

TAMBULI: AN EMERGENCY ALERT SYSTEM FOR CITY OF BACOOR

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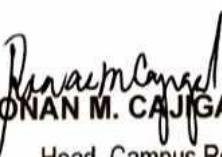
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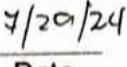

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THE AUTHORS

ABSTRACT

MARTINEZ JR., JOEY C., MOJAS, JULIOS M., SANCHEZ, GIO GABRIEL B., SUAREZ, APRIL JOY M., TAMBULI: An Emergency Alert System for City of Bacoor. Undergraduate Thesis. Bachelor of Science in Computer Science. Cavite State University - Bacoor City Campus, City of Bacoor, Cavite. May 2024. Adviser: Ms. Ely Rose L. Panganiban-Briones.

The study "TAMBULI: An Emergency Alert System for the City of Bacoor" aimed to develop a comprehensive emergency alert monitoring system featuring a website for the Bacoor Disaster Risk Reduction Management Office and an Android application for residents. The system provides real-time alerts, evacuation routes, and safety guidelines, enhancing Bacoor's emergency reporting and information delivery. Through surveys, interviews, and manual process monitoring, the study identified challenges in the existing manual process and highlighted the benefits of digitalized emergency response monitoring using a Fishbone Diagram.

The study revealed that nearly half (48.9%) of residents needed to be made aware of the Alert 161 hotline, indicating a potential gap in emergency communication. The research identified key issues such as the need for more awareness of the ALERT 161 Ordinance hotline, unfamiliarity with evacuation routes, and difficulties accessing reliable information during emergencies. Emphasizing resident participation in reporting emergencies can bring a more resilient community. Utilizing the Agile Scrum methodology enabled flexibility and swift adjustments based on client feedback.

The study identified issues, analyzed challenges, designed and developed the application, and evaluated user satisfaction. The theoretical framework of the built application includes four access levels and several modules, such as registration, emergency-response monitoring, dispatch, news, and update, including evacuation modules. Respondents rated the TAMBULI system as "Excellent" (4.61) according to ISO 25010 criteria.

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TAMBULI: AN EMERGENCY ALERT SYSTEM FOR CITY OF BACOOR

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INTRODUCTION

In natural and man-made emergencies, communities often face severe consequences, including loss of life, infrastructure damage, and service disruptions. The actions taken in the initial minutes of an emergency were critical, as prompt action and warnings saved lives, minimized physical damage to structures and property, and allowed for better resiliency.

Bacoor, located in Cavite province in the Philippines, has faced significant challenges, particularly flooding-related ones. As a catch basin for the province, the city has experienced frequent flooding events that threaten the safety of its residents and the stability of its infrastructure (PNA, 2020). To address the following issues, the Bacoor local government established the Bacoor Disaster Risk Reduction Management Office (BDRRMO) to enhance its disaster preparedness, response, and recovery capacity. Given a city's vulnerability to various emergencies due to rapid urbanization, the researchers aimed to help the community by developing a comprehensive emergency alert monitoring system website and an Android application designed for Bacoor residents.

The application serves as a central hub for collecting, processing, and disseminating crucial information, enabling stakeholders to make informed decisions promptly during emergencies. The application offers real-time alerts, evacuation routes, and safety guidelines, empowering individuals to take proactive measures during emergencies that will be easily accessible to residents, allowing them to report emergencies anytime and anywhere in the city. Accessibility is particularly important during disasters or emergencies when communication lines are disrupted or overloaded.

In addition, emergency applications provide users with real-time updates and notifications. Including information regarding ongoing emergencies, evacuation routes powered by Google Maps, and safety advisories. Users remain informed and take necessary actions based on the latest information.

The emergency application allows advanced communication and coordination between the emergency responders and residents. Providing a centralized platform for reporting emergencies and dispatching and tracking the status of incidents helped improve the overall effectiveness of the emergency response efforts.

To improve the response time and effectiveness, developing and implementing emergency plans, ensuring adequate training for workers, and using emergency notification systems that communicate needs are crucial. The analyzed studies by Alkhaddar et al. (2021) revealed the effectiveness and limitations of emergency alert systems (EAS) across the spectrum of disaster management to examine the impact of EAS on early warning channel effectiveness, preparedness for individual and community activities, response coordination, real-time updates, and recovery communication and support, highlighting the importance of multichannel redundancy, cultural sensitivity, and public education to maximize EAS effectiveness and build safer and more resilient communities.

Statement of the Problem

Generally, the study aims to develop an application for Bacoor residents and emergency responders along with a website for the Bacoor Disaster Risk Reduction Management Office (BDRRMO). The research sought to answer key questions using surveys and resident interviews.

The term "161" in Bacoor refers to the ALERT 161 Ordinance, a rapid response system for emergencies and public complaints that responds to community involvement in disaster risk reduction and promotes public order and safety.

The current study found that awareness of the hotline fell short, with nearly half (48.9%) of the residents having never heard of it. The gap could hinder the ability to alert the authorities during emergencies. A lack of experience (35.6%) and unfamiliarity with the purpose (28.9%) were identified as significant factors. Consequently, many residents resorted to alternative, potentially delayed methods such as calling friends (26.7%) or searching online (8.9%).

The survey highlighted the need for targeted outreach campaigns to bridge the awareness gap. Engaging temporary residents and those lacking emergency experience through diverse channels was crucial.

Emphasizing residents' role in reporting diverse emergencies could build confidence and create a more resilient community in which individuals actively participate in response efforts. *Other than the 161 hotlines, how do Bacoor residents inform authorities about emergency or accident events?*

Moreover, the majority (54.5%) of the residents seemed to access emergency information readily, and a concerning number (45.5%) faced challenges, but residents relied heavily on social media (68.9%) as the primary source, raising concerns about dependence on a platform that is often vulnerable with misinformation. Unverified rumours and misleading information can easily cause confusion, panic, and delayed action, hindering effective response efforts and exacerbating the stress experienced by affected individuals, as evidenced by a study by Lin *et al.* (2020).

The survey emphasizes the need for Bacoor to proactively strengthen official information channels and equip residents with critical skills to discern reliable information from misinformation. The system would enable informed decisions during emergencies and contribute to a more resilient community. *How should accurate information and announcements be provided to residents?*

Knowing evacuation routes is crucial during disasters or emergencies to ensure individual safety, enable efficient and organized evacuation, avoid hazards, and promote community resilience and preparedness.

The researchers' survey revealed that nearly 40% (38.6%) were somewhat familiar with the community's evacuation centers, and 31.8% were completely unfamiliar. The lack of awareness poses a significant risk during emergencies, potentially hindering efficient evacuation and jeopardizing safety. The researchers pointed to the need for effective communication strategies to provide residents with evacuation route information. Identifying clear methods to reach residents affected by disasters or emergencies is essential to ensure knowledge and preparedness. *How are evacuation routing sites provided to residents during disasters or emergencies?*

Objectives of the Study

The study aims to develop an emergency response monitoring system-related application to improve emergency reporting and offer the Bacoor Disaster Risk Reduction Management Office and Bacoor residents real-time information. The study aimed to achieve the following objectives:

1. identify the current issues that Bacoor residents face in emergencies by monitoring the manual processes that are currently in place to report disaster-related incidents (see Appendix 15), interviewing the Bacoor Disaster Risk Reduction and Management Office (BDRRMO) Research and Planning Division, and conducting surveys (see Appendix 5);

2. analyzed the identified challenges and limitations of the existing manual process and explored the potential benefits of digitalizing the emergency response monitoring process using a Fishbone Diagram (see Appendix Figure 1);
3. design of an application using the Agile Scrum methodology;
4. develop an application with the use of Android Studio 2023 for the IDE and system functions, which uses the Flutter-dart programming languages in the coding process for creating user applications, Visual Studio 2023 for the features of the emergency report monitoring, which is in C# Programming; Canva Pro 2023 and Adobe Photoshop Pro 2023 for the application design; and Firebase for the database Microsoft Word for the documentation, draw.io for the development of diagrams;
5. evaluate the level of user satisfaction in terms of accessibility, reliability, usability, security, maintainability, and portability of the system using the ISO 25010.

Theoretical Framework of the Study

The built application's theoretical framework provides an in-depth understanding of fundamental concepts. The system has four access levels: administrator, moderator, responder under the Disaster Risk Reduction Management Office (BDRRMO), and Bacoor residents as the End-User (see Figure 1).

Registration Module captures and maintains accurate user data, ensuring efficient emergency communication. Users provide essential information for logins and communication. Email verification serves as an authentication step to prevent false reports.

Emergency-Response Monitoring Module was designed to send emergency reports from users by uploading images and details about ongoing events. Additionally, the module facilitated collaboration among reporters and provided the Bacoor Disaster

Risk Reduction Management Office (BDRRMO) with critical emergency records, including post-incident reports.

Dispatch Module offers emergency response teams and individuals important information about current incidents, including location, type, and deployment descriptions. This enables responders to make informed decisions based on the data provided.

News and Update Module provides residents with weather updates, news, and official announcements from the BDRRMO. It helps inform users about changing weather conditions and encourages the necessary precautions. Moreover, ensuring that residents stayed updated with official statements and public announcements. The module was moderated by BDRRMO staff to ensure accurate and reliable information dissemination within the city.

Evacuation Module provides residents access to evacuation routes with pinpoint navigation instructions on a map. The visual guidance aided the victims in efficiently finding the nearest evacuation center.

SOS Module offered a dedicated emergency call feature allowing users to contact BDRRMO directly by clicking the SOS button, automatically dialling the emergency hotline number 161.

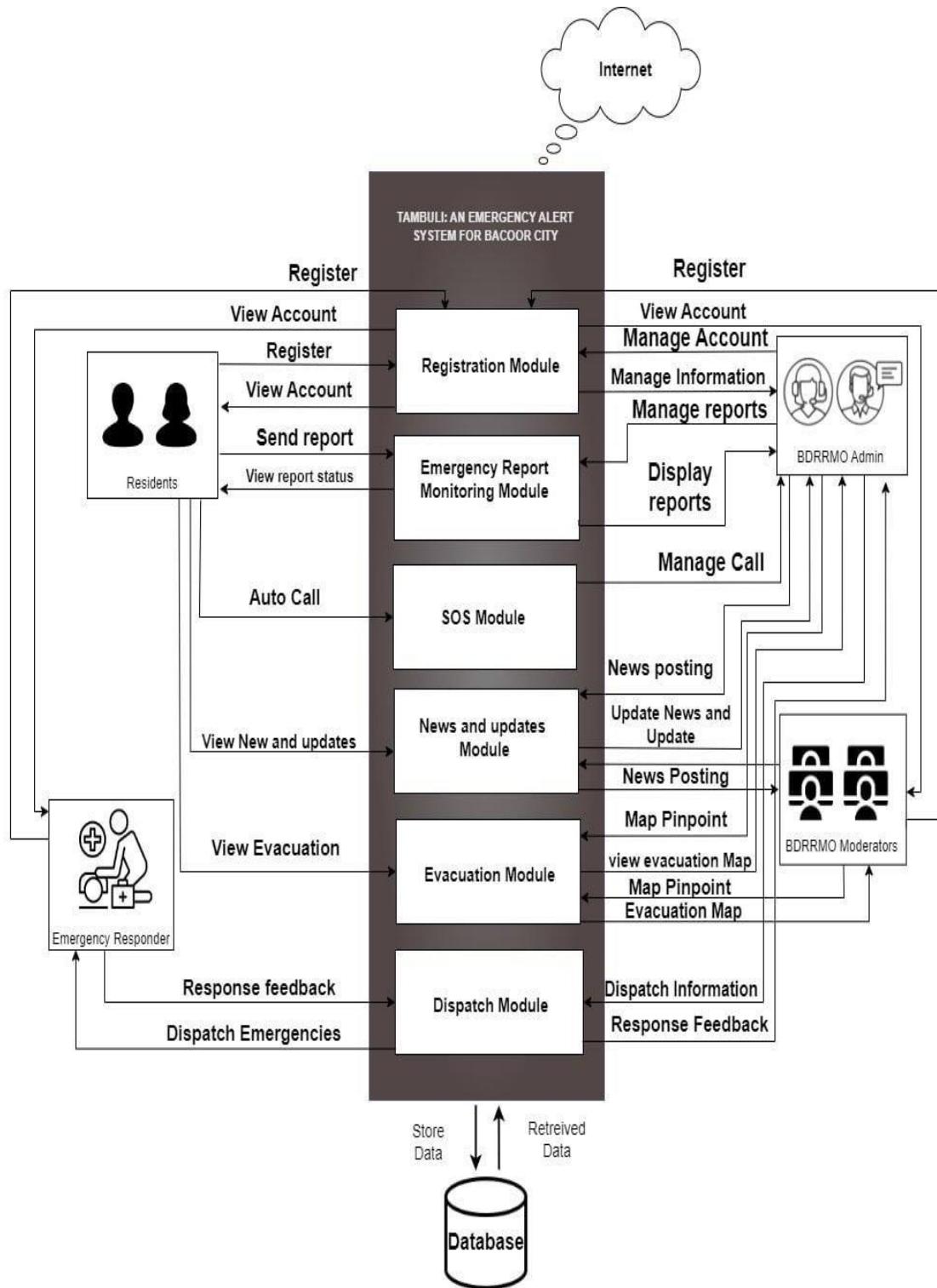


Figure 1. Theoretical Framework of TAMBULI: An Emergency Alert System for City of Bacoor

Significance of the Study

The significance of an emergency alert system for Bacoor extends to multiple beneficiaries, including the Bacoor Disaster Risk Reduction Management Office, Bacoor residents, researchers, and future researchers.

The City of Bacoor Residents. The benefit directly to the residents from implementing an Emergency Alert System. The system empowers residents by providing a user-friendly platform to report incidents, access reliable real-time information, and actively participate in disaster response efforts. Using the system, residents find evacuation routes to ensure safety and enhance preparedness for future disasters through an Android application.

The Bacoor Disaster Risk Reduction Management Office (BDRRMO). It directly relates to operations and responsibilities. The office developed emergency monitoring system operations, enhanced coordination, and facilitated online incident reporting. It provides dashboards of incident reports and relevant information, allowing for announcements and disseminating information directly to the residents.

Researchers. The researchers who conducted the study gained valuable knowledge and practical experience in the development of an Emergency Alert System through their involvement in the study. The study allows applying theoretical concepts, technical skills, and research methodologies in a real-world context. The study's findings contribute to personal and professional growth and enhance the understanding of disaster management, technological solutions, and research methodologies.

Future Researchers. The study's significance extends to those seeking to conduct research in disaster management or develop similar monitoring systems in the future. The study serves as a valuable reference and source of inspiration, providing insights into the process, challenges, and outcomes of developing an emergency alert system for Bacoor City.

Time and Place of the Study

The researchers used the Agile Scrum development method for the project, which commenced on May 10, 2023, at Cavite State University's Bacoor City Campus. The research Continued with a face-to-face interview session held on June 29, 2023, with staff from the Bacoor Disaster Risk Reduction Office's Research and Planning Division (see Appendix 2) stakeholder meeting and Sprint Planning; the session received prior approval from the mayor's office.

After the interview in July 2023, the researchers engaged in brainstorming exercises to construct the theoretical foundation of the research. Continue to gather and compile secondary information from relevant online studies, the literature, and materials. Additionally, materials from various Cavite State University libraries were references for Backlog Refinement to be proposed to the Department of Computer Studies at the Bacoor City Campus.

August 2023 Planning session was conducted with the Bacoor Disaster Risk Reduction Management Office Research and Planning Division staff, marked the data-gathering through a survey questionnaire (see Appendix 5) administered to Bacoor residents for requirement gathering with Sprint

In September 2023, the sprint backlogs commenced. Tools such as Photoshop Professional 2023, Canva Pro, and Figma are utilized to design graphical user interfaces (GUIs) for mobile applications and websites.

By November 16, 2023, a sprint review had been conducted to clarify and validate the information gathered during the research process.

January 2024, the researchers presented an outline to the Department of Computer Studies, followed by another sprint review session with the BDRRMO and Thesis adviser to validate progress and gather feedback. The period also included the pre-evaluation of residents of Bacoor City to test user acceptance and the submission of a request for research materials to the municipal hall (see Appendix 5).

Upon approval of the thesis adviser on April 4, 2024, researchers started to evaluate the residents of Bacoor.

On April 8, 2024, the researchers returned to the Bacoor Disaster Risk Management Office of Bacoor City to finalize the project and set a meeting with Mr. Richard Quion. The researchers facilitated a simulation of the emergency alert system to evaluate the system and continued to evaluate IT Professionals.

A Gantt Chart was meticulously prepared to guide the researchers and ensure researchers achieved the objectives according to the scheduled activities and allotted timeframe (see Appendix Table 1), and Burned down the chart to track the progress of the development (see Appendix Figure 6).

Scope and Limitation of the Study

The study developed an emergency response monitoring system with incident reporting, responder dispatching, evacuation navigation, weather and news updates, and an SOS function. This system aimed to provide Bacoor residents and the Bacoor Disaster Risk Reduction and Management Office (BDRRMO) with an efficient and user-friendly disaster reporting and response platform. An Android application was designed for residents and emergency responders, while a web-based platform was created for administrators and moderators to manage the Emergency Alert System.

The BDRRMO managed system functionality, including user account management, responder dispatching, and supervising moderators who handled news updates, evacuation routes, and dispatches. Residents could submit incident reports with image attachments through the Android app, allowing them to view mapped evacuation routes.

The study identified several limitations. Successful implementation depended on factors such as digital literacy, access to mobile devices, and internet connectivity, which could impact resident usage.

The study also highlighted the need for ongoing system maintenance and updates, requiring consistent support and resources for long-term sustainability. Data privacy and security were crucial, necessitating measures to protect user information and comply with relevant data protection regulations.

However, the system had some limitations. It did not support offline mode since it was a real-time application and could not be installed on non-Android devices. Minimum requirements included Android 10 or higher (API Level 21+), 3 GB RAM, 500 MB of free storage, and an active internet connection for certain functionalities.

Recommended requirements were Android 11 (Q) or higher (API Level 30+), 8 GB RAM, 1 GB of free storage, and a reliable internet connection (Wi-Fi or 4G/5G). Hardware requirements included a GPS module, phone call functionality, alert vibration support, and Wi-Fi or mobile data connectivity. The call feature was facilitated through the default phone call app, and the user's location was provided only when they submitted a report.

Definition of Terms

Administrator. It refers to a privileged user with elevated access rights. Administrators can configure settings, manage users, and perform essential tasks for efficient operation and maintenance.

Agile Scrum Method. Iterative approach to software development that emphasizes collaboration and adaptability.

Authentication. Verifying a user's identity before granting access to the application.

Bacoor Disaster Risk Reduction Management Office (BDRRMO). The government agency responsible for managing disaster risks.

Catch Basin. The area of low land that collects water runoff from surrounding areas.

Data Flow Diagram. A graphical representation that illustrates the data flow within a system.

Dispatching. Sending emergency responders to the scene of an incident.

Emergency Alert System. The system that warns people about potential dangers.

Evacuation Center. A safe location for people to gather during an emergency.

Fishbone Diagram. A visual tool used to identify and analyze the causes of a problem.

Flutter. An open-source UI software development toolkit created by Google. It is used to build natively compiled mobile, web, and desktop applications using a single codebase.

Foreground. A service that performs work or operation visible to the user and can continue executing even when the user is not directly interacting with the app. Such a service must display a system notification to inform the user that it is active and using system resources.

HIPPO (Hierarchy plus Input-Process-Output). A structured design methodology that represents program logic through a hierarchical structure.

Incident. An event or situation that requires a response from the emergency services.

ISO 25010. It is an international standard that defines a set of quality characteristics and sub-characteristics for software product evaluation. It provides a framework for assessing attributes such as functionality, reliability, usability, efficiency, maintainability, and portability, which contribute to overall software quality.

Moderator. In discussions or forums, a Moderator is an individual responsible for facilitating and overseeing the conversation. The moderator ensures adherence to rules, encourages meaningful discussion and may intervene to address conflicts or off-topic contributions.

Module. A distinct section of a software application with specific functionalities.

Notification Systems. It was used to send out messages to large numbers of people.

Resilience. It is the ability to adapt, recover, and thrive in adversity, challenges, or difficult situations.

Stakeholders. People or groups who are affected by or have an interest in an issue.

REVIEW OF RELATED LITERATURE

This chapter presents a review of related literature and studies that provided proper guidelines for creating and formulating the requirements needed to start the project. Moreover, the chapter was designed to examine the literature in the field, and researchers gained insights into the key concepts, methodologies, challenges, and best practices associated with the development and utilization of such systems.

Related Foreign Literature

4 Phases of Disaster Management Explained (the Easy Way)

The vital role of disaster preparedness in protecting lives and property during emergencies. Evacuating individuals from danger zones to safe havens is a crucial response phase action (Jones, 2020). Following the immediate response, damage assessment, pre-planned response implementation, cleanup prioritization, and resource allocation become key priorities (Brown, 2019).

However, the alarming reality is that natural disaster frequency has risen fivefold in the past five decades. Even seemingly safe organizations need help to afford complacency. Statistics from January 2013 to January 2023 reveal that a staggering 88.5% of all U.S. counties experienced at least one natural disaster (White, 2021). This highlights the critical need to factor in potential financial consequences.

Economic losses from natural disasters, including storms, floods, and fires, have risen sevenfold from the 1970s to the 2010s. Between 2010 and 2019, the average daily cost of natural disasters reached an astronomical \$383 million (Francoeur, 2023). The figures underscore the urgent need for proactive disaster preparedness measures to safeguard lives and mitigate financial losses.

Mobile Emergency Notification Apps: Current State, Barriers and Future Potential

The widespread use of mobile phones has transformed communication, and its potential to improve emergency response is undeniable. Researchers explored the role of mobile emergency notification apps, particularly their ability to strengthen global emergency management systems, in a study by Repanovici *et al.* (2021).

Domain experts evaluated three emergency communication options: traditional voice calls, SMS messages, and mobile applications, using a detailed multi-criteria analysis. The innovative approach emphasizes the researchers' commitment to identifying the most effective method in critical situations.

Moreover, the analysis concluded that mobile applications are the most efficient emergency communication channel. These findings paved the way for further exploration of the application's current state, potential benefits, and any remaining obstacles.

Lastly, Mobile emergency apps are gaining popularity worldwide, offering a range of advantages over traditional methods that will automatically transmit location data, eliminate language barriers with translation features, and provide rich contextual details about an emergency, making them powerful tools for rapid response.

IoT-Based Smart Accident Detection and Alert System

C.V. Suresh Babu *et al.* (2023) presented a captivating vision for a future where accidents are swiftly identified, and assistance is mobilized through a sophisticated, Internet-of-Things (IoT) powered system.

The proposed "smart accident detection and alarm system" capitalized on the power of sensors, GPS, and the Arduino UNO microcontroller to collect crucial data about accident location and severity in real-time. The data, processed through complex algorithms and protocols, was seamlessly transmitted to emergency responders. The

system could save lives and significantly streamline response efforts for authorities, road users, and transportation agencies.

By harnessing the power of technology, Babu et al. proposed a solution that could revolutionize accident response. Their vision aimed to minimize delays, maximize efficiency, and protect lives through swift and coordinated action.

Geolocation-based routing

Leveraging real-time location data, geolocation-based routing is reshaping logistics and operational strategies for businesses, as DiMelis et al. (2023) highlighted. The innovative approach, extending beyond delivery routes, yields benefits in network performance, content distribution, and address recognition. Geolocation-based routing optimizes delivery routes, minimizing fuel consumption and vehicle wear, ensuring faster deliveries, and reducing the carbon footprint.

Precise address recognition eliminates routing errors, streamlines operations, and increases efficiency. Across industries, it optimizes delivery services, ride-hailing, and field service management. While promising, businesses must address privacy concerns, stay updated on technological advancements, and ensure scalability for sustained success. Embracing geolocation-based routing positions businesses to thrive in the evolving landscape, unlocking efficiency, optimization, and superior customer satisfaction.

IP Geolocation with Intermediate Routers Based on Topology Discovery

In the 2019 study, ang et al. introduce an innovative approach to IP geolocation known as "Common Routers-based Geolocation (CRG)." The method capitalizes on the prevalence of common routers as secondary landmarks to enhance accuracy, particularly in regions with limited primary landmarks, addressing a persistent challenge in the field. CRG's operational process involves identifying common routers through topology discovery, analyzing the correlation between delay, hop metrics, and

distance to web servers through statistical learning, and incorporating routers into the geolocation process for more precise location estimation.

The advantages of CRG include significantly reduced geolocation errors, expanded coverage to a broader range of devices and locations, and scalability due to reliance on accessible network data. While promising, CRG prompts considerations regarding privacy safeguards, adaptation to dynamic network landscapes, and seamless integration with existing systems for widespread adoption.

These aspects underscore the need for ongoing research and development efforts to unlock CRG's full potential in IP geolocation. Additional points for exploration include CRG's adaptability to diverse network types, optimization for real-time location updates, and potential applications beyond target advertising and fraud detection, offering avenues for enriching the discourse on IP geolocation advancements.

iReportMo: An Emergency Report Android Mobile Application for Metro Manila

Geographical Information System helps everyone in many industries regularly. "iReportMo" is an Android mobile application that uses GIS-based to let a citizen report an incident from the mobile device. The application provides easy access to emergency concerns such as fire, accident, crime, and barangay incidents in Metro Manila. The user may provide details such as location, date, time, and images when reporting an incident.

Few existing studies have focused on assisting with any emergency using the newest technology. However, only some have touched on providing a centralized system that caters to all emergencies in one application. The paper automates the manual transaction efforts to effectively respond to an emergency hazard in the City of Manila, thus making it more efficient in gathering important information in real-time. (Maghanoy *et al.* 2019).

Promoting Built-for-Disaster-Purpose Mobile Applications: An Interdisciplinary Literature Review to Increase the Penetration Rate Among Tourists

The researchers conducted an interdisciplinary literature review focusing on the critical role of mobile applications designed specifically for disaster situations among tourists. Building upon existing literature on mobile app adoption and user behavior, the review identifies key points that shed light on the complexities of influencing tourist behavior in adopting disaster apps.

Citing Pappas *et al.* (2019), the review emphasizes the intricate relationship between various behavioral variables and their impact on user behavior. Notes the causal asymmetry inherent in perceived usefulness, ease of use, and trust, which may not directly translate into app adoption. Unforeseen barriers impede user engagement, highlighting the need for a nuanced understanding of the adoption process.

The review underscores the significance of individual perceptions in shaping tourists' decisions to adopt disaster apps. Drawing from Yang and Lin (2019) notes that personal beliefs and attitudes toward technology, influenced by prior experiences, familiarity, and cultural background, play a pivotal role in the adoption process.

Related Foreign Studies

Safety Souls Mobile Application for Emergency Response System

According to the study of Alharbi *et al.* (2020), numerous catastrophic events affect many people in the world, including crises, fires, floods, road accidents, earthquakes, and terrorist attacks. The majority of public people use mobile and internet all day long. From the literature review, researchers found that the coordination between agencies in emergency responses could be more satisfactory. Emergency organizations should share different resources such as information, equipment, vehicles, etc. Therefore, the emergency response teams need to use an effective coordination framework to mitigate the results of any emergency, such as loss of life. Under the circumstances, respondents, emergency services, and volunteers work hard

to communicate and divide resources. The paper aims to investigate emergency response coordination with mobile techniques by developing a flexible and dynamic mobile platform that offers a tracking mechanism and information management.

Shake Up: an Android Mobile Learning Application based on Earthquake Mitigation for Junior High School Students

Sukmawati *et al.* (2019) shed light on Indonesia's vulnerability to powerful earthquakes within the Pacific Ring of Fire and emphasize the critical need for preparedness. In response, researchers pioneered a unique initiative by developing a mobile learning application for earthquake mitigation, employing Unity, a game-engine software.

The study, conducted with 30 junior high school students in Bandung and the science teacher, aimed to evaluate the effectiveness of the gamified approach. Experts conducted rigorous assessments focused on content, language, and artwork, ensuring the app's clarity, accuracy, and engagement. Results were overwhelmingly positive, with students and educators praising the app's design and educational value.

The mobile learning game signifies a promising stride in fortifying earthquake resilience in Indonesia, particularly among the youth. By harnessing the captivating nature of games, the app transforms intricate disaster preparedness concepts into interactive experiences, fostering knowledge retention and critical thinking skills. Such an immersive approach equips students with essential tools for effective navigation during earthquake emergencies. Several factors contribute to the initiative's success.

The utilization of Unity allows for visually appealing and dynamic game environments, enhancing the learning experience. Targeting the younger demographic ensures early adoption and dissemination of community earthquake preparedness knowledge. Involving science educators in the development process guarantees the app's scientific accuracy and educational relevance.

Increasing Disaster Victim Survival Rate: SaveMyLife Mobile Application Development

Berawi *et al.* (2021) study underscores the life-or-death importance of efficient disaster response. It introduces a compelling perspective on the transformative role of mobile applications in streamlining search and rescue operations.

The innovative approach, centered around victim prioritization and technology integration, offers a promising avenue for enhancing life-saving efforts during catastrophic events.

The research accentuates the pivotal role of mobile apps in expediting search and rescue response times. By incorporating crucial variables such as age, health status, distance to safety points, and regional disaster risk into victim prioritization algorithms, apps strategically allocate resources to those with the greatest immediate needs and vulnerability. The targeted strategy optimizes rescue efforts, ensuring a more effective deployment of resources to maximize the chances of survival.

The study identifies key factors for consideration in victim prioritization, recognizing age as a significant determinant due to younger individuals' generally higher survival rates. Health status, encompassing pre-existing medical conditions and disaster-induced injuries, is another crucial factor. Moreover, the distance to safety points and the level of regional disaster risk play integral roles in shaping the urgency of rescue operations, ensuring a timely response to those facing immediate danger.

Beyond prioritization, Berawi *et al.* advocate leveraging technology to enhance overall search and rescue efficiency. Through real-time updates on victim locations, environmental conditions, and resource availability, mobile apps empower search teams to coordinate efforts seamlessly. Additionally, apps facilitate crucial communication between rescuers, victims, and families, fostering a sense of connection and hope during crises.

While the potential benefits are substantial, implementing a technology-driven approach necessitates addressing inherent challenges.

Data accuracy and accessibility are paramount, emphasizing the need for reliable information to avoid hindering rescue efforts. Furthermore, ensuring widespread adoption and providing comprehensive training for rescue teams and potential users are critical aspects of the effective deployment of mobile apps.

Despite challenges, the transformative potential of mobile apps in revolutionizing disaster response is evident. By strategically prioritizing victims based on their needs and harnessing technology to optimize rescue operations, apps can save lives and instill hope in communities grappling with the aftermath of disasters. Berawi, et al.'s study, is a compelling testament to the impactful synergy of innovation and technology in the face of adversity.

Interaction Modes for Emergency Mobile Apps

According to the study of Nass et al. (2018), The RESCUER App's transformative design recognizes the inherently stressful nature of emergencies and the need for streamlined interactions. Simplifying the reporting process, predefined buttons enable users to convey vital information such as location or assistance requests with minimal cognitive load during stressful situations. Providing step-by-step instructions for specific tasks, the mode offers clear guidance for actions like first aid or safe evacuation, catering to individuals in panic. Chat interaction Facilitating through text-based communication with the command center, the mode accommodates more complex situations, allowing nuanced information exchange and personalized assistance.

Validation of the app's design through a simulated emergency, where participants faced high cognitive load, yielded encouraging results. The RESCUER App effectively enabled individuals to interact under pressure, showcasing potential effectiveness in real-world emergencies.

The study envisions a future where the RESCUER App plays a pivotal role in civilian participation during emergencies. By integrating human-computer interaction

principles and addressing the cognitive limitations of stressed individuals, the innovative approach not only promises to save lives but also significantly improves the overall outcomes of emergency response efforts.

The present study and the RESCUER App compare approaches to emergency response, revealing similarities and differences, each contributing valuable insights to the field.

Similarities include a user-driven reporting system, emphasizing real-time information sharing during critical situations. Both studies recognize the importance of designing user interfaces that are intuitive and effective, especially considering the cognitive strain experienced during emergencies. Additionally, both provide step-by-step guidance, empowering users to take necessary actions such as first aid or safe evacuation even in high-stress situations.

However, key differences exist between the two studies. The present study focuses on a specific technology, such as GIS or mobile applications, as part of the proposed solution. In contrast, the RESCUER App is *elf* the proposed solution, with a detailed exploration of three distinct interaction modes (one-click, guided, and chat) tailored to different stress levels and information complexities. Interaction modes differ from the approach taken in the present study. Furthermore, the RESCUER App was validated through a simulated emergency, while the validation methods for the present study may vary.

Further research and development are imperative to refine the RESCUER App's functionality and assess broader implementation. Long-term studies could delve into the app's impact on emergency preparedness and response, refining interaction modes based on real-world deployment insights and exploring synergies with other emerging technologies in emergency response.

In conclusion, the RESCUER App stands as a testament to technology's transformative potential in empowering civilians and enhancing emergency response. By prioritizing human factors in high-stress situations and designing technology that

aligns with these considerations, researchers create tools that save lives and nurture a sense of community and resilience in the face of adversity.

GEMAR: Web-Based GIS for Emergency Management and Ambulance Routing

Ramdani *et al.* (2021) address a pressing challenge in healthcare. the timely and effective delivery of medical care during emergencies. The innovative solution, a web-based emergency management system, harnesses technology to bridge the crucial gap between patients and essential medical resources. The system consists of two interconnected subsystems designed to streamline emergency response.

Firstly, the Emergency Reporting subsystem employs geocoding and geolocation to gather precise emergency information from urban areas in real-time. This ensures accurate location identification, enabling a swift and targeted response. Secondly, the Ambulance Routing subsystem integrates geospatial technologies and optimization techniques. Calculates the optimal route for ambulance pick-up, considering variables such as traffic conditions and the shortest distance. Additionally, it identifies the nearest hospital equipped to handle the patient's specific medical needs, thereby saving crucial time in critical situations.

To assess the system's efficacy, the researchers conducted an evaluation involving medical professionals and GIS specialists. The feedback indicated positive attitudes toward the system and willingness to adopt it in real-world emergencies. Usability testing revealed high scores, emphasizing the system's intuitive interface and ease of navigation. Medical experts particularly found the subsystems helpful in understanding emergencies comprehensively and streamlining clinical operations. The study's iterative approach, incorporating expert feedback for continuous improvement, ensures that the final system addresses the needs of both medical professionals and patients, maximizing effectiveness in emergency response.

Looking ahead, the web-based emergency management system developed by Ramdani *et al.* presents a promising solution for optimizing emergency response in

urban areas. By leveraging technology to expedite data collection, route optimization, and hospital selection, the system holds the potential to save lives and improve patient outcomes during critical medical situations.

The comparison between the features of the web-based emergency management system by Ramdani *et al.* (2021) and the mobile app reveals both similarities and differences, showcasing the strengths and potential areas for improvement in each approach.

Similarities include a shared focus on efficient emergency response through the utilization of technology. Both systems leverage technological tools to enhance emergency response, with the web-based system employing geocoding, routing algorithms, and a web interface, and the mobile app offering functionalities like incident reporting, communication, and navigation. Additionally, both emphasize the importance of accurate and timely information sharing for situational awareness and coordinated response efforts.

Differences arise in the target audience, functionality focus, user interaction, and implementation scale. The web-based system primarily caters to medical professionals in urban areas, concentrating on emergency reporting, ambulance routing, and hospital selection. On the other hand, the mobile app has a broader scope, serving a wider range of users and incident types, with functionalities encompassing incident reporting, responder tools, weather updates, and evacuation guidance. The web-based system may require specific training for medical professionals, while the mobile app is designed to be more user-friendly for citizen reporting and interaction. In terms of implementation scale, the web-based system may necessitate institutional adoption and infrastructure setup, while the mobile app is deployed more readily with individual user adoption.

Strengths of the web-based emergency management system lie in the ability to streamline medical emergency response in urban areas, optimizing ambulance routing and hospital selection. However, they may need more specialized training

requirements and a more focused scope limited to medical emergencies in urban settings. On the other hand, the mobile emergency app offers flexibility and adaptability to diverse needs and contexts, providing a broader range of functionalities for various emergencies. However, potential areas for improvement include reliance on user adoption and data quality and the need for effective communication strategies and training for various stakeholders.

