A Mobile Application for Road Rescue Services

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An Information System Documentation Submitted to the School of Computing and Engineering Sciences in partial fulfillment of the requirements for the award of a degree in Bachelor of Business Information Technology.

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Declaration

I declare that this proposal has not been submitted to any other University for the award of a Degree in Business Information Technology. To the best of my knowledge and belief, the documentation contains no material previously published or written by another person except where due reference is made in the documentation itself.

Student Signature:

Sign: _____ Date: _____

Supervisor's Signature:

Sign: _____ Date: _____

Abstract

The Kenyan road system, as known by the citizens, has its advantages and disadvantages. Although the presence of the super highways and the Bypass has improved it quite significantly, the system still faces challenges in its day to day use. Some of these challenges are: traffic jams which are mostly caused by poor drivers who don't know or follow the traffic rules, having to carry bulky road safety handbooks and long response time during car emergencies that require road rescue services. This road rescue system comes to combat some of the above problems where the road users can have a mobile application platform where they can learn the basic road safety rules and also get access to various rescue services like tow car services or roadside assistance and contacting the traffic police in case they are needed. The application being mobile based makes it easily accessible than the web based ones as it can be accessed by a single icon tap on the screen. The system will be developed using an object oriented approach through the agile methodology. It will be developed using android studio as the integrated development environment and firebase as the database management system. The programming language will be java and CSS for styling and mark-up.

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Abbreviations

GPS - Global Positioning System

GIS - Geographic Information Systems

IDE – Integrated Development Environment

IOS - IPhone Operating System

KENHA - Kenya National Highways Authority

KTCIP - Kenya Transparency and Communication Infrastructure Project

NHTSA - National Highway Traffic Safety Administration

NTSA - National Transport and Safety Authority

OOAD - Object Oriented Analysis and Design

TMDD - Traffic Management Data Dictionary

TIMS - Transport Integrated Management System

TMDD - Traffic Management Data Dictionary

USSD - Unstructured Supplementary Service Data

Chapter 1: Introduction

1.1: Background

The Traffic Incident Management Handbook defines an incident as "any non-recurring event that causes a reduction of roadway capacity or an abnormal increase in demand." hence events like traffic crashes, disabled vehicles, spilled cargo, highway maintenance and reconstruction projects, and special non-emergency events (e.g. ballgames, concerts) are classified as an incident.

The roads in Kenya are built and maintained by the government through the National Transport and Safety Authority which was established through an Act of Parliament; Act Number 33 on 26th October 2012. The objective of forming the Authority was to harmonize the operations of the key road transport departments and help in effectively managing the road transport sub-sector and minimizing loss of lives through road crashes. The vision and mission of the authority are: To have an Efficient, Reliable and Safe Road Transport in Kenya and to continuously improve on Road Safety for All Users through Planning, Managing and Regulating the road transport system, respectively (NTSA, n.d).

Road safety in Kenya has been an issue of the years as several factors contribute to what makes it hard to declare them safe. These factors are summarized into one major factor which is the attitude of all road user (this is inclusive of motorcycles, cyclists and pedestrians). 'These people, choosing to ignore the rules, make it difficult for the authority to achieve its targets" said the NTSA director general, Francis Meja (2018) in an interview by Hussein Mohammed. According to the Highway code (2016) in Kenya, the norm is to drive on the left-hand side of the road and pedestrian to walk on the right side of the road. However, many locals drive on the wrong side of the road whenever they encounter a pothole or an animal in their way, posing a risk to those on the incoming lane.

Another factor that makes it hard to declare the roads safe is the conditions of the roads. The major roads around Nairobi, like the Thika-road highways and the Bypasses, are well-paved and constructed, despite lacking some features like traffic lights and road marks. The minor roads, still in Nairobi, have bad road conditions since they are not taken care of as often as the major ones. These minor roads are prone to have potholes and some even are not tarmacked. However, the road conditions are constantly improving, so one may encounter some roadworks along the way. The further you go from Nairobi, the more likely you will be to encounter less tarmacked roads and more unsurfaced roads. While a few unsurfaced roads may be in good condition, most roads in Kenya are notorious for their large potholes, rocky surfaces and rivers overflowing over them (S.M. Mwakubo et al., 2014).

Over the past few years, NTSA and KENHA have been coming up with solutions to curb these issues. Some solutions like the digitalization of the licenses, improve their tracking system. The authorities have also made improvements on the roads thus reducing the number of road accidents and increasing efficiency as time taken in transit is reduced. They also enforce some rules that are mostly forgotten by the road users like the use of safety belts for vehicle users and the use of helmets and reflectors for the motorcyclists and cyclists. They have also implemented various technologies to be used like the TIMS which is funded by World Bank through the Kenya Transparency and Communication Infrastructure Project (KTCIP). The NTSA Chairman, Jackson Waweru (2017), said in a statement that the agency will also roll out new smart driving licenses. "The new DL will have a biometric system that will facilitate capturing of driver details with the aim of profiling them. This data will help the Authority and any other interested institutions profile drivers based on their behavior and driving history," he said. He also said that the smart driving licenses will tame repeat offenders and good drivers will be rewarded.

The participation of private sector, civil, International organization and society organizations in road safety activities, has been on the rise in the recent past, but there is need to streamline their activities to achieve maximum impact. (Draft National Road Safety Action Plan 2015 - 2020).

1.2: Problem Statement

There has been challenges that road users experience in cases of emergencies that require rescue services like vehicle breakdowns for motor vehicle users, where they have to know someone who has a towing car or has the contact of a traffic police officer who if lucky is around the area you are. These challenges have a significant impact if not solved in time lead to traffic jams mostly around the rush hour period leading to costly travel delays, wastage of time as people try pushing their cars, secondary crashes, hazards for involved motorists and incident responders, air pollution, waste of fuel and can also lead to chaos when the people involved in an accident don't come to an understanding or reconciliation.

In most countries, during a road emergency, they advise motor vehicle users to turn on their hazard lights, get off the roadway, exit the car with caution and try fixing some of the issues. In Kenya, the same advice is followed according to the highway code by NTSA (2016). This however is not the best solution to every moto vehicle user since some aren't knowledgeable with cars or don't have the tools for the job and hence end up asking for help. With the rise in cases of car theft under such situations where people pretend to have car trouble, getting help is often hard leaving people with no help since leaving the car by the roadside is also a risk. The police can also be called depending on the severity of the emergency like serious car accidents.

The proposed system comes in to help curb this situation since calling for help or road rescue is now done by a touch of a button. This can be done by the victims involved and if not possible, the nearby pedestrians can also help. The system being a mobile application makes it easier to access and can have more functionalities as opposed to it being a web based one.

1.3: Aim

This system aims in making it easier for road users to receive recovery services to the location of their choice without much hustle and stress by providing simple step-by-step guidance on how to request for the services. The system solves the problem of accurately tracking where an incident has taken place, requesting of the necessary rescue service and also provide the relevant information on road safety and emergency handling.

