ISSN No:-2456-2165

# Development of Hazard Safety Tips Mobile Application in Local Dialect

Marco C. Bergongoy
College of Computer Studies
Eastern Samar State University
Salcedo, Eastern Samar, Philippines

Gil G. Dialogo
College of Computer Studies
Eastern Samar State University
Salcedo, Eastern Samar, Philippines

Leonher B. Gahoy
College of Computer Studies
Eastern Samar State University
Salcedo, Eastern Samar, Philippines

**Abstract:- Mobile Technology plays significant contributions to the humanity in many areas. One of these is on the issues on Disaster Risk Reduction Management through developments of mobile applications. This study primarily aims to design, develop and test the Hazard Safety Tips Mobile Application in Waray-waray dialect. This study is conducted to help the residents of Salcedo, Eastern Samar become more aware of how they will be able to manage their safety in times of calamities and disaster through the aid of this application. Waterfall model is used as System Development Life Cycle (SDLC) which includes the following phases: Requirement Definition, System and Software Design, Implementation and Unit Testing, Integration and System Testing and Operation and Maintenance. The researchers gathered data in the Municipal Disaster Risk Management Office and its website which served as inputs in the development of the application. Flowcharts and data flow diagrams were created for the designing of the application. User interfaces were designed and developed using Android Studio. The application had undergone three testing strategies: Benchmark, Alpha and Beta Tests using ISO scorecard. Results showed that in terms of usability, the application scored 88.75, which is above average. This means that the developed application was a great help in terms of hazard and disaster preparedness to the residents of Salcedo, Eastern Samar and the region as a whole. The study concluded that the mobile application was effective and functional because it conforms to the specified requirements.**

***Keywords:-*** *Mobile Development, Mobile Application, Hazard, Safety Tips, Waterfall Model.*

## I. INTRODUCTION

In the past couple of years, many people have been killed by earthquakes, landslide, floods, tropical storm, drought, and other injury, disease, homelessness, and misery, and caused colossal material damages. In the period 2000-2009 as many as 85 per cent of the people reported affected by disasters belonged to the Asia-Pacific Region, where Australia provides most of its international development assistance [1]. The Philippines is situated along a highly seismic area lying along the Pacific Ring of Fire and is highly-prone to earthquakes. According to the Philippine Institute of Volcanology and Seismology (PHIVOLCS), the country experiences an average of five (5) earthquakes a day [2].

Over the past 20 years disasters have affected 4.4 billion people, caused 2 trillion dollars of damage and killed 1.3 million people. These losses have outstripped the total value of official development assistance in the same period. Natural disasters disproportionately affect people living in developing countries and the most vulnerable communities within those countries. Over 95% of people killed by natural disasters are from developing countries [3].

Disaster risk reduction is at the core of the mission of the World Meteorological Organization (WMO). WMO, through its scientific and technical programs, its network of Global Meteorological Centers and Regional Specialized Meteorological and Climate Centers, provide scientific and technical services. This covers a variety of dangers associated to the weather, the climate, and the water, as well as its observation, detection, monitoring, prediction, and early warning. WMO responds to the information needs and requirements of the disaster risk management community in an efficient and timely manner through a coordinated approach and collaboration with its partners. Disasters resulting from meteorological, hydrological, and climate hazards claim a considerable number of lives each year and significantly impede social and economic advancement for years, if not decades.

Over 2 million people died as a result of the over 7500 natural disasters that occurred between 1980 and 2007; these disasters also caused economic damages worth over 1.2 trillion US dollars. Of this, 90 per cent of the natural disasters, 71% of casualties and 78% of economic losses were caused by weather-, climate- water-related hazards such as droughts, floods, windstorms, tropical cyclones, storm surges, extreme temperatures, landslides and wildfires, or by health epidemics and insect infestations directly linked to meteorological and hydrological conditions. Over the past five decades, economic losses related to hydro-meteorological hazards have increased, but the human toll has fallen dramatically. This is thanks to scientific advances in forecasting, combined with proactive disaster risk reduction policies and tools, including contingency planning and early warning systems in a number of high-risk countries [4].

