National College of Ireland

IEEE Requirements Specification Document

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Course: *BSc Honours Technology Management – Business Analysis*

Project: *E-Sacco Fleet Manager*

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Declaration Cover Sheet for BSHTM4 Project Submission

SECTION 1

Final Project – E-Sacco Fleet Manager

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- Prohibiting a student from sitting any examination or assessment.
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DEFINITIONS

Matatu: Privately owned public service vehicle mini-buses in the Kenya ferrying people to different parts of the country.

E-Sacco: A name given to the proposed fleet management application for this project.

Matatu Sacco: Registered companies managing the matatus and buses in the public transportation industry in Kenya.

Fleet Management: The management of commercial vehicles, in this case management of matatus including planning trips, allocating drivers, collecting reports etc.

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1.0 Requirement Elicitation and Analysis Planning

1.1 Introduction

E-Sacco Fleet Manager is a mobile application with the aim of digitizing the operations of Matatu/Bus Saccos. Saccos are companies manage the operation of the public transportation vehicles in Kenya. As a managing company, saccos need to provide different reports to its stakeholders. Owners of vehicles usually need reports regarding their vehicles as well as their returns. Legal authorities also look forward to receiving comprehensive reports from Saccos in regards to the operation of the public transport vehicles under their jurisdiction. Given the authority to manage, the Saccos are tasked with the responsibility of operating each and every vehicle. The business comes in with a large number of employees depending on the number of routes they flee to and the number of vehicles they own. Keeping records for such huge number of vehicles becomes a great challenge. Providing reports to the stakeholders is also a problem since no stored real time data in the existing manual ways. Moreover, retrieval of important information regarding the operation of different vehicles or the performance of respective saccos becomes a challenge. This also makes decision making difficult since it is not based on available real-time data.

Automation of fleet management makes it easy for the saccos to perform their duties and responsibilities. The mobile application will bring in a solution to the existing need. The application looks forward to satisfy the need for matatu owners to access details or reports regarding their vehicles. It will also satisfy the need for the Saccos to submit real time reports to the legal authorities. Moreover, the application will save time and costs incurred by the Saccos in running their day to day operations manually.

In this project, the major aim is to come up with the requirements specifications that are necessary for the creation of a mobile application that will aid in the automation of fleet management and Sacco operation. As a business analyst it is my responsibility in this project to come up with the requirements specification document which is the major aim of this project. The project is guided by the Business Analysis Body of Knowledge (BABOK) and therefore will utilize business analysis techniques and tools recommended by this book.

The project involves a number of stakeholders to help in the requirements elicitation for the proposed solution. To gather the requirements, I will use different techniques. Surveys is the first techniques that I will apply in elicitation of the requirements. A survey is a set of questions that are aimed at researching and collecting required amount of data or information for a study.

Surveys usually target a larger population contrary to interviews which focus on a specific group or individuals. In this case the survey will be administered online. Online survey tool known as google forms is used for the survey.

Interviews are also applied in this research. Interviews help in getting more detailed information from a selected group of persons. In this case, the interviews will help in getting more detailed information from the stakeholders. It is this confirmation that will help in other elicitation techniques to gather more data about the subject of study. In this project, four interviews will be done with a matatu owner, a matatu Sacco who are the clients of this solution, a system developer and drivers. The four interviews will help come up with different requirements which can be discussed later on a requirements workshop. The interviews will be contacted online via a meeting link.

Brainstorming will also be used in this research. Brainstorming is an important technique especially at the initial stages of the project. The techniques help in gathering information and insights on different ideas that can be applied in coming up with a more suitable solution.

After gathering all the requirements, it is important to hold an online workshop to discuss on the requirements. This will be aided by an application prototype that will help in understanding the features and requirements of the application after which a second workshop meeting will be done to discus the previous agreements after changes are made on the prototype. This second workshop will contain the prototype with inclusion of changes made by stakeholders. The recommendations and critiques made by the stakeholders will be used to come up with an advanced prototype of the application.

The last technique that will be used on this project is interface analysis. The analysis of the interface will involve diagrams that will help in explaining the relation with the stakeholders and their interaction with the application. Use case diagrams will be used in this stage.

After the collection of all the necessary requirements. A requirements specification document done using the IEEE template will be developed. These requirements will be analysed and prioritized using MOSCOW analysis tool and technique.

1.2 Business Need

In Kenya, a noticeboard filled with number plates of different vehicles and a strike through line is a common scene is almost every bus stop especially in the town centre. The culture of the Sacco managers or stage managers waking around with a piece of paper and pen ticking the

trips a vehicle has made is a common practice. The reliability of these manual ways of management is not guaranteed since the data is not real time and therefore difficult to store. It is also very difficult for a new staff to understand the data written on these charts therefore difficult to keep records and make decisions.

Moreover, managing a fleet using manual means is not an easy task. Keeping track of every vehicle in the Sacco and been able to account for it each through out the day becomes a very difficult business. Matatu owners also find it very difficult to get reliable details regarding their vehicles. A huge fleet of vehicles attracts a big number of employees who include drivers, touts and stage managers. These manual ways have been seen as practical but in the technological world, it is not realistic to run such huge businesses manually.

Automation of the fleet management and especially by saccos may not be an easy task due to resistance to change from different stakeholders in the business.\

Some of the shortcoming of these two ways of managements include the following:

Demerits of Manual Sacco Management	**Demerits of Automation of Fleet and Sacco Management**
Lack of transparency in management	Involves costs in management
Poor time management	Users will require to use smartphones
Low profits	Employees will be monitored
No clear way of accounting for the fleet	
Poor storage of important business data	
Huge procedures for report submission	

The automation of fleet management will solve most of the problems that come with manual management of Saccos. Eliminating the need for notice boards in the bus stop areas and papers will bring in a more reliable way of managing the fleet. The application will help store the data in the databases thus can be retrieved wherever needed for decision making. This will ease the process of business analysis. The process of report submission will also be simplified since it is possible to generate the required reports by click of a button.