1.4: Objectives

1.4.1: Specific Objectives

i. To analyze challenges experienced by road users in case of an emergence requiring a rescue service.
ii. To review existing technologies and applications used to handle emergencies that require rescue by road users.
iii. To design and develop a mobile-based application for connecting roaders to rescue services within a location where they need it.
iv. To validate the application using real data.

1.5: Justification

This system being a solution to an existing problem in the road sector as a valid and comprehensive tool in solving specific problem areas in the sector to improve efficiency. For example, the road users, being a beneficiary will have a tools that makes it easier to get the rescue services they seek despite of their location. The system could also be integrated with a real-time tracking system making it easier to know and estimate the arrival times of the services, traffic information media where the road users can be updates on any major road incidents so to avoid those routes. The system could also assist with navigation and avoidance of traffic incidents.

The government can also be a primary beneficiary since the major road infrastructure belongs to them. This system can make it easier for them when it comes to managing traffic jams caused by road accidents where they have a system that could help reduce the time taken to remove the cars involved in the emergency from the road hence opening up the traffic there. The government could also use the system as a medium of sharing the road rules and regulations as having them integrated in the system makes it easily available as compared to the booklets which can be bulky at times and are prone to be damaged when wrongly handled because they are made of paper, this is also environmental friendly.

1.6: Scope & limitation

This system is set to cover all the bases of the specific objectives. Some of the limitations of the system is getting the services the system offers to remote places or places with poor network coverage. Another limitation involves people who don't have smart phones since they can't access the application. Another limitation involves the officers and towing guys' response time, their ease of accessibility and their level of preparedness when called upon.

The system, being mobile based, could also contribute to road accidents since use of mobile phone while driving is against the laws since it's a major contributor to car accidents.

Chapter 2: Literature Review

2.1: Introduction

This chapter is focused on the work done in reference to various rescue services and traffic management systems. The review also focuses on the success and failures of the previous works on the topic and also narrows down to the improvement areas of such projects, where potential for growth and bigger developments exists. This chapter also looks into how various countries and organizations have implemented such systems, the trends in mobile technology with reference to road transport and the adaptations of such systems in other industries.

2.2: Challenges experienced by road users in case of an emergence requiring a rescue service

There are some challenges that require rescue services like in the case of a car trouble like tire punctures mostly when its more than one tire with a puncture. Although this is rare, if it happens one is left with no option unless they leave their car which is a security risk and get one tire fixed. This can happen since most personal cars have only one tire as a spare. Minor mechanical issues are another challenge and according to the latest data from the National Highway Traffic Safety Administration (NHTSA), mechanical failure plays a significant role in the number of car accidents and injuries (Singh, 2015). Some of these issues are like the steering or brake issues which can be addressed there on the road first. The roadside assist rescue services can act as a first aid before one decides to take the car to their mechanic. Minor police intermediation where the participants are unable to come to an agreement after an accident and hence seek the mediation of a police officer as per the traffic act (Kenya Law (2012) however they don't want to draw too much attention to the case. Calling the police via their call center can often take time and draw unwanted attention. Access to the right emergency services on time is also a challenge as someone in an emergency or incident can often struggle knowing the numbers to call for services like the roadside rescue and where they are exactly. This can lead to a lot of time wastage and can lead to the emergency getting out of hand or escalation.

2.3: Technologies and Applications Used to Handle Emergencies

There are various existing systems that are used to handle emergencies like the Geographic Information Systems (GIS) which is an analytical mapping technology that helps in understanding where hazards are located, how many people are affected and what response is needed. "GIS models and simulation capabilities enable decision-makers to both exercise response and recovery plans during non-disaster times and also understand near real-time possibilities during an event." (Susan L. Cutter,2014). Another existing system is the Emergency Communication Application like the FEMA app where the USA users can receive weather reports, locate emergency shelters, and even upload their own photos of a disaster to help responders better understand the threat. The app offers tips for handling over 20 types of emergency situations and disasters.

2.3.1: Technologies and applications used to handle emergencies

Some examples of systems used to handle emergencies are the; Global Positioning System (GPS) which is a satellite navigation system used to determine the ground position of an object. This technology is useful when trying to get the accurate location of where an emergency is. Another system is the traffic monitoring systems which can be used during emergencies to get the fastest and clearest routes to and from an emergency site. As compares to the GPS, the monitoring systems give out more real-time data since they have sensors on the actual roads.

2.4: Current rescue services & incident management systems

Actions based on improving and reducing the impact of road emergencies must rely on information provided for by the Road Safety Information Systems since many countries have different databases, owned by national agencies for road safety but supported by other information from other agencies and actors (Yalcinkaya, 2007). The author goes on to say that some of the critical information for traffic policing involves the drivers and their behavior, types of vehicles involved and their conditions, road conditions, weather, traffic intensity and the location of the accident or incident.

In Kenya, a majority of the people contact the police by either physically going to the station or contacting them via their private phone numbers. This however created issues and delays such that if one doesn't have the private numbers, they have no other choice but to go physically to the station. This is in accordance to the fact that the police must be contacted in case of any road accidents, to inspect, talk to the involved parties and write up an accident report (Traffic Act CAP 403, 2015). These reports are beneficial while filing a claim. This also applies to other rescue services like towing services and roadside assist where one has to have their phone numbers to contact them.

Police Act 84 of 2010 of Kenya stipulates "It shall be the duty of the Force to regulate and control traffic and to keep order on and prevent obstructions in public places, and to prevent unnecessary obstruction … "hence they have to use appropriate traffic management techniques to restore normal operations and to prevent the effect of congestion from spreading elsewhere.

2.5: Related Works

This proposed system has some similarities with other system in terms of objectives and how various objects interact. Uber services (2009) and Taxify are one of the systems since they were created to make commuting easier within some areas. It involves a mobile application where one can order/hail for a cab and even register as a driver (Robbins, 2011). Contacting the police using their main emergency line (911,999) is another legacy system that is used till today, one can call the police and the relevant steps and actions are taken from there. The main advantage of this system is the use of USSD but has its disadvantage where all calls go through the call center of the police which can result in a single point of failure. In the case where a police officer is needed to mediate maybe during the small car accidents, people often prefer not to call the emergency lines but rather to contact the nearest police. The MySOS application is another south African emergency application that links the users to various emergency service providers. It offers emergency SOS assistance in case of a medical, rescue, fire, police, security or roadside emergency (Dr. Fanie Hattingh,2013).

2.6: Architecture for A Mobile-Based Application

This is a set of technologies and models for the development of fully-structured mobile programs based on industry and vendor-specific standards. The most popular architecture is the three-layer architecture which consist of the following:

Presentation layer – contains the user interface and its process components. It is basically how the application would be presented to the user.

Business/ Application layer – this is the core of the application which contains the functionalities. It is the business logic of the application (Create, Read, Update & Delete operations).

