Project Proposal Document

COMP8117-2021S-Team11

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1. Project Description

1.1.   Document Objective

This document focuses on the objectives and requirements of the project. It serves as a key management tool for the implementation of the project. This document proposes a mobile application, SAS (Safe Society) that is compatible with both android as well as iOS platforms. The purpose of this is to design a system based on Machine Learning which will assist towards a better approach to defining society's safety. This document provides all general information about the proposed project including functional and non-functional requirements, market and cost analysis, target audience, prototype, and Quality Assurance Plan.

1.2.   Project Proposal

Sexual assault and harassment are persistent forms of gender-based violence that are rooted in gender inequality. The number says that sexual assault is the only violent crime in Canada that is not declining. Canada has an abhorrent record of accomplishment in all forms of sexual exploitation. In homes, on streets, in public transports, and even offices, people especially women are in a constant state of vigilance, like a country on terrorist alert. Its impact goes far beyond survivors, dealing with the aftermath of sexual assault costs billions of dollars every year. With the growing number of harassment and violence cases prevailing in society, the security of people has become a major area of concern.

Freedom from violence is essential for everyone. So, to curb the atrocities against the group of people especially women and the LGBTQ community can be now ended with the help of an application called SAS. The purpose of this project is to design a system, or an application based on voice recognition which will help to create a safe and secure society by detecting the distress sound(signal) of victims and then after it will give details of

victim's location to the emergency contacts mentioned in the application by the user. A siren sound is also integrated with the message that plays upon arrival of the message onto the rescuer's mobile phone. The application will also have a feature that displays the live location in Google maps.

1.3.   Project Goal Overview

In a distress situation, the mobile phone can be the best protector of the victim. But sometimes it is difficult to press the button in a critical situation when the keypad is locked. The current safety applications prevalent in the market have the functionality of pushing the button to send a message. With a speech recognition-based smartphone app that is supposed to be running on the user's device in the background using minimal resources possible the user can easily call out for help in an emergency. Message can be sent even if the keypad is locked. This declines the violence happening worldwide.

Our proposed application has the above-mentioned diverse feature that makes it stand out amongst the other existing applications. A complete solution for voice command recognition and emergency detection based on audio signals entirely integrated into a low-consuming embedded platform is defined in the system. In addition to this, it also combines an active operation mode where distress calls are captured.

Facilities of the application include sending the emergency (SOS) signal or an offline simple message to registered emergency contacts that have been provided by the user. A message consists of GPS location information of the victim. The rescuer can acknowledge the message and it will be notified to the victim. The live location that is provided by the system can help the rescuer to reach toward the victim and there is a siren also that is continuously active and can be turned off by the victim only.

Not only does this help individuals possessing this technology, but it will also help collect data from users and classify threats at various locations, classifying the threat regions from the database. This can hopefully reduce the number of criminal activities against a particular community of people to a greater extent. This system will provide a chance to live a stress-free life by assuring them their security.

1.4.   References

- https://canadianwomen.org/the-facts/sexual-assault-harassment/
- https://www.canada.ca/en/employment-social-development/services/health-safety/reports/workplace-harassment-sexual-violence.html
- https://www.javatpoint.com/software-cost-estimation
- https://www.app-press.com/blog/whats-the-cost-to-maintain-an-app
- http://www.businessworld.in/article/10-Safety-Apps-For-Women/12-06-2018-151793/

2.   Market and Cost Analysis

2.1.   Market Analysis

Market analysis is a crucial step in software development as it gives the details about current market conditions in which the software is going to be launched. Through market research and analysis, the project director and the developers could get an idea of what customers are interested in and identify the gaps in customer expectations. The table below shows the details about the application already present in the market. These details include Unique Selling Point, Customer Base (number of downloads), and how these applications do not fit in our customer's expectations.

