency information may be processed and disseminated in real time.

According to Kang and Choo (2016), Emergency Information Systems based on cellular phones, emails, and text messaging services cannot transmit the required alert message to all persons, nor are they useful for a location-based emergency. Proloy et al. (2017) emphasizes the need of safe and dependable wireless network transmission, emphasizing the use of modulation methods to counteract bit error. Forstmann et al. (2011) stated that networks such as Ethernet and WIFI are vulnerable to failure in times of disaster, particularly when the electrical power goes out.

Another concern is the accuracy of the emergency information presented. Endsley et al. (2011) and Jennex (2007) suggested that emergency information should be delivered as soon as possible and as correctly as possible. Furthermore, Endsley, Bolte, and Jones (2011) and Jennex (2007) recommended that emergency information be supplied as soon as the event occurs.

Another critical problem is the extent to which technology that may be utilized to construct an Emergency Information System in remote places is available. According to Jang et al. (2009), one major issue that occurs while dealing with disasters is the loss of communication networks. It is critical to note that technologies such as the internet and wireless networks are not always available in rural regions. This is especially true in the case of distant islands. Despite the fact that such technical facilities serve certain rural places, the service supplied is typically of poor quality, making it impossible for an Emergency Information System developer to employ such a service. Other prospective technologies, such as digital radio broadcasting, digital television, and GIS systems, might provide more efficiency to the ultimate emergency information system in such instances.

Android-based Mobile Panic Button UI application design development in responding to emergency situations in Universitas Indonesia (UI)

This study aimed to enhance emergency response at Universitas Indonesia through the development and redesign of the Mobile Panic Button UI (PB1) application. The research utilizes operational research design and a theoretical framework focusing on input, process, and output. Primary data, obtained through observation, measurement, and interviews, along with secondary data from literature reviews, inform the study. Findings indicated weaknesses in the initial PB1 version, affecting its performance and meeting only 30% of mobile emergency application standards.

To address these issues, the new version, Panic Button UI (PB2), was developed. PB2 introduces features such as user information collection, emergency categories, victim details, multimedia information, and enhanced notification delivery to emergency response teams. The

study emphasizes the 20-second improvement in response time with PB2, showcasing enhanced efficiency, accuracy, and communication in emergency situations. The research's originality lies in addressing the lack of information on notification alert systems in Indonesia, particularly in an educational context. This pioneering study informs stakeholders, especially in educational institutions, on implementing mobile app–based emergency response notification systems. Given the critical importance of emergency response, the study contributes valuable insights to the field, emphasizing the unique context of the Indonesian setting.

Acceptance of Mobile Application on Disaster Preparedness: Towards Decision Intelligence in Disaster Management

In the pursuit of effective disaster management, this article delved into strategies aimed at minimizing the adverse impact of disasters. Leveraging recent technological advancements, particularly the integration of mobile applications and artificial intelligence (AI), the study emphasized their pivotal role across various phases of disaster management, including mitigation, preparation, response, and recovery.

Specifically focusing on the context of the Philippines, a developing country vulnerable to natural calamities, the paper introduced a comprehensive architecture for smart disaster management. In parallel, the research evaluated the acceptance of a newly developed mobile application designed for disaster preparedness simulation.

The study engaged disaster management personnel from non-government organizations, and the preliminary findings from surveys and focus group discussions revealed a notable level of acceptance, with users expressing the application's utility and engagement. This research underscored the potential of the proposed system architecture in enhancing decision intelligence

within disaster management. Notably, this study stands as one of the pioneering attempts to showcase a smart disaster management architecture in a developing country, offering valuable insights for policy development and practical implementation. The keywords associated with this research include disaster preparedness, mobile application, disaster management, intelligent disaster management, and simulation.

Albay Emergency Response and Report Tool (Alerrt)

A robust and effective public alert and warning system, particularly crucial during national, regional, and local emergencies, immediate emergency alerts have become a top priority for both national and local governments. With a vision to become the most liveable province in the Philippines, the Provincial Government of Albay is committed to fostering an environment characterized by good education, healthcare, and overall well-being.

Recognizing the importance of disaster risk reduction and climate change adaptation in achieving this goal, the focus of this study centers on the design and development of a mobile-based Albay Emergency Reporting and Response Tool (ALERRT). Functioning as a resilient form of emergency alert notification, ALERRT empowers concerned citizens to report emergencies, accidents, and issues requiring immediate attention from the government sector.

The Featured-driven (FDD) methodology was employed for the project's realization, while opinions from diverse segments of society were gathered on aspects such as social awareness, readiness to respond, and willingness to use a mobile application for incident reporting. Remarkably, 92.5% of respondents expressed their willingness to report incidents or emergencies through the application, indicating a positive shift towards leveraging IT solutions for resilience during emergencies. ALERRT is versatile, capable of reporting various emergencies, from fires

and typhoon-related incidents to vehicular accidents with casualties, health concerns, community-related incidents, and any occurrences demanding immediate response from relevant agencies. The implementation of such a resilient emergency alert notification system is deemed essential for disaster-prone regions like Albay, fostering a proactive and technology-driven approach to emergency response and community safety.

Improvement of Emergency Situation Management through an Integrated System Using Mobile Alerts

The absence of rapid medical assistance at the scene of an accident, according to Repanovici (2022), might increase the probability of fatality. This is because emergency operators do not get critical information in a timely manner, and research has shown that if the response time of emergency teams is reduced by one minute, the odds of preserving an individual's life rise by up to 6%.

Fischer (1998) has mentioned that scientific investigations have shown that progress in the sphere of information and communication technology provides new chances for early warnings and speedier reaction times. The most recent technologies enable collaboration across legally formed organizations to intervene in emergency circumstances by identifying possible hazards, mitigating those risks, and coordinating public warning operations of imminent calamity.

According to the EENA (European Emergency Number Association), mobile devices are now the primary mode of communication; 70% of calls to emergency number "112" are made using these devices. Mobile technology advancements have transformed mobile applications into a strong tool for communication in emergency circumstances.

Several scientific publications and articles on catastrophe communication and disaster management have been published, indicating a greater emphasis on emergency response research. According to EENA (European Emergency Number Association) research, emergency mobile applications are important and should function in the same way as a phone call to "112." The European Commission issued a universal regulation in 2016 creating an electronic means of communication in emergency circumstances, asking all EU member states to ensure equal access to emergency services for all users, including persons with impairments. The EENA has fostered the development of suitable methods of communication in emergency circumstances, which means that individuals in a crisis scenario may choose the best communication solution for their requirements.

According to Yuan (2013), in order to better crisis event management, rescue professionals should rely on the involvement of individuals directly involved in the event, because they may function as "human sensors" during an emergency. Romano et al. (2016) created a mobile application to be used in small-scale emergency situations, using people as human sensors; Astarita et al. (2018) used the same concept, but added the concept of bidirectional communication: from users to rescue operators and from operators to users.

Researchers have discovered that in the immediate aftermath of a disaster, online activity increases around the world as the population seeks up-to-date news, and emergency response agencies and rescue crews use the Internet to coordinate activities and resources for rescue, raising funds, expressing points of view, and finding missing persons (Sung, 2011).

According to Manoj et al. (2007), the most popular technique to improving emergency response is to build a two-way channel between emergency management operators and residents.

This channel is used by an emergency communication system to relay real-time information. Such systems are referred to as "Emergency Notification Systems" and are mostly employed in emergency scenarios (Malizia et al., 2010).

Related Studies

This section discusses the related studies which served as a reference in developing and used to conduct the study.

According to Conjuico's (2014) study entitled "Social Media for Risk Management and Emergency Response for Philippine Local Government Units", it attempted to explain the nature of social media and their technological affordances, discussed the communication needs of people at risk met by social media, and identified the key functions of social media in times of crises.

De Guzman et al. (2014) stated in his study entitled "Mobile Emergency Response Application Using Geolocation for Command Centers" the proposed method used the current trends in mobile and web technologies for fast and efficient dispatching of emergency units. Their goal is not to create a new protocol in emergency response, they have just maximized the use of smart phones to act as medium and to help people save their lives in case of disaster.

According to Raluca et al. (2022) entitled "Improvement of Emergency Situation Management through an Integrated System Using Mobile Alerts" pointed out that there are several programs that can be used to warn specific individuals in emergency situations, but as the investigation found, these have issues with their interactions and content. Most mobile applications that enable delivering text-based alerts provide the user position via embedded GPS, a feature that the application included in this study also provides. The mobile app described here might eventually include a function that allows for the collection of data in the form of images, videos, or audio, much like other programs do.

Romano et al. stated in his study “Designing Mobile Applications for Emergency Response: Citizens Acting as Human Sensors” (2016), when an emergency occurs, citizens can be a helpful support for the operation centers involved in the response activities. Modern mobile devices embed several sensors such as GPS receivers, Wi-Fi, accelerometers or cameras that can transform users into well-equipped human sensors. Emergency organizations and small and medium enterprises have demonstrated a growing interest in developing smart applications for reporting any exceptional circumstances. In this paper, we present a practical study about this kind of application for identifying both limitations and common features. Based on a study of relevant existent contributions in this area and our personal direct experience in developing and evaluating emergency management solutions.

Figuracion et al. (2016) stated in his study “Albay Emergency Response and Report Tool (Alerrt)” that bridging communication between the constituent and the concerned agency is the main goal of the study. It seeks to provide ways on how a certain concern can be brought forward directly to intended agencies. The literature on mobile applications for emergency alert and response is extensive and constantly evolving. Researchers and practitioners are working to enhance the effectiveness, usability, and scalability of these apps to improve public safety during emergencies. These studies offer valuable insights for future research and development.

The study of Syahputra et al. (2020) a study entitled “Eco Friendly Emergency Alert System (EFEAS)” stated that EFEAS is a home security system that aims to help residents to get emergency response assistance when a threat enters their home. EFEAS was developed using a microcontroller, android application and solar panel devices. Microcontroller was used to develop a main device of EFEAS that functions to activate siren, send SMS, switch electrical power from

solar panels to conventional source or vice versa, and communicate with an android smartphone. This system can achieve the objective of being able to be operated using an Android smartphone to control all components within the system with 100% success rate to send SMS within 13 seconds and 100% successful rate to switch between solar panel and adaptor.

According to Suaybaguio (2016) in addressing this growing concern, the Provincial Government of Davao del Norte, through the Provincial Disaster Risk Reduction Management Council (PDRRMC), took advantage of the SMS Technology as its disaster warning and alert system.Disaster Warning and Alert System is a communication strategy that provides people early warning of all hazards, natural or manmade disasters, to create effective response actions to disasters before impact, thus dramatically reducing their effects on the lives of people and properties.Short Message Service (SMS) or text messaging, on the other hand, allows text messages to be sent to and received from mobile devices (Kable, 2014).

Oneal et al. (2018) stated that this study builds on current research by uniquely using social media data, collected in the field through qualitative interviews, to create a supervised machine learning model that compares human and machine coded attributes, finding that Google Vision API is a more reliable source of detecting attributes for the training set. This study buildt on current research by uniquely using social media data, collected in the field through qualitative interviews, to create a supervised machine learning model. Collected data represents rescuers and rescuees during the 2017 Hurricane Harvey. Preliminary findings indicate a 99% accuracy in classifying data between signal and noise for signal-to-noise ratios (SNR) of 1:1, 1:2, 1:4, and 1:8. It was also trend that it was 99% accurate in classifying between respondent types (volunteer rescuer, official rescuer, and rescuee).

According to the study Avvenuti et al. (2018) entitled “CrisMap, a Big Data crisis mapping system capable of quickly collecting and analyzing social media data”, CrisMap extracts potential crisis-related actionable information from tweets by adopting a classification technique based on word embeddings and by exploiting a combination of readily available semantic annotators to geoparse tweets. The enriched tweets are then visualized in customizable, Web-based dashboards, also leveraging ad-hoc quantitative visualizations like choropleth maps. The maps produced by our system help to estimate the impact of the emergency in its early phases, to identify areas that have been severely struck, and to acquire a greater situational awareness.

Stated in the study of Cepalo et al. (2011) “Analysis of Alert Messages formats for Environmental Disaster Management”, crisis and emergency management require fast response times and the most efficient use of resources. It is required to have an effective response to hazards, for example, calls for early alert, reliable and accurate position information about the location of events. Police and emergency services need reliable and accurate knowledge of the location of deployed forces in order to coordinate them efficiently. This issue is particularly critical when the ‘traditional’ infrastructures are not available because of the emergency conditions (i.e. floods, maritime emergencies, oil spills, earthquakes and humanitarian aid operations).

According to the study Johnson et al. (2023) entitled “Moving Emergency Response Forward: Leveraging Machine-Learning Classification of Disaster-Related Images Posted on Social Media”, social media platforms are increasingly used during disasters. In the United States, users often consider these platforms to be reliable news sources and they believe first responders will see what they publicly post. While having ways to request help during disasters might save lives, this information is difficult to find because non-relevant content on social media completely overshadows content reflective of who needs help. To resolve this issue, a framework was

developed for classifying hurricane-related images that have been human-annotated. The approach used transfer learning and classifies each image using the VGG-16 convolutional neural network and multi-layer perceptron classifiers according to the urgency, relevance, and time period, in addition to the presence of damage and relief motifs.

According to the study of Mythili and Shalini (2016) entitled “A comparative study of Smart Phone Emergency Applications for Disaster Management”, catastrophic disasters cause failure of conventional wired and cellular communication systems where it collapses completely or partially. Communication during disaster times is crucial for both survivors and rescue forces. There are various technological applications available in smart phones for emergency management. In this paper we provide a comprehensive overview of existing emergency applications by evaluating its operations, benefits and limitations. It provides an alternative direction to vanish the conventional problem of having manual intercession and reporting emergencies. Smartphones act as a powerful tool and can be used as a way for emergency communication. Energy source is the important factor that has to be considered to enhance the performance and functionality of smart phones.

Stated in the study of Campos et al. (2020) “Mobile Augmented Reality Techniques for Emergency Response” in times of emergencies, quick and accurate responses are crucial for response agents. To aid them, a mobile application combining georeferenced systems and augmented reality techniques has been developed. This application aimed to enhance operatives' capabilities by efficiently organizing displayed data and augmenting their surroundings. User studies, conducted with National Navy members, showed positive results, yet some aspects require further improvement. The paper outlined the development of a mobile application tailored for first responders, emphasizing its augmented reality features. Its primary goal is to streamline data

reporting, including incidents and points of interest, while facilitating communication among on-site agents. The prototype integrates an interactive map displaying occurrences and an augmented reality option for users to interact with information content.

De Luna and Pingol (2020) highlighted the Philippines' vulnerability to various natural and man-made disasters, causing significant casualties and property damage. Acknowledging the need for improved disaster response, the study aimed to create "HELP BRO," a mobile application catering to calamities and emergencies. Divided into two modules—Rescuer and Rescue—the app enables government agencies like NDRRRMO, BFP, and Red Cross to locate individuals in need via GPS, Wi-Fi, or cellular data. Evaluation involved 20 ICT professionals and 30 rescue experts using ISO 9126's Software Quality Standards. The findings demonstrated the app's high functionality, reliability, usability, efficiency, maintainability, and portability, meeting "very acceptable" standards across the board. Notably, its functionality aligned with regulations and laws, ensuring proper execution of tasks while safeguarding resources against unauthorized access. Regarding usability, respondents found the app easily installable on Android phones with a user-friendly interface, facilitating easy navigation and learning. The overall high acceptability score (4.4) indicated the app's user-friendliness, even for non-technical users.

According to Romano, Onorati, Aedo, and Diaz (2016), the design and evaluation of mobile applications aimed at leveraging citizens as human sensors during emergency response situations. As witnesses to crises, citizens equipped with modern mobile devices can provide real-time and detailed information, utilizing embedded sensors such as GPS, Wi-Fi, accelerometers, and cameras. The study, drawing upon existing contributions in the field and the authors' practical experience in developing emergency management solutions, aimed to identify limitations and common features of such applications. The research presented findings on designing effective and

efficient mobile emergency notification applications by leveraging basic mobile sensors and users' aptitude. The evaluation includes both practical and theoretical components, involving a simulated traffic accident and expert interviews. The results demonstrate the positive impact of emergency notification applications from both operators' and citizens' perspectives, providing insights for future design challenges.

According to Lal, Sait, Kumar, Bhaumik, Shivakumar, and Bhalla (2020), despite continuous preventive attempts, road accidents remain a substantial hazard to persons due to their unexpected disaster. Quick medical attention after an accident has been found to be essential to saving lives. The design and development of a smartphone application for monitoring, documenting, and triggering the required procedures for an emergency response to accident victims is described in depth in this study. The program uses accelerometer data from the victim's smartphone to identify collisions and, if verified, sends SOS notifications to ambulance services, emergency medical services, registered contacts, and friends who live nearby, the report suggests connection with weather and ride-hailing services, as well as alerts for hazardous driving conditions and natural calamities.

According to Mohamed, Ahamed, and Robin (2023), to enhance the existing Emergency Medical Service (EMS) system, responsible for delivering out-of-hospital acute medical care to individuals with diseases and injuries. Traditionally, the public engages with the EMS through a voice call system connected to a control room, leading to potential delays, human errors, and less accurate signal tracking. This study introduced an integrated mobile application, named "Fast Aid," aimed at strengthening the connection between the public and EMS authorities. The application automated EMS processes, reducing human errors, leveraging GPS for precise accident

location, providing access to various emergency services, and selecting an optimal distance hospital—all achieved through a user-friendly interface. The application aims to streamline emergency response, offering a monitoring system to handle a high volume of emergency requests.

According to Edillo, Garrote, Domingo, Malapit, and Fabito (2017), the development of a dedicated mobile application designed for the Philippine National Police Emergency Hotline 911 aimed to improve response efficiency by optimizing the data gathering process during emergency calls, with an emphasis on minimizing the collection of personal information. The proposed solution involved a user registration system, ensuring that user data becomes immediately visible to dispatchers upon requesting assistance through the mobile app. Additionally, the application integrated smartphone geolocation capabilities to enable prompt identification of the caller's location by dispatchers. The assessment of the proposed system, conducted using the ISO 9126 standard, yielded strong acceptance from evaluators. The practical recommendation is to implement the proposed i911 mobile application concurrently with the existing 911 phone call system.

According to Goh, Manahan, Mangalus, Carreon, Ong, and Vicente (2023), to enhance incident and emergency reporting in Pasig City through the development of a comprehensive web and mobile application named iAlerto. Employing the scrum methodology in software development, the team utilized Android Studio and Code Igniter for the mobile and web applications, respectively, with PHP as the backend scripting language. Evaluation involved 20 IT professionals, 20 residents, and DRRMO employees, using ISO-9126 criteria. The results demonstrated the system's effectiveness in collecting crucial information for decision-making and report generation. The web application efficiently manages user profiles, evacuation centers,

incident reports, and facilitates alerts, while the mobile app integrates GPS services for precise incident location determination. Overall, the system received positive feedback, with a mean rating of 4.48, indicating its functionality and acceptance. The study concludes that the developed applications are feasible for improving incident reporting, and recommendations include integrating an SMS module for broader accessibility and a survey response feature for wellness checks during critical events.

According to Hussein, Ibrahim, Alotaibi, Ahmed, and Alharbi (2020), the contemporary world, numerous catastrophic events, ranging from crises and fires to floods, road accidents, earthquakes, and terrorist attacks, impact a substantial number of people globally. Given the widespread use of mobile phones and the internet by the general public throughout the day, there is a growing recognition of the need for effective coordination among various agencies involved in emergency responses. The literature review revealed that existing coordination mechanisms among emergency organizations are often deemed unsatisfactory. In emergency situations, different organizations must share diverse resources, including critical information, equipment, and vehicles. To address this challenge, emergency response teams require an efficient coordination framework to better manage the consequences of emergencies, ultimately reducing the potential loss of life. Amid these circumstances, responders, emergency services, and volunteers exert considerable effort to communicate and allocate resources among themselves. This paper aimed to delve into the intricacies of coordination in emergency response, particularly exploring the application of mobile techniques. The primary objective was to develop a flexible and dynamic mobile platform that incorporates tracking mechanisms and information management to enhance the coordination efforts during emergencies.

The study of Thuri (2015), “Emergency Push Notification Mobile Application: A Study on Personal Safety Using Mobile Phone and Prototype Design.” investigated the role of mobile applications in enhancing personal safety, specifically addressing concerns about the efficacy of existing solutions. It identified a critical issue in the time-consuming and inefficient process that users undergo when seeking help through current personal safety mobile applications, especially in life-threatening situations like kidnapping. The research aimed to alleviate these challenges by developing a prototype for a personal safety mobile application, streamlining the help-request process and addressing associated issues. The study employed a combination of qualitative and quantitative methodologies, utilizing tools such as the Android Software Development Kit. Focused on Malaysian society, the research gathers data through surveys and examines existing personal safety issues among Malaysian citizens. The anticipated outcome is a mobile application prototype that enables victims to quickly and effectively request help by sending notifications to pre-stored contacts, serving as evidence of the concept's feasibility in improving personal safety.

The study of Sun, Zhou, Gao, and Li (2022) entitled “Sustainable Development of Emergency Response Ability of Novice Policemen—An Empirical Study Based on Case-Based Instruction.” addressed the often-overlooked area of factors influencing the emergency response ability of novice policemen, a crucial aspect of their profession and public security support. The article focused on case-based instruction (CBI) as a training method, leveraging automatic semantic analysis and hierarchical linear regression models to explore the impact of personal differences, prior knowledge, and basic professional skills on emergency response ability. Results revealed that basic professional skills, specifically in information processing and judgment, command and decision, and order maintenance, exhibit stronger predictive validity than personal differences and prior knowledge. The study highlighted the effectiveness of automatic semantic

analysis in extracting valuable insights from textual data generated during CBI, providing support for stakeholders in designing strategies, making decisions, and conducting evaluations in training and instructions. The goal is to contribute to the sustainable development of the emergency response abilities of novice policemen and enhance the overall effectiveness of their careers.

Conceptual Model of the Study

The Conceptual Model that was used in the study is the Input- Process – Output model as shown Figure 1. The IPO Model of this study was used to show the process done in the Development of a Mobile Application for Emergency Alert and Response.

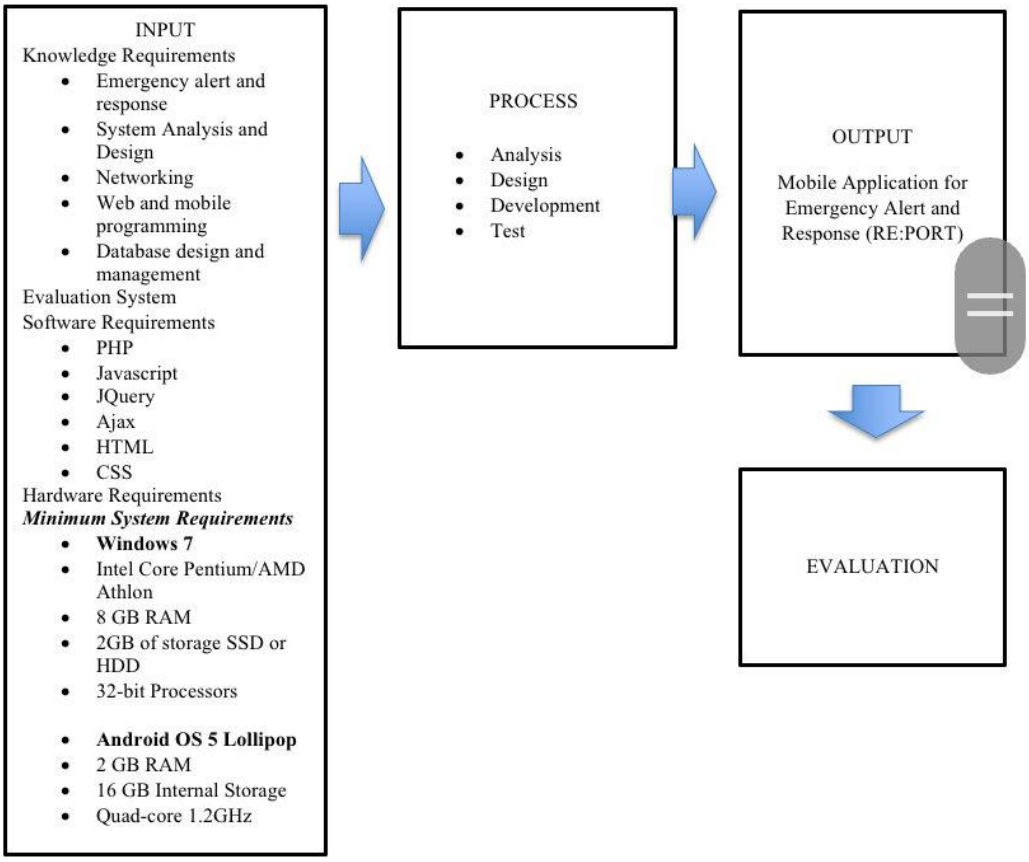


Figure 1. Conceptual Model of the Study

Input

This part of the study involves the basic foundation for the development of the system. This includes the requirements, environment and knowledge for the construction of the program. Interviews for user specific needs, tools to use for production and the resources to fund the development. It also includes the proper specification for the devices intended for the system to be used on and proceed.

Process

In this part of the study follows the structural instruction for the system's development. These include the initial analysis of the gathered inputs to determine the objectives need for the system to solve. Then the planning of the development whilst continuously gathering data for the program. Then, the designing of features and additional functionalities that can and will be used by the users according to their need. Full development will then commence once all necessary inputs for the process are met. Lastly will be the evaluation for the system in terms of its functionality, reliability and other sorts of test for the program.

Output

Overall, the expected output of the study is the resulting outcome from the development of all data gathered and resource procured by the researchers during the process. This also includes the deployment of the system for general use. Additional returns such as feedback is included in the deployment of the system for the sole purpose of bettering the system for futureproofing and advancement.

Operational Definition of Terms

To facilitate understanding of this study, the following terms are defined:

Alert System - is a system that is used to warn you in the event of emergencies.

Application - is a type of software that allows us users to perform specific tasks.

Connection - the ability to communicate and link with other systems and electronic devices over the internet.

Disaster - a serious dilemma that happened in a period that damages and causes human, economic, or environmental loss.

Emergency Response System - is designed to address any natural or human-made incidents that may happen to protect the environment and community.

Fire Emergency Response System - a fire-related preventive way to protect life, equipment, and properties threatened by fire.

Natural Disaster - severe weather occurs without warning which impacts the safety of human health, societies, and the environment.

Smart Devices - are gadgets like smartphones that can connect, share, and interact with other smart devices wire or wireless connection.

Global Positioning System - is a network satellite and use to navigate to locate objects.

SOS - is a signal calling for help.