Indeed, recent disasters in Haiti and Pakistan in 2010 showed the need to “use knowledge, innovation, and education to build a culture of safety and resilience at all levels” as articulated in the Hyogo Framework for Action 2005-2015 [5]. In the opinion of [6], a critical components of disaster

preparedness are the knowledge of available local resource information and how to response at the time of disaster. To help fill this gap a mobile application was created for the android phone with the information or how to implement the hospital incident command system (HICS) for Healthcare Providers for disaster mitigation preparedness, response and recovery. A test team was used to evaluate the feasibility of the app and provide feedback for its usefulness for disaster education and training for hospital-based professional. To equip Filipinos with a better and improved knowledge in preparing for disasters, the National Disaster Risk Reduction and Management Council and Smart telecommunications launched Batingaw, an application for disaster risk reduction and management. Batingaw, is aimed to "facilitate a nationwide system for disaster response and management," a statement said. "You could probably save a lot of lives" this said Defense Secretary Gazmin who was installed the app in his phone. "People would be aware; well, it takes dedication to practice what they have learned." [7].

In the evolution of first century technology mobile applications have become more useful to us as an electronic resource that the public can use in time of emergencies. Mobile technology has become easy and affordable to purchase nowadays. This technology allows people to send and receive information directly to and from someone using compatible devices, and also real-time monitoring of events, procedures or even meteorological circumstances. Although communication systems can be struck during a natural disaster, as soon as mobile networks are re-established people try to use their devices to report their condition or to ask for rescue.

Nowadays, apps and social networking are commonly used to share moments, feelings and mood states, but it can be used furthermore for post-disaster risk management [8]. In fact, the OCD and NDRRMC continue to explore ways to inform the public disaster risk reduction and management measures and system to help save lives and properties" and this mobile application we have added another strategy to reach out to people by helpful tools right at their guard tips," Sec. Alexander P. Pama, Civil Defense Administrator and NDRRMC executive Director said [9].

Thus, this research focused on the development of a user-friendly android application called Hazard Safety Tips Mobile Application Waray Version. This research can be used to give users immediate access to hazard prevention tips. It features step-by-step instructions that can guide users to safety in times of hazardous events. With this mobile application, the proponents have added another strategy to reach out to people with helpful tools right at their fingertips. These days, almost everyone has a mobile phone that can be used during emergency.

## II. SYSTEM DESIGN AND SPECIFICATION

### *A. Conceptual Framework*

The researchers used the Waterfall Model as a System Development Life Cycle tool in developing the Disaster Preparedness Mobile Application. It is very simple to understand and use. In the first phase to the last phase of the waterfall model, each phase must be completed before the next phase can begin and there is no overlapping in the phases. The requirement gathering, analysis and definition must be done in order to design and develop a system. After the designing and developing of the system, the researchers tested the system together with some respondents. And lastly, the operation and maintenance where it was done will also be tested there. At the last phase, some errors or design problems may occur. So, it is necessary to modify all the errors for the system to remain useful. In modifying the system, it involved repeating some or all the previous phase [10]. Fig. 1 shows the conceptual framework of Waterfall Model – Software Development Life Cycle. It comprises the following phases:

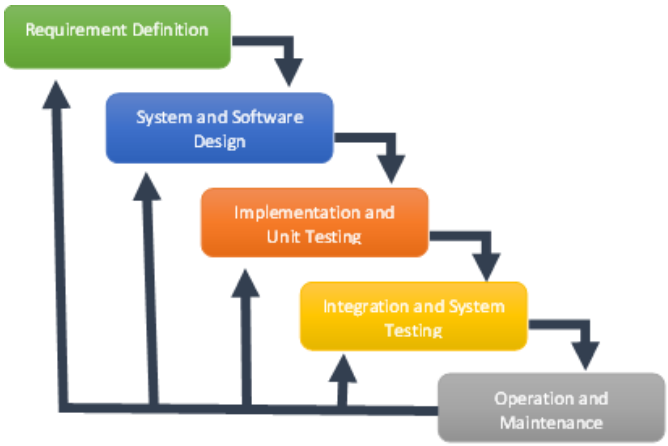



Fig. 1. Waterfall Model – Software Development Life Cycle

### *B. Data Flow Diagram*

Fig. 2 shows the Data Flow Diagram of the Hazard Safety Tips Mobile Application in Local Dialect. It shows how the app interacts with the user. It has entity named user. The user will select hazardous event and display it on the application. The user retrieves the information and views the hazard tips.


Fig. 2. Data Flow Diagram of the Hazard Safety Tips Mobile Application

### *C. Hardware Specification*

Table 1 shows the hardware requirements used in developing and deploying the application. This is needed to complete the action of the application. This would include the following hardware requirements.

In developing the application, the app required a hard disk drive and a processor for the computer to run. The application would also require a keyboard to allow the researchers to type the codes of the system and a mouse to position the cursor, draw and execute program functions by clicking mouse buttons. The application would also require a flash drive for the

documentation. In deploying the application, the researchers would need a smart phone to run the application.

Table 1. Hardware Specification

| Hardware | Minimum Requirements | Actual Use |
|---|---|---|
| ***Development*** | | |
| Processor | Intel Pentium dual core 1.3GHz | Intel® Celeron® CPU N3060 @ 1.60GHz |
| RAM | At least 2GB | 4GB |
| Hard Disk Drive | 50 GB (At least) | 150 GB |
| Mouse | Any Mouse | Acer Mouse |
| Flash Drive | GB Standard Flash Drive | 16 GB |
| ***Deployment*** | | |
| Android Phone | Any Android Phone | Samsung J5 |

*D. Software Specification*

Table 2 shows the software requirements used in developing and deploying the application. This is needed to complete the action of the application. This would include the following software requirements.

In developing the application, the application would require Microsoft operating system to interact with computer's hardware. The application also required Android Studio as the software to be used in developing the application. The researchers used Java as programming language in developing the application. In the deployment of the application, the researchers would use an Android OS to run the mobile phone.

Table 2 Hardware Specification

| Software | Minimum Requirement | Actual Use |
|---|---|---|
| ***Development*** | | |
| Android Studio | 3.2 | 3.2 |
| Microsoft OS | Windows 7 | Windows 10 |
| Java | Java 6.0 | Java 7.0 |
| ***Deployment*** | | |
| Android OS | Android 4.4 | Android 6.0 |

*E. System Development*

In developing the system, the researchers gathered data or information from the DRRM office and their official site, which were needed to conceptualize the overall features of the application. The researchers also gathered the hardware and software specifications needed to start the development of the system. The researchers designed the system by making a data flow diagram and system flowchart.

The researchers developed the application by operationally putting together all the gathered data or information and all the concepts that the researchers made. Then, Java was used as the programming language in coding the app. The researchers tested the application to check for design mistakes, usability issues and access bugs before it would be deployed to its end users.

The researchers conducted series of tests which were benchmark, alpha and beta tests to modify all the errors and satisfy all the user requirement specifications. These tests were evaluated by the residents of Salcedo, Eastern Samar as they are considered as the main evaluator and the end user of the application.

*F. System Deployment*

In the deployment of the application, the user must have a mobile phone with an android version of at least android 4.4 (Kitkat). The application can be transferred via Bluetooth, Shareit, or can be downloaded on Play Store once uploaded.

## III. RESULTS AND DISCUSSION

*A. Acceptance Testing*

After the development phase of the application, the developed application had undergone series of testing to evaluate its quality. This allowed the researchers to determine if the requirements as specified during the development stage were accomplished. After each testing, the respondents tell whether requirements are not satisfied and which must be deleted, revised, or added because of changing needs.