Data access layer – this combines the data utilities, data access components and service agents. It facilitates secure data transactions

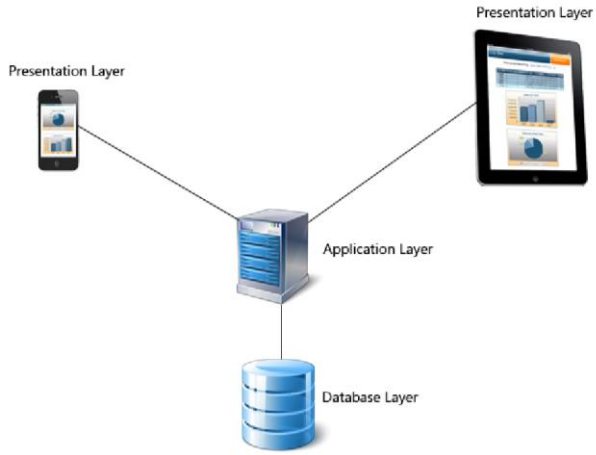

Figure 1: Architecture of a Mobile Application

2.7: Gaps in Existing Works

According to the procedures taken in case of an accident (Anthony Owino, 2019). He stated out the best practices taken in case of an accident both major and minor ones. In one of the points he stated that one should call the police to the incident cite. This move however becomes hard for some of the parties involved since getting in contact with a police officer mostly during an accident proves to be difficult since not everyone has their phone numbers in their phones.

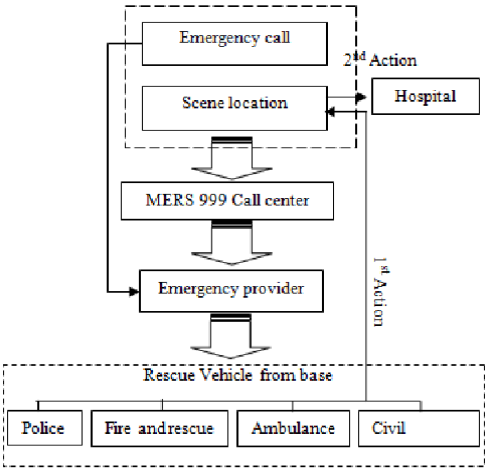

Figure 2: Existing Works (A.A.Mustaffa et.al., 2014 , p.16)

2.9: Conceptual Framework

This is the conceptual diagram that shows how the proposed system functions. The framework shows how the various components and actors interact with each other within the system.

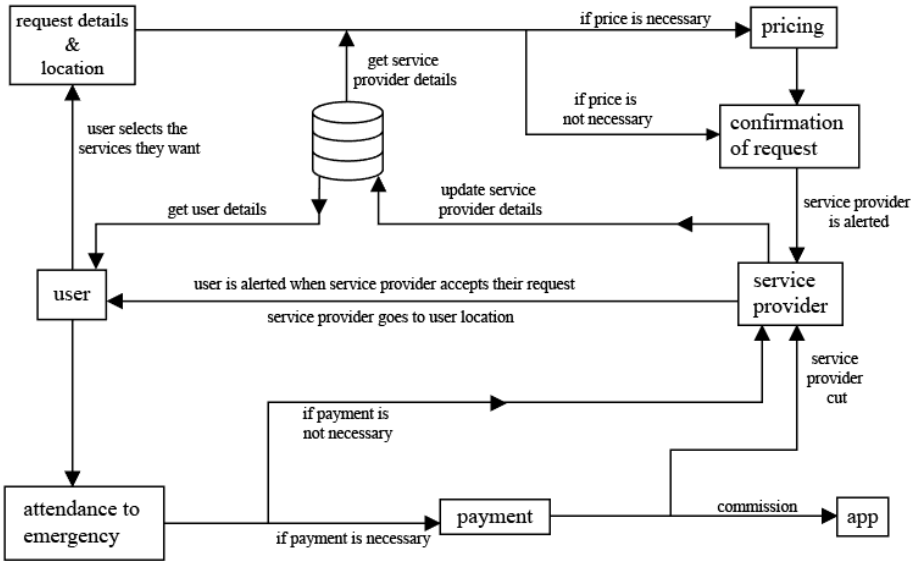

Figure 3:Conceptual Framework

Chapter 3: System Development Methodology

3.1: Introduction

System development methodology refers to a framework that is used to structure, plan and control the process of developing an information system (Kashif Khan, 2016). This chapter involves a deeper description of the approaches and methodologies to be used in development and testing of the system.

3.2: System Development Methodology

The main methodology that will be used for this system is the agile development methodology since it's easier to measure progress as you can see how much work is completed. It is also useful for a tight deadline as it allows for a rapid delivery. This development methodology is better due to its continuous planning, testing, integration, risk evaluation and control on the progress of the project and thereupon reduces the chances of project failure (Yodiz team, 2016). This methodology makes it possible to convert the system into smaller parts which can be developed, tested and reviewed individually.

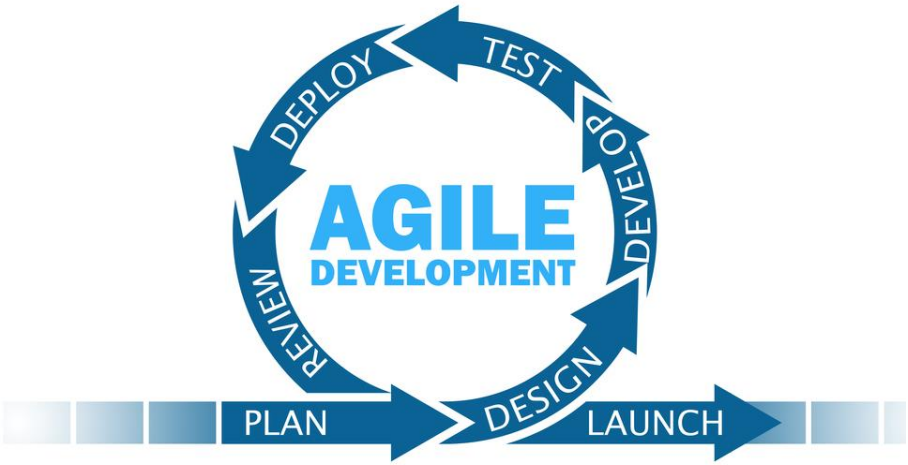

Figure 4: System Development Methodology (Agile)(D'Ambra, 2018)

3.2.1: Plan

This is the first step of the agile methodology. It where the vision of the project is created and involves gathering relevant data, mapping processes and coming up with the scope. The data in this phase is analyzed to ensure they are realistic and achievable. In the proposed system, the data being collected and analyzed is the number of people who are faced with emergencies that require rescue services, the issues that can be solved within the time period given and also the features that can be built in the application.

3.2.2: Design

This phase uses the data gotten from the planning phase to come up with the design of the system to optimize it with the right technology. The tools and technologies to be used are also listed here. According to the data gotten, the system being mobile based and having features like the access to GPS and location services makes it suitable to solve the problem.

3.2.3: Develop

This phase involves the actual creation and coding of the system based on the designs gotten from the design phase. The system will be created with java programming language which is suitable for mobile applications.

