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## RESEARCH ARTICLE

# AlarmaPh: A Mobile Swiss Knife for Quick Response Incidents

Neil A. Basabe<sup>1</sup> ✉, Christine Joy E. Carubio<sup>2</sup>, Joshua R. del Mar<sup>3</sup> and Carlo T. Saberon<sup>4</sup>

<sup>1</sup>Dean, College of Computer Studies, University of Cebu, Cebu City, Philippines

<sup>2</sup>Project Management Officer, Operations, Everbank Vananaz, Cebu City, Philippines

<sup>3</sup>Research & Development Engineer, Development, Advanced World Systems Inc., Cebu City, Philippines

<sup>4</sup>Senior Salesforce Developer, PH Delivery, Merkle, Cebu City, Philippines

**Corresponding Author:** Neil A. Basabe, **E-mail:** [nbasabe@uc.edu.ph](mailto:nbasabe@uc.edu.ph)

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## ABSTRACT

Accidents can happen at any time, even if you follow traffic rules and practice safe driving. That's why it's important to be prepared for the unexpected. This study aims to provide emergency quick response and enable government agencies to track and manage emergencies all over Cebu City. As we all know, communication is the heart of any unwanted situation. So for Filipinos to be equipped with better and improved knowledge in preparing for disasters and emergencies such as earthquakes and road accidents, respectively, AlarmaPh will let each individual send distress calls to the fire department, police department, and call for ambulance assistance with just a click away. Moreover, AlarmaPh provides basic first aid manuals and before/during/after incident guides. More importantly, the system will let each individual connect with their families and be notified if the family that is registered in the system is involved in an accident or otherwise. On the other hand, other disaster applications have a high rate of subscription fee. As a result, individuals won't have access to the necessary features that they need. AlarmaPh gives you fast access to incident information, remote content management, easy maintenance, and a scalable platform for future growth. The descriptive developmental method of research was used to gather data from the Philippine National Police, Emergency Rescue Unit Foundation, Bureau of Fire Protection, barangay officials, and constituents of Cebu City. The data was analyzed using frequency, simple percentage, and weighted mean. The results showed that the application prototype was highly acceptable to the users. The researchers strongly recommend that the system be implemented and evaluated to solve the existing problems relating to emergency quick response.

## KEYWORDS

Mobile Swiss knife, disaster response, dispatcher, guardian, responder, agile software development, Trello, kanban

## ARTICLE INFORMATION

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## 1. Introduction

Accidents are inevitable. These days, it's not enough that you follow traffic rules or practice safe driving. Yes, driving safely can greatly save your life and the lives of your passengers and pedestrians, but accidents are one of the things we cannot control in life. Every time you hit the road, your life and property are at stake. One of the fundamental reasons for this study is to provide emergency quick response and enable government agencies to track and manage emergencies all over Cebu City.

The number of road accidents in the Philippines is on the rise. In 2015, there were 24,656 vehicular mishaps, up from 15,572 in 2014 and 12,875 in 2013. This alarming trend is a cause for concern, as it is costing the country millions of pesos in terms of medical expenses, moral damages, and lost productivity. According to PNP official Tanseco, each death from a road accident costs around P2.5 million. Of this amount, 8% goes to medical expenses, and 14% goes to moral damages (Bad Turning Leading Cause of Vehicular Accidents in 2016, 2017). The remaining 78% is for lost productivity, as the victim is no longer able to work and contribute

to the economy. Vehicle speed within the human tolerances for avoiding serious injury and death is a key goal of modern road design because impact speed affects the severity of injury to both occupants and pedestrians.

"Life is valuable. Which is why, as humans, we do everything to protect it and keep our lives safe against any untoward incidents or accidents that may lead to injury or even death" (Joanna, 2011). That's why we take precautions to avoid accidents and injuries. We wear seatbelts, obey traffic laws, and avoid risky behavior. We do everything we can to keep ourselves safe because we know that life is too short to waste on preventable accidents. "Most of the time, accidents happen due to recklessness and irresponsibility. People who don't follow the safety precautions always end up getting injured or, worse, getting killed. Whether it's inside the house or in the workplace, exercising safety precautions is a must" (Joanna, 2011).

Workplace injuries and deaths can have a devastating impact on families, friends, communities, and coworkers. The loss of a loved one can be incredibly painful, and the financial and emotional burden can be overwhelming. In addition to the emotional toll, workplace injuries can also have a significant financial impact on families. The injured worker may be unable to work for a period of time, which can lead to lost wages. The family may also have to pay for medical expenses, rehabilitation, and other costs associated with the injury. The time demands on uninjured family members can also be significant. They may have to take on additional responsibilities at home, such as childcare, cooking, and cleaning. They may also have to provide emotional support to the injured worker and other family members (*The Importance of Safety (WorkSafeMT), 2014*).

Promoting safety everywhere can help people become more aware of safety issues and be more disciplined in their safety practices. For example, people who work in dangerous jobs are often required to wear safety gear and receive regular safety briefings. This helps to mitigate the risks associated with their work and protect them from harm. Safety is important for everyone, regardless of their job or where they are. For example, cooks, engineers, carpenters, policemen, firefighters, and chemists all work in dangerous environments and need to take precautions to protect themselves. However, safety is also important in the home, school, and workplace. Even in the streets, where there are a lot of people driving cars, accidents can happen anytime, anywhere.

The current disaster response application run by disaster response agencies offers an incident management solution that lets you process calls, gain insight into incidents, coordinate with other agencies, access business intelligence data, and respond quickly to save lives. Moreover, they also provide a Law Enforcement Records Management solution that combines data management with the benefits of web-based operations. It can be deployed anywhere, not just on fixed PCs, so you have flexibility while reducing the cost of ownership. We give you fast access to incident information, business intelligence data, remote content management, easy maintenance, and a scalable platform for future growth. On the other hand, disaster applications have a high rate of subscription fee. As a result, individuals won't have access to the necessary features that they need.

For Filipinos to be equipped with better and improved knowledge in preparing for disasters such as road accidents and crime incidents with just one click away and have free access to any features that the users want, AlarmaPh is proposed. It is a quick disaster and emergency response application that will help individuals and even volunteers learn basic first aid with the manuals provided by AlarmaPh. While help is on the way, no time is wasted. AlarmaPh will guide you on what to do before, during, and after the incident. In addition, individuals can set their location, and the system will notify them in case of any disasters near them. Communication is the heart of any unwanted situation. But in case of an emergency, do you have in mind who to call? If you don't, we got AlarmaPh for you to keep in line. This application also provides up-to-date dynamic emergency hotlines from different disaster and emergency response and government agencies. Lastly, individuals can connect with their families, and AlarmaPh will notify them if their families are involved in an accident reported to the responders.

### **1.1 Objectives of the Study**

This study aimed to analyze, design and develop web and mobile based applications that provide emergency quick response.

Specifically, it sought to 1) determine the strengths and weaknesses of existing solutions through a thorough review of related literature and studies and 2) test the application to determine the problem-solution fit.

## **2. Literature Review**

"Accidents will happen sometimes no matter how careful a man may be." – The Hunted Hotel by Wilkie Collins.

Natural and man-made disasters can have a devastating impact on communities, causing widespread loss of life and property. These events are often unpredictable and can leave people feeling helpless and traumatized (Substance Abuse and Mental Health Services Administration, 2014).

Human-caused disasters are events that are caused by human actions, such as industrial accidents, shootings, acts of terrorism, and incidents of mass violence. These events can cause widespread loss of life and property, and they can also have a significant impact on mental health (Halpern & Vermeulen, 2017).

Technological or man-made hazards are events that are caused by human activity and occur in or close to human settlements. They can include a wide range of events, such as: complex emergencies/conflicts, famine, displaced populations, industrial accidents, and transport accidents (Active Learning Network for Accountability and Performance in Humanitarian Action (ALNAP), n.d.). Complex emergencies/conflicts are events that involve armed conflict and can lead to widespread displacement, loss of life, and damage to infrastructure. Famine is a severe shortage of food that can lead to widespread hunger and death. Displaced populations are people who have been forced to flee their homes due to conflict, natural disasters, or other factors. Industrial accidents are accidents that occur in industrial settings and can release hazardous materials into the environment. Transport accidents are accidents that occur in transportation systems, such as car crashes, train derailments, and plane crashes.

Natural disasters can happen anywhere in the world, and they can have a devastating impact on people and the environment. While we cannot prevent natural disasters from happening, we can be better prepared for them by understanding the different natural causes of these events. Natural hazards are naturally occurring events that can cause harm to people and property. They can be caused by rapid or slow onset events, and they can be geophysical, hydrological, climatological, meteorological, or biological in nature (Ubongeh, 2022).

A disaster is a natural or man-made hazard that has come to fruition, resulting in an event of substantial extent causing significant physical damage or destruction, loss of life, or drastic change to the natural environment. A disaster can be extensively defined as any tragic event with great loss stemming from events such as earthquakes, floods, catastrophic accidents, fires, or explosions (Wisner, 2004).

In disaster research, there has been a focus on the impact of disasters, risk management, and post-disaster recovery and reconstruction. However, less attention has been paid to the social consequences of disasters (Xu, Wang, Shen, Ouyang, & Tu, 2016). Sorokin was one of the first researchers to identify the polarizing effects of disasters. He found that disasters can lead to increased social inequality and conflict. Cuny also noted that disasters can act as triggers for social structural change. He argued that disasters can create opportunities for new social groups to emerge and for existing social structures to be reorganized. Natural disasters can also cause political unrest. For example, the 2010 Haiti earthquake led to widespread looting and violence. Some studies have also shown that the occurrence of natural disasters can significantly increase the risk of violent civil conflict in both the short and medium term. It is important to consider the social consequences of disasters when developing disaster response and recovery plans. By understanding the potential social impacts of disasters, we can better mitigate their negative effects and promote more sustainable and equitable recovery.

Local communities can form disaster management groups to help people before, during, and after a disaster. These groups can include first aid, health, food, and welfare teams. They can be trained by local community members and can be sent to help other communities that are affected by disasters. They can also help to evacuate people to safe areas and provide them with shelter and other essential services (Alexander, 2002). The government can also work to provide better facilities during disasters. They can do this by providing funding for disaster management groups, training for volunteers, and building shelters and other infrastructure in disaster-prone areas.

The establishment of an emergency management system using Android, GIS, and web platforms is a clear example of how the merging of multiple technologies can be helpful in saving lives and property (Saeed, Bhatti, Ajmal, Waseem, Akbar, & Mahmood, 2013). Emergency management systems (EMS) can greatly improve daily life rescue operations and the work of agencies that deal with emergency response challenges. EMS can help emergency response teams to make their services better and more effective by providing them with real-time information about disasters, such as their location, severity, and impact. This information can be used to help people evacuate safely, receive medical assistance, and get back to their homes and businesses as quickly as possible.

The following are the related studies or applications:

a. PureForce505 - The objective is to provide government agencies, emergency agencies, and private organizations with a geospatially enabled and robust workforce management platform that can be used to track and manage emergencies across the country (Pure Force and Rescue Corporation Philippines, n.d.).