The first test that was conducted was the benchmark test. The application was evaluated by the forty-two (42) second-year BSCS students. After the Benchmark testing, Pilot test which includes the Alpha test and Beta test followed. Alpha test was held by the core faculty members who are expert in the field of software development. They rated the application using of the same score card. The last test conducted was the beta test where selected residents of Salcedo Eastern Samar evaluated the application by the use of the same score card. The respondents of the test were the citizens of Salcedo Eastern Samar as they are considered as the main evaluator and the end user of the application.

The application was rated based on the ISO which are functionality, reliability, usability, efficiency, maintainability and portability. The functionality perspective defined the quality of being suited to serve a purpose well; practically.

The reliability perspective defined the quality of being trustworthy or of performing consistently well. The usability perspective defined the degree to which something is able or fit to be used. The Efficiency perspective defined the state or quality of being efficient. The maintainability perspective defined as the probability of performing a successful repair action within a given time. The portability defined the ability of software to be transferred the categories of a 5-point Likert scale, code and its description are as shown in Table 3.

Table 3 Lickert Scale

| Scale | Code | Description |
|---|---|---|
| 4.20 – 5.00 | 1 | Excellent |
| 3.40 – 4.19 | 2 | Very Good |
| 2.60 – 3.39 | 3 | Good |
| 1.80 – 2.59 | 4 | Poor |
| 1.00 – 1.79 | 5 | Very Poor |

The data gathered was analyzed using frequency counts and weighted scoring system. Weighted means was derived from the frequency counts, while the total mean score was derived from the average of the equivalent statistical interpretation.

➢ *Benchmark Test Results on the Quality Attributes of the Hazard Safety Tips Mobile Application*

The first test of the system was the Benchmark test. The evaluators are forty-two (42) second year BSCS students. Before the test started, the researchers used a score card to rate the developed system. During the test, the students run the system's functionality. As the application running, the students noticed that application is already functioning but it needs to be improved.

- *Summary of Benchmark Test.*

Table 4 presents the summary of Benchmark Test on the quality attribute of the Hazard Safety Tips Mobile Application. After a successful testing, the computation of all criteria of the benchmark test was done. The result of the six criteria was added to obtain the overall mean. The application has been changed based on the errors encountered, such as changing the images and animations. After the benchmark test, the system functionality was improved. The application is now ready for Alpha Testing wherein the core faculty members who are expert in software development were the evaluators.

Table 4Summary Of Benchmark Test For Hazard Safety Tips Mobile Application

| Criteria | Mean | Interpretation |
|---|---|---|
| 1. Functionality | 3.75 | Very Good |
| 2. Reliability. | 3.50 | Very Good |
| 3. Usability | 3.40 | Very Good |
| 4. Efficiency | 3.30 | Good |
| 5. Maintainability | 3.30 | Good |
| 6. Portability | 3.20 | Good |
| **Overall Mean** | **3.40** | **Very Good** |

In the criteria of "Functionality", it obtained a mean score of 3.75 and interpreted as Very Good. "Reliability" obtained a mean score of 3.50 and interpreted as Very Good. "Usability" obtained a mean score of 3.40 and interpreted as Very Good. "Efficiency" obtained a mean score of 3.30 and interpreted as Good. "Maintainability" obtained a mean score of 3.30 and interpreted as Good. "Portability" obtained a mean score of 3.20 and interpreted as Good. The grand mean score of the quality attribute of the application was 3.40 and interpreted as Very Good. This means that the developed application in terms of efficiency, maintainability, and portability needs to undergo further testing.

➢ *Alpha Test Results on the Quality Attributes of the Hazard Safety Tips Mobile Application*

Alpha test done with respondents of twenty core faculty members who were expert in system testing. Before the rating, the researchers explained first on how to rate the application using the Android Application and explain each criterion. During the testing, most of the second-year students appreciated the application performance and being user friendly, but some has different suggestions with regards to the application.