Real-Time Notification - to receive updates and notification directly on time.

Chapter 3

METHODOLOGY

This chapter presents the method of research employed in the conduct of the study. It includes the project design, development, operation and testing procedure and evaluation procedure

Project Design

The project's goal is to utilize PHP and HTML to develop the application working effectively on desktop as a main control dashboard and an adaptive mobile-designed platform to work on android phones. The application onsists of a simple design with direct buttons that emphasizes user-friendly interface for better app usage and navigation.

Usage of PHP enables effective cross-platform development because it allows programmers to write code once and sustain compatibility on different operating systems. Compared to developing unique native applications for each platform, this strategy drastically cuts development cost and time.

Context Diagram

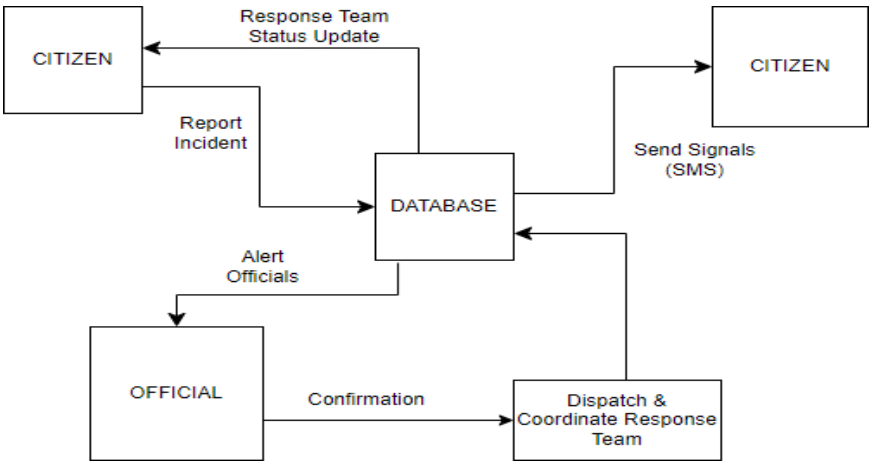


Figure 2. Context Data Flow Diagram

Figure 2 shows the circulation of the data transmitted from the user's signal that travels from the user's devices through the database for it to be recorded to the end-users which are the response teams in accordance with the type of emergency called for.

Top Level Dataflow Diagram

Level 0 Diagram

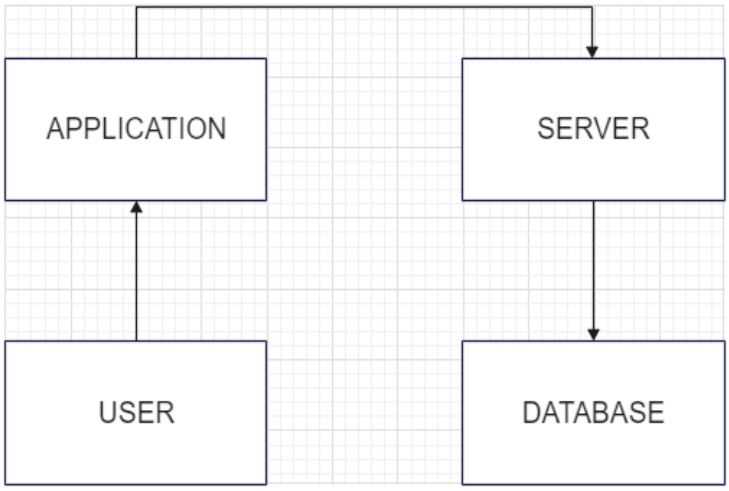


Figure 3. L0 Data Flow Diagram

In Figure 3, the system is shown in its simplest construction from the initial input from the user towards the refined output to the Admin. Users send signal from their application on mobile devices to the database controlled by the admin panel.

Level 1 Diagram

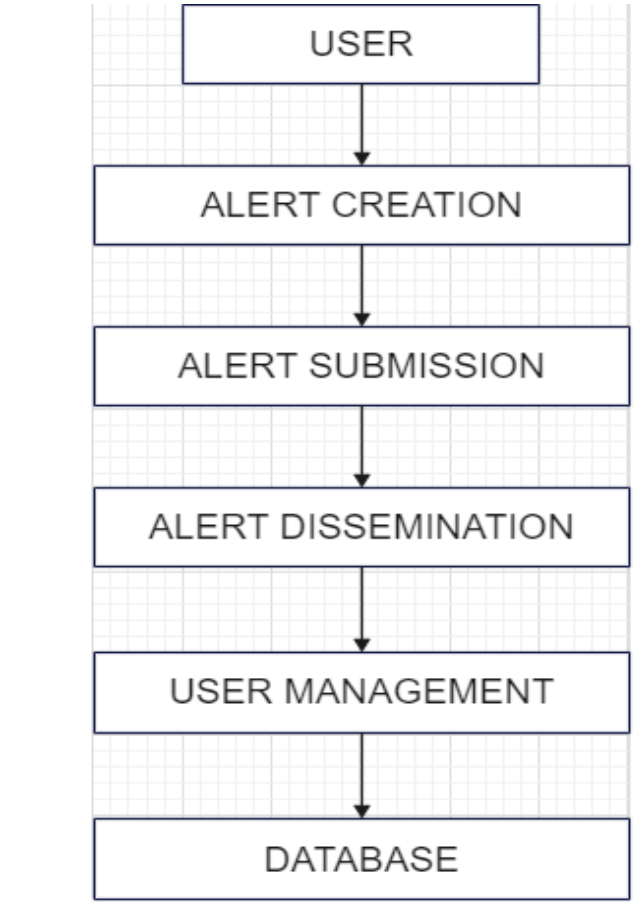


Figure 4. L1 Data Flow Diagram

As shown in Figure 4, respectively L0 Data flow diagram and the L1 data flow diagram, it displays a more direct flow of data and raw information processed in each phase applied to the system.

Process Flow

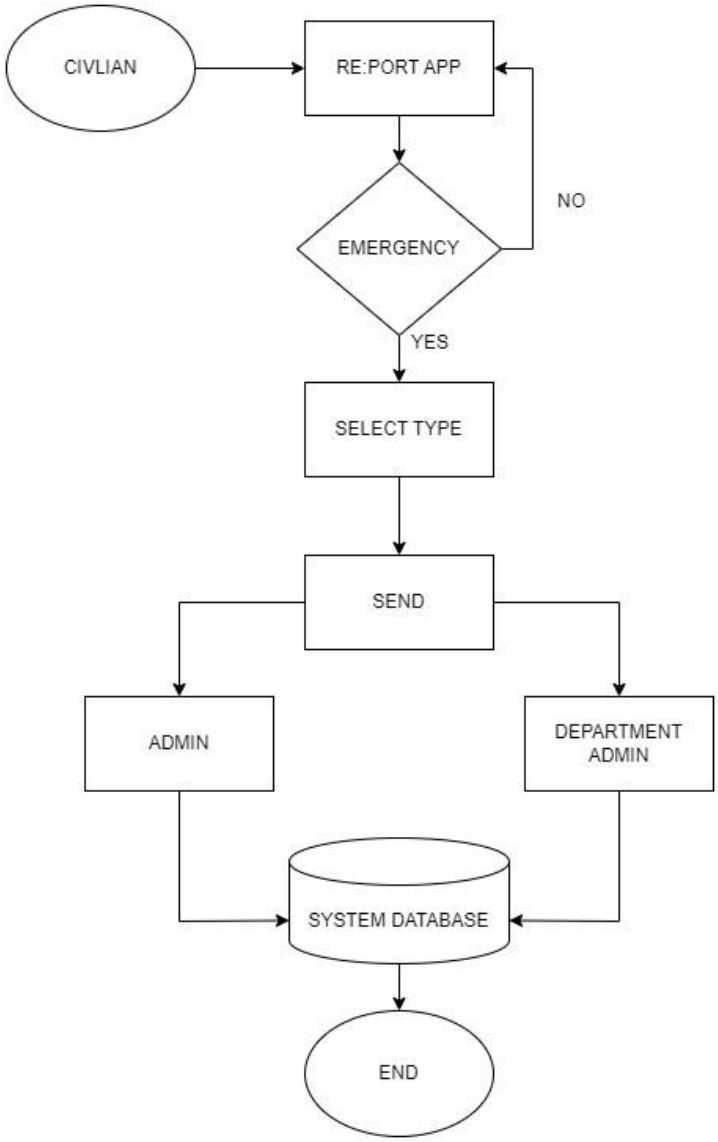


Figure 5. Civilian Process Flow

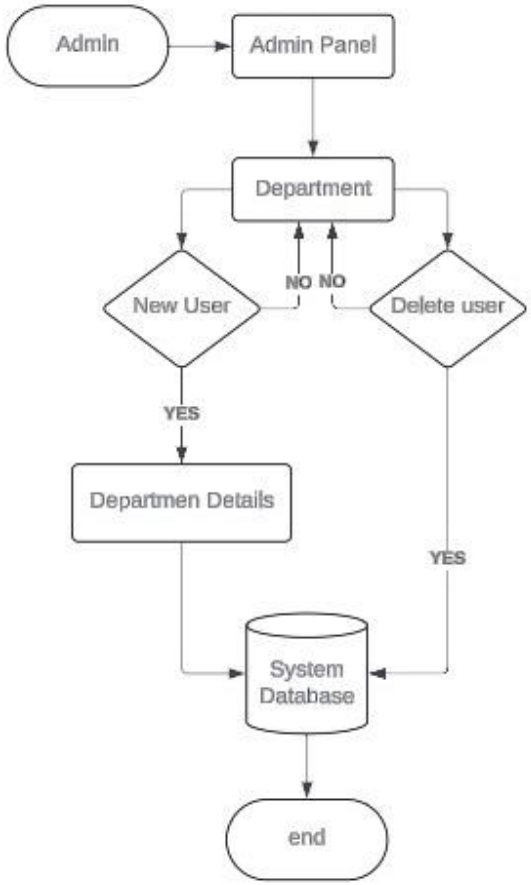


Figure 6. Admin Add and Delete User

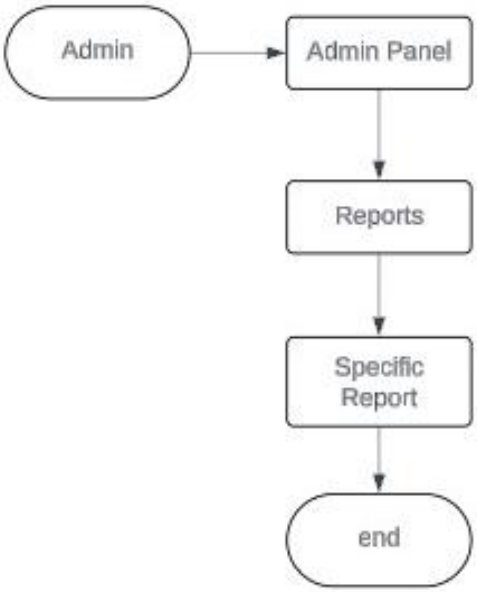


Figure 7. Admin Report Viewing

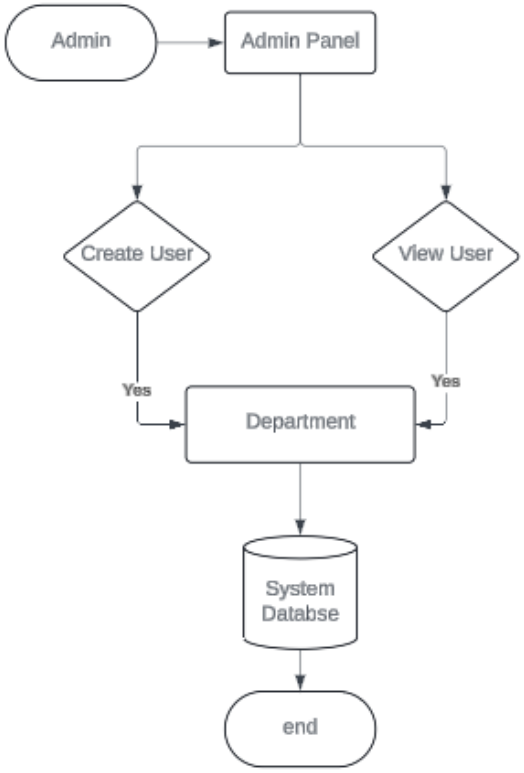


Figure 8. Admin Account

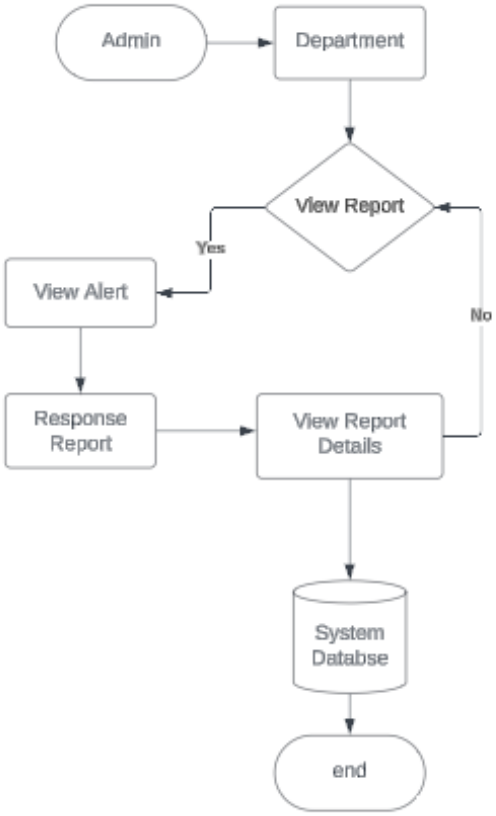


Figure 9. Department Admin Report Viewing

Entity-Relationship Diagram

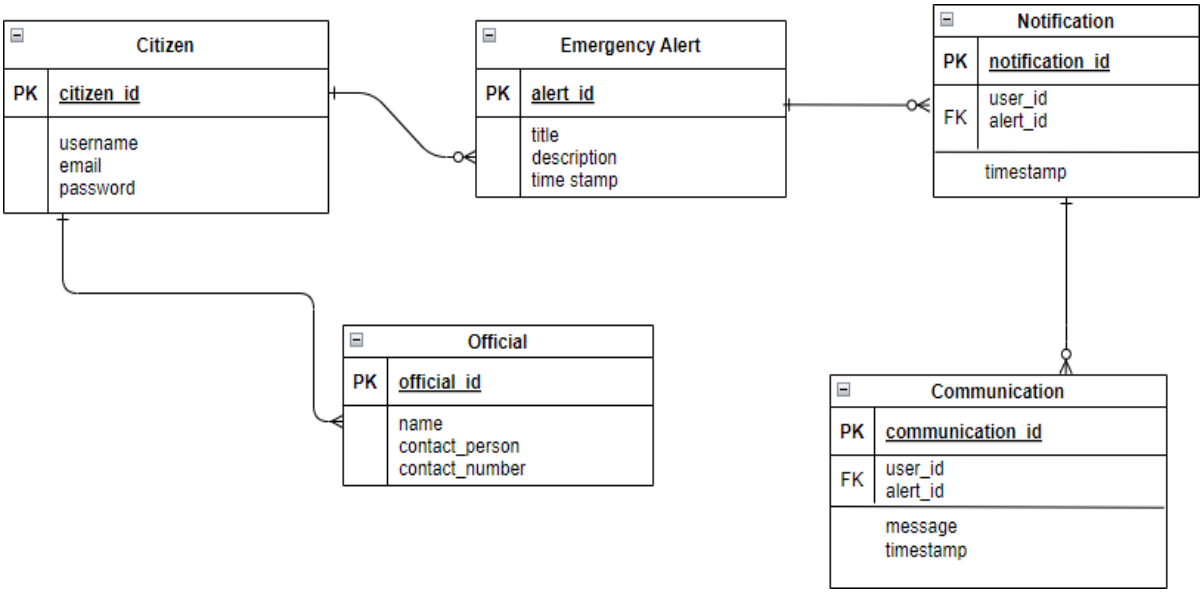


Figure 10. ERD Diagram

Use Case Diagram

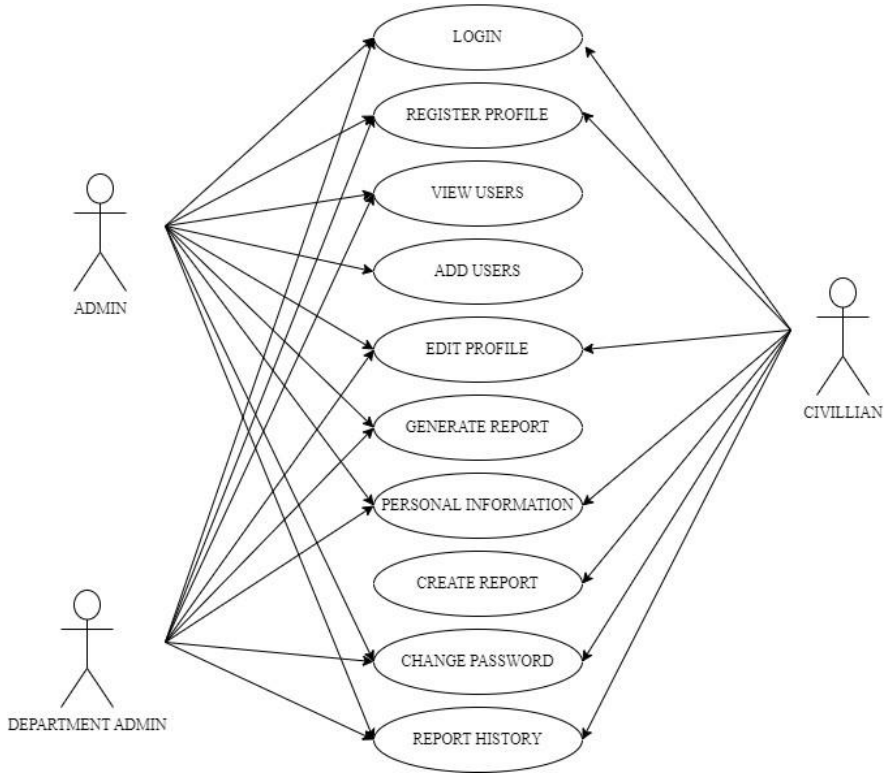


Figure11. Use Case Diagram

The Use Case Diagram shows the corresponding actions allowed by the system based on the type of user present.

Admin: The admin has the absolute authorization and control over all users presented within the system. They can manipulate the department users and has complete access to the system.

Department Admin: The Department admin is another type of user that has jurisdiction over a specified department registered in the system. Although they are restricted only to their corresponding department.

Civilian: The primary users of the application. They can create reports and configure their own respective profiles for better identification. They are also able to view past made reports.

Database Design

The following tables are from the database that construct the system used by the mobile application and web: Re-Port.

Table 1. *Admin Account Table*

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
1	**id**	int(11)			No	*None*		AUTO_INCREMENT
2	**fullname**	varchar(100)	latin1_swedish_ci		Yes	*NULL*		
3	**usertype**	varchar(10)	latin1_swedish_ci		Yes	*NULL*		
4	**region**	varchar(100)	utf8mb3_unicode_ci		Yes	*NULL*		
5	**province**	varchar(40)	utf8mb3_unicode_ci		Yes	*NULL*		
6	**city**	varchar(40)	utf8mb3_unicode_ci		Yes	*NULL*		
7	**brgy**	varchar(40)	utf8mb3_unicode_ci		Yes	*NULL*		
8	**street**	varchar(75)	latin1_swedish_ci		Yes	*NULL*		
9	**responder**	varchar(80)	latin1_swedish_ci		Yes	*NULL*		
10	**contact_num**	varchar(30)	latin1_swedish_ci		Yes	*NULL*		
11	**username**	varchar(15)	latin1_swedish_ci		Yes	*NULL*		
12	**password**	varchar(100)	latin1_swedish_ci		Yes	*NULL*		
13	**status**	varchar(1)	latin1_swedish_ci		Yes	*NULL*		
14	**datecreated**	timestamp			No	current_timestamp()		ON UPDATE CURRENT_TIMESTAMP()
15	**accountnumber**	varchar(15)	latin1_swedish_ci		No	*None*		

The Admin Account Table is where the accounts working off from the departments and command center are listed and saved. These include users that have full access to the system and the ones strictly by their respective department.

Table 2. *Damage Report Table*

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
1	id	int(11)			No	*None*		AUTO_INCREMENT
2	reportid	varchar(11)	latin1_swedish_ci		Yes	*NULL*		
3	affected_family	varchar(10)	latin1_swedish_ci		Yes	*NULL*		
4	injured	int(11)			Yes	*NULL*		
5	casualties	int(11)			Yes	*NULL*		
6	estimated_damage	varchar(16)	latin1_swedish_ci		Yes	*NULL*		
7	cause	varchar(250)	latin1_swedish_ci		Yes	*NULL*		
8	status	varchar(1)	latin1_swedish_ci		Yes	*NULL*		
9	remarks	varchar(250)	latin1_swedish_ci		Yes	*NULL*		

This table refers to the damage report of the incidents reported by the public user. These include the estimated collateral damage, injured individual documented by the responders and the status of the report. Additional remarks can be added by the responders after the incident event

Table 3. *Department Table*

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
1	id	int(11)			No	*None*		AUTO_INCREMENT
2	officename	varchar(75)	utf8mb4_general_ci		No	*None*		

This simple table illustrates how departments are listed on the system by the admin. Despite being a simple input, only the main admin can add, delete, and modify departments.

Table 4. *Civilian User Table*

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
1	id	int(11)			No	*None*		AUTO_INCREMENT
2	FullName	varchar(100)	latin1_swedish_ci		Yes	*NULL*		
3	gender	varchar(6)	latin1_swedish_ci		Yes	*NULL*		
4	contact_number	varchar(11)	latin1_swedish_ci		Yes	*NULL*		
5	Email	varchar(40)	latin1_swedish_ci		Yes	*NULL*		
6	City	varchar(40)	utf8mb3_unicode_ci		Yes	*NULL*		
7	Brgy	varchar(40)	utf8mb3_unicode_ci		Yes	*NULL*		
8	region	varchar(40)	utf8mb3_unicode_ci		Yes	*NULL*		
9	province	varchar(40)	utf8mb3_unicode_ci		Yes	*NULL*		
10	st	varchar(50)	latin1_swedish_ci		Yes	*NULL*		
11	OTP	varchar(6)	latin1_swedish_ci		Yes	*NULL*		
12	username	varchar(15)	latin1_swedish_ci		Yes	*NULL*		
13	password	varchar(80)	latin1_swedish_ci		Yes	*NULL*		
14	date_created	timestamp			No	current_timestamp()		ON UPDATE CURRENT_TIMESTAMP()

This table refers to the general users of the application mainly the public civilians. The list includes information of their identity for the documentation of reports made.

Table 5. *Notification Table*

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
1	id	int(11)			No	*None*		AUTO_INCREMENT
2	reportid	varchar(11)	latin1_swedish_ci		Yes	*NULL*		
3	touser	varchar(11)	latin1_swedish_ci		Yes	*NULL*		
4	fromuser	varchar(15)	latin1_swedish_ci		Yes	*NULL*		
5	message	varchar(40)	latin1_swedish_ci		Yes	*NULL*		
6	status	varchar(1)	latin1_swedish_ci		Yes	*NULL*		
7	datecreated	timestamp			No	current_timestamp()		ON UPDATE CURRENT_TIMESTAMP()

This table refers to the information sent by the notifications once a report is created and is successfully received by the admin or responders. Table includes the respective message sent to the reporting user and the admin receiving.

Table 6: *Report Table*

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra
1	id	int(11)			No	*None*		AUTO_INCREMENT
2	incedent_id	varchar(16)	latin1_swedish_ci		Yes	*NULL*		
3	incedent	varchar(11)	latin1_swedish_ci		Yes	*NULL*		
4	userid	varchar(11)	latin1_swedish_ci		Yes	*NULL*		
5	other_details	varchar(200)	latin1_swedish_ci		Yes	*NULL*		
6	status	varchar(1)	latin1_swedish_ci		Yes	*NULL*		
7	datecreated	timestamp			No	current_timestamp()		ON UPDATE CURRENT_TIMESTAMP()
8	photo	varchar(500)	utf8mb3_unicode_ci		Yes	*NULL*		
9	long	varchar(150)	latin1_swedish_ci		Yes	*NULL*		
10	lat	varchar(150)	latin1_swedish_ci		Yes	*NULL*		

This table refers to the information listed on the report made by a user sent to the admin. A unique incident ID is generated for an easy identification of the event. Other details such as date creation, photographic proof and log is also included.

Project Development

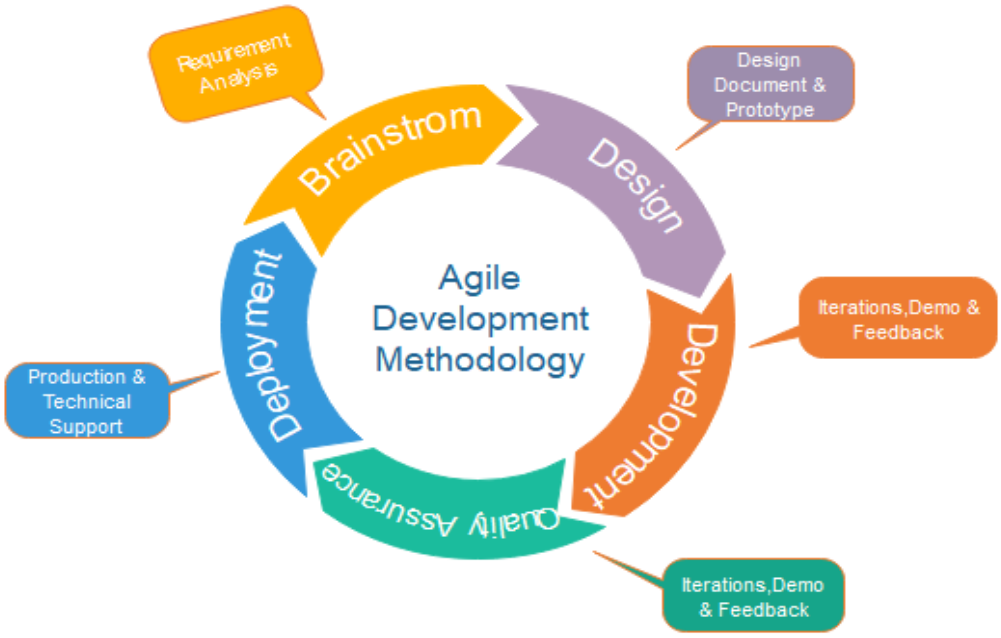


Figure 12. AGILE Methodology

The development approach used in the project development is the AGILE methodology. This goes into detail with the project broken down into segments.