Some of the Benefits of this app include the following:

- Advanced management of matatu saccos
- Automation of the management of fleet

- Simplified generation and report submission
- Statistical and realistic decision-making process
- Realisation of higher profit margins
- Time efficient and cost-effective services

1.3 Business Case

The concept of Fleet Management System aims at automating the operation of saccos. The application will benefit saccos and matatu owners. The matatu owners register their vehicles under saccos and hand over to them for the purposes of business management. Therefore, the matatu saccos are tasked with the responsibilities of managing and running the matatu business. A matatu Sacco usually certain number of vehicles under their jurisdiction. Therefore, it is the purpose of theses saccos to employ the human resources who will use the vehicles.

Therefore, these matatu saccos are the major stakeholders who are clients for this application. They will apply the application in running of their day to day activities. The application will take in the requirements from the saccos together with other stakeholders to ensure customer cantered solution designs. The application will be designed to simplify the work of the saccos.

The saccos can purchase the application or subscribe to it. Purchasing of the application will see the Sacco have full ownership of their customised application. This means that they have full control of the application. This will be one of the ways in which the projects intend to make money.

However, purchasing of the application may be too expensive for some of the saccos. The application can be given to the saccos on a subscription basis. This means that, a Sacco can subscribe to use the application services for a period of time after which the subscription expires and will require them to renew their subscription by paying an agreed-on amount of money. This business case will see the small saccos or saccos who do not have the ability to purchase the application still use the services. A subscriber who later on decides to purchase the product will get a high discount.

1.4 Project Risks

Every business usually has risks involved with it. This project involves a business case and therefore it is not an exemption thus has risks associated with it. It is important for the stakeholders to understand the risks associated with this business before venturing into it.

Risks to Matatu Saccos:

- Risks of committing their finances in purchasing the product
- Risk of using technology for their first time in management
- Risk of some employees not having smartphones or knowledge of using technological devices
- Risk of possible security breaches
- Risk of resistance by their stakeholders

Risks to Matatu Drivers:

- Risk of been closely monitored at work
- Risk of losing the mobile phones which is essential for work
- Security risks

Risks to Developer:

- Risk of acceptance of the technology in use
- Security breaches risks
- Risk of resistance by the clients
- Risk of developing an application that the stakeholders do not want

1.5 List of stakeholders

Matatu Saccos (Clients)

Roles and responsibilities:

The role of matatu saccos in this application is to use the application in their day to day activities while performing their Sacco duties. They are the clients of the application.

Matatu Sacco responsibility in this project is very important. They are responsible of giving features and functionalities for the development of the application. They should also review the prioritized requirements before handing them over for development.

Matatu Owners

Roles and Responsibilities:

The role of matatu owners is to use the application to register their vehicles under saccos. The saccos will also check reports regarding their vehicle as well as reach out to the Sacco in case of any issues.

Their responsibility in this application is to give features and functionalities they would want included in the application which they will be major users of. They will also be used in the testing stage to test the performance and productivity of the mobile application.

System Developer

Roles and Responsibilities:

The role of the developer is analysing the requirements and performance of the application. They are the coders of the app.

They play a major role as developer of the application. Translating the requirements to see if achievable and to get ways of achieving them. They are technical advisors of the app in the project. They also contribute by giving the technical and non-functional requirements of the application.

Business Analyst

Roles and responsibilities:

The business analyst will be liaison among the project stakeholders.

The business analyst is responsible for gathering the requirements, eliciting the requirements, prioritizing the functional, non-functional and technical requirements, analysing the requirements, translating them into solution and documenting the requirements specification document.

Matatu Drivers and touts

Roles and Responsibilities

The matatu drivers are employees of the saccos thus are users of the application. Their role is to use the mobile application to view their trips and any other tasks assigned to them

The responsibility of the matatu drivers is to help in testing the performance and usability of the application. They will also give some requirements as expected in the mobile application.

Potential Passengers

Roles and responsibilities:

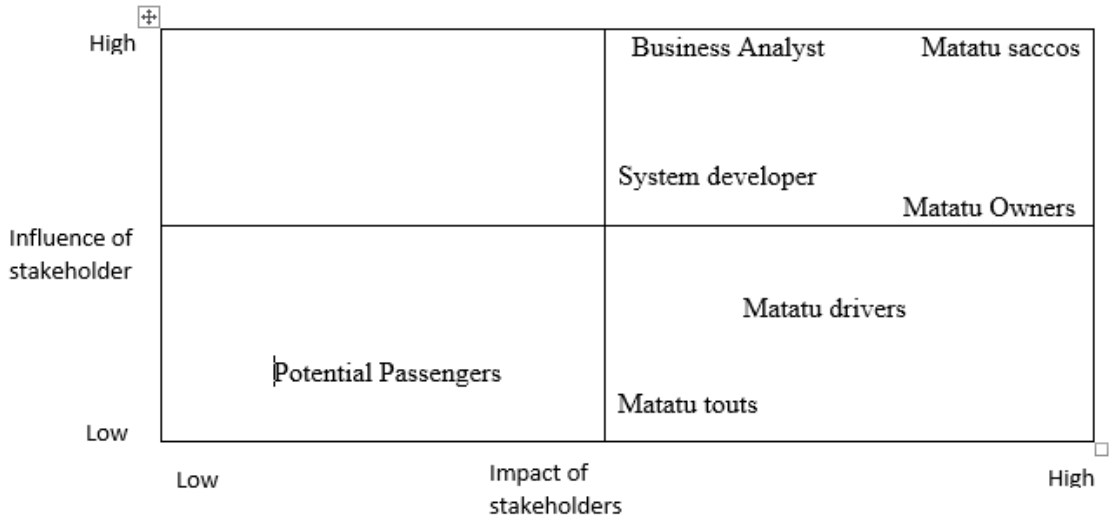
The passengers are not users of the application and therefore their role in this project is to participate in the surveys to give an oversight of the public transportation industry and their experience in different matatu Sacco vehicles. They will help understand the industry and its situations better during the requirements gathering stage.