Related Local Studies

iRubwat: A Disaster Preparedness Mobile Application

It presents a compelling study on the transformative potential of mobile apps in community empowerment and resilience-building against disaster risks. The project, iRubwat ("preparation" in Ilo o), stands out for its mixed-method approach and systematic development process. It aims to deliver essential disaster preparedness and mitigation information directly to users.

The study embraces a multifaceted development strategy, employing quantitative and qualitative data collection methods. The inclusive approach enables the researchers to gather diverse insights and understand users' nuanced needs and expectations. Clustered sampling further ensures a tailored approach, addressing distinct communities' specific vulnerabilities and risks.

Adhering to the Spiral Model, the iRubwat development follows a controlled and iterative process. The Planning, Risk Analysis, Engineering, and Evaluation phases are systematically implemented, fostering constant evaluation and refinement—the methodological rigor results in a robust and user-friendly application.

Technical quality and user experience are paramount considerations, prompting the involvement of professionals and students for evaluation. Assessing usability, effectiveness, efficiency, accessibility, and assistive technology support provides a comprehensive understanding of the app's functionality. Further evaluation

involves users' perceptions of usefulness, simplicity, and intention to use, ensuring a holistic assessment of the app's impact.

The study's outcomes are promising, indicating that iRubwat possesses commendable technical qualities and potential for effective information dissemination and educational purposes.

This suggests a signifying role for the app in raising awareness about disaster preparedness, equipping communities with essential knowledge, and fostering effective responses to emergencies.

To enhance iRubwat's impact, future iterations could focus on localization and translation, expanding language support to cater to diverse communities. Integrating interactive elements such as gamified features, quizzes, and simulations may enhance engagement and knowledge retention. Furthermore, connecting with local emergency response networks would ensure real-time updates and facilitate coordinated efforts during emergencies, strengthening the app's role in community resilience.

Help Me: An Emergency Response Mobile Application

Caliston *et al.* (2021) research addresses a critical aspect of disaster management: emergency response. The project, "Help Me: An Emergency Response Mobile App," is designed to facilitate swift and efficient responses to critical situations. The app introduces key features that enhance timely intervention and communication between individuals in need and emergency services.

At the heart of the app is a prominent red button that empowers users to instantly report emergencies, triggering an immediate alert to relevant authorities. Location tracking is seamlessly integrated to ensure rescuers quickly pinpoint users' locations, a crucial element in time-sensitive situations. The app's communication tools include Firebase-powered push notifications for real-time updates and agora. location-enabled video calls for direct communication between users and emergency

personnel, and leaflet map integration for efficient route planning. The "Help Me" app extends impact to various stakeholders:

The app's alert system and location tracking empower firefighters to respond swiftly to fire emergencies. Philippine National Police (PNP), Supporting police in responding to crime scenes and medical emergencies enhances public safety and security. Barangay Police and Captain, the app strengthens localized emergency response through accessibility and communication features, benefiting communities at the grassroots level. Municipal Disaster Risk Reduction and Management Office (MDRRMO) Provides valuable data and insights, and the app contributes to disaster preparedness and mitigation efforts, enhancing overall community resilience.

The app's compatibility with Android phones ensures a broad user base in the Philippines, yet potential future development could explore expanding compatibility to other platforms for increased reach. Additional features like language translation, offline functionality, and integration with local emergency response networks can enhance the app's adaptability and effectiveness in diverse contexts. Caliston et al.'s research demonstrates the transformative power of technology in improving emergency response, providing a valuable tool to save lives and enhance community resilience.

The comparison between the "Help Me" app and the researcher's Mobile Emergency App System underscores key similarities and differences. Both applications share a mobile platform focus, prioritize user-initiated emergency reporting, leverage Firebase for real-time communication, and aim for efficient emergency response. However, distinctions exist in app focus, technology integrations, additional features, and stakeholder engagement.

While the "Help Me" app concentrates specifically on emergency response with features like video calls and stakeholder notifications. The "Help Me" app incorporates specific technologies like [agora.io](#) and leaflet maps, whereas researchers' systems may use different technologies based on specific designs. Additional features

mentioned in the researchers' system, such as language translation, offline functionality, and local network integration, are not explicitly discussed in the "Help Me" app study. The "Help Me" app outlines the impact on specific stakeholders, whereas the researchers' system may benefit from further elaboration on target beneficiaries and stakeholder engagement approach.

iHanda: A Mobile Application for Disaster Preparedness

The iHanda mobile application, as meticulously outlined in Fernando et al.'s study (2019), emerges as a significant and laudable effort to equip Filipinos, with a specific focus on Manila residents, with indispensable information and resources for effective disaster preparedness. The Android application is purposefully designed to cater to the unique challenges posed by various natural hazards prevalent in the region, including earthquakes, floods, fires, and typhoons.

The key features of iHanda go beyond the conventional bounds of a mobile application, aiming to be a comprehensive tool for disaster preparedness. Functionality extends to assisting users in the assembly of essential emergency kits. This feature ensures that individuals are not only informed about potential hazards but also equipped with tangible supplies to weather the impact of disasters.

One of the notable aspects highlighted in the study is iHanda's ambition to extend coverage nationwide. While initially targeting Manila, the developers envision reaching Filipinos nationwide. The expansion is a strategic move to empower individuals in diverse geographical locations, each facing specific disaster vulnerabilities and risks.

The study recognizes potential improvement areas and suggests enhancements that could elevate iHanda's effectiveness. Firstly, expanding the application's compatibility to iOS devices is recommended to broaden accessibility and cater to a wider user base. Real-time notification systems are proposed to keep users

updated on the latest developments, a critical feature during emergencies when timely information is crucial.

iAlerto: A Web and Mobile Alert System for Pasig City Disaster Risk Reduction Management Office (PCDRRMO) with Mobile GPS Service Integration

Goh *et al.* (2023) contribute to advancing emergency response and citizen engagement with the groundbreaking study introducing a web and mobile application tailored for Pasig City. The innovative system facilitates incident and emergency reporting by residents and strengthens the disaster response capabilities of the Pasig City Disaster Risk Reduction and Management Office (PCDRRMO).

Central to the study is the recognition of the need for efficient communication during emergencies. The multi-platform application design addresses the need by enabling residents to report incidents and emergencies seamlessly through the mobile app. The real-time reporting mechanism enhances the PCDRRMO's situational awareness, leading to quicker and more informed responses. The study underscores the transformative potential of the direct communication channel, turning residents into proactive contributors to community safety.

A key takeaway from the study is the positive user perception of the system's functionality, signaling viability for broader implementation. The envisioned widespread adoption within Pasig City promises to transform disaster preparedness and response dynamics. By establishing an effective framework for citizen-driven reporting, the study lays the groundwork for a future where communities actively ensure safety and disaster response agencies benefit from real-time, on-the-ground data.

The study proposes enhancements to amplify the system's impact further. Addressing the digital divide, an SMS module is suggested to extend critical information access to those without internet connectivity. The inclusive approach ensures that everyone receives timely updates regardless of digital access and actively participates in community resilience. Additionally, the proposal to implement a survey

response feature creates a two-way communication channel, allowing PCDRRMO to gather resident feedback during critical events. The feedback loop guides improvements to the system and facilitates targeted interventions, such as wellness checks for vulnerable populations.

Goh *et al.* study marks a significant advancement in fostering collaboration between citizens and disaster response agencies. The multi-platform application, with emphasis on real-time reporting and citizen participation, has the potential to reshape the landscape of emergency response in Pasig City. With envisioned enhancements, the innovative system is a beacon for creating a more resilient and responsive community, poised to face emergencies with collective action and heightened preparedness.

The system is also a web and mobile application connected to the study. Both studies aim to provide real-time response, enabling residents to send incident reports and emergencies through the mobile app.

Design and Development of an Incident Reporting

Traditional methods of reporting emergencies, such as phone calls and SMS messages, have been widely acknowledged as inefficient and susceptible to errors, as emphasized by Bulusan *et al.* (2019). In response to the challenge, the researchers advocate for developing mobile applications explicitly tailored for emergency reporting.

Bulusan *et al.* (2019) key findings underscore the substantial advantages offered by mobile apps. Compared to traditional methods, the app facilitates swifter and more precise reporting of incident types, provides location accuracy within 5 meters using GPS, and includes crucial details such as images. The study's commitment to user-centered design through a prototyping model ensures that the app aligns with the needs of target users—trained first responders. The dedication is validated by the positive feedback, emphasizing the app's accuracy, ease of use, and reduced potential for errors.

Beyond improved reporting capabilities, the app enhances emergency personnel's response capabilities by furnishing valuable information, including location mapping, details of nearby facilities, and centralized data storage for analysis, thereby refining response processes. Bulusan et al. (2019) also suggest the application of artificial intelligence (AI) to automate emergency response, potentially predicting hotspots and peak times based on collected data, indicating scalability and future potential for wider implementation across larger geographical regions.

However, several considerations merit further discussion. Addressing data security and privacy concerns is paramount when handling sensitive emergency information. Ensuring accessibility to a diverse user base with varying technological literacy is essential for widespread adoption. Moreover, contemplating long-term sustainability models and funding mechanisms is crucial for such applications' large-scale implementation and maintenance. By expanding upon Bulusan et al.'s (2019) research and engaging with additional considerations, valuable contributions were made to the ongoing discourse on the potential and challenges of mobile emergency reporting applications, ultimately serving as indispensable tools for improving response times, saving lives, and enhancing community resilience.

ALERTO SILANG: Incident Locator Mobile Application

Gerodias (2019) advocates for a transformative approach to incident reporting in the Municipality of Silang through the utilization of geolocation capabilities in modern mobile devices. The study introduces "ALERTO SILANG," a mobile app designed to empower citizens by enabling them to send geo-tagged incident reports directly to local authorities, thereby enhancing communication and expediting response times during emergencies.

The study emphasizes several key points, primarily on harnessing geolocation technology for improved incident reporting. ALERTO SILANG capitalizes on the technology's prevalence, capturing precise location data alongside incident details to

facilitate faster and more accurate response efforts. The app's citizen-centric communication approach aims to bridge the gap between residents and local agencies, encouraging active participation in ensuring public safety and fostering a collaborative and responsive emergency response system.

An essential aspect of the study is an evolutionary development methodology involving citizens and local authorities in iterative testing and refinement processes. The approach ensures that the final product addresses both user groups' specific needs and preferences. Beta testing involving random residents and local officials yielded positive results, affirming the app's usability and effectiveness in improving communication and responsiveness during emergencies.

Table 1 shows the comparison of related foreign studies, which includes system, author/s and year, methodology, objectives, and contributions of the study.

Table 1. Comparison of related foreign studies

SYSTEM	AUTHOR(S) /YEAR	METHODOLOGY	OBJECTIVES	CONTRIBUTIONS
Development and Evaluation of a Mobile Application for Earthquake Early Warning	Firazzi (2019)		To establish an application that detects the earthquake and to receive the early warnings.	Information dissemination
GEMAR: Web-Based GIS For Emergency Management and Ambulance Routing	Ramdani, U. (2021)		Provides timely treatments to patients in emergency conditions.	Emphasizing the significance of geospatial technologies in emergency response.
Increasing Disaster Victim Survival Rate: Mobile Application Development	Berawi, L. & Siahaan, A. (2021)	Sequential Mixed Method	Victim prioritization and technology utilization during disaster event	Adopt common features and provides useful information
Interaction Modes for Emergency Mobile Apps	Nass, J., Groen, Villela, & Holl (2018)	ABC Model	To provide an interactive app that allow civilian to participate in emergency response.	Elaborate the signify and emergency alert app in terms of emergencies.
Safety Souls Mobile App for Emergency Response	Hussein, I. & Alotabi, A. (2020)		Developed a flexible and dynamic mobile app which offerstracking mechanism and information management.	Enhanced the tracking mechanism, and information management system for emergency response teams and respondents.

Table 2 shows the comparison of related local studies, which includes system, author/s and year, methodology, objectives, and contributions of the study.

Table 2. Comparison of related local studies

SYSTEM	AUTHOR(S) /YEAR	METHODOLOGY	OBJECTIVES	CONTRIBUTIONS
ALERTO SILANG: Incident Locator Mobile Application	Gerodias	Evolutionary Development methodology	To apply an existing technology to develop an efficient tool to the people of Silang which can help decrease the risk of lives or properties.	Provide an easy to use SOS tool for users.
“Help Me”: An Emergency Response Mobile Application	Caliston & Damitaras (2021)	Sequential Design Process	Established a system that would provide a quick response to emergencies	Enhancing capabilities for effective emergency alert and response
iAlerto: A Web and Mobile Alert System for Pasig City Disaster Risk Reduction Management Office (PCDRRMO) with Mobile GPS Service Integration	Goh, Manahan, Mangalus, Carreon, Ong, & Vicente (2023)	Scrum Methodology	Improves the incidents or emergency reporting of the residents in Pasig City and better supports the disaster response of PCDRRMO	Provide related useful information for developing an efficient emergency alert app
iHanda: A Mobile Application for Disaster Preparednes s	Fernando, Lagman (2019)	Scrum Method, Black Box Approach	Implement real-time notifications for new announceme nts appearing in the status bar when the device is online.	Information dissemination

Table 2. Continued

SYSTEM	AUTHOR(S) /YEAR	METHODOLOGY	OBJECTIVES	CONTRIBUTIONS
iRubwat: A Disaster Preparedness Mobile Application for Earthquake Early Warning	Olipas, Urmatan (2019)	Mixed Method, Spiral Model	To provide an interactive app that disseminate information about disaster and risk reduction.	Adopting specific context, such as the development of city specific emergency alert system.

Table 3 shows the comparison of foreign study to other existing systems. It shows the comparison of the feature to the existing system from the study.

Table 3. Comparison of the developed study to the other existing systems

FEATURES	EXISTING SYSTEM										PROPOSED SYSTEM
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	
Account Management				✓	✓				✓	✓	✓
Disaster Response Monitoring	✓	✓			✓	✓	✓	✓	✓	✓	✓
Notification and News			✓						✓		✓
Evacuation Routing				✓							✓
SOS Call				✓			✓				✓

Legend:

S1 – Assessment of the Adequacy of Mobile Applications for Disaster Reduction

S2 – Increasing Disaster Victim Survival Rate: SaveMyLife Mobile Application Development

S3 – Development and Evaluation of a Mobile Application for Earthquake Early Warning

S4 – Interaction Modes for Emergency Mobile Apps

S5 – Safety Souls Mobile Application Emergency Response System

S6 – iRubwat: A Disaster Preparedness Mobile Application

S7 – “HEPL ME”: AN EMERGENCY RESPONSE MOBILE APPLICATION

S8 – Designing Mobile Application for Emergency Response: Citizens Acting as Human Sensors

S9 – iHanda: A Mobile Application for Disaster Preparedness

S10 – iAlerto: A Web and Mobile Alert System for Pasig City Disaster Risk Reduction Management Office (PCDRRMO) with Mobile GPS Service Integration

✓ - include in the system

MATERIALS AND METHODS

This chapter presents the requirements for developing a system. It discusses the necessary materials used by researchers, including the research design and techniques or methods needed in developing the system.

Materials

The material used in the development of the system had the following specifications: System Model: HP ProBook 640 G1 with BIOS: L77 Ver. 01.20 (type: UEFI) with an Intel(R) Core (TM) i5-4200M CPU @ 2.50GHz (4 CPUs), ~2.5GHz with Memory of 8192MB RAM.

The system utilized the following development tools: researchers used Flutter Dart for programming languages. Researchers used the Android Studio 2023 Integrated Development Environment (IDE) tool to create Android-based application software (C# Blazor 2020). Photoshop 2023 styled the system's user interface. Firebase managed the data and directly accessed the system's database. The internet was also used to gather information on the topic. Finally, Microsoft Word was used to document the study.

Method



Figure 2. Agile Scrum Methodology

The Agile Scrum methodology relies on incremental development, with each iteration consisting of two- to four-week sprints. The goal of each sprint is to build the most important features and obtain a potentially deliverable product. Subsequent sprints add more features, which are adjusted based on stakeholder and customer feedback between sprints. The greatest benefit of the Agile Scrum methodology is its flexibility, as the Scrum team typically receives feedback from stakeholders after each sprint, allowing for quick adjustments to product goals in future sprints.

Initiation

The initiation of a project is essential for laying the groundwork for success. The phase involves outlining goals, defining objectives, and determining deliverables. Additionally, developing a clear vision for the project, creating a project backlog, and allocating team roles are included.

To begin with, resident pain points are identified through surveys, interviews with the Bacoor Disaster Risk Reduction and Management Office (BDRRMO), and process observations in the office. The initial sprint provides a comprehensive understanding of the challenges faced during emergencies. Using a Fishbone Diagram, current system limitations are examined, and the advantages of digitalizing emergency reporting are visualized.

In Scrum, the Product Backlog is a prioritized inventory of all necessary features and enhancements for product development and improvement. It functions as the primary source of information for the team and is continuously updated to incorporate new features, feedback, and ideas.

The BDRRMO acts as the Product Owner, supervising the Product Backlog. Responsibilities involve prioritizing user stories, making decisions on feature development, and ensuring alignment with the broader project objectives.

Planning and Estimation

In the planning and estimation phase, the project is divided into product epics and user stories. Product epics capture the big picture, while user stories detail specific tasks. Collaboration with the product owner prioritizes these stories and establishes a sprint backlog for the upcoming sprint. Researchers participate in Sprint Planning, a collaborative session that determines the scope of the next sprint.

The phase involves gathering data and understanding current problems. Surveys conducted among residents and interviews with the Bacoor Disaster Risk Reduction and Management Office (BDRRMO) provide valuable insights into existing reporting processes and challenges.

Using the Fishbone Diagram, a visual tool for problem-solving, identified challenges are explored in depth. The analysis examines root causes and highlights the potential benefits of digitalizing disaster preparedness efforts.

Stakeholder engagement is crucial for TAMBULI's success. In Sprint 0, collaborative workshops will be conducted with the BDRRMO and residents to shape the application's features actively. An inclusive approach ensures that the developed solution directly addresses the needs and preferences of the target users.

Execution

The phase entails bringing ideas to life by creating user stories and completing tasks within the sprint. The development team holds daily stand-up meetings and tracks progress using burndown charts to ensure alignment and transparency. Communication and problem-solving are facilitated through brief, 15-minute Daily Scrums held every workday during the sprint.

During Daily Scrums, progress on tasks within the Sprint Backlog is discussed, obstacles or impediments are identified, solutions are collaboratively sought, and adjustments to the approach are made as needed.

The development process then focuses on building the application. Sprint 0 involves designing a clear and intuitive user interface using Adobe Photoshop Pro 2023. Sprints 1 to 4 delve into core functionalities, utilizing Android Studio 2023 and Flutter-dart for the mobile application and Visual Studio 2022 for the BDRRMO's web interface for managing reports and updates. Each sprint is a time-boxed iteration where researchers work to complete a set of tasks from the product backlog, estimating the effort required for each task within the Sprint Backlog, fostering transparency and accountability.

Review & Retrospective

At the end of each sprint, progress is reflected upon. Completed user stories are showcased to stakeholders, feedback is gathered, and a retrospective meeting is conducted to analyze the sprint process for improvements. Once the sprint concludes, researchers gather for a Sprint Review. This session showcases the completed work, functionalities, and features developed during the sprint. BDRRMO Research and Planning staff and potential users are invited to provide feedback on the completed work, offering valuable insights for future iterations.

Following the Sprint Review, a Sprint Retrospective is held. The reflective session allows an analysis of what went well during the sprint, identification of areas for improvement, and adaptation of processes for future sprints.

Release

The release phase marks the delivery of the product, ensuring a successful outcome. A project retrospective may be conducted to evaluate overall performance and capture lessons learned for future projects. In Agile Scrum, the Product Increment refers to the sum of all completed and potentially shippable product backlog items delivered by the end of a sprint. The approach is incremental and iterative, with new

functionality, improvements, or features continually integrated and demonstrated after each sprint.

Data security and scalability are critical considerations. In Sprint 1, the Firebase Realtime Database is integrated to ensure secure and efficient data management. Sprint 3 enhances features like evacuation routing and the SOS button, incorporating user feedback through continuous testing and refinement cycles. The final sprint ensures that the application meets the highest standards. Comprehensive user testing, using ISO 25010 standards as a benchmark, assesses the application's accessibility, reliability, usability, security, maintainability, and portability. The rigorous evaluation ensures that the application is a robust and effective tool for the Emergency Alert System.

Participants of the Study

The study was based on Random sampling, wherein all respondents were selected from various people to check and evaluate the system. The respondents were ten (10) IT Professionals, twenty (20) BDRRMO Admin/staff, and one hundred (100) Bacoor Residents.

The breakdown of the respondents was based on snowball-purposive sampling, wherein samples were chosen based on the number of respondents, and the corresponding data were used in the system.

Table 4 shows the respondents' breakdown for the system's evaluation.

Table 4. Breakdown of the respondents on the evaluation

CLASSIFICATION	FREQUENCY	PERCENTAGE
IT Professionals	10	7.69%
BDRRMO Admin/Staff	20	15.38%
Bacoor Residents	100	76.92%
TOTAL	130	100 %

Sampling Technique

Simple random sampling is a technique for selecting a sample of participants from a larger population. It entails selecting individuals to ensure that every population representative has an independent and equal chance of being included in the sample.

Furthermore, this guarantees that the sample is a member of the population and reduces the chance of partiality.

Statistical Treatment of Data

After the researcher's manual tabulation of data, the following statistical tools were used:

1. **Percentage.** Tabulation, presentation, and interpretation were used for the distribution.

The formula is: $P = \frac{f}{n} \times 100$

Where: P = percentage

f = frequency

n = total number of respondents

2. **Weighted Mean.** A weighted mean is average. Instead of each data point contributing equally to the final mean, some data points contribute more weight than others. If all weights are equal, then the weights are equal, then the weighted mean equals the arithmetic mean.

The formula is:

Where: \bar{x} = is the weighted mean

f_i = frequency

x_i = weight

N = total number of populations

3. Slovin's formula. Slovin's formula, also known as Slovin's sampling formula, is a statistical method used to determine the sample size needed for a survey or research study when the population size is considerable and it is not feasible to survey the entire population. It estimates the sample size required to achieve a certain confidence level in the survey results.

The formula is expressed as: $n = \frac{N}{(1+Ne^2)}$

Where:

- n is the required sample size.
- N is the total population size.
- e is the Margin of error

4. Likert Scale. The researchers used the Likert Scale to evaluate the system software. The scale consisted of a number from 1 to 5, denoting a poor to excellent rating respectively. The respondents evaluated the software using a number scale from one to five, denoting a poor to excellent rating.

Table 5 shows that the researchers used the Five-Point Likert's Scale to interpret the data gathered from the participants. In a Likert Scale questionnaire, the participants should specify their level of agreement with the statements listed.

Table 5. Likert's Scale

RATE	EQUIVALENT	VERBAL INTERPRETATION
5	4.50 - 5.00	Excellent
4	3.50 - 4.49	Very Satisfactory
3	2.50 - 3.49	Satisfactory
2	1.50 - 2.49	Fair
1	1.00 - 1.49	Poor

RESULTS AND DISCUSSION

This section of the study discusses the deliverables of each stage of the methodology used in the research and the statistical results of the evaluation conducted of the study.

System Concept and Requirements

The TAMBULI: An Emergency Alert System for the City of Bacoor was developed to enhance incident reporting and disseminate crucial announcements to residents of Bacoor, Cavite. The system is designed exclusively for Bacoor's emergency services and employs C# Blazor on Visual Studio for the web application and Flutter-dart on Android Studio for the Android application. The development process utilized Agile Scrum methodology, emphasizing iterative development, collaboration, and flexibility, particularly suitable for complex projects. Scrum, a subset of Agile, provides a structured framework, facilitating continuous improvement, client feedback, and adaptive planning.

The Tambuli App has specific system requirements. The minimum requirements include Android 10 or higher (API Level 29+), 3 GB RAM, 500 MB of free storage, and an active internet connection for certain functionalities. Recommended requirements are Android 11 or higher (API Level 30+), 4 GB RAM, 1 GB of free storage, and a reliable internet connection (Wi-Fi or 4G/5G). Hardware necessities include a GPS module, phone call functionality, alert vibration support, and Wi-Fi or mobile data connectivity.

The app requires various permissions: FOREGROUND_SERVICE to run foreground services, ACCESS_BACKGROUND_LOCATION for background location access, ACCESS_FINE_LOCATION and ACCESS_COARSE_LOCATION for precise and approximate location access, CALL_PHONE to initiate phone calls, VIBRATE for

notifications, INTERNET for internet access, and WAKE_LOCK to prevent the device from sleeping.

For the web system, server-side requirements include modern web browsers like Google Chrome, Microsoft Edge, Mozilla Firefox, or Safari, supporting WebAssembly and JavaScript, which are essential for Blazor. Any device capable of running a modern web browser is sufficient, with processing mainly handled server-side in Blazor Server apps. Firestore setup involves configuring a Firebase project with Firestore enabled, setting security rules and indexes, and selecting an appropriate billing plan based on usage.

The minimum server requirements are a Windows/Linux/macOS operating system, a dual-core CPU, 2 GB RAM, and 10 GB of disk space. Recommended server requirements are a quad-core CPU or better, 4 GB RAM, and 20 GB of disk space. Client requirements include a modern web browser and any device supporting it. Firestore setup requires enabling a Firebase project and choosing an appropriate billing plan.

Bacoor, located in Cavite, Philippines, faces significant challenges, particularly flooding, as it acts as a catch basin for the province. Frequent flooding events threaten residents' safety and infrastructure stability. To address these issues, the Bacoor local government established the Bacoor Disaster Risk Reduction Management Office (BDRRMO) to enhance disaster preparedness, response, and recovery. Rapid urbanization has increased the city's vulnerability to various emergencies, prompting the development of the TAMBULI system to assist the community.

The application serves as a central hub for collecting, processing, and disseminating crucial information, enabling stakeholders to make informed decisions promptly during emergencies. It offers real-time alerts, evacuation routes, and safety guidelines, empowering individuals to take proactive measures during emergencies. The app ensures accessibility, particularly during disasters when communication lines are disrupted or overloaded, providing users with real-time updates and notifications

about ongoing emergencies, evacuation routes powered by Google Maps, and safety advisories.

Design Specification and Coding

The system development utilized various IDEs and programming languages. Android Studio 2023 outlined and coded the Android application, while Firebase managed the database. Visual Code facilitated web system features, with Canva Pro 2023 used for the graphical user interface and Draw.io for system diagram creation. Programming languages included Flutter-Dart for functionality and C# for web development, incorporating four access levels: administrator, moderator, responder, and end-user.

Agile Scrum, an iterative framework, guided project management and software development through several phases. Initiation involved establishing a clear vision, defining objectives, creating a project backlog, and identifying team roles. Planning & Estimation prioritized product epics and user stories, creating a sprint backlog with effort estimates. Design strategy transformed collected data into presentations illustrating data structures, flow, and interface layouts using tools like Fishbone, Data Flow, Use Case, and HIPO diagrams.

Testing involved Test Cases, Unit Testing, Integration Testing, and a System Checklist. The Scrum process centered on roles (Product Owner, Scrum Master, Development Team), artifacts (Product Backlog, Sprint Backlog, Increment), and meetings (Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective).



Figure 3. Screen Layout of the Application (User Side/ Responder)

Figure 3 shows that the splash screen of the application will be displayed upon installation.

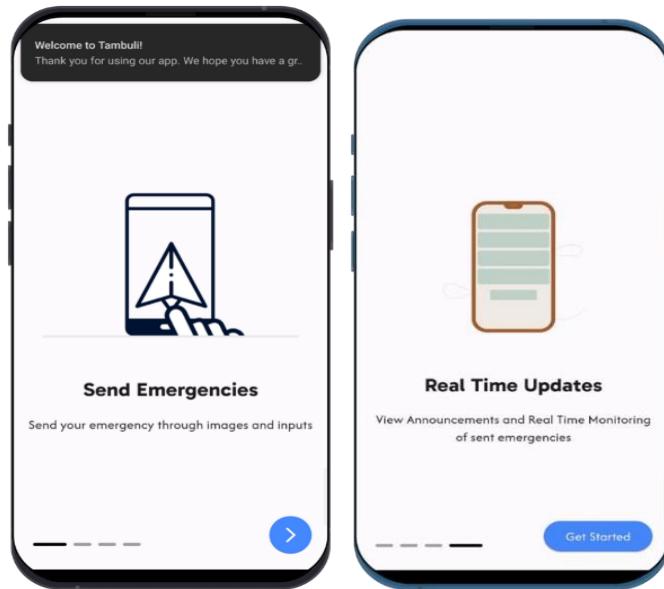


Figure 4. Screen Layout of the User Landing Application (User Side/ Responder)

Figure 4 shows upon installation the splash screen of the application will be displayed.

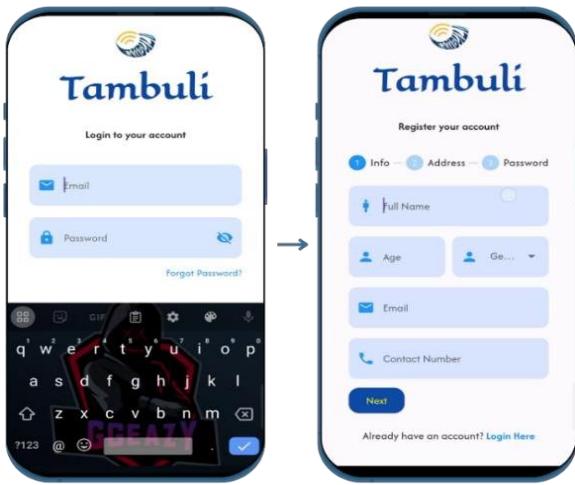


Figure 5. Screen Layout of the Login Registration Application (User Side/Responder)

Figure 5 shows that the Login Registration display requires users to provide their full name, email address (for verification purposes), and mobile number and create a secure password. Agree to the Terms and Conditions and Privacy Policy before submitting your registration; this information is crucial for creating a unique user profile and ensuring safe access to the app.

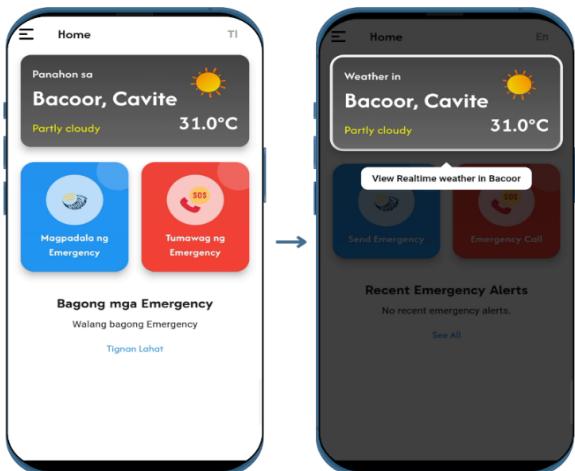


Figure 6. Screen Layout of the Board Screen Application (User Side)

Figure 6 shows the onboard screen, which displays the real-time weather and sends reports and emergency calls, including recent emergency alerts.



Figure 7. Screen Layout of the Application's Weather Display (User Side)

Figure 7 shows the application's weather and the latest weather conditions, including temperature, humidity, wind speed, and general weather status (e.g., sunny, rainy). It helps users prepare for current weather conditions.

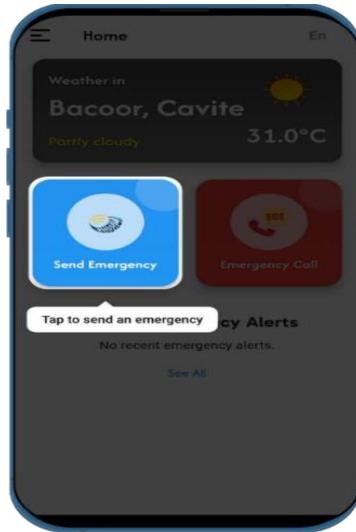


Figure 8. Screen Layout of the Application's Send Report (User Side)

Figure 8 shows the application's send report, which provides a quick access form for submitting new incident reports. Users can select the type of emergency, add descriptions, attach photos, and confirm their GPS location. This allows users to report incidents accurately and promptly.



Figure 9. Screen Layout of the Application's Emergency Call (User Side)

Figure 9 shows the application's emergency call feature, an easily accessible button that directly dials the BDRRMO emergency hotline (161). This ensures users can quickly reach emergency services when needed.

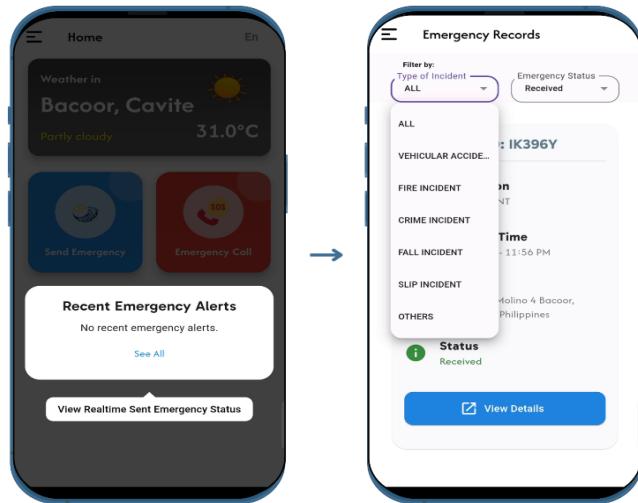


Figure 10. Screen Layout of the Application's Recent Emergency Alert (User Side)

Figure 10 displays the lists of recent incident reports submitted by other users, including details like the type of emergency, location, and time. This helps users stay aware of incidents happening nearby.

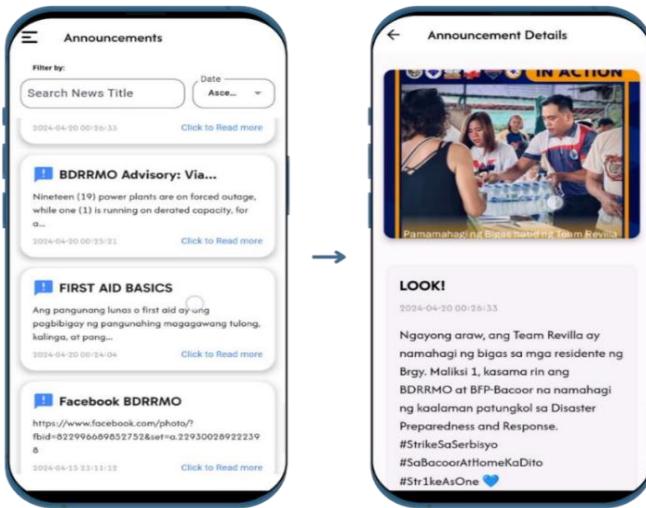


Figure 11. Screen Layout of the News and Update Module (User Side)

Figure 11 shows the News and Update Module Displays the latest announcements from the Bacoor Disaster Risk Reduction and Management Office (BDRRMO), including safety advisories, emergency preparedness tips, and community updates.



Figure 12. Screen Layout of the Evacuation Module (User Side)

Figure 12 shows the Evacuation Module, which shows the user's location on a map and highlights the nearest evacuation centers. Users can click on these centers for more details.

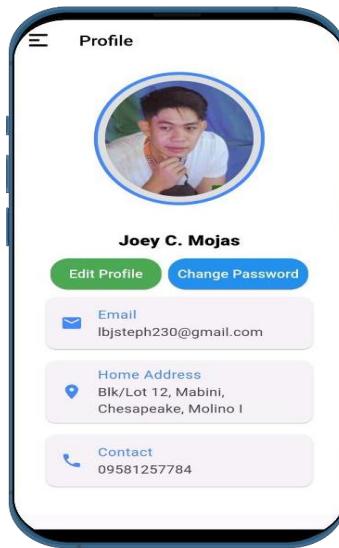


Figure 13. Screen Layout of the User Profile Page (User Side)

Figure 13 shows the user's profile and details such as name, email, and phone number. Users can update this information to keep their contact details current.