PHASE I. Requirements Phase

The primary stage of the methodology. During this phase, the developers will procure necessary information based on the needs of the program. The planning in which the system and the service is required for the framework to be compatible with. The following iterations will be monitored for documentation and from its feedback and reviews will serve as the primary requirements for the program.

PHASE II. Designing Phase

During this phase, the developers will create a prototype of the proposed system using the procured information and methodology used. The prototype will then be used as a guide further as the project goes on. This includes the basic interface and structural model that will be used after the designation of the program is completed.

PHASE III. Development Phase

After the initial planning and implementation of a prototype designation, the developers will begin system development, incorporating the appropriate design and functions. The prototype structure will be pre-coded and will only be added to accomplish this. In this phase, the system's components are improved based on the reports acquired for future trials and iterations.

PHASE IV. Testing Phase

With the development of the system, the developers will begin to start primary testing within the program to determine if there are underlying errors and redundancies in its system. Through trial and error, the testing will be to ascertain the integrity of the program to resist bugs and unforeseen errors. This ensures the quality of the results from the system.

PHASE V. Deployment Phase

After the testing phase comes next is the deployment. The developers make sure that the developed system is fully functional. The complete program will then be distributed to the corresponding user-clients. This will serve as a production trial of the system for it to slowly integrate with the environment. Constant monitoring and continuous maintenance and support are required to ascertain the system's operation.

PHASE VI. Reviewing Phase

In the last phase of the methodology, the developers will constantly receive feedback and reports from the users and the system logs. This will serve as guidelines for the developers to see which area of the system is at fault or is requiring improvement or adjustments based on the needs of the users. These reviews will be documented as references for future modifications and continuous improvement.

Operational and Testing Procedure

The following procedures were carried out to evaluate the effectiveness and functionality of the developed system and serve as basis for corrective action should there be contingencies and errors found on the program.

Table 7. *Testing Procedure of the System*

Criteria for Testing	*Procedure*	*Expected Output*
Functionality	1. Open Re-Port Application/Admin Panel a. Log in page	User views the Log-in page. Once they are logged- in, depending on what type of user they are, will be directed to their respective dashboard.
	2. Browse individual dashboard. a. Specific paged based on the user type. Public user/System Admin.	For Admin: They will be directed to the admin dashboard accessible by web. For Department Admin: They will only see the tabs and navigation within their reach e.g., fire reports only. For Civilian Users: Their own dashboard, for emergency reporting.
	3. Access Emergency button. a. Main dashboard. b. Tap Emergency button.	For all Civilian users: Will be able to file emergency report using a specific report category and optional info and photo.
	4. Log in as Admin. a. Access Admin panel b. Enter the	If the log in was successful, the admin can now view the admin dashboard which consists of:

	username and password. c. View Data specific by departments d. Add New Data e. Update Data f. Delete Data	• General specification • Fire Department • Police Department • Rescuers • Admin Accounts • Report list
	5. Log in as Department Admin. a. Access Admin	If the log-in was successful for the Department Admin can now view the dashboard consist of:

	Panel b. Enter the username and password. c. View Data d. Add New Data e. Update Data f. Delete Data	• The main dashboard • Reports under the department specifics
	6. Log in as Civilian User. a. Access Re-Port Application b. Enter the username and password. c. View Report History d. Add New Report e. Update Data	If the log in is successful for the Employee can now view the Employee dashboard consist of: • Profile Account • Create Report • Report History • Update Profile
Security	7. Turn off JavaScript feature in the browser setting. a. Access Admin Panel b. Turn off java scripts	The system can only be accessed on devices that have their JavaScript settings on. Otherwise, the system will be showing an error, or the site will not be viewable.
	8. Encrypt Account Passwords. a. Access Admin/User Panel b. Dashboard c. View Reports d. Add New Data e. Update Data	The system uses a password hash to encrypt account password when data passes onto the database to prevent viewable access. Passwords are also censored during login to prevent leak and unwanted access.
	9. Designate homepage for all users of the system. a. Access Admin/User Panel	Depending on the account type, the user will only be directed to their specific home page or dashboard to prevent unauthorized access or modification.

	Automatically end session or log out. b. Access Admin Panel c. Enter the username and password.	If the user were to go idle for too long due to forgetting to logout or AFK reasons, the system will automatically logout for a specified time.
Dashboard	11. Friendly User- interface. a. Access Admin/User Panel b. Enter the username and password. c. Dashboard	The configuration of the panel and the application is easy to navigate with understandable tabs and buttons.
Usability	12. Identity of Buttons. a. Access Admin/User Panel b. Enter the username and password. c. View Buttons d. Add New Buttons e. Update Buttons	Each button has symbols, icons, and words to easily identify the function, (e.g., Sign In, Sign Out, View, Add New, Update, delete buttons have respective symbols to make it easier for the users to identify the function.)

Table 8. *Module Testing Table*

Development of a Mobile Application for Emergency Alert and Response

Module	Testing Procedure	Desired Output
Mobile Application	Send out SOS signals with precise location tracking and detail support.	The system will create a distress call prompt on the database and record it while sending the signal to the end-users.
GPS	Locate the signals sent by the users.	System will identify and recognize the user's signal location and distribute it to the end-users.
	Real-time location tracking, date and time recording.	System will automatically flag the coordinate with emergency prompt in the specific place and time reported.
	Login as a normal user in the program application, prompt	The system will allow the user to enter the civilian page should info is correct,

User login	username and password.	otherwise invalid.
	Change login credentials of the user.	The system will facilitate user login modification. The system will ask for current password and input new password once.
End-User login	Login as an end-user in the system, e.g., police station, fire station, hospital, response unit. Prompt username and password.	The system will allow user to access the end-user page with admin control, report monitoring and dispatch order.
	Change login credentials of the user.	The system will facilitate user login modification. The system will ask for current password and input new password once.
User report clearance	User presses on the Emergency button, photo and detail options will appear in accordance with the user's prompt.	When the user makes a report, it will appear on the end-user's side with the information attached. The end-user admin will have access to return prompt by signaling back the normal user that help is on the way.
Real-time notification alert	Users will attempt to create a distress call and report.	End-user admin will receive a notification alert with the report attachment, location and details.
Connectivity	Refresh application or restart internet connection.	The system should be in sync with the real-time tracking and is functional.

Evaluation Procedure

The Response on Emergency Portal Application was evaluated by a total of 35 respondents composed of 20 civilian users and 15 response candidates divided on different emergency sectors, e.g., police precinct, fire station, and hospital. The evaluation metrics was conducted as a survey after the completion of all phases of testing were complete. The checklist criteria were given based on the ISO 25010 Software Product Quality. Using these criteria, the respondents evaluated the system's Accessibility, Aesthetic, Portability, Engagement and Functionality.

1. The developer demonstrated the functionality of the application and how it works. To ensure proper operation, the application must be tested by the developers first to the intended users.

2. The listed respondents were given their respective evaluation papers to fill up after the

demonstration.

3. The evaluation papers from the respondents must consist of the primary feedback of the application, level of difficulty and additional suggestions.

4. The assessment sheet needs to meet the following standards: portability, maintainability, efficiency, usability, compatibility, and reliability.

5. The developers gathered insights from the respondents to integrate adjustments and improvements in the system.

6. A statistical weighted mean calculation was made after the data has been gathered and organized in tabular form.

Table 9. *Qualitative Interpretation of the Weighted Mean Table*

Range	Interpretation
4.21 – 5.00	Highly Acceptable
3.41 – 4.20	Acceptable
2.61 – 3.40	Moderately Acceptable
1.81 – 2.60	Unacceptable
1.00 – 1.80	Highly Acceptable

Chapter 4

RESULTS AND DISCUSSIONS

This chapter presents the project description, structure, test result, capabilities and limitations, and evaluation results.

Project Description

The study focused on the design and development of a mobile-based emergency reporting system to support emergency response in Quiapo, Manila (RE: PORT - Rapid Emergency: Portable Operations and Reporting Technology). RE: PORT is a comprehensive emergency reporting application offering a user-friendly interface for individuals to report various emergencies.

In the application, users can report different types of emergencies such as incidents, natural disasters, fires, and medical emergencies. The system enables users to choose appropriate responders like police, fire departments, medical services, and disaster management units based on the nature of the emergency. Users can attach photos, videos, and precise location data to their reports to provide more context for the responders.

The Administrator manages the system, including user accounts, responder coordination, and system settings. Users can track the real-time location of responders and receive estimated time of arrival updates. Additionally, the system sends automated alerts and notifications to ensure timely and accurate incident reporting.

Users are required to fill in their contact information and emergency details. The system provides multilingual support to cater to a diverse user base. Security measures include robust login and authentication systems to protect user data.

This system can be accessed using a smartphone with internet or data connectivity. The application was developed using modern mobile and cloud-based technologies to ensure reliability and efficiency.

To use the application, users need to download it from the respective app store (Google Play Store) and ensure their device meets the necessary hardware and software specifications.

To effectively run the application, users must have a smartphone with internet or connectivity. The application aims to improve emergency response times and coordination in Quiapo, Manila, ultimately enhancing public safety and saving lives.

Project Structure

The following figures present the Development of a Mobile Application for Emergency Alert and Response, and the Web Interface of Admin and Responders.

Mobile Application

In the application, users can report different types of emergencies such as incidents, natural disasters, fires, and medical emergencies. The application enables users to choose appropriate responders such as police, fire departments, medical services, and disaster management units based on the nature of the emergency.

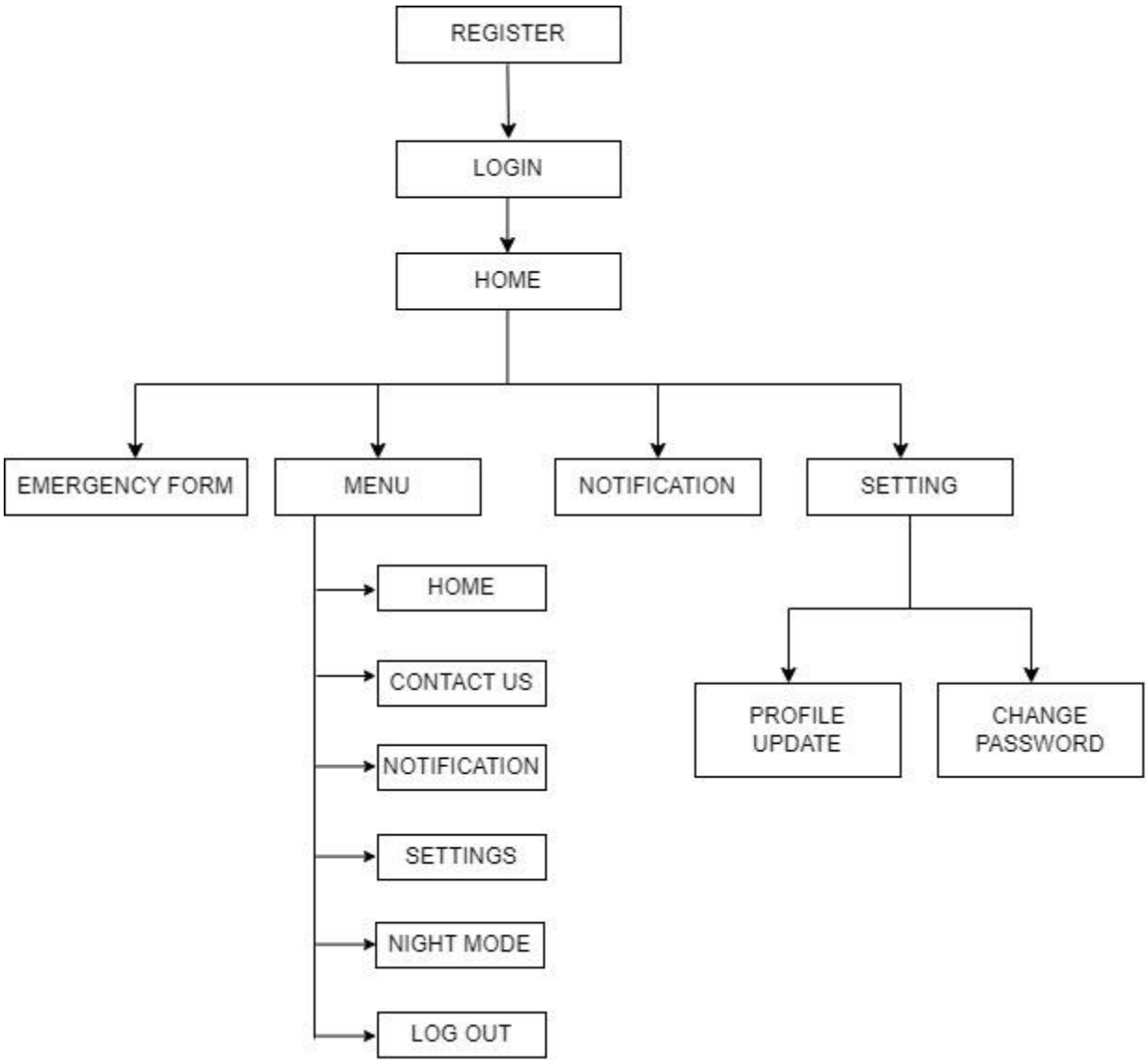


Figure 13. Mobile Application Hierarchy

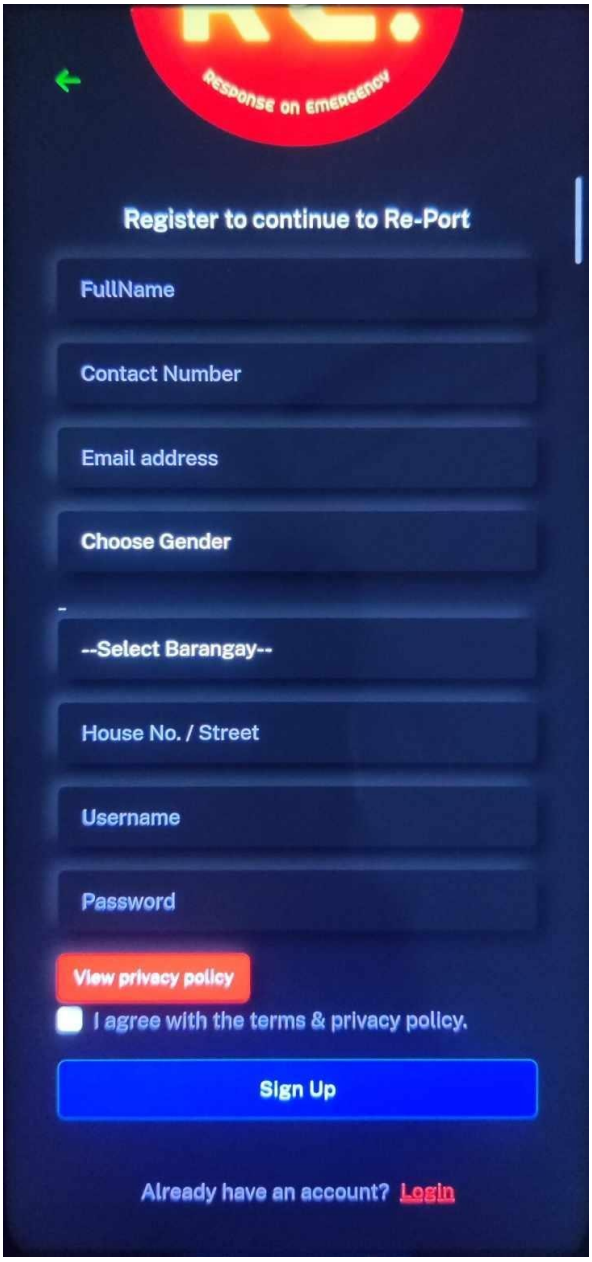


Figure 14. Register Page

The register is for the creation of new user account that did not have registered username and password. It requires to fill up the form that contains personal information, view and agree the terms and privacy policy to create an account.

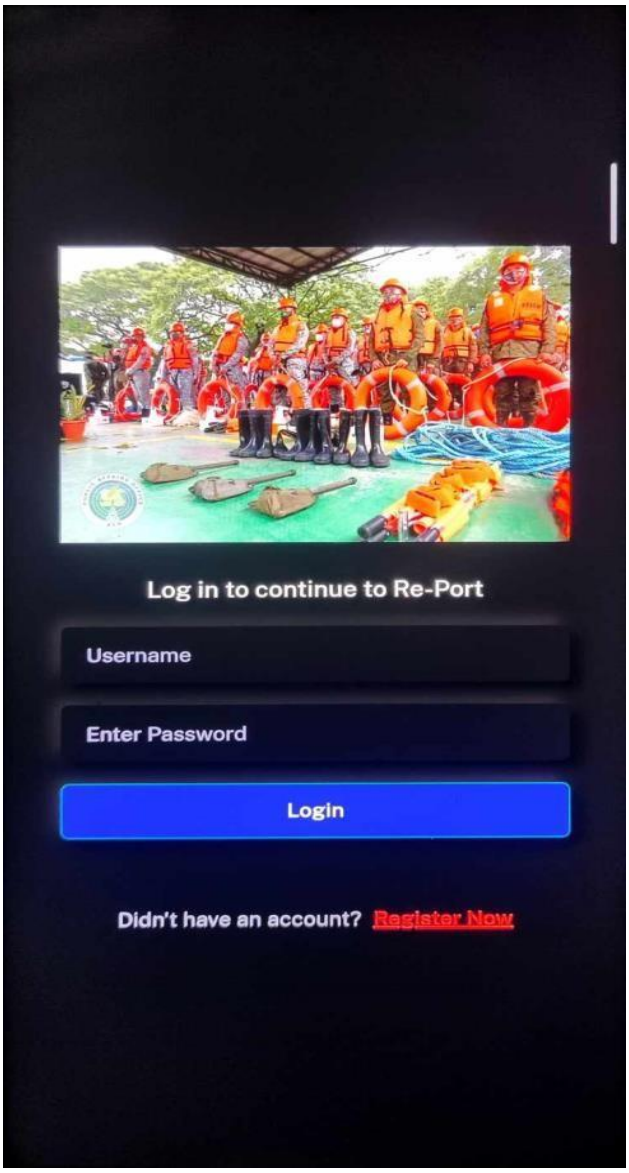


Figure 15. Login Page

The user needs to login to access the system as shown in Figure 8. It requires username and password to proceed to the home page.

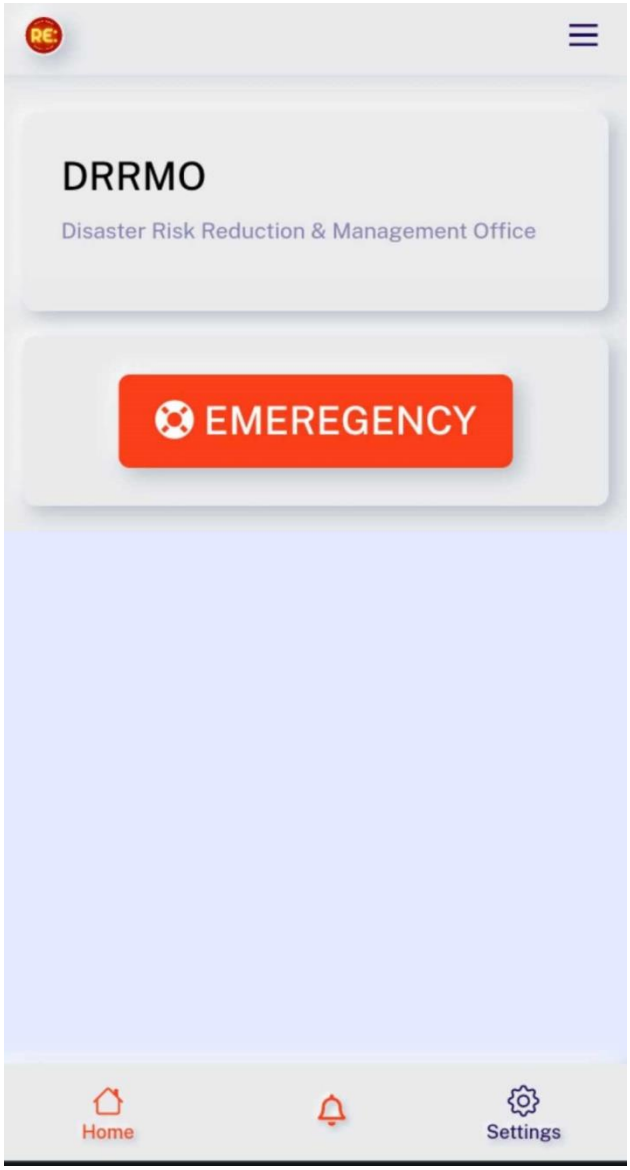


Figure 16. Home Page

Figure 10 shows home page which provides a summary of the application. The upper part contains the logo of the application and the menu button, going down is a slide show of emergency response team. The middle part shows the emergency button. Lastly, the bottom part shows the home, notification, and settings button.

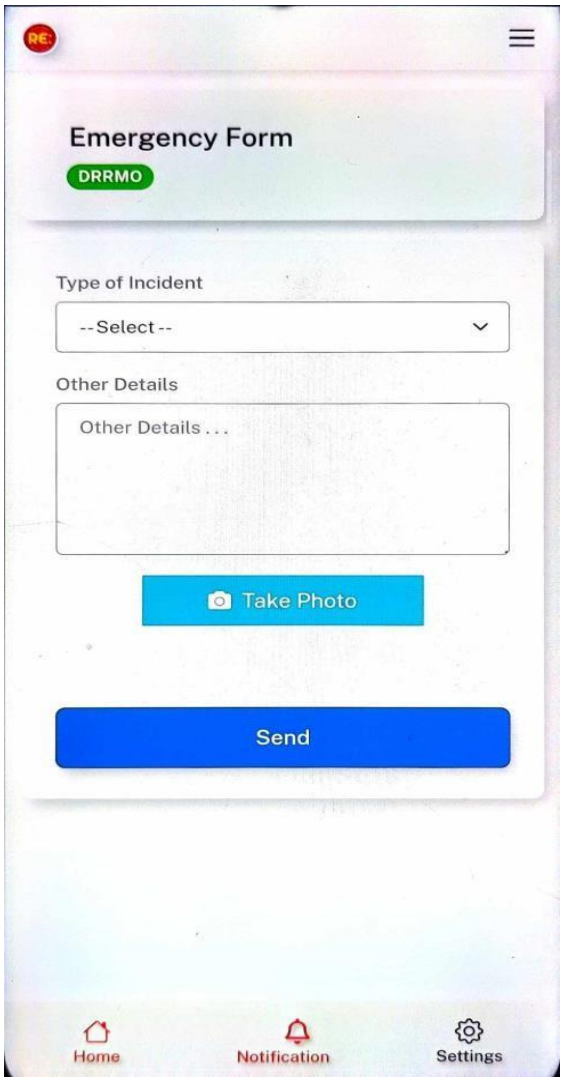


Figure 17. Emergency Form Page

The emergency form is the step of sending a response. As shown in Figure 11, the user needs to select the type of incident happening. Next, is the additional details that the user can input as long as it is relevant to the emergency report. And lastly, the users are required to take a photo of the incident so that the responders can verify the legitimacy of the report.

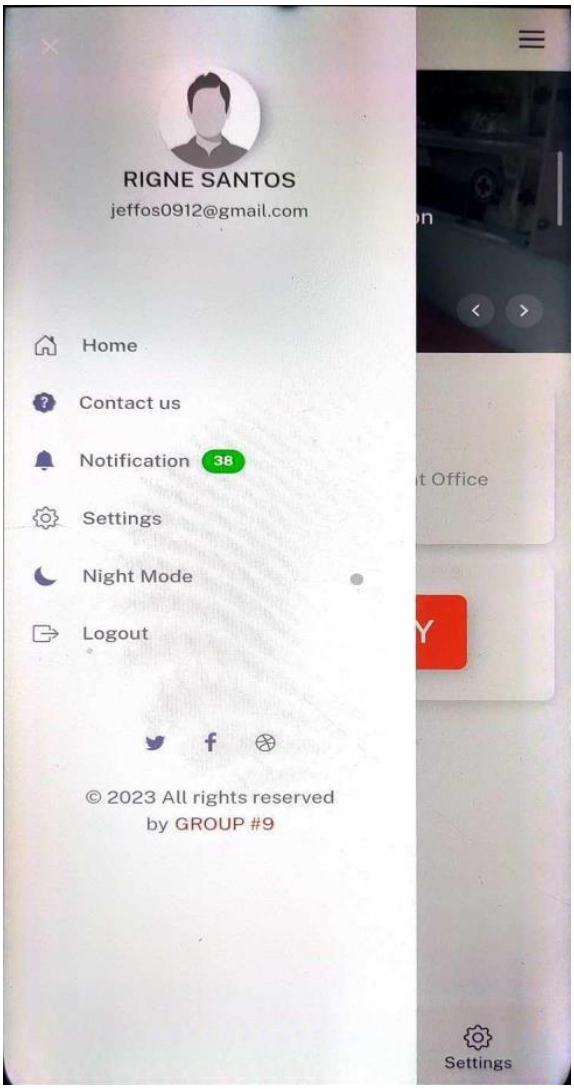


Figure 18. Menu Page

The menu of the application is at the upper right corner of the mobile phone, it is the three-line icon or hamburger button. As shown in Figure 12, it contains the photo, name, and email address of the user and also home page, contact reference, notification page, settings, night mode that can turn on and off for the user preference, logout button, and other information of the application creators.