3.2.4: Test

This is the phase where the developed system is put into testing to find out if there are any bugs or vulnerabilities in it. Some testing techniques are:

i. Black box testing - The testers here will not have access to the code or have any knowledge of the system but will interact with the user interface.

ii. Security testing - It involves testing whether one can access the data in the system using wrong credentials or without logging in.

iii. Compatibility testing - The system is put to run in different environments or operating systems like android or IOS (iPhone operating system).

3.2.5: Deploy

This is the phase that involves installation, configuration, testing and making changes to optimize the performance of the software. This is usually done to a smaller population before being officially launched to the public.

3.2.6: Review

This is the phase where the data gotten from the deployment is carefully examined to validating the quality, functionality and other vital features and components of the software. With this data, the team can know whether to make further improvements to the system or launch it.

3.2.7: Launch

This is the final phase of the methodology where the system is officially opened to all the population. This is usually done after closely examining the reviews gotten earlier.

3.3: Requirements Analysis

Software requirement analysis is the description of features and functionalities of the system. Requirements convey the expectations of users from the software. The requirements can be functional (the basic function of the system) and non – functional (how the system performs certain functions). These requirements are listed in chapter 4.3 of this document.

3.4: Design

For this system, the most preferred design is the Object Oriented Analysis and Design (OOAD). This approach is represented by the Use case diagrams, class diagrams and sequence diagrams. With this approach it is easier to reuse objects and classes since inheritance is allowed.

3.5: System Development Tools and Techniques

System development tools are the computer programs and coding languages that will be used in developing this system.

i. The Integrated development environment for developing this system will be android studio.
ii. The programming languages to be used are java and c++.
iii. The database management system to be used is firebase real-time database.

3.6: Method for Testing the System

The system will first be tested using dummy data to test if the data parameters are working then the major testing will involves testing each module separately. Some of these modules include the ordering or requesting module and registration module.

3.7: Domain of Execution

The domain of execution for this system will be mobile based since it is easier to access, just by a single tap, as most users will be on the road and have their mobile phones with them. The system being mobile based makes it easier to get locations access as opposed to it being web-based.

Chapter 4: System Analysis and design description

4.1: Introduction

This chapter describes what the system is set to achieve. It shows in more details what the actors are able to do in the system currently, what entities they will interact with and how different entities interact with each other.

4.2: Requirements Gathering

There are various methods used in the collection and gathering of system requirements of this system. One of them involved interacting with different users of the system to know the specific requirements will be met by the system and the tasks each user needs to accomplish and how they relate to each other.

There was the use of questionnaires for both the users and the drivers. For the drivers, some of the questions asked involved knowing how they get their customers, their proximity to them and how often they get called for their services. For the users, some of the questions asked was to know their ease of getting such rescue services. The questions asked were both closed-ended and open-ended for more detailed answers.

Observation and first-hand experience was also used to get some information on the process of acquiring these rescues services. This helped come up with my own judgement on the process of having to call several people just to get one number of a road side assist just for it to be far way and waiting for hours. Such experience removed any bias from the previous questionnaire method of gathering requirements as some requirements can be difficult to explain in writing and hence the need to come up with a user-friendly application.

4.3: System Requirements

The system requirements are the features and functionality of the road rescue service application. They comprise of functional and non-functional requirements.

4.3.1: Functional requirements

The applications functional requirements are what the system must do and they are as follows:

ID	DESCRIPTION
FRQ 1	The system should allow clients to register
FRQ 2	The system should allow clients to sign in
FRQ 3	The system should authenticate users based on their role
FRQ 4	The system should store the relevant data for the customers and drivers
FRQ 5	The system should enable customers to request for rescue services
FRQ 6	The system should enable drivers to accept or reject requests
FRQ 7	The system should pick the nearest rescue service driver based on location
FRQ 8	The system should Inform users on the road safety rules and procedures
FRQ 9	The system should allow the users to update their profiles

4.3.2: Non-functional requirements

The applications non-functional requirements are;

ID	DESCRIPTION
NFR 1	The system should be device friendly
NFR 2	The system should remember users unless they log out (sessions)
NFR 3	The system should be scalable to accommodate more users with time
NFR 4	The system should provide security for users and their details.
NFR 5	The system should be adequately fast

4.4: System Architecture

The system architecture that shows the interaction between the system components can be illustrated by the diagram as shown in figure 4.1 below.

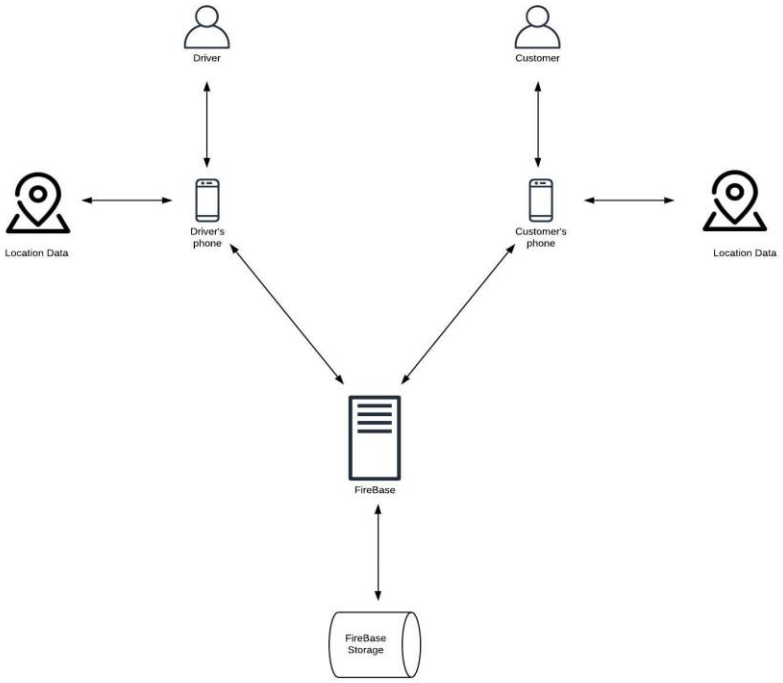

Figure 5: System Architecture

The system architecture comprises of the customer and the driver who are the users of the system. The architecture also includes the transmission of user location data to firebase and other user data like their profiles (names, email, phone number) which are stored in the firebase storage.