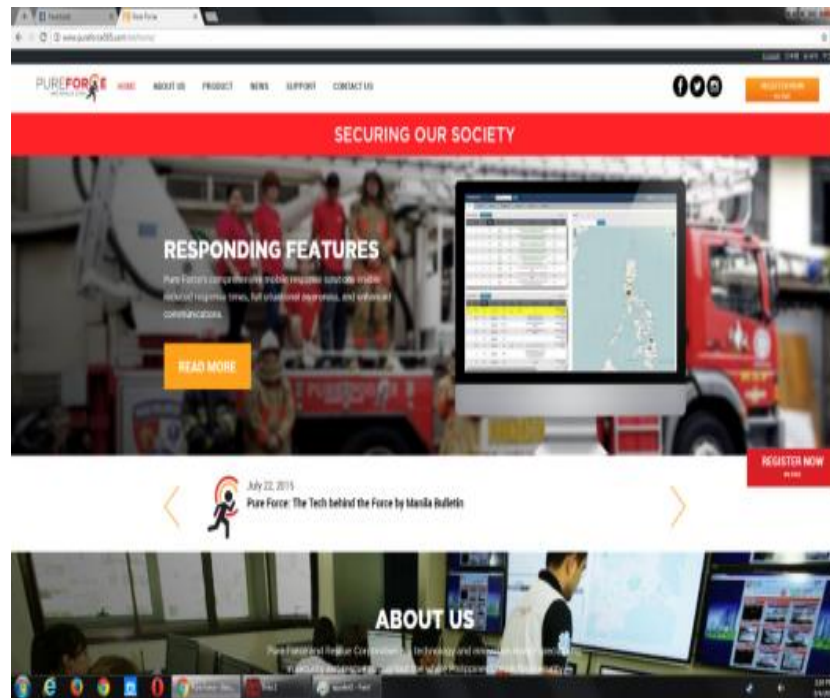


Figure 1: PureForce505 Interface

b. AppAlert - develops a real-time, cloud based, school bus tracking application for mobile users. Its solution sends live roll-call and instant boarding or de-boarding notifications to parents (Kashyaap, 2016).



Figure 2: AppAlert Interface

c. Batingaw - serves a number of different functions for utility purposes, providing information dissemination services of Batingaw is a feed of tweets from a number of different organizations. This includes the National Disaster Risk Reduction and Management Council, the Philippine Red Cross, the Department of Education, and others (Rappler, 2014).

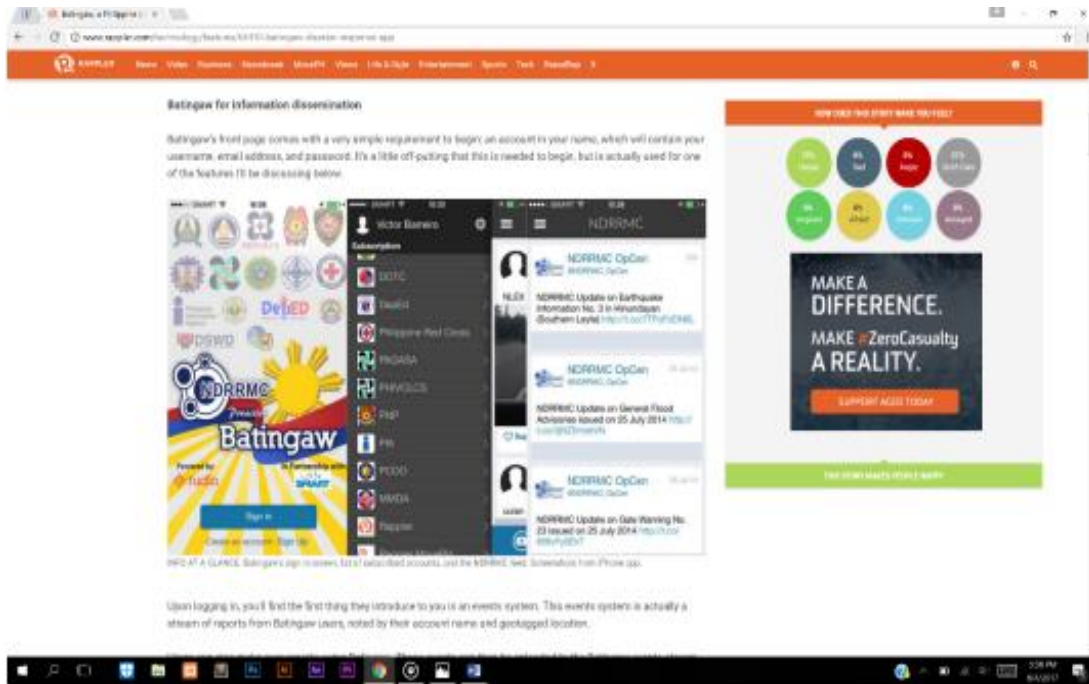


Figure 3: Batingaw Interface

d. Sagip Pinoy - Web and Mobile Based Philippine Emergency Quick Response Portal is an application that can provide interaction between the concerned citizens and the emergency units. This application can help Filipino citizens in case of emergencies, disasters and calamities such as car accidents, crimes, earthquakes, typhoons, fire accidents, and just a click of a fingertip, emergency units will be aware of the emergency being triggered by the users (Casay & Malbago, n.d.).



Figure 4: Sagip Pinoy Interface

e. Got.Cha - is a web and mobile-based application for citizen patrol and emergency quick response. It serves as a communication between both the citizen patroller and the emergency unit. The objective of the study is to develop a web and mobile-based application for all concerned citizens, government agencies, private sectors and emergency units.



Figure 5: Got.cha Interface

### 3. Methodology

The study utilized the descriptive developmental method to gather data about web and mobile-based applications for quick emergency response. The AlarmaPh was developed using the Agile model and implemented using the Trello workflow. Trello uses the kanban paradigm for managing projects. Projects are represented by boards, which contain lists (corresponding to task lists). Lists contain cards (corresponding to tasks) to make project collaboration simple and kind of enjoyable.

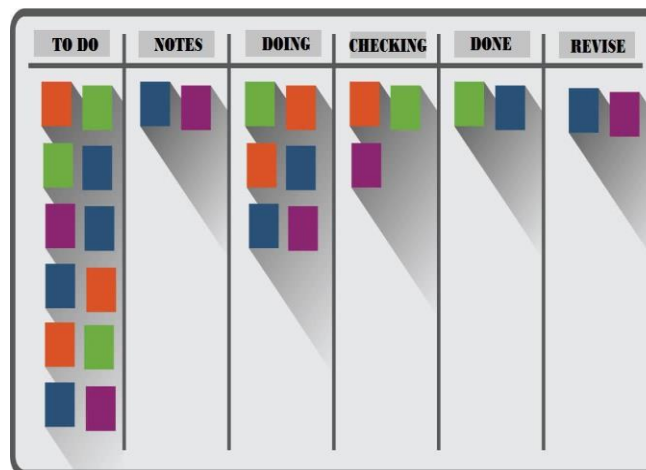


Figure 6: Trello Implementation Board

Agile software development is a method of developing software that breaks down projects into small, manageable pieces called user stories. These user stories are then prioritized and delivered in short, iterative cycles called sprints. This allows for continuous feedback and improvement, and it helps to ensure that the software is developed in a way that meets the needs of the users (Sukasi, 2018).

4. Results and Discussion

4.1 System Analysis as to Web and Mobile Functionalities

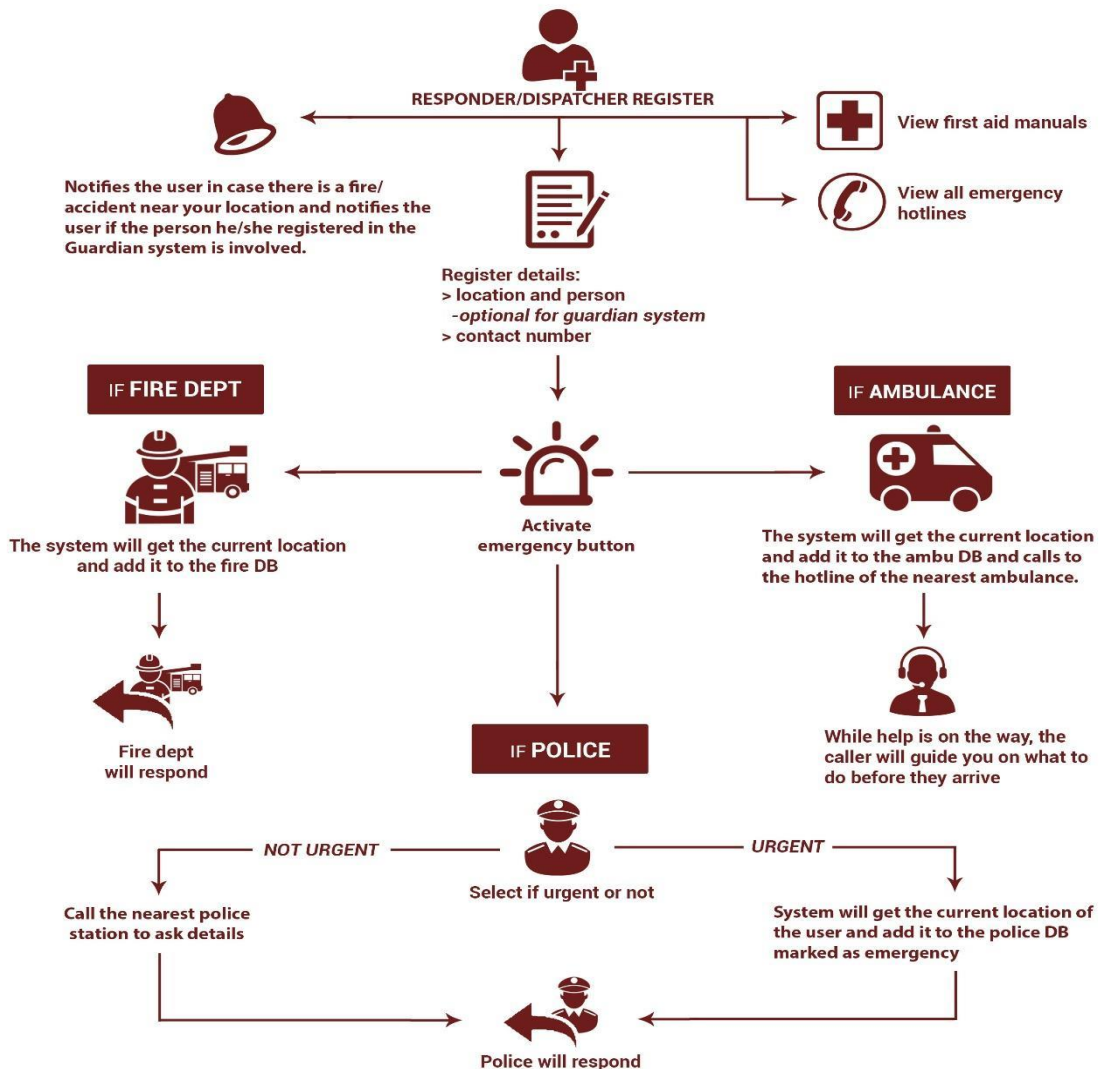


Figure 7: Responder/Dispatcher Program Workflow

Figure 7 shows that after creating an account, users can view first aid manuals, emergency hotlines and call for help. Call for help could be police assistance, ambulance or fire assistance. Police assistance comes with two options, either "Emergency" or "Police Assistance". The "Emergency" means that the user itself is in trouble; the system will give the current location of the user to the nearest Police Station. The "Police Assistance" will call the nearest Police Station, and the User will give details on what is the problem the user wants to be assisted with. For Ambulance, the system will call the nearest ambulance available. It will also get the current location of the user. While the ambulance is on their way, the system will connect you to the ambulance crew in order to guide the user on what to do before they arrive. For Fire assistance, the system will get the current location and report it to the Fire Department. The Fire Department will then respond to the fire alarm with the use of the location they got from the system. The Guardian System uses all the information gathered by the emergency information the system got. If one of the person/property you added to your account is involved in an accident. The system will notify you.