1.6 Power/Influence Matrix

KEY	
HIGH	H
MEDIUM	M
LOW	L

	Stakeholders	Level of Influence	Impact
1.	Matatu saccos	H	H
2.	Business Analyst	H	H
3.	Matatu Owners	M	H
4.	System developer	M	M
5.	Matatu drivers	L	M
6.	Matatu touts	L	M
7.	Potential Passengers	L	L

Stakeholder Matrix



Stakeholder Matrix Explanation:

According to the matrix above, the stakeholders with Low influence and low impact in the project lie at the bottom left quadrant of the matrix. The stakeholders are enumerated in the stakeholder power diagram and their influence and impact indicated according to the key. Stakeholders with medium influence and medium impact appear in the bottom right quadrant. The stakeholders who are highly influential with high impact in the project lie at the top right quadrant of the matrix.

In relation with the Fleet Management Application, the matatu saccos are the most important stakeholders in the project therefore lie at the top most far right corner of the quadrant. Their input in the project is highly valued. Been the project client, the matatu saccos are highly influential in the project. Their requirements therefore must be treated as high priority in the project. The business analyst which is the position I take in the project is also highly valued. This is because they are tasked with the responsibility of analysing and applying business analysis knowledge in achieving the major objective of the project. Matatu owners and developers come next according to the Fleet management application. Their input is of medium influence and high impact to the project. The matatu drivers and touts have low influence yet high impact in the project. This is because they will be users of the application and been employees of the matatu saccos have high impact on the application. The possible passengers have low influence and impact on the application. Therefore, the business analyst should

engage all the stakeholders according to their importance in the project showing interests in their concerns to elicit more requirements.

2.0 Requirements Elicitation Techniques

2.1 Survey

Overview and Objectives:

Survey is a form of requirements elicitation technique that usually targets a larger population. In this project, a survey was created using google form and the link distributed in different channels to gather responses. The advantage with google forms is that it allows real-time receipt of responses as well as providing an easy way of response analysis. The survey targeted 50 responses. This survey helped in gathering more information and understanding the area of study as well as the users of the application better.

Ways of distribution:

- WhatsApp groups
- WhatsApp status

Survey Link:

https://forms.gle/AbnCpoADAJQ59Zn88

Survey Questions

Please indicate your gender

Male

Female

What is your age bracket?

Under 18

18 to 30

31- 40

40 – 50

Above 50

Which of the following mobile devices do you use?

iPhone

Android Phone

Other

Have you ever used public transportation means in Kenya?

Yes

No

How many matatu/bus saccos operate in your area of residence?

1 to 5

5 to 10

More than 10

How are the matatu/bus saccos you have used operated/managed?

Manually

Digitally

Have you ever wanted to return to a matatu/bus due to forgotten item or related issues?

Yes

No

How often are you unable to return to a matatu/bus you boarded due to unavailable track records in the Sacco?

Never

Rarely

Often

Sometime

Always

On a scale of 1 to 5, 1 being the lowest, how would you rate the management of matatu saccos in Kenya?

<Scale>

How useful would it be to manage matatus digitally other than using manual ways?

Very Useful

Useful

Maybe

Not Useful

How likely would you recommend a matatu Sacco to use digital management ways?

Very Likely

Likely

Maybe

Not likely

2.2 Brainstorming

Overview and objectives:

Brainstorming is an elicitation technique that usually involve stakeholders to produce different ideas and discuss them to understand their functionality. In this project, a brainstorming session is used to gather requirements from the discussion of three stakeholders. Listening to the discussion will enable easy identification and collection of application features and functionalities. The brainstorm session will be done online.

Participants:

Three stakeholders, matatu Sacco, owner and developer.

Location:

Online link https://meet.google.com/iwu-xncr-qrw

Time:

2pm to 4pm EAT

Date:

Saturday 30th October, 2021

Session Rules and Regulations:

- Invited stakeholders should ensure stable internet connectivity for the entire session time.
- The stakeholders participating in the brainstorming session should not discuss their ideas before the material day.
- Attendees should join the meeting at least 10minutes before starting time.
- Every participant will be allocated their expected time to air their ideas, late participants will take the last slots after the other participants and there will be a discussion and review of the ideas after everyone has aired their views.
- The meeting is professional therefore all participants should ensure they have minimal disturbance in a quiet environment.
- Attendees to mute their microphones when it is not their turn to talk.

Brainstorming Deliverables:

- At the end of the session, there will be a list of the ideas, features and functionalities of the application as well as the overall solution.

2.3 Interviews

Interview One:

Participant:

Project Client.

Interview Location:

Online https://meet.google.com/ims-ihwv-jam

Time:

2pm to 3pm EAT.

Date:

Wednesday 3rd November, 2021.

Objectives of the Interview:

This interview session is very important to the success and progress of the project. The interview session involves one of the project clients MSL matatu Sacco. The aim of the interview is to understand the expectations of the client from the application solution. The client

will also be able to give the expectations they have from me as the business analyst and owner of the project. Interacting with the client will also enable me to understand the environment to expect in the market for the application, understanding the special needs of the matatu saccos and travel industry at large. The interview session will be online. It will be informal since I have interacted with MSL matatu Sacco managers before. The session will involve a set of questions that will be prepared before the session begins.

Interview Questions:

- Please explain how a normal day looks like while carrying your day to day activities of MSL Sacco?
- Could you explain what you think about the application?
- Please tell me about what you would want the application to do
- Explain what you would want the main features and functionalities of the application to be?
- Who do you think will be potential clients of the application?
- Why do you think the application is important in the public transport industry?
- What are your timelines in regards to the development of the application?
- What features do you consider good but can be scheduled to the nest version of application upgrade?
- What do you think is the major challenge affecting the implementation of technological solutions in the public transportation industry?
- Lastly, please discuss the expectations you have to me throughout the project.