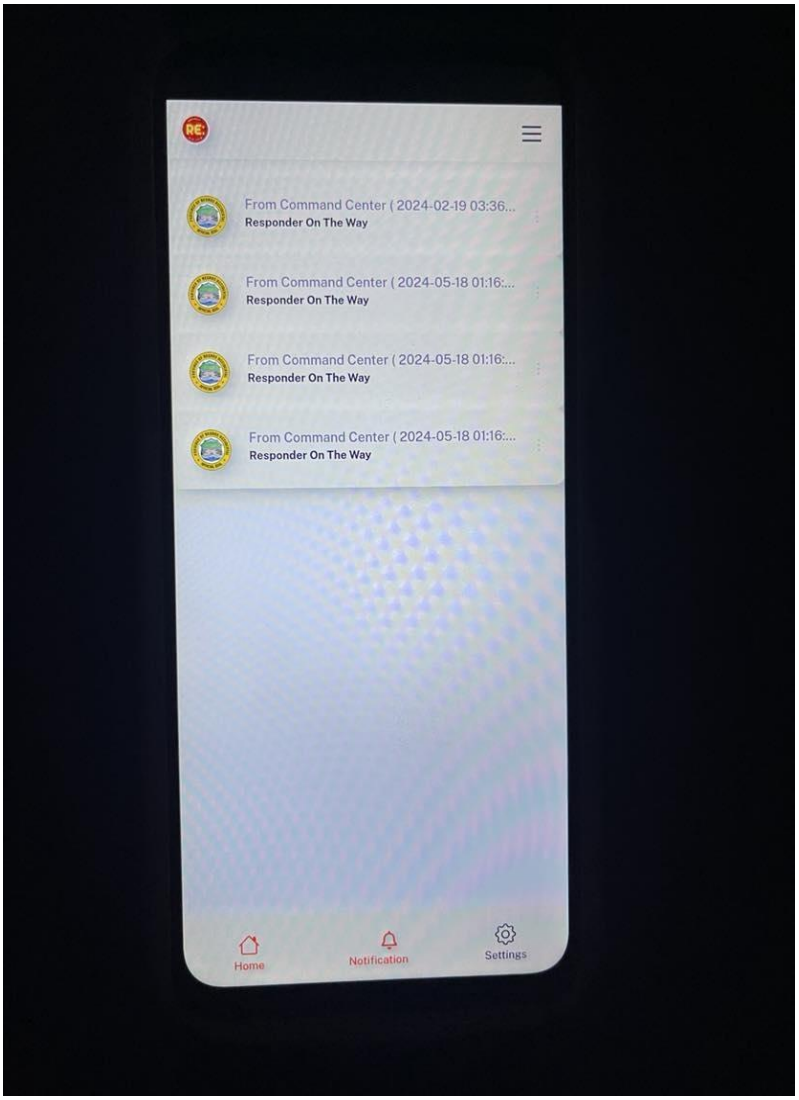


Figure 19. Notification Page

Notification page displays the information that was sent by the responders. It shows that the user's report was acknowledged, and the responders are on their way to take care of the incident.

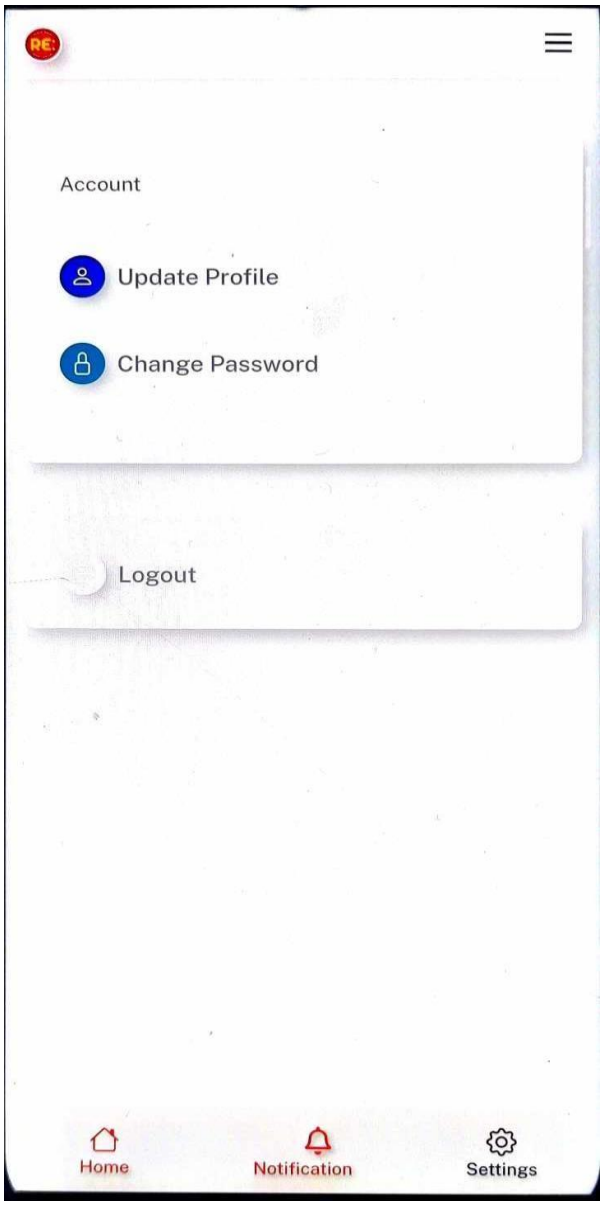


Figure 20. Setting Page

Figure 14 displays the settings. It contains the users account information such as update profile and change password of the account, and the logout button to close the account and it will return to login page.

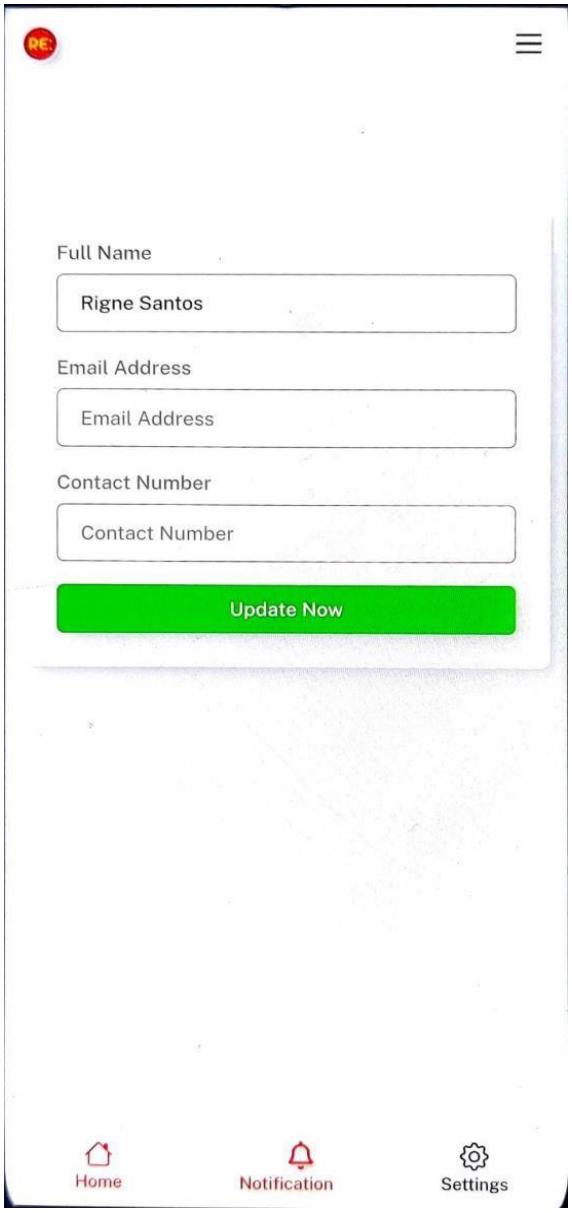


Figure 21. Update Profile Page

The update profile page is for changing the user information. The users can update their information such as the name, email address and contact number.

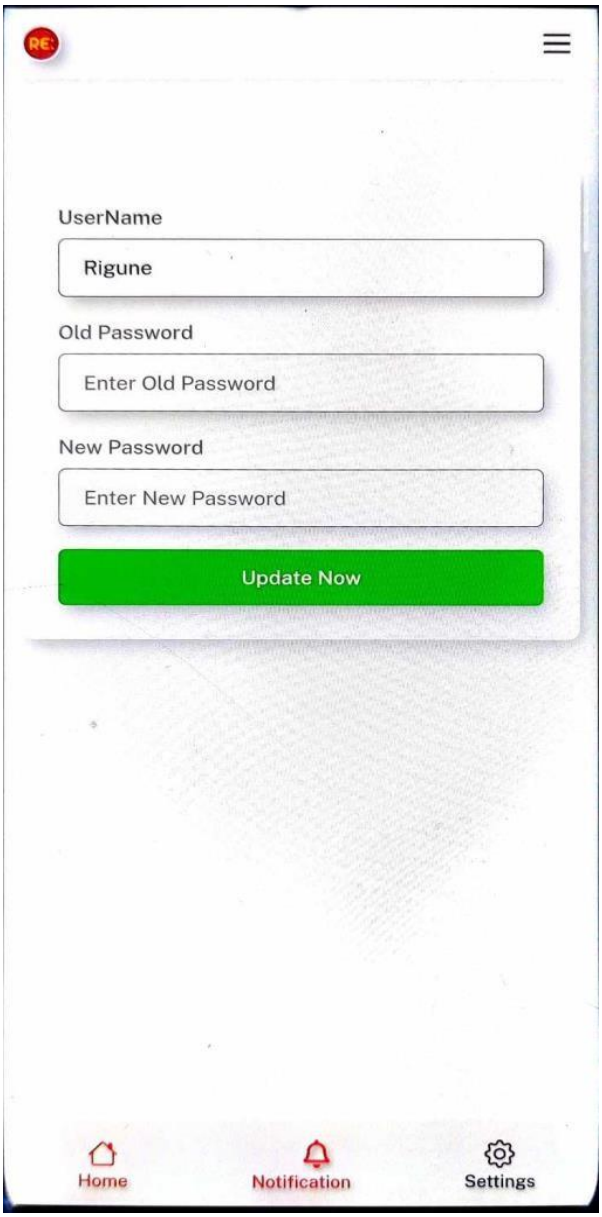


Figure 22. Change Password Page

The change password page is for updating the password of the user account. The form requires the user to input the username, the old password and the new password to update the account password.

ADMIN WEBPAGE

The Administrator manages the system, including user accounts, responder coordination, and system settings.

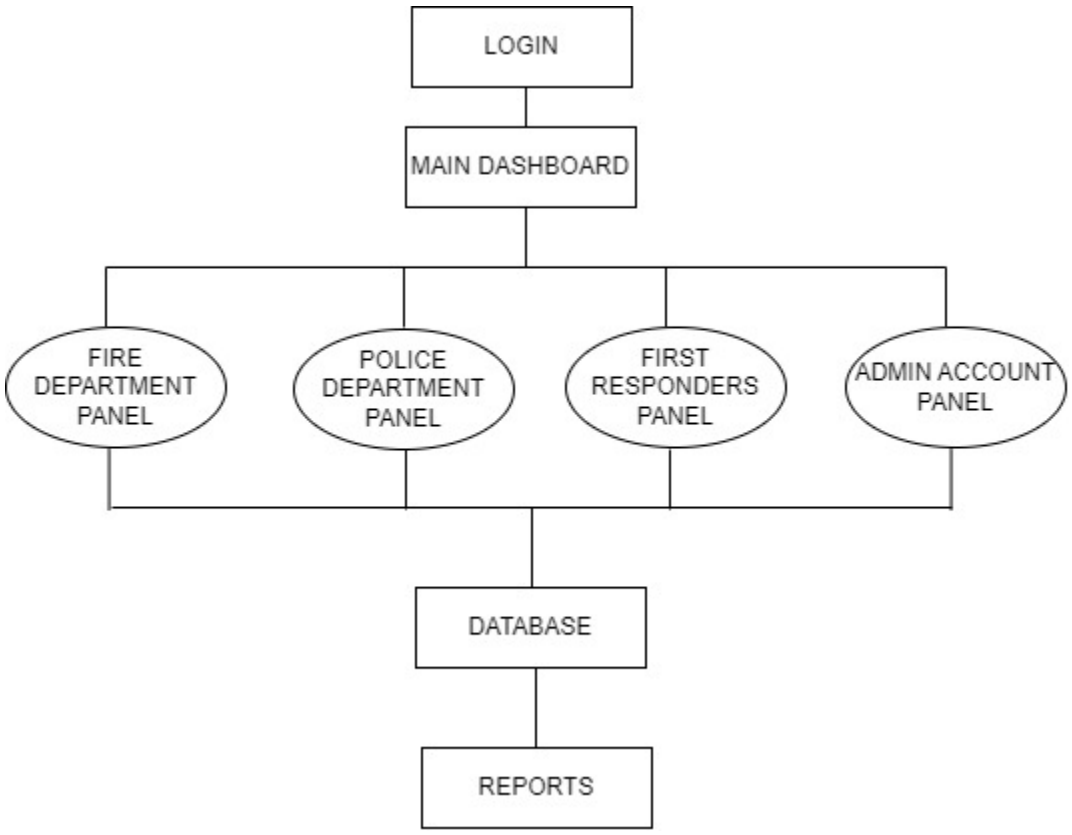


Figure 23. Admin Web Page Hierarchy

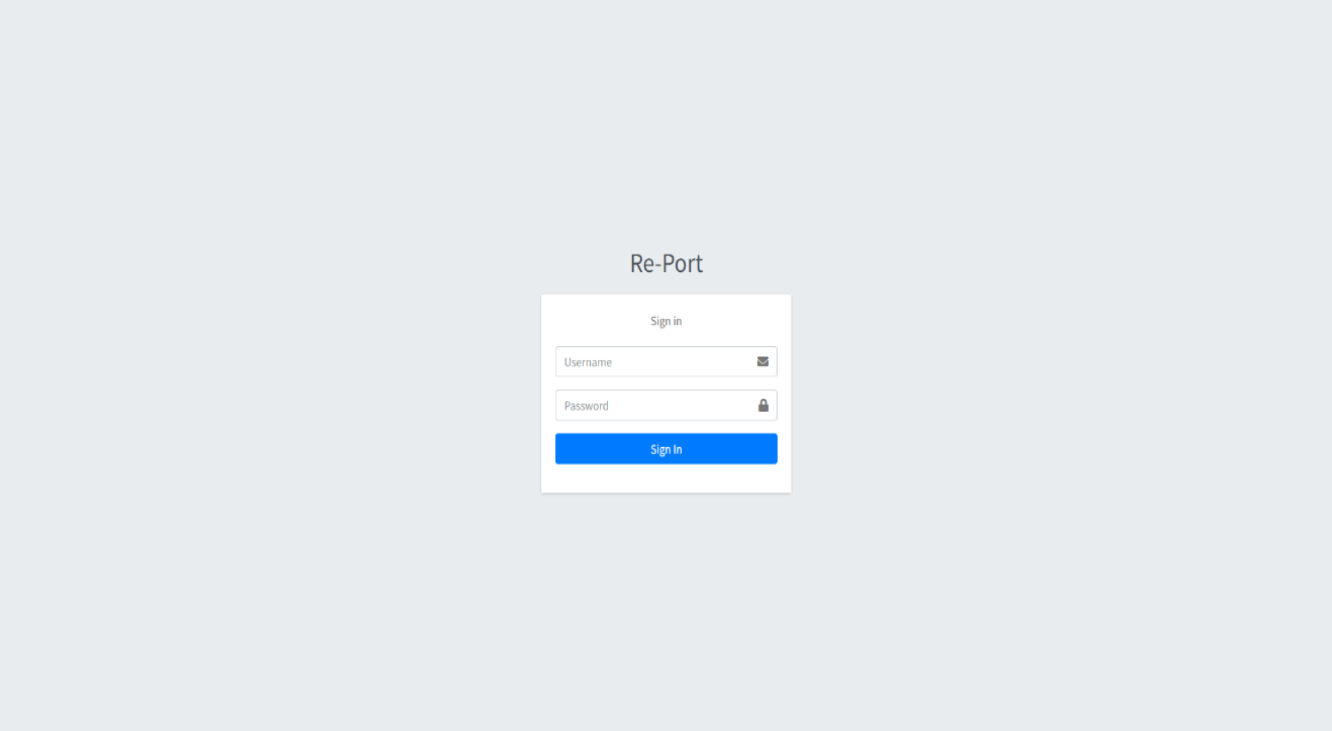


Figure 24. Admin Login Page

The admin needs to login in the webpage to access the main dashboard. It requires the admin to input the username and password.

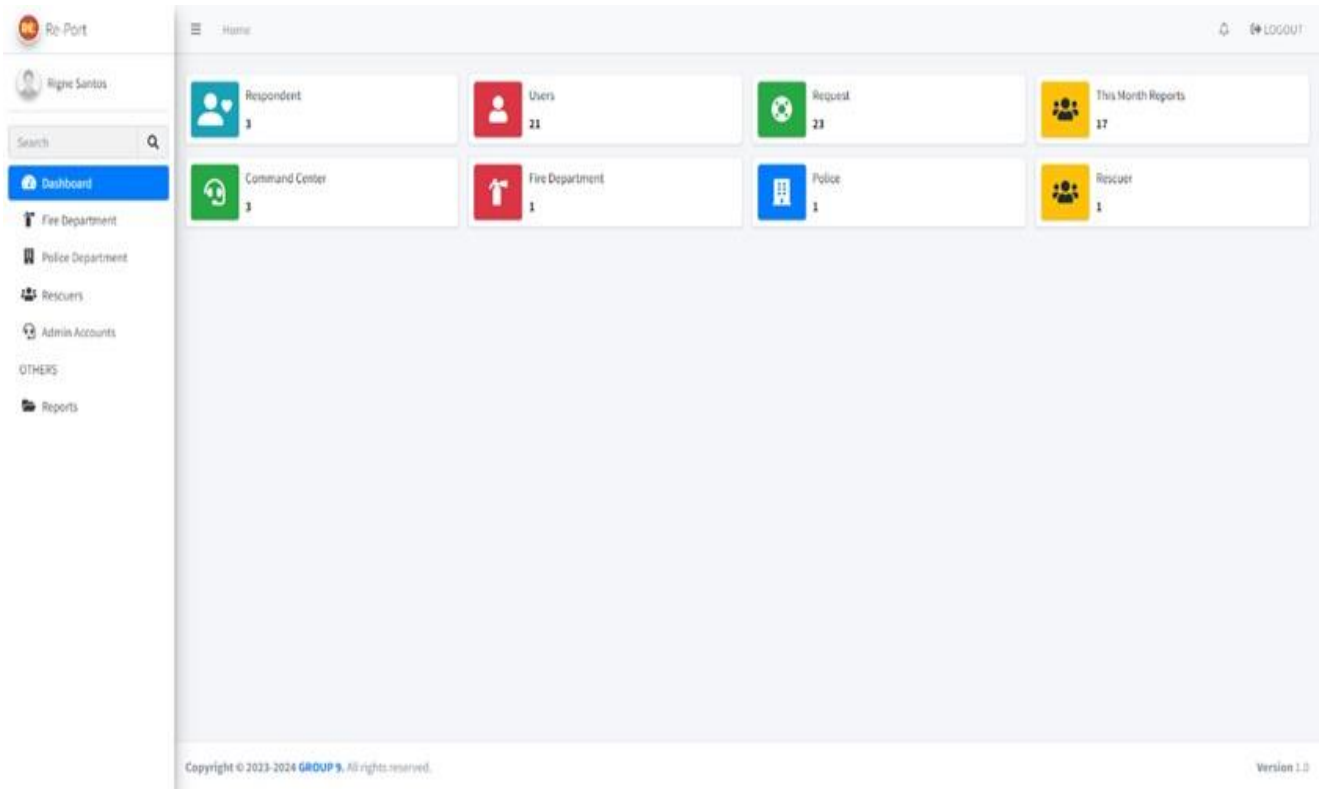


Figure 25. Main Dashboard

The Main Dashboard is the summary of the total number of reports. As shown in Figure 17, there is a list of the different departments and the number of gathered reports.

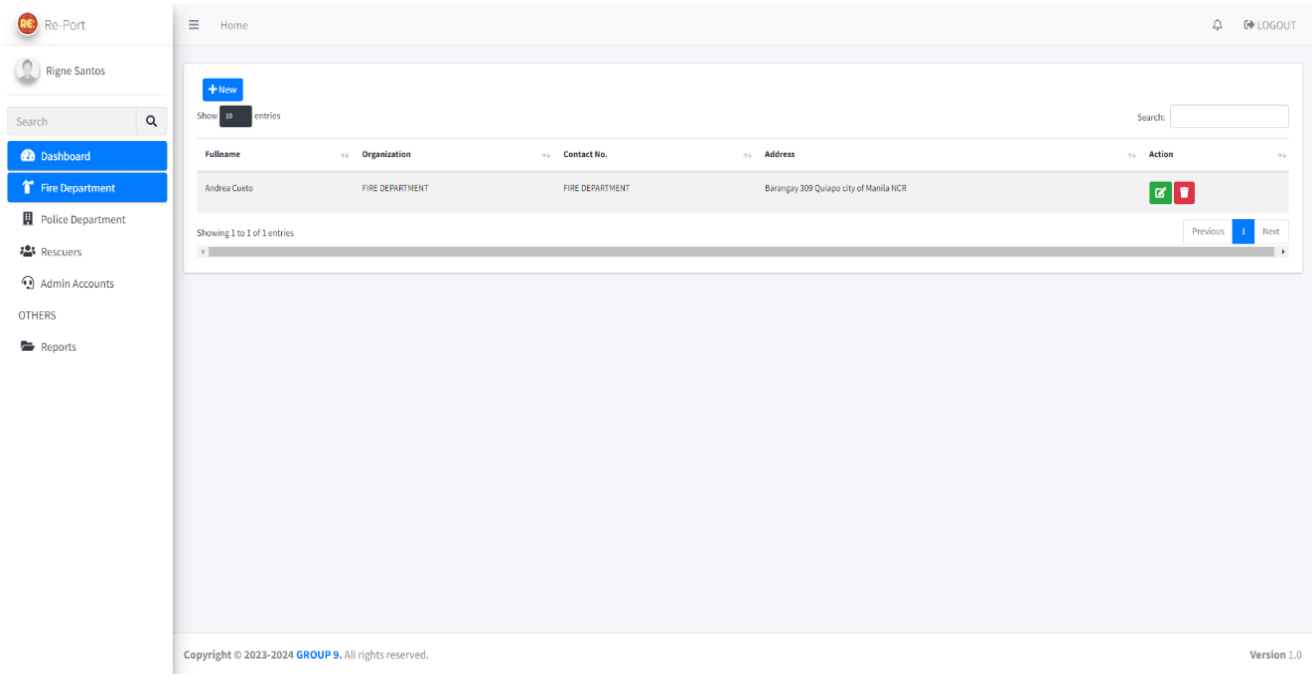


Figure 26. Fire Department Panel

The Fire Department Panel is the list of users under the fire department. In this page one can view, edit and delete the responders' information that includes their full name, organization, contact number, address and action.

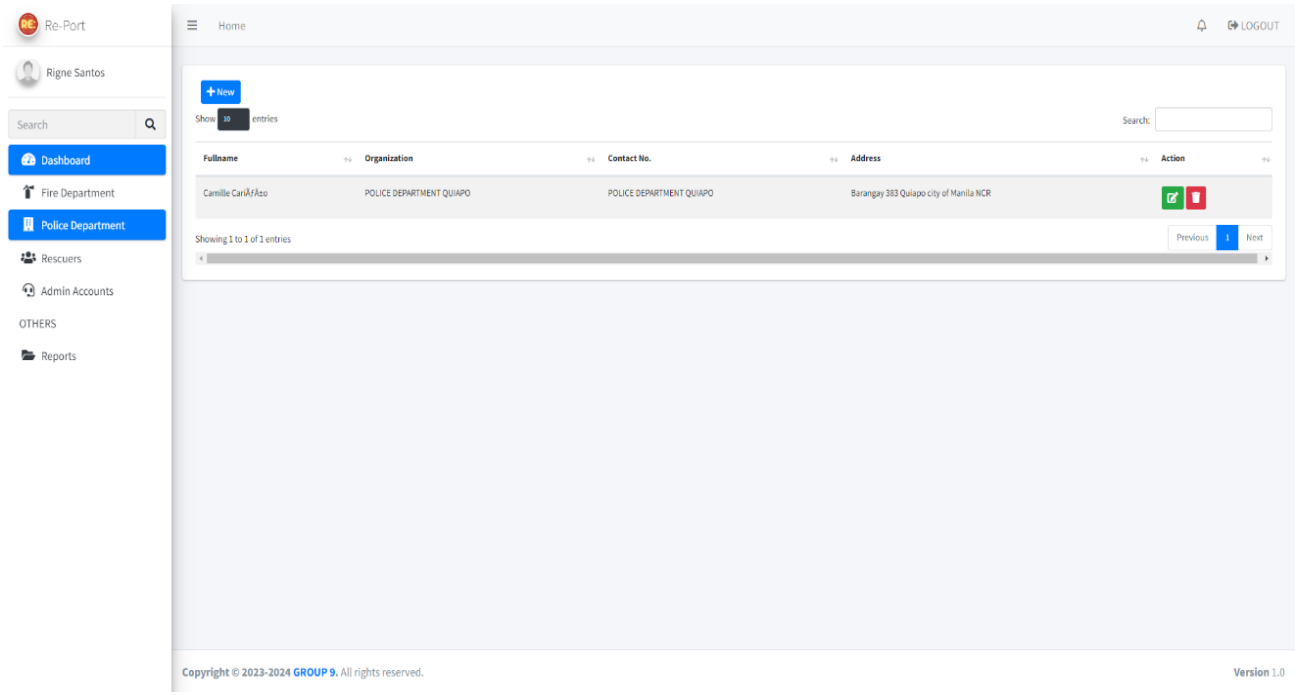


Figure 27. Police Department Panel

The Police Department Panel is the list of users under the police department. In this page one can view, edit, and delete the responders' information that includes their full name, organization, contact number, address, and action.

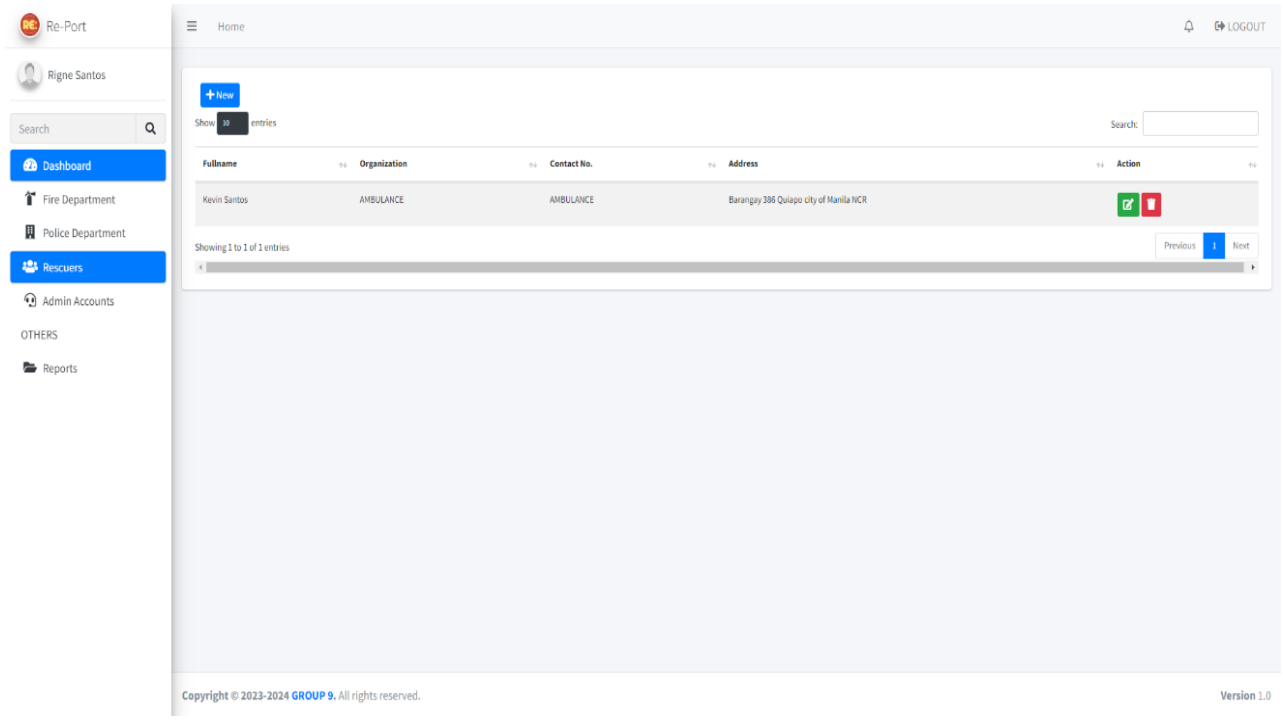


Figure 28. First Responders Panel

The Rescuers Department is the list of users under the rescuers department. In this page one can view, edit, and delete the responders' information that includes their full name, organization, contact number, address, and action.