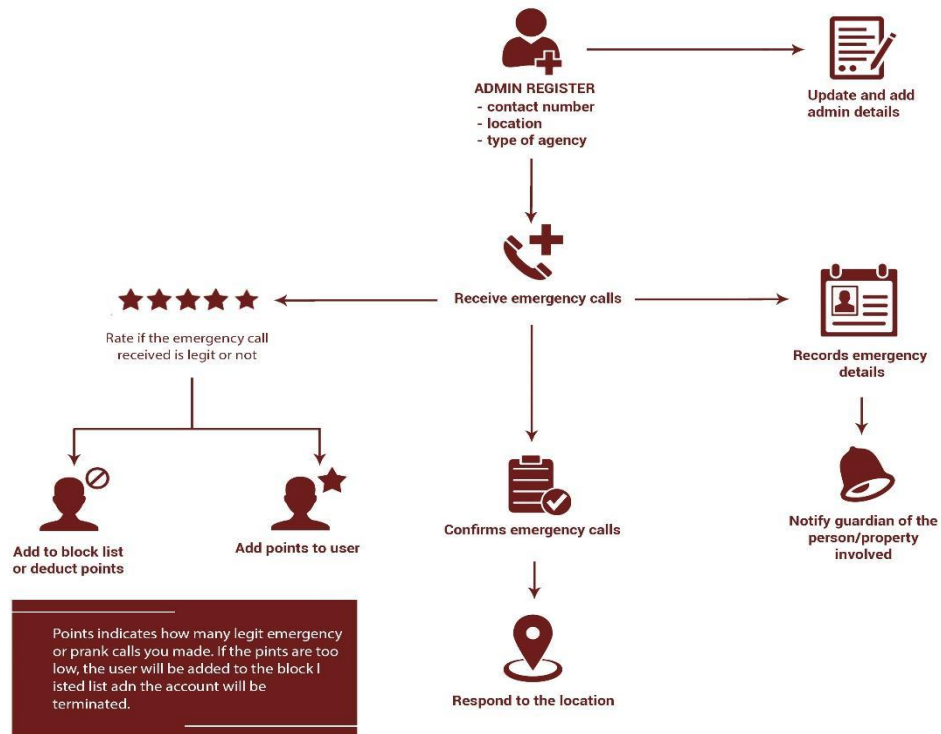


Figure 8: Admin Program Workflow

Figure 8 shows that after registering as an admin, they can add or edit admin details. After filling up all necessary requirements, it will be able to receive emergency calls. After they receive an emergency call, they will reply to the user that they will respond; otherwise, it will be given to the next nearest emergency personnel. If they confirm, the user will be connected to their line to ask for details while they are on their way to the location. After a call, the system will record the emergency call for history purposes. The admin then will rate if the emergency call they receive is a legit call or not. If it is a legit call, the user will be added reputation points otherwise deducted or even blocked listed, depending on the severity of the call violation. Users with low reputation points will be prohibited from calling, or the account will be terminated.

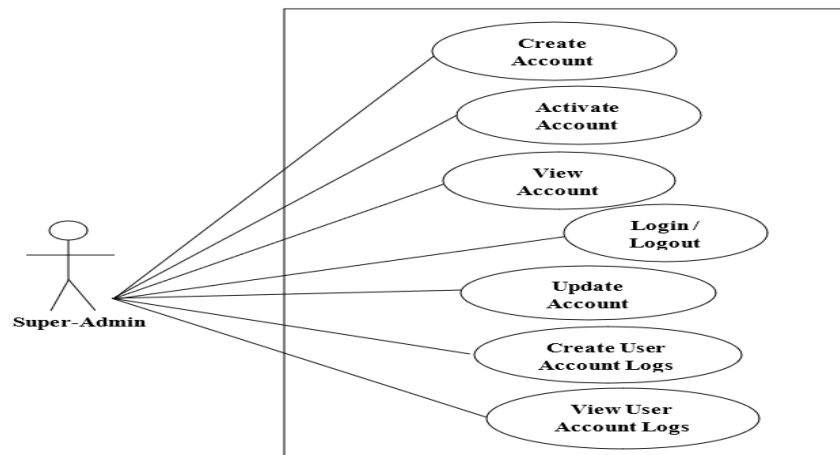


Figure 9: Use Case Diagram: Super-Admin

Figure 9 illustrates that the Super-Admin has the ability to create, view and update its own account. The administrator activates User accounts after assessing that the account information is not fraudulent and also monitors user account activities.



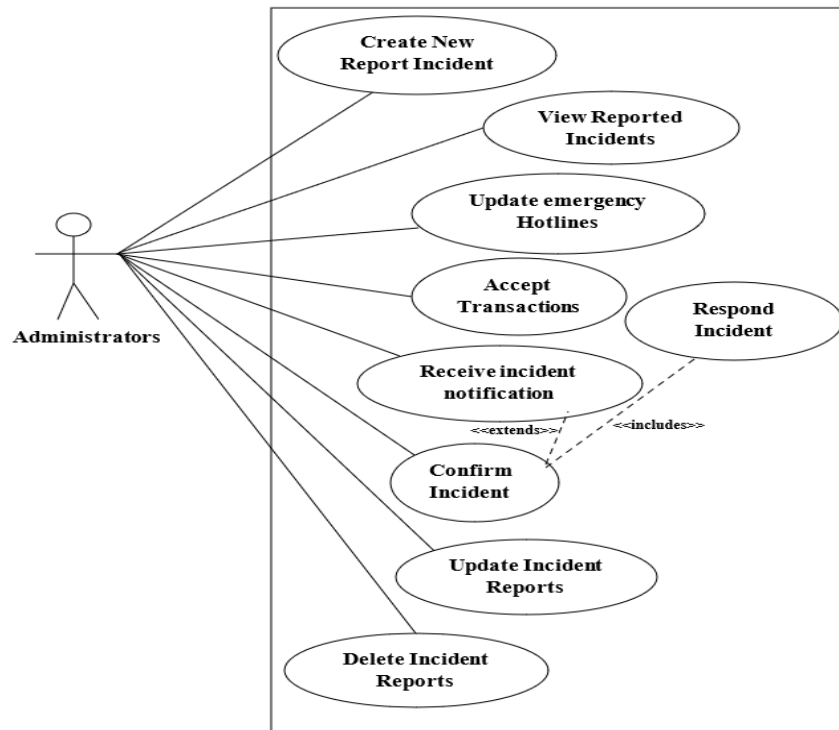


Figure 10: Use Case Diagram: Administrators

Figure 10 illustrates that the administrators(government agencies) are required to create new report incidents for the system; the information about the new report will be viewed by the users as news. Upon creating a new report, partnered agencies can update and delete incident reports. In addition, they can accept transactions provided by the users. These transactions are reports made by the users. Government agencies can receive incident notifications. If the incident report is confirmed or is valid, dispatch teams for the necessary emergency responders are deployed.

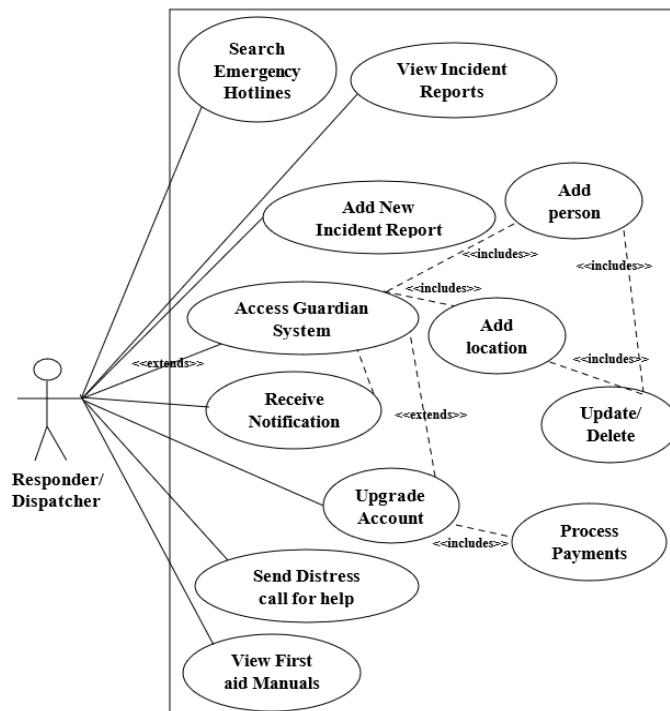


Figure 11: Use Case Diagram: Responder/Dispatcher

Figure 11 illustrates that the users can view and post new incident reports, view first aid manuals, browse for up-to-date emergency hotlines, and send distress calls for police assistance, emergency assistance, and fire assistance. If the user's account is upgraded to premium, he/she can access the Guardian system feature of the system. He/she can add a new person or location to the said feature, and notifications are to be sent by the system if any harm comes to the registered person or property.

**4.2 System Design as to Web and Mobile Functionalities**

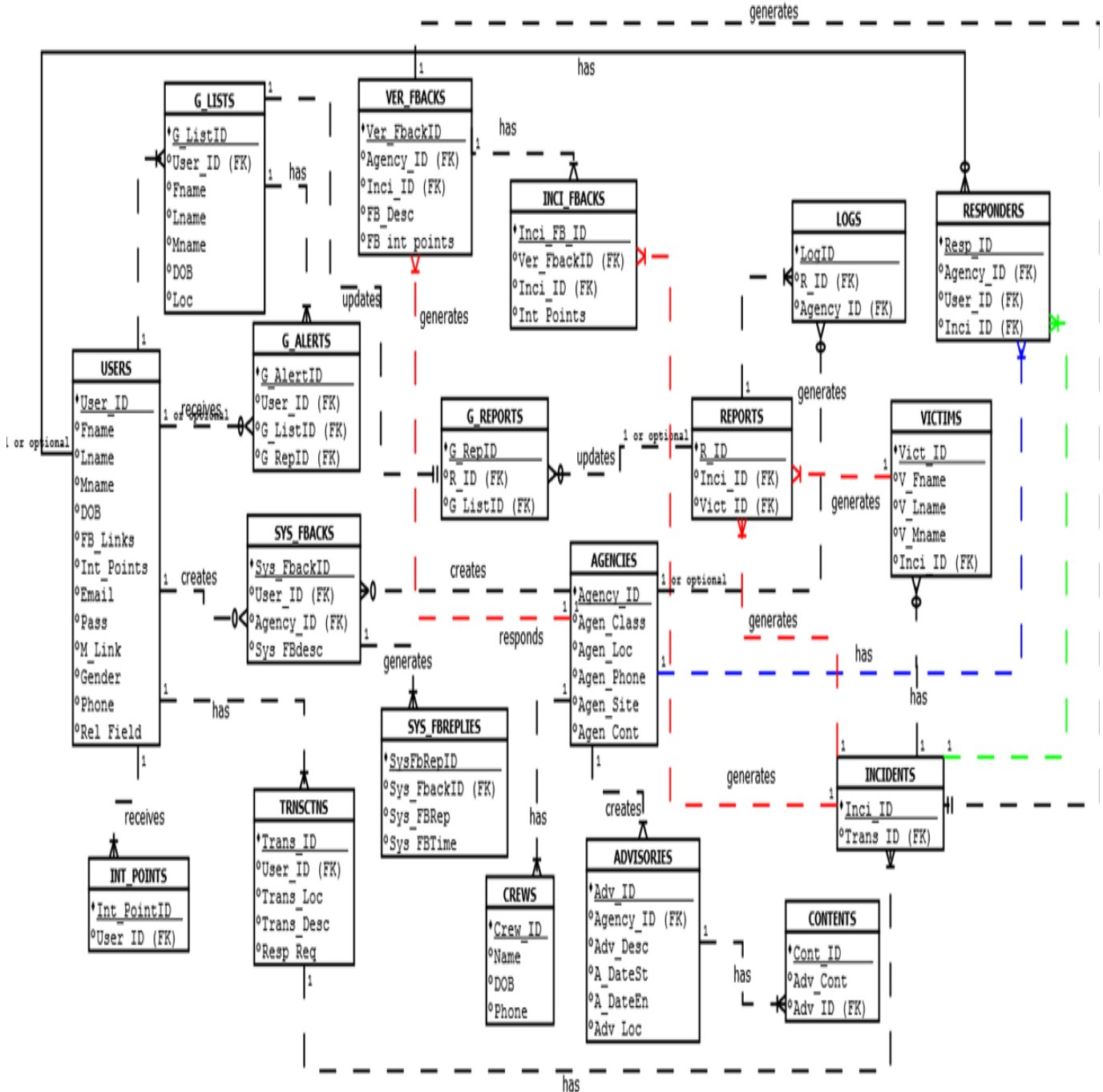


Figure 12: Database Design

Figure 12 shows the design of the database of the application using the Entity-Relationship Diagram. As shown in the diagram, there are 19 entities. The solid lines show a strong relationship between the connected entities, while the dashed lines show a weak relationship between the connected entities

4.2.1 Graphical User Interface (GUI) Design.

Figures 13 to 32 show the sample screenshots of the mobile application for AlarmPH. Also, figures 33 to 40 display the sample screenshots of the web application.