Sr. No.	Application	USP	Customer Base	Customer Expectations
1	Shake2Safety	App sends SOS message to emergency contacts saved for the victim on shaking the phone or pressing the power button 4 times, also sends the location of the victim.	100K+	As the customer requested our SAS app responds to the voice keywords of the victim directly and sends the notification as well as SMS with live location details to contacts every 60 seconds, so Shake2Safety app does not satisfy the need of our customer.
2	SOS Alert | Emergency & Safety App	This app sends the SOS message when victim presses the SOS widget or button, as soon as the victim presses the button countdown of 3 seconds starts immediately, the alert can be cancelled before the countdown ends.	10K+	In our app emergency contact can acknowledge the alert and inform the victim that he/she is on the way to help the victim, this feature was suggested by the customer during the project proposal meeting which will be incorporated in our app. SOS alert app does not provide this feature.

| 3 | Chilla: Women safety app with scream detection | This app can be triggered by just a sharp scream and sends the SMS with location to the emergency contact. | 10K+ | Our app gets triggered with voice keywords by training the deep learning model and we have kept the high-pitched sound detection for future enhancement as this feature requires high accuracy which requires time more than 10 weeks (about 2 and a half months). Our app is not confined only to women but applies to all users who feel unsafe. Extra features include an acknowledgment from emergency contact. |

Based on the research on existing application limitations and customer feedback we have incorporated the needs to make the application different and better from the above existing applications.

2.2.   Target Users

The target users of any application are the customers for whom this application is being developed. The user classes distinguishing this application's working are as follows.

This application is to ensure the safety of everyone including teenagers and adults. The main feature of this application is that it does not differentiate between emergency contact and victim, i.e., in some cases, emergency contact can also be a victim and a victim might also be someone's emergency contact. Future enhancements also include different organizations such as non-profitable companies that can have access to the application as a user.

2.3. Unique Selling Point

- Safe Society Application is based on machine learning which triggers an SOS alert on recognizing keywords from the user. This SOS alert will be sent to all the emergency contacts of the user.
- In case the voice recognition method does not work as expected, the victim can press the SOS button manually to send a notification or alert to all the emergency contacts.
- Moreover, when the emergency contact receives the SOS alert, he/she can acknowledge the victim that they have seen their alert and coming for help.
- The victim can also notify the emergency contacts once he/she is out of danger, or the risk has been mitigated.

2.4. Market Risk

Technology is booming and changing rapidly all over the world for the last few years. Hence, the application should be suitable and working on every device. Looking forward to the future enhancements, the application will expand and will band together with multiple users leading to an increase in the usage of the application. The maintaining of the paid storage of the databases would be a challenge and handling the cost of the storage will be a risk in the market.

2.5. Cost Analysis

Cost analysis is used to find out the rough cost of the software to be developed. It is a financial cost that is spent on the areas and efforts to develop, design, and test the software during the software development life cycle. This estimation is needed before the development is started and has several methods involved with some principles. The

process of predicting the number of efforts is expressed in terms of hours spent on developing and maintaining the software based on uncertainty and incompleteness.

Estimation of expenses:

The cost based on building and developing the application so far have been calculated as follows:

- **Development Cost:**

   Currently, a team of 8 software engineers is working on the development and documentation of this application. Considering yearly salary of one software engineer as 60k CAD.

   Time of developing mobile application – 10weeks (about 2 and a half months)
   Average salary of engineer per month – 5000 CAD
   Total salary of 8 engineers per month 5000*8 – 40,000 CAD,
   10 weeks (about 2 and a half months) project - 40000 * 2.5 = **100k CAD**

- **Licenses:**

   JIRA license for deployment and checking the development - 140/month - **350 CAD** for   10 weeks (about 2 and a half months).

- **Firebase real-time database:**

   For storage - $5/GB
   For downloading - $1/GB
   For hosting - $0.026/GB (Storage), $0.15/GB (360MB/day)
   Maintenance cost and modifications as when needed are decided based on the development process where things like performance requirements, changes in design, new devices coming into the market, the new operating system being launched are some reasons for having app maintenance. So, the maintenance cost is necessary, and it takes up to 20% of the cost of the first development.

3.   Requirement Analysis

3.1.   Feature List

Sr. No.	Feature	Description
1	Signup	User will be able to register in the Society Safe Using their Email. User's Phone number is necessary to allow Application to send SMS on phone. App will ask for emergency contacts so they can be contacted in emergency. • Email • Password • User's Contact Number • Emergency Contacts
2	Sign in	User can login with registered Email. User can login through Google • Email • Password • Sign in using Google.
3	Forgot Password	Registered users can reset Password.
4	User Manual	User will receive proper instruction on how to use the application.
5	SOS Voice	• User can tap on a button to start recording and activate voice recognition algorithm. • User can tap on button to stop recording. • If probability of user being in danger is high, then Safe Society will invoke a send notification method.
6	Send Notification method	• On detection of danger in SOS Voice, this method will be invoked and send a notification to emergency contacts with location of the user. • Recipient will also get a SMS, if user is in danger. • User will get a toast message if the emergency call message has been sent. • Recipient can acknowledge the notification via Safe Society application. User will receive an acknowledgement message if the recipient has acknowledged the notification.