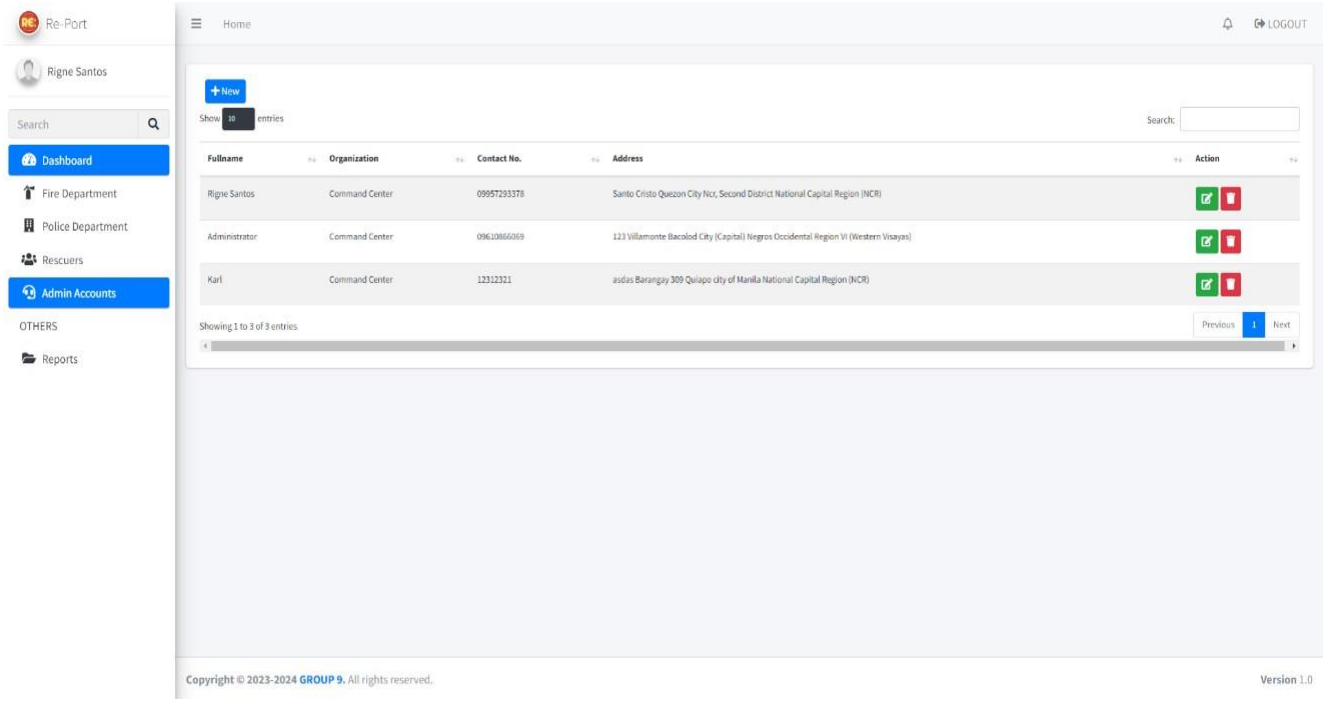


Figure 29. Admins Account Panel

The Admins Panel is the list of admin users. As shown in Figure 22, there is a list of admins who control the web page of the admin accounts.

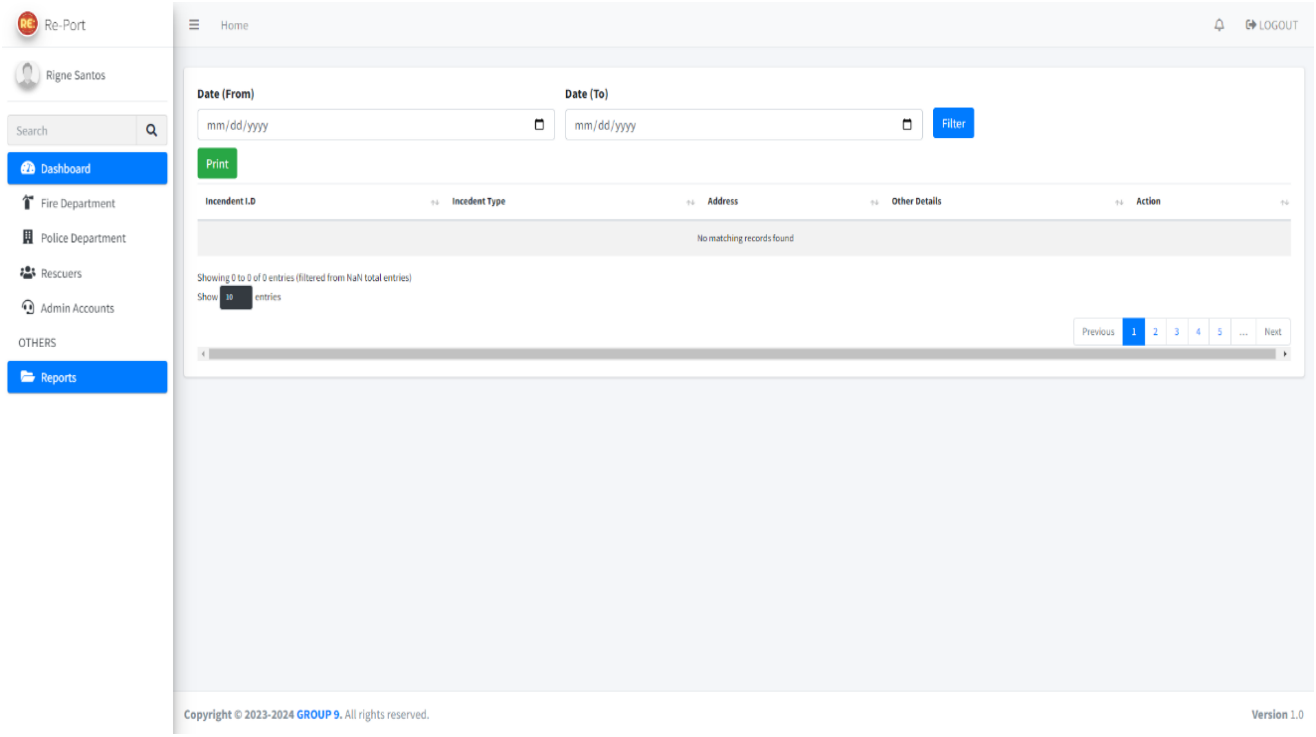


Figure 30. Reports Directory

Reports directory is the detailed summary reports from all departments. The reports directory can filter and sort the needed date of the reports in daily, weekly, monthly, quarterly, and annually basis.

Responder Web Page

The responder's system sends automated alerts and notifications to ensure timely and accurate incident reporting.

Project Capabilities and Limitations

The following are the developed system's capabilities:

1. Provides estimated time of arrival of responders.
2. Can choose responders who correspond to the type of emergency needed.
3. Facilitates incident reporting from any location and at any time using cloud-based platforms or mobile applications.
4. Allow users to attach photos and location data to their reports.
5. Implements a secure login and authentication system to protect user data.
6. Generates detailed reports and analytics for emergency response optimization.
7. Connects users directly to local emergency services.
8. Ensures the system is easy to navigate, even in stressful situations.

The following are the developed systems limitations:

1. The system is limited to android user devices.
2. The system is limited to users who do not have cellular data and wi-fi.
3. The system might not cover all types of emergencies comprehensively.
4. Limited by the accuracy and reliability of the information provided by users.
5. Potential delays in response time due to system or network issues.

Test Result

Table 10. *Test Result of the System*

Criteria for Testing	*Procedure*	*Expected Output*	*Actual Result*
Functionality	2. Open Re-Port Application/Admin Panel a. Log in page	User views the Log-in page. Once they are logged- in, depending on what type of user they are, will be directed to their respective dashboard.	Users were able to view their respective home pages for both civilian and admin users.
	3. Browse individual dashboard. a. Specific paged based on the user type. Public user/System Admin.	For Admin: They will be directed to the admin dashboard accessible by web. For Department Admin: They will only see the tabs and navigation within their reach e.g., fire reports only. For Civilian Users: Their own dashboard, for emergency reporting.	For Admin: Successfully directed to admin panels with no errors. For Department Admin: Only specified panel for the department admin are viewable. For Civilian Users: Successfully directed to civilian emergency home panel.
	4. Access Emergency button. a. Main dashboard. b. Tap Emergency button.	For all Civilian users: Will be able to file emergency report using a specific report category and optional info and photo.	For all Civilian users: User can file emergency reports despite some situational problems, such as bad internet connection (slow processing of report).
	5. Log in as Admin. a. Access Admin panel b. Enter the username and password. c. View Data specific by departments d. Add New Data e. Update Data f. Delete Data	If the log in was successful, the admin can now view the admin dashboard which consists of: • General specification • Fire Department • Police Department • Rescuers • Admin Accounts • Report list	Login was successful and panels were available which consist of: • General specification • Fire Department • Police Department • Rescuers • Admin Accounts • Report list
	6. Log in as Department Admin. a. Access Admin	If the log-in was successful for the Department Admin can now view the dashboard which consists of:	Login was successful and panels were available which consist of:

	Panel b. Enter the username and password. c. View Data d. Add New Data e. Update Data f. Delete Data	• The main dashboard • *Reports* under the department specifics	• The main dashboard of the specific department • Reports under the department
	7. Logged in as Civilian User. a. Access Re-Port Application b. Enter the username and password. c. View Report History d. Add New Report e. Update Data	If the log in is successful for the Employee can now view the Employee dashboard consist of: • Profile Account • Create Report • Report History • Update Profile	Login was successful and panels were available which consist of: • Profile Account • Create Report • Report History • Update Profile
Security	8. Turn off JavaScript feature in the browser setting. a. Access Admin Panel b. Turn off java scripts	The system can only be accessed on devices that have their JavaScript settings on. Otherwise, the system will be showing an error, or the site will not be viewable.	System did not run on any web device if JavaScript is not enabled. System is set to run only with JavaScript enabled, otherwise the page would only return a blank or a prompt that says enable JavaScript.
	9. Encrypted Account Passwords. a. Access Admin/User Panel b. Dashboard c. View Reports d. Add New Data e. Update Data	The system uses a password hash to encrypt account password when data passes onto the database to prevent viewable access. Passwords are also censored during login to prevent leak and unwanted access.	The system successfully hashed a registered password in the database to prevent unauthorized access.
	10. Designated homepage for all users of the system. a. Access Admin/User Panel	Depending on the account type, the user will only be directed to their specific home page or dashboard to prevent unauthorized access or modification.	The system only directed the user to their specified home pages without fail.

	Automatically end session or log out. d. Access Admin Panel e. Enter the username and password.	If the user were to go idle for too long due to forgetting to logout or AFK reasons, the system will automatically logout for a specified time.	The system sometimes does its intended purpose of logging out when idled for too long, but on some device it does not.
Dashboard	12. Friendly User-interface. a. Access Admin/User Panel b. Enter the username and password. c. Dashboard	The configuration of the panel and the application are easy to navigate with understandable tabs and buttons.	The system was successfully logged in. On both user scenario as civilian and admin user, the configuration panel did its job of being a user-friendly interface.
Usability	13. Identity of Buttons. a. Access Admin/User Panel b. Enter the username and password. c. View Buttons d. Add New Buttons e. Update Buttons	Each button has symbols, icons, and words to easily identify the function, (e.g., Sign In, Sign Out, View, Add New, Update, delete buttons have respective symbols to make it easier for the users to identify the function.)	The buttons in the system all have labels for the user‘s convenience to know its functions and not to guess.

Project Evaluation

The developers have accumulated a total of 35 respondents to determine if the criteria of the planned system have been met and qualified for general use through the satisfaction standards of ISO 25010.

Table 11. *Accessibility Weighted Mean Results*

Mobile Application Evaluation		
Accessibility	**Weighted Mean**	**Equivalent**
1. The RE-PORT app has all the features needed for emergency reporting.	**4.31**	**Highly Acceptable**
2. The RE-PORT app provides accurate results when used.	**4.59**	**Highly Acceptable**
3. The RE-PORT app's features are easy to use for reporting emergencies.	**4.55**	**Highly Acceptable**
4. The RE-PORT app supports reporting for all types of emergencies.	**3.91**	**Acceptable**
5. The RE-PORT app's alerts and prompts make reporting easier.	**4.28**	**Highly Acceptable**
Criterion Weighted Mean	**4.34**	**Highly Acceptable**

Table 11 shows the evaluation of the system in terms of its accessibility using the ISO 25101 standards. The result established the overall accessibility of the system to the testers. It yielded a high satisfactory rating (w=4.34) when it comes to the features that the system can its intended functions.

Table 12. *Aesthetic Weighted Mean Results*

Aesthetic	**Weighted Mean**	**Equivalent**
1. The RE-PORT app looks attractive and pleasant.	**4.44**	**Highly Acceptable**
2. The RE-PORT app is well-organized and easy to navigate.	**4.57**	**Highly Acceptable**
3. The RE-PORT app's design elements are consistent throughout.	**4.31**	**Highly Acceptable**
4. The RE-PORT app's colors and graphics are appealing.	**4.22**	**Highly Acceptable**
5. The RE-PORT app uses fonts and icons that are easy to read and understand.	**4.46**	**Highly Acceptable**
Criterion Weighted Mean	**4.00**	**Highly Acceptable**

Table 12 displays the evaluation result of the system based on its design and how easy it is for the users to use. The result shows a high satisfaction rating (w=4.00) when it comes to being user-friendly with its functions simplified and aesthetically pleasing.

Table 13. *Portability Weighted Mean Results*

Portability	**Weighted Mean**	**Equivalent**
1. The RE-PORT app is easy to install on Android mobile devices.	**4.14**	**Acceptable**
2. The RE-PORT app works well on Android mobile devices.	**4.56**	**Highly Acceptable**
3. The RE-PORT app works efficiently on both mobile networks and Wi-Fi.	**3.80**	**Acceptable**
4. The RE-PORT app can be easily updated and maintained.	**3.25**	**Acceptable**
5. The RE-PORT app conforms with portability requirements.	**3.66**	**Acceptable**
Criterion Weighted Mean	**3.88**	**Acceptable**

Table 13 shows the evaluation result (w=3.88) of the system based on its portability on specific devices and environments. The test yielded a mixed result resulting in a lower satisfactory rating compared to the previous tests. The portability of the system did not fully satisfy the primary criteria of the evaluation, thus, improving the system and adding current limitations and future recommendations.

Table 14. *Engagement Weighted Mean Results*

Engagement	**Weighted Mean**	**Equivalent**
1. The RE-PORT app encourages user interaction and engagement.	**4.35**	**Highly Acceptable**
2. Users are likely to keep using the RE-PORT app over time.	**4.37**	**Highly Acceptable**
3. The RE-PORT app includes features that make it engaging and interesting to use	**4.14**	**Acceptable**
4. The RE-PORT app motivates users to report emergencies promptly with clear and accessible emergency reporting features.	**4.43**	**Highly Acceptable**
5. Users receive alerts and notifications in a timely manner to keep them informed about emergencies.	**4.49**	**Highly Acceptable**
Criterion Weighted Mean	**4.36**	**Highly Acceptable**

Table 14 shows the evaluation of the system based on the testers' engagement and response to it. The test favored high satisfaction rating (w=4.36). The system performed well enough for the users to be kept engaged and test out all features.

Table 15. *Functionality Weighted Mean Results*

Functionality	**Weighted Mean**	**Equivalent**
1. The RE-PORT app works without failures or errors.	**4.31**	**Highly Acceptable**
2. The RE-PORT app uses resources efficiently and performs well.	**4.59**	**Highly Acceptable**
3. The RE-PORT app protects user data and privacy.	**4.55**	**Highly Acceptable**
4. The RE-PORT app loads quickly and responds to user actions without delay.	**3.91**	**Acceptable**
5. The RE-PORT app handles many users and high traffic without slowing down.	**4.28**	**Highly Acceptable**
Criterion Weighted Mean	**4.33**	**Highly Acceptable**

Table 15 presents the evaluation result based on the functionalities exhibited by the system. The test emphasized its capacity to do its intended purpose with little to no errors. The result yielded a high satisfactory rating (w=4.33) with a high margin of successful test runs of the system.

The result of the entire evaluation was tallied and statistically computed for a better emphasis and understanding of the score. The evaluation yielded a grand weighted mean of 4.18 for the system. The findings indicate that Re-Port emergency response and alert perform well despite the limitations currently present in the system. Some areas of the system were recorded for improvement, especially on the systems portability on different kinds of devices and the addition of better and advanced features.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter provides the summary of findings, conclusions, and recommendation based on the given resources and evaluation.

Summary of Findings

Based on the following facts that this study aimed to evaluate, Re-Port Emergency Alert and Response System is a system developed to efficiently create real- time reports of incident, and emergency events, providing a smooth and remarkable experience in times of need. In addition to maintaining data confidentiality and identification that prevents unauthorized access, the system effectively protects user data by sporting a good security counter measure. The system was successfully tested in different android platforms for the mobile application and is tested without major flaws in several web browsers. After a thorough demonstration of the system to the respondents, it was proven that the system met the basic founding criteria of the study.

The system was evaluated by 35 respondents consisting of 20 civilians, 5 fire fighters, 5 police, and 5 first responders. The evaluation of the system provided significant insights of the system's flaws and area of improvement. Highly noting the current Portability of the system could use a major rework to support wider platforms. Despite the obvious flaws of the system, it received a high satisfaction rating when it comes to the users' overall experience of using the system. From its Accessibility and Functionality that testers have reported, the system is easy to install regardless of their device's version of android and the ease of use when it comes to the features.

Conclusions

Based on the following criteria that were set for this study and the result from the evaluation of the system, the following conclusions were drawn:

1. The system's design and functions developed by the researchers are working as intended, despite the countable flaws that were discovered by both the testers and the developers during the evaluation, the system still held its intended purpose and following features:

    a. The system's interface design is as straightforward as possible, delivering precise instruction to the user and avoids confusion.

    b. The system integrates a password encryption that uses hash to enforce its security over the system login and access.

    c. It automatically flags the signal location from where the user sends report, and from where departments receive them.

    d. Use of mobile application for the creation of reports and a web- based admin system for the responders for better monitoring and response.

    e. Delivery of estimated details for every report made.

2. The system was developed using PHP, JavaScript, JQuery and Ajax. The web system was hosted using NameCheap Hosting and is by Stellar Plus domain.
3. In the evaluation of the system using ISO 25010 standard, the system was able to meet the set criteria to its Accessibility, Portability, Aesthetic, Security, and Functionality with a grand weighted mean of 4.18, a high satisfaction rating. The system can be deployed with an exception that the system be under monitoring for further improvements and maintenance.

Recommendations

Based on the study's findings and solution, the following recommendations are put forward:

1. Widen the application's portability for other devices such as desktop and iOS devices.
2. Enable the system to be used with little to no data consumption.
3. Simplify the interface further for less interaction required for reporting.
4. Add multi-language support to make the app accessible for different nationality.
5. Improve interface design for ease of use and appeal.
6. Report button bypasses media picker directly to camera for faster report making.
7. Provide users with emergency instructions such as safety tips.
8. Integrate machine learning for image identification further reducing the amount of task needed to make a report.
9. Social networking platform for an interconnected pool of users based on emergency and report activities functioning like Facebook, Instagram, etc.
10. Notification update for the user that allows for a real-time update of the report created, e.g., the situation has been resolved, etc.
11. Wider area of responsibility for a bigger scope of responders available for application and website usage.
12. Better map API for faster geolocation tracking while improving accuracy and reliability when reporting.

APPENDIX

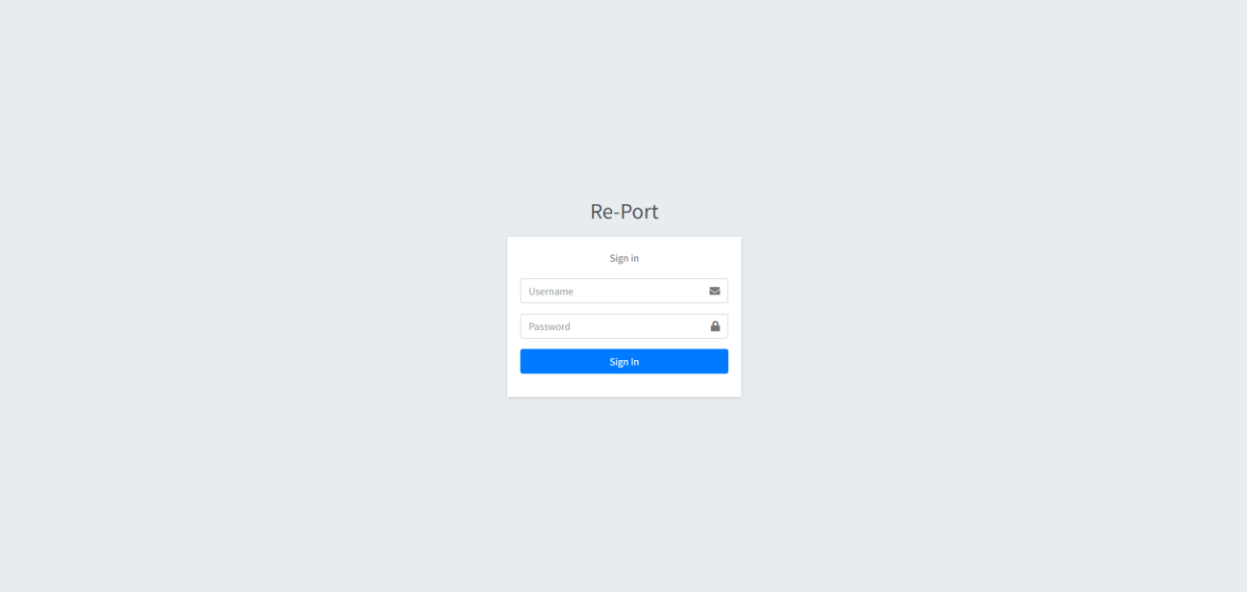
APPENDIX A

User's Manual

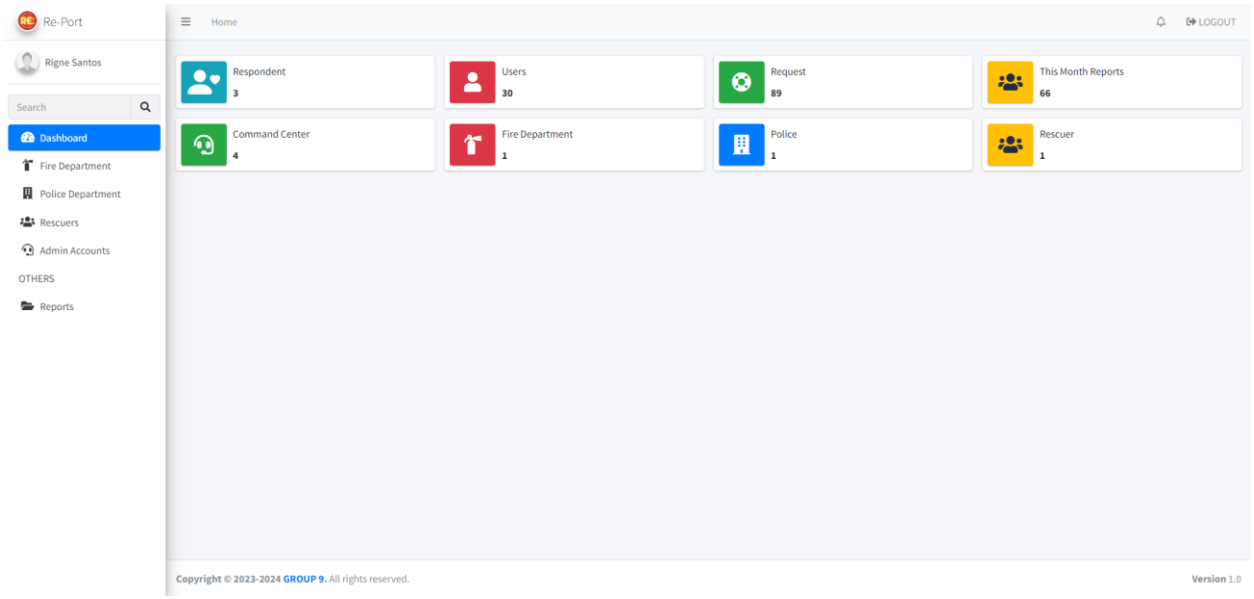
This user manual will serve as a guide for the users, both general public and authorized admins who would use the system. This contains a brief step-by-step instruction on how to use the system and help access the platform.

ADMIN LOGIN PAGE

The web system can be accessed by two types of users: a control admin and department admin. On the application, the general public, mainly civilians have complete access of use of it. The Control Admin is the one who regulates the profiles and accounts being active and used on the website, they oversee the ones that facilitate each admin's department. They can add/remove users, access all department's report database and modify system configuration. A Department Admin has the same access as the Control Admin, but s(he) is are not allowed to add/remove users, not change the system configuration. Lastly, the public users who are catered using the application, can make and send reports of emergencies at their convenience.