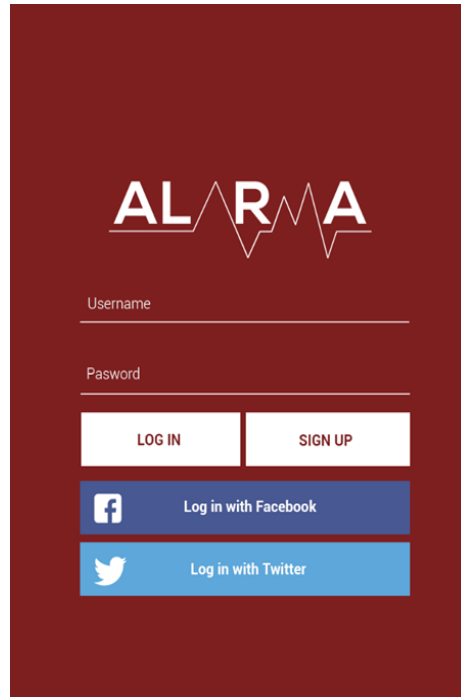


Figure 13: Login

The user is prompted at the start of the app to either connect with Facebook for his/her sign up or use the app's sign up form.

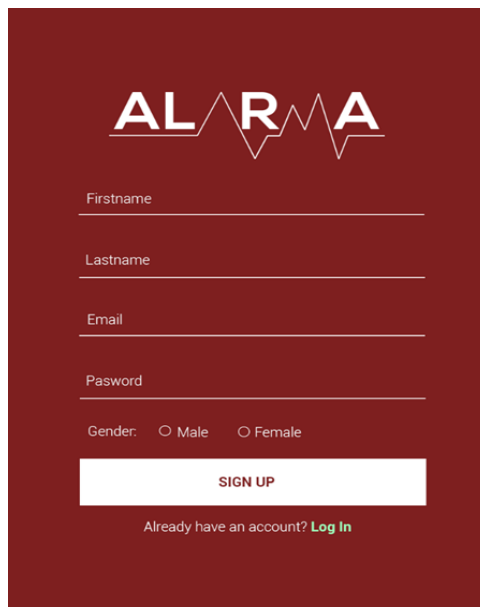


Figure 14: Sign up

The user is prompted to the app's sign up form for signing in.

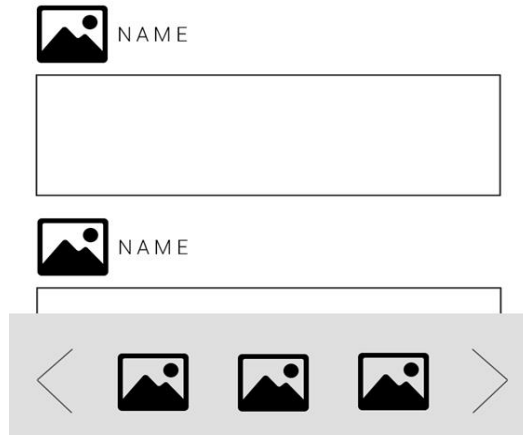
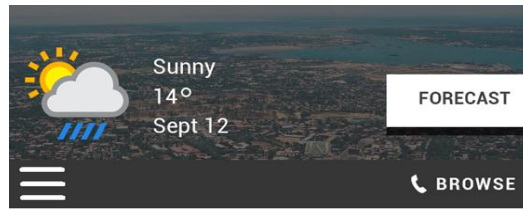


Figure 15: Events Tab

After signing in, the user is prompted to the Events Tab.

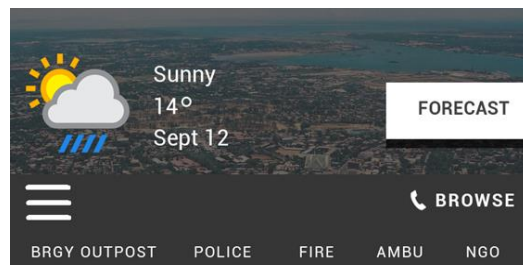


Figure 16: Browse Tab

When the user clicks the Browse tab.

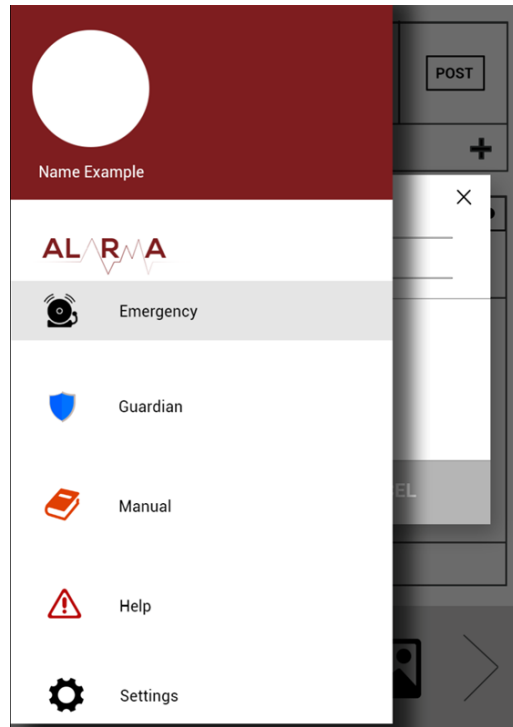


Figure 17: User's Option

The drawer shows the user's options.

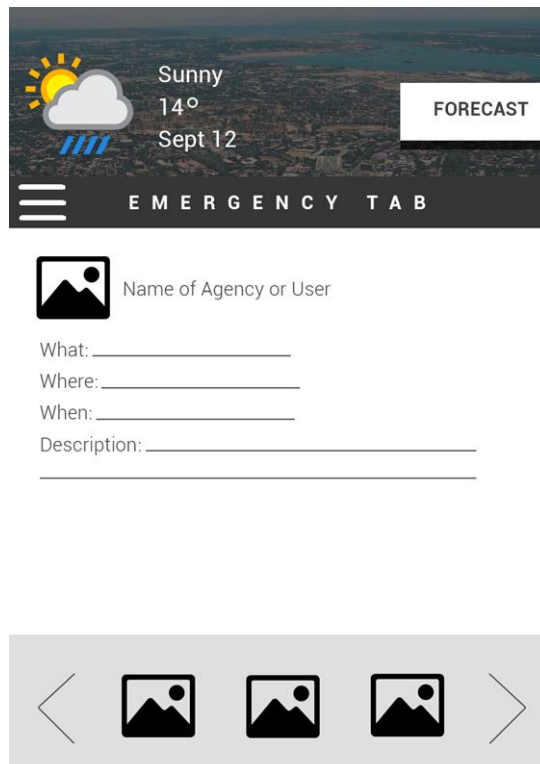


Figure 18: Emergency Tab

Users can view notifications here.

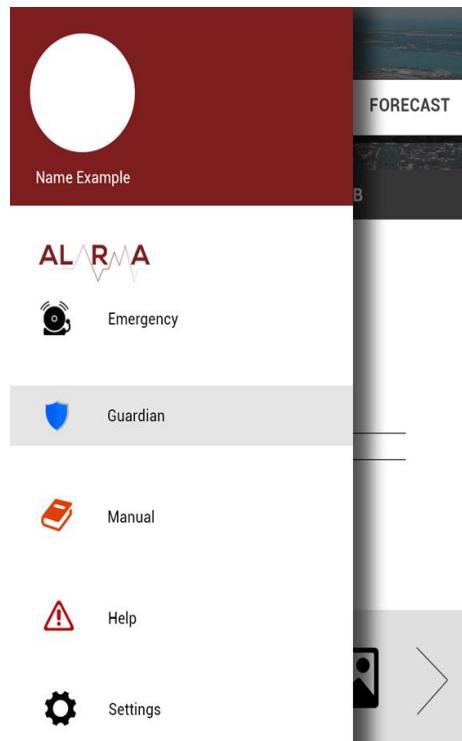


Figure 19: Guardian System

The user can check the drawer and then the Guardian System.

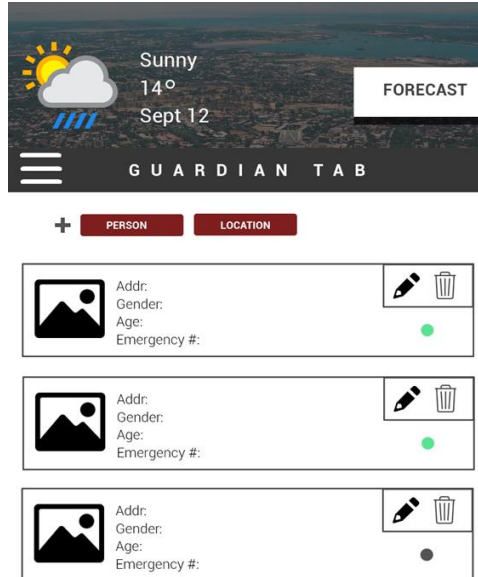


Figure 20: Guardian System

The user can add, edit, and delete his/her registered person or property for the Guardian System. The green circle represents an active status while the black circle represents an inactive status.

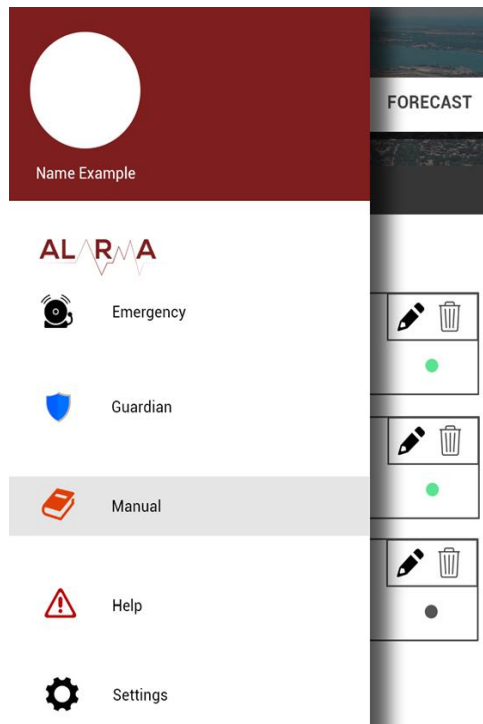


Figure 21: Manual Tab

The user can check the drawer and then the manual tab.

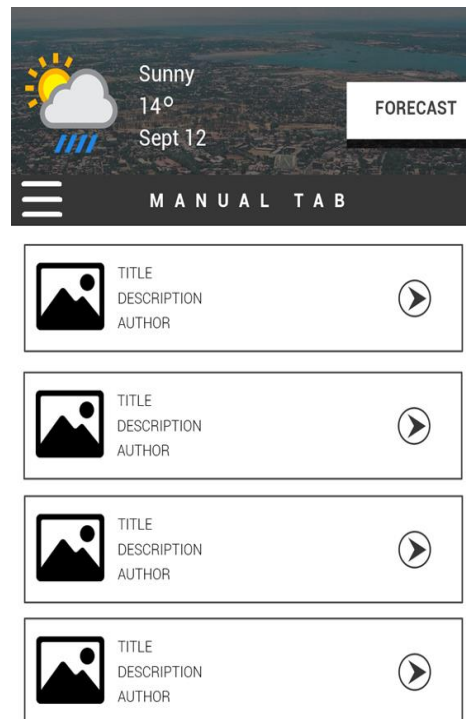


Figure 22: Display Manuals

The user is prompted to the lists of first aid manuals available.

