Mobile App for Public Safety

Dayanand Dyawarashetty, Karishma Saini, Jorgelina Alba, Danny Squicciarini, Charles C Tappert and Avery M. Leider
Seidenberg School of Computer Science and Information Systems, Pace University
Pleasantville, NY 10570, USA
Email: {dd6856p, ks04929p, ja47338n, ds15954p, ctappert, aleider}@pace.edu

***Abstract*—Our technocentric society has conditioned individuals to develop the expectation that emergency medical treatment will always be readily available during times of distress. Emergency medical responders are often pressured to provide services within areas too vast for their capabilities. This results in response times that are less than adequate. In the realm of lifesaving, minutes and seconds may determine whether an individual succumbs to their injuries or survives. The basic skills required to prolong the life of the majority of individuals who are suffering from a traumatic injury are not only within the grasp of emergency medical responders and medical personnel. The simple acts of performing cardiopulmonary resuscitation and applying pressure to wounds is taught to many individuals such as firefighters, police officers, military members, and other first responders. This effort will concern developing a mobile application with the primary goal of allowing individuals to report emergencies that involve patients suffering from traumatic bleeding wounds at high risk of exsanguination, as well as patients that are not breathing or who have a blocked airway. These reported emergencies will be forwarded to a network of certified off-duty professionals as well as first responders who are within the area of the patient and can expediently provide lifesaving measures before emergency medical responders arrive. The secondary goal of this application will be to provide first responders with a more accurate location of the patient in need by utilizing Global Positioning System technology.**

***Index Terms*—Application, Flutter, Medical Emergency, Public Safety**

I. Introduction

Recent technological advancements have an impact on almost every aspect of an individual's daily life. The daily activities impacted by technology vary from communication, transportation, commerce, to how the environment within your home is controlled. Technology has made open access to the internet and related information systems commonplace in nearly every corner of the planet regardless of the area's socioeconomic condition. In recent years there has been a documented rise in the number of individuals who are living within developing and emerging nations that are owning smartphones for the first time and regularly using the internet according to surveys conducted by Pew Research Center [1].

The commonplace availability of technologies such as internet connected smartphones, tablets, and smartwatches have farther reaching potential to serve the world's population over simply being used as convenience and luxury devices. Most individuals use mobile applications for communication, entertainment, and convenience. This undeniable truth is braced by the popularity and cultural significance placed on applications such as Facebook, WhatsApp, and YouTube. Bohmer et al. [2] concisely stated that mobile phones and their applications have become "increasingly analogous to a Swiss Army Knife" in that they are capable of bringing an ever expanding array of applications and features to their users that can be utilized in all aspects of their daily lives. Despite the wide array of applications available today, very few are designed with the specific goal of increasing public safety and promoting the preservation of life.

This research effort will focus on the creation of a mobile application with the explicit goal of becoming a tool that facilitates the delivery of immediate lifesaving medical treatment to individuals in need. The application will serve as a method of crowd-sourcing immediate medical treatment from vetted and certified professionals who have been trained to provide such assistance before emergency medical responders arrive.

II. Literature Review

Emergency can happen anywhere, and the world today is in a state where accidents have reached an alarming level. Therefore, there is a need to develop an app that solves this problem. In that regard, this paper looks at the literature analysis of various emergency response apps to come up with an ultimate public safety App.

The study by Jahanshir et al. [3] sought to establish the degree to which smartphones, as well as medical applications, have been integrated into the emergency department's everyday use. To achieve this, the study uses a standard questionnaire with demographic data as well as information concerning the quality and quantity of a medical app and smartphone use, which was sent to medical practitioners and interns. According to the result of the study, the use of smartphones is popular with interns as well as residents in the emergency departments. A significant number of them have a smartphone, so they are using apps regularly in their medical practice. However, the study by Sarlan et al. [4] was aimed at reporting the development of an Emergency Accident Alert mobile application used to send accurate alerts as well as a notification of emergency of an accident to the emergency call center. The methodology of the research involved Rapid Application Development strategy to come up with mobile phones by using a phone gap, CSS, HTML, JQuery, and JavaScript. It was then followed by a usability test carried out on 35 respondents to determine the acceptance of the apps based on the top ten heuristic principles. Based on