ADMIN DASHBOARD

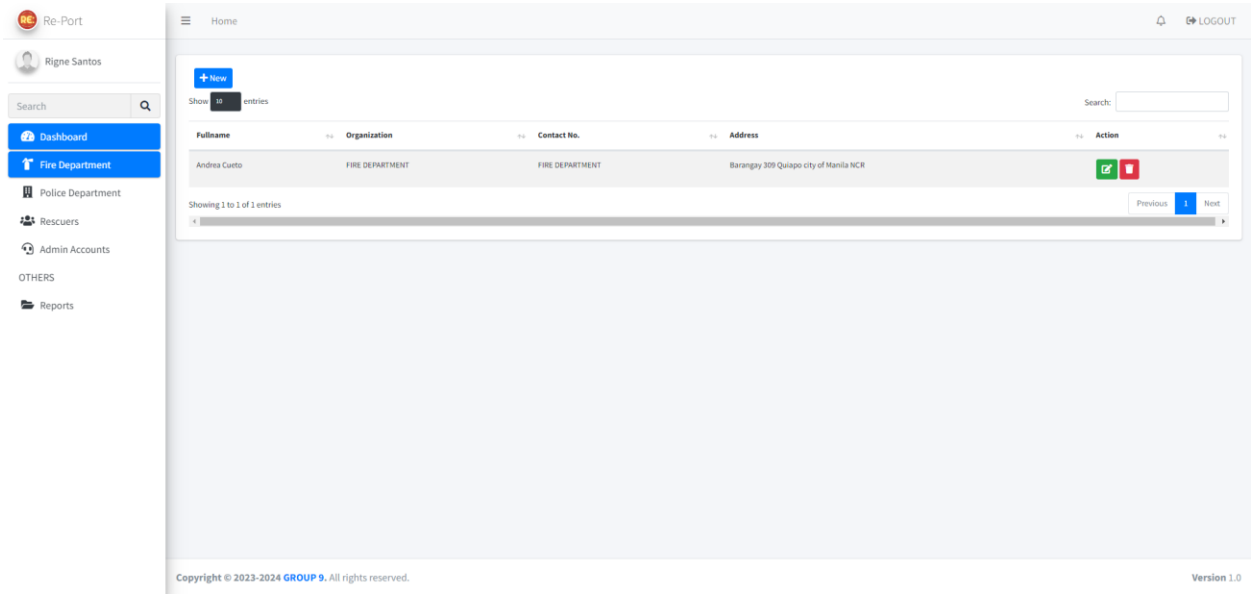


This is the Control Admin's main home panel. The admin will be able to see the general data available in the system once log in is successful. Number of responders registered, public users, reports pending, monthly reports, other control admin count, and the departments registered in the system.

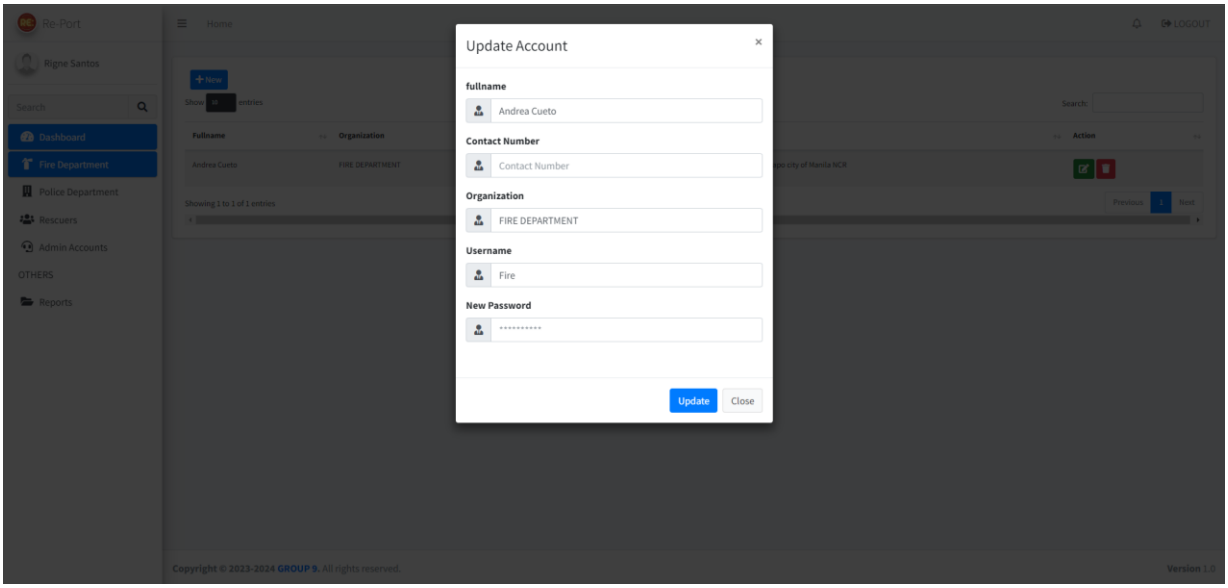
On the side of the panel are the tabs available for selection based on what the admin needs to do. The sidebar consists of the departments and other control admin accounts panel and the reports list where all reports from different departments are compiled.

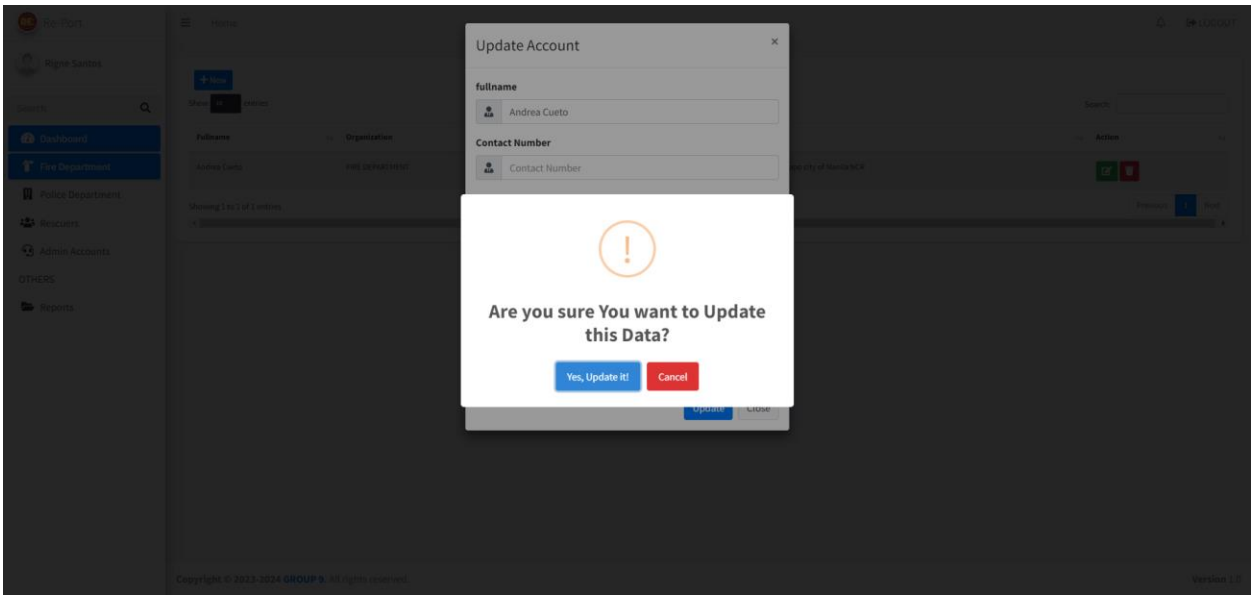
DEPARTMENT MODIFICATION

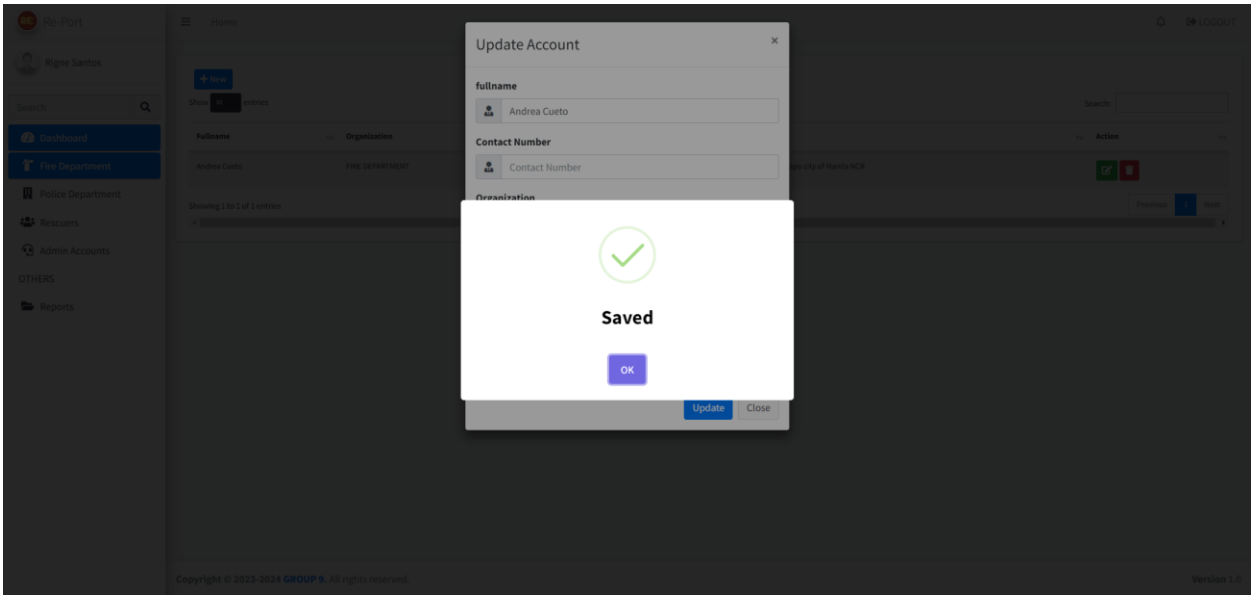
Control Admin can add/remove/modify any department users as they wish, provided that the department user has been notified of the modification being carried out. This activity can be done through all available departments.



Once changes are in place, the system will ask for verification followed by a confirmation about the changes made on the profiles selected. It will then reflect the next time the users log in or if the system or browser is refreshed.

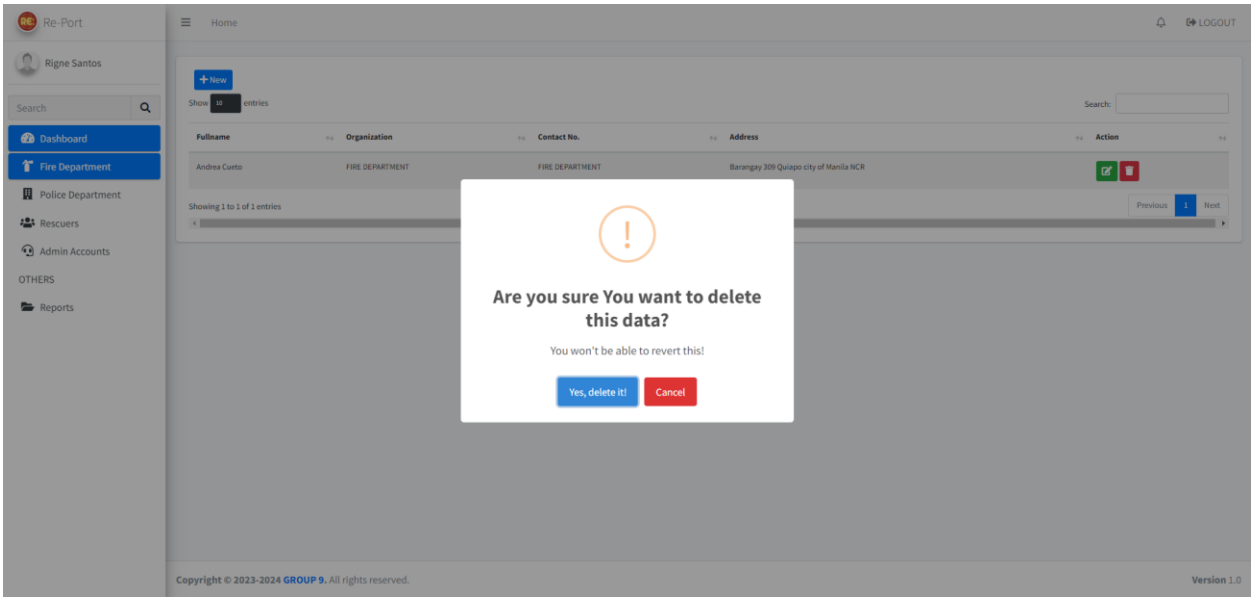


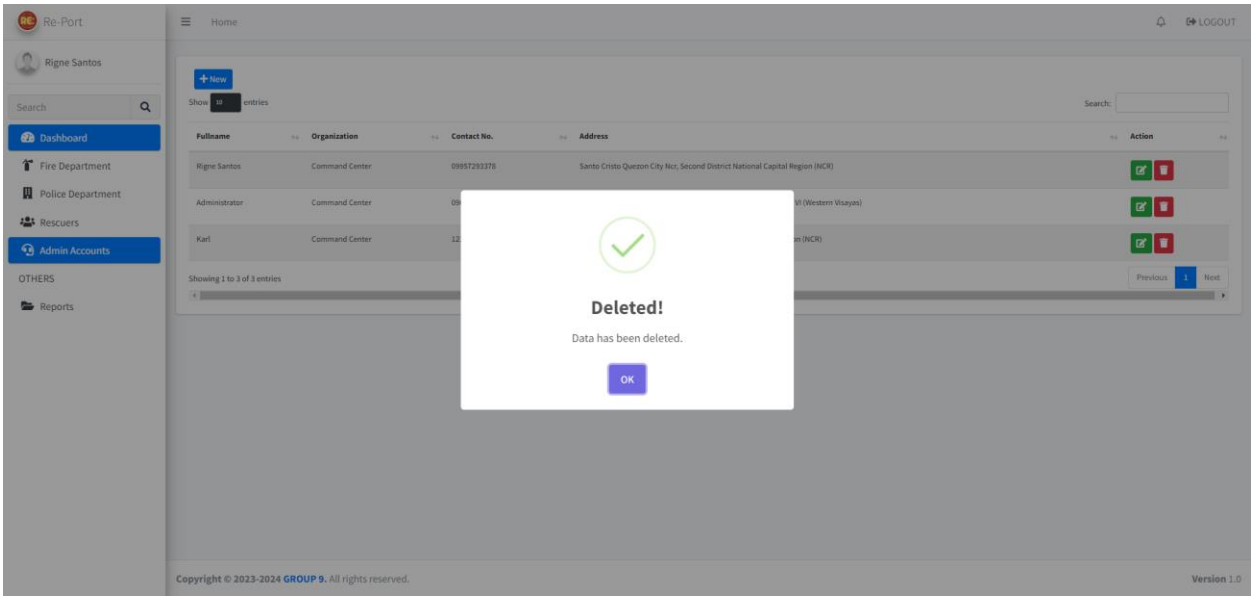




Admin will be prompted to confirm the changes after which will receive a notification of the changes and will be brought back to the previous panel.

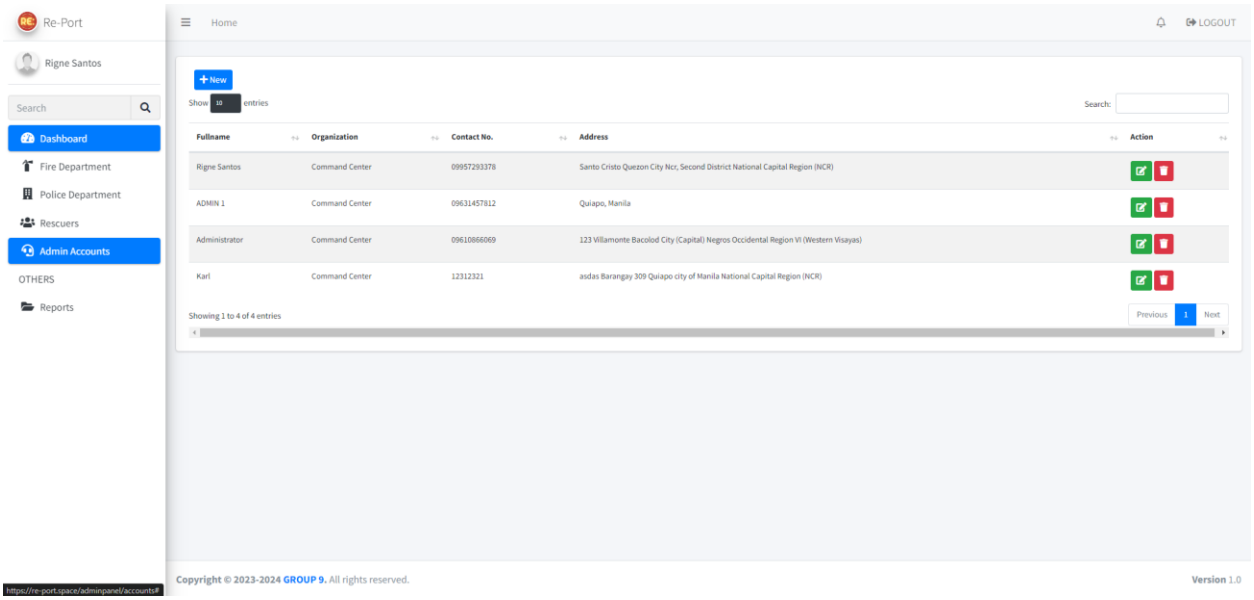
Should the control admin opt for the deletion of an account, a new prompt will show and will ask for confirmation of the action.





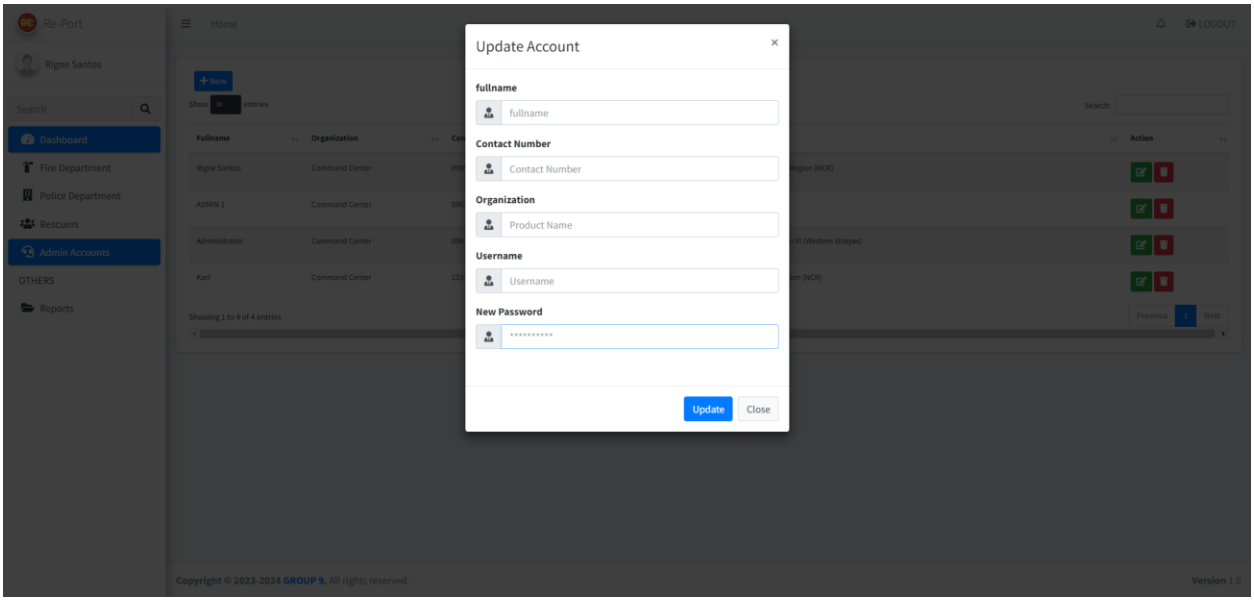
Once deleted, the account can never be recovered as recycling repository for the system is yet to be established. Either way, account creation is easier than to recover.

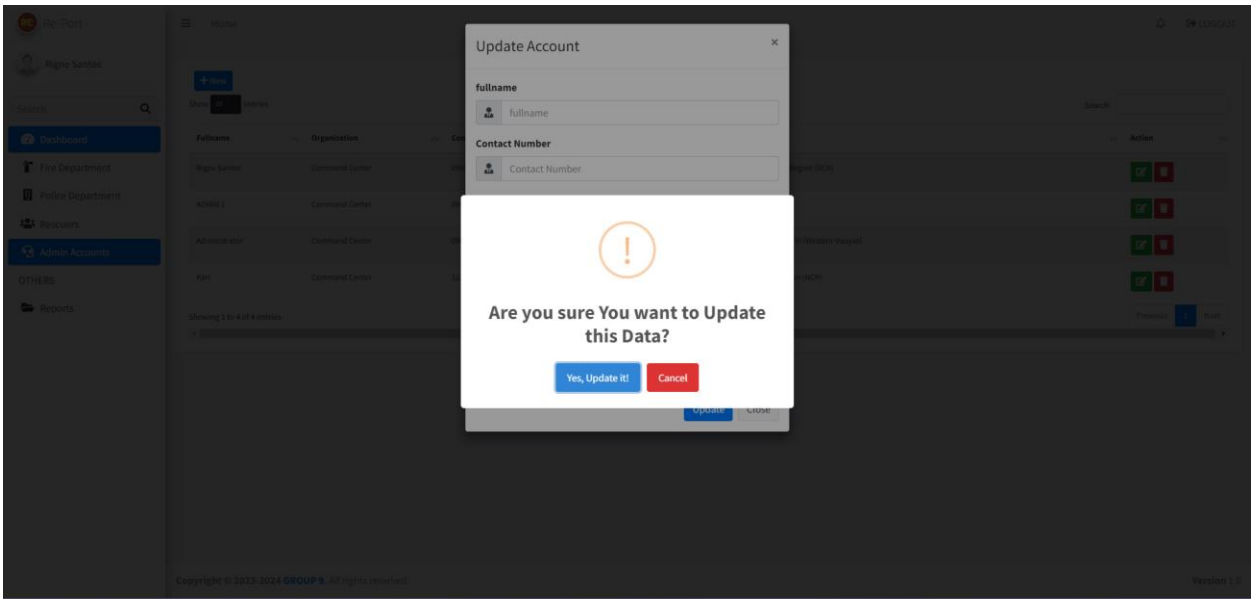
CONTROL ADMIN ACCOUNT

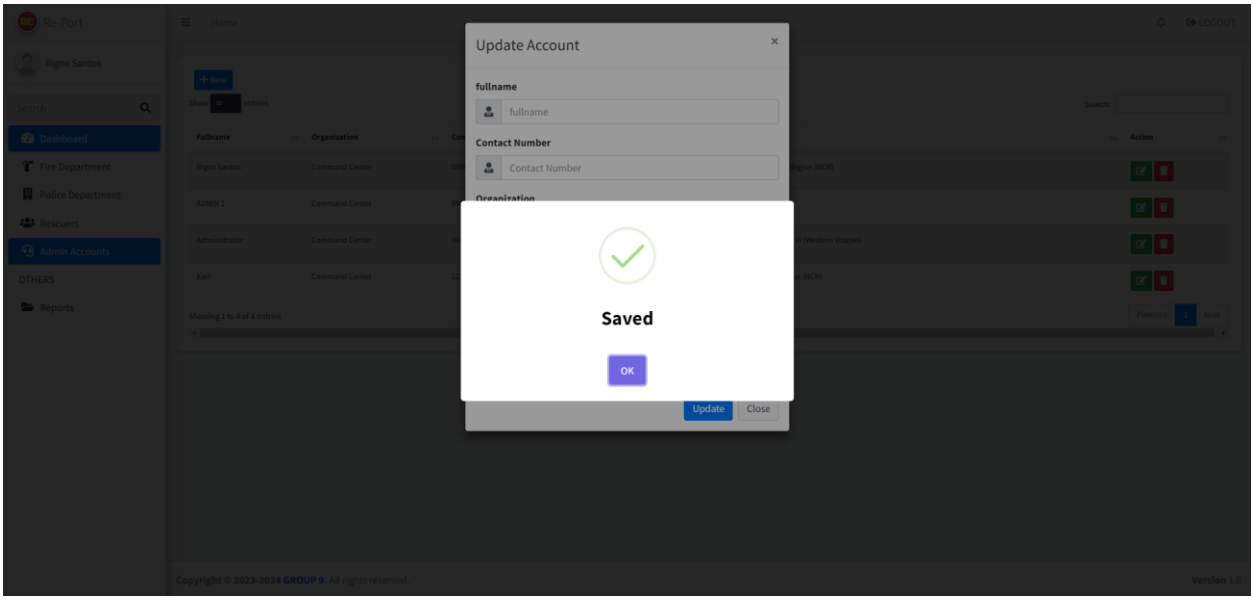


This page shows the list of active control admins within the system. Profiles can be added, modified, or deleted in this panel. Although the action can be done quite easily, any activity that takes place within control admin modification is recorded in the system's logs and can be viewed for inspection or potential investigation.