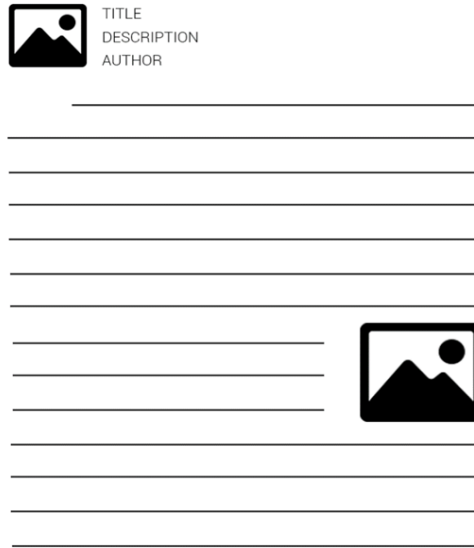


Figure 23: Opened Manual

The user can now view his chosen manual.

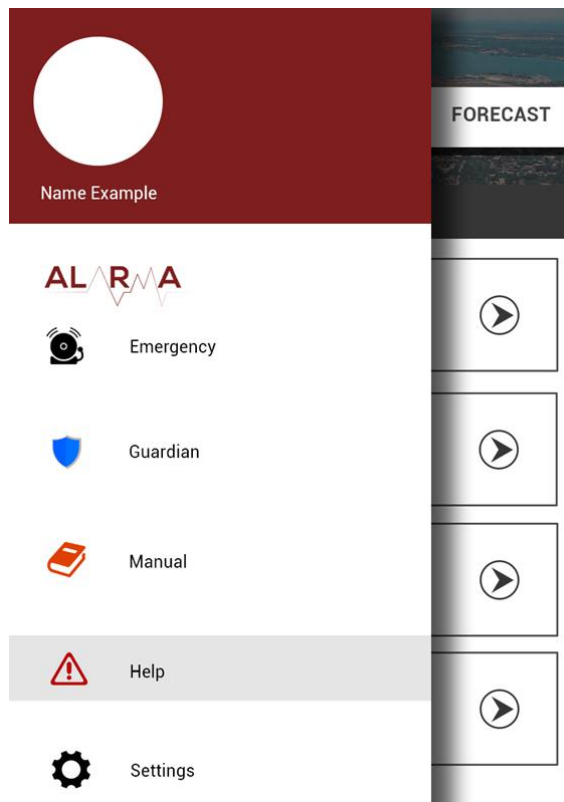


Figure 24: Help Tab

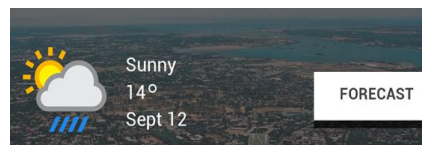
The user can check the drawer and then help tab.





Figure 25: Call for Help

With just one click, the user can now call for help necessary to his/her situation.



MON	<b>Sunny</b> 14°
TUES	<b>Cloudy</b> 20°
WED	<b>Windy</b> 39°
THU	<b>Snow</b> 5°
FRI	<b>Sunny</b> 12°
SAT	<b>Storm</b> 47°
SUN	<b>Sunny</b> 14°

Figure 26: Forecast Tab

The user can view daily weather forecasts.

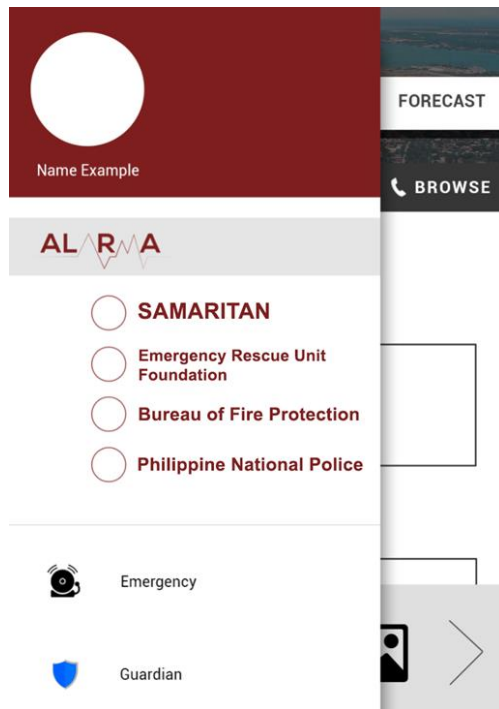


Figure 27: User's option

The user can check the drawer and then AlarmaPh, different partnered agencies are viewed here.

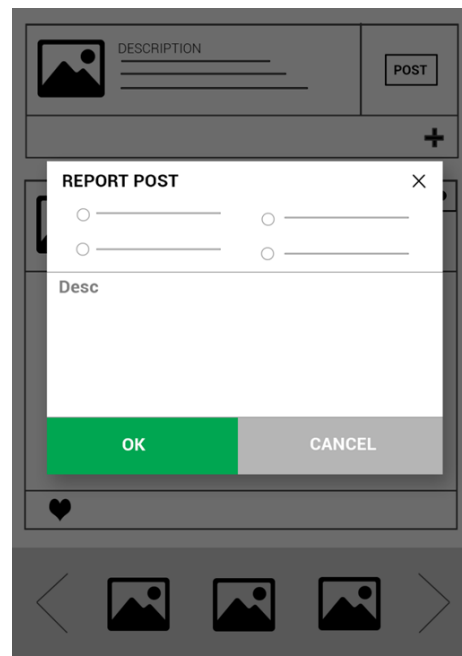


Figure 28: Community Tab (Report)

Users post new report or event.

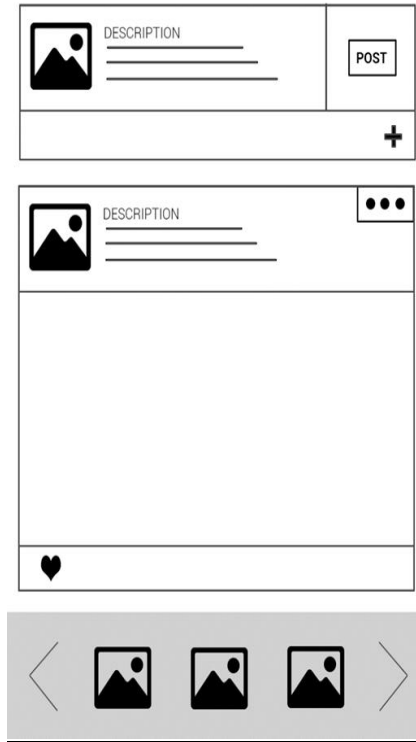


Figure 29: Community Tab

The user can view, post and react to new events posted by the community.

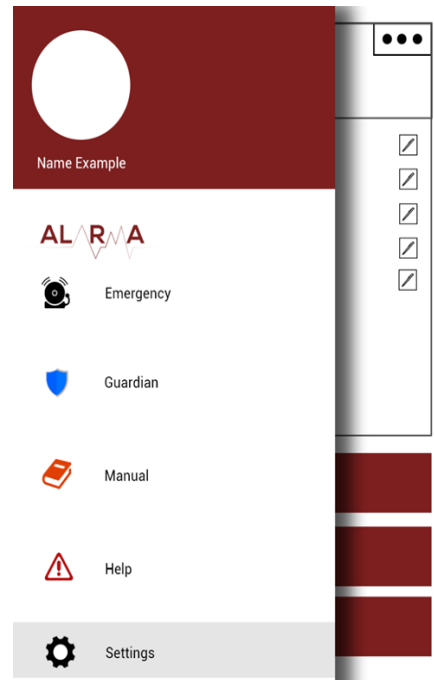


Figure 30: Settings

The user can check the drawer and then Settings.

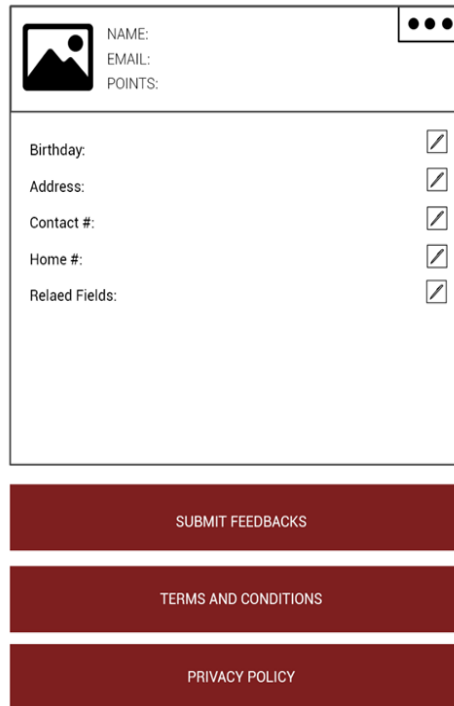


Figure 31: Settings Tab

The dots on the upper right indicate the logout button. Also, the user can edit his/her profile.

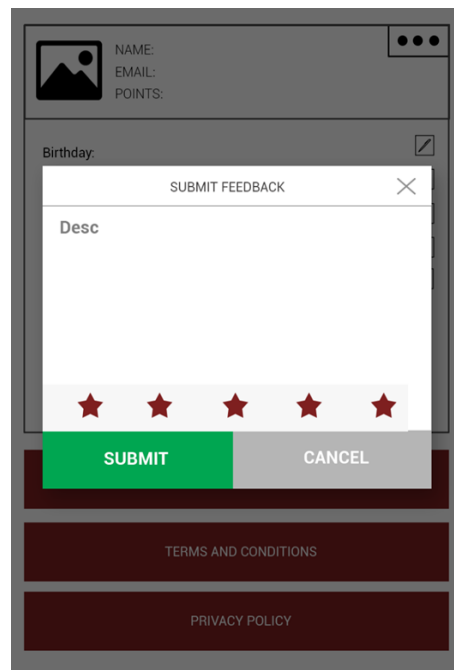


Figure 32: Submit Feedback

The user can submit feedback and ratings here

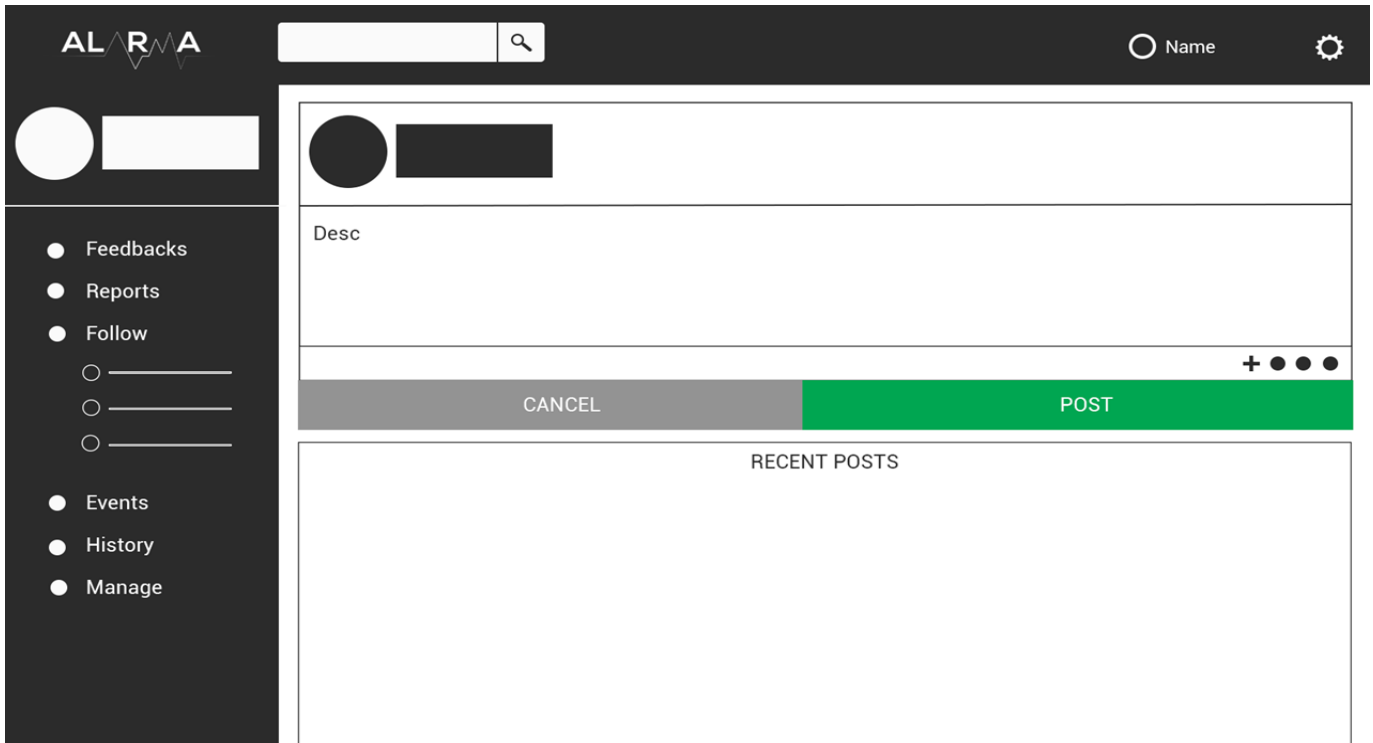


Figure 33: Web – Home

Upon logging in, the admins are prompted here. They can post new events and news here too.