Web System

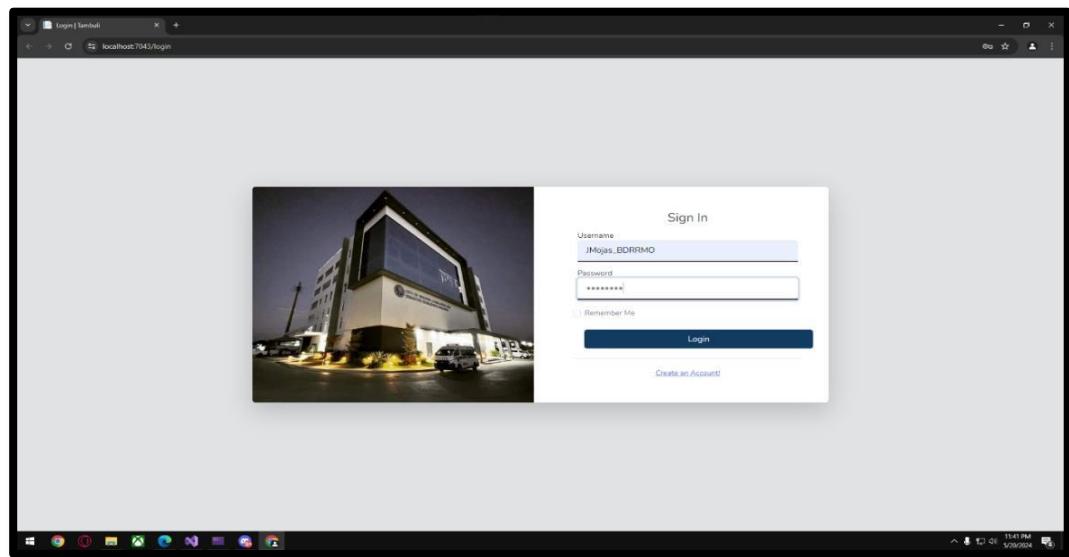


Figure 14. Screen Layout of the Login Page (Admin Side)

Figure 14 shows the login page, which requires the admins and moderators to enter their usernames and passwords to access the Tambuli Admin website.

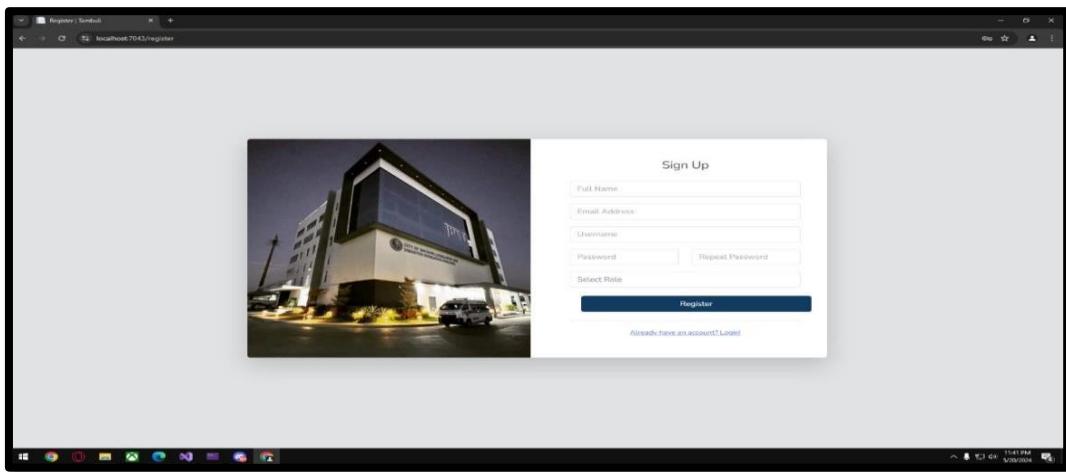


Figure 15. Screen Layout of the Registration Page (Admin Side)

Figure 15 shows the Registration page, which allows the admins and moderators to create their accounts. The system requires their full name, email address, username, password, and account role. After registering their account, the super admin must verify it.

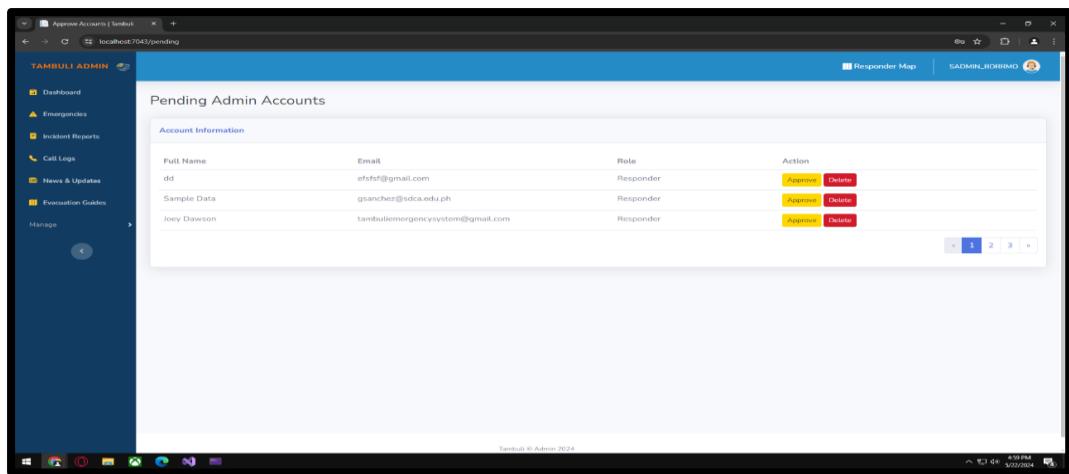


Figure 16. Screen Layout of the Admin Approval Page (Super Admin)

Figure 16 shows the Admin Approval Page, where the super admin can view created accounts of admins, moderators, and responders that are pending approval. Depending on the verification, the super admin can approve or deny their registration.

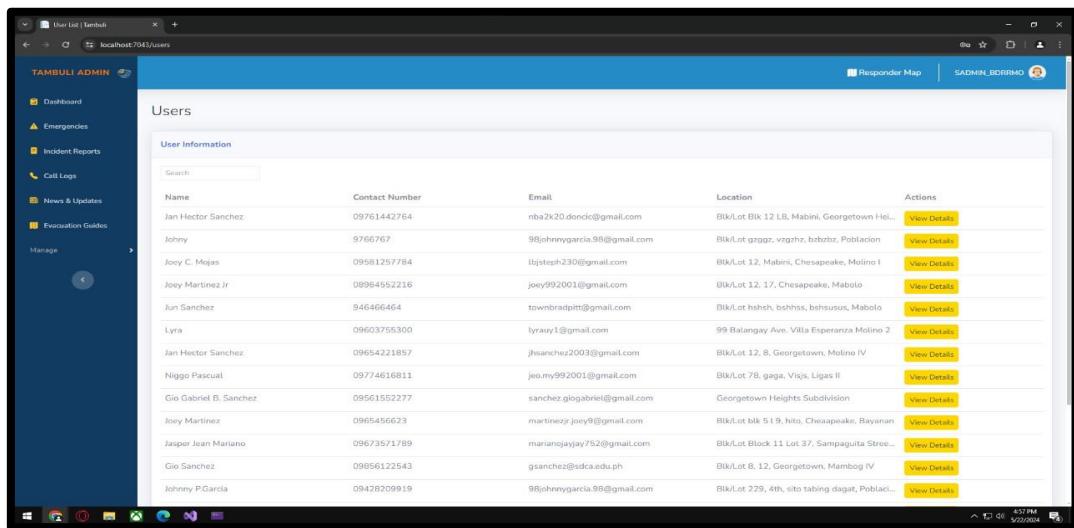


Figure 17. Screen Layout of the Users List Page (Super Admin)

Figure 17 shows the Users List page, which displays the users registered to the Tambuli Application. This page is only visible to the super admin and only shows limited information about the user's privacy.

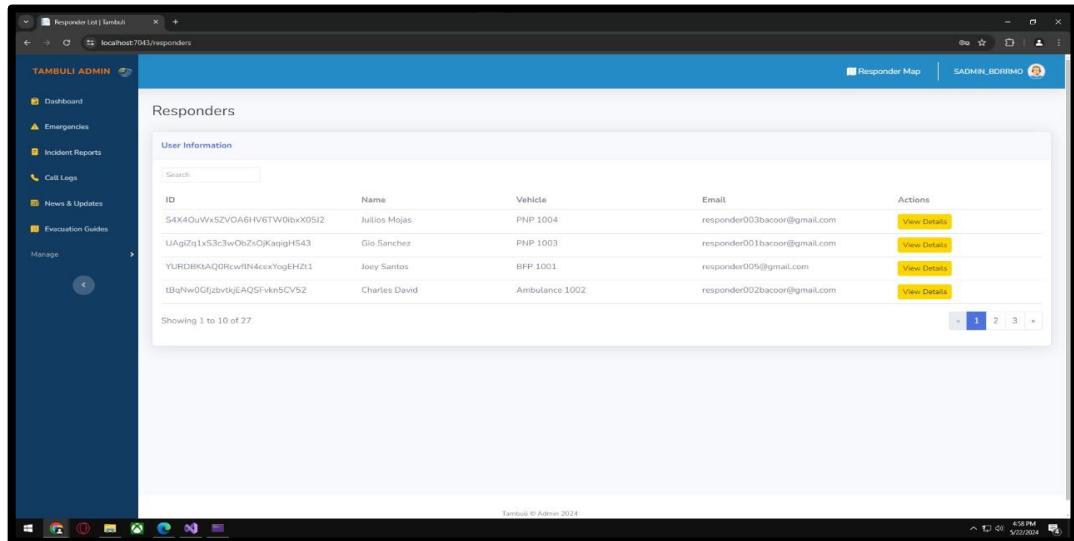


Figure 18. Screen Layout of the Responders List Page (Super Admin)

Figure 18 shows the Responders List page, which displays all the registered responders in the Tambuli App. This page shows the responders' IDs, names, vehicles, and emails. It is only visible to the Super Admin.

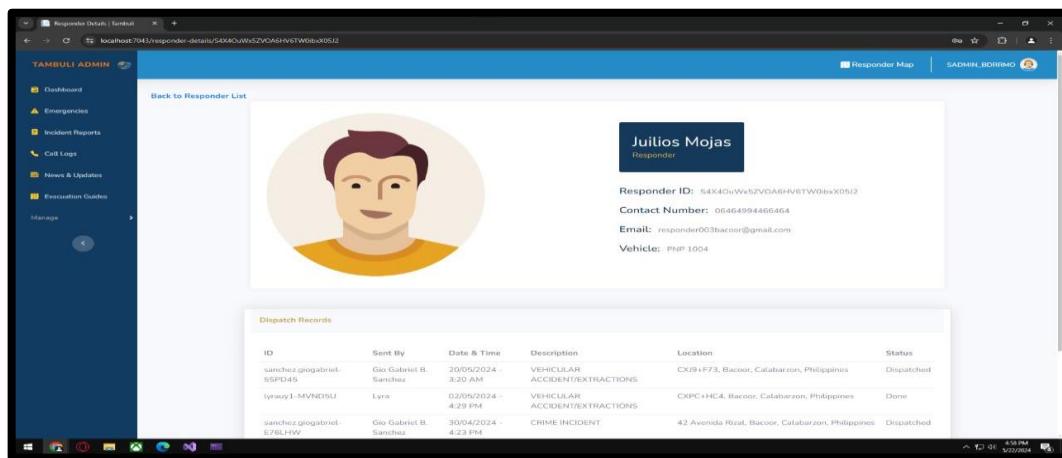


Figure 19. Screen Layout of the Responder Information Page (Super Admin)

Figure 19 shows the Responder Information page, which shows the complete information of the responders alongside the records of emergencies dispatched to their accounts.

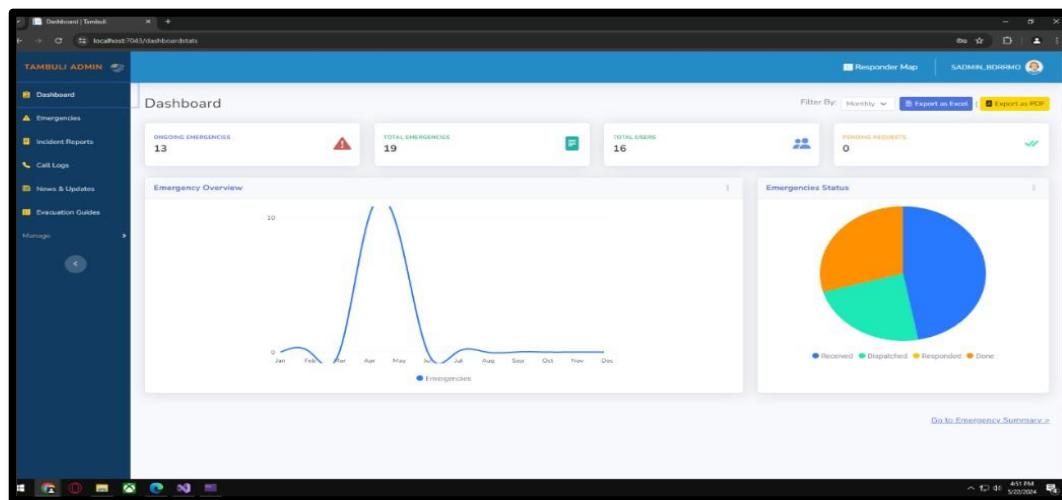


Figure 20. Screen Layout of the Dashboard Page (Admin)

Figure 20 shows the dashboard page, which shows the total ongoing emergencies, total emergencies, total users, and total accounts pending approval. It also shows a yearly graph showing the emergencies per month and a pie chart showing the status of the emergencies. The admins can also export records into an Excel or PDF file.

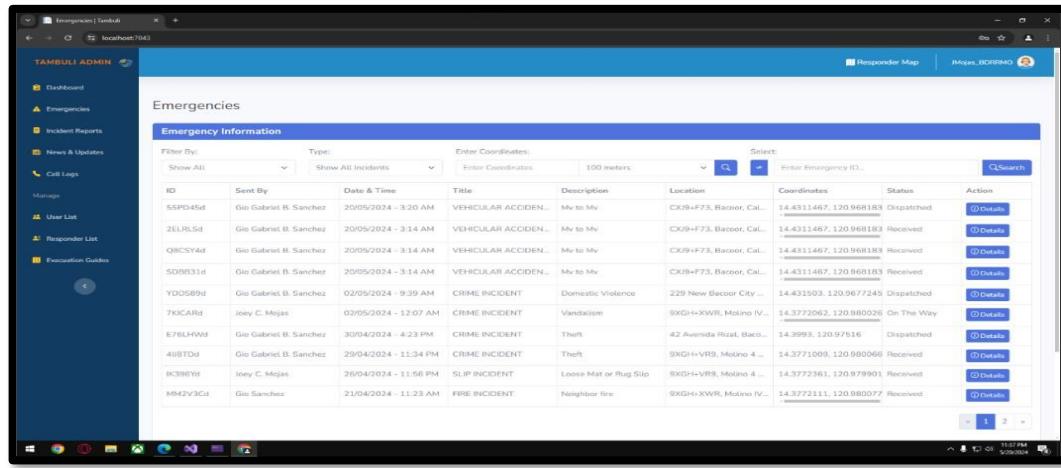


Figure 21. Screen Layout of the Emergencies Page (Admin)

Figure 21 shows the Emergencies page, the admins' landing page. It shows information on the emergencies sent by the users, including the ID, date and time, name of the sender, type, location, and coordinates of the emergency. Some filters allow the admins to search for specific emergencies.

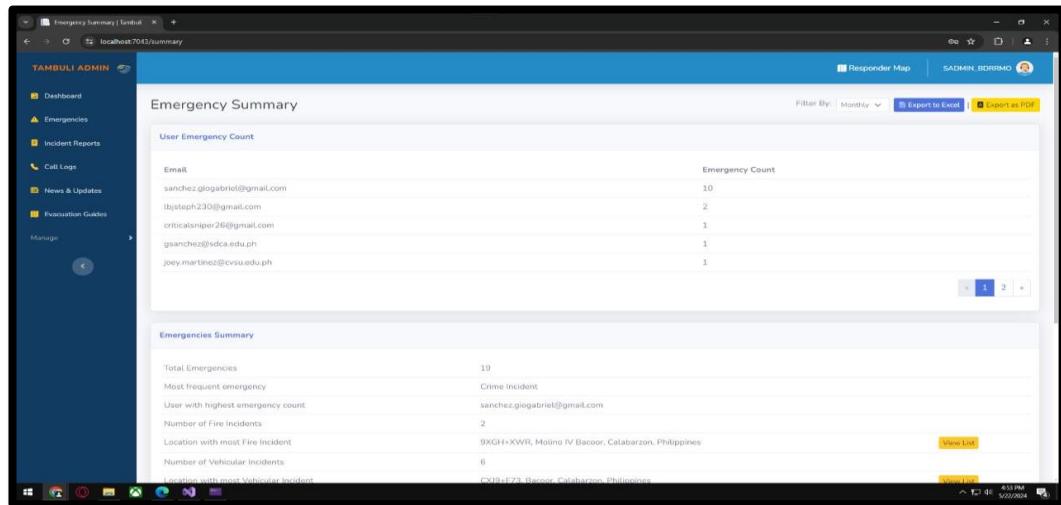


Figure 22. Screen Layout of the Emergency Summary Page (Admin)

Figure 22 shows the Emergency Summary page, which summarizes the data of the emergencies. It displays the user's email with the most sent emergencies. The admins can also export records into an Excel or PDF file.

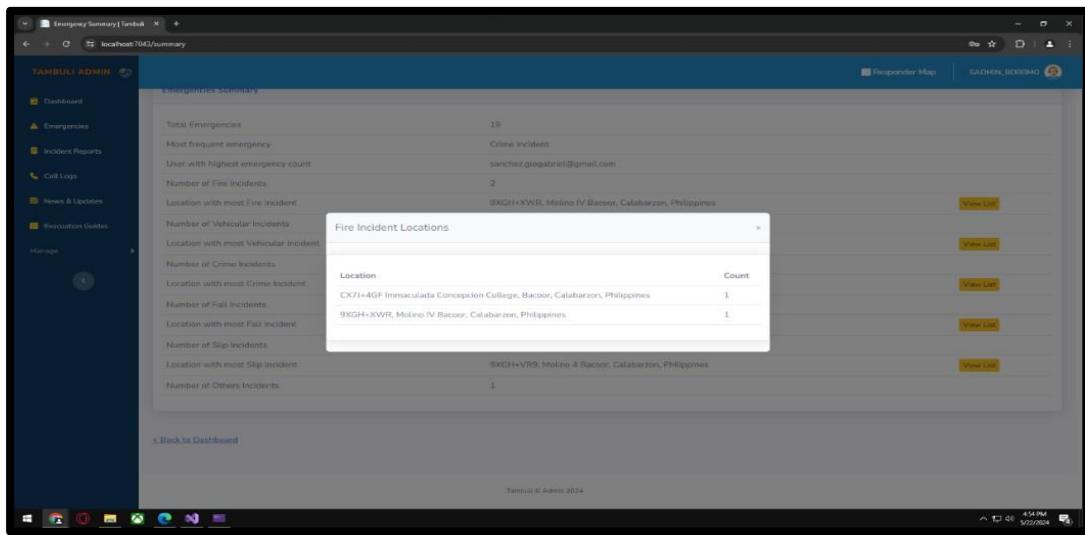


Figure 23. Screen Layout of the Emergency Summary Location List Modal (Admin)

Figure 23 shows the location modal inside the Emergencysummary page. It lists the places in which an emergency has occurred and displays the number of times it has occurred.

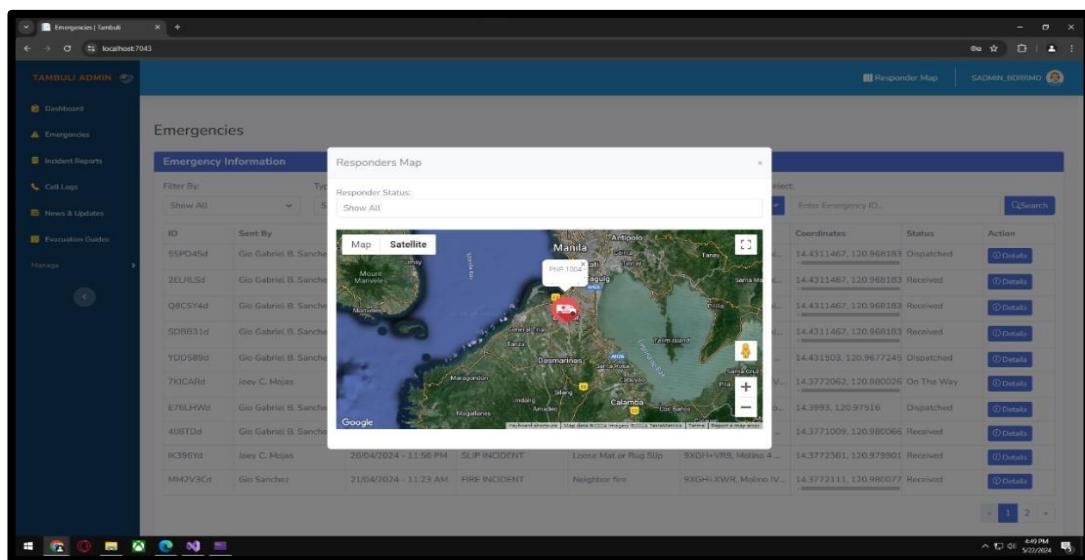


Figure 24. Screen Layout of the Responders Map (Admin)

Figure 24 shows the responder map, which allows the admin to track the locations of all the responders. The admins can select an option to display all of the responders, the available responders, or the preoccupied responders.

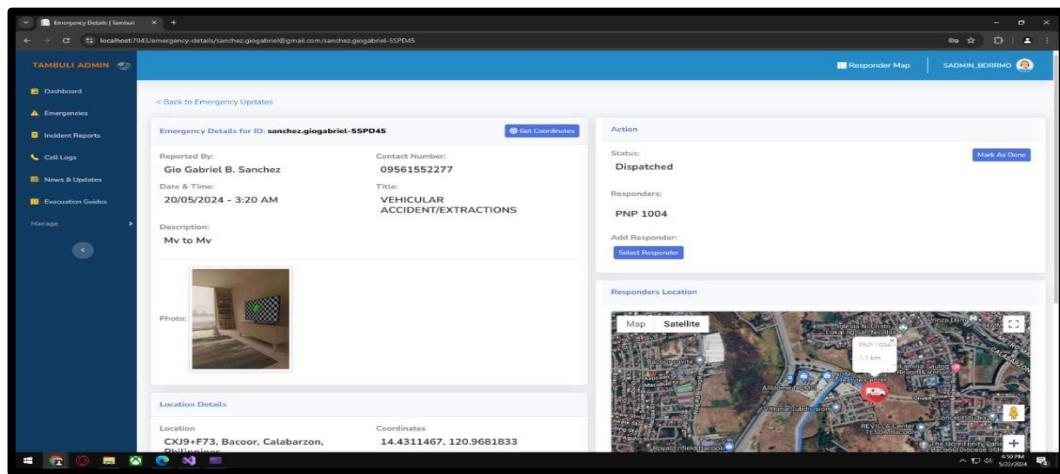


Figure 25. Screen Layout of the Emergency Details Page (Admin)

Figure 25 shows the Emergency details page, which displays all the information the user sends through the Tambuli application. It displays crucial information such as the sender's contact number, the detailed description of the emergency, and the photos if the user decides to send one.

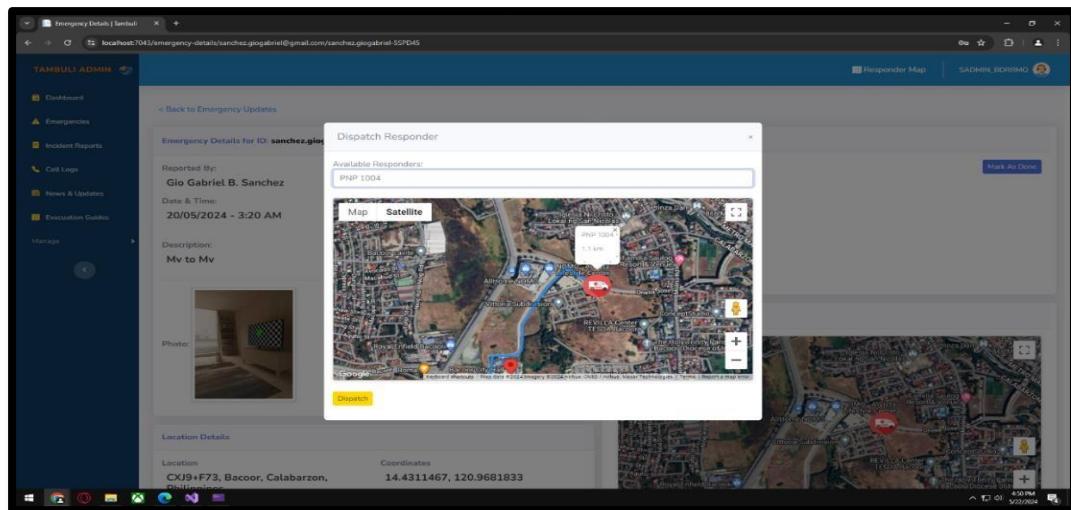


Figure 26. Screen Layout of the Emergency Details Dispatch Modal (Admin)

Figure 26 shows the dispatch modal on the Emergency Details page, which allows the admin to dispatch responders to the emergency. The dispatcher can view the estimated time of arrival and the responders' distance from the emergency.

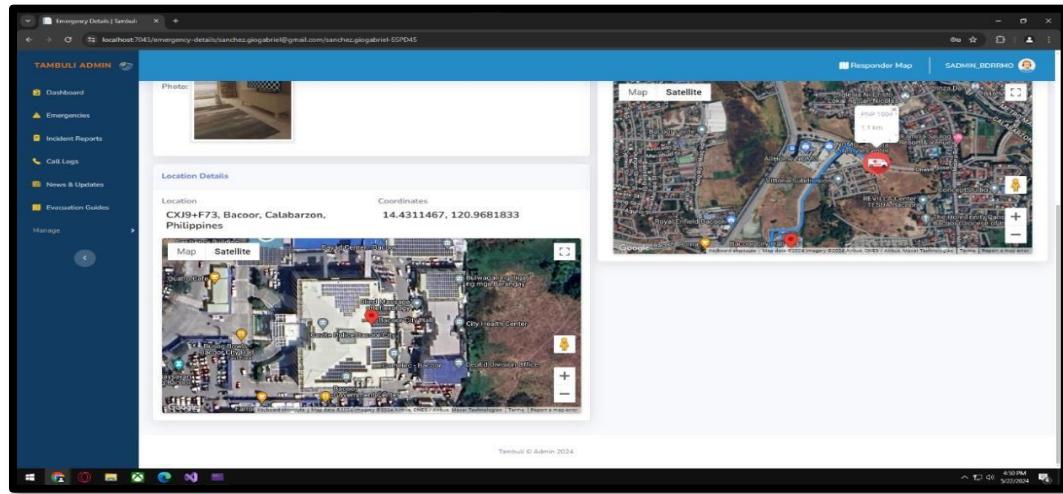


Figure 27. Screen Layout of the Emergency Details Tracking Maps (Admin)

Figure 27 shows the maps inside the emergency details page showing the exact location of the emergency using Google Maps. The admins can also track the responder's location on the map, which allows them to determine the responder's arrival at the emergency location.

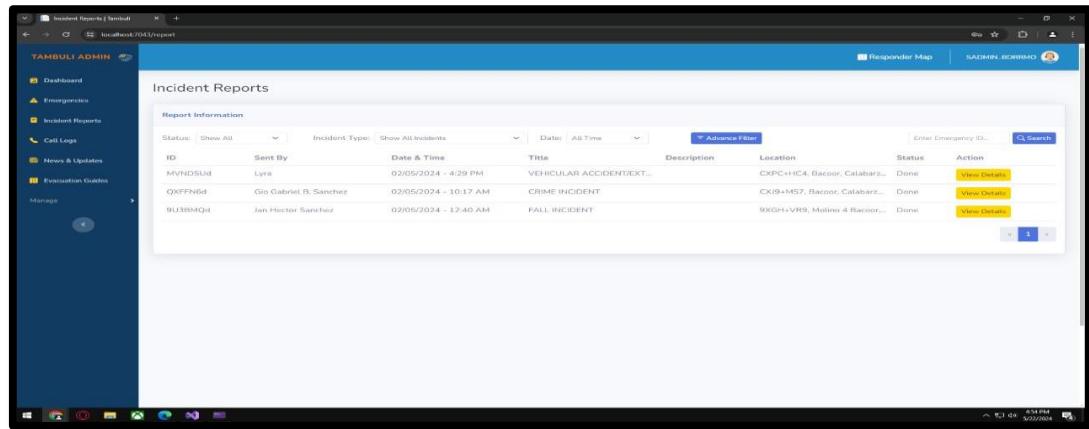


Figure 28. Screen Layout of the Incident Reports Page (Admin)

Figure 28 shows the incident reports page displaying the emergencies that are either done or archived. After the responder has completed the post-assessment form, the emergency will automatically be transferred to the incident reports page.

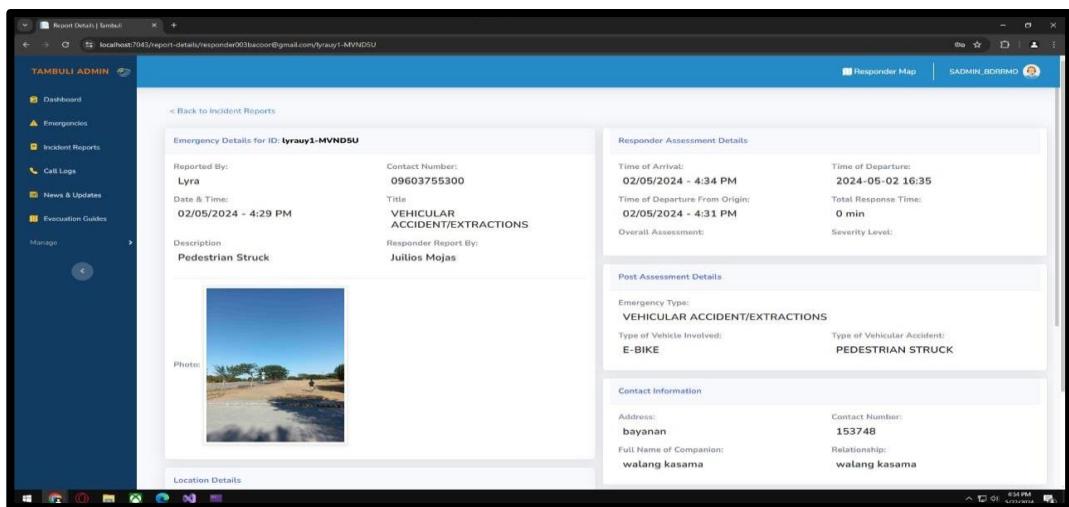


Figure 29. Screen Layout of the Incident Information Page (Admin)

Figure 29 shows the incident information page, which displays the details of the post-assessment form the responder completed, as well as the patient details and responder profile.

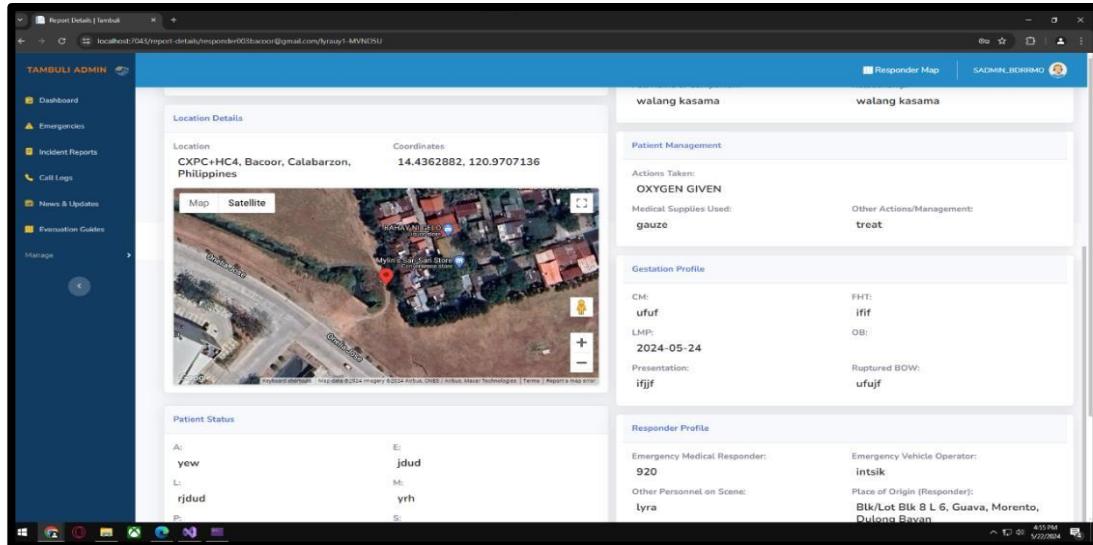


Figure 30. Screen Layout of the Incident Information Page Map (Admin)

Figure 30 shows that the incident information page will still display the exact location of the emergency using Google Maps.

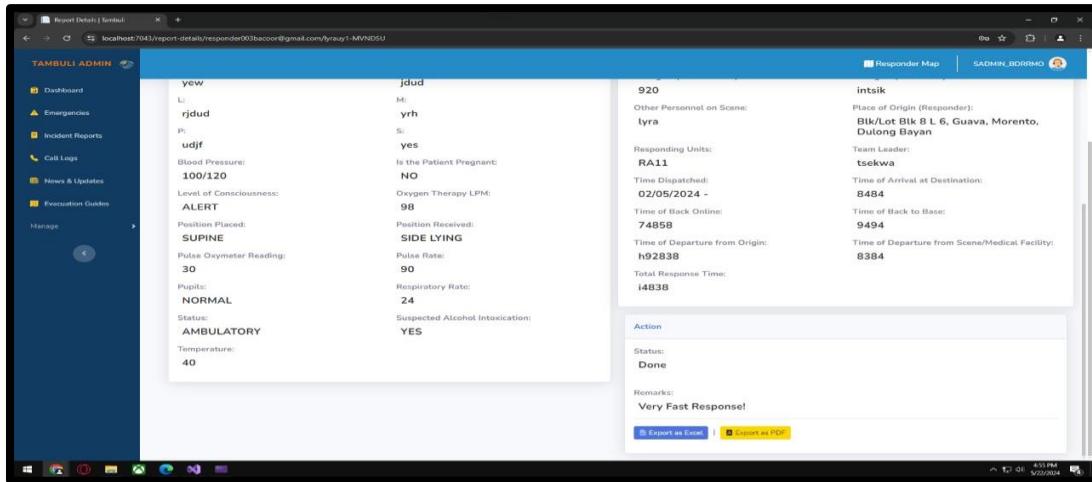


Figure 31. Screen Layout of the Incident Information Page Export (Admin)

Figure 31 shows the export function on the incident information page. This function allows the admin to export the emergency record either as an Excel file or a PDF file, which can be printed.

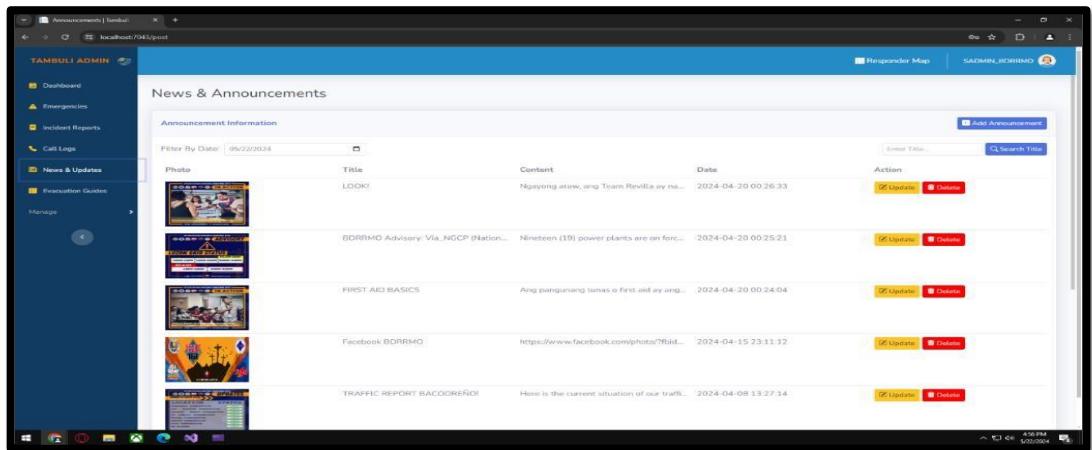


Figure 32. Screen Layout of the News and Announcement Page (Moderator)

Figure 32 shows the news and announcement page, which allows the admins and moderators to post announcements that will be displayed on the Tambuli application news page. The page displays all the announcements posted by the admins and moderators.