4.5: Analysis

this application is using the Object Oriented Analysis and Design (OOAD) since it is easier to reuse objects and classes as inheritance of objects is allowed. This approach is represented by the Use case diagram in chapter 4.5.1

4.5.1: Use case Diagram

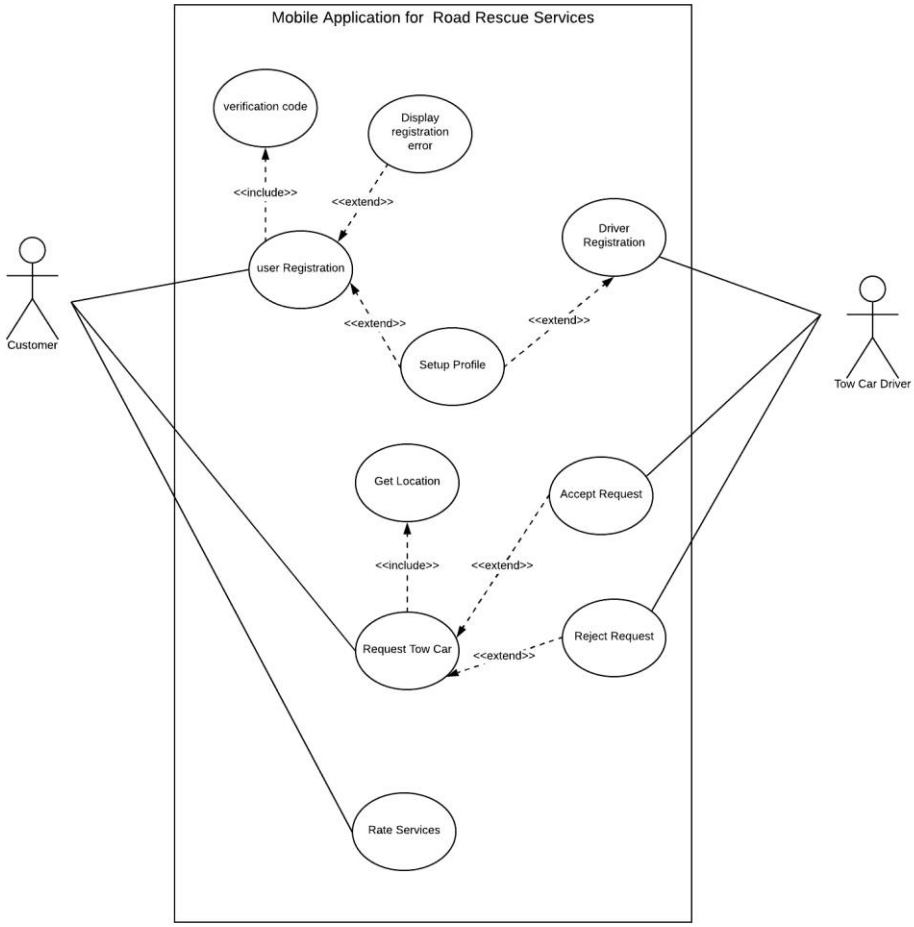

Figure 6: Use Case Diagram

4.6: Design

4.6.1: Database schema

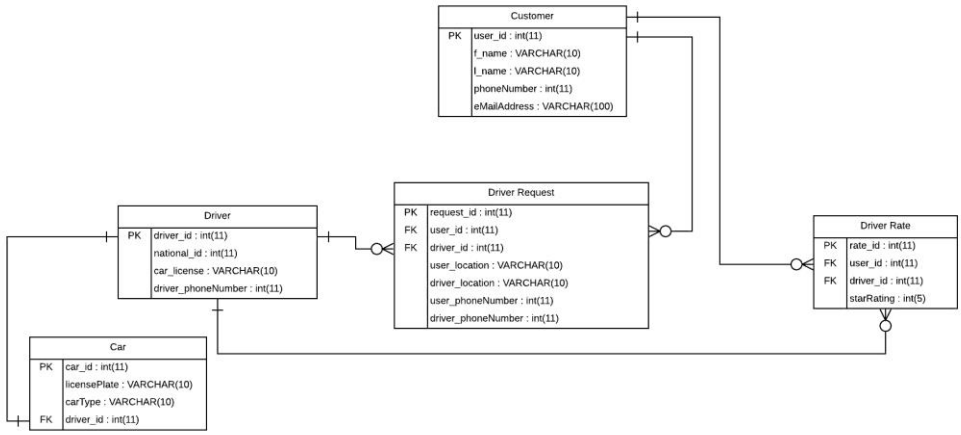

Figure 7: Database Schema

4.6.2: Class diagram

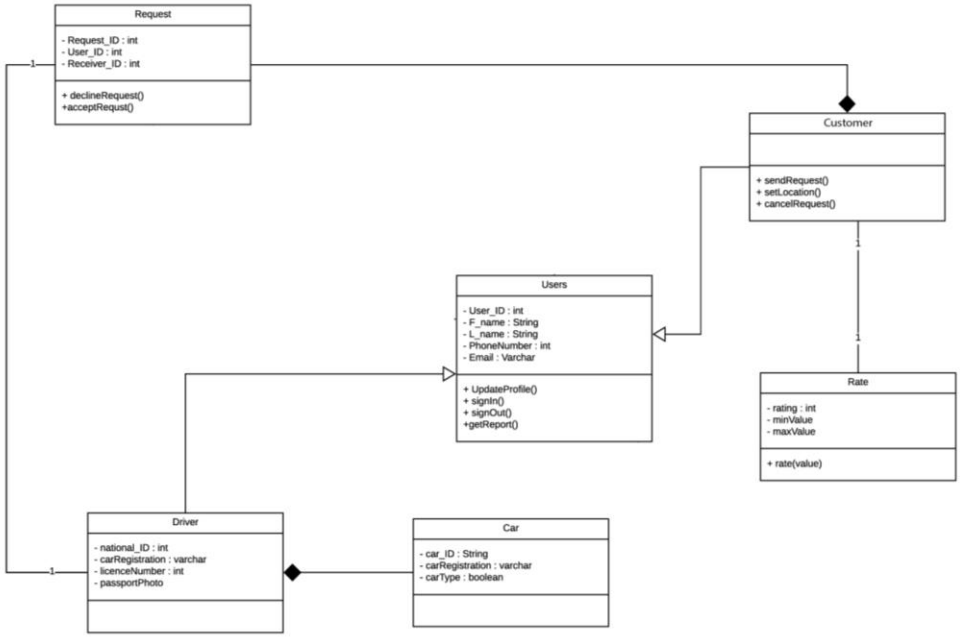

Figure 8: Class Diagram

4.6.3: Sequence Diagram

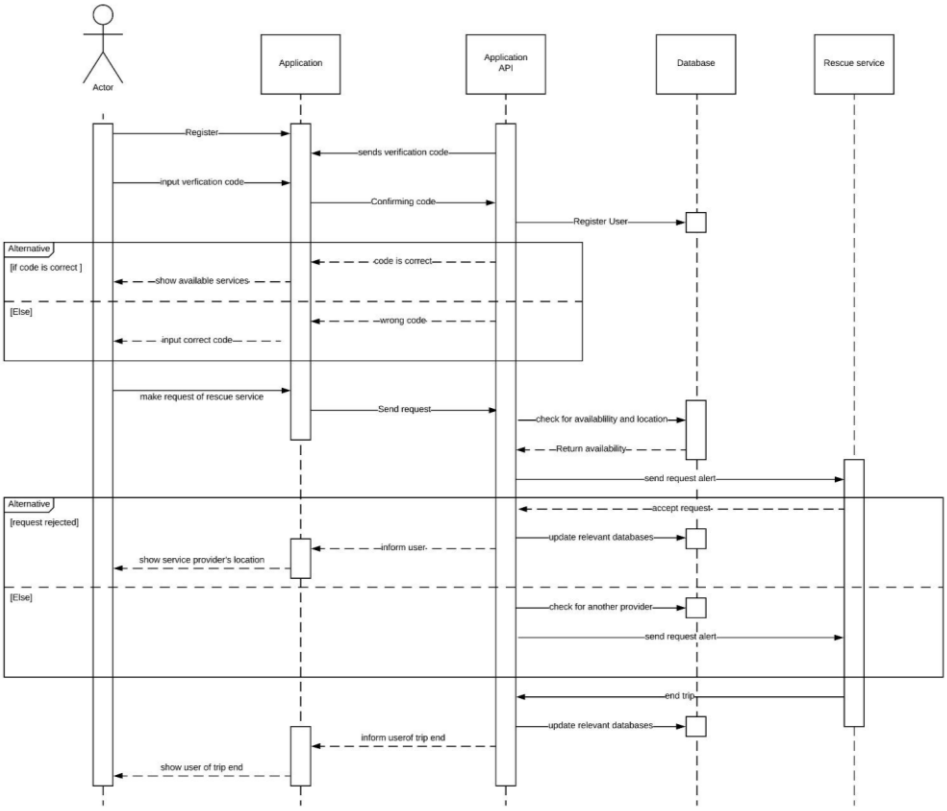

Figure 9: Sequence Diagram

4.6.4: Entity relationship Model