Figure 34: Web – Submit Feedback

Admin can submit their feedback and suggestions here for the improvement of the system.

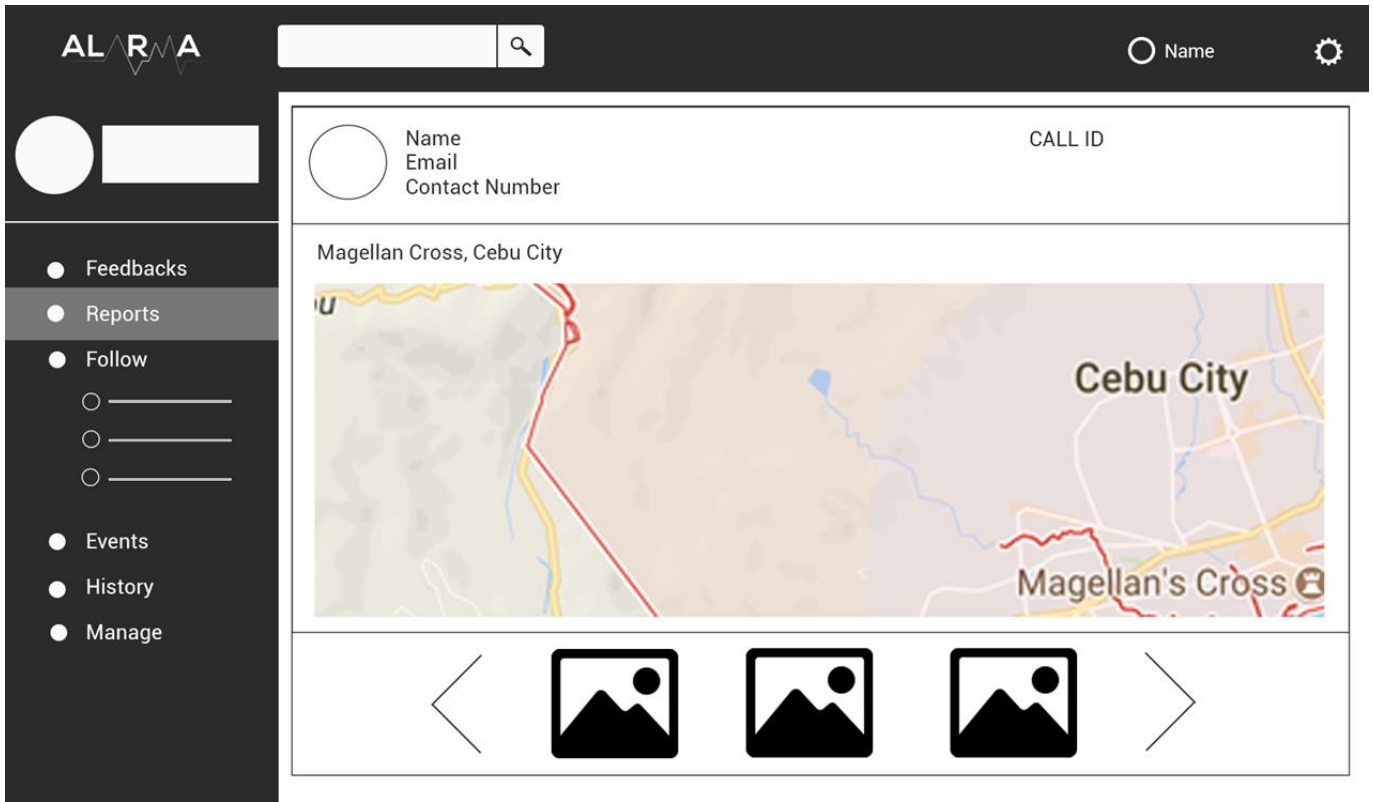


Figure 35: Web – Received Reports

This is where the reported incidents of the users are flashed.



Figure 36: Web – List of Events

All events and the number of users interested in going to that said event are viewed here.

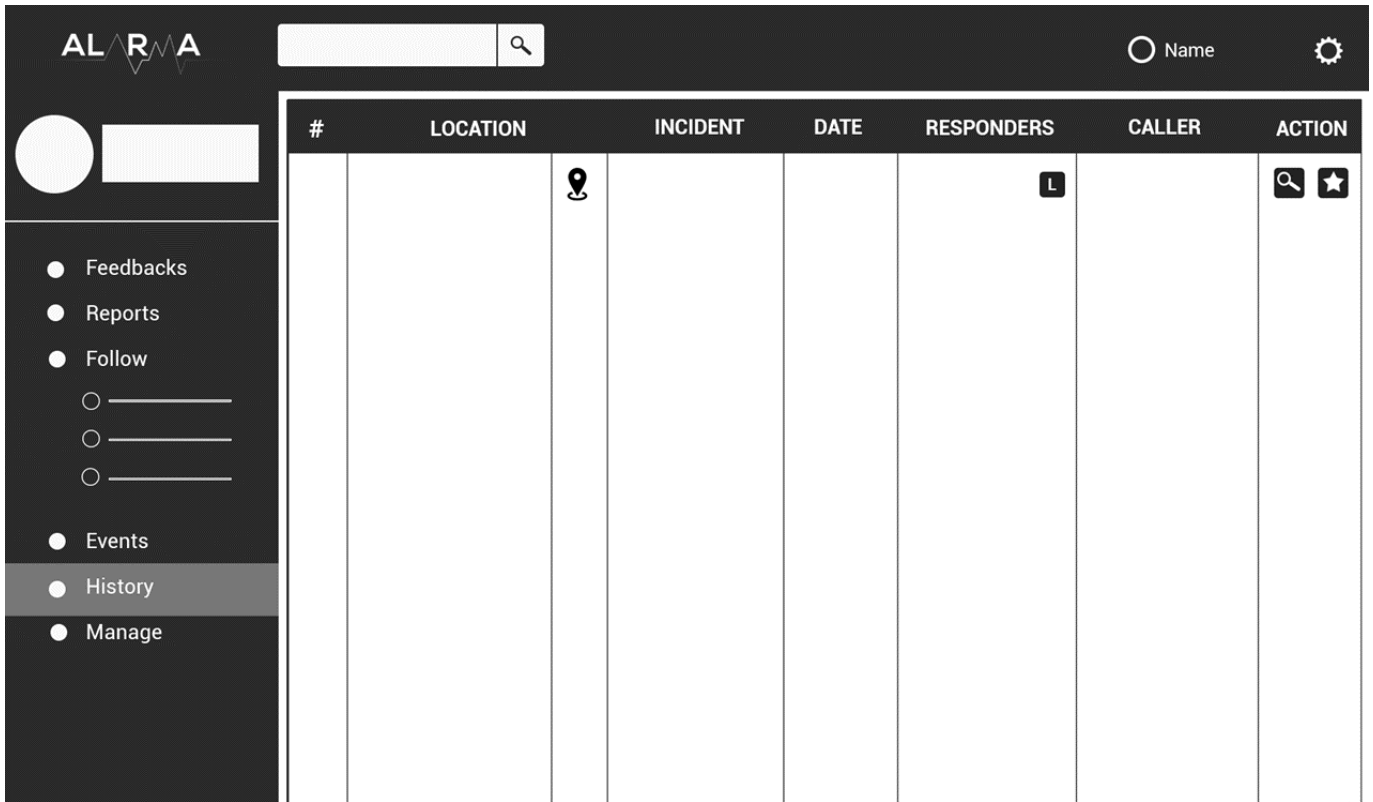


Figure 37: Web – Report History

This is where the history of reported incidents of the users are seen by the Admins. The location, type of incident, date reported, who are the responder of the said incident, and the caller's name are viewed here. Admins can rate the validity of the reported incident in the Action tab.

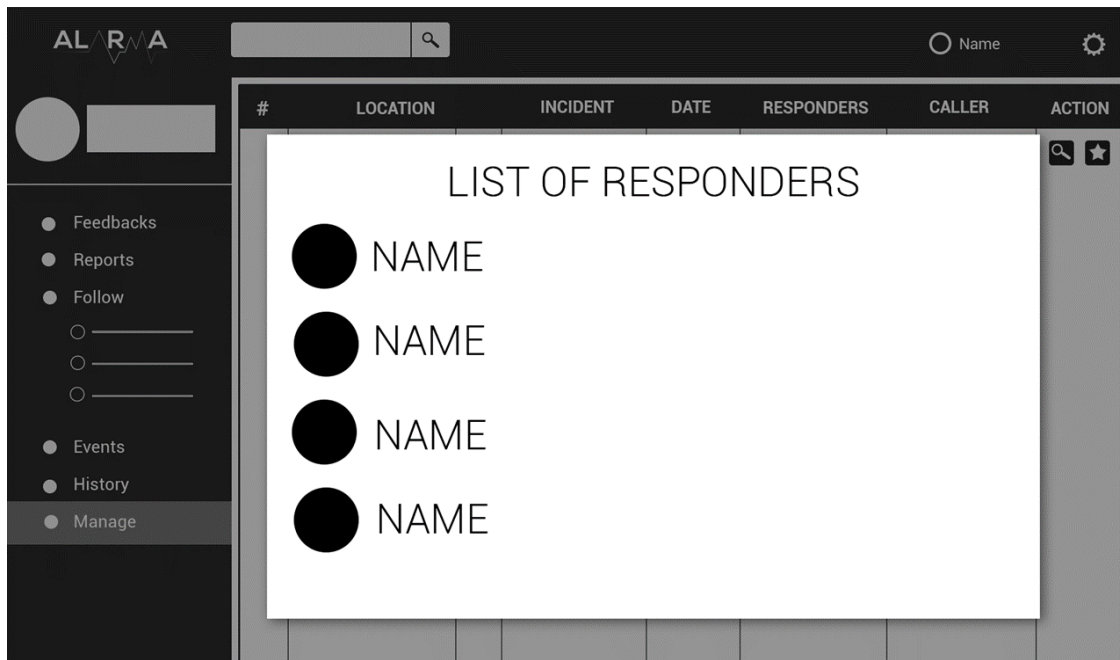


Figure 38: Web – List of Responders

Lists of Responders of the incident are viewed here.