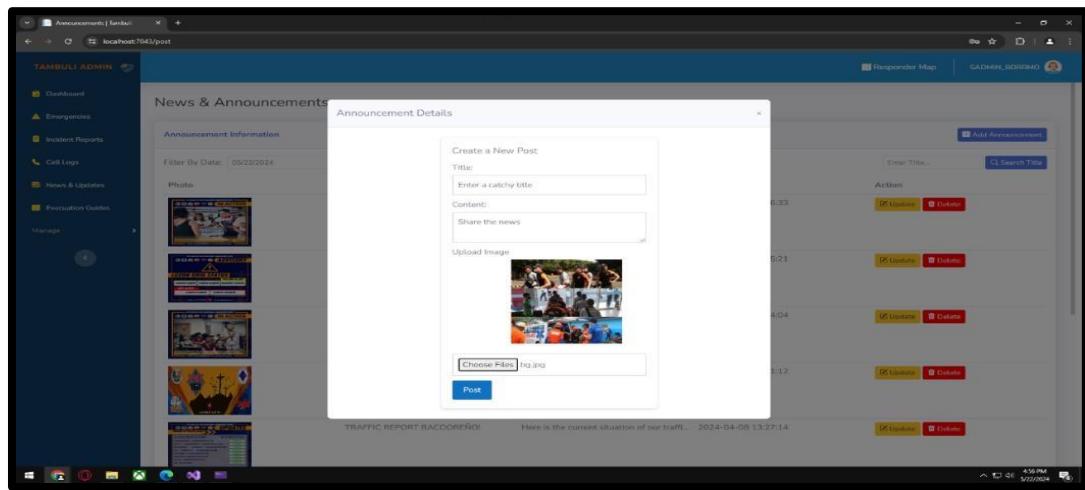


Figure 33. Screen Layout of the News and Announcement Page Post Modal (Moderator)

Figure 33 shows the post model inside the news and announcements page. This page allows the admins and moderators to create an announcement that users can see on the Tambuli Application. The admins or moderators must input the announcement's title, content, and image.

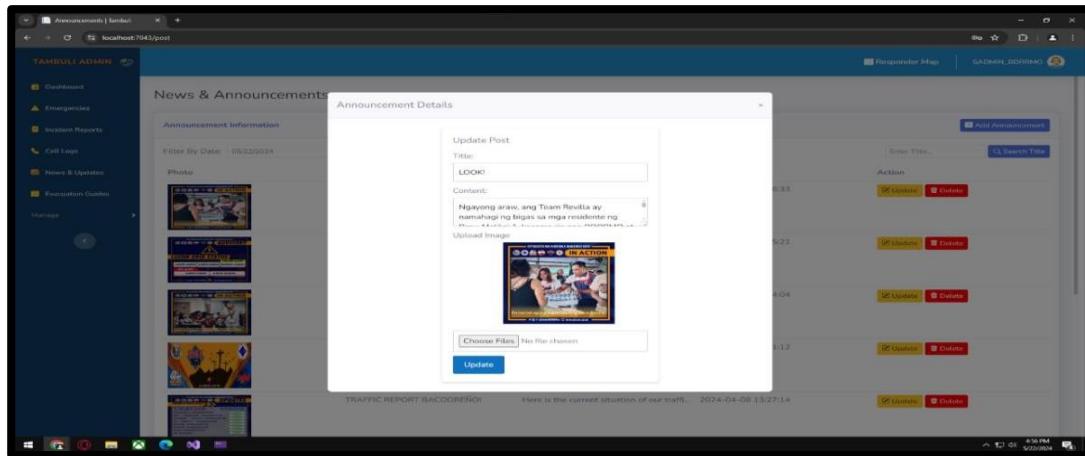


Figure 34. Screen Layout of the News and Announcement Page Update Modal (Moderator)

Figure 34 shows the update modal inside the news and announcement page. This allows the admins and moderators to modify or delete existing announcements.

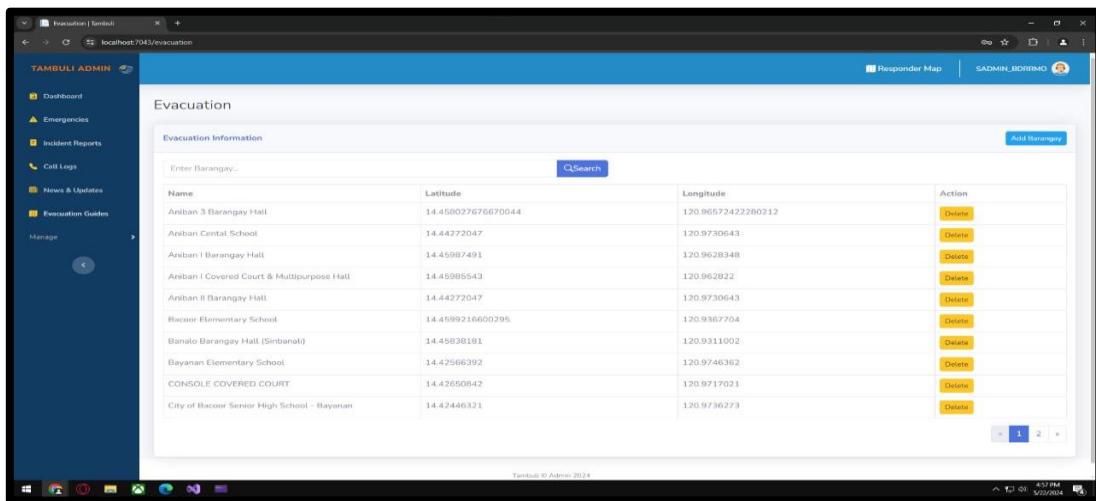


Figure 35. Screen Layout of the Evacuation Page (Moderator)

Figure 35 shows the evacuation page, which displays all the evacuation sites added by the admins and moderators. The admins and moderators can add a new evacuation site or delete an existing one.

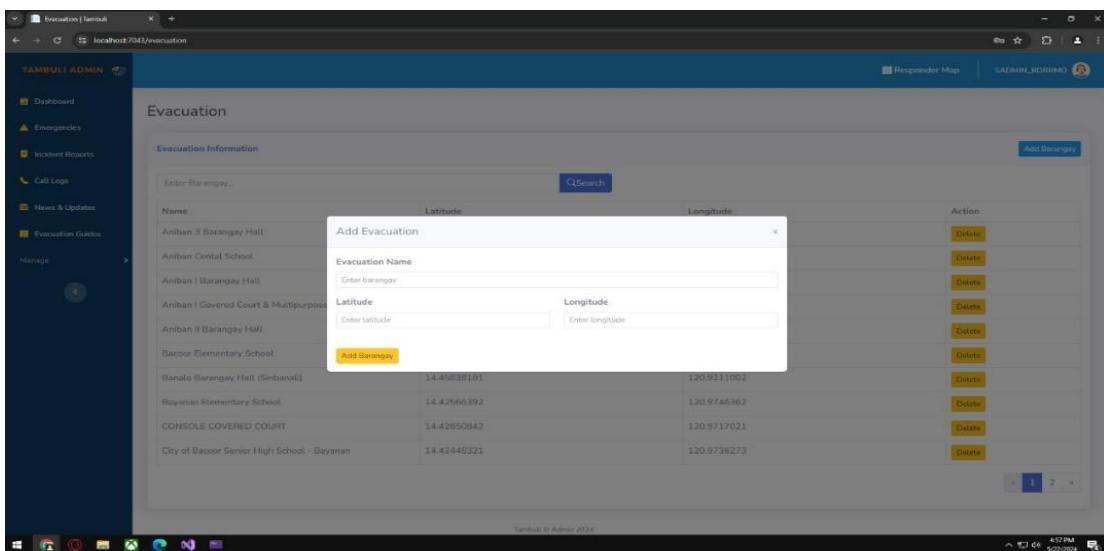


Figure 36. Screen Layout of the Evacuation Page Add Modal (Moderator)

Figure 36 shows the add evacuation modal inside the evacuation page, where the admins and moderators can add a new evacuation site. Information such as the evacuation name, latitude, and longitude must be inputted for the site's validity.

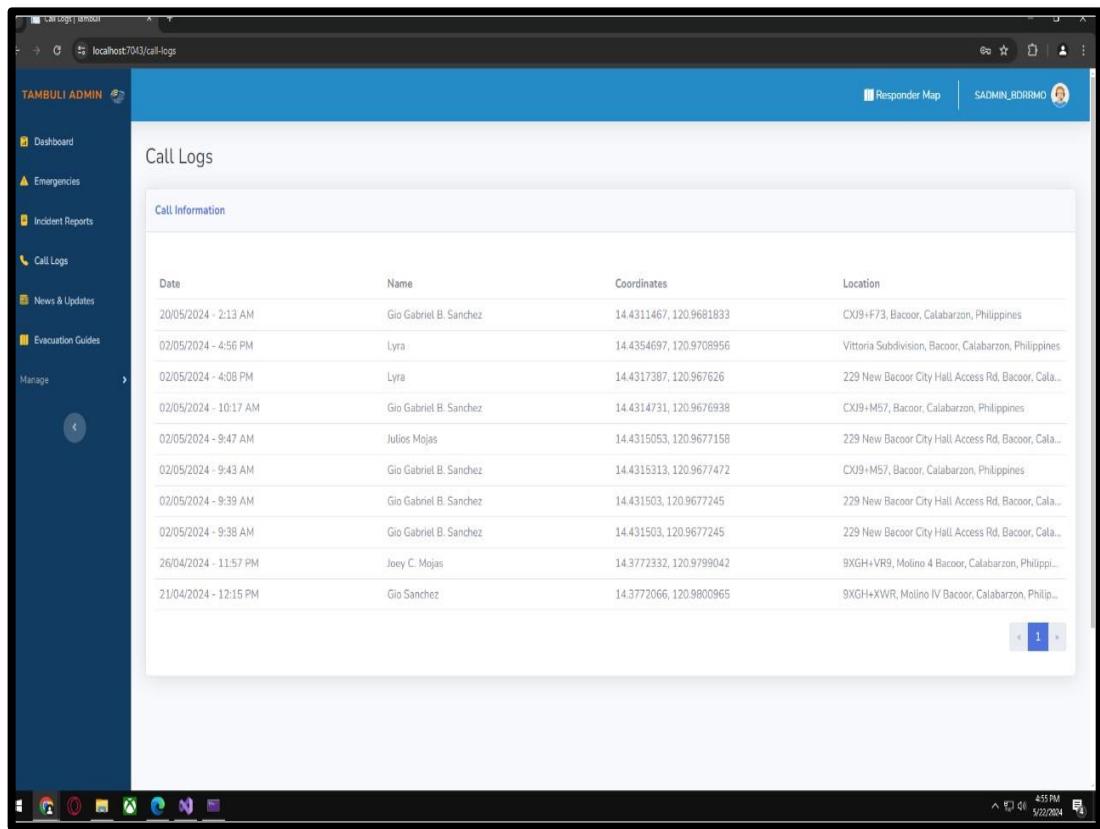


Figure 37. Screen Layout of the Call Logs (Admin)

Figure 37 shows the Call Logs page, which displays all the times the user has called 161 through the Tambuli application.

Responder

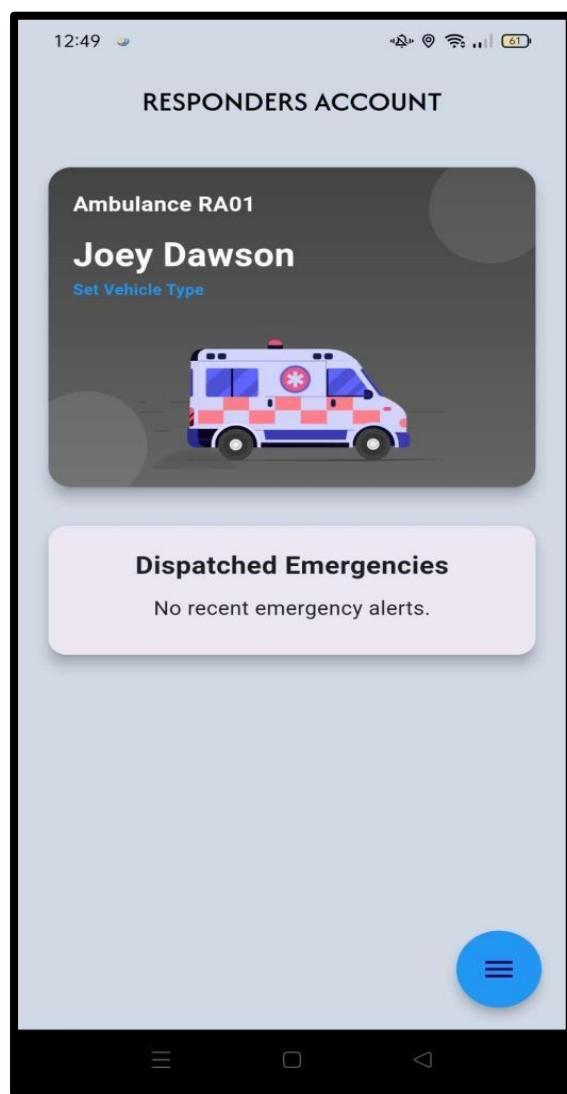


Figure 38. Screen Layout of the Home Page (Responder Side)

Figure 38 shows the home page, which displays the responder's name and what kind of vehicle type it is. The Home Page also allows the responders to see the recent and dispatched emergencies.

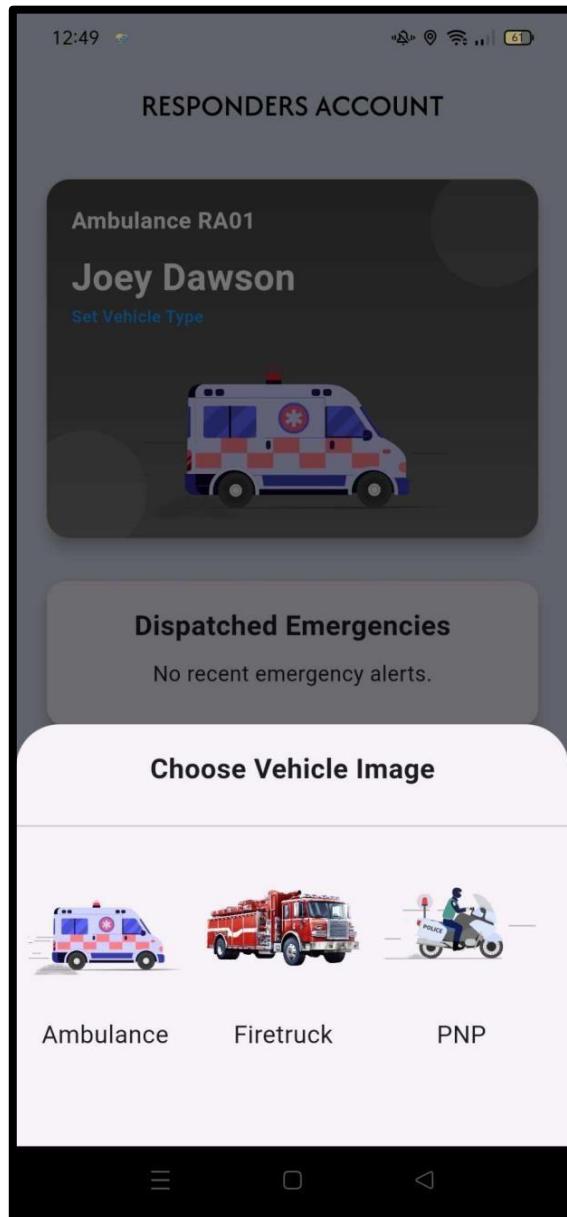


Figure 39. Screen Layout of the Choose Vehicle Image (Responder Side)

Figure 39 shows that the Choose Vehicle Image enhances the functionality of the emergency response system by providing a visual representation of the vehicles used during response activities and improving identification to avoid confusion.

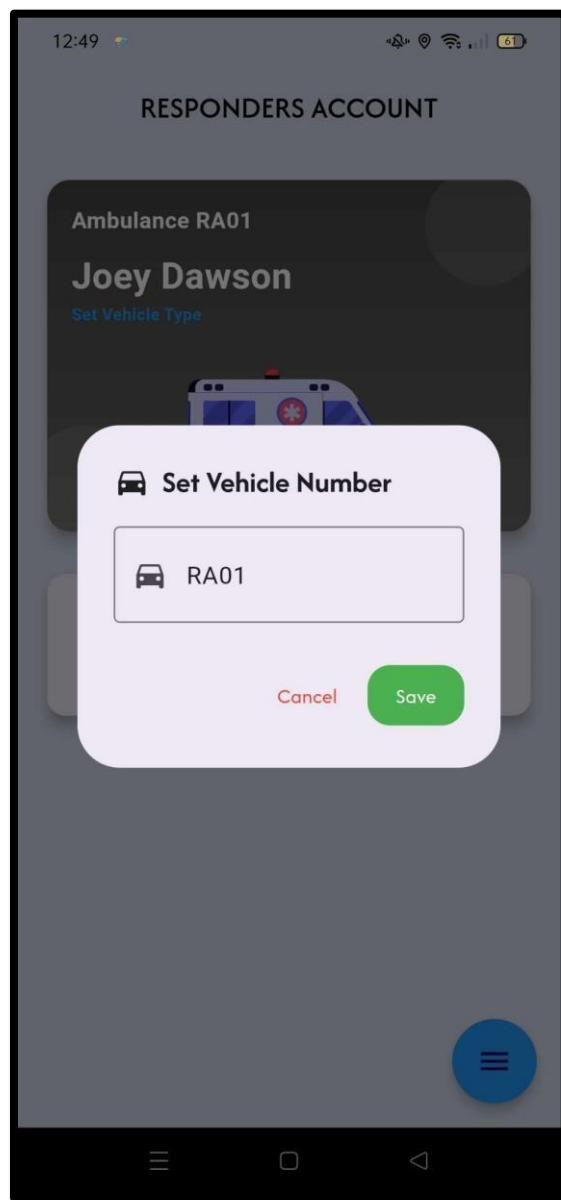


Figure 40. Screen Layout of the Set Vehicle Number Page (Responder Side)

Figure 40 shows the Set Vehicle Number Page allows the admin to modify how many responders are available after the responders set the Vehicle Number. By setting the Vehicle Number enables admin to identify and select the vehicle will be using to respond to the dispatched emergency. It could be an ambulance, fire truck, police car, or other types of emergency vehicles.

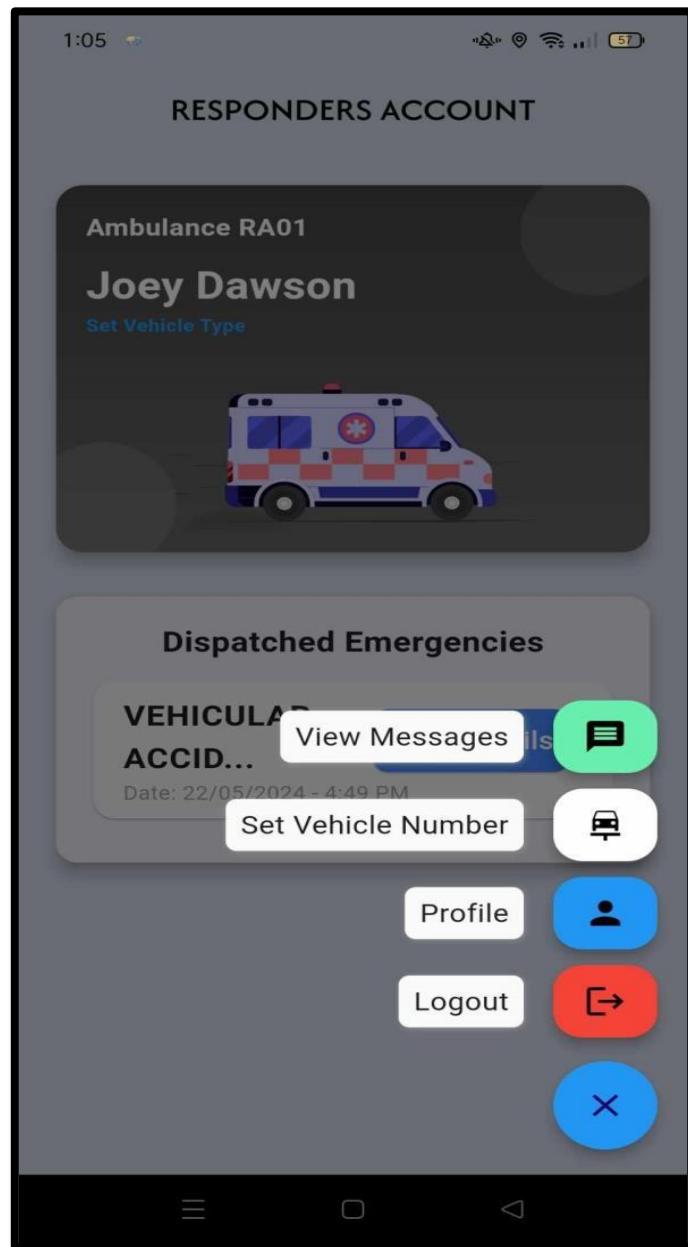


Figure 41. Screen Layout of the Speed Dials (Responder Side)

Figure 41 shows the Speed Dial page. It shows the View messages section, where the responder can view and reply to the user's message. There is also the Set Vehicle Number and Profile section, where the responder can edit their information.



Figure 42. Screen Layout of the Response Information page (Responder Side)

Figure 42 shows the Response information page, an emergency response system designed specifically for responders. This section provides essential information about an incident they are assigned.

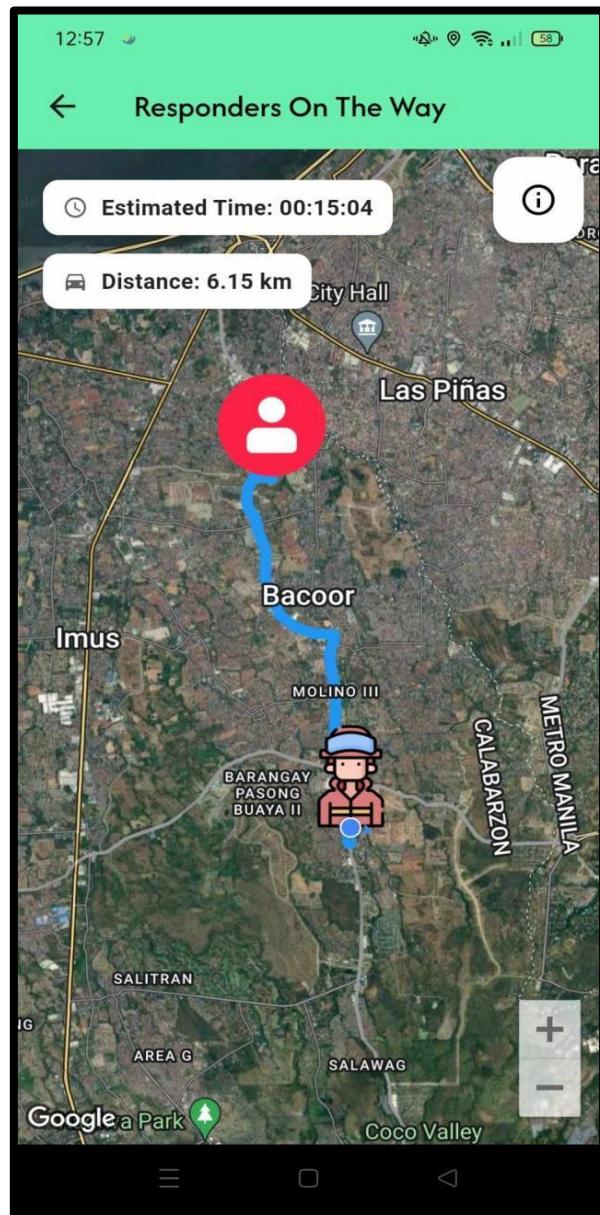


Figure 43. Screen Layout of Responder Map (Responder Side)

Figure 43 shows the responder map, which allows users to track the responders' locations. The map also displays the responder's distance and estimated arrival time to the user's location.

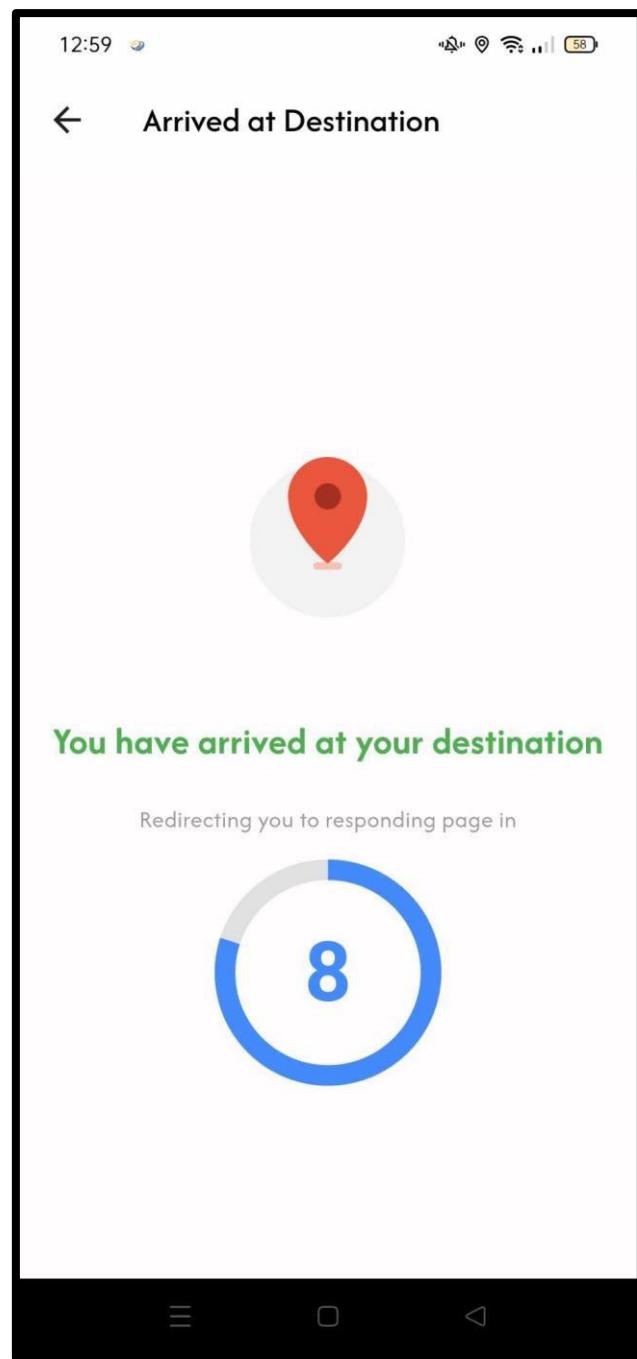


Figure 44. Screen Layout of the Arrive at Destination Page (Responder Side)

Figure 44 shows that the Arrive at Destination will appear once the responder has arrived at their destination.

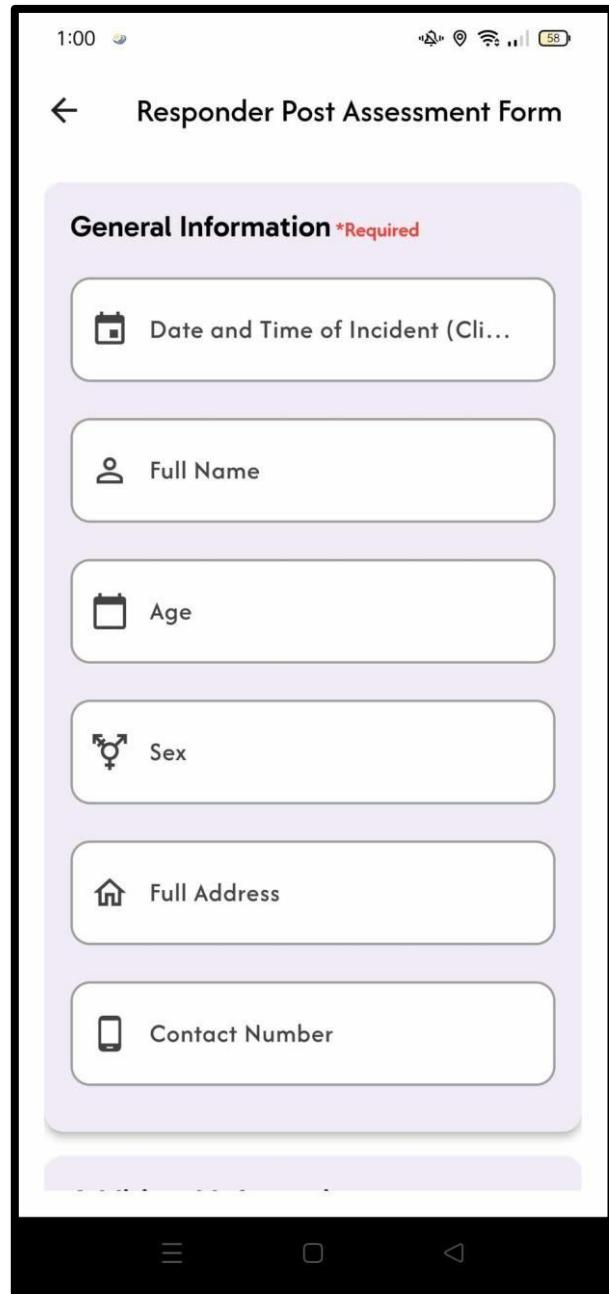


Figure 45. Screen Layout of the Responder Post Assessment Form Page (Responder Side)

Figure 45 shows the Responder Post Assessment Form Page, a tool within an emergency response system designed for responders to evaluate and document their observations or assessments after responding to an incident.

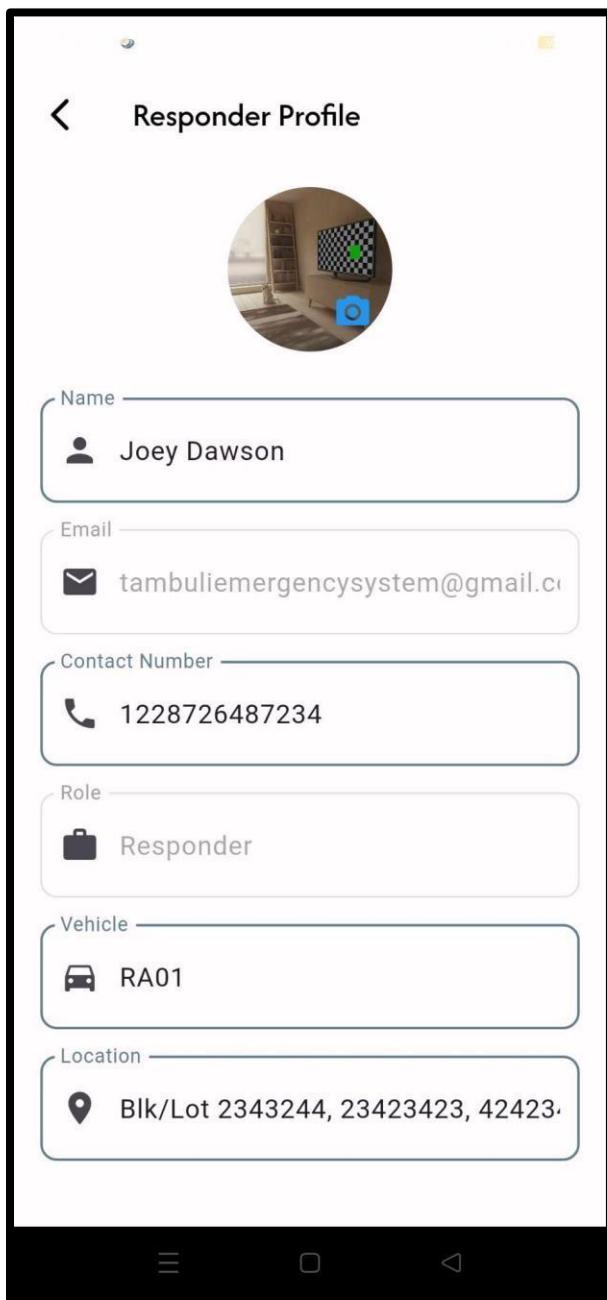


Figure 46. Screen Layout of the Responder Profile Page (Responder Side)

Figure 46 shows the Responder Profile Page on the responder side of an emergency response system, which provides a centralized platform for responders to manage their personal information.

Module Construction and Prototype Refinement

Each part of the module required coding to meet the requirements. The system prototype includes all the designs created and identified by constructing all its modules. A listing module was identified, and alternatives and position interaction through requirements were discussed. The modules were designed, built, and tested to determine the system's performance.

Software Testing

The system's features and functionality were thoroughly tested using Test Cases (see Appendix Table 2), Unit Testing (see Appendix Table 3), and Integration Testing (see Appendix Table 4).

Software Evaluation

The system's features and functionality were thoroughly tested based on the requirements of the Agile Scrum methodology. Software evaluation was done by the expected respondents of the system, such as Residents, IT Professionals, and Bacoor residents. The total number of respondents was 100 Residents, 20 BDRRMO officials/Staff, and 10 IT Professionals evaluated the software using ISO 25010 with a set of Criteria such as Functional Suitability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability and Portability.

The technical aspects of the software and materials were rated on a scale of 5—Excellent, 4—Very Satisfactory, 3—Satisfactory, 2—Fair, and 1—Poor. The evaluation result was analyzed and interpreted using weighted means.

Table 6 shows respondents' evaluation of "TAMBULI:" City of Bacoor, Cavite as excellent in terms of Functional Completeness, with a weighted mean of 4.67 that was verbally interpreted as Excellent. Functional Correctness, with a weighted mean of 4.60, was rated as Excellent, and Functional Appropriateness, with a weighted mean of 4.65, was rated as Excellent. The respondents rated the Application as Excellent in Functional Suitability, with an overall mean of 4.64.

Table 6. Functional suitability assessment of the software

FUNCTIONAL SUITABILITY	WEIGHTED MEAN	VERBAL INTERPRETATION
1. Functional completeness - if the functions cover all the specified tasks and user objectives.	4.67	Excellent
2. Functional correctness - if the system provides the correct results with needed degree of precision.	4.60	Excellent
3. Functional appropriateness - if the functions facilitate the accomplishment of specified tasks and objectives.	4.65	Excellent
GENERAL WEIGHTED MEAN	4.64	EXCELLENT

Table 7. shows respondents' evaluation of the "TAMBULI: An Emergency Alert System for the City of Bacoor." As shown in the table, the respondents rated the TAMBULI: An Emergency Alert System for the City of Bacoor as excellent in terms of Time Behavior, with a weighted mean of 4.59 that was verbally interpreted as Excellent, Resource Utilization with a weighted mean of 4.61 was rated as Excellent and Capacity with a weighted mean of 4.61 was rated as Excellent. Overall, the respondents rated the website as Excellent in Performance Efficiency, with an overall mean of 4.60.

Table 7. Performance efficiency assessment of the software

PERFORMANCE EFFICIENCY	WEIGHTED MEAN	VERBAL INTERPRETATION
1. Time behavior - if the system response and processing times and throughput rates, when performing its functions, meet requirements.	4.59	Excellent
2. Resource utilization - if the system amounts and types of resources, when performing its functions, meet requirements.	4.61	Excellent
3. Capacity - if the system maximum limits meet requirements.	4.61	Excellent
GENERAL WEIGHTED MEAN	4.60	EXCELLENT

Table 8 shows respondents' evaluation of the "TAMBULI: An Emergency Alert System for the City of Bacoor." As shown in the table, the respondents rated the TAMBULI: An Emergency Alert System for the City of Bacoor as excellent in terms of Coexistence, with a weighted mean of 4.60 that was verbally interpreted as Excellent, and Interoperability, with a weighted mean of 4.60 rated as Excellent. The respondents rated the website as Excellent in Compatibility, with an overall mean of 4.60.

Table 8. Compatibility assessment of the software

COMPATIBILITY	WEIGHTED MEAN	VERBAL INTERPRETATION
1. Co-existence - if the system can perform its required functions efficiently while sharing a common environment and resources with other systems, without detrimental impact on any other system.	4.60	Excellent
2. Interoperability - if the system can exchange information and use the information that has been exchanged.	4.60	Excellent
GENERAL WEIGHTED MEAN	4.60	EXCELLENT

Table 9 shows respondents' evaluation of "TAMBULI: An Emergency Alert System for the City of Bacoor." The table shows that the respondents rated the overall system as excellent. The system's appropriateness recognizability scored a weighted mean of 4.68, indicating it meets users' needs well. Learnability and operability both received a score of 4.66, showing the system is easy to learn and control. User error protection scored 4.60, user interface aesthetics 4.63, and accessibility 4.63, all reflecting excellent ratings. Overall, the weighted mean of 4.64 confirms the system's exceptional usability.