Interview Two:

Participant:

Matatu Owner

Interview Location:

Online https://meet.google.com/onb-nszu-ori

Time:

2pm to 3pm EAT.

Date:

Thursday 4th November, 2021.

Objectives of the Interview:

The main objective of this interview session is to understand the expectations of the matatu owners in regards to the features and functionality of the application. The interview session will be online. It will be an informal session since I have interacted with the matatu owner severally been a relative to me. The matatu owners are a key stakeholder in the project since they are users of the application. The interview questions will be prepared before the session begins.

Interview Questions:

- What are the major challenges you face in terms of management in the public transportation industry.
- From the experience you have as a matatu owner, do you find manual management tiring and unreliable?
- Please tell me what is your initial thought of the application
- What are the major tasks you expect the application to perform?
- What are the features and functionalities you expect in the application?
- Could you please explain about the process of registering your vehicle in a sacco
- What features do you consider important but cannot be accomplished in the first version of the application?
- Do you have any additional feature not yet discussed?

Interview Three:

Participants:

Software developer

Interview Location:

Online https://meet.google.com/kxi-kity-pxe

Time:

2pm to 3.15pm EAT.

Date:

Friday 5th November, 2021.

Objectives of the interview:

The software developer is an important stakeholder in this project. His input will assist in understanding the actualization of the proposed application. It will help gain a deeper understanding of what is the development process of the application looks like from a professional point of view and what the features and functionalities would produce as a result of it. This will help understand what features and functionalities would be considered important while doing the MOSCOW prioritization and analysis. The session will be a formal online meeting.

Interview Questions:

- Based on your understanding of the application, would it be possible to develop the application of different platforms?
- Will it be possible for the application to store this mass records of data and how will this be achieved?
- From your professional point of view how will the application generate and send the reports to respective persons via mail?
- In the application, what technologies will be most suitable for tracking the movement of the vehicles without involving costs of installing new GPS trackers on the vehicles?
- Is it possible to implement the subscription criteria, prompting the user to pay on expiry?
- How long would it take to implement this solution and what costs would it take?
- What processes will the maintenance process of the application be?
- What are some of the ways will be used to ensure security of data and passwords in the application?

2.4 Prototyping

Prototyping is a way of showing the appearance of the features and functionalities of an application. In this project, prototyping will assist in displaying the features and functionalities gathered from the previous sessions of interviewing, brainstorming and survey. Displaying these requirements to the stakeholders will bring in a discussion which will help to elicit the requirements from them.

The first prototype containing the amalgamated features and functionalities will make it easy to explain how the application will work and its goal in solution creation. The stakeholders will discuss and critique the prototype. The importance of one feature will be discussed and agreed on in the requirements workshop. The collected recommendations and corrections will be implemented and another workshop done to review the same. All the reviews will be documented and implemented again.

Resources Required:

Prototyping will require blasmiq software. The requirements, features and functionalities gathered from previous interviews, survey and brainstorming sessions will be used at this point.

Prototype Development Checklist:

- Combine all the requirements gathered in the previous sessions to use in the prototype creation.
- Create a prototype using blasmiq software, that will be explained and discussed in the requirements workshop.
- Make corrections and alterations as per the requirements workshop review and recommendations from the stakeholders to produce version two of the mobile application solution.

Requirements Workshop:

Participants:

Stakeholders

Location:

Online meeting https://meet.google.com/rxg-advf-rqp

Time:

2pm to 4pm EAT

Date:

Monday 15th November, 2021

Objectives of the Workshop:

The requirements workshop will be an elicitation workshop that will involve the key stakeholders of the project with an aim of enhancing trustworthiness and acceptability among the stakeholders. The workshop will be an online event. The participants will be able to discuss the application and critique it since it will be the first time they are reviewing the layout, appearance and functionality of the application. The recommendations they make will be recorded and used to develop the second version of the app.

Agenda of the Workshop:

- Describe the importance of the requirements workshop in the project.
- Introduce the stakeholders and their role in the project.
- Read the rules and regulations of the workshop.
- Give the expectations of the workshop.
- Examine and evaluate the prototype with the stakeholders.
- Identify the design and layout features to be changed.
- Outline the features and functionalities to be included in the application.
- Get to an agreement with the stakeholders on the appearance, performance, features and functionality of the application.

Rules and regulations of the Workshop:

- The meeting will be virtual thus every participant should have strong internet connectivity in a quiet environment.
- Attendees to join the meeting at least minutes before the start time.
- The ideas that relate to the project can be discussed amongst the attendees.
- The meeting is professional therefore high levels of discipline must be maintained.

2.5 Interface Analysis

In this section, diagrams will be used to explain the interaction of the stakeholders with the system. This will be developed after the completion second version of the app prototype. The interface analysis will be done through UML use case diagrams. The first diagram will show the how the matatu Sacco interacts with the system in its main activities. It will involve matatu saccos, the system admin, drivers and the mobile application. The other diagram will show how the matatu owner interacts with system while accessing services. It will show how an owner register in the application, approval of their account, report generation and other services in the

app. This describes reports submitted to matatu owners, legal bodies and any other reports required for decision making in the matatu saccos.

Resources:

- Lucid Charts online tool to draw the diagrams.

Use Case Diagram Development Checklist:

- Evaluation of the results of previous elicitation techniques and tools to get proper insight.
- Examine and review the latest version of the application prototype to identify the areas of interaction between the stakeholders in the application.
- Draw UML diagrams of the application using Lucid Online tool.