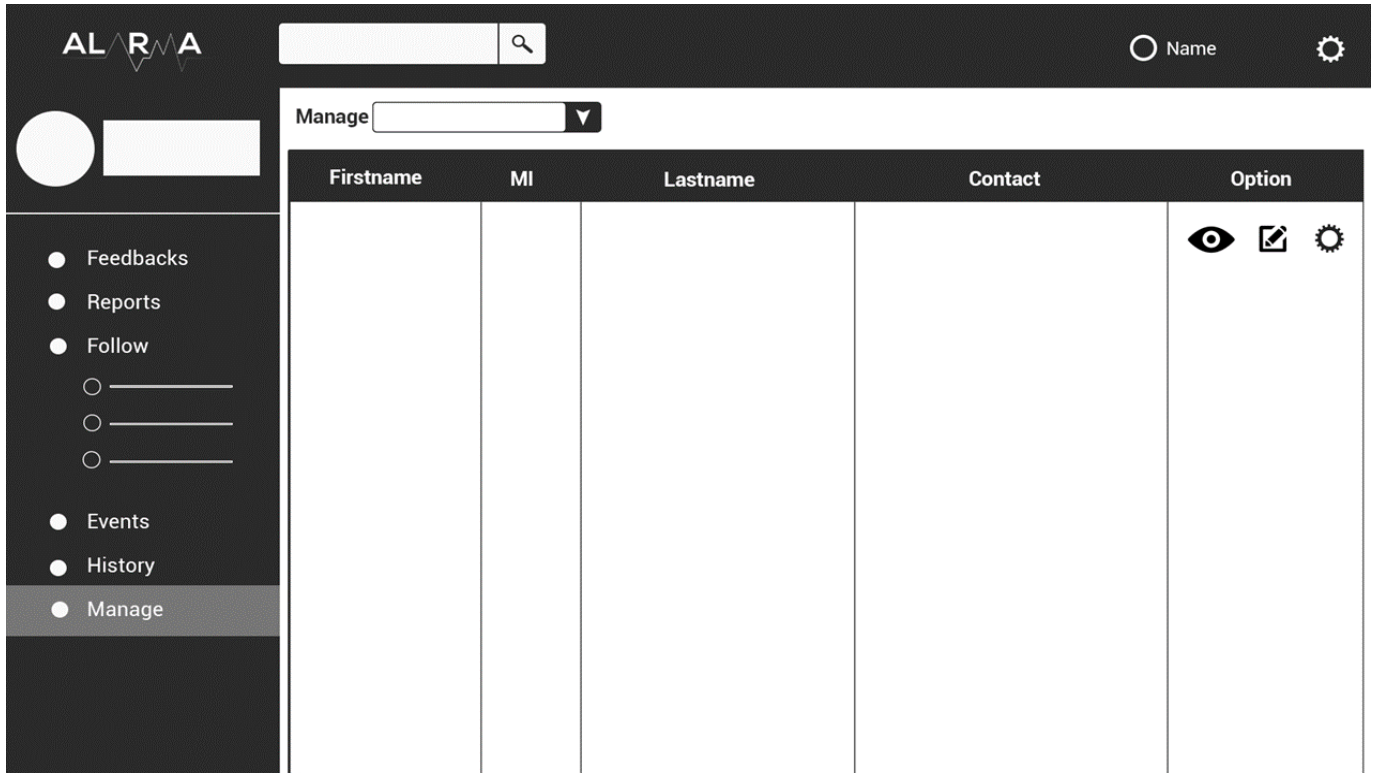


Figure 39: Web – Crew Management

Lists of the name of the Agency's crew or responders are viewed here.

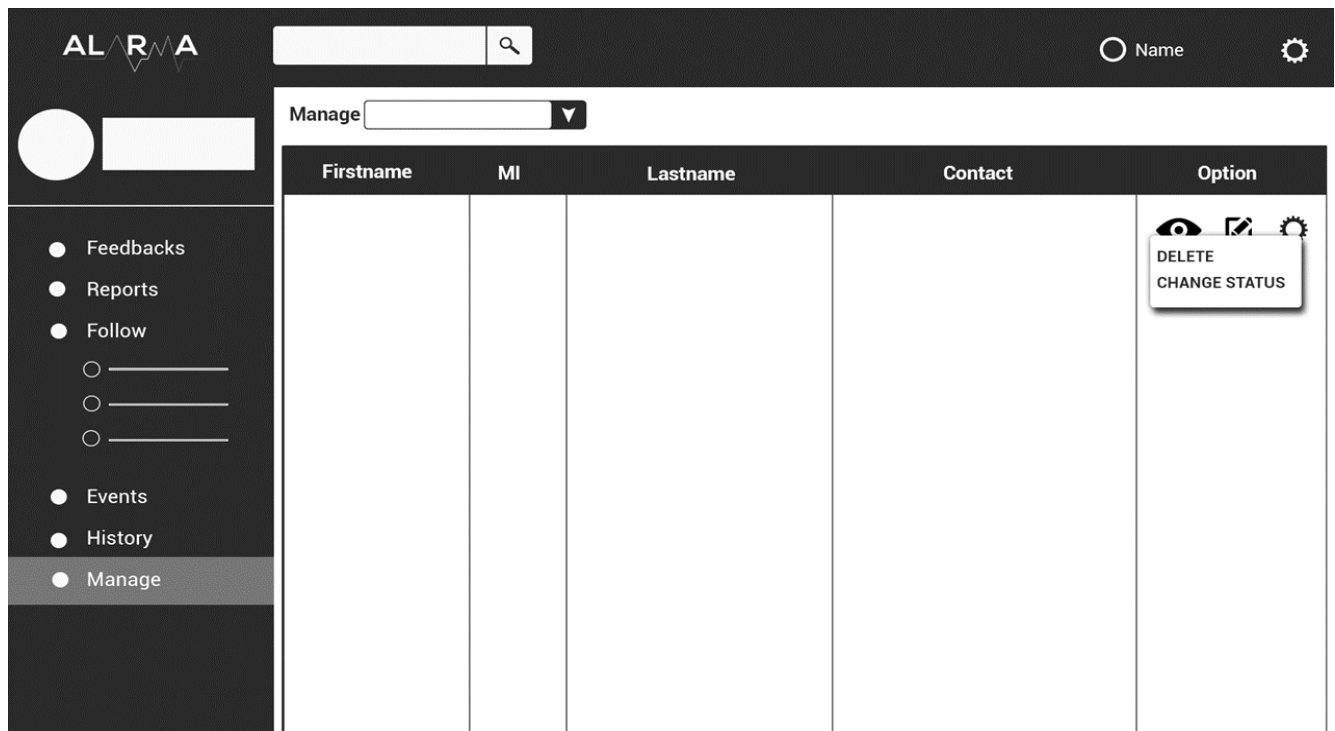


Figure 40: Web – Crew Management Option

The Admin can delete and change the status of the Crew into active or inactive.



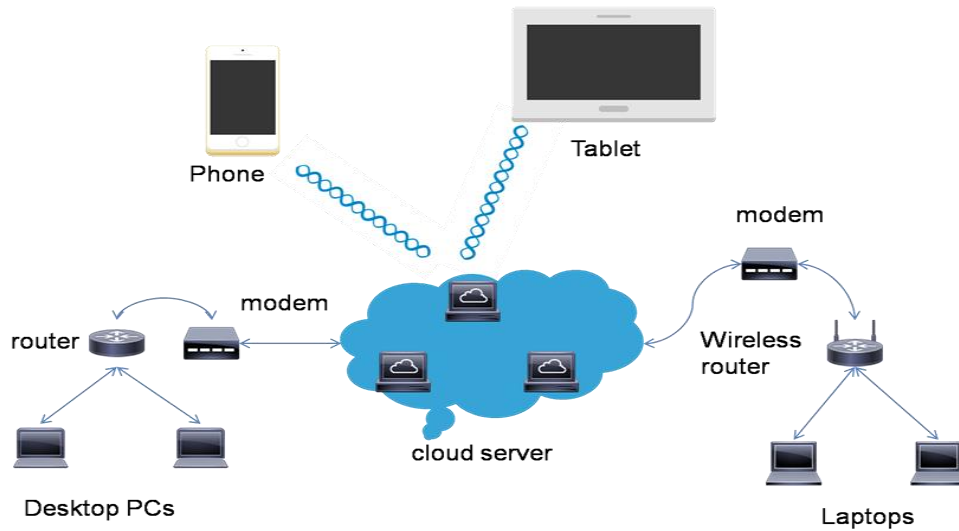


Figure 41: Network Design

Using active network technology for a Quick Emergency Response application helps develop an efficient and high portable quality of service mechanisms to perform a variety of system tasks in a secure manner. The system is hosted in a cloud server, and users can access the system through computer terminals, laptops, and mobile devices as long as it is connected to the internet. Internet connectivity could either be wireless (Wi-Fi/3G/4G) or hardwired connection.

#### 4.3 Testing/Quality Assurance

Table 1: Unit Testing

Module	Unit Featured	Expected Result	Actual Result	Remarks
Administrator Account Management	Create (Sign up, log in, and log out)	Admin can sign up, log in, and sign out of the system.	-Admin successfully execute expected result  -Forgot password	-No error message  -Change to "Remember me?"
	Validate Email Address (during sign up)	Admin will receive an email to their account to validate email address  Admin will wait for super-admin approval. If approved, admin account is registered	-Email message sent to admin's email for email address validation  -Did not send approval request to super-admin	-Performed as expected  -Must send approval request to super-admin
	View Account	Admin can view their own account and can visit other accounts	-Admin can view own account  -Admin can't view/visit other account	- Performed as expected  -Admin should be able to visit other account
	Update Account Profile	Admin can update their profile	-All details can be updated except profile picture	-Profile picture must be updated
Responder/ Dispatcher Account Management	Create (Sign up, log in, and log out)	Responder/ Dispatchers can sign up, log in, and sign out of the system.	-Responder/ Dispatcher successfully execute expected result  -Forgot password	-No error message  -Change to "Remember me?"
	Validate Email Address	Responder/ Dispatcher will receive an email to their account to validate email address	-Email message sent to Responder/ Dispatcher's email for email address validation	-Performed as expected
	View Account	Responder/ Dispatcher can view their own account and can visit other accounts	- Responder/ Dispatcher can view own account  - Responder/ Dispatcher can't view/visit other account	- Performed as expected  - Responder/ Dispatcher should be able to visit other account
	Update Account Profile	Responder/ Dispatcher can update their profile	-All details can be updated except profile picture	-Profile picture must be updated
	Upgrade Account	Responder/ Dispatcher can upgrade account to premium	-Account not upgraded	-Account should be updated to premium
Super-Admin Account Management	Activate Account	Super-Admin can activate the Admin's Account	-Admin account successfully activated by super-admin	-Performed as expected
	Deactivate Account	Super-Admin can deactivate admin and responder/dispatcher's account	-Admin and responder/dispatcher's account is deactivated by super-admin	-Performed as expected

	Update Account Profile	Responder/ Dispatcher can update their profile	-All details can be updated except profile picture	-Profile picture must be updated
Admin Emergency Management	Create/Post daily news/citizen report	Admin can post informative news	-Unable to create post with pictures	-Pictures must be posted to citizen report
	View Posted News	Admin can view own post	-Performed as expected.	-No error message
	Delete Posted News	Admin can delete own post	-Performed as expected	-No error message
	Add emergency hotlines	Admin can add emergency hotline (added during sign up)	-Emergency Hotline added	-Performed as expected
	Update emergency hotlines	Admin can update emergency hotline (updated during profile update)	-Emergency Hotlines updated	-Perform successfully
	View emergency hotlines	Admin can view emergency hotlines of other AlarmaPh registered admins	-Viewing successful	-Perform successfully
	Receive incident notification	Admin can receive incident notification	-Admin can't receive incident notification	-Admin must receive incident notification
Responder/ Dispatcher Emergency Management	Create/Post daily news/citizen report	Responder/ Dispatcher can post informative news	-Unable to create post with pictures	-Pictures must be posted to citizen report
	View Posted News	Responder/ Dispatcher can view own post	-Performed as expected.	-No error message
	Delete Posted News	Responder/ Dispatcher can delete own post	-Performed as expected	-No error message
	View emergency hotlines	Responder/ Dispatcher can view emergency hotlines of other AlarmaPh registered admins	-Viewing successful	-Perform successfully
	Receive incident notification	Responder/ Dispatcher can receive incident notification	- Responder/ Dispatcher can't receive incident notification	- Responder/ Dispatcher must receive incident notification
	View first aid manual	Responder/ Dispatcher can view first aid manuals	-Viewing successful	-Perform successfully
Super-Admin Emergency Management	Delete Posted News	Super-Admin can delete scam news that are posted	-Admin needs to file a report regarding the scam/fake news that is posted	-Admin must report the fake news
Admin Rate and Review/Feedback Management	Rate Response unit agencies	Admin can rate other admin/agencies	-Admin is able to rate unfollowed agencies	-Successful