Table 9. Usability assessment of the software

USABILITY	WEIGHTED MEAN	VERBAL INTERPRETATION
1. Appropriateness recognizability - if the system is appropriate for the need of the users.	4.68	Excellent
2. Learnability - if the system can be used by specified users to achieve specified goals in learning to use the system with effectiveness, efficiency, freedom, and control.	4.66	Excellent
3. Operability - if the system has attributes that make it easy to operate and control.	4.66	Excellent
4. User error protection - if the system protects users against making errors.	4.60	Excellent
5. User interface aesthetics - if the system user interface enables pleasing and satisfying interaction for the user.	4.63	Excellent
6. Accessibility - if the system can be used by the people with the widest range of characteristics and capabilities to achieve specified goal in a specified context of use.	4.63	Excellent
GENERAL WEIGHTED MEAN	4.64	EXCELLENT

Table 10 shows respondents' evaluation of "TAMBULI: An Emergency Alert System for the City of Bacoor." The table shows that the respondents rated the TAMBULI: An Emergency Alert System for the City of Bacoor. The system's maturity, indicating its reliability under normal operation, scored a weighted mean of 4.58, rated as excellent. Availability, assessing the system's operational and accessible status when needed, received an excellent score of 4.62. Fault tolerance, which measures the system's ability to function correctly despite hardware or software faults, earned a score of 4.53, also excellent. Recoverability, evaluating the system's ability to recover data and re-establish the desired state after an interruption or failure, scored an excellent rating with a weighted mean of 4.60. Overall, the general weighted mean of 4.58 confirms the system's exceptional reliability.

Table 10. Reliability assessment of the software

RELIABILITY	WEIGHTED MEAN	VERBAL INTERPRETATION
1. Maturity - if the system meets need for reliability under normal operation.	4.58	Excellent
2. Availability - if the system is operational and accessible when required for use.	4.62	Excellent
3. Fault tolerance - if the system operates as intended despite the presence of hardware or software faults.	4.53	Excellent
4. Recoverability - if the system, in the event of an interruption or a failure, can recover the data directly affected and re-establish the desired state of the system.	4.60	Excellent
GENERAL WEIGHTED MEAN	4.58	EXCELLENT

As shown in Table 11, the respondents rated the TAMBULI: An Emergency Alert System for the City of Bacoor. The security evaluation of the system shows

outstanding performance across all criteria. The system's confidentiality, ensuring data is accessible only to authorized individuals, scored a weighted mean of 4.59 and was rated excellent. The system's integrity, which prevents unauthorized access or modifications, received an excellent score of 4.60. Non-repudiation, which ensures actions or events can be proven to have occurred, scored a remarkable 4.66, which is also excellent. Accountability, tracing actions uniquely to the responsible entity, earned a score of 4.60. Authenticity, verifying the identity of a subject or resource, matched the highest score with 4.66. Overall, the general weighted mean of 4.62 confirms the system's exceptional security.

Table 11. Security assessment of the software

SECURITY	WEIGHTED MEAN	VERBAL INTERPRETATION
1. Confidentiality - if the system ensures that the data are accessible only to those authorized to have access.	4.59	Excellent
2. Integrity - if the system prevents unauthorized access to, or modification of, computer programs or data.	4.60	Excellent
3. Non-repudiation - if the system's action or events can be proven to have taken place so that the events or action cannot be repudiated later.	4.66	Excellent
4. Accountability - if the system's actions of an entity can be traced uniquely to the entity	4.60	Excellent
5. Authenticity - if the system's identity of a subject or resource can be proved to be the one claimed.	4.66	Excellent
GENERAL WEIGHTED MEAN	4.62	EXCELLENT

Table 12 shows the respondent's evaluation of "TAMBULI: An Emergency Alert System for the City of Bacoor." As shown in the table, the respondents rated the TAMBULI: An Emergency Alert System for the City of Bacoor as excellent in terms of Modularity, with a weighted mean of 4.57 that was verbally interpreted as Excellent, Re Usability with a weighted mean of 4.58 was rated as Excellent, Analyzability with a weighted mean of 4.59 was rated as Excellent, Modifiability with a weighted mean of 4.61 was rated as Excellent and Testability with a weighted mean of 4.60 was rated as Excellent. The respondents rated the website as Excellent in Maintainability, with an overall mean of 4.58.

Table 12. Maintainability assessment of the software

MAINTAINABILITY	WEIGHTED MEAN	VERBAL INTERPRETATION
1. Modularity - if the system composed of discrete components such that a change to one component has minimal impact on other components.	4.67	Excellent
2. Reusability - if the system's assets can be used in more than one system, or in building other assets.	4.59	Excellent
3. Analyzability - if the system is possible to assess the impact of an intended change to one or more of its parts, or to diagnose the system for deficiencies or causes of failures, or to identify parts to be modified.	4.63	Excellent
4. Modifiability - if the system can be effectively and efficiently modified without introducing defects or degrading existing products quality.	4.64	Excellent
5. Testability - if the system can establish test criteria and can be performed to determine whether those criteria have been met.	4.63	Excellent
GENERAL WEIGHTED MEAN	4.63	EXCELLENT

Table 13 gives respondents' evaluation of "TAMBULI: An Emergency Alert System for the City of Bacoor." As shown in the table, the respondents rated the TAMBULI: An Emergency Alert System for the City of Bacoor as excellent in terms of Adaptability, with a weighted mean of 4.63 that was verbally interpreted as Excellent, Instability with a weighted mean of 4.56 rated as Excellent and Replaceability with a weighted mean of 4.71 was rated as Excellent. The respondents rated the website as Excellent in Portability, with an overall mean of 4.68.

Table 13. Portability assessment of the software

PORATABILITY	WEIGHTED MEAN	VERBAL INTERPRETATION
1. Adaptability - if the system can effectively and efficiently be adapted for different or evolving hardware, software, or other operational or usage environments.	4.63	Excellent
2. Instability - if the system can be successfully installed and/or uninstalled in a specified environment.	4.56	Excellent
3. Replaceability - if the system can replace another specified software product for the same purpose in the same environment.	4.62	Excellent
GENERAL WEIGHTED MEAN	4.60	EXCELLENT

Table 14 shows the total and summary of each criterion. The weighted mean was 4.61, interpreted as “Excellent,” which meant that the system passed all the necessary criteria and satisfied all the evaluators.

Table 14. Summary table showing the assessment of the software

EVALUATION CRITERIA	WEIGHTED MEAN	VERBAL INTERPRETATION
1. Functional Suitability	4.64	Excellent
2. Performance Efficiency	4.60	Excellent
3. Compatibility	4.60	Excellent
4. Usability	4.64	Excellent
5. Reliability	4.58	Excellent
6. Security	4.62	Excellent
7. Maintainability	4.63	Excellent
8. Portability	4.60	Excellent
TOTAL RATING	4.61	EXCELLENT

Table 15 compares the evaluators' perceptions classified as Residents, barangay officials/Staff, and IT Professionals. The highest general rating of software was observed from the Residents, who gathered a general weighted mean of 4.71, while the lowest general weighted mean was perceived from the BDRRMO Admin/Staff, who gathered a value of 4.34. Hypothetically, the researchers concluded that the respondents acknowledge that the system is excellent.

Table 15. Comparison of the perception of the evaluators based on the different indicators

EVALUATION CRITERIA	TYPE OF REPORT		
	Residents	BDRMO Admin/Staff	IT Professionals
FUNCTIONAL SUITABILITY			
Functional completeness	4.88	3.90	4.79
Functional correctness	4.82	3.85	4.64
Functional appropriateness	4.88	3.90	4.64
GENERAL WEIGHTED MEAN	4.86	3.88	4.69
PERFORMANCE EFFICIENCY			
Time behavior	4.77	3.95	4.64
Resource utilization	4.85	3.90	4.50
Capacity	4.83	3.90	4.57
GENERAL WEIGHTED MEAN	4.82	3.92	4.57
COMPATIBILITY			
Co-existence	4.80	3.85	4.71
Interoperability	4.78	3.90	4.71
GENERAL WEIGHTED MEAN	4.79	3.88	4.71
USABILITY			
Appropriateness recognizability	4.89	3.85	4.86
Learnability	4.86	3.95	4.71
Operability	4.88	3.85	4.79
User error protection	4.83	3.90	4.50
User interface aesthetics	4.86	3.85	4.64
Accessibility	4.85	3.80	4.79
GENERAL WEIGHTED MEAN	4.86	3.87	4.71
RELIABILITY			
Maturity	4.85	3.85	4.36
Availability	4.80	3.85	4.86
Fault Tolerance	4.80	3.75	4.36
Recoverability	4.85	3.80	4.57
GENERAL WEIGHTED MEAN	4.82	3.81	4.54

Table 15. Continued

EVALUATION CRITERIA	TYPE OF REPORT		
	Residents	BDRMO Admin/Staff	IT Professionals
SECURITY			
Confidentiality	4.77	3.95	4.64
Integrity	4.83	3.85	4.57
Non-repudiation	4.89	3.85	4.71
Accountability	4.80	3.85	4.71
Authenticity	4.88	3.90	4.71
GENERAL WEIGHTED MEAN	4.83	3.88	4.67
MAINTAINABILITY			
Modularity	4.89	3.85	4.79
Reusability	4.82	3.80	4.64
Analyzability	4.86	3.80	4.71
Modifiability	4.86	3.80	4.79
Testability	4.86	3.80	4.71
GENERAL WEIGHTED MEAN	4.86	3.81	4.73
PORABILITY			
Adaptability	4.85	3.90	4.64
Instability	4.80	3.70	4.64
Replaceability	4.83	3.85	4.71
GENERAL WEIGHTED MEAN	4.83	3.82	4.67
TOTAL RATING	4.83	3.86	4.66

SUMMARY, CONCLUSION, AND RECOMMENDATION

The chapter presents a summary of the research and its findings, the conclusions that the researchers perceived, and the recommendations regarding the research and the system developed by the researchers.

Summary

The Bacoor local government established the Bacoor Disaster Risk Reduction Management Office (BDRRMO) to enhance its disaster preparedness, response, and recovery capacity. The study aimed to develop a comprehensive emergency alert monitoring system website and an Android application designed for Bacoor residents. The Agile Scrum methodology was used in the application development, which relies on incremental development with each iteration consisting of two- to four-week sprints. The software evaluation using ISO 25010 showed that the system passed all the necessary criteria and satisfied all the evaluators, with a weighted mean of 4.61, which was interpreted as "Excellent."

Conclusion

The study aimed to develop an application for Bacoor residents and emergency responders, alongside a website for the Bacoor Disaster Risk Reduction Management Office (BDRRMO), to enhance disaster preparedness, response, and recovery. The findings highlighted critical gaps in public awareness and usage of the ALERT 161 Ordinance hotline, which could undermine the effectiveness of emergency responses. With nearly half (48.9%) of the residents unaware of the hotline and significant portions needing more experience or understanding of its purpose, there is an urgent need for targeted outreach and education campaigns.

Residents frequently resort to alternative communication methods, such as contacting friends or searching online, which could delay critical responses. The study

underscores the importance of engaging residents through diverse channels to promote the ALERT 161 system and its role in disaster risk reduction. Moreover, the heavy reliance on social media (68.9%) for emergency information raises concerns about misinformation, which can lead to confusion and delayed actions during crises. The need for Bacoor to strengthen official information channels and equip residents with skills to discern reliable information is paramount.

Awareness of evacuation routes could have been improved, with nearly 40% of residents only somewhat familiar and 31.8% completely unfamiliar with evacuation centers. This poses a significant risk during emergencies, emphasizing the necessity for effective communication strategies to inform residents about evacuation procedures.

The study successfully developed an emergency alert monitoring system using the Agile Scrum methodology, resulting in a robust application evaluated with the ISO 25010 standards. The system received an overall rating of 4.61, interpreted as "Excellent," across various criteria, including functional suitability, performance efficiency, and security. This confirms the system's efficacy in providing a comprehensive platform for incident reporting, responder dispatching, evacuation navigation, and real-time updates.

However, the study acknowledged limitations such as the need for digital literacy, access to mobile devices, and internet connectivity, which could affect resident usage. Additionally, ongoing system maintenance, updates, and data privacy were identified as crucial for long-term sustainability.

Based on the study's results, developing the emergency alert monitoring system marks a significant step toward enhancing disaster management in Bacoor. Addressing the identified gaps in awareness, communication, and digital accessibility will maximize the system's impact and foster a more resilient community. The BDRRMO and proactive community engagement and education can ensure that Bacoor residents are well-prepared to respond effectively during emergencies.

Recommendations

The following are recommended as measures to enhance the system's performance:

1. The system should be scaled vertically or horizontally, depending on the growing needs of the users and staff, considering factors such as performance requirements, cost-effectiveness, redundancy, fault tolerance, and future scalability.
2. The system should be able to handle large quantities of traffic, depending on the growing needs of the users and staff.
3. System security should be enhanced by implementing and using a framework to further protect the system and its data.
4. The system should explore the integration of Artificial Intelligence and Machine Learning to predict potential disaster areas and provide early warnings.
5. The application should include relevant, informative entertainment features for user engagement.

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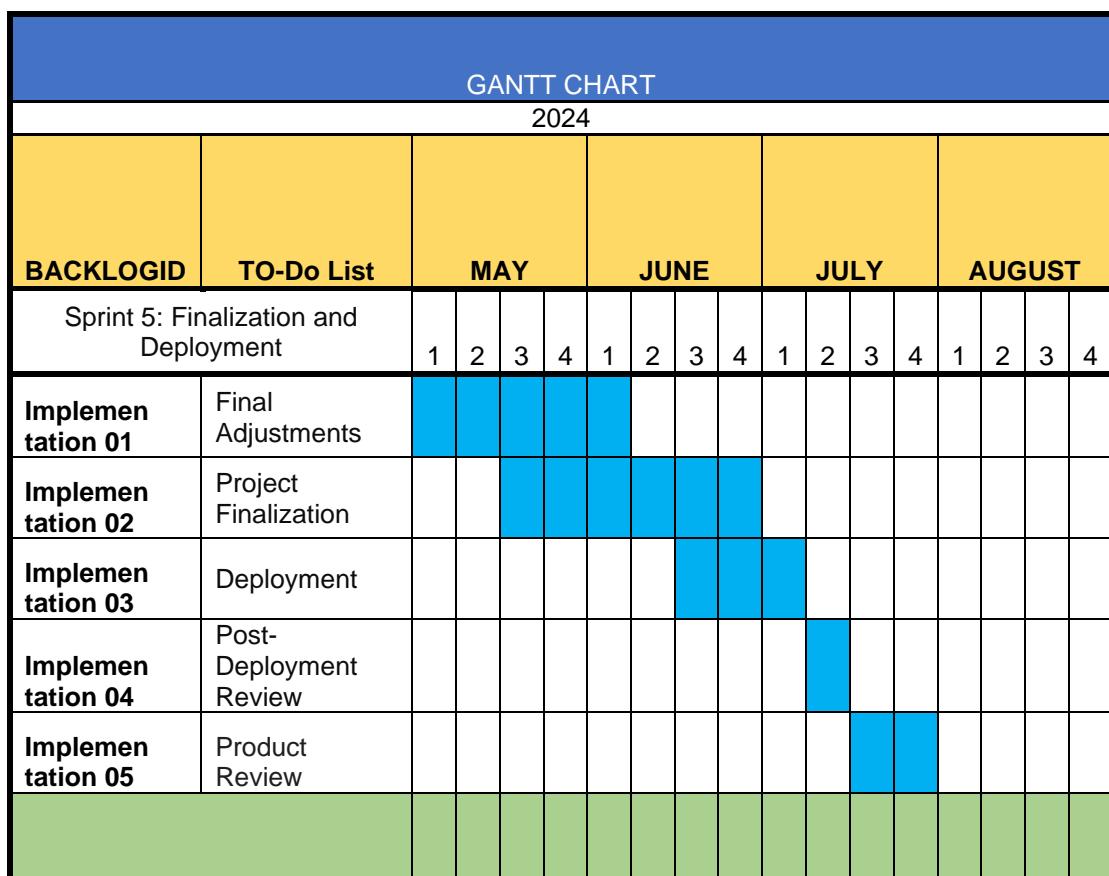
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APPENDICES

Appendix Table 1. Gantt Chart

GANTT CHART																	
2023																	
BACKLOGID	TO-DO LIST	MAY				JUNE				JULY				AUGUST			
Sprint 0: Initiation and Planning	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Innitial-01	Project Kickoff		1														
Innitial-02	Requirement Gathering			1	2	3	4										
Innitial-03	Fish bone Analysis				1	2	3	4									
Innitial-04	Define Project Scope		1	2	3	4											
Innitial-05	Gantt Chart		1														
Innitial-06	Context Diagram					1	2	3	4								
Innitial-07	HIPo Chart						1	2	3	4							
Proto-typing-01	GUI Design (Mobile and Web)							1	2	3	4						
Proto-typing-02	Initial Development							1	2	3	4						
Innitial-08	Sprint Planning							1	2	3	4						
Sprint 1: Requirement Gathering and Brainstorming																	
Module-01	Registration Module									1	2	3	4				
Module-02	Emergency-Response Monitoring Module									1	2	3	4				
DBM-01	Database Management									1	2	3	4				
Docu-ment-01	Introduction	1	2	3	4	1	2	3	4	1	2	3	4				
		1	2	3	4	1	2	3	4	1	2	3	4				

GANTT CHART																	
2024																	
Backlog ID	To-Do List	January				February				March				April			
	Sprint 4: Continuation and Evaluation	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Module-05	Evacuation Module	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Module-06	SOS Module	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Review 01	Product Refinement	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Testing 01	Pre-Evaluation Preparation	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Testing 02	Pre-Evaluation	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Testing 03	Feedback Integration	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4



Appendix Table 2. Test Cases

User: User Side

Action	Activities	System Response	Actual Errors	System Response
Log in	Input Username Input Password Proceed to Log in	Login as User	Invalid Username or Password	Prompt user to input valid credentials
Registration	Enter First Name, Middle Name, Last Name, Address, User Name, Password, and Confirm Password Proceed to Register	Created an Account	Email already exist	Prompt user to re-enter email
Incident Report	Select Incident, select type, Add Description (optional), Add image/photo Proceed to send	Inform user that report is sent	Emergency cannot be sent due to slow or no internet connection	No internet page will be shown
Emergency Call	Tap Button, proceed to dial 161	Dialing 161	No load or Globe Sim	Bring back user to home page
Announcement	Search titles, Show lists of Announcement	Display filtered Announcement, Display Announcement	Cannot fetch announcements	An error text will show an error on the database
Emergency Record	Type of incident, Emergency Status	Display filtered incident, Display Emergency Status	Cannot fetch emergency records	An error text will show an error on the database
Log out	Click log out	Log out Account Back to Login side	No expected errors	No system response

User: Administrator Side

Action	Activities	System Response	Actual Errors	System Response
Manage Accounts	-Show ongoing emergencies, total of emergencies, total users and pending request	-Display ongoing emergencies, total of emergencies, total users and pending request	Slow computation	Delayed display of data
	- Generate report in spreadsheet	- Display generate report in spreadsheet		
Dashboard	- Shows Emergencies Information	-Display list of emergencies	Possible duplication records	Same records displaying on the table
	-Enter Coordinates -Search Emergency ID	-Display coordinates -Display filtered Emergency ID		
News and Announcement	-Search announcement - Add announcement	-Display filtered list of announcements -Post announcement	Modal content of posts update does not reset	The same image will be shown on the update post modal
	-Show all incident types - Show status -Search Emergency ID	-Display list of incident types -Display filtered list of emergency ID	Possible duplication records	Same records displaying on the table
Incident Reports	-Search Barangay/ Evacuation	-Display filtered barangay/evacuation	No expected errors	No system response
	-Add Barangay/Evacuation	-Post barangay/evacuation		
Log out	Click Log out	-Log out Account -Back to Login side	No expected errors	No system response

User: Moderator Side

Action	Activities	System Response	Actual Errors	System Response
Announcements	<ul style="list-style-type: none"> - Show List of Announcements - Update Announcement - Delete Announcement - Search List of Announcements 	<ul style="list-style-type: none"> - Display list of announcements - Display image and content of the Announcement - Display filtered announcement 	Modal content of posts update does not reset	The same image will be shown on the update post modal
Evacuation Routing	<ul style="list-style-type: none"> -Show list of evacuation sites - Add evacuation 	<ul style="list-style-type: none"> - Display filtered Evacuation sites - Display Map, Evacuation details 	No expected errors	No system response
Log out	Click Log out	<ul style="list-style-type: none"> -Log out Account -Back to Login side 	No expected errors	No system response

User: Responder (BDRRMO)

Action	Activities	System Response	Expected Errors	System Response
Dispatch	-Response feedback	-Response submit	No expected errors	No system response
Log out	Click Log out	<ul style="list-style-type: none"> -Log out Account -Back to Login side 	No expected errors	No system response

Appendix Table 3. Unit Testing

Module: Registration Module

Function	Satisfactory (S) / Unsatisfactory (U)	Note
Account (User Side)		
Register Account	S	Working
Login Account	S	Working
Modify Account	S	Working
Account (Admin Side)		
Login Account	S	Working
Modify Account	S	Working
View Users List	S	Working
Account (Moderator Side)		
Login Account	S	Working
Modify Account	S	Working
Account (Responder Side)		
Register Account	S	Working
Log in Account	S	Working
Modify Account	S	Working

Tester: Julios M. Mojas

Module: Emergency-Response Monitoring Module

Function	Satisfactory (S) / Unsatisfactory (U)	Note
Report Incident (User Side)		
Insert Photo	S	Working
Send Report	S	Working
View Map	S	Working
View Report Status	S	Working
Incident Report (Admin Side)		
Receive Report Incident	S	Working
View Incident Report Information	S	Working
Mark Incident Report as Done	S	Working
Archived Incident Report	S	Working
Print Incident Report	S	Working

Tester: Joey C. Martinez Jr.**Module: SOS Module**

Function	Satisfactory (S) / Unsatisfactory (U)	Note
Emergency Call (User Side)		
Dial 161 (User Side)	S	Working
Emergency Call (Admin Side)		
Manage Calls	S	Working

Tester: Apriljoy M. Suarez

Module: News and Update Module

Function	Satisfactory (S) / Unsatisfactory (U)	Note
Announcements (User Side)		
View Announcements	S	Working
Announcements (Admin Side)		
View Announcements	S	Working
Add Announcement	S	Working
Edit Announcement	S	Working
Delete Announcement	S	Working
Post Announcement	S	Working
Announcements (Moderator Side)		
View Announcements	S	Working
Add Announcement	S	Working
Edit Announcement	S	Working
Delete Announcement	S	Working
Post Announcement	S	Working

Tester: Gio Gabriel B. Sanchez

Module: Evacuation Module

Function	Satisfactory (S) / Unsatisfactory (U)	Note
Evacuation (User Side)		
View Evacuation	S	Working
Evacuation (Admin and Moderator Side)		
View Evacuation	S	Working
Pin point	S	Working
Add Evacuation	S	Working
Edit Evacuation	S	Working
Delete Evacuation	S	Working
Post Evacuation	S	Working
Evacuation (Moderator Side)		
View Evacuation	S	Working
Pin point	S	Working
Add Evacuation	S	Working
Edit Evacuation	S	Working
Delete Evacuation	S	Working
Post Evacuation	S	Working

Tester: Julios M. Mojas

Module: Dispatch Module

Function	Satisfactory (S) / Unsatisfactory (U)	Note
Dispatch (Responder Side)		
Dispatch Emergencies	S	Working
Response Feedback	S	Working
Dispatch (Admin Side)		
Dispatch Information	S	Working
Response Feedback	S	Working

Tester: Joey C. Martinez Jr.

Appendix Table 4. Integration Testing

Function	Module	Check if properly working
Manage Access	Registration	
Register Account		✓
Login		✓
View Users List		✓
Search User Information		✓
View Users Details		✓

Integration Testing Registration

Function	Module	Check if properly working
	Emergency – Response Monitoring	
Attach Photo		✓
Send Emergency Report		✓
View Map		✓
Receive Report		✓
Archive Report		✓
View Incident Report		✓
Print Report		✓

Integration Testing Emergency – Response Monitoring

Function	Module	Check if properly working
	SOS	
Auto Dial 161		✓
Manage Calls		✓

Integration Testing SOS

Function	Module	Check if properly working
	News and Updates	
Display News and Updates		✓
Add New Announcement		✓
Delete Announcement		✓
Edit Announcement		✓
View Announcement		✓

Integration Testing News and Updates

Function	Module	Check if properly working
	Evacuation	
View Evacuation Routes		✓
Add Evacuation Routes		✓
Edit Evacuation Routes		✓
Delete Evacuation Routes		✓
Pin Point		✓

Integration Testing Evacuation

Function	Module	Check if properly working
	Dispatch	
Dispatch Emergencies		✓
Select Responder		✓
Track Responder		✓
Response Feedback		✓

Integration Testing Dispatch

Appendix Table 5. Test Plan

Test Plan		Test name: Tambuli test plan Date: June 07, 2024 Project manager: Julios Mojas						
PROCESS	NO.	TEST CASE	STEP	DESCRIPTION	STATUS	EXPECTED RESULT	ACTUAL RESULT	COMMENT
User Side	1	Registration						
			1	Enter First Name	passed	user input		
			2	Enter Middle Name	passed	successful		
			3	Enter Last Name	passed	user input		
			4	Enter Address	passed	successful		
			5	Enter Username	passed	user input		
			6	Enter Email	passed	successful		
			7	Enter Password	passed	user input		
			8	Proceed to Register	failed	user details registered successfully	email already exists	
SOS	2	Emergency Call						
			1	Tap the Call button	passed	button prompts confirmation		
			2	Proceed to call 161	passed	app proceeds to open Phone		
			3	Connect user to 161 Emergency hotline	failed	user successfully connects to 161	Not enough load balance	If SIM is not SMART
Admin Side	3	Dashboard						
			1	Proceed to Dashboard page	passed	admin is directed to dashboard		
			2	Page loads statistical data of records	in works	page loads statistics efficiently	delayed loading of statistics	

Appendix 1. System Checklist

Tester: Julios M. Mojtas

Date: May 30, 2024

System Checklist

Login (Administrative)

- ✓ Enter username & password
- ✓ Invalid username & password > Display “Password or Username incorrect”
- ✓ Click ‘Login’ > Redirect to Emergencies (Page)

Dash board (Administrative)

- ✓ Select filter type “Monthly” or “Yearly” > display filtered chart
- ✓ Click ‘Export’ > choose between PDF or Excel

Registration (Moderator)

- ✓ Click ‘Accept’ > verify moderator account
- ✓ Click ‘Deny’ > deny the moderator account

Login (BDRRMO)

- ✓ Enter Username & Password
- ✓ Invalid Username & Password > Display “Password or Username Incorrect.”
- ✓ Click ‘Login’ > redirect to Emergencies (Page)

Emergency Page (BDRRMO)

- ✓ Receive notifications of new emergency updates
- ✓ Click ‘View Details’ > redirect to Emergency Details (Page)
- ✓ Select filter type > display filtered records on table.

Incident Report (BDRRMO)

- ✓ Click ‘View Details’ > redirect to Incident Details (Page)
- ✓ Select filter type > display filtered records on table.
- ✓ Input ‘Remarks’ on remarks field > display remarks
- ✓ Click ‘Export’ > view exported excel file.

Login

- ✓ Enter Username & Password
- ✓ Invalid Username & Password > display “Password or Username Incorrect.”
- ✓ Click ‘Login’ > Redirect to News and Announcement (Page)

Announcement (Moderator)

- ✓ Choose a photo > click "upload image"
- ✓ Input an appropriate title > display title
- ✓ Input content of announcement > Display
- ✓ Click 'Delete' > Delete Announcement
- ✓ Click 'Update' > change title, content, or upload new image > update announcement

Evacuation Guide (Moderator)

- ✓ Use 'Search bar' > enter barangay name > search specific date
- ✓ Click 'Add Barangay' > enter coordinates & barangay name > add barangay
- ✓ Click 'Delete' > delete barangay evacuation data

Login (Resident)

- ✓ Enter email and password
- ✓ Invalid email and password > Display "Invalid Credentials"
- ✓ Email not verified > Display "Email not verified"
- ✓ Click Forgot Password > Send Password Reset to your email
- ✓ Click Login > Redirect to Home Page

Registration (Resident)

- ✓ Click Register > Register all the credentials inputted by the user

Home Page

- ✓ View Real Time Weather on Bacoor
- ✓ View Recent Sent Emergency Alert
- ✓ Click Send Emergency on Home Page > Redirect to Emergency Alert Page
- ✓ Click Add Photo on Emergency Alert Page > Add up to 3 photos
- ✓ Click Send on Emergency Alert Page > Send Images and Information inputted by the user
- ✓ Click Emergency Call on Home Page > Call automatically the 161 Hotline of Bacoor
- ✓ Click See all > Redirect to Emergency Records Page

Announcements

- ✓ View Announcements List
- ✓ Click and Input on filters > Filters the announcement page

Emergency Records

- ✓ View All the Emergency Records Sent by the user
- ✓ Click and Input on filters > Filters the Emergency Records list

- ✓ Click View Details on Emergency Records Page > Redirect to Map Details Page
- ✓ View Sent Emergency Location on Map Details Page
- ✓ Click View Details on Map Details Page > Redirect to Emergency Details Page

Evacuation Routing

- ✓ View the Current Location of the user
- ✓ Click View Evacuation Details > Redirect to Users Evacuation Details
- ✓ Click the nearest Evacuation List > Redirect to Evacuation Routing and show routes and time
- ✓ Click End Routing > End the Routing

Profile

- ✓ View the Profile
- ✓ Click the Edit Profile > Redirect to Edit Profile Page
- ✓ Click Change Password > Send Password Reset Link to your Email
- ✓ Click Save Changes in Edit Profile Page > Save the changes on the Profile

Appendix 2. BDRRMO Interview Report



Republic of the Philippines
CAVITE STATE UNIVERSITY
Bacoor City Campus
 SHIV, Molino VI, City of Bacoor
 ☎ (046) 476-5029
 📩 cvsubacoor@cvsu.edu.ph

Date: June 21, 2023

TAMBULI: AN EMERGENCY ALERT SYSTEM FOR CITY OF BACOOR

Name (Optional) : Garcia, Johnny P. Sex: M

Job Position: BDRRMO – Research and Planning Division Staff

Interview Report

Objectives: To gather information's about the disaster response monitoring in the city of Bacoor.

Interviewer: Could you share details about your experience and expertise in disaster risk response? How many years have you been affiliated with the City of Bacoor Disasters Risk Response Office?

Interviewee: I have been a part of this office since 2013, contributing to its growth and acquiring comprehensive knowledge in disaster risk management from Research and Planning Division.

Interviewer: In your perspective, what primary challenges does the office encounter in efficiently handling disaster risks and responding to emergencies?

Interviewee: Managing a high volume of simultaneous emergency calls poses a significant challenge. Additionally, the continuous on-call duty without breaks, including holidays, places a demand on our resources. Even during off-duty hours, the staff remains on call, creating a persistent operational challenge.

Interviewer: Can you elaborate on your current response procedures?

Interviewee: Our response protocols involve all employees being certified at Level 4 in the Incident Command System (ICS). The ICS is a standardized system employed globally for managing emergencies. Each staff member is well-versed in the system and assigned different tasks based on their expertise.

Interviewer: Conversely, could you provide examples of specific disasters or scenarios where the present system demonstrated its effectiveness?

Interviewee: The Disaster Command System was effectively utilized during the occurrence of Bagyong Paeng.

Interviewer: Can you outline the procedures for responding to disasters like a car crash?

Interviewee: In cases like vehicle accidents, we have the BTMD and rely on concerned citizens. They can connect with the Operation Center by dialing the 161 hotline. Our Emergency Operations Center (EOC) manages information from external sources, including incidents like fires and car accidents.

Interviewer follow-up: Is calling 161 free of charge?

Interviewee: Yes, calling 161 is free for users on smart, sun, and PLDT networks. However, charges for globe and other networks are still under process.

Interviewer: How do you assess the reports received?

Interviewee: Upon receiving reports through calls, the assessment begins immediately. Callers are prompted to specify the type of emergency they are reporting. Simultaneously, the information is forwarded to the relevant agency for prompt action.

Interviewer: What sources do you rely on for information?

Interviewee: We utilize multiple reliable data collection channels, including NDRRMC, Civil Defense, PAGASA, and DOST, through platforms like GC and Viber.

Interviewer: In the event of PAGASA declaring heavy rain in Bacoor, is the evacuation site always prepared?

Interviewee: The readiness of evacuation sites depends on the circumstances. PAGASA issues warning signals five days before the typhoon makes landfall. In such cases, we conduct a Pre-Disaster Risk Assessment (PDRA). Before the typhoon arrives, Bacoor's councils, led by Mayor Strike Revilla, hold a meeting to discuss preparedness measures for both barangays and the city. Three days before the expected impact, barangays are already prepared, with relief goods

distributed a day prior to the typhoon's landfall. All necessary resources are deployed and ready for use.

Interviewer: Please outline the typical workflow of various user roles within the Disaster Risk Response Office during a disaster event.

Interviewee: We organize our response into three divisions. First is the Admin and Training division, tasked with communicating with higher councils, disseminating information, and handling approvals and policies. The second division is Research and Planning, responsible for research and planning activities both before and after a disaster, as well as during the event. The last division is Operations and Warning, which is responsible for executing the plans devised by the other divisions.

Interviewer: Could you elaborate on the process of receiving reports?

Interviewee: Certainly, in our system, those familiar with the 161 hotlines can directly connect to the BDRRMO office. For those unaware of the hotline, there's the option of reaching out to the Barangay or using social media (Facebook page) connected to the BDRRMO. The 161 hotline is widely disseminated, with an estimated 90% of Bacoor residents being aware of it. New residents unaware of the hotline can seek assistance from neighbors, Barangay Captain, or the Barangay Hall, which will then inform us.

Interviewer: Regarding the evacuation sites posted on the Facebook page, are these regularly updated?

Interviewee: Yes, the evacuation site information is consistently updated. Any changes are minimal.

Interviewer: In case of a fire disaster, for instance, how are evacuation sites determined and contacted?

Interviewee: The selection of evacuation sites depends on the preferences and needs of the Barangay. We assess these needs and coordinate with the relevant stakeholders in the area to ensure availability.

Interviewer: Is there a system for tracking and obtaining information about evacuees? Interviewee: DSWD manages the tracking and information gathering of evacuees through their system, CCCM (Camp Coordination and Camp Management). Once the information is gathered, DSWD provides it to us, and we subsequently report it to the Office of Civil Defense and the provincial authorities.

Interviewer: What features would you envision in the application?

Interviewee: When developing the application, it's crucial to consider the diverse user demographics. Once activated, the app will provide information relevant information about Bacoor. And the resident report data will then be sent to BDRRMO. Additionally, including procedures, tutorials, and clear Do's and Don'ts can prevent misuse. Images or a drop-down list, can streamline the input process—users only need to provide basic details like name, age, and relevant information from those seeking help.

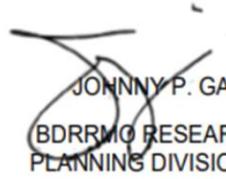
Researcher/s:

MARTINEZ JR., JOEY C.

MOJAS, JULIOS M.

SANCHEZ, GIO GABRIEL B.

SUAREZ, APRILJOY M.


JOHNNY P. GARCIA
BDRRMO RESEARCH AND
PLANNING DIVISION STAFF

Appendix 3. Minutes of Meeting

MINUTES OF THE MEETING

I. Call to Order

Mr. Julios Mojas has called to order for a short meeting of his other members in thesis at exactly 1:00 PM on December 11, 2023 via Face to Face meeting.

II. Agenda

A. Adjustment of Incident Report (Add Fields)

The team discussed adjustments made to the incident reports within the application. Furthermore, they explored and decided upon specific fields that would be included in the enhanced incident report.

B. Adding another access level (Moderator and Responder)

The team discussed adding another access level, moderator, and responder. They discussed the assigned tasks for the responders as well as the corresponding responsibilities for the moderator.