7	SOS Button	• This feature can be invoked manually by the user if SOS voice failed to detect danger in voice. User can Press the button to invoke Send notification method.
8	False Alarm	• If the user has accidentally clicked on SOS button, then this feature can be used to notify recipients that user is out of danger.
9	CNN Algorithm	• Safe society will be integrated with Convolution neural network algorithm to detect danger. • Algorithm will detect key words like "help," "help me," "SOS" etc. • Algorithm will return probability of each word. • Algorithm will be equipped with a class to detect background noise.

3.2. User-role Specification

Common Functionalities:

- Initially, users are required to register themselves and then after login to use our services.

- The application will run in the background if it is enabled by the user.

- The permission for location, microphone, sending messages is required to be granted.

- It will continuously monitor the microphone, looking for the pre-defined word.

- A normal SOS TEXT message with location will be sent to emergency contacts number if they do not have our application.

- If the rescuer has our application, the SOS message will arrive on phone integrated with the siren sound as well as with the google maps showing the live location, if they are connected to the internet.

Rescuer Functionalities:

- Predominantly, upon arrival of the SOS message, the rescuer will be having 2 options to choose from:
    i.   Get live location of the victim.
    ii.   Call the victim.
- The rescuer is required to respond to the SOS message: Decline or Accept.
- The above-mentioned response will be sent to the victim's phone in form of a pop-up notification.

User Functionalities:

- The User will be able to stop or deactivate our service whenever he/she wants.
- The emergency contact number is to be feed into the application by the user.
- To avoid any mishappening to occur during a regular routine, an option is also given to the user to disable the application if he/she feels secure and safe in the area.
- Accidently, if the user speaks the pre-defined word but is in the guarded environment, he/she has the option to stop the SOS message within a predetermined timestamp through the button that will be provided for this purpose only.

3.3.   Technical Constraints

Technical Constraints	Tools
Mobile OS	Android and IOS
Languages	Dart, Java, Python, Objective C

Framework	Flutter, Tensorflow and Tensorflowlite
Cloud	Firebase realtime database
APIs	Google Maps APIs, Firebase APIs
IDE	Android Studio, Jupyter notebook
Version Control	GitHub
Additional Tool	Jira, Google dataset, Kaggle