- *Summary of Alpha Test.*

Table 5 illustrates the summary of Alpha test on the quality attribute of the Hazard Safety Tips Mobile Application.

After the successful testing of the second-year students, the computation of all criteria of alpha test was also done. The result of the six criteria was added to obtain the overall mean. Based on the suggestions of the second-year students, the application's interface was changed into material design which is attractive and the fonts was changed into Roboto, a Google themed font style that matches the material design and is readable. This means that the application is now ready for beta testing in which the respondents of the system will test the efficiency and functionality of the system.

Table 5. Summary Of Alpha Test For Hazard Safety Tips Mobile Application

| Criteria | Mean | Interpretation |
|---|---|---|
| 1. Functionality | 4.01 | Very Good |
| 2. Reliability. | 3.98 | Very Good |
| 3. Usability | 4.03 | Very Good |
| 4. Efficiency | 3.97 | Very Good |
| 5. Maintainability | 3.95 | Very Good |
| 6. Portability | 3.99 | Very Good |
| **Overall Mean** | **3.98** | **Very Good** |

In the criteria of "Functionality", it obtained a mean score of 4.01 and interpreted as Very Good. "Reliability" obtained a mean score of 3.98 and interpreted as Very Good. "Usability" obtained a mean score of 4.03 and interpreted as Very Good. "Efficiency" obtained a mean score of 3.97 and interpreted as Very Good. "Maintainability" obtained a mean score of 3.95 and interpreted as Very Good. "Portability" obtained a mean score of 3.99 and interpreted as Very Good. The grand mean score of the quality attribute of the system was 3.98 and interpreted as Very Good. This means that the developed application in terms of maintainability needs further testing.

➢ *Beta Test Results on the Quality Attributes of the Hazard Safety Tips Mobile Application*

Beta test was done at the municipality of Salcedo Eastern Samar. The respondents of the test were the citizens of Salcedo, Eastern Samar who are the end user of the system. The respondents run the application and observed its technicality and functionality. The same score card was used to rate the application but before the rating, the researchers explain first every criterion of the score card. It will help the citizens of Salcedo, Eastern Samar in preparing for a hazardous time.

- *Summary of Beta Test.*

Table 6 presents the summary result of Beta Test on the quality attribute of Hazard Safety Tips Mobile Application.

After the Beta test, the computation of all criteria was done. The result of the six criteria was added to obtain the overall mean of the beta test. Based on the results of the test the application performs its accurate functions and is well designed. After Beta testing the researchers look forward to the

recommendations of the respondents. The application has been improved and updated. All the criteria evaluated gained a mean score of 5.00 and interpreted as Excellent. The grand mean score of the quality attribute of the system was 5.00 and interpreted as Excellent. This indicates that the application is functional, reliable, usable, efficient, maintainable, and portable.

Table 6 Summary Of Alpha Test For Hazard Safety Tips Mobile Application

| Criteria | Mean | Interpretation |
|---|---|---|
| 1. Functionality | 5.00 | Excellent |
| 2. Reliability. | 5.00 | Excellent |
| 3. Usability | 5.00 | Excellent |
| 4. Efficiency | 5.00 | Excellent |
| 5. Maintainability | 5.00 | Excellent |
| 6. Portability | 5.00 | Excellent |
| **Overall Mean** | **5.00** | **Excellent** |

*B. Usability Testing*

The usability test followed after the acceptance testing to ensure that the created system adhered to the specifications and was prepared for implementation. The System Usability Scale (SUS), developed by Digital Equipment Corporation in 1986, was used by the respondents to gauge how well a product enables users to achieve their objectives. SUS has established itself as a dependable and strong evaluation instrument. It has a strong correlation with other arbitrary usability measurements.