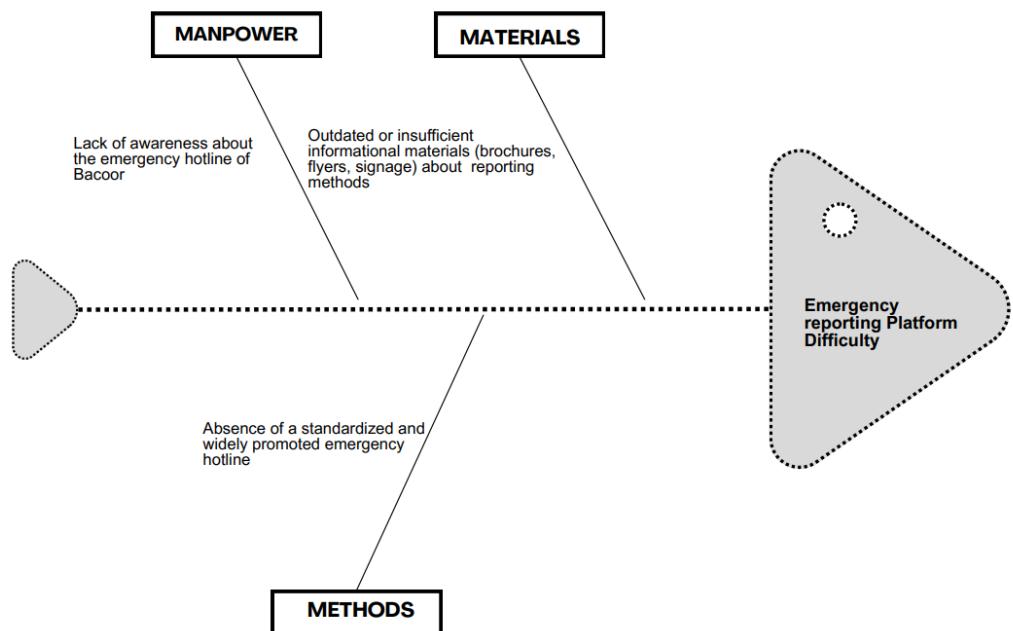
C. Update on KANBAN Board

The team leader reminds his team to update the Kanban Board if they're finished doing the tasks assigned to them.

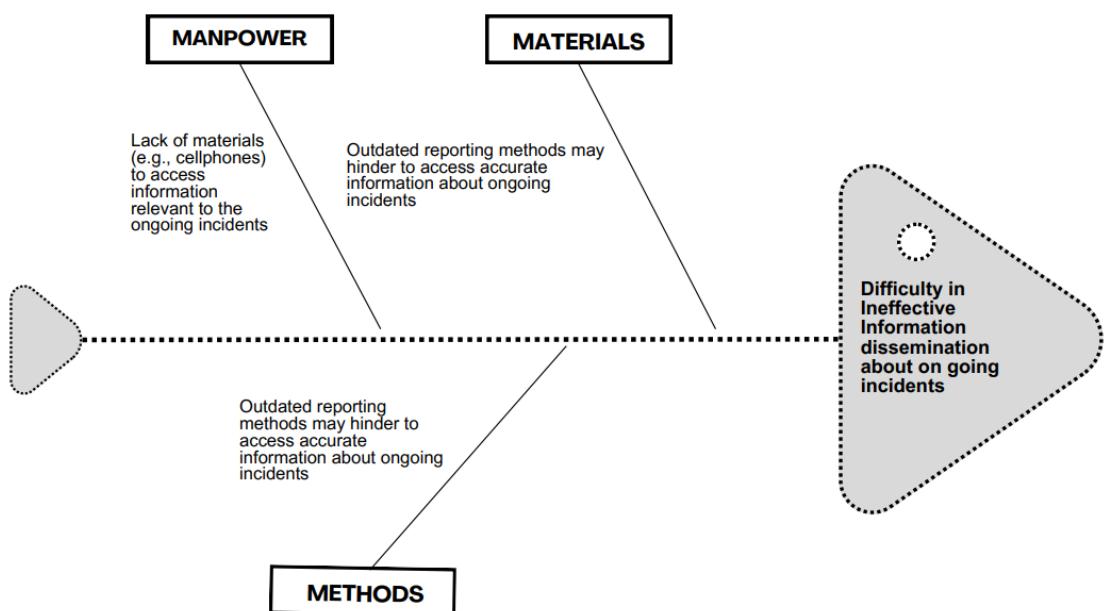
III. Adjournment

Mr. Julios Mojas adjourned the meeting at exactly 1:20 PM

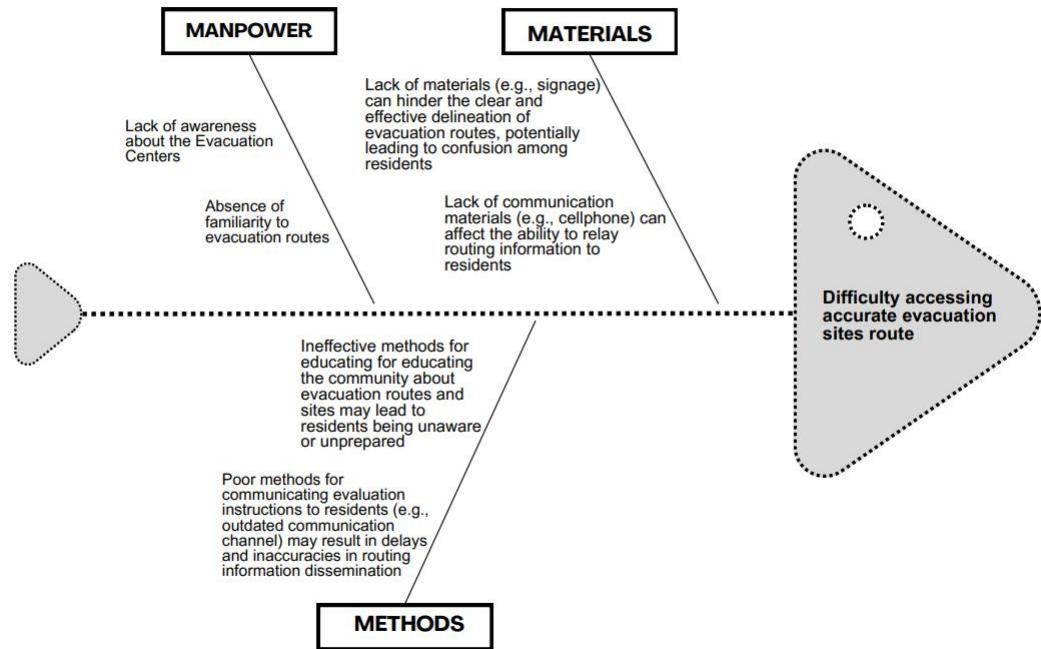
Appendix Figure 1. Fish Bone Diagram



Fish Bone Diagram of difficulty in informing residents

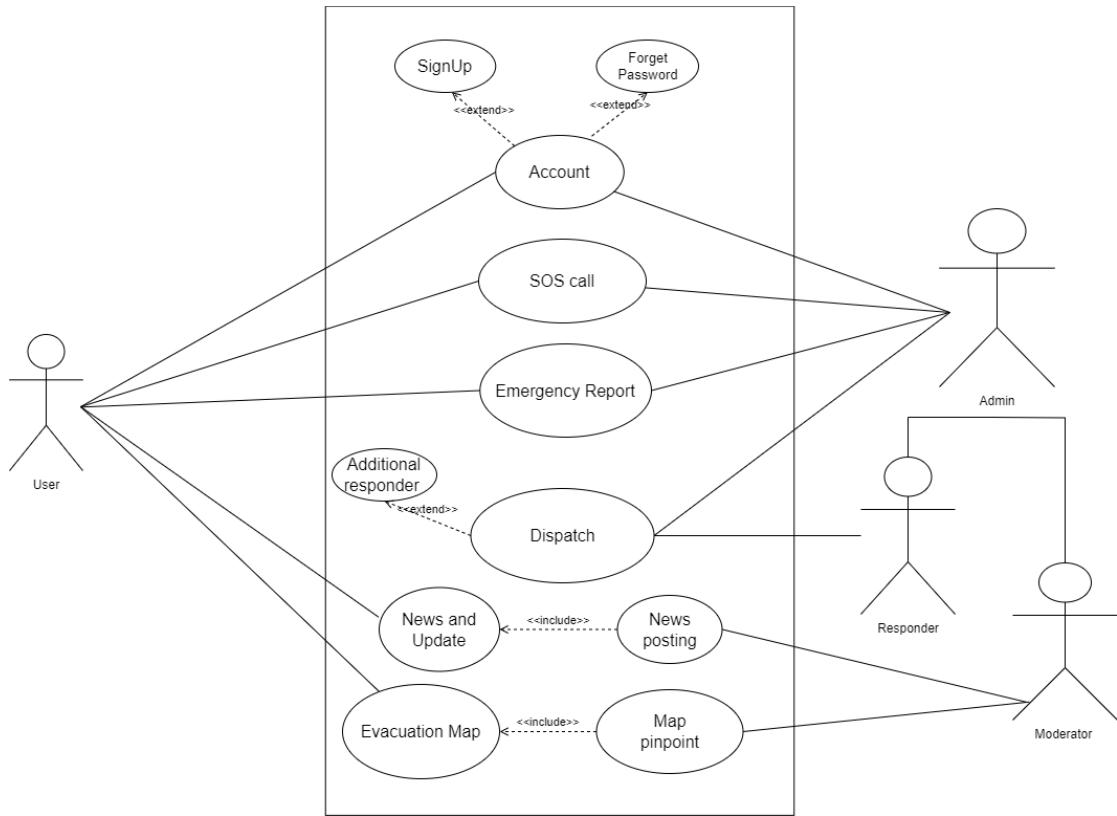


Fish Bone Diagram of difficulty in accurate information



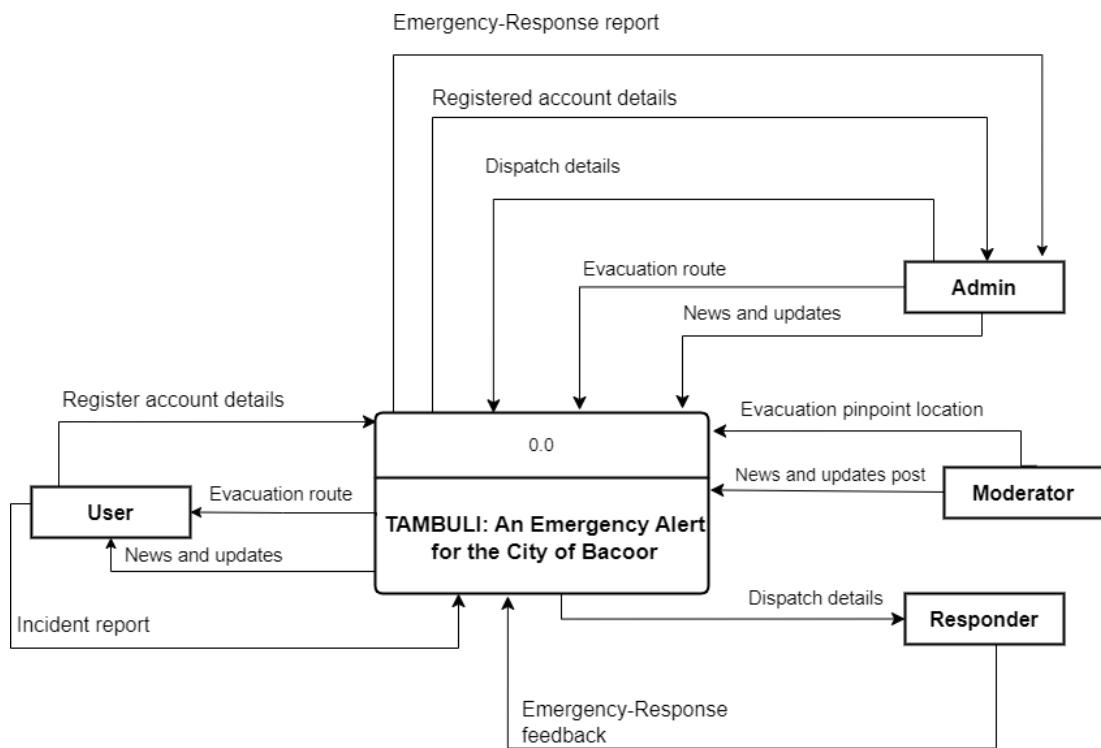
Fish Bone Diagram of difficulty in evacuation routing sites

Appendix Figure 2. Use Case Diagram



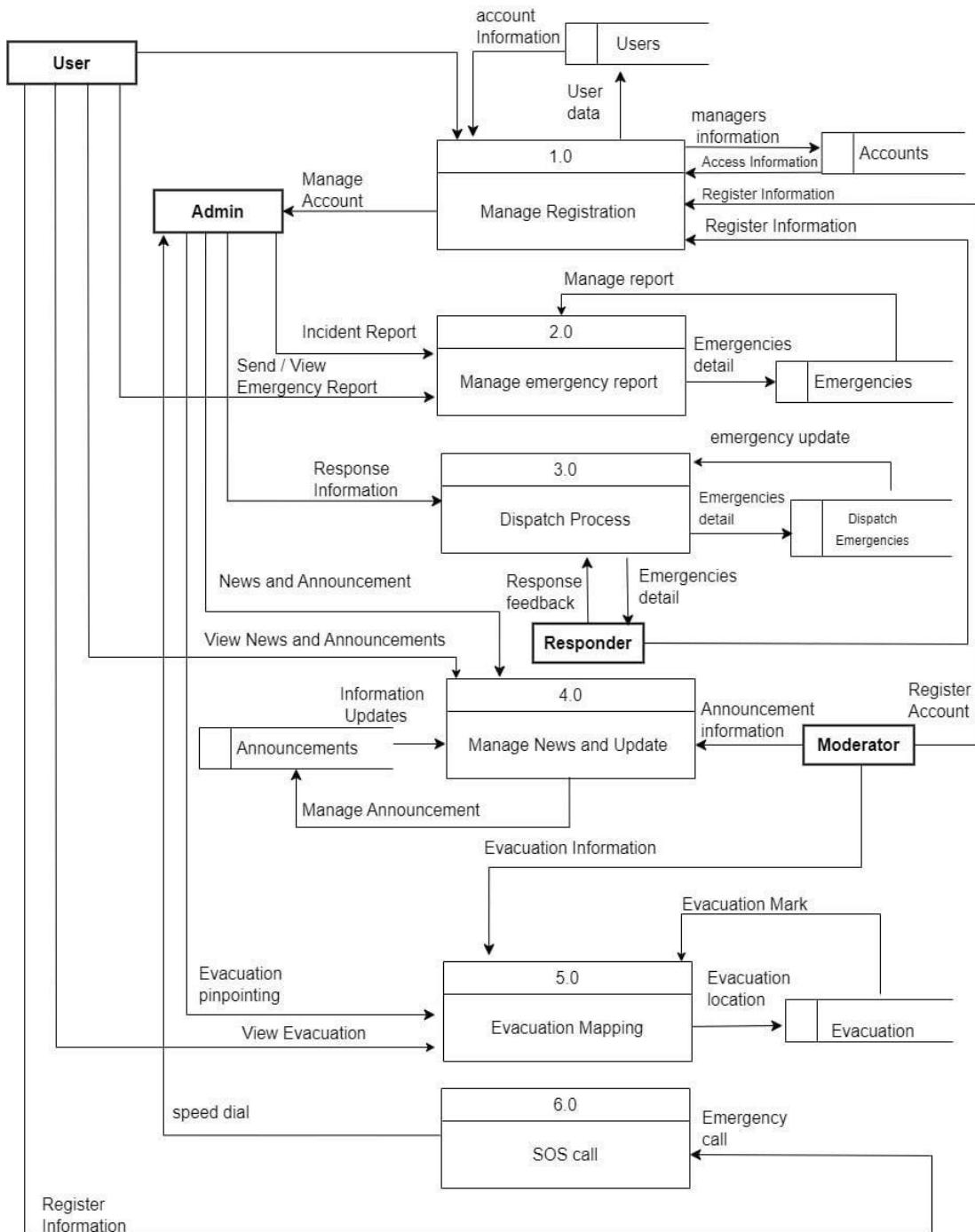
Use Case Diagram of TAMBULI: An Emergency Alert System for City of Bacoor

Appendix Figure 3. Context Diagram

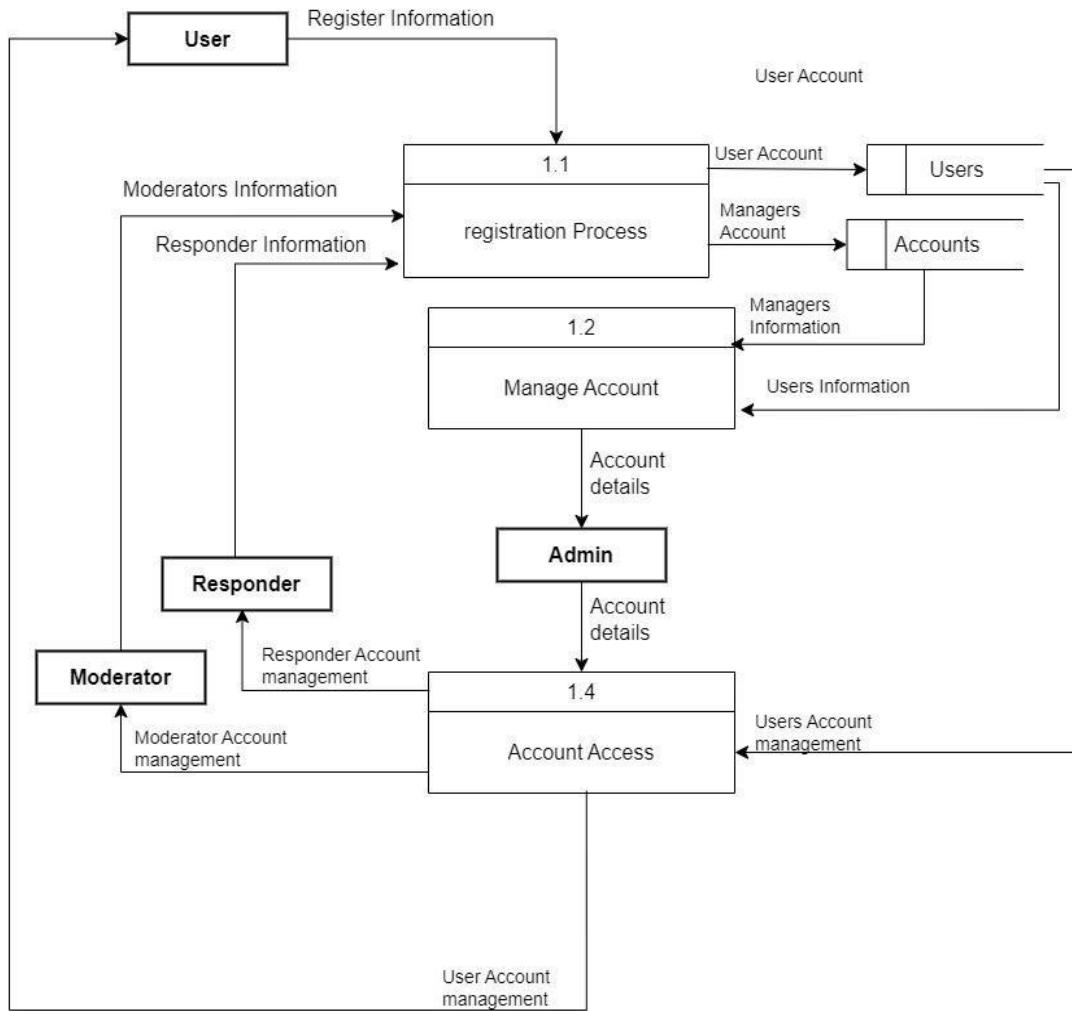


Context Diagram of TAMBULI: An Emergency Alert System for City of Bacoor

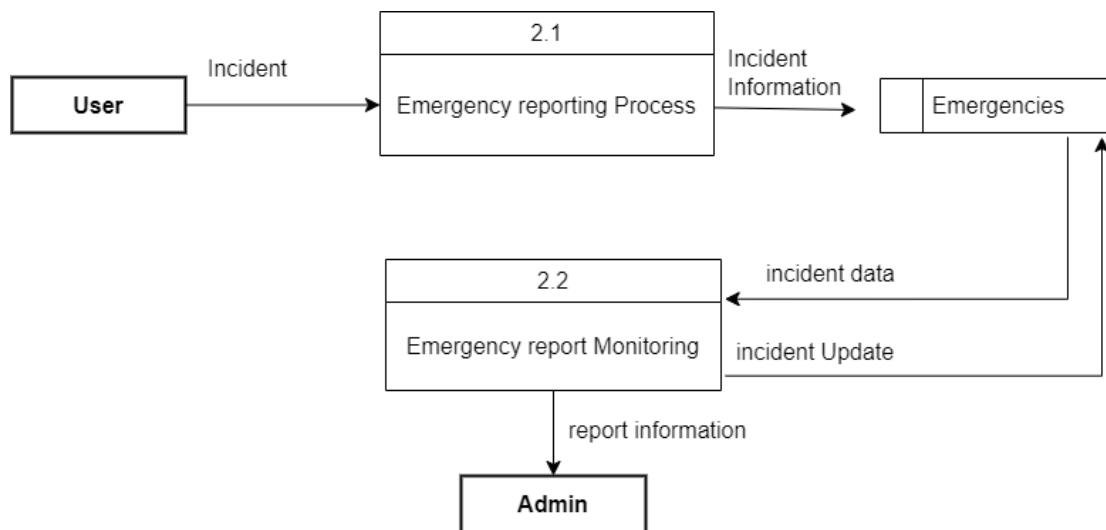
Appendix Figure 4 Data Flow Diagram



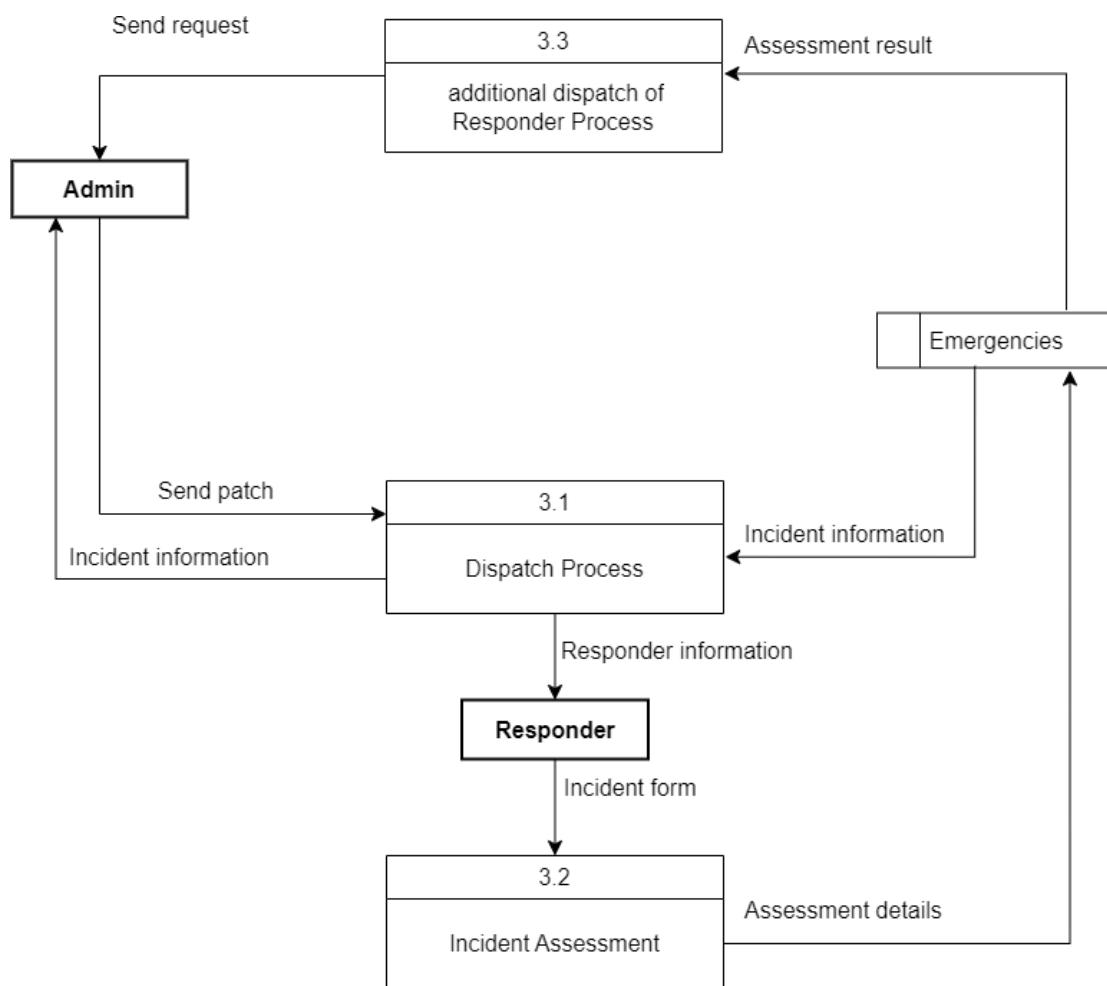
Data Flow Diagram Level 1 of TAMBULI: An Emergency Alert System for City of Bacoor



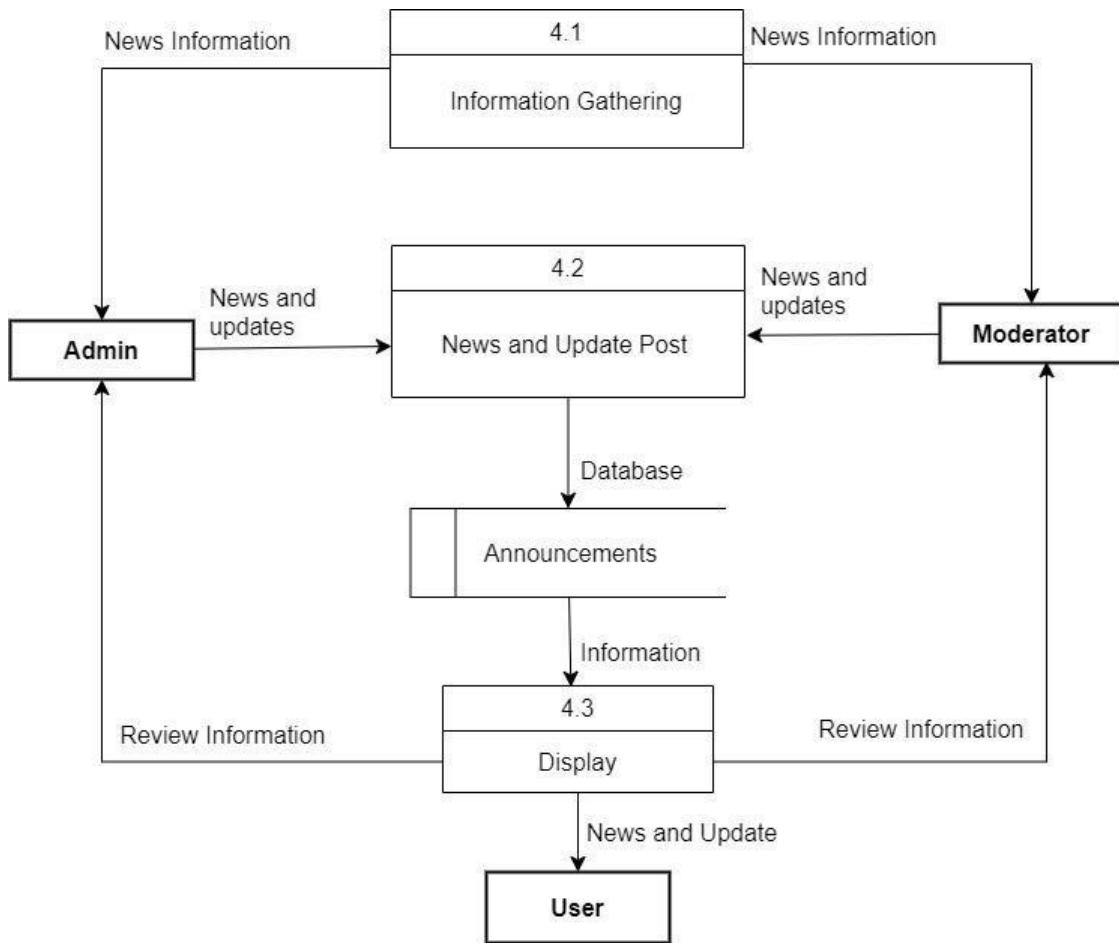
Data Flow Diagram Level 1.1 of TAMBULI: An Emergency Alert System for City of Bacoor



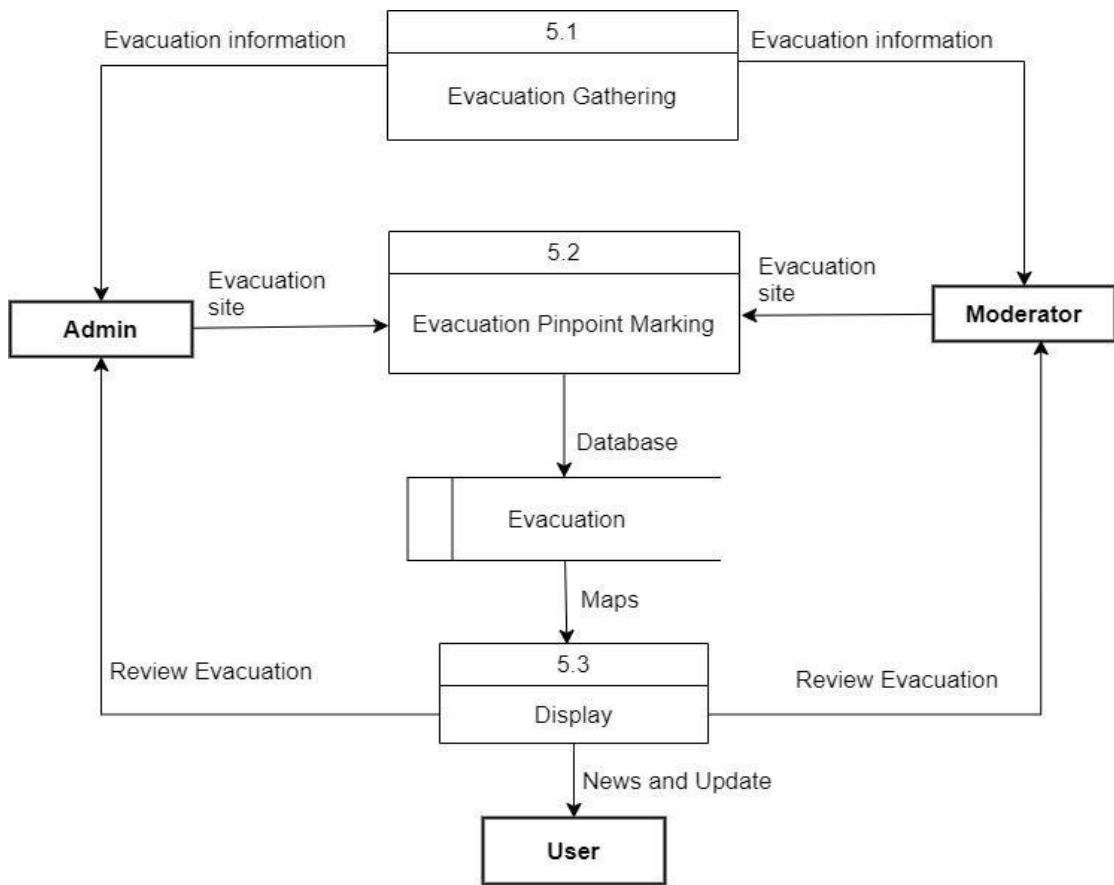
Data Flow Diagram Level 2.1 of TAMBULI: An Emergency Alert System for
City of Bacoor



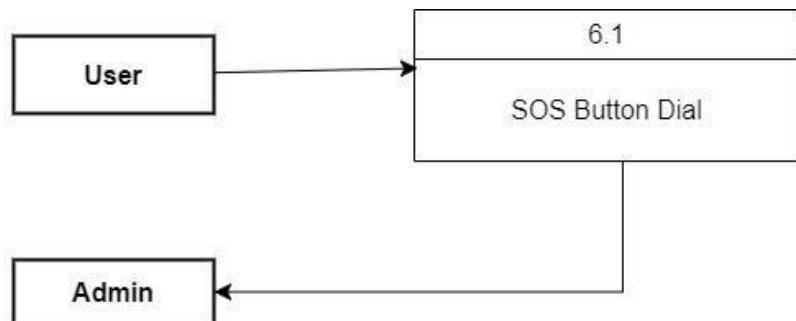
Data Flow Diagram Level 3.1 of TAMBULI: An Emergency Alert System for City of Bacoor



Data Flow Diagram Level 4.1 of TAMBULI: An Emergency Alert System for City of Bacoor

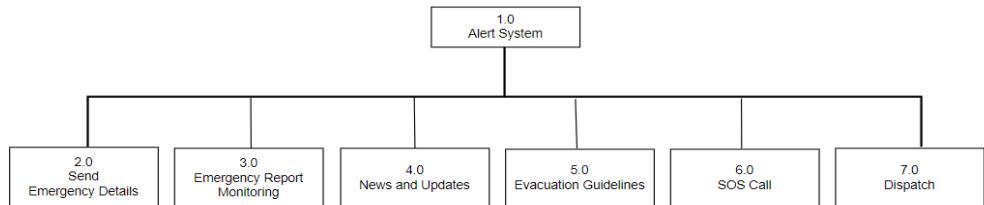


Data Flow Diagram level 5.1 of TAMBULI: An Emergency Alert System for City of Bacoor

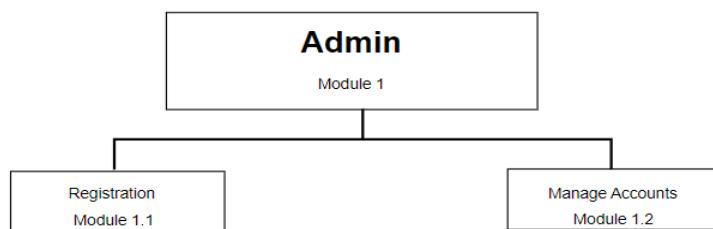


Data Flow Diagram Level 6.1 of TAMBULI: An Emergency Alert System for City of Bacoor