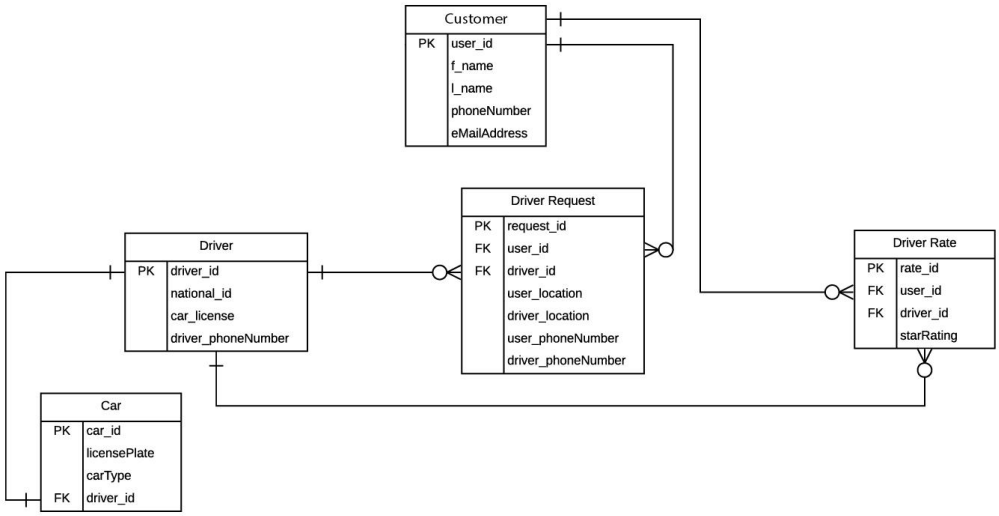

Figure 10: Entity relationship Model

4.7: Graphical user interface Mockups

4.7.1: Welcome screen

this is the screens used to choose between a normal customer and a driver. After this they are directed to their respective login screens.

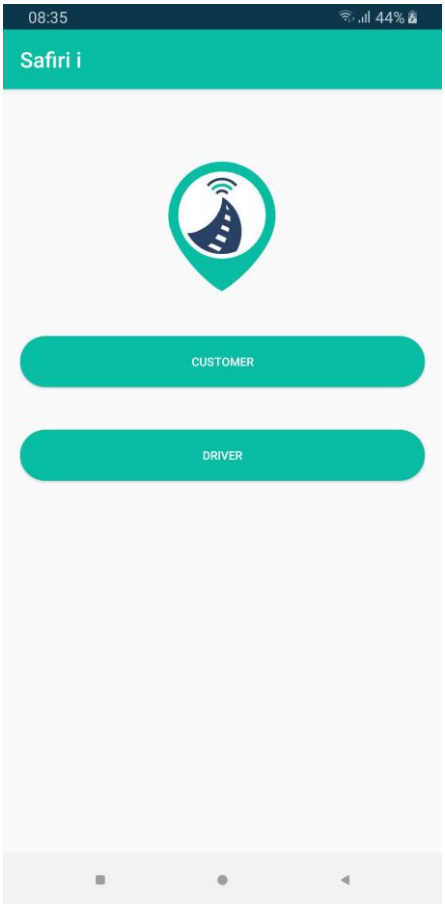

Figure 11: Welcome Screen

4.7.2: Login screen

Customer login: here the customer logs in using an OTP system to ease of use.

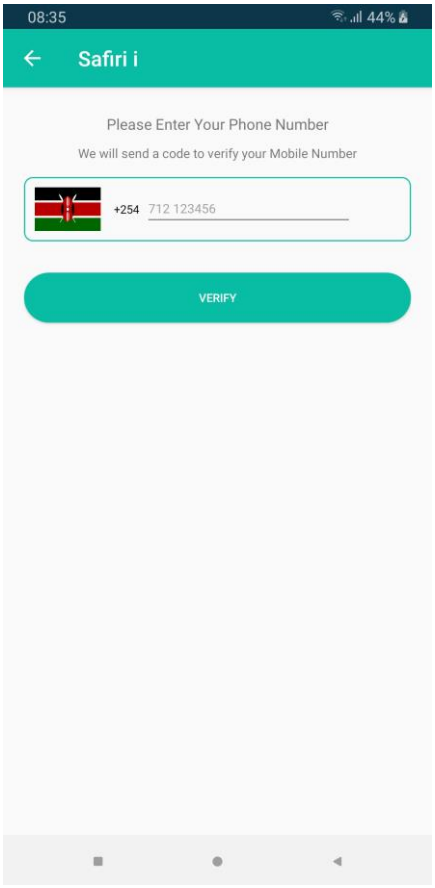

Figure 12: Customer Login Screen

Driver login: Here the driver logs in using their emails and respective password.

The next screen is the dashboard.