UML Use Case Names:

- Sacco Management Use Case Diagram
- Matatu owner Activities Use Case Diagram

Use Case Actors:

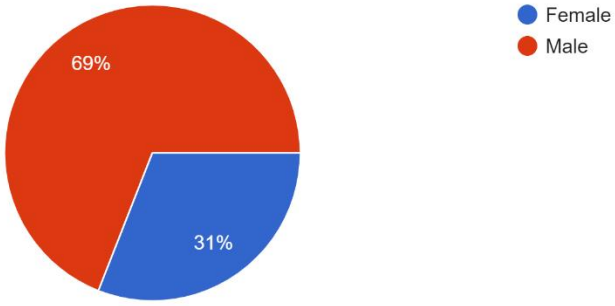
- Matatu owner
- Matatu Sacco
- System Admin
- Matatu Drivers

3.0 Requirements Elicitation Techniques Results

3.1 Survey

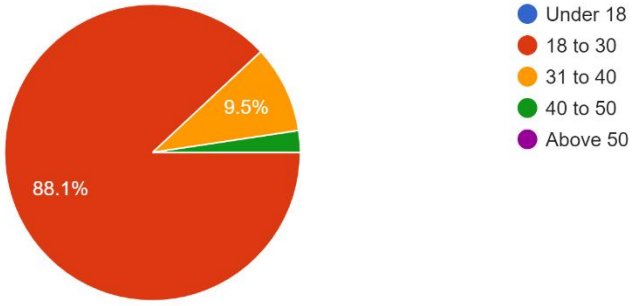
Please indicate your gender

42 responses



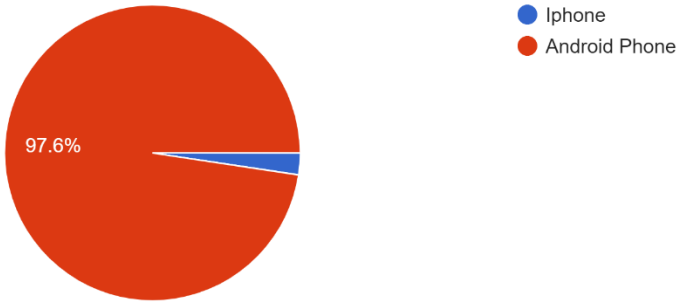
What is your age bracket?

42 responses



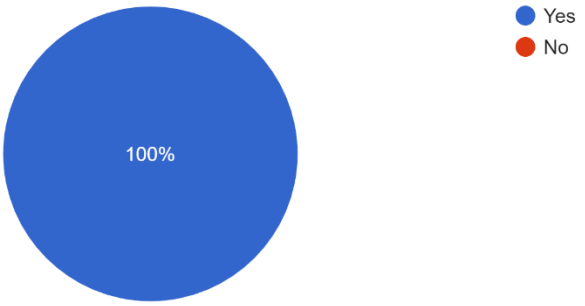
Which of the following mobile devices do you use?

42 responses



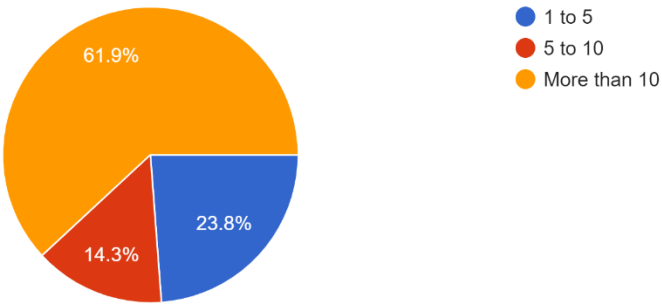
Have you ever used public transportation means in Kenya?

42 responses



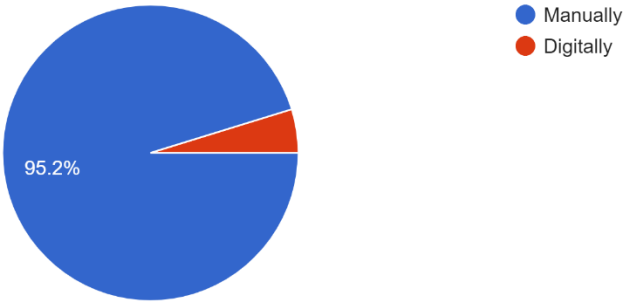
How many matatu/bus Saccos operate in your area of residence?

42 responses



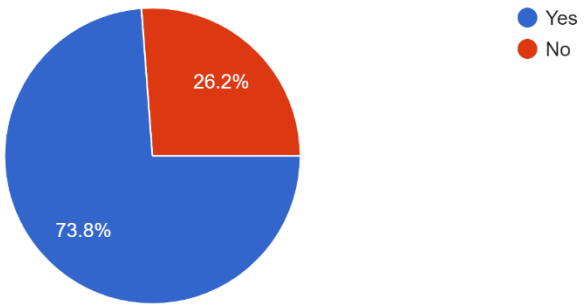
How are the matatu/bus Saccos you have used operated/managed?

42 responses



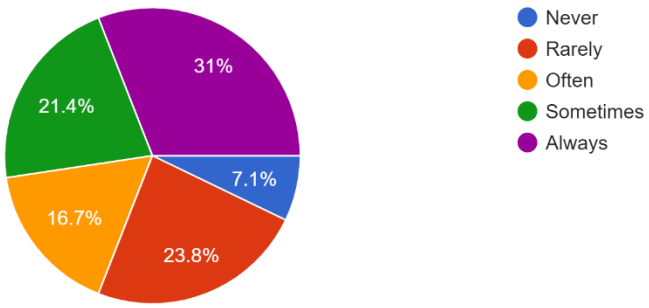
Have you ever wanted to return to a matatu/bus due to forgotten item or related issues?