The same prompt from the department admins is also used in this scenario:

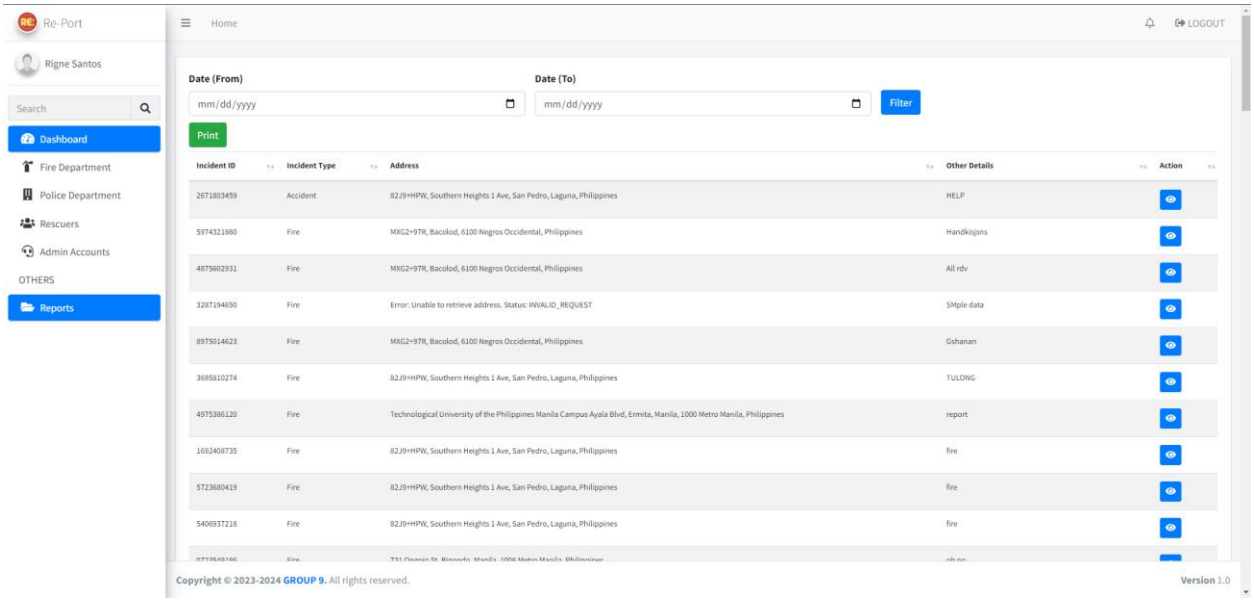



Update Account
fullname
fullname
Contact Number
Contact Number
Are you sure You want to Update this Data?
Yes, Update it!
Cancel


Update Account
fullname
fullname
Contact Number
Contact Number
Saved
OK
Update
Close

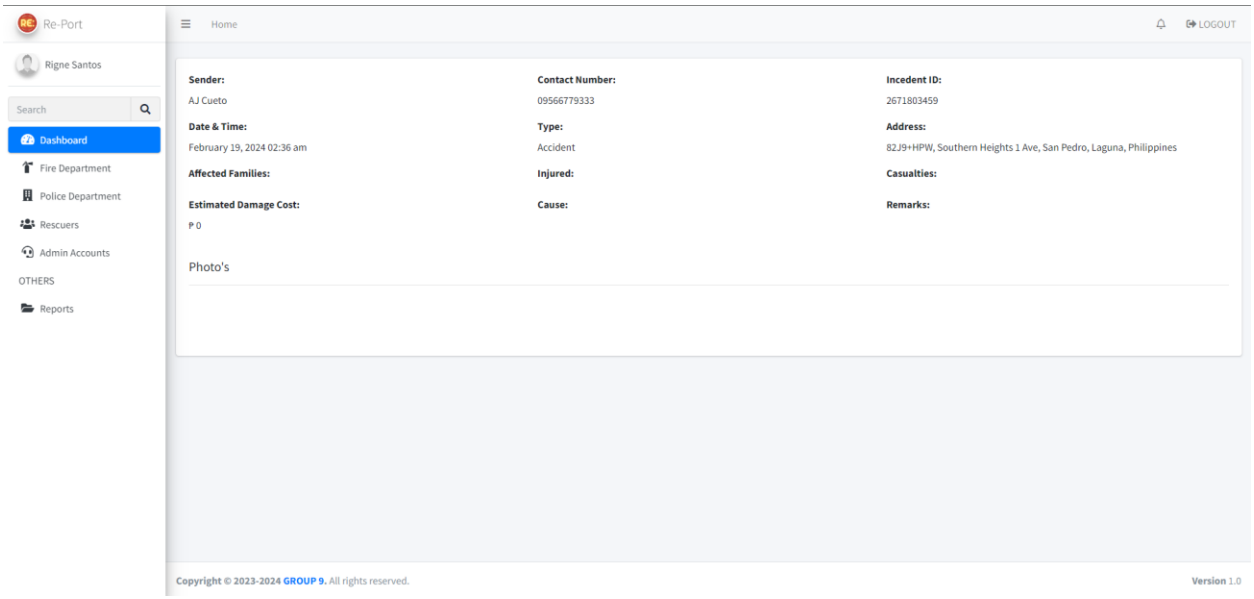
REPORTS DIRECTORY

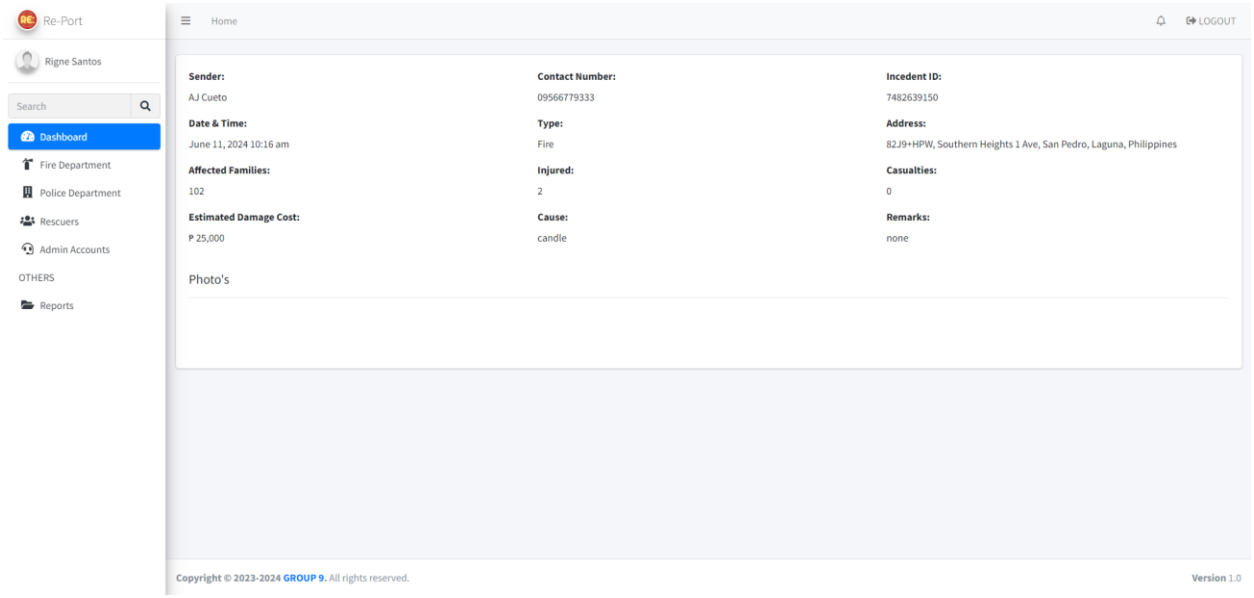
In this panel, the reports are compiled and are sorted based on the most recent time it was created. The page allows for the reviewing of the incident and also provides the option for the report details to be printed for a physical copy.



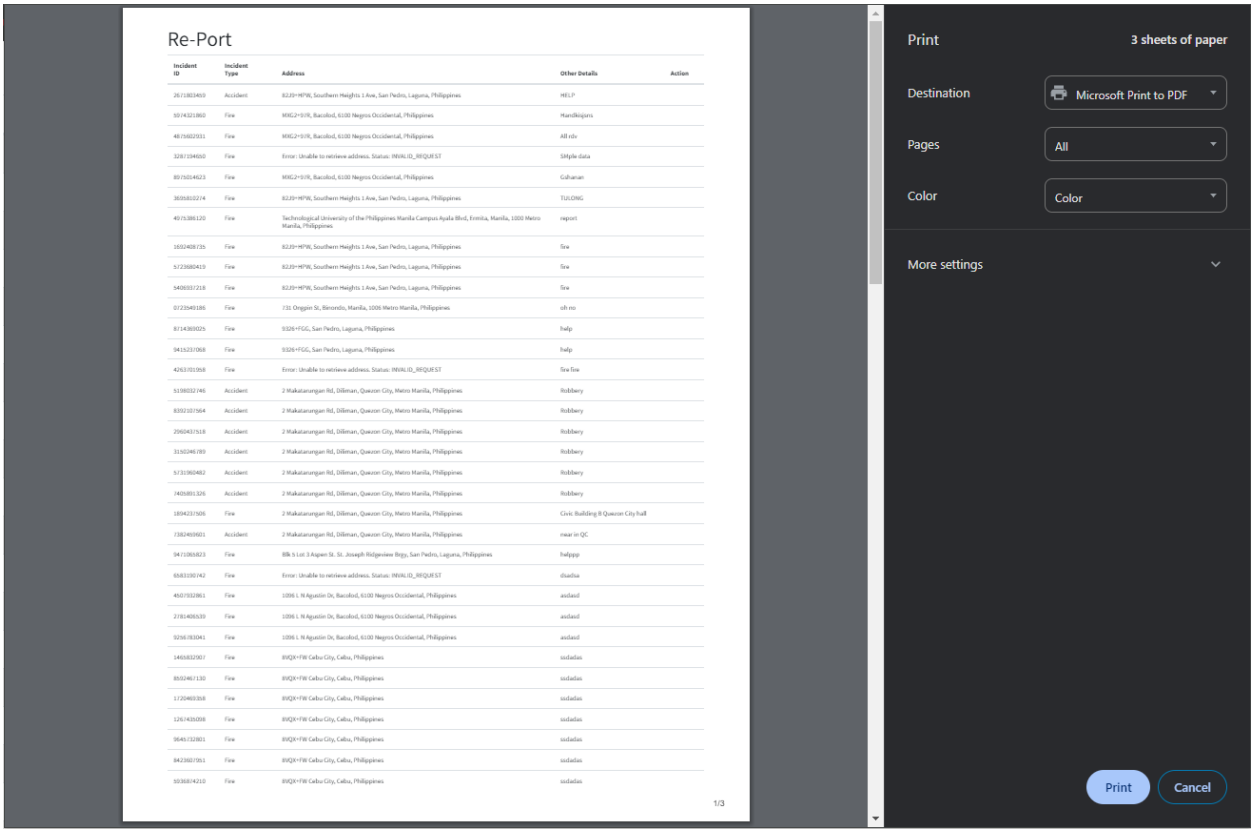
Each report has its own unique identifier for better management and sorting. This helps when a particular report is needed, an admin can use the identifier to quickly find the report and not have to rummage around the reports database.

The report once viewed have details that consists of the reporter's name, contact number, date and time of the report, type of accident, event address, their respective identifier, affected families, collateral damage report, estimated damage cost and the cause of the emergency, along with the photos taken by the user if available.

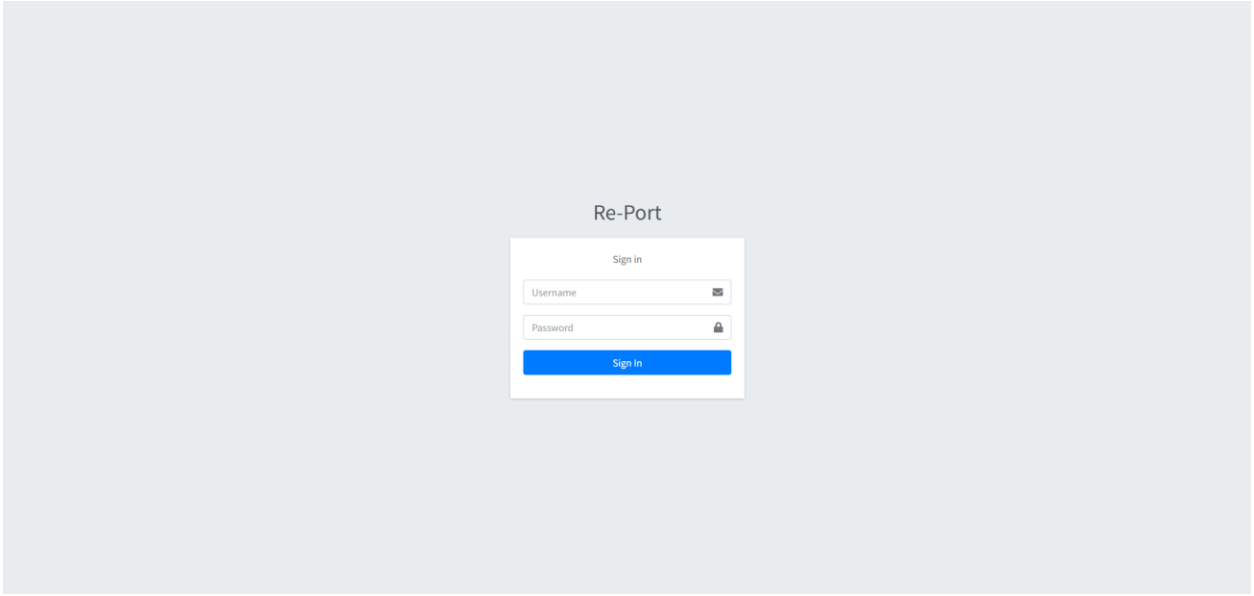




Once the report is verified, admin can generate a printable copy of individual report details or the entire list available on the screen or selected items.

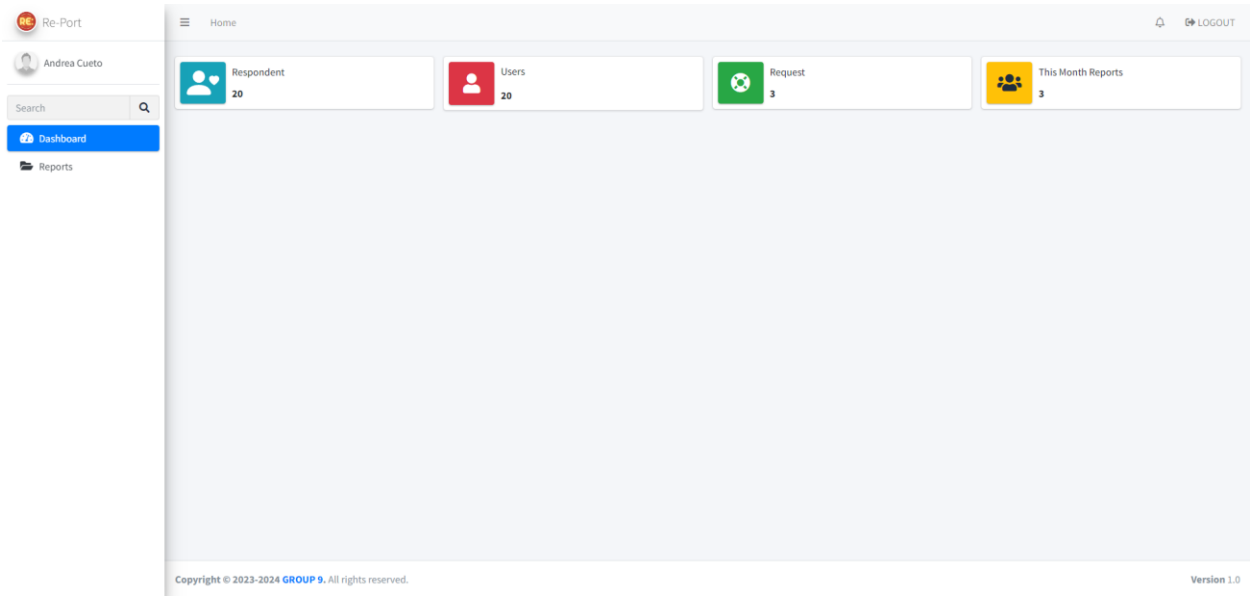


DEPARTMENT ADMIN



The login process of the department admin is not very different from the control admin, provided

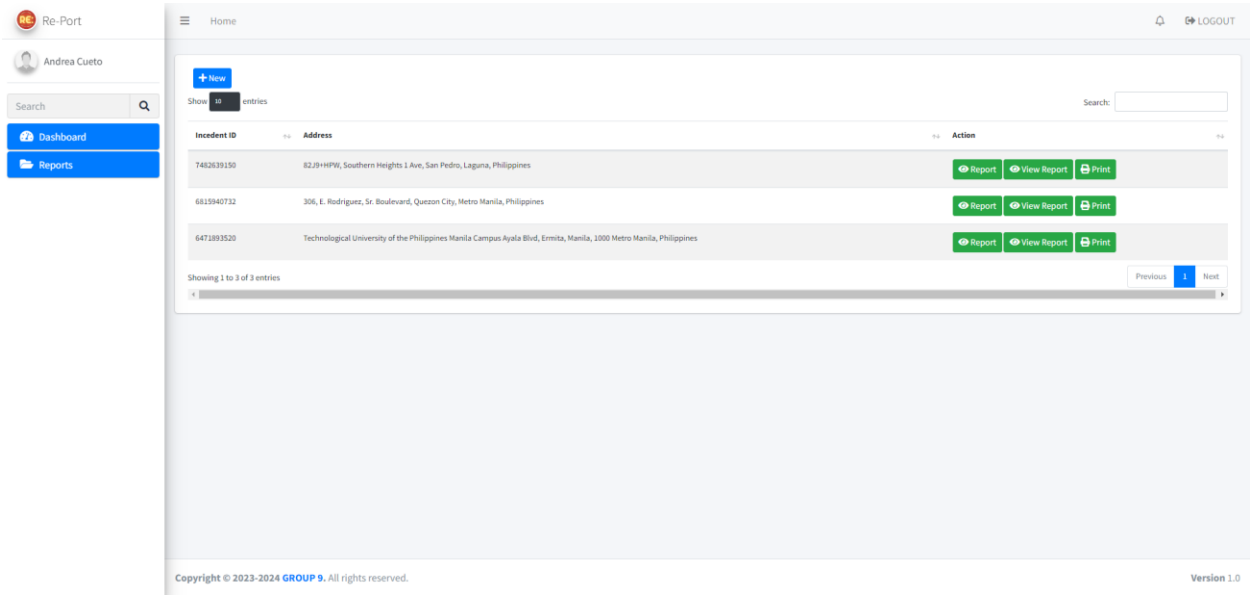
that the account being used is only for the department admin. Once logged in, first thing to notice is the reduced items available from the main panel as opposed from the control admin's panel.



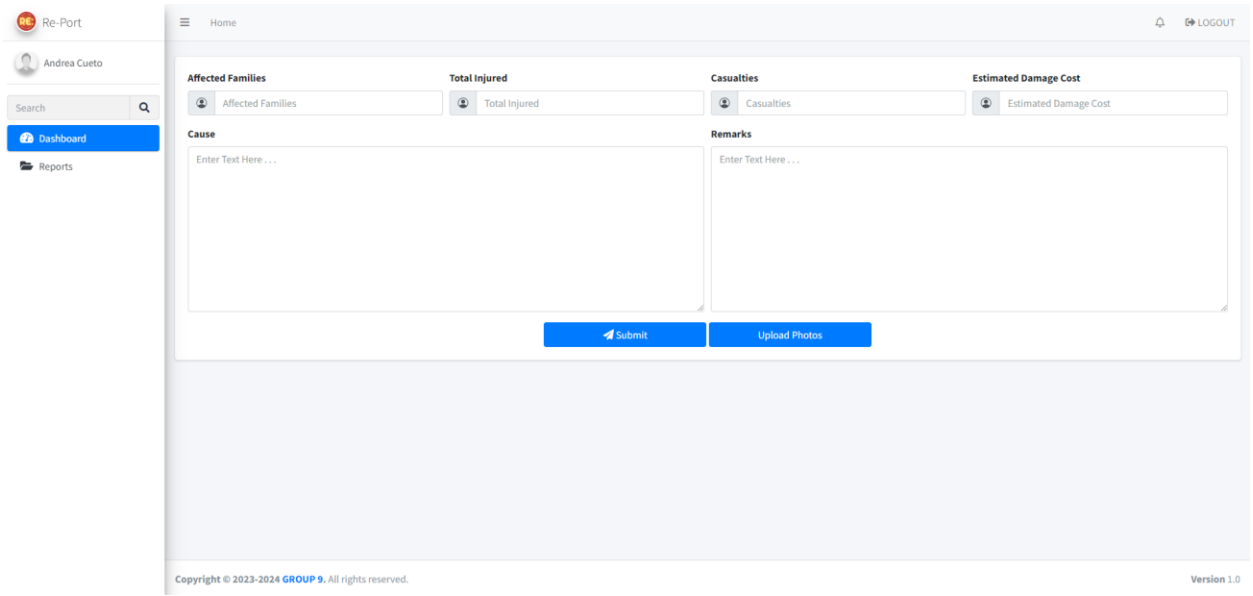
Although the selections are less, the functions are still similar in terms of availability of the report and respondents.

DEPARTMENT ADMIN REPORT DIRECTORY

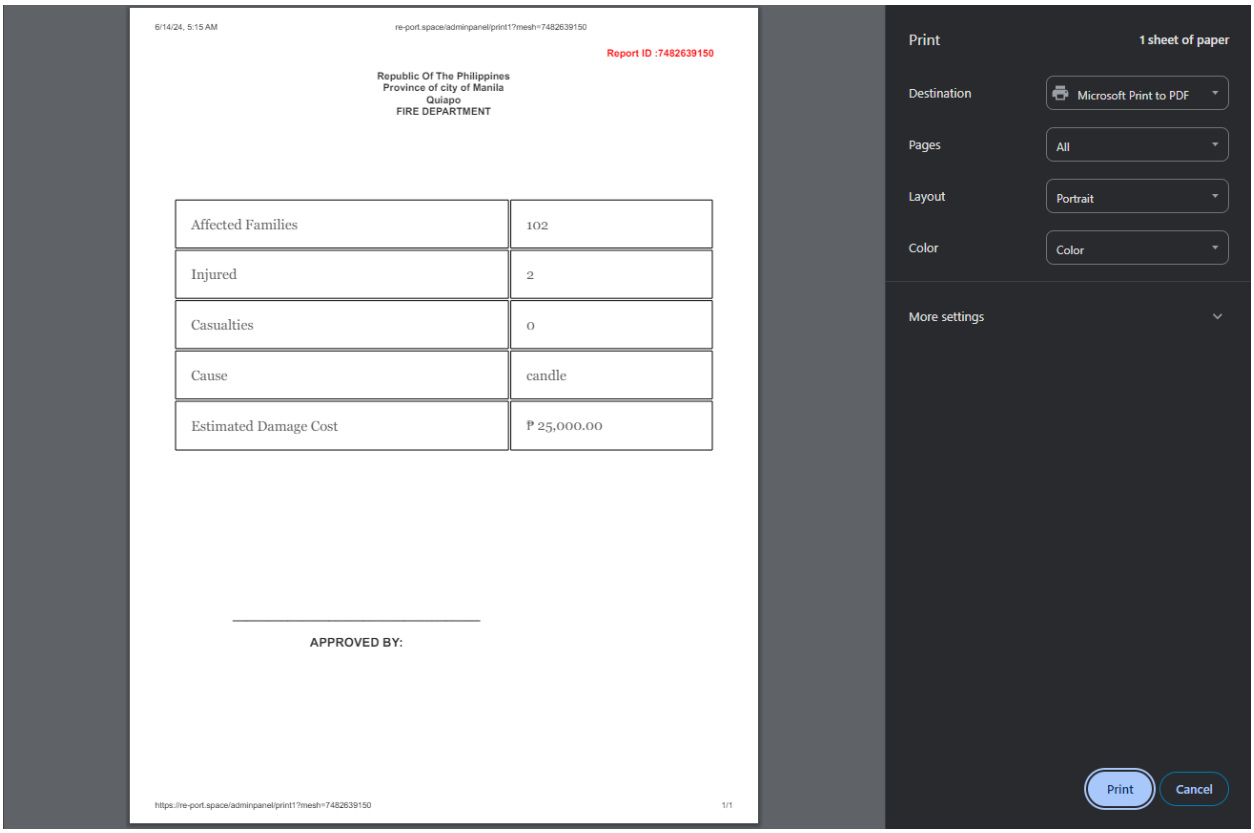
The department admin has a slightly different variation of the report directory, because the department admin can act directly on the reports.



The department admin can input details of the incident during the aftermath of the emergency. Details such as affected families, collateral damage, casualties, and estimated damage cost are all modifiable for the department admin.

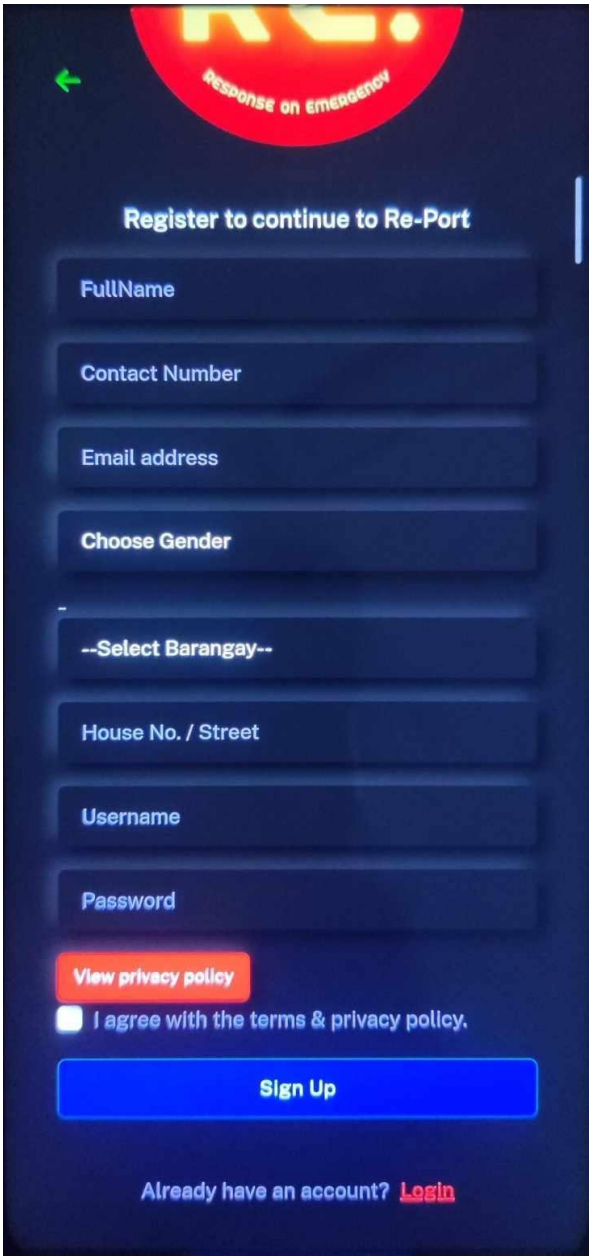


Once done applying details, the department admin can submit the report and will be digested for the database. It will be reflected on all users in the department and can also be prepared for a printable material.