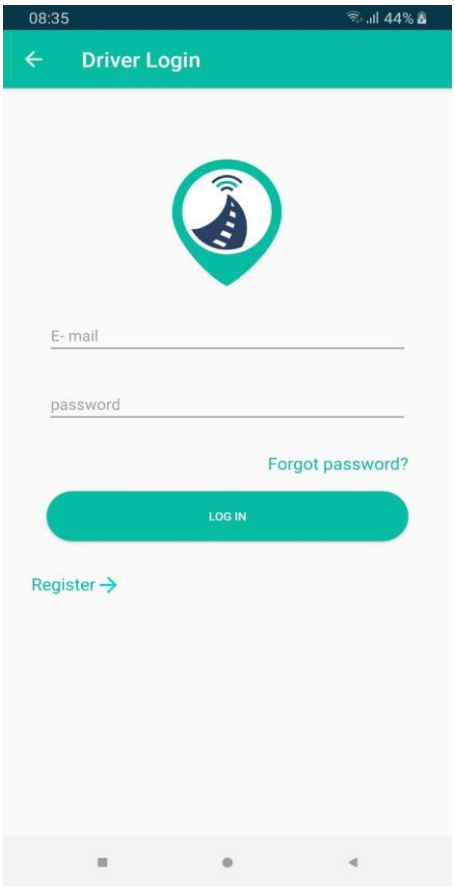

Figure 13: Driver Login Screen

4.7.3: Dashboard

Customer dashboard, driver dashboard. The dashboard includes the various functionalities that the application offers to the respective user.

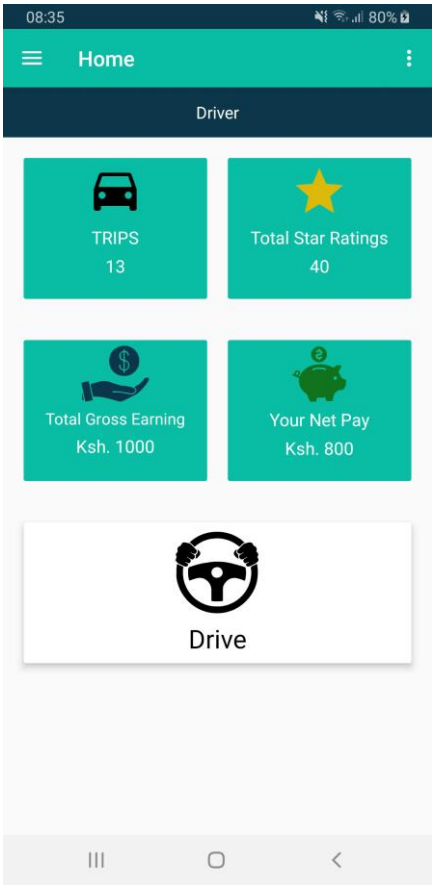

Figure 14: Driver Dashboard

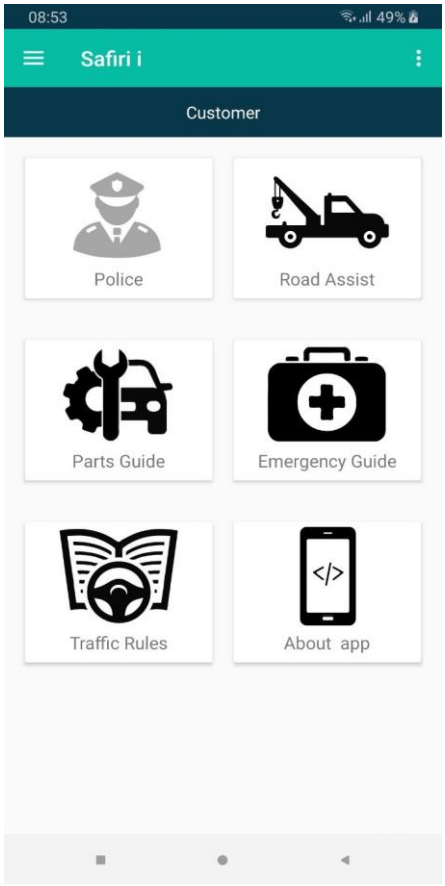

Figure 15: Customer Dashboard

4.7.4: Customer request

At the customer request page, the customer has to input their destination and select the type of rescue service vehicle they prefer.

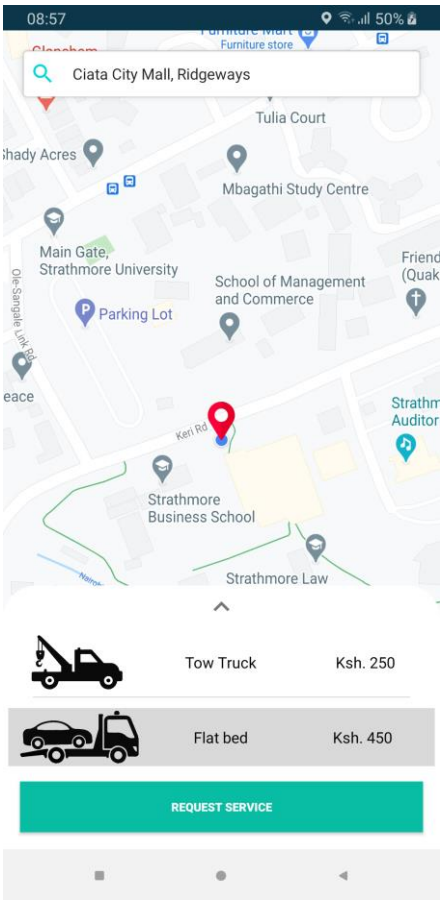

Figure 16:Customer Request

4.7.5: Driver request

At the driver request page, the driver is prompted with a reject and accept button and details about the customer including their name and location.

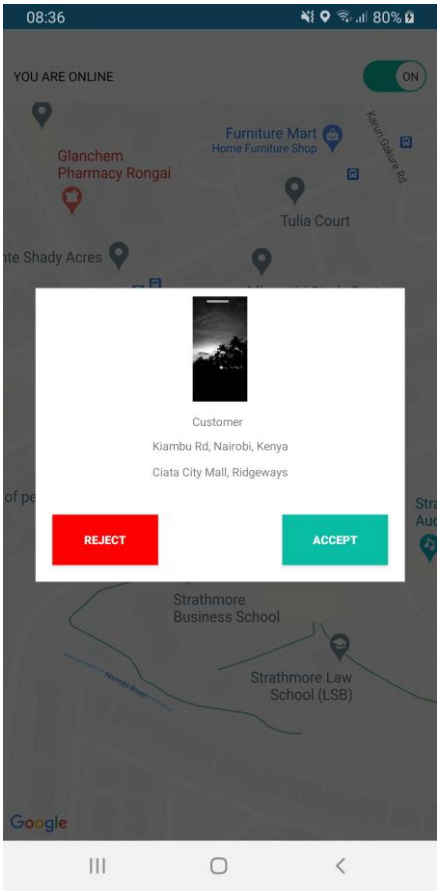

Figure 17: Driver Request prompt

4.7.6: Update profile screen

the profile screen is where the uses are able to see and update their details like the first name, last name and email. The changes are implemented after the users press the update button.