42 responses



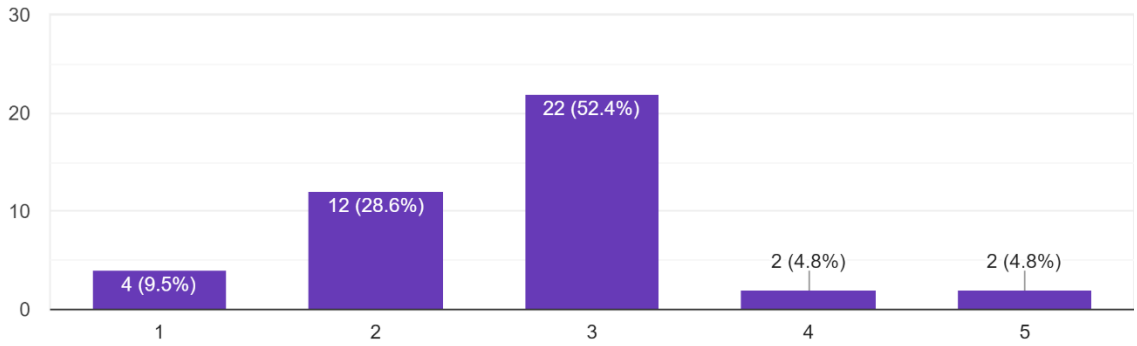
How often are you unable to return to a matatu/bus you boarded due to unavailable track records in the Sacco?

42 responses

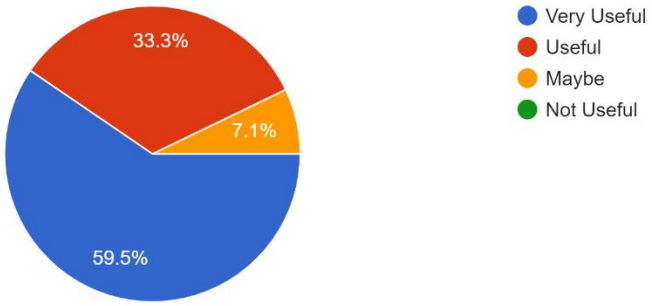


On a scale of 1 to 5, 1 being the lowest, how would you rate the management of matatu Saccos in Kenya?

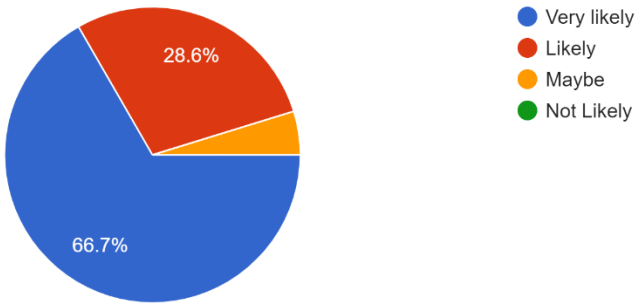
42 responses



How useful would it be to manage matatus digitally other than using manual ways?
42 responses



How likely would you recommend a matatu Sacco company to use digital management ways?
42 responses



Survey Conclusion:

The online survey was created and distributed via WhatsApp. I used WhatsApp to reach to Kenyans to give me feedback over the subject of study. The survey was created using Google form and its responses received through excel which allowed for analysis using charts. The survey aimed at 50 responses and managed to get at least 42 responses. The main aim of this survey was to gather information on the current state of the industry and how the target market would receive the application.

According to the responses, 69% of the respondents were male while the other 21% represented by the ladies. The distribution of the survey online called for a mix up in terms of age brackets. The biggest population came from people of between the age of 18 to 30, followed by 9.5% from 31 to 40 and the rest was occupied by person between the age of 41 to 50. The next question aimed at information on the most commonly used mobile devices. 97.6% confirmed to be using android phone while the rest of the respondents were using iPhone. All the

respondents confirmed to have used Kenyan Public Transportation Means. The first four questions aimed at understanding the audience and the target market better. From these questions it is clear that most people use android phones and have previously used matatus.

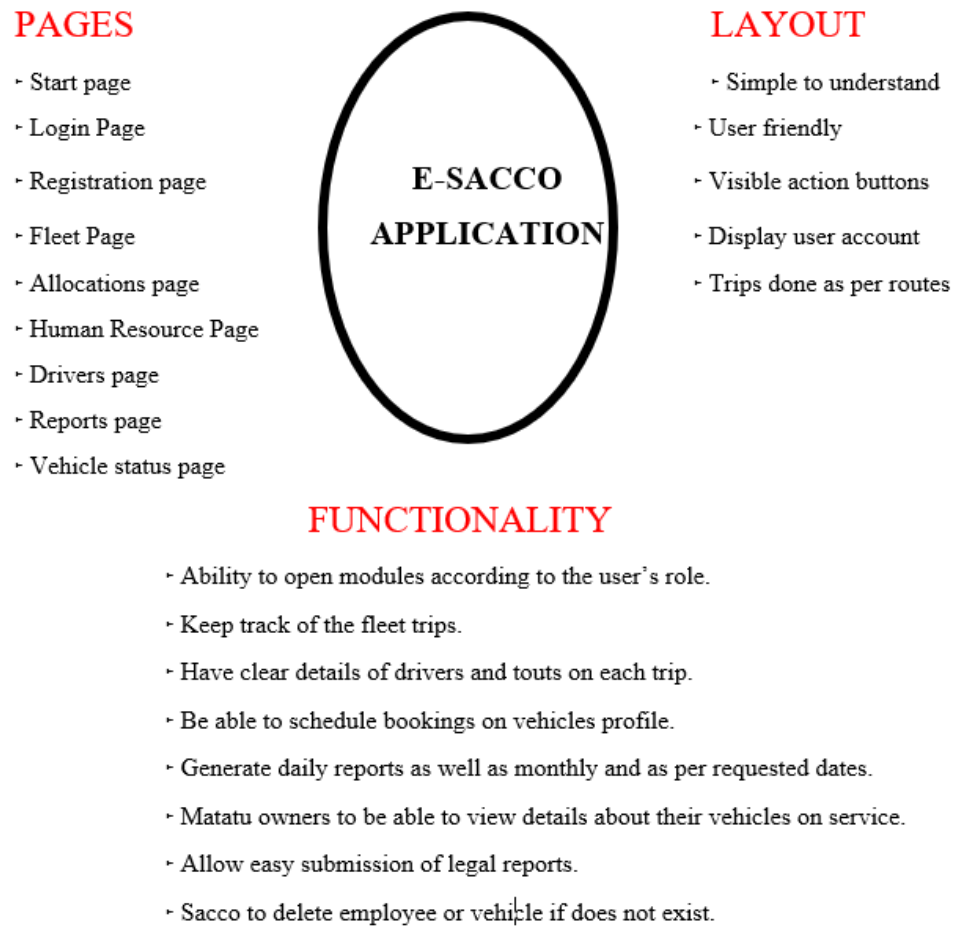
The next set of questions focused on understanding more about the operation of matatu saccos and the use of technology in management of these saccos. The survey shows that 61.9% of the respondents have more than 10 matatu saccos operating in their area of residence. This shows that there are a very large number of public vehicles in the given area thus the need for a better management technique. 23.8% had 1 to 5 saccos in their areas while 14.3% had between 5 and 10 saccos in their area of residence. 40 respondents stated that their matatu saccos are operated manually forming 95.2% of the respondents while two stated that they operated digitally. 73.8% of the respondents agreed to have wanted to get back to the matatus they have used due to an issue such as forgotten item. 31% have always been unable to reach to the matatus due to lacking track records from the Sacco managements, 23% rarely have such issues, 21.4% sometimes faced such issues, 16.7% often face this issue while 7.1% never faced this challenge before. The question on the management of saccos had 52.4% rate it as average, 28.6% and 9.5% rated it as below average. 59.5% of the respondents confirmed that it would be very useful to use digital ways of management in the matatu saccos. This shows that digital management would improve the services of the transportation industry. Lastly, 66.7% and 28.6% were very likely and likely respectively to recommend the application of digital app in Sacco management.