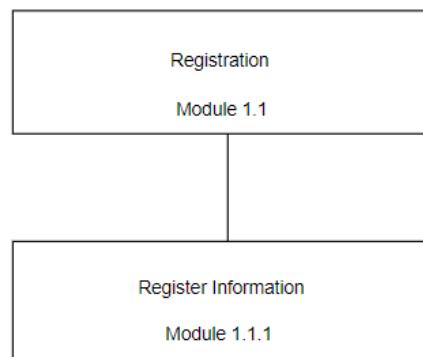
Appendix Figure 5. HIPO Chart



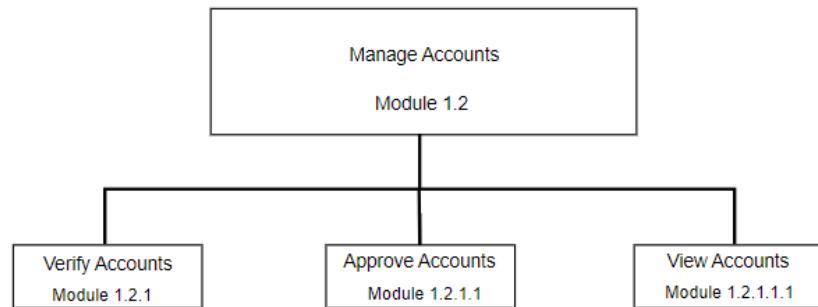
HIPO Chart Module 0.0 Home



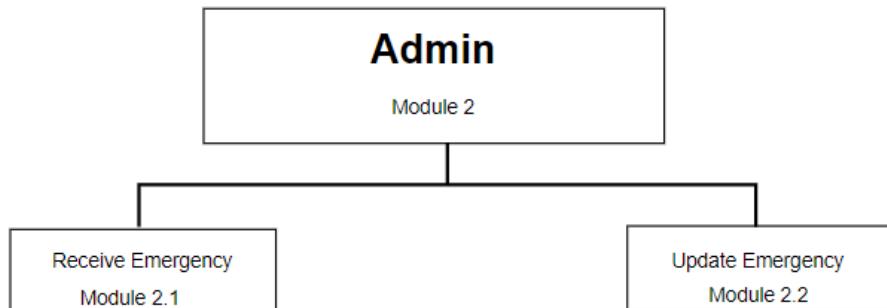
HIPO Chart Module 1 Home



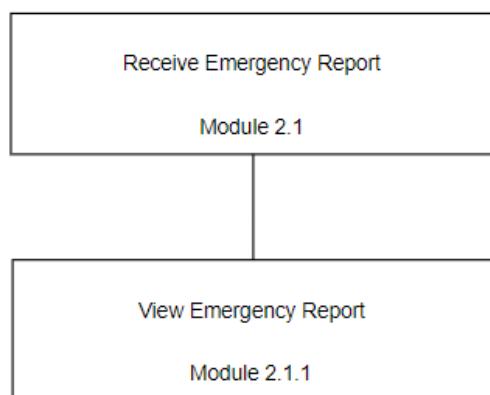
HIPO Chart Module 1.1 Registration



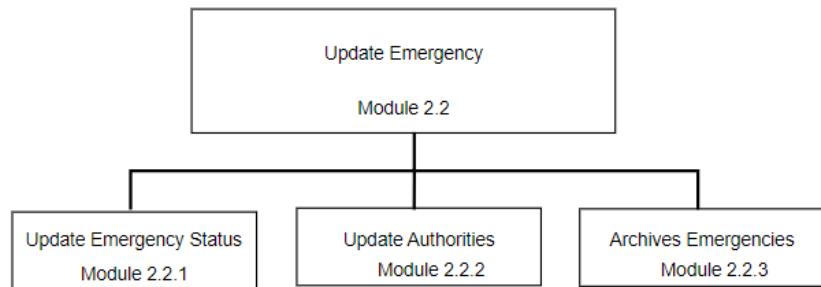
HIPO Chart Module 1.2 Manage Accounts



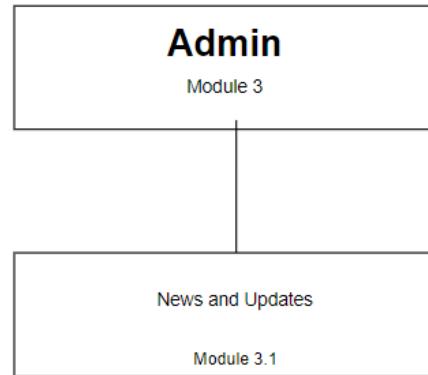
HIPO Chart Module 2 Admin



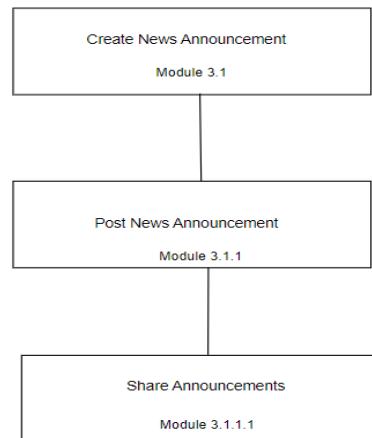
HIPO Chart Module 2.1 Receive Emergency Updates



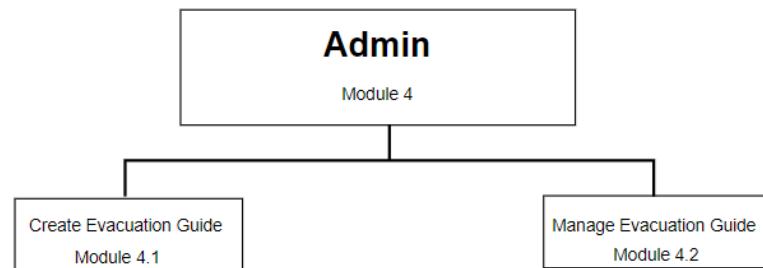
HIPO Chart Module 2.2 Update Emergency



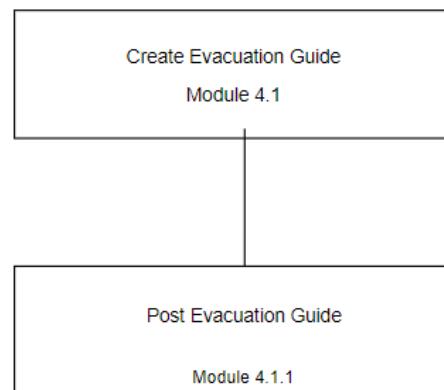
HIPO Chart Module 3 Admin



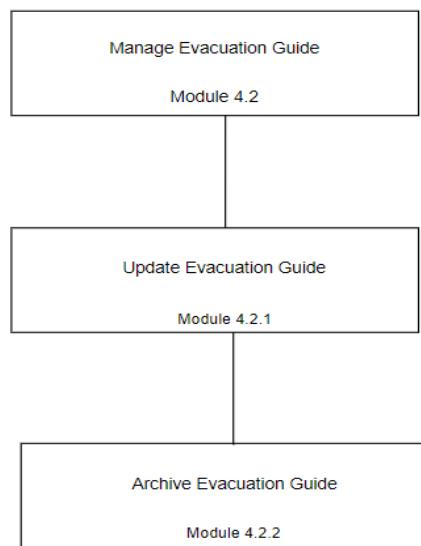
HIPO Chart Module 3.1 Post News Announcement



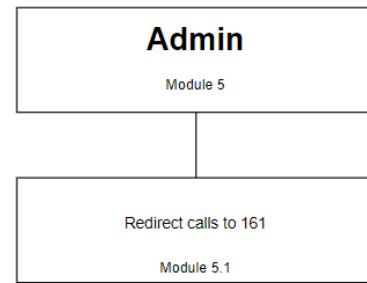
HIPO Chart Module 4 Admin



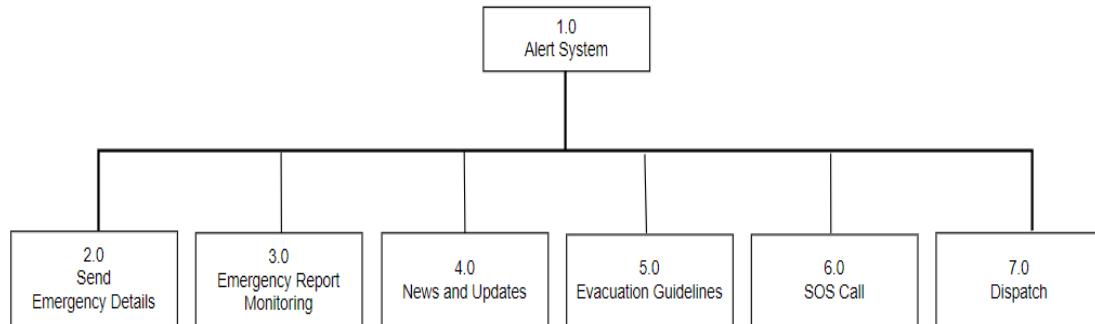
HIPO Chart Module 4.1 Create Evacuation Guide



HIPO Chart Module 4.2 Manage Evacuation Guide



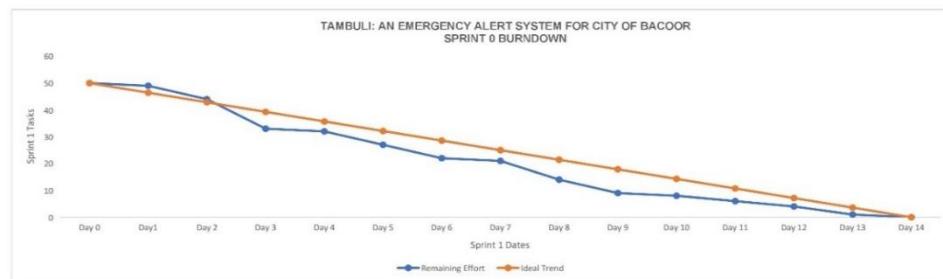
HIPO Chart Module 5 Admin



HIPO Chart Module 1.0 Alert System

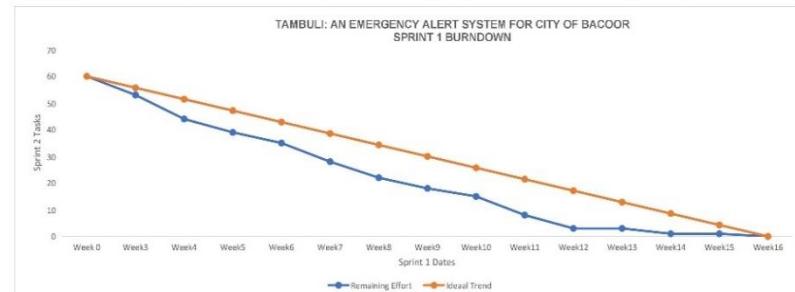
Appendix Figure 6. Burn Down Chart

BACKLOGID	Product Backlog	Initial Estimate	29-May	30-May	5-Jun	6-Jun	7-Jun	8-Jun	9-Jun	10-Jun	12-Jun	13-Jun	14-Jun	15-Jun	16-Jun	17-Jun
		Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
Initial-01	Sprint Planning meeting	5	1		4											
Initial-02	Identify Stakeholders	1		1												
Initial-03	Fan bone Analysis	2			1		1									1
Initial-04	Define Project Scope	5			2			3								
Initial-05	Gant Chart	3				1		1								
Initial-06	Context Diagram	5		2												
Initial-07	HIPo Chart	2							1	1						
Initial-08	Request Letters	7			1		1	1								
Initial-09	Requirement Gathering	3														
Review-1	Sprint Review	7			3											
Initial-11	System Wireframe	10		2		3				3					2	
Remaining Effort		50	49	44	33	32	27	22	21	14	9	8	6	4	1	0
Ideal Trend		50	46.4286	42.8571	39.2857	35.7143	32.1429	28.5714	25	21.4286	17.8571	14.2857	10.7143	7.14286	3.57143	0

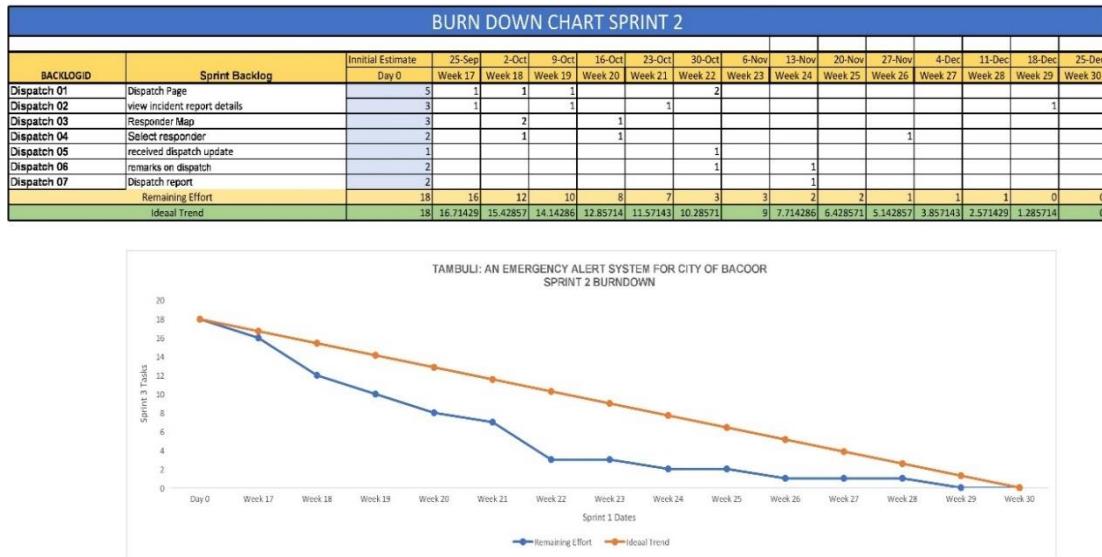


Burn Down Chart Sprint 0 of TAMBULI: An Emergency Alert System for City of Bacoor

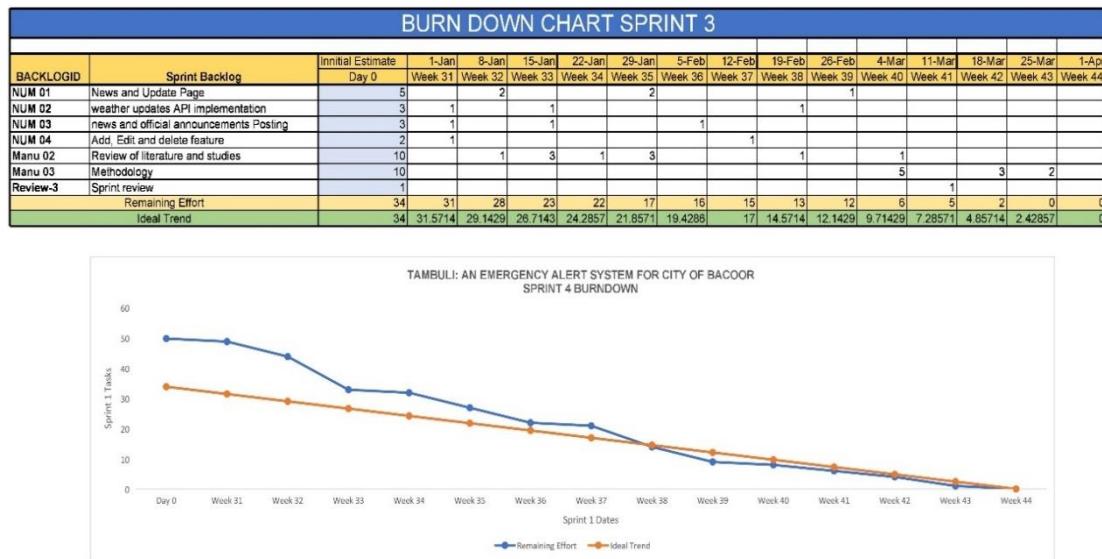
BACKLOGID	Sprint Backlog	Initial Estimate	19-Jun	26-Jun	3-Jul	10-Jul	17-Jul	24-Jul	31-Jul	7-Aug	14-Aug	21-Aug	28-Aug	4-Sep	11-Sep	18-Sep
		Week 0	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16
Registration-01	Login Page	3	1		2											
Registration-02	Registration Page	2		1		1										
Registration-03	Account Verification	5		2			3									
Registration-04	Forgot Password Page	5			2				3							
AppScreen-01	On board screen & Dashboard	12		1				2		3	1	3			2	
Document-01	Introduction	10	2	1		2						5				
ERM-01	Image attachment and forms	2	1				1									
ERM-02	GPS location tracking	6		3			2				1					
ERM-03	View Emergency detail	1				1										
ERM-04	Emergency Status Update	2	1					1								
ERM-05	Received report to admin	2						1				1				
ERM-06	view map incident	5	1		1			2	1							
ERM-07	Filter incidents reports	2		1			1									
DBM-01	Database Management	2	1									1				
Review-2	Sprint review	1													1	1
Remaining Effort		60	53	44	39	35	28	22	18	15	8	3	3	1	1	0
Ideal Trend		60	55.7143	51.4286	47.1429	42.8571	38.5714	34.2857	30	25.7143	21.4286	17.1429	12.8571	8.57143	4.28571	0



Burn Down Chart Sprint 1 of TAMBULI: An Emergency Alert System for City of Bacoo

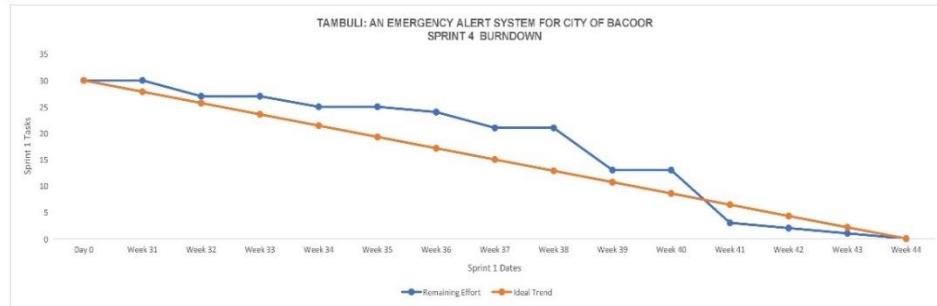


Burn Down Chart Sprint 2 of TAMBULI: An Emergency Alert System for City of Bacoor



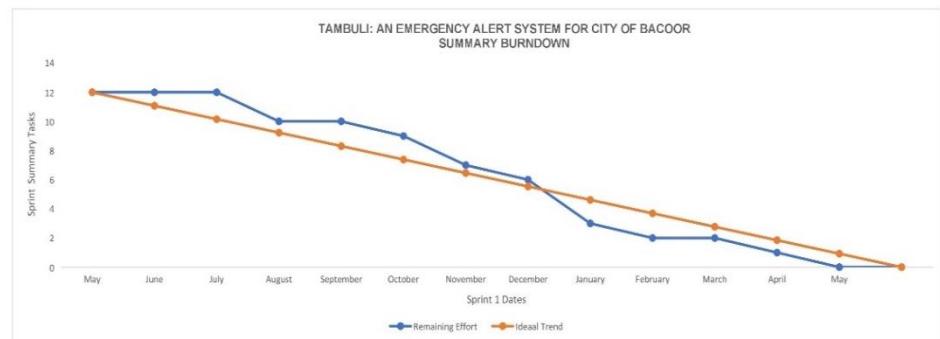
Burn Down Chart Sprint 3 of TAMBULI: An Emergency Alert System for City of Bacoor

BURN DOWN CHART SPRINT 4																		
BACKLOGID	Sprint Backlog	Initial Estimate	18-Mar	25-Mar	1-Apr	8-Apr	15-Apr	22-Apr	29-Apr	6-May	13-May	20-May	27-May	3-Jun	10-Jun	17-Jun		
		Day 0	Week 31	Week 32	Week 33	Week 34	Week 35	Week 36	Week 37	Week 38	Week 39	Week 40	Week 41	Week 42	Week 43	Week 44		
Evac M 01	List all of evacuation center	3																
Evac M 02	Evacuation page on admin	2		1		1									5			
Evac M 03	Add evacuation site	6															1	
Evac M 04	Evacuation pin point	5															1	
Evac M 05	Evacuation routing	3				1												
Evac M 06	Add / Edit/ Delete Evacuation	6								3					5			
Evac M 07	Display on user side	3		2				1				5						
SOS M 01	call dial on 181	2																
Remaining Effort		30	30	27	27	25	25	24	21	21	13	13	3	2	1	0		
Ideal Trend		30	27.85714	25.71429	23.57143	21.42857	19.28571	17.14286	15	12.85714	10.71429	8.571429	6.428571	4.285714	2.142857	0		



Burn Down Chart Sprint 4 of TAMBULI: An Emergency Alert System for City of Bacoor

BURN DOWN CHART SUMMARY																												
Modules	Initial Estimate	May	June	July	August	September	October	November	December	January	February	March	April	May	Percent done	5%	10%	15%	25%	45%	55%	65%	75%	80%	85%	90%	95%	100%
	Registration Module	1			1																							
Emergency-Response Monitoring Module	5							1	1	2														1				
Dispatch Module	1																											
News and Update Module	2							1	1																	1		
Evacuation Module	2																											
SOS Module	1																						1					
Remaining Effort		12	12	12	10	10	9	7	6	3	2	2	1	0														
Ideal Trend		12	11.07692	10.15385	9.230769	8.307692	7.384615	6.461538	5.538462	4.615385	3.692308	2.769231	1.846154	0.923077	0													



Burn Down Chart Summary of TAMBULI: An Emergency Alert System for City of Bacoor

Appendix Figure 7. Residential Survey Report



Republic of the Philippines
CAVITE STATE UNIVERSITY
Bacoor City Campus
 SHIV, Molino VI, City of Bacoor
 ☎ (046) 476-5029
 ✉ cvsubacoor@cvsu.edu.ph

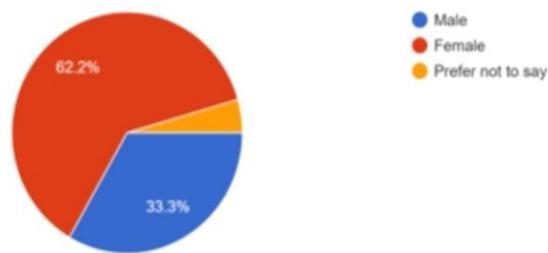
Date:

TAMBULI: AN EMERGENCY ALERT SYSTEM FOR CITY OF BACOOR

Survey Report

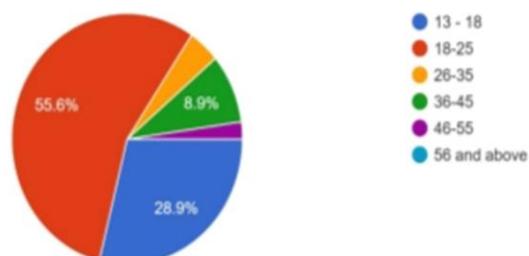
Objectives: To gather information's about the disaster response monitoring in the city of Bacoor.

sex

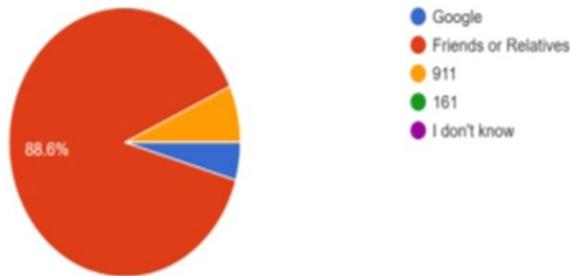


After conducting a survey among residents of Bacoor, 62.2% of the respondents were female, 33.3% were male, and 4.4% indicated they would not have preferred to disclose their sex.

Age:

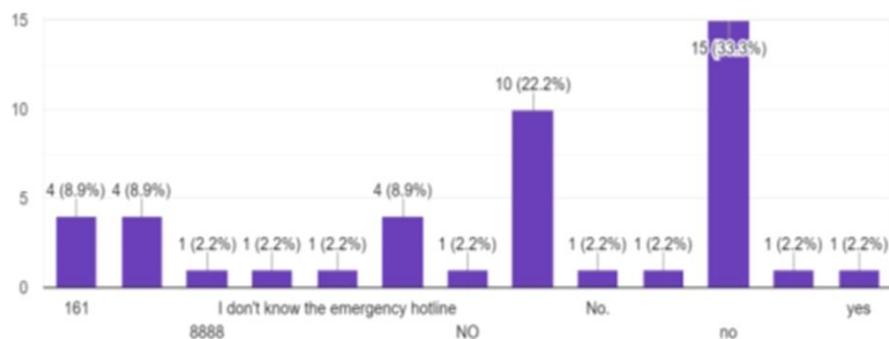


Who do you usually call in case of an emergency?



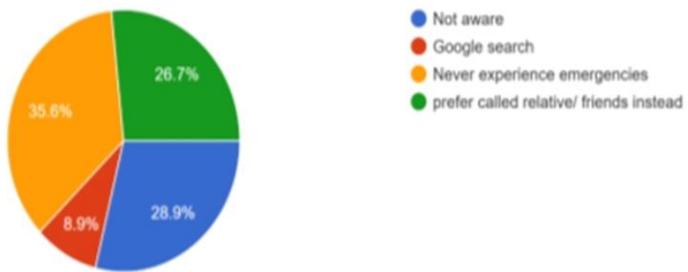
In this part, it shows who do the respondents usually call-in case of emergency. The chart above shows that the respondents preferred to call their friends or relatives (88.6%) in case of an emergency, while others preferred to call 911(6.8%) and use google (4.5%) in case of an emergency.

Do yo know the contact number of emergency services in your area? if yes please provide.



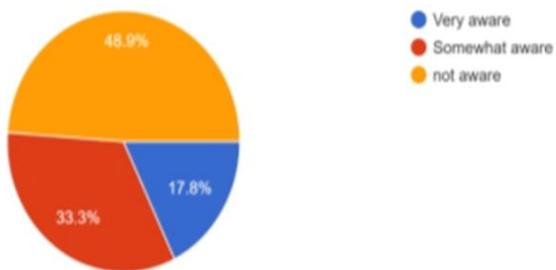
The graph above shows if the respondents know the contact number of emergency in their area. The result shows that many of the respondents didn't know the contact number of emergency services in their area, many respondents answered NO with the percentage of 33.3%.

What is the reason you don't know the contact number of emergency services?



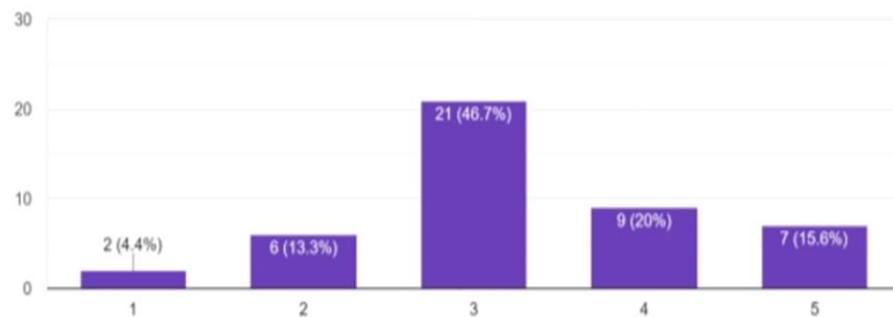
The chart displayed above shows the reason why respondents is not aware about the emergency hotline of Bacoor City. The result shows that most of the respondents never experienced emergency (35.6%), while other respondents are really not aware (28.9%) with the hotline number of Bacoor, then other respondents prefer to call their friends or relative (26.7%) and they use google search instead (8.9%).

Are you aware of the BDRRMO Emergency hotline (161) for reporting disaster events or seeking assistance?



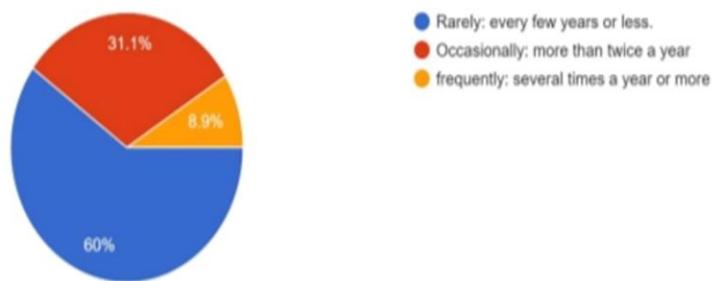
The result above shows the awareness of the respondents to BDRRMO Emergency Hotline (161) for reporting emergencies events. The charts shows that respondents are not totally aware (48.9%) to BDRRMO Emergency Hotline, then others are somewhat aware (33.3%) to the emergency hotline, and last some of the respondents are very aware to the BDRRMO Emergency Hotline.

On the scale 1 to 5, please rate the effectiveness of the current method(s) of informing authorities about a disaster event in Bacoor?



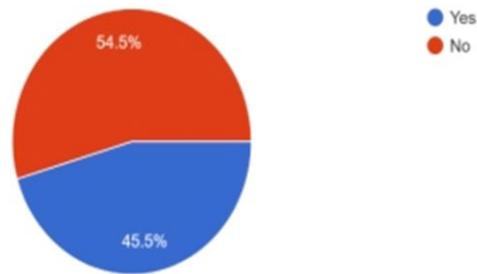
On scale 1 to 5, 46.7% of the respondent's rate (3/5) the effectiveness of the current methods of informing authorities about disaster events in Bacoor.

how frequently do you experience or encounter natural disasters in your area?



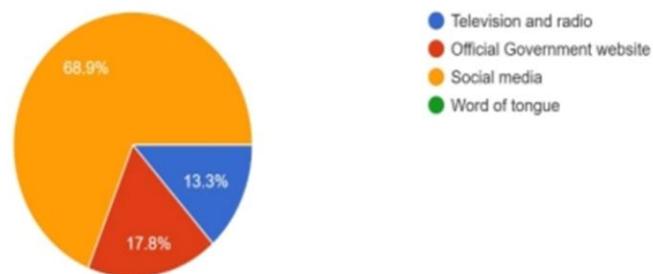
The result above shows how the respondents experience or encounter natural disaster in their area. 60% (Rarely: every few years or less) the respondents experienced natural disaster, while 31.1% (Occasionally: more than twice a year) of respondents who answered the survey experience natural disaster and 8.9% (Frequently: several times a year or more) of respondents experience natural disaster in their area.

Have you ever encountered challenges in accessing emergency information quickly?
44 responses



The chart above shows the challenges that respondents encounter in accessing emergency information. The result above shows that 54.5% of the respondents didn't encounter challenges in accessing emergency information, while 45.5% of the respondents' encountered challenges in accessing emergency information

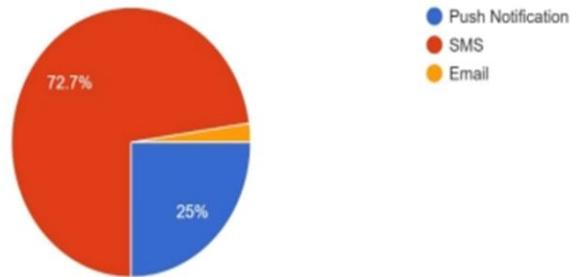
How do you obtain emergency-related information



The result above shows how the respondents obtain emergency-related information. Most of the respondents, they obtain emergency-related information using social media (68.9%), while other respondents they obtain emergency-related information using television or radio (13.3%) and Official government website to obtain emergency-related information.

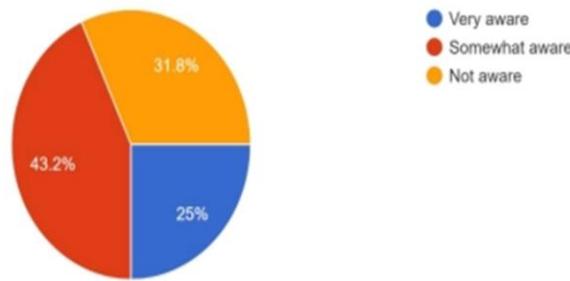
Appendix 21. Continued...

How would you prefer to receive emergency alerts?



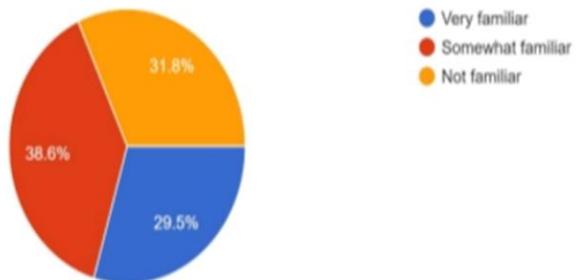
Most of the respondents who answered the survey, they preferred SMS (72.7%) when receiving emergency alerts, while other respondents preferred Push Notification (25%) when receiving emergency alerts.

Are you aware with the existing Evacuation Centers?



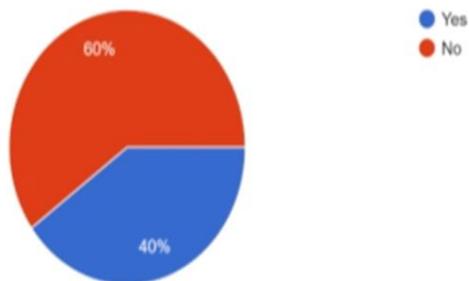
The result above showing how the respondent's awareness in the existing evacuation centers. 43.2% of respondents are somewhat aware to the existing evacuation centers, while there are 31.8% are not aware to the existing evacuation centers and lastly, there's 25% of respondents are very aware to existing evacuation centers.

How familiar are you with the designated evacuation routes in your area?



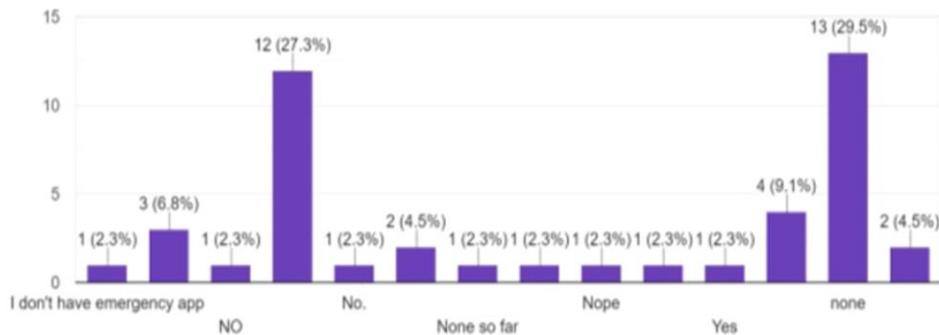
Most of the respondents are very familiar (29.5%) to the designated evacuation routes in their area, while others are somewhat familiar (38.6%) to the designated evacuation centers and lastly, other respondents are not totally familiar (31.8%) to the designated evacuation center in their area.

are you aware of developed emergency app?



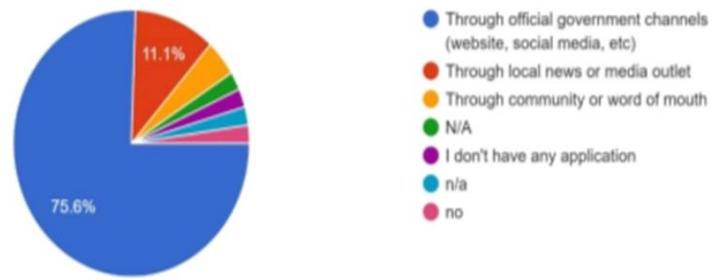
The result above shows about the awareness of respondents to the developed emergency app. Most of the respondents are not aware to the developed emergency app (60%), while there are residents who's aware (40%) to the developed emergency application.

Are you currently using any emergency alert systems or apps? If yes, please specify.



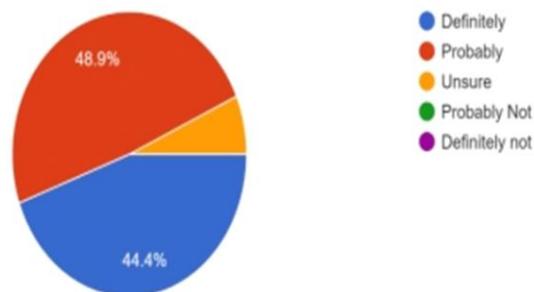
The result of graph above shows that most of the respondents who answered the survey are not using any emergency alert system or application.

If yes how do you become aware of emergency information?



76.6% of the respondents became aware of emergency information through official government channels like social media, websites, etc.

Would you interested in the TAMBULI: AN EMERGENCY ALERT SYSTEM APPLICATION FOR CITY OF BACOOR?



The result above shows how many residents of Bacoor would be interested in the TAMBULI: AN EMERGENCY ALERT SYSTEM APPLICATION FOR THE CITY OF BACOOR. 48.9% of the residents will probably use the Tambuli, while 44.4% of respondents will definitely use the Tambuli app.

Appendix 4. Request Letters



Republic of the Philippines
CAVITE STATE UNIVERSITY
Bacoor City Campus
SHIV, Molino VI, City of Bacoor
[¶] (046) 476-5029
cvsubacoor@cvsu.edu.ph

June 06, 2023

Dear Sir/ Madam:

Greetings in peace!

We, the undersigned would like to ask your esteemed office's permission to allow us to conduct series of interview and data gathering with regards to the process of disaster monitoring and response in the City of Bacoor. This is in relation to our undergraduate thesis entitled "**DEVELOPMENT OF A DISASTER RESPONSE MONITORING SYSTEM FOR THE CITY OF BACOOR**"

Rest assure that all data that will be gathered will be treated with confidentiality. Thank you and looking forward for your cooperation with this matter.

God bless you with all the things that really matters.

Respectfully yours,

GIO GABRIEL B. SANCHEZ

JOEY C. MARTINEZ JR.