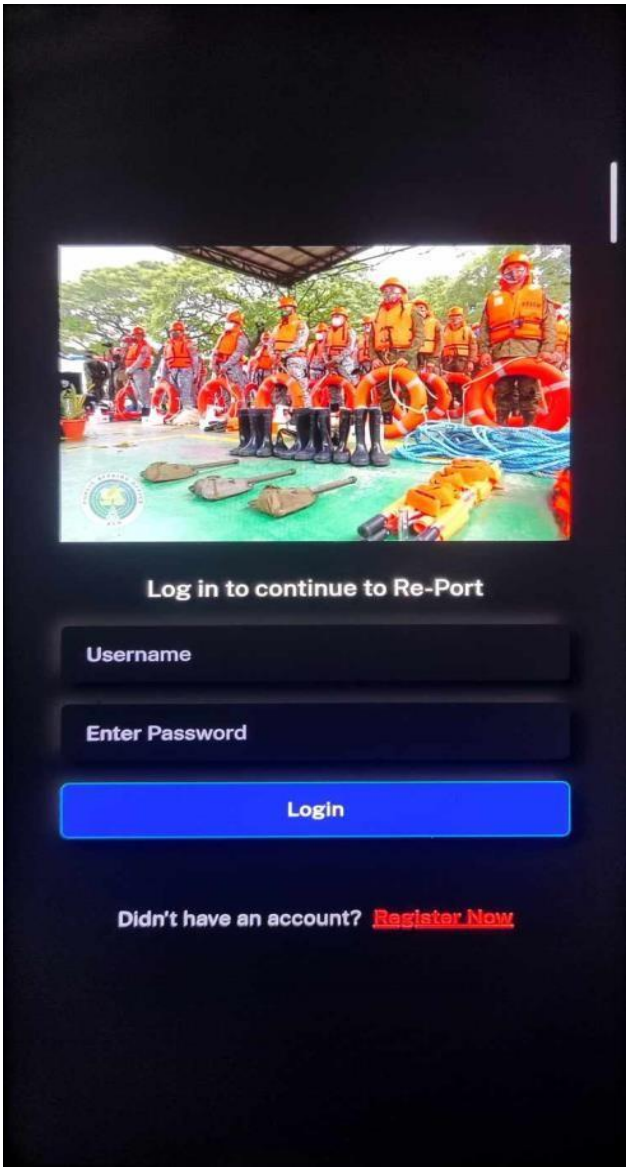
The report sheet can only be generated if the report has been catered for documentation by the department admin, otherwise the printable will return as blank.

MOBILE APP REGISTRATION



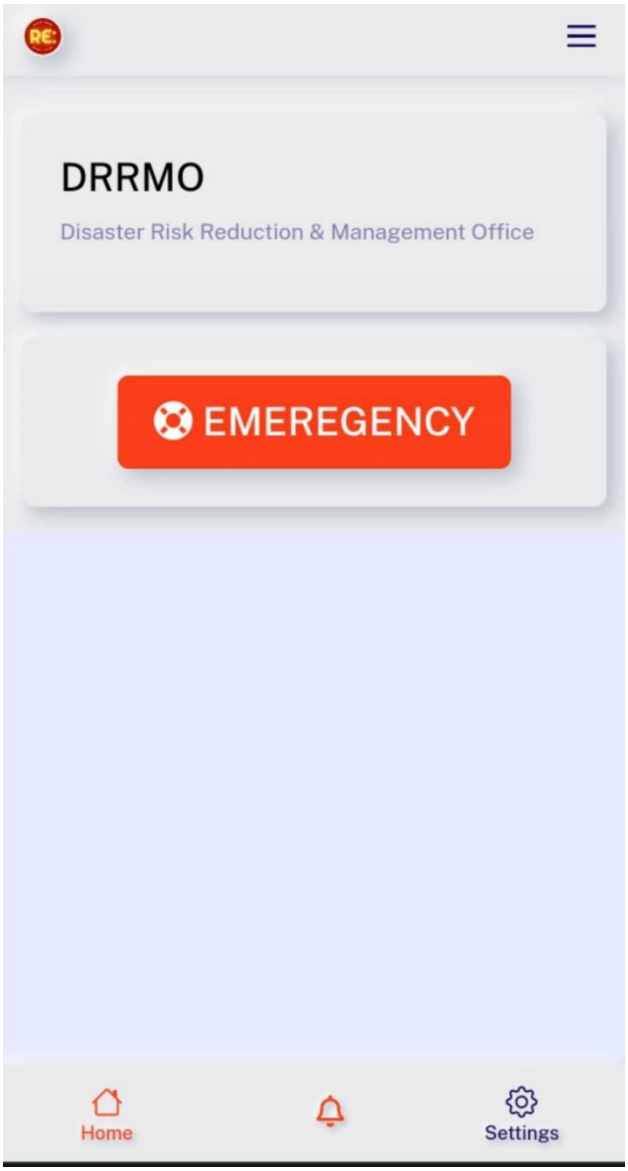
Public users start with a registration. Accounts are immediately activated and can only be accessed with one, otherwise the system will reject any attempt of login in the system.

MOBILE APP LOGIN



Once the user is registered, the system can now be accessed using the credentials provided during registration.

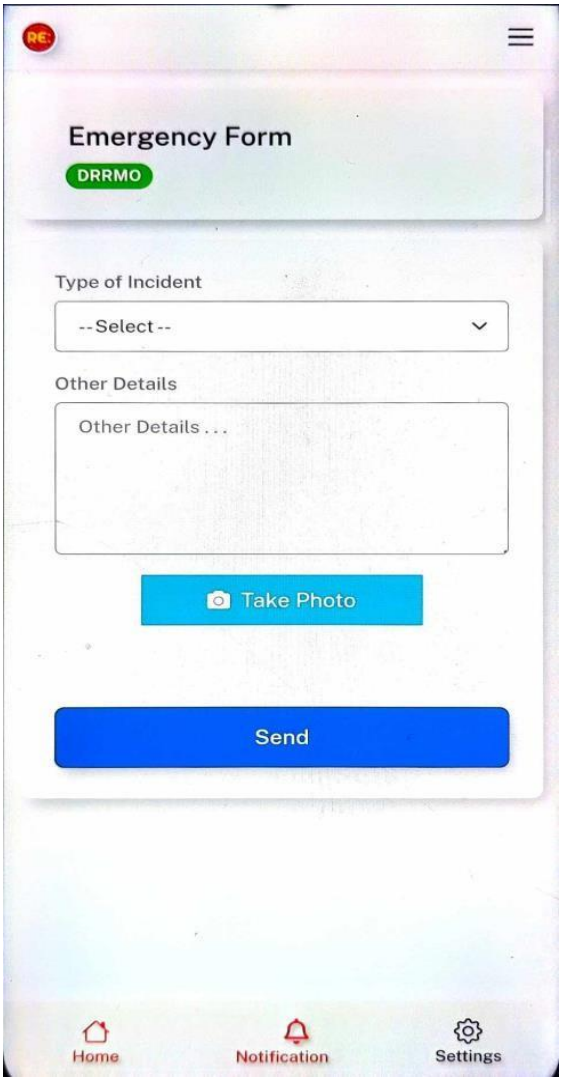
MOBILE APP DASHBOARD



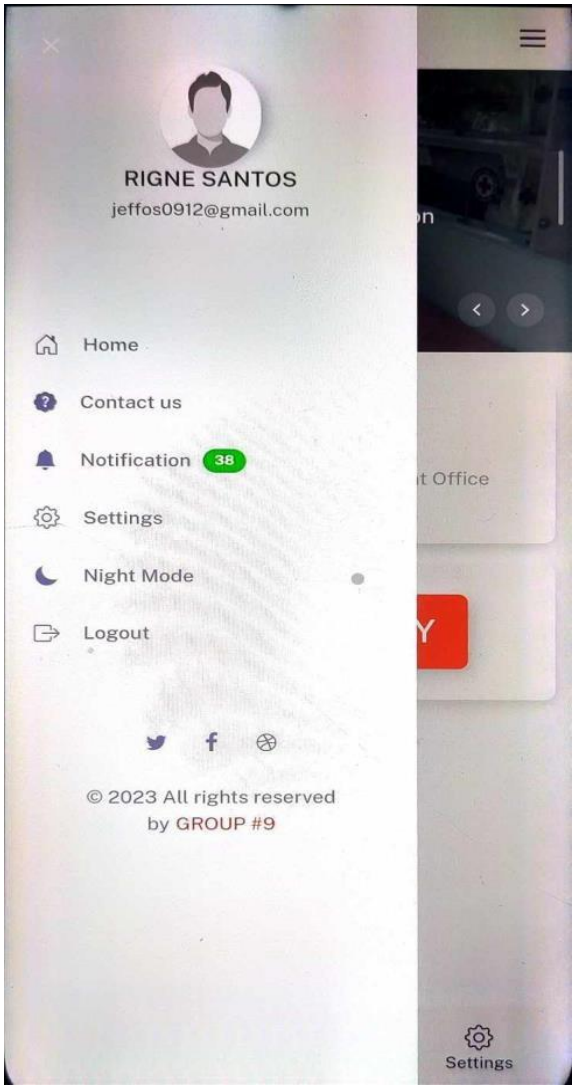
Once logged in, the user can now use the functions available in the mobile application. The app was made to be as simple as possible to avoid user confusion when using the application. This also reduces the number of taps and activities needed to make a report.

EMERGENCY FORM

The Emergency Form can be accessed by selecting the emergency button from the home page. This will direct the user to the page where reports can be made with the following options: Type of Incident, Optional Details, and image proof of the ongoing emergency.

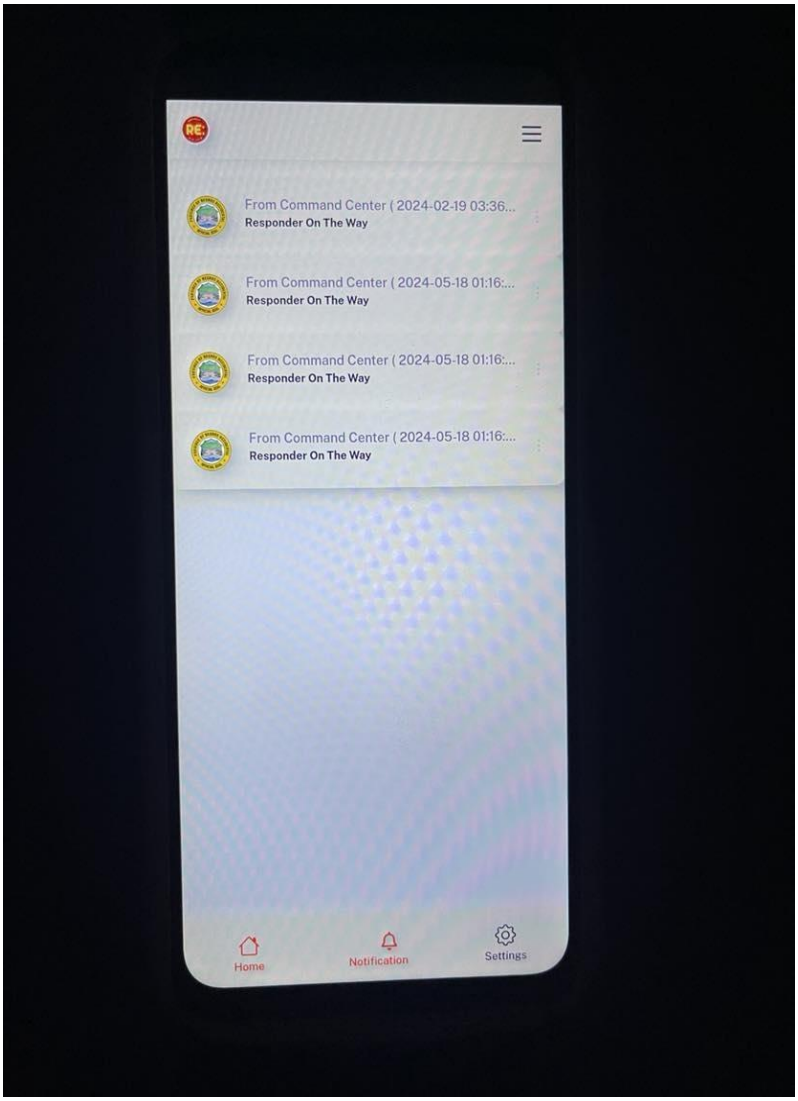


MOBILE APP TABS



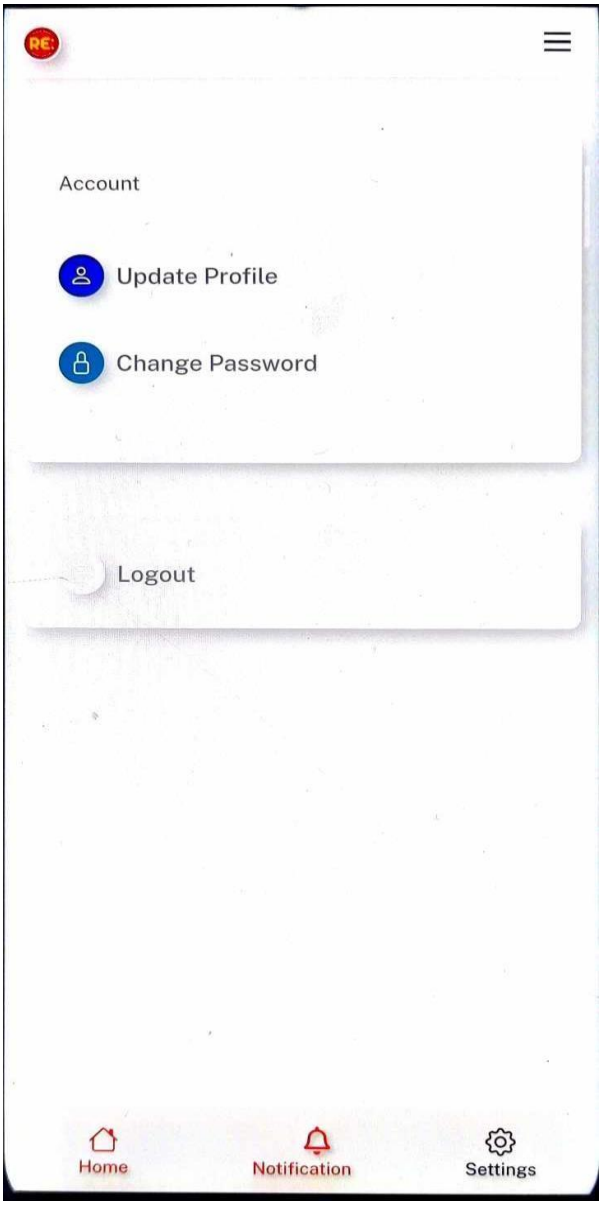
Apart from the emergency report making, the application also allows the users to navigate freely from the main page to the report notification for when a report is made, complementary night mode for users that prefer darker screen, settings for profile modification and contact page.

NOTIFICATIONS TAB

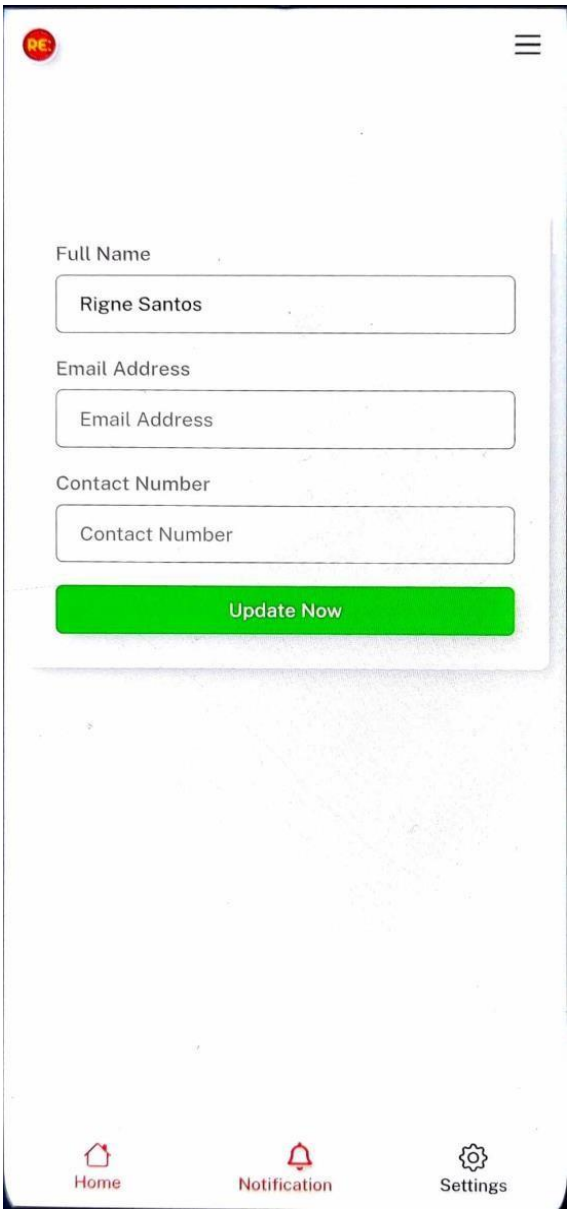


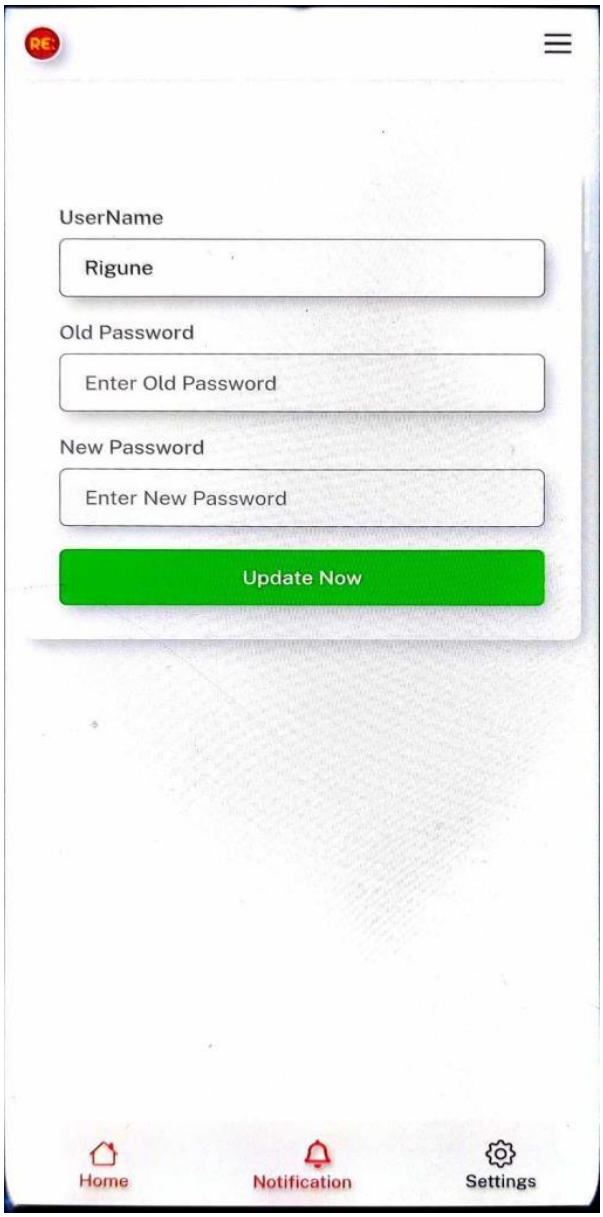
The notifications tab contains notification report that a user made. This provides real-time updates and details for the report currently ongoing or being responded to. Details such as expected time of arrival and emergency status are available from the notifications page.

ACCOUNT MODIFICATION



This is where the users can modify their account, from the name of the profile, image and contact number. Along with it is the option to change password. This takes the users to a new page where new info can be placed.


Full Name
Rigne Santos
Email Address
Email Address
Contact Number
Contact Number
Update Now
Home
Notification
Settings


UserName
Rigune
Old Password
Enter Old Password
New Password
Enter New Password
Update Now
Home
Notification
Settings

APPENDIX B

Evaluation Sheet Instrument

Development of a Mobile Application for Emergency Alert and Response

CHECKLIST QUESTIONNAIRE FOR EVALUATION OF MOBILE APPLICATION FOR EMERGENCY ALERT AND RESPONSE

Personal Profile Form

Direction: Please fill in the necessary information asked in the questionnaire by supplying data or by checking the item in the space provided for each item.

Name: _____

Profession (for Expert) / Course (for Student): _____

Mobile Application Evaluation Form

Direction: Please evaluate the mobile application material by using the given scale and placing a check mark (✓) under the corresponding numerical rating. Assess using the following scales with corresponding interpretation and description.

Scale	Interpretation
5	Highly Acceptable
4	Acceptable
3	Moderately Acceptable
2	Unacceptable
1	Highly Unacceptable

Software Application Evaluation	5	4	3	2	1
Accessibility					
The RE-PORT app has all the features needed for emergency reporting.					
The RE-PORT app provides accurate results when used.					
The RE-PORT app's features are easy to use for reporting emergencies.					
The RE-PORT app supports reporting for all types of emergencies.					
The RE-PORT app's alerts and prompts make reporting easier.					
Aesthetic					
The RE-PORT app looks attractive and pleasant.					
The RE-PORT app is well-organized and easy to navigate.					
The RE-PORT app's design elements are consistent throughout.					
The RE-PORT app's colors and graphics are appealing.					
The RE-PORT app uses fonts and icons that are easy to read and understand.					
Portability					
The RE-PORT app is easy to install on android mobile devices.					
The RE-PORT app works well on android mobile devices.					
The RE-PORT app works efficiently on both mobile networks and Wi-Fi.					

The RE-PORT app can be easily updated and maintained.					
The RE-PORT app conforms with portability requirements.					
Engagement					
The RE-PORT app encourages user interaction and engagement.					
Users are likely to keep using the RE-PORT app over time.					
The RE-PORT app includes features that make it engaging and interesting to use					
The RE-PORT app motivates users to report emergencies promptly with clear and accessible emergency reporting features.					
Users receive alerts and notifications in a timely manner to keep them informed about emergencies.					
Functionality					
The RE-PORT app works without failures or errors.					
The RE-PORT app uses resources efficiently and performs well.					
The RE-PORT app protects user data and privacy.					
The RE-PORT app loads quickly and responds to user actions without delay.					
The RE-PORT app handles many users and high traffic without slowing down.					

Comments/Suggestions:

_____

_____

_____

_____

Respondent's Name and Signature

APPENDIX C

Summary of Evaluation Result

Accessibility	Mean	Equivalent
The RE-PORT app has all the features needed for emergency reporting.	4.31	**Highly Acceptable**
The RE-PORT app provides accurate results when used.	4.59	**Highly Acceptable**
The RE-PORT app's features are easy to use for reporting emergencies.	4.55	**Highly Acceptable**
The RE-PORT app supports reporting for all types of emergencies.	3.91	**Acceptable**
The RE-PORT app's alerts and prompts make reporting easier.	4.28	**Highly Acceptable**

Aesthetic	Mean	Equivalent
The RE-PORT app looks attractive and pleasant.	4.44	**Highly Acceptable**
The RE-PORT app is well-organized and easy to navigate.	4.57	**Highly Acceptable**
The RE-PORT app's design elements are consistent throughout.	4.31	**Highly Acceptable**
The RE-PORT app's colors and graphics are appealing.	4.22	**Highly Acceptable**
The RE-PORT app uses fonts and icons that are easy to read and understand.	4.46	**Highly Acceptable**

Portability	Mean	Equivalent
The RE-PORT app is easy to install on Android mobile devices.	4.14	**Acceptable**
The RE-PORT app works well on Android mobile devices.	4.56	**Highly Acceptable**
The RE-PORT app works efficiently on both mobile networks and Wi-Fi.	3.80	**Acceptable**
The RE-PORT app can be easily updated and maintained.	3.25	**Acceptable**
The RE-PORT app conforms with portability requirements.	3.66	**Acceptable**

Engagement	Mean	Equivalent
The RE-PORT app encourages user interaction and engagement.	4.35	**Highly Acceptable**
Users are likely to keep using the RE-PORT app over time.	4.37	**Highly Acceptable**
The RE-PORT app includes features that make it engaging and interesting to use	4.14	**Acceptable**
The RE-PORT app motivates users to report emergencies promptly with clear and accessible emergency reporting features.	4.43	**Highly Acceptable**
Users receive alerts and notifications in a timely manner to keep them informed about emergencies.	4.49	**Highly Acceptable**

Functionality	Mean	Equivalent
The RE-PORT app works without failures or errors.	4.31	**Highly Acceptable**
The RE-PORT app uses resources efficiently and performs well.	4.59	**Highly Acceptable**
The RE-PORT app protects user data and privacy.	4.55	**Highly Acceptable**
The RE-PORT app loads quickly and responds to user actions without delay.	3.91	**Acceptable**
The RE-PORT app handles many users and high traffic without slowing down.	4.28	**Highly Acceptable**

APPENDIX D

Communication Letter

Dear Respondent:

Our research project at Technological University of the Philippines - Manila Campus is called "DEVELOPMENT OF A MOBILE APPLICATION FOR EMERGENCY ALERT AND RESPONSE." We are students pursuing a Bachelor of Science in Information Systems. The study's goal is to design and build a button-pressed emergency report creation tool. By reducing the amount of time needed to properly report an emergency and increasing productivity with fewer tasks, the system is designed to make emergency response procedures easier.

We are a team of researchers, and we would like to ask for your time to help us evaluate the Emergency Alert and Response mobile application. Your involvement will only be utilized for the study project and will be treated with the highest confidentiality.

Respectfully,
Cariño, Camille Mae
Cueto, Andrea Jienne
Estilo, Nikko
Santos, Kevin Jean
Santos, Rigne

Researchers

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To secure a challenging position in a reputable organization to expand my learnings, knowledge, and skills. Where I can enhance my abilities in working with people.

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COMPUTER SKILLS

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Database Management

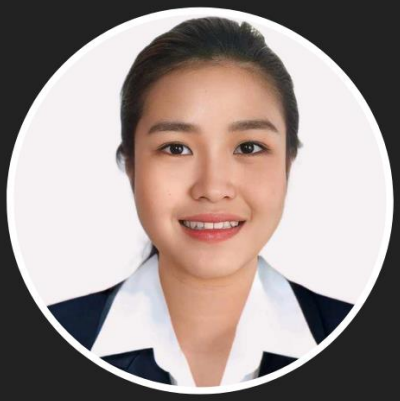
Microsoft Office Skills

EXPERIENCE

WORK IMMERSION

Citi Global

- Designing advertisement for the real estate and recruiting applicants to be part of the company
- Interviewing of new applicants and reviewing the resume of all applicants



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HTML & CSS

Python

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EXPERIENCE

WORK

San Pedro City Hall - Councilor's Assistant

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- Community Engagement: Assisting with attending meetings, events, and forums. Organizing town halls and outreach initiatives

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Currently taking Information System and interested on latest technology advancements. I consider myself a responsible and persevere person. I am looking forward for my first work experience.

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COMPUTER SKILLS

HTML and CSS

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Computer Knowledge

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PROFILE

To be part of a progressive organization in which I can contribute my knowledge and sills, as well gain experience of the advancement of my career, work effective with people and acquire fulfillment in the field that I have chosen.

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COMPUTER SKILLS

Network Administration

Web Development

UI/UX Design

EXPERIENCE

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- Great Job Provider Manpower Services, Inc. - OJT

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2020-PRESENT

LANGUAGE

Filipino

English

COMPUTER SKILLS

Hardware Troubleshooter

Zendesk Mastery

MS Office Expertise

EXPERIENCE

WORK

Customer Service Representative / E-Commerce and Technical Agent - 24-7 Intouch

- Assisted customers in order-related inquiries and technical complaints
- Cooperated with clients in implementing new process flow
- Led a team-in-team under stress and queue periods of the year