In conclusion, the overall responses to the interview are positive. The outcomes will be recorded and used in the MOSCOW requirements analysis tool.

Requirements Outcomes from the Survey:

- The application to be developed must be on iOS and android operating systems.
- The application must keep track of the vehicle details including fleet details.
- The application must focus on management of vehicles in the Sacco.

3.2 Brainstorming



Brainstorm Summary:

The brainstorming session emerged to be a great success. The participants joined the meeting in time and did not have any distractions or internet connectivity issues. The stakeholders obeyed the rules as they were able to listen to others talk as they listened carefully taking notes. The session started by allowing each stakeholder time to explain their ideas and expound on it. The ideas contained requirements, features and functionalities of the application. Afterwards there was a review discussion where we discussed the requirements elicited. The discussed and agreed on features and functionalities were recorded and later send out to the participants via mail. The results can be seen on the diagram above.

2.3 Interviews

Interview One:

Participant: Project Client

Interview Questions and Answers:

Please explain how a normal day looks like while carrying your day to day activities of MSL Sacco?

On a daily basis, I am responsible of planning how the vehicles will work through out the day. It is my work to allocate different drivers and touts the vehicles and routes they will go for the day. There are other persons we call stage managers, I get in touch with them to ensure that they pick roll call of the buses on every trip they make. At the end of the day it is also our duty to make sure, the drivers fuelled the vehicle and has handed over the rest of the cash to the Sacco. We should also make sure the vehicles are set for the following day in terms of maintenance and give necessary reports to vehicle owners. It is our duty to deal with legal issues if the vehicle has some issues. The day is basically about management and very hectic.

Could you explain what you think about the application?

I think the thought of having this application in place is a great sigh of relief. It is a good idea that will at least help in having more efficient and effective way of management. I also view the application as a solution that every matatu Sacco in Kenya would want to have in place at a cheaper price.

Please tell me what you would want the application to do

The greatest expectation is the application to simplify management work by eliminating this papers and blackboards we use at the stage points. It will be really helpful if we can be able to allocate the trips through the application and be able to get daily reports from an application.

Explain what you would want the main features and functionalities of the application to be?

Simple to understand and use: Most of our employees are drivers and touts and usually have minimum education. This means that if the solution is difficult to understand for them, it will face rejection thus difficult to implement on our side.

Fleet and trip allocation: It will really be of help when the application is allowing us to allocate trips via the application. Drivers can login and check such details other than calling them one by one.

Peruse by data reports: I expect the application to enable me to look for reports based on dates. I can be able to choose a start date and end date then get the reports.

Simple way to register: If it our duty to register the vehicles and our staff members, the process should be easy to go through.

Reports: Downloading the reports will be a big assistance in the application.

Analysis of business information: The application should contain a way of searching for information regarding a certain business feature. It should be able to list for example all vehicles with pending legal issues.

Staff performance: We have had a challenge over time of evaluating the performance of our staff especially the drivers and touts. If the system can allow a way of evaluating their performance will even make them work hard at work,

Login: A login page will be important for our staff to login and access the details registered under their level of user access. Make the login page simple for our users.

Security: Should be held a top-notch requirement in this project. This is because it will contain sensitive details about the returns of the vehicle's day in day out. It should also not expose the information of our business to the public.

Who do you think will be potential clients of the application?

This application in my point of view is very marketable. This is a business and every business person would want to reach the levels of their competitors and really do better. I think that all the saccos would want to use this solution if offered at a favourable price. The target market is the matatu saccos not only in town service but also in the rural and up-country areas.

Why do you think the application is important in the public transport industry?

In my point of view, the application is very important in the public transport industry. There is a very fast-growing population in the country therefore the industry keeps on growing. This means that the number of vehicles in a Sacco keep on increasing. It is important to have a

digital way that will simplify the work, reliable reporting system, effective time saving fleet allocation and increased profit levels which come with better management.

What are your timelines in regards to the development of the application?

For my Sacco, we would consider it good to have the application within seven months. Gather the necessary requirements and review them within two months the do a design and begin the development process. It would be good if we review the work timely during the development phase to make sure quality work is provided.

What features do you consider good but can be scheduled to the nest version of application upgrade?

Though expensive, it would be good to include a way of detecting motion and monitoring the vehicle every where it goes, like having a smart device. It would be good in the near future to integrate this application directly with those of the NTSA to have very easy flow of data.

What do you think is the major challenge affecting the implementation of technological solutions in the public transportation industry?