JULIOS M. MOJAS

APRIL JOY M. SUAREZ

Researchers

Noted by:

ALVINA E. RAMALLOSA

Department Research and Extension Coordinator

ELY ROSE L. PANGANIBAN – BRIONES, MIT, LPT

BS Computer Science Coordinator

DONNALYN B. MONTALLANA, MIT

Department of Computer Studies Chairperson

OFFICE OF THE CITY MAYOR CITY OF BACOOR, CAVITE	
Reference no.:	4265
Received by:	JDY
Date / Time:	6-7-23 / 3:29 (046) 481-4100 Loc. 411 or 09271891751

Reference No. 2023- <u>4265</u>	 Republic of the Philippines Province of Cavite CITY OF BACOOR <i>Office of the City Mayor</i>	STRIKE AS Date <u>JUN 07 2023</u>																				
<input type="checkbox"/> Endorsement <input type="checkbox"/> Follow-up <input type="checkbox"/> Invitation <input type="checkbox"/> Proposal/Business <input type="checkbox"/> Report <input type="checkbox"/> Information <input type="checkbox"/> Legal <input checked="" type="checkbox"/> Request/Solicitation <input type="checkbox"/> For Approval/Signature <input type="checkbox"/> Others _____																						
<u>M. JULIUS M. MOSAS</u> <u>REQUEST FOR HELEN</u> Remarks: <u>CPDC Weng</u> <u>FYMA!</u>  																						
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;">  <p>Date: <u>06-17-23</u> RECEIVED By: <u>McCarthy</u> <u>Sign:</u> <u>161</u></p> </div> <div style="width: 45%;"> <p style="text-align: center;">OFFICE OF THE MAYOR CITY OF BACOOR, CAVITE</p> <table border="0" style="width: 100%; border-collapse: collapse;"> <tr> <td>Ref. No.:</td> <td><u>4265</u></td> <td>Date:</td> <td><u>6-7-23</u></td> </tr> <tr> <td>Received by:</td> <td><u>Joy</u></td> <td>Time:</td> <td><u>3:29</u></td> </tr> <tr> <td>Name:</td> <td colspan="3"><u>Julius M. Mosas</u></td> </tr> <tr> <td>Contract No.:</td> <td colspan="3"><u>09127396078</u></td> </tr> <tr> <td>Address:</td> <td colspan="3"><u>B1 K1 Lot 1, Strawberry St., Sawgrassman Est., Bacoor City, Cavite</u></td> </tr> </table> </div> </div>			Ref. No.:	<u>4265</u>	Date:	<u>6-7-23</u>	Received by:	<u>Joy</u>	Time:	<u>3:29</u>	Name:	<u>Julius M. Mosas</u>			Contract No.:	<u>09127396078</u>			Address:	<u>B1 K1 Lot 1, Strawberry St., Sawgrassman Est., Bacoor City, Cavite</u>		
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Contract No.:	<u>09127396078</u>																					
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Appendix 5. Evaluation Form

 Republic of the Philippines CAVITE STATE UNIVERSITY Bacoor City Campus SHIV, Molino VI, City of Bacoor ☎ (046) 476-5029 ✉ cvsbacoor@cvsu.edu.ph																																																																			
EVALUATION INSTRUMENT FOR TAMBULI: AN EMERGENCY ALERT SYSTEM FOR CITY OF BACOOR																																																																			
Name (Optional): <u>geha</u> Date: _____																																																																			
Address (Optional): _____																																																																			
Profession: <u>Student</u> Specialization: _____																																																																			
<input type="checkbox"/> IT Professionals <input checked="" type="checkbox"/> BDRMO Admin/staff <input checked="" type="checkbox"/> Bacoor residents																																																																			
Instructions: Please Evaluate using the given scale and placing a checkmark (✓) on the appropriate column corresponding to your response.																																																																			
Numerical Rating: 5 – Excellent 4 – Very Good 3 – Good 2 – Fair 1 – poor																																																																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding-bottom: 5px;">INDICATORS</th> <th style="text-align: center; padding-bottom: 5px;">5</th> <th style="text-align: center; padding-bottom: 5px;">4</th> <th style="text-align: center; padding-bottom: 5px;">3</th> <th style="text-align: center; padding-bottom: 5px;">2</th> <th style="text-align: center; padding-bottom: 5px;">1</th> </tr> </thead> <tbody> <tr> <td colspan="6">Functional Suitability</td> </tr> <tr> <td>1. Functional completeness - degree the set of functions converse all the specified tasks and users objectives.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>2. Functional correctness - the degree to which a product or system provides the correct result with the needed degree of precision.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>3. Functional appropriateness - the degree to which the function facilitates the accomplishment of specified tasks and objects.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td colspan="6">A. Performance efficiency</td> </tr> <tr> <td>1. Time behavior - the degree to which processing times and throughput rates of a product or system, performing its function, requirements.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>2. Resource utilization - degree amounts and types of resources used by any system when performing its functions to meet requirements.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>3. Capacity - the degree to which the maximum limits of a product or system parameter meet requirements.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td colspan="6">B. Compatibility</td> </tr> <tr> <td>1. Coexistence efficiently while sharing a common environment and resources with other products without detrimental impact on any other product.</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		INDICATORS	5	4	3	2	1	Functional Suitability						1. Functional completeness - degree the set of functions converse all the specified tasks and users objectives.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2. Functional correctness - the degree to which a product or system provides the correct result with the needed degree of precision.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3. Functional appropriateness - the degree to which the function facilitates the accomplishment of specified tasks and objects.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A. Performance efficiency						1. Time behavior - the degree to which processing times and throughput rates of a product or system, performing its function, requirements.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2. Resource utilization - degree amounts and types of resources used by any system when performing its functions to meet requirements.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3. Capacity - the degree to which the maximum limits of a product or system parameter meet requirements.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	B. Compatibility						1. Coexistence efficiently while sharing a common environment and resources with other products without detrimental impact on any other product.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
INDICATORS	5	4	3	2	1																																																														
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3. Functional appropriateness - the degree to which the function facilitates the accomplishment of specified tasks and objects.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																														
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3. Capacity - the degree to which the maximum limits of a product or system parameter meet requirements.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																														
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1. Coexistence efficiently while sharing a common environment and resources with other products without detrimental impact on any other product.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																														

2. Interoperability - the degree to which two or more systems or components can exchange information and use the rock information that has been exchanged.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Usability					
1. Appropriateness recognizability - the degree to which can you recognize either a product or system is appropriate for their needs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Learnability - the degree to which a system can be used by specified users to achieve specific goals of learning to use the product or system with effectiveness, and freedom from satisfaction in a specified context of use.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Operability to which a product or system has attributes that make it easy to operate and control.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. User error protection - the degree to which a system excuses her against making errors.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. User interface aesthetics- the degree to which a user interface enables pleasing and satisfying interaction for the user.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Accessability - degree to which a product or system can be used by the people with the widest range of characteristics and capabilities to achieve a specific goal in a specific context of use.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Reliability					
1. Maturity - Degree to which a system, product or component meets needs for reliability under normal operation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Availability - Degree to which a system, product or component is operational and accessible when required for use.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Fault tolerance - Degree to which the system, product or component operates as intended despite the presence of hardware or software faults.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Recoverability - the degree to, the event of an interruption or a failure, our system can recover the data directly affected and he establish the desired state of the system.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. security					
1. Confidentiality - degree to which or system ensures that the data are accessible only to those authorized to have access.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Integrity- degree to which a systems, Product or component prevents an authorized access to, or modification of , computer programs or data.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Non-repudiation - degree to or events can be proven to have taken place so that the events or actions cannot be repudiated later.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Accountability - degree reactions of an entity can be traced uniquely to the entity.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Authenticity to which of a subject or resource can be proved to be one claimed.	<input checked="" type="checkbox"/>			
F. Maintainability				
1. Modularity- system or computer program is composed of discrete components such that a change to one component is minimal impact on other components.	<input checked="" type="checkbox"/>			
2. Reusability to which an asset can be used in more than one system, in building other assets.	<input checked="" type="checkbox"/>			
3. Analyze ability - degree of effectiveness it is possible to assess the impact on a product or system of an intended change to one or more of its parts, a product for deficiencies or causes of failures, to be modified.	<input checked="" type="checkbox"/>			
4. Modifiability can be effectively and efficiently modified without introducing defects or degrading existing product quality.	<input checked="" type="checkbox"/>			
5. Testability - Degree of effectiveness with which does criteria can be established for a system, components and dust can be performed to determine either those criteria have been met.	<input checked="" type="checkbox"/>			
G. Portability				
1. Adaptability – Degree to or system can be effectively and efficiently be adapted for different or evolving hardware, software operational or usage environments.	<input checked="" type="checkbox"/>			
2. Install ability – Degree of effectiveness in efficiency with which a product or system can be successfully installed and - or in a specified environment.	<input checked="" type="checkbox"/>			
3. Replaceability - Degree to which a product another specified song her product for the same purpose in the same environment.	<input checked="" type="checkbox"/>			

Remarks/ Comments/ Suggestions:

Posses a great potential to fight those fakebook dwellers

Who use emergencies to gain likes and followers.

Magazinda the main implement we widespread para
ma normalize any message around the situation
eg. lobby tab. Good initiative and I'm looking
forward to seeing more of the app.

Name and Signature of Respondents

Appendix 6. Request for Adviser and Technical Critic



Republic of the Philippines
CAVITE STATE UNIVERSITY
Bacoor City Campus
 SHIV, Molino VI, City of Bacoor
 ☎ (046) 476-5029
 📩 cvsabacoor@cvsu.edu.ph

DEPARTMENT OF COMPUTER STUDIES

REQUEST FOR ADVISER AND TECHNICAL CRITIC

Name of Researcher(s): JOEY C. MARTINEZ JR
 JULIOS M. MOJAS
 GIO GABRIEL B. SANCHEZ
 APRILJOY M. SUAREZ

Title of Study : TAMBULI: AN EMERGENCY ALERT SYSTEM
 FOR CITY OF BACOOR

CONFORME:


ELY ROSE L. PANGANIBAN - BRIONES, MIT 6-19-23 
 Thesis Adviser Date Technical Critic 6-19-23

RECOMMENDING APPROVAL:


DONNALYN B. MONTALLANA, MIT 6-19-23
 Department Chairperson/
 Campus Research Coordinator Date

APPROVED:


RONAN M. CAJIGAL, MAEd 10/13/23
 Campus Administrator Date

cc: undergraduate thesis instructor, adviser, technical critic, research coordinator, student

Appendix 7. Capsule Approval Sheet



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CAPSULE APPROVAL SHEET

Name of Researcher(s): JOEY C. MARTINEZ JR
 JULIOS M. MOJAS
 GIO GABRIEL B. SANCHEZ
 APRILJOY M. SUAREZ

Title of Study : TAMBULI: AN EMERGENCY ALERT SYSTEM
 FOR CITY OF BACOOR

APPROVED:


ELY ROSE L. PANGANIBAN - BRIONES, MIT 6-19-23 
 Thesis Adviser Date Technical Critic Date


DONNALYN B. MONTALLANA, MIT 6-19-23
 Department Chairperson/
 Campus Research Coordinator Date


RONAN M. CAJIGAL, MAEd 10/13/23
 Campus Administrator Date

Appendix 8. Title Approval Sheet



Republic of the Philippines
CAVITE STATE UNIVERSITY
Bacoor City Campus
SHIV, Molino VI, City of Bacoor
☎ (046) 476-5029
✉ cvsbacoor@csvs.edu.ph

TITLE APPROVAL SHEET

Name of Researcher(s): JOEY C. MARTINEZ JR
JULIOS M. MOJAS
GIO GABRIEL B. SANCHEZ
APRILJOY M. SUAREZ

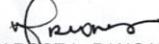
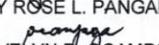
Title of Study : TAMBULI: AN EMERGENCY ALERT SYSTEM FOR CITY OF BACOOR

APPROVED:

D. Montallana
DONNALYN B. MONTALLANA, MIT
Department Chairperson/
Campus Research Coordinator
6-11-23
Date

Ronan M. Cajigal ✓
RONAN M. CAJIGAL, MAEd ID 18 13
Campus Administrator Date

Appendix 9. Revision List

 <p style="text-align: center;"> Republic of the Philippines CAVITE STATE UNIVERSITY Bacoor Campus SHIV, Molino VI, City of Bacoor (046) 476-5029 DEPARTMENT OF COMPUTER STUDIES </p> <p style="text-align: center;">REFERENCE LIST FORM</p> <p style="text-align: center;">TAMBULI: AN EMERGENCY ALERT SYSTEM FOR THE CITY OF BACOOR</p>	
DOCUMENTATION	SYSTEM
<ul style="list-style-type: none"> • Author, year in text citation • Portrait Theoretical Framework • Summarize Chap 2 • Page numbers • Rephrase RRS • APA citation • Alphabetical of Def. terms 	<ul style="list-style-type: none"> • GUI Enhancement • Nearest Evacuation route • May use Map API (Google) • Responders relevant field based on level of severity. • Statistical data (Monthly/ Annual incident report) • Revise ID Transactions with format • Map based Tracking of Responder • Once arrived Status update • Categorize agencies • Responders Update • Centralization of Data
<p>RESEARCHER/S:</p> <p>MARTINEZ JR., JOEY C.  MOJAS, JULIOS M.  SANCHEZ, GIO GABRIEL B.  SUAREZ, APRILJOY M. </p> <p>PANELISTS:</p> <p> ELY ROSE L. PANGANIBAN - BRIONES</p> <p> JOVELYN D. OCAMPO</p> <p> MIKAELA G. ARCIAGA</p>	

Appendix 10. Routing Slips



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DEPARTMENT OF COMPUTER STUDIES

ROUTING SLIP BEFORE ERB

Name of Researcher(s) : JOEY C. MARTINEZ JR.
 JULIOS M. MOJAS
 GIO GABRIEL B. SANCHEZ
 APRILJOY M. SUAREZ

Program : BS COMPUTER SCIENCE
 Title of Study : TAMBULI: AN EMERGENCY ALERT SYSTEM
 FOR CITY OF BACOOR

Type of Study :

Thesis (System) EDP Field Study Capstone Project

	DATE RECEIVED	DATE RELEASED	REMARKS
ELY ROSE L. PANGANIBAN – BRIONES, MIT Undergraduate Thesis Adviser		11/03/2023	Registration verification
		11/06/2023	Revise Logo, auto detect location
		12/11/2023	Mapping and home page UI enhancement
ALVIN D. CATALO, MIT Technical Critic		10/28/2023	Emergency Report Module Add
		11/30/2023	GUI enhancement
		12/16/2023	GUI enhancement
		01/06/2024	Evacuation Module

cc: undergraduate thesis instructor, adviser, technical critic, research coordinator, student



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DEPARTMENT OF COMPUTER STUDIES

ROUTING SLIP BEFORE ERB

Name of Researcher(s) : JOEY C. MARTINEZ JR.
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APRILJOY M. SUAREZ

Program : BS COMPUTER SCIENCE
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FOR CITY OF BACOOR

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Thesis (System) EDP Field Study Capstone Project

	DATE RECEIVED	DATE RELEASED	REMARKS
ELY ROSE L. PANGANIBAN – BRIONES, MIT Undergraduate Thesis Adviser	3-16-24 3-25-24 4-1-24 4-1-24	3-16-24 3-25-24 4-1-24 4-1-24	80% done w/ rev. <i>✓ ready</i> 85% done w/ min. rev. <i>✓ ready</i> 95% done (backtrack) <i>✓ ready</i> 100% go for eval <i>✓ ready</i>
ALVIN D. CATALO, MIT Technical Critic	3-16-24 3-25-24 4-03-24 4-04-24	3-16-2024 3-25-2024 04-03-2024 04-04-2024	80% done w/ rev. <i>✓ A/A</i> 25% done w/ rev. <i>✓ A/A</i> 98% improve app w/ <i>A/A</i> 100% go for evaluation <i>✓ A/A</i>



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ROUTING SLIP

Name of Researcher(s) : JOEY C. MARTINEZ JR.
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 APRILJOY M. SUAREZ

Program : BS COMPUTER SCIENCE
 Title of Study : TAMBULI: AN EMERGENCY ALERT SYSTEM
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Type of Study :

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	DATE RECEIVED	DATE RELEASED	REMARKS
ELY ROSE L. PANGANIBAN-BRIONES, MIT Undergraduate Thesis Adviser	June 19, 2024	June 19, 2024	Revisions done <i>6/24</i>
ALVIN D. CATALO, MIT Technical Critic	June 20, 2024	June 20, 2024	Revisions <i>A/N</i>
JOVELYN D. OCAMPO, MIT Panel 1	June 26, 2024	June 26, 2024	Revisions done <i>A/A</i>
MIKAELA G. ARCIAGA Panel 2	June 25, 2024	June 25, 2024	Revisions done <i>prompt</i>
	June 24, 2024	June 24, 2024	REVISIONS DONE <i>A/D</i>

cc: undergraduate thesis instructor, adviser, technical critic, research coordinator, student

Routing Slip (System)



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DEPARTMENT OF COMPUTER STUDIES

ROUTING SLIP BEFORE ERB

Name of Researcher(s) : JOEY C. MARTINEZ JR.
 JULIOS M. MOJAS
 GIO GABRIEL B. SANCHEZ
 APRILJOY M. SUAREZ

Program : BS COMPUTER SCIENCE
 Title of Study : TAMBULI: AN EMERGENCY ALERT SYSTEM
 FOR CITY OF BACOOR

Type of Study :

Thesis (Manuscript) EDP Field Study Capstone Project

	DATE RECEIVED	DATE RELEASED	REMARKS
ELY ROSE L. PANGANIBAN – BRIONES, MIT Undergraduate Thesis Adviser		07/10/2023	Revise chap 1
		07/17/2023	Revise chap 1
		11/3/2023	Synthesis and comparison on chap 2
		12/11/2024	Rev. DFD, firshbone and use cased
		1/4/2024	Minimal revision
		1/10/2024	Rev. Done
ALVIN D. CATALO, MIT Technical Critic		06/16/2023	Revise chap 1
		06/21/2023	ERD and Database clarification
		10/13/2023	Rev. chap 1
		10/28/2023	Fishbone
		11/30/2023	Revision on chap 3
		12/16/2023	Revise diagrams
		1/4/2024	Revise diagrams
		1/10/2024	Go for defense

cc: undergraduate thesis instructor, adviser, technical critic, research coordinator, student



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DEPARTMENT OF COMPUTER STUDIES

ROUTING SLIP BEFORE ERB

Name of Researcher(s) : JOEY C. MARTINEZ JR.
 JULIOS M. MOJAS
 GIO GABRIEL B. SANCHEZ
 APRILJOY M. SUAREZ

Program : BS COMPUTER SCIENCE
 Title of Study : TAMBULI: AN EMERGENCY ALERT SYSTEM
 FOR CITY OF BACOOR

Type of Study :

Thesis (Manuscript) EDP Field Study Capstone Project

	DATE RECEIVED	DATE RELEASED	REMARKS
ELY ROSE L. PANGANIBAN - BRIONES, MIT Undergraduate Thesis Adviser	Feb 8, 2024	Feb 2024	Revisions Done ✓ <i>[Signature]</i>
ALVIN D. CATALO, MIT Technical Critic	Feb 07, 2024	Feb 07, 2024	Reviewed & Rev. Done ✓ <i>[Signature]</i>

cc: undergraduate thesis instructor, adviser, technical critic, research coordinator, student



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DEPARTMENT OF COMPUTER STUDIES

ROUTING SLIP

Name of Researcher(s) : JOEY C. MARTINEZ JR.
 JULIOS M. MOJAS
 GIO GABRIEL B. SANCHEZ
 APRILJOY M. SUAREZ

Program : BS COMPUTER SCIENCE
 Title of Study : TAMBULI: AN EMERGENCY ALERT SYSTEM
 FOR CITY OF BACOOR

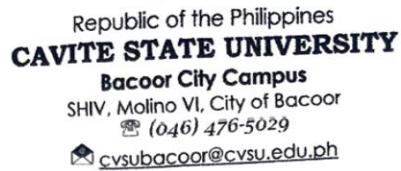
Type of Study :

Thesis (Manuscript) EDP Field Study Capstone Project

	DATE RECEIVED	DATE RELEASED	REMARKS
ELY ROSE L. PANGANIBAN-BRIONES, MIT Undergraduate Thesis Adviser	June 26, 2024	June 26, 2024	REVISIONS DONE ✓
ALVIN D. CATALO, MIT Technical Critic	June 20, 2024	June 20, 2024	Review Limitation & Appendices ✓
JOVELYN D. OCAMPO, MIT Panel 1	June 26, 2024	June 26, 2024	Revisions Done ✓
MIKAELA G. ARCIAGA Panel 2	June 26, 2024	June 26, 2024	REVISIONS DONE ✓

cc: undergraduate thesis instructor, adviser, technical critic, research coordinator, student

Routing Slip (Manuscript)



DEPARTMENT OF COMPUTER STUDIES

ROUTING SLIP

Name of Researcher(s) : JOEY C. MARTINEZ JR.
JULIOS M. MOJAS
GIO GABRIEL B. SANCHEZ
APRILJOY M. SUAREZ

Program : BS COMPUTER SCIENCE
Title of Study : TAMBULI: AN EMERGENCY ALERT SYSTEM
FOR CITY OF BACOOR

Type of Study : Thesis EDP Field Study Capstone Project

	DATE RECEIVED	DATE RELEASED	REMARKS
ELY ROSE L. PANGANIBAN-BRIONES, MIT Undergraduate Thesis Adviser	7/14/2024	7/21/2024	Rev. Done by [Signature]
ALVIN D. CATALO, MIT Technical Critic	7/14/2024	7/21/2024	Rev. Done [Signature]
DONNALYN B. MONTALLANA, MIT Department Chairperson	7/14/2024	7/21/2024	Rev. Done [Signature]
RIZZA ELLEEN URBIZTONDO, LPT English Critic	7-8-24	7-8-24	Mr. [Signature] paid w/ DRC
ZANNIE I. GAMUYAO, MSM Statistician	7/14/2024	7/14/2024	[Signature]
ALVIN D. CATALO, MIT Department Research Coordinator	July 05, 2024	July 08, 2024	Contribution No. BCCS - 2023-2024-002 [Signature]
RONAN M. CAJIGAL, MAEd Campus Research Coordinator	7/18/24	7/18/24	RonanM.Cajigal
MENVYLZ S. MACALALAD, MBA Campus Administrator	7/18/24	7/18/24	[Signature]

N.B. Manuscript must be released at most one (1) week after receipt.
Manuscripts with corrections must be submitted along with previously corrected paper.

Routing Slip (Final)

Appendix 11. Photo Documentation



Appendix Figure 8. Interview with Mr. Johnny Garcia and Mr. Nonoy (BDRRMO)



Appendix Figure 9. Interview with Mr. Johnny Garcia (BDRRMO) (1)



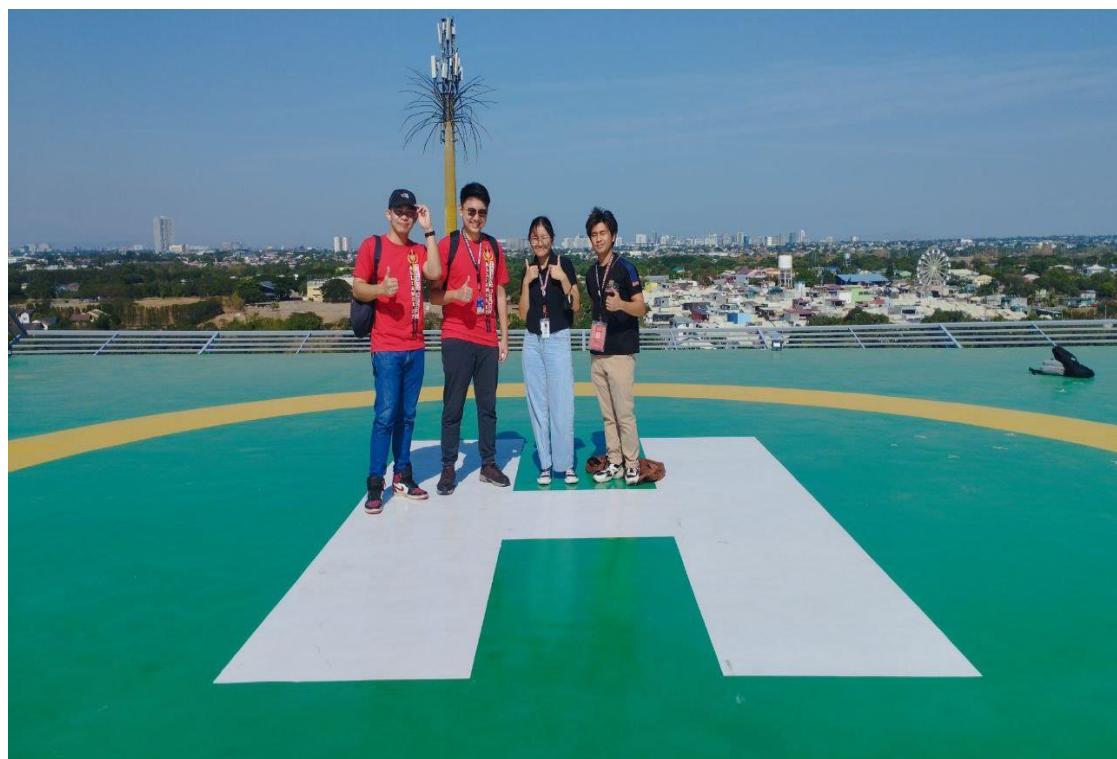
Appendix Figure 10. Interview with Mr. Johnny Garcia (BDRRMO) (2)



Appendix Figure 11. Interview with Mr. Johnny Garcia (BDRRMO) (3)



Appendix Figure 12. First Demonstration of System with BDRRMO Staffs (1)



Appendix Figure 13. First Demonstration of System with BDRRMO Staffs (2)

Appendix 12. Certification from Statistician

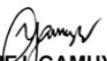


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July 4, 2024

C E R T I F I C A T I O N

This is to certify that the thesis entitled: "**TAMBULI: AN EMERGENCY ALERT SYSTEM FOR CITY OF BACOOR**" of **Joey C. Martinez Jr., Julios M. Mojus, Gio Gabriel B. Sanchez, and April Joy M. Suarez** has been carefully examined to the best of my ability to satisfy its purpose and needed information by the undersigned as Statistician.


ZANNIE I. GAMUYAO, MSM
Assistant Professor III
Statistician

Certificate of the Statistician



Appendix 13. Certification from English Critic



Republic of the Philippines
CAVITE STATE UNIVERSITY
(CvSU)
DON SEVERINO DELAS ALAS CAMPUS
Indang, Cavite



CENTER FOR LANGUAGE LEARNING AND RESEARCH

C E R T I F I C A T I O N

July 3, 2024

This is to certify that the thesis manuscript/ student teaching portfolio/ narrative report/ /capstone project manuscript/ EDP manuscript/design project manuscript entitled **TAMBULI: An Emergency Alert System for City of Bacoor** of **Joey C. Martinez Jr., Julios M. Mojas, Gio Gabriel B. Sanchez and Apriljoy M. Suarez** for the course/degree **Bachelor of Computer Science** has been read and edited by the undersigned English Critic.


RIZZA ELLEEN J. URBIZTONDO
(Name and Signature of the English Critic)

Appendix 14. Resume



JOEY MARTINEZ JR.

Developer

About Me

I am an ambitious and motivated fourth-year college student pursuing a Bachelor of Science in Computer Science. Passionate about the ever-evolving world of technology, I am eager to contribute my skills and creativity to drive innovation in the field. As a self-driven individual with a strong desire to learn and grow, I continuously seek opportunities to expand my knowledge and stay up-to-date with the latest industry trends.

ACADEMIC ACHIEVEMENTS

Highschool
With Honors
Senior Highschool
With Honors
College (1st year - 2nd Year).
Dean's Lister

EDUCATION

ELEMENTARY SCHOOL
UNIVERSITY OF PERPETUAL HELP SYSTEM
DALTA MOLINO CAMPUS
Year: 2013-2014

HIGHSCHOOL
ST. DOMINIC COLLEGE OF ASIA
Science, Technology, Engineering, |
and Mathematics (STEM)
Year: 2019-2020

COLLEGE
CAVITE STATE UNIVERSITY BACCOR
Bachelor of Science in computer Science
Year: 2020 - Present

LANGUAGE

- Filipino
- English

EXPERTISE

- Web Design
- Design Thinking
- Frontend Coding
- Problem-Solving
- Computer Literacy
- Backend Coding

OTHER SKILLS

• Capable of using Blender software for rendering 3D images. Proficient in using Microsoft Word and Powerpoint

PROJECTS	HONORS/AWARDS
Attendance App - Backend Developer & Database Management (11/2022-01/2023)	1st Year Deans Lister (1st sem -2nd sem) Cavite State University - Bacoor Campus
Online Food Ordering System - Login & Profile Management and Admin Management (11/2021-04/2022)	2nd Year Deans Lister (1st sem -2nd sem) Cavite State University - Bacoor Campus
PROGRAMMING LANGUAGES	3rd Year Deans Lister (1st sem) Cavite State University - Bacoor Campus
Java For back-end development by using Android Studio PHP For back-end development by using VS Code	4th Year Deans Lister (1st sem) Cavite State University - Bacoor Campus
C# For back-end development by using Visual Studio 2022	Graduated With Honors (Senior High School) St. Dominic College of Asia
MR. Elywn Mar Salvador, College Instructor, St Dominic College of Asia 09162216166	Graduated With Honors (Junior High School) Bacoor National Highschool - Georgetown Annex & Villa Maria Annex
MS. Ma. Krisanta Basa, SHS Instructor, St. Dominic College of Asia 09177127595	
CHARACTER REFERENCES	



JULIOS MOJAS

PROJECT MANAGER
/DEVELOPER



+639-121-596-078



mojasjulios2@gmail.com



Gawaran Ext. Molino 7,
Bacoor City, Cavite

EDUCATION

TECHNICAL PROFICIENT

Basic and common competencies in installing, maintaining, configuring, and diagnosing computer systems and networks, along with basic knowledge of front-end development using HTML, CSS, Android Studio, and proficiency in Adobe Photoshop, Canva, sketchUp and Microsoft Office applications.

Additionally, I possess strong skills in management, creativity, negotiation, critical thinking, leadership, quality assurance, documentation, and tech support.

Bachelor of Science in Computer Science

Cavite State University - Bacoor City Campus
2020 - Present

Senior High School - TVL (ICT-CSS)

SHS in San Nicholas III, Bacoor City
2018 - 2020

Junior High School

Bacoor National High School - Gawaran Annex
2014 - 2018

BASIC COMPETENCIES:

- Effective workplace communication
- Teamwork and collaboration
- Career professionalism
- Occupational health and safety practices

COMMON COMPETENCIES:	WORK EXPERIENCE
<ul style="list-style-type: none"> • Applying quality standards • Performing computer operations • Mensuration and calculation • Technical drawing interpretation • Using hand tools • Electrical wiring and electronic circuit termination and connection • Testing electronic components 	<p>Tech Support ClickOne Hospitality Human Resource Services Corporation & WMall Trading and Services</p> <p>Social Media Manager AllCars By Jayce</p> <p>Work Immersion Datacom Institute of Computer Technology</p> <p>On-The-Job Training SHS in San Nicholas III, Bacoor City Cavite</p>
CORE COMPETENCIES	CERTIFICATIONS, ACHIEVEMENTS AND AWARDS
<ul style="list-style-type: none"> • Computer Systems: Installation, configuration, and maintenance. • Network Setup: Installation and configuration of computer networks and servers. • System Repair: Maintenance and repair of computer systems and networks. 	<ul style="list-style-type: none"> • Computer Systems Servicing National Certification 2 • Best Poster Presenter (Innovation) Research Congress for SHS Tracks, • Graduated with Honors Elementary, Junior High School, and Senior High School. • outstanding Student skills in the arts and above average creativity and craftsmanship. • Gawad Parangal: Leadership awardee • 3RD DCS Techcellence: Dean's lister awardee
AFFILIATIONS	
<p>Alliance of Computer Scientists (ACS), Cavite State University - Bacoor City Campus:</p> <ul style="list-style-type: none"> • Class Representative (2020-2021) • Public Relations Officer (2021-2022) • Chairperson (2022-2023) • President (2023-2024) 	

PROJECTS	SEMINARS ATTENDED
Android-based QR code Attendance Monitoring Application - frontend Developer (11/2022-01/2023) Java For back-end development by using Android Studio	FY 2023 Financial Planning Workshop (CSG Fund) Leadership Summit 2023: Kabsuhenyong Liderato sa Panibagong Panahon
Online Food Ordering System - Frontend developer (11/2021-04/2022) C# For back-end development by using Visual Studio 2022	Cyber Security Awareness and Information Campaign Media and Information Literacy: Voices, Powers, and Trendsetters Symposium
PROGRAMMING LANGUAGES:	WEB DEVELOPMENT:
C++ Java C# SQL	HTML CSS JavaScript
DATABASE:	SOFTWARE DEVELOPMENT TOOLS:
MySQL Microsoft SQL Server Firebase	Visual Studio Sublime Text NetBeans
CHARACTER REFERENCES	
 Mr. Ryan E. Roy, LPT Teacher II, SHS in San Nicholas III Email: ryan_672003@yahoo.com	 Ms. Mikaela G. Arciaga Instructor I, Cavite State University - Bacoor Campus Email: mikaela.arciaga@cvsu.edu.ph



GIO GABRIEL SANCHEZ

Developer

About Me

I am a dedicated and ambitious college student in my Fourth year, approaching every project with a fresh perspective and a determination to find innovative solutions to complex challenges. With a keen interest in the dynamic field of computer science, I am passionate about exploring cutting-edge technologies and staying up-to-date with industry trends.



github.com/gabzkie30



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sanchez.giogabriel@gmail.com



Georgetown Heights Subdivision,
Bacoor City, Philippines

SKILLS

Basic - Intermediate Microsoft Office Skills (Word, PowerPoint, Excel)

Back-End Web Development

(Php & C#)

Android App Development (Java & Flutter)

Database Management (SQL & NoSQL)

Core Interpersonal Skills

(Communication, Teamwork, Adaptability, and Active Listening)

Operating IDE's (Android Studio, Visual Studio 2022, Visual Studio Code, IntelliJ, & Netbeans)

EDUCATION

College/Bachelor of Science in Computer Science
Cavite State University - Bacoor Campus

2020 - Present

Senior High School

St. Dominic College of Asia

2018-2020

High School

Bacoor National Highschool - Georgetown Annex & Villa Maria Annex 2014-2018

CERTIFICATES/BADGES

- Microsoft Office Specialist Word 2016 (01/2019)

For verification - <https://rb.gy/0yx2a>

- Microsoft Office Specialist PowerPoint 2016

(01/2019) For verification - <https://rb.gy/9bci5>

PROJECTS	HONORS/AWARDS
Attendance App - Backend Developer & Database Management (11/2022-01/2023)	1st Year Deans Lister (1st sem -2nd sem) Cavite State University - Bacoor Campus
Online Food Ordering System - Login & Profile Management and Admin Management (11/2021-04/2022)	2nd Year Deans Lister (1st sem -2nd sem) Cavite State University - Bacoor Campus
PROGRAMMING LANGUAGES	
Java For back-end development by using Android Studio PHP For back-end development by using VS Code	3rd Year Deans Lister (1st sem) Cavite State University - Bacoor Campus
C# For back-end development by using Visual Studio 2022	4th Year Deans Lister (1st sem) Cavite State University - Bacoor Campus
CHARACTER REFERENCES	
MR. Elywn Mar Salvador, College Instructor, St Dominic College of Asia 09162216166	Graduated With Honors (Senior High School) St. Dominic College of Asia
MS. Ma. Krisanta Basa, SHS Instructor, St. Dominic College of Asia 09177127595	Graduated With Honors (Junior High School) Bacoor National Highschool - Georgetown Annex & Villa Maria Annex



APRILJOY SUAREZ

DEVELOPER

About Me

Looking for an opportunity to work in a dynamic challenging environment workplace, where I can advance my career while broadening my knowledge, adopt new skills, embracing new technologies, and helping the company succeed.



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Gardenia Valley Subd.
Molino 3 Bacoor, Cavite

LANGUAGE

- English
- Filipino

EDUCATION

Primary:

Pandacaqui Elementary School-Hacienda, Mexico, Pampanga (2008-2014)

Secondary:

Don Jesus Gonzales High School, Mexico, Pampanga (2014-2018)

Senior High School:

San Nicholas 3 Senior High School Bacoor, Cavite (2018-2020)

STRAND: Information and Computer Technology

Tertiary:

Cavite State University - Bacoor Campus (2020-Present)

COURSE: BSCS - Bachelor of Science in Computer Science

SKILLS

- Basic - Intermediate Microsoft
- and PowerPoint Skills
- Front-end Coding
- Video editing/photo editing
- HTML
- CSS
- Java Programming

CERTIFICATION

Computer Systems Servicing National Certification Passer (NC2)

Dean's lister TECHCELLENCE Award, CvSU-Bacoor (2024)

REFERENCE

• Shan Kyle Pangan (Analyst)
09760379541
Accenture Company