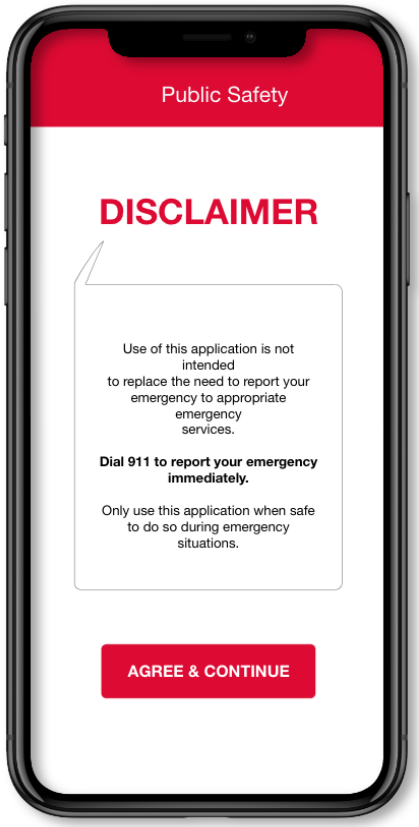

Fig. 1. Disclaimer Page for our App

the findings, there has been an emergency Accident Alert Mobile application, which has been effectively developed. It incorporates the ten heuristic standards to send notification and alert to emergency centers successfully.

The article by Nass et al. [5] presents an app known as RESCUER, which makes it possible for its users to be part of the emergency response. It achieves this by giving information and receiving instructions concerning emergency to a command center. They then go ahead to develop a human interaction model for emergencies so they can have a clear comprehension of the capability of human-computer interaction of people who are in an emergency [5]. Using the model, the authors define the interaction modes that include chat interaction, one-click interaction, as well as guided interaction. Those interaction models were actualized in an intuitive model, and their assessment was done in an examination where the psychological burden was induced so it could reproduce a distressing circumstance that was the equivalent to the stress experienced in an emergency. The outcome of the examination indicated that the three interaction modes made it workable for individuals to communicate with the application despite being in a stressful condition.

On the other hand, the study by Spies et al. [6] was the principal period of improvement as well as testing of an automated clinical decision support system (CDSS) device that can be utilized in controlling emergency treatment. The instrument is a mobile application that can help an untrained healthcare worker to offer essential crisis care to patients who cannot get emergency care or those who do not have access to emergency care. The tool will offer assistance, so the user is not supposed to be knowledgeable.

The study by Sakriya and Samual [7] looks at an android based mobile application project that is intended to revolutionize how people are calling an ambulance. The app has been designed to be reliable and efficient for emergency medical services (EMS). The app has been designed to help its users access the available ambulance without necessarily having to call hospitals to inquire about an ambulance. The app has been designed to react with a single tab on the button. That way, it will be able to send the notification concerning the user details as well as location using GPS to the closet ambulance center. It will be the duty of the authority to approve the requested notification, and then a GPS location will be sent to the user's location.

Tan et al. [8] conducted a review to determine the involvement of mobile apps in crisis informatics literature as well as to look at the opportunity of further research. The results of the study showed that communication, which occurs during disasters, is more dispersed between the public and authorities. On the other hand, the study by Sukhwani and Shaw [9] looked at the state of 33 disaster-related apps in India. The result of the study showed that most of the apps were primarily educational so their general outreach has a huge limitation thus a need for GPS based apps.

A study in Ireland was conducted in order to measure ambulance response times to emergency calls within the nation. Nick Breen et al. [10] conducted this study by performing a national survey designed with the goal of collecting response time data concerning emergency calls that ambulance services within the nation were responding to. The study encompassed all nine ambulance services within Ireland for a period of one week. Key pieces of data collected included the type of emergency, the time of ambulance arrival and departure from the emergency scene, the location of the emergency, and the distance from the ambulance base of operation. The study concluded that ambulance response times were often unsatisfactory due to ambulances being utilized for non-urgent emergency medical transports. The study suggested the establishment of priority-based dispatching protocols in order to reduce the response times to true emergencies.

Emergency service response times are directly impacted by the remoteness of the areas which are receiving the services. This reality was discussed in a research study authored by Thomas Lambert and Peter Meyer [11] in which they examined suburban and exurban emergency response times and the quality of such services provided compared to those within urban areas. The study addresses the relationship between response times and the likelihood of individuals surviving critical injuries when reached expediently by emergency medical services. It is noted by Lambert and Meyer [11] that the sizeable 70 percent decline in the murder rate since the 1960s

has been largely attributed to the more widespread availability of emergency medical services.

Emerging and developing nations have been experiencing a steep increase in the number of individuals who are now able to access the internet and own connected devices such as smartphones, tablets, and smartwatches. This information gathered by Pew Research Center indicates that as individuals within these nations increase their wealth and education levels, the frequency in which they use the internet and own smart devices increases in tandem [1]. This information speaks to the probability that the application researched and developed within this effort will have far reaching benefits to individuals within emerging and developing nations where timely emergency medical services may not be readily available.

III. Project Requirements

As of today, all are using the Internet-connected devices and which has changed the way users are interacting with media, exchanging their role from passive and unidirectional to proactive and interactive.This document explains the high-level technical and functional requirements, and provides information about the roles and responsibilities needed to support such mobile app named "Public Unity".