	Create Review/ Feedbacks	Admin can create feedback to followed agencies	-Admin is able to create feedback to unfollowed agencies	-Successful
	Update Feedback	Admin can update feedback	-Performed as expected	-Successfully updated
Super-Admin Review/Feedback Management	Monitor/View Rate and Review/ Feedback	Super-Admin can monitor and view rate and feedback made by admin and user	-Performed as expected	-Performed successfully
Admin Reward and Points Management	Give Points	If users post daily news/report valid incidents, admin will automatically add 20 points( <b>created by admin</b> )to the user that reported the incident  If invalid news/incident report, users' points will automatically be deducted	-Performed as expected	- Points must be reflected to users' account  -20 point = 1 additional guardian list
Responder/Dispatcher Reward and Point Management	Gain Reward  Redeem Reward	-Automatic gaining of point -Automatic deduction of points  -Automatic Redeeming of points	- Performed as expected	- If Responder/Dispatcher gains 20 points, additional guardian list is obtained since 20 point = 1 additional guardian list
Super-Admin Content Management	Create, Update, Delete Content	Super-Admin can create, update and delete content	-Performed as expected	-Successfully created, updated and deleted content
Admin History Management	View Summary of Incident	Admin can view summary of incident	-Performed as expected	-Should have complete data to be displayed
Admin Event Management	Create, Update, Delete Event	Admin can create, update and delete event	-Performed as expected but pictures can't be saved	-Pictures should be saved
	View Event	Admin can view followed agencies' event	-Admin can view unfollowed agencies' event	-Should view followed agencies' event only
Responder/Dispatcher Event Management	View Event	Responder/Dispatcher can view followed agencies' event	- Responder/Dispatcher can view unfollowed agencies' event	-Should view followed agencies' event only
Responder/Dispatcher Incident Report Management	File Incident Report	Responder/Dispatcher can send distress calls to AlarmaPh registered agencies	-Calls registered agencies	-Admin hotlines should be sorted to the nearest location of the caller

Admin Incident Report Management	View Pending Incident Report	Super-Admin and Admin can view pending incident report	-Performed as expected	-Successful
	Respond Incident	Admin can transfer pending incident report to on going	-Performed as expected	-Successful
	Update Status of the incident	Admin can transfer an ongoing incident to a closed and resolved incident.	-Performed as expected	-Successful
	Add Type of incident		-Performed as expected	-Successful
	Add detail of incident		-Performed as expected	-Successful
	Add actions taken by responders		-Performed as expected	-Successful
	Add Victim		-Performed as expected	-Successful (For guardian system reference)
Super-Admin Incident Report Management	View reported fake news  Delete Posted Fake News	Super-Admin can delete scam news that are posted	-Admin needs to file a report regarding the scam/fake news that is posted	-Admin must report the fake news
Admin Crews Management	Add, Update, Delete, View Crew Member	Admin can Add, Update, Delete, View Crew Member	-Performed as expected	-Performed as expected
Responder/Dispatcher Guardian Management	Add, Update and Deactivate person/location	Responder/ Dispatcher can Add, Update and Deactivate person/location	Can't view Guardian List	-Should display added person/Location to Guardian List
Admin and Responder/Dispatcher Follow Management	Search Response unit agencies	Admin, Responder/ Dispatcher, Super-Admin follow can search for other disaster response agencies	-Performed as expected	-Success
	Follow Response Unit Agencies	Admin and Responder/ Dispatcher can follow other agencies	-Performed as expected	-Success
	Unfollow Response Unit Agencies	Admin and Responder/ Dispatcher can unfollow their followed agencies	-Performed as expected	-Success

	View Agency Profile	Admin and Responder/ Dispatcher can view agency profile	-Performed as expected	-Success
	View Events Posted	Admin and Responder/ Dispatcher can view events posted (only of their followed agencies)	-Performed as expected	-Success

Table 2: Integration Testing

<b>Module 1</b>	<b>Integration Process</b>	<b>Module 2</b>	<b>Pre-Condition</b>	<b>Result</b>	<b>Remarks</b>
Emergency Management	Users create daily news under an existing account	Account Management	User accounts should exist.	Performed as expected	✓
Feedback and Ratings Management	Users can create feedback and ratings under an existing account	Account Management	User account should exist	Performed as expected	✓
Rewards and Points Management	Users can acquire rewards under an existing account	Account Management	User accounts should exist.	Performed as expected	✓
Event Management	Users can create event under an existing account	Account Management	User account should exist	Performed as expected	✓
Incident Report Management	Users can file incident report under existing account	Account Management	User account should exist	Performed as expected	✓
Guardian Management	Users can create "guardian" under existing account	Account Management	User account should exist	Performed as expected	✓
Guardian Management (Notification)	Users can receive notification under existing account	Account Management	User account should exist	Performed as expected	✓
Follow Management	Users can follow an agency under existing account	Account Management	User account should exist	Performed as expected	✓
Emergency Management	Users can receive incident notification under incident report management	Incident Report Management	User should send distress calls	Performed as expected	✓
Feedbacks and Ratings Management	Users can create feedback under existing followed list	Follow Management	User should follow an agency	Performed as expected	✓
Rewards and Points Management	Users can receive rewards and points every valid incident report	Incident Report Management	User should send distress calls	Performed as expected	✓

To verify functional, performance and reliability requirements of the system, integration testing was used. Integration testing is used to test the interactions between different modules where the individual modules are combined and tested as a group. It will identify possible problems that may occur when combining all the units.

Table 3: Alpha Testing

Test Criteria		Responders/ Dispatchers		Government Agency/ Barangay		Admins		Consolidated	
		[n= 40]		[n= 13]		[n= 13]		[n=66]	
		Mean	Inter	Mean	Inter	Mean	Inter	Mean	Inter
<b>Graphical User Interface (GUI)</b>									
1	Consistency (The user interface is of the same formatting style and icons throughout the system.)	3.58	VG	3.23	G	3.23	G	3.35	VG
2	Reusability (The system contains reusable GUI components such as familiar buttons, text and checkboxes, and other tools.)	3.48	VG	3.38	VG	3.31	VG	3.39	VG
3	Forgiveness and Tolerance (The interface displays message or confirmation prompts that would allow the users to undo or redo critical actions.)	3.58	VG	3.54	VG	3.46	VG	3.53	VG
4	Simplicity (The GUI design includes simple GUI buttons, such as simple screens with clear, uncrowded messages.)	3.73	VG	3.54	VG	3.54	VG	3.60	VG
5	Readability (The interface has appropriate colors, font sizes, and styles that are convenient to the target users.)	3.65	VG	3.77	VG	3.54	VG	3.65	VG
6	Clarity (Displayed error, help, and warning messages are clear, concise, and as elementary as possible to assist users in operating the software.)	3.70	VG	3.54	VG	3.62	VG	3.62	VG
7	Flexibility (The system includes user preferences setting to allow changes, for example, increasing the font size.)	3.43	VG	3.38	VG	3.38	VG	3.40	VG
8	User-friendliness (The GUI design must be user-friendly, by providing helpful, courteous, and non-offending messages.)	3.68	VG	3.31	VG	3.31	VG	3.43	VG
<b>System Performance</b>									
1	Conformance to the Requirements (The system effectively met all the identified features and/or requirements.)	3.53	VG	3.23	G	3.31	VG	3.35	VG
2	Conformance to the Objectives (All specific objectives of the system are met by the	3.48		3.00		3.08		3.18	



	program.)		VG		G		G		G
<b>3</b>	Efficiency (The entire system functions efficiently. There is no delay in any transaction.)	3.48	VG	3.23	G	3.23	G	3.31	VG
<b>4</b>	Security (The system is secured. Login details are authenticated. Input parameters are ensured prior to the execution of the transaction.)	3.13	G	3.08	G	3.08	G	3.09	G
<b>5</b>	Integrity (The software allows the registered user to have control over its own private information.)	3.48	VG	3.23	G	3.15	G	3.29	VG
<b>6</b>	Overall Impression (In general, the program or system is functional and useful.)	3.43	VG	3.23	G	3.15	G	3.27	VG
	<b>Aggregate Mean</b>	<b>3.52</b>	<b>VG</b>	<b>3.34</b>	<b>VG</b>	<b>3.31</b>	<b>VG</b>	<b>3.39</b>	<b>VG</b>

Range:

1.00-1.74 Poor [P]; 1.75-2.49 Fair [F];  
2.50-3.24 Good [G]; 3.25-4.00 Very Good [VG]

To evaluate the system's actual operational testing by potential users, the proponents used the alpha testing method to determine whether a system satisfies its acceptance criteria to enable the respondent to determine whether to accept the system. The table shows that most responders/dispatchers rated the highest, the application's simplicity [Mean = 3.73]. While the indicator, security, got the lowest mean of 3.13 [Good].

Also, the table reveals that most respondents from the government agency/barangay rated the highest, with the application's readability [Mean = 3.77]. While the indicator, conformance to objectives, got the lowest mean of 3.00 [Good].

Further, the table shows that most admins rated the highest, with the application's clarity [Mean = 3.62]. While the indicator, security, got the lowest mean of 3.08 [Good].

**5. Conclusion**

The purpose of this study was to develop web and mobile applications that can quickly respond to emergencies. Specifically, the study aimed to:

- a. Analyze existing solutions. The researchers reviewed the literature and studies on existing emergency response applications to identify their strengths and weaknesses.
- b. Design and develop new applications. Based on the findings of the literature review, the researchers designed and developed new web and mobile applications that address the shortcomings of existing solutions.
- c. Test the applications. The researchers tested the applications with real users to ensure that they were effective in responding to emergencies.

The study found that existing solutions have several strengths, such as the ability to provide quick response to emergencies, the ability to track the location of users, and the ability to connect users with emergency services. However, the study also found that existing solutions have several weaknesses, such as the lack of a central repository for emergency data, the lack of integration with other emergency response systems, and the lack of user-friendly interfaces.

This study focused on helping Filipino individuals to monitor their loved ones' safety and provide a quick emergency and disaster response. AlarmaPh offers a much more variety of help to Filipinos during an emergency or disaster with the use of their Android phones. Users can view first aid manuals and a before/during/after incident guide. Moreover, users can send distress calls to the fire department, police department, and call for ambulance assistance with just a click away. The objectives that were defined have been achieved. Therefore, the developers conclude that AlarmaPh can help Filipino people to have fast access to incident information, remote content management, easy maintenance, and a scalable platform for future growth. The study concluded that the new web and mobile based application is a valuable addition to the arsenal of emergency response tools. The application can

help to improve the efficiency and effectiveness of emergency response by providing quick and accurate information to users and emergency responders.

The study was limited by the fact that it was conducted in a small sample size. Future research should be conducted with a larger sample size to confirm the findings of this study. The findings also suggest that there is a need for further research on the development and use of these applications. Future research with a larger sample size would help to address this limitation and provide more reliable and generalizable findings.

The study calls for the development and implementation of web and mobile based applications that can help to improve the efficiency and effectiveness of emergency response. These applications should be designed to be user-friendly and should be integrated with other emergency response systems.

## 6. Recommendations

For future researchers, the authors of AlarmaPh will gladly allow them to use and deploy the system. The authors of AlarmaPh recommend that:

- a. They should know the basic operation of responding to an accident or emergency;
- b. The system should have an audio recorder between the responder and the caller;
- c. It should be updated as time progresses to ensure the flexibility of the system to the fast changing technology; and
- d. Conduct another study to support the preliminary findings.

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## ORCID iD (if any)

<sup>1</sup><https://orcid.org/0000-0001-6889-7465>, <sup>2</sup><https://orcid.org/0009-0000-7370-0911>,

<sup>3</sup><https://orcid.org/0009-0000-9822-0877>, <sup>4</sup><https://orcid.org/0009-0007-3466-5587>

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