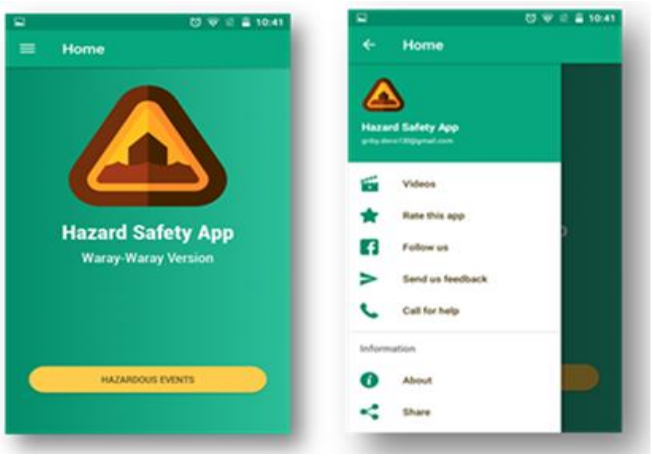
To calculate SUS score, first add the score contributions from each item before calculating the SUS score. The score contributions for each item will range from 0 to 4. The scale position minus one is used to calculate the score contributions for items 1, 3, 5, 7, and 9. The contribution for items 2, 4, 6, 8, and 10 is 5 less the scale position. To determine the overall value of SU, multiply the total score by 2.5. Anything with a SUS score of 68 or higher would be deemed above average, whereas anything with a score of 68 or lower would be considered below average. The chosen locals of Salcedo, Eastern Samar served as the system usability test evaluators. The application gained 88.75 SUS Score which means that the developed application is usable already.

Table 7 System Usability Results Of The Hazard Safety Tips Mobile Application

| Statement | Mean | SUS Score |
|---|---|---|
| . I think that I would like to use the application frequently | 3.5 | 2.5 |
| . I found the application unnecessarily complex | 1.0 | 4.0 |
| . I thought the application was easy to use | 3.5 | 2.5 |
| . I think that I would need the support of a technical person to be able to use the system | 0 | 5.0 |
| . I found the various functions in this application were all integrated | 3.5 | 2.5 |
| . I thought there was too much inconsistency in this system | 1.0 | 4.0 |
| . I would imagine that most people would learn to use this system very quickly | 4.0 | 3.0 |
| . I found the system very cumbersome to use | 0.5 | 4.5 |
| I felt very confident using the application | 3.5 | 2.5 |
| I needed to learn a lot of things before I could get going with this system. | 0 | 5.0 |
| SUS Score | | **35.5** |
| Overall SUS Score (SUS Score *2.5) | | **88.75** |

*C. Screenhots*

Fig.3 (a) and (b) show the Home Interface. This interface is the first activity to be prompt after the splash screen. In this interface the user can navigate to the Hazardous Events Options, Open the Navigation Drawer, and Exit the application.




(a) Home interface (b) Navigation Drawer

Fig. 3. Home Interface and Navigation Drawer

ISSN No:-2456-2165

Figs. 4 (a) and (b) display the interfaces of the Hazardous Events Options. In this interface you can select your desired Hazardous Events and prompts safety tips for each event.


(a) Hazardous Events (b) Safety Tips

Fig 4. Hazardous Events and Tips

## IV. CONCLUSION AND RECOMENDATIONS

Based on the results of the study conducted, the following conclusions were drawn: 1.) The developed Hazard Safety Tips Mobile Application is functional and usable enough for the residents in Eastern Samar since it has undergone several testing strategies with different evaluators, and 2.) Another study may be conducted to examine the effectiveness of the developed mobile application.

## ACKNOWLEDGMENT

The authors owed its esteemed status to the following individuals who in many ways had helped in the conduct of the study: Dr. Marina S. Apilado, Engr. Renato A. Padullo, Dr. Lito D. Lacaba, Ms. Charito B. Lacasa, Dr. Arvin Anthony S. Araneta, Ms. Mae Richelle L. Roca.

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