This mobile APP service is enable people to share intelligence about daily nearby incidents in the city. By sharing their ciritical incident experiences may help others safety and also connect with fellow peoples and enhance public services. As this system capture all nearby reported incidents and provide notification to others based on thier location. So, it helps to stimulate communication, cooperation, reciprocity and social cohesion between all users in order to make the app useful.

Based on the insights of the qualitative research on user's needs, we have highlighted all User stories. In order to implement, this document is serve as the starting point for development by the project team.

Flutter :- Flutter is Google's mobile app SDK which have complete features with a framework, widgets, and tools. Its easy to build and deploy fast and also development can done on both Android and iOS platforms simultaneously.

User Authentication :- Flutter provide Authentication libraries as a common task put on mobile apps.

Dart language:-Dart is Google's modern programming language since 2011.Its intermediate with Object Oriented Programming and Generics.

FireBase :- To setup and store CRUD Operations.

GeoLocator/Geolocation Plugin :- This Flutter geolocation plugins helpful to track specific location of provide notifications on nearby incidents.

The Figure below display the process of the building the application using Flutter. Flutter consists of widgets that allows developers to build contents using widgets. From the diagram below, begins with the Material App widget that displays the navigation portion of the application. Next is the contents for the home screen, then the Scaffold widget and then it's divided into two parts. The AppBar and the Center alignment for the text for the Home screen application.

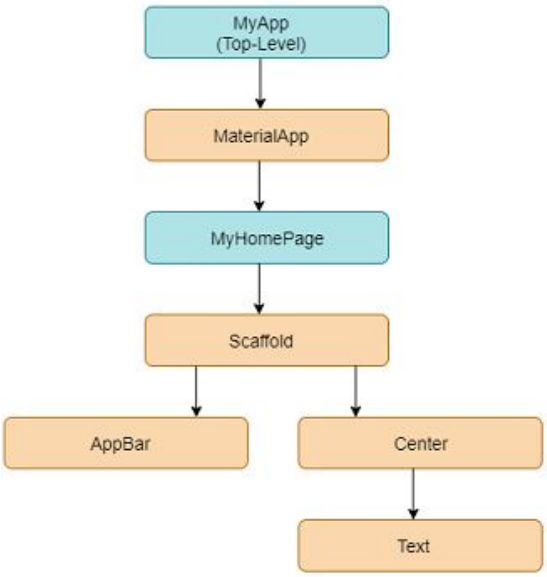

Fig. 2. App Flow Diagram

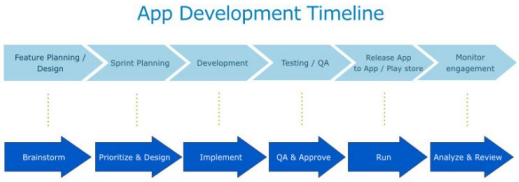

Fig. 3. App Processing Project Timeline

A. User Stories

User story is a concept used in Agile software development to capture a description of a software feature from an end-user perspective. The story describe the type of user, what he or she want and the reason. The user story allows developers to understand the requirements needed for building the application. User stories are structured in the following ways.

- Epic
- User Stories

An Epic is known for the overall big story or large bodies of work that can be broken down into smaller stories. The user story template is, as a **user type**, I want **his/her goal** so that **benefit**.

Epic: ***Managing User Profile***

User Stories:

1) As a civilian user, I want to be able to easily edit my profile and privacy settings.
2) As a civilian user, I want signing up for the application to be easy to accomplish.
3) As a professional user, I want to be able to adjust the distance of emergency alerts in order to receive only

near-by push notification emergency alerts.
4) As a first responder user, I want to be able to only receive emergency alerts within my area of responsibility.

Epic: ***Reporting an Emergency***
User Stories:

1) As a civilian user, I want to be able to report my emergency quickly and efficiently while under stress.
2) As a civilian user, I want my location to be shared with professional users in order to receive near-by assistance.

Epic: ***Responding to Emergencies***
User Stories:

1) As a first responder user, I want a push notification to alert me to emergencies within my area of responsibility.
2) As a first responder user, I want each reported emergency event to be mapped and to receive navigation guidance to the location.
3) As a professional user, I want to receive push notifications concerning emergencies within my area so I could provide assistance.

IV. Figures and Tables

The table below explains the Good Samaritan Law under specific states.

Good Samaritan Law Protections by State		
State	**Code Section**	**Protection from Civil Liability**
New York	NY PBH 3000-A	Yes
Texas	TS 74.151	Yes
California	HSC 1799.102	Yes
Florida	FS 768.13	Yes
Pennsylvania	42 Pa.C.S.A. 8332	Yes
Illinois	745 ILCS 49/1	Yes
Ohio	ORC 2305.23	Yes
Georgia	OCGA 51-1-29	Yes

Fig. 4. Good Samaritan Law Protections by State

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