3.4. Use Case diagram
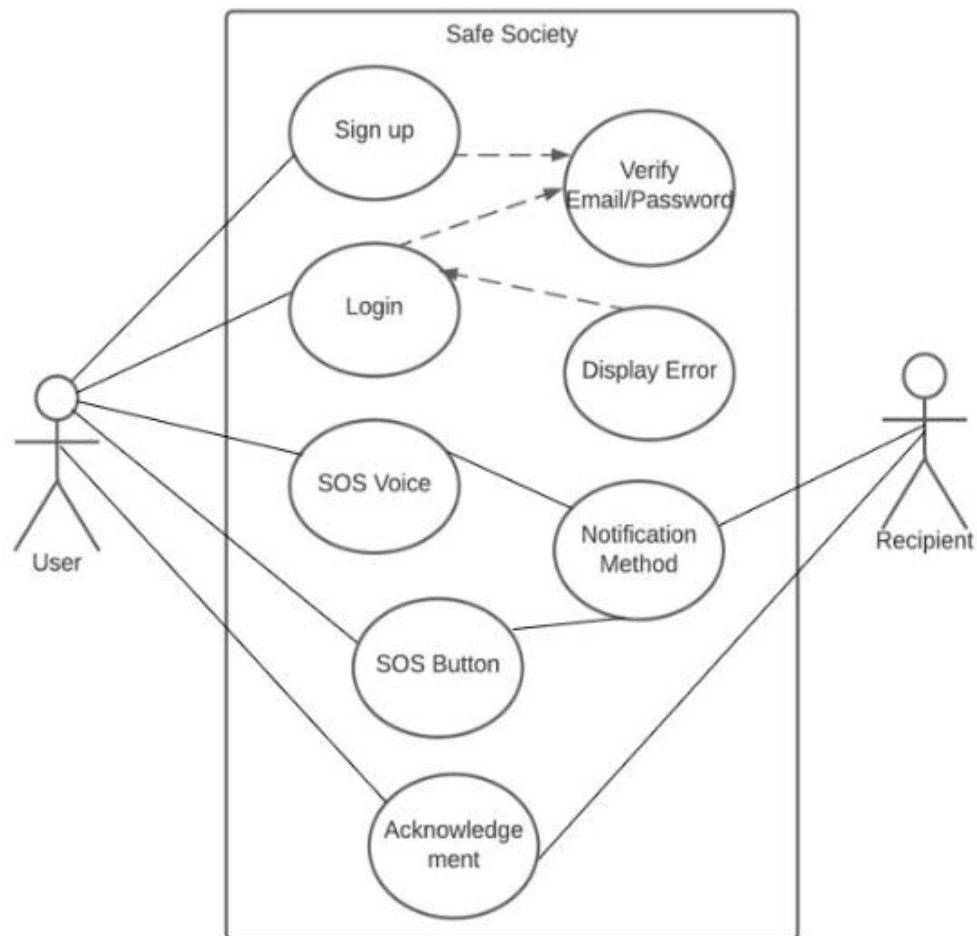
4. Quality Assurance Plan

4.1. Development Life Cycle – SCRUM

Scrum follows the Agile Method Principles of a software development life cycle. Its basis is to deliver small product increments in continuous sprint iterations. Its goal is to set transparency in communication while satisfying customer needs. Its emphasis is on software development and the continuous feedback from customers helps in adjusting to the need of the customer. The team before the sprint start date does a sprint planning meeting to consider features that can be done in a sprint.

4.2. Roles and Responsibility

Team Member	Role	Responsibility
Dipen Desai	Scrum Master	- Facilitates the scrum team in achieving the sprint goals. - Manages sprint activities such as sprint planning, sprint retrospective.
Bansri Thakkar Helly Patel Soham Shah Amardeep Singh Kush Darji Paramvir Desai	Scrum Team	- Team of developers, testers, and reviewers. - For each sprint, the team works on delivering the product increment. - Scrum team members are required to meet the Definition of Done. - The team needs to follow scrum norms.

Zorawar Singh	Product Owner	• Manages the Product Backlog • Specific Vision for the Product to meet its client goals. • Key member in sprint activities communicating the customer goals to sprint members.

4.3 Weekly Standup Meetings

Meetings will be considered every alternate day for 30 minutes and agenda points will be:

- Are we on track to finish the sprint stories on time?
- Any blockers/problems with the current assigned tasks?
- Each individual work to be discussed during this meeting.

4.4 Team Member Roles

Team Members	Role
Amardeep Singh	Frontend - Flutter, Dart
Bansri Thakkar	Frontend - Flutter, Dart
Dipen Desai	Backend - Python, Firebase
Helly Patel	Backend - Python, Firebase
Paramvir Desai	Frontend - Flutter, Dart
Soham Shah	Backend - Python, Firebase
Kush Darji	Frontend - Flutter, Dart
Zorawar Singh	Backend - Python, Firebase

4.5   Sprints

- Each sprint will be for two weeks.
- Conduct sprint review and sprint retrospective at the end of each sprint.
- Conduct Sprint Planning Meeting regarding Product Backlog.

4.5.1 Timeline

Sprint	Starting Date
Sprint-1	May 31st, 2021
Sprint-2	June 7th, 2021
Sprint-3	June 21st ,2021
Sprint-4	July 2nd, 2021
Sprint-5	July 16th, 2021

4.6 Risks

- As the team is new and we do not know the strengths and weaknesses of the members, it would be hard to design the sprints and meet the expectations.

- Since all the team members are located at various places, and most are new to the methodology, it would be difficult to implement it successfully.

4.7 Validation and Verification

- To deliver the product as described or committed, timely review and validation and verification are the two of the most important aspects of the life cycle.
- We are going to take a couple of measures to evaluate our development progress and direction.

- To maintain the track of development, all the progress and issues will be tracked on JIRA Projects under CP8117P11.
https://pmc.cs.uwindsor.ca/jira/projects/CP8117P11/summary
- For version control and as a code repository, GitHub repository has been created and will be maintained throughout the development cycle.
https://github.com/Zorawar920/sas_application.git
- Peer Review: A formal peer review system will be in a place where the development of one team member will be reviewed by any other member of the team.
- For validating and tracking the progress, below mentioned tests will be conducted.
→ Unit test
→ Integration test
→ System test

5.　Prototype of the application

The prototype of the application is as attached below. Please double click on it to read the full document or please refer to attached Prototype presentation.