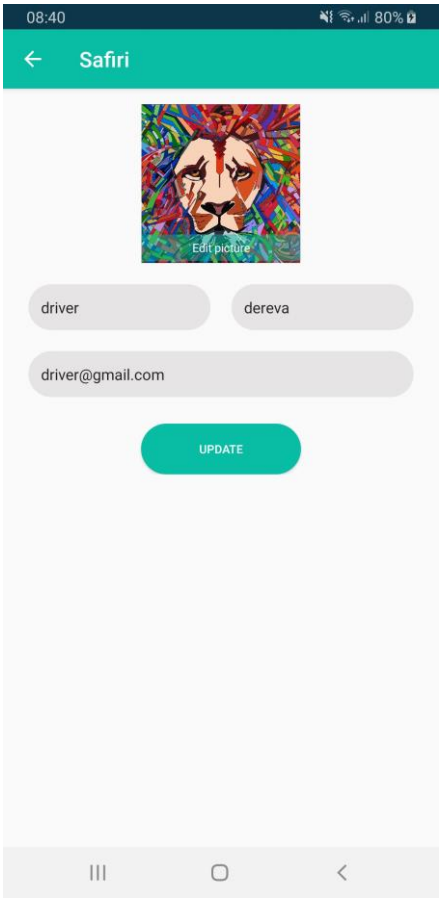

Figure 18: Profile Page

Chapter 5: System Implementation and Testing

5.1: Introduction

The purpose of this chapter is to focus on the system testing and know which sections of the system have truly succeeded or not. This chapter aims at detecting system failures so that defects can be discovered before the application is released to the public. I must test the system to know if it truly works as expected.

5.2: System Implementation

System implementation involves the process of defining how the application is to be built, ensuring it is operational and that it meets its requirements. The construction and development of the system was done using JAVA due to the fact that it was an android mobile application. The users and user requirement were identified earlier on and implemented in the system. Some main functionalities like user authentication, customer requests and driver requests were implemented first as they are most needed for the functioning of the application. Using the proposed system development methodology, it proved easy and more applicable to develop the application by prototyping, developing each module at a time and linking them together.

5.3: System Testing

This sections focuses on the requirements of the system where they are tested to check for any failures and defects before the application is live and release to the public.

Test ID	**Related requirement**	**Inspection check**	**Pre-condition**	**Test data**	**Priority level**
T1	Registration of Users	Does the system allow users to register themselves	The system should register users and store their data	First name: customer Last name: customer Phone number: 0712346578 Email address: customer@gmail.com Password:******	High
T2	Logging in users	Does the system login in registered users	The system should log in users who are registered	Email: customer@gmail.com Password: ******	High
T3	Updating user profiles	Does the system allow users to update their profiles	The system should allow users to update their profiles.	Click the menu button and go to the profile page. Click on the field to be changed and make necessary changes	Medium

T4	Make emergency service request	Does the system allow the customers to make requests	The system should allow customers to make requests	From the dashboard, click on the road assist button and fill the appropriate fields then click on the request service	High
T5	Get closest drivers based on location and availability	Does the system get the closest driver based on location and availability	The system should allocate drivers to customers according to their location and availability	None	High
T6	Alert users on requests	Are there ringtones when a driver receives a request or when customer is prompted to start the trip	The system should alert the users via ringtones	Ringtones should be heard	Medium
T7	Can the driver accept and reject requests	Are there buttons for both rejecting and accepting requests	The system should have two separate buttons for accepting and rejecting requests	Presence of the buttons. Pressing the accept button should show location of customer. Pressing the reject button stops the ringtone	High
T8	Logout users	Are there logout buttons and are they functional	The system should have logout buttons for the users and they should be functional	Pressing the logout button should take uses to the login screens	High

Chapter 6: Conclusions, Recommendations and Future Works

6.1: Introduction

The aim of this chapter is to cover what the system has been able to achieve at this point in time and the future works of the application that can be achieved by the system or similar system that aims in solving the same problem.

6.2: Discussion

This section entails and analysis of the developed system. The developed application can be used by two main actors of the system; that is the customer and the drivers of the recovery cars. On the customer side, they are able to login if their number is registered in the system and if not, they are taken to the registration screen. The customer is then able to make rescue service requests after the login process and rate the services they received after the driver ends the trip. The ratings range from one star to five stars. The Drivers also have to register themselves and their vehicles which then have to be inspected. The drivers then can now get requests from customers or reject them otherwise. Both users have the ability to update their profile; names and pictures.

As per the completion of the system, it is reasonable to comment that the main purpose of the system; that is getting the rescue service to your location and taking your vehicle to a destination, has been accomplished and the different users can perform their tasks independently.

6.3: Future works

The road rescue service application is a functional system as at the moment but a lot of aspects and functionalities can be added into the system by future developers. The system can be improved in a way that makes it possible to contact a police officer during the whole process or even contact them independently. This may come in handy during situations like car accidents where an intermediary is needed to solve the dispute. The system can also be integrated with various features like the ability to source car parts, get the nearest garages, inform users on road safety procedures and many more road related features.

6.4: Conclusion

The mobile road rescue service application was developed with the aim of helping motorists or road users get rescue services with ease through their modern smartphones. The system has met this problem by having easy to use interfaces with minimal user requirements.

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Appendix A: Gantt Chart

IS Project 2 Gantt Chart																
Activity	Date (2020)		Duration (Week(s))													
	Start	End	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Concept note & proposal Wirting	22nd April	3rd June															
Chapter 1: Introduction	29th April	5th May															
Chapter 2: Literature Review	13th May	19th May															
Chapter 3: System Development Methodology	20th May	26th May															
Proposal Submittion	3rd June	3rd June															
System analysis & Design	4th June	1st July															
Behavioral diagram	4th June	9th June															
Structural diagram	10th June	16th June															
Entity Relationship model	17th June	23rd June															
Database Schema	24th June	30th June															
Progress Presentation	1st July	1st July															
Coding, class presentations & Documentations	5th August	3rd Nov															
Final Presentation	4th Nov	7th Nov															

Figure 19: Gantt Chart

Appendix B: QUESTIONNAIRE

Customer Questionnaire

1. How do you contact a rescue service when in need of one?
   _____
   _____

2. How do you contact a traffic police officer when in need of one?
   _____
   _____

3. Do you have a dedicated rescue service provider?
   - Yes
   - No

4. If yes? What do you do if they are not available or far?
   _____
   _____

5. How long can you wait for a rescue service to arrive?
   - 5 minutes
   - 15 minutes
   - 30 minutes
   - 1 hour
   - More than 1 hour

6. Has your vehicle ever been in an incident that required it to be towed?
   - Yes
   - No

7. If yes? How would you describe the process of getting the rescue service car (tow car)?
   - Easy
   - Hard
   - Long
   - Short
   - I didn't mind

8. Have you ever used a car hailing application?
   - Yes
   - No

9. What do you think of an online rescue service system?
   _____
   _____

10. Would you trust an online rescue service system?
    - Yes
    - No

11. If yes? Why?
    - Ease of use
    - Saves on time

Driver Questionnaire

1. How many times are you called for rescue services?
    - Less than 5 times a day
    - Less than 10 times a day
    - More than 10 times a day

2. How do your customers reach you?
   _____
   _____

3. What do you do if your customer is far away?
   _____
   _____

4. How do you calculate payment charges?
   _____
   _____

5. Do you get to know the destination of your customer before going to their location?
    - Yes
    - No
6. What is your view towards an online rescue service system?
   _____
   _____