In the capacity of a Sacco manager, I would say that costs of the technologies is a challenge. Most of our vehicles are usually taken on loans by the matatu owners. This means that we work hard to repay the loans and remain with some profit to keep the business going. If a solution is expensive then no one will want to take it in.

Lastly, please discuss the expectations you have to me throughout the project.

I expect your maximum cooperation as we work together in the project. I also promise to be available whenever needed in this process.

Interview One Conclusion:

This was the first interview I did and my first official meetup with my client in regards to this project. It was an informative session that gave clear understanding of the features and functionalities my client expects in the application. It also brought in clarity on the timelines of the project development.

Q1: This was the interview opener and helped understand better the duties the matatu saccos are tasked with. It also confirmed what I should expect in the market.

Q2: The second question aimed at understanding the thoughts of the client as well as a measure of their interest in the solution.

Q3: This was a question to understand whether the overall function the application should undertake. This is basically a summary of the project objective from the interviewees reasoning.

Q4: This question aimed at collecting the features and functionalities of the application. The question collected features such as registration, login, report generation and trip allocation. The client emphasized on the application been very simple to understand and use for their staff. The security features of the application should also be top-notch.

Q5: The matatu Sacco manager explained that the application would find ready market in the transport industry as most saccos would want to use it to simplify their work if it is offered at an affordable price.

Q6: The question aimed at understanding the importance of this application in the industry as well as validate whether the application is needed in the market. The response added a new feature of fleet management and emphasized on report generation.

Q7: A question on the timeliness helped understand clearly the amount of time available. This will be used in scheduling of the activities in relation to the availability of time and help in delivering the solution in time.

Q8: For the purposes of upgrading, this question brought in requirements of low priority that would be used for the next level of the application.

Q9: Question on the challenges of technology helped understand the issues in the market. In the development of this project, such guidelines brought a clear understanding of the issues faced thus avoiding them or coming up with a way of curbing the same in the application market.

Q10: The closing question aimed at getting a clear understanding of what is expected of me in the project.

Requirements from Interview One:

- Understandability
- Easy to use
- Fleet allocation module
- Fleet tracking module
- Report generation
- Report sharing
- Registration page
- Easy to register
- Analytics
- Performance and evaluation functionality
- Login Page
- High security in the application
- Minimalistic

Interview Two:

Participant:

Renown Matatu Owner

Interview Questions and Answers:

What are the major challenges you face in terms of management in the public transportation industry.

Major challenge is not having direct control or even access to information regarding your vehicles. Sometimes we have to make very many phone calls to get to know what is happening especially when a vehicle has a legal issue or is involved in a bad event.

From the experience you have as a matatu owner, do you find manual management tiring and unreliable?

Manual management of these vehicles is never an easy task. We usually be very many matatu owners in one Sacco. This means that to get any information you have to keep calling the Sacco management to access any information.

Please tell me what is your initial thought of the application

To be honest, this application will really be helpful to us. It will at least give us the privilege to view details of your vehicle, know how much your vehicle makes and when the vehicle has any issues. It will bring in a higher level of trust in our management and help eliminate cartels in the industry.

What are the major tasks you expect the application to perform?

I would want the application to eliminate manual work completely in the management of these vehicles. Having a reliable digital process will even simplify our work as well as enhance communication and our business relationship.

What are the features and functionalities you expect in the application?

As a matatu owner, the application should give me the privilege to login and register my vehicle. The process should be easy such that I can view the status of my vehicle registration to the Sacco online other than making calls and going through long processes. The application should at least show the drivers using my vehicle for the day and get informed when my vehicle is hired for long trips or events. It is also very crucial to be able to search for reports and download them. Condition of the vehicle should also be visible in the application since some of these vehicles we acquire them on loans.

Could you please explain about the process of registering your vehicle in a Sacco?

Once you have acquired a vehicle, you need to register it under a Sacco. That Sacco you are registering under will help you acquire most licences of operation. The process is usually very long since you have to physically follow up on the same daily. The vehicle has to be inspected and terms of purchase of the same vehicle confirmed. It is after all these processes you get to agree on the terms of payment and returns of your vehicle. The Sacco can also help you acquire a vehicle on loan. Doing this digitally would be good.

What features do you consider important but cannot be accomplished in the first version of the application?

Having a cheap way automatic tracking of these vehicles will be good. Sometimes drivers can take advantage of your vehicles and use them for their own personal gains. A smart device to record how they drive will be good for monitoring.

Do you have any additional feature not yet discussed?

It would be good to be able to view all vehicle registered under my name at once without necessarily searching using the number plate. When I login under my account have the vehicles holding my name. The security of the application should also be checked in terms of data protection and information security since hackers will be watching this solution.

Interview Two Conclusion:

The second interview was very successful and an in informative session. It brought a clear picture of how matatu saccos and owners interact and the expectations from both sides. It clarified on registration process. This question brought in more requirements which will be very helpful in the nest stage of the project development.

Q1: This was the first question which acted as an ice breaker, targeting to gather information on the challenges a matatu owner faces while interacting with the Sacco. The matatu owner confirmed that the major challenge is knowing about the status and progress of your vehicle. He stated that it involves making numerous calls and especially the times when there is defaulted weekly payments.

Q2: This question aimed at collecting information on the take of the matatu owner on existing management and to understand what they really go through currently. The matatu owner confirmed that is really hectic to acquire any information regarding your vehicle. He insisted that most of the times you might not get an honest response from the driver.

Q3: This question sought to get an overview of the level of interest the user has in the application. It confirmed that the application is needed and added one more benefit that is to increase transparency in their business.

Q4: This question got it clearly that the matatu owner seeks to have a digital way of doing things other than the lengthy manual processes.

Q5: This question aimed at getting features and requirements of the application from the interviewee. It collected features such as login, registration and approval. It also brought in issues of reports and status of the vehicle.

Q6: This question aimed at understanding the process of having a vehicle registered under a Sacco. The owner explained that most of the licences are usually processed by the Sacco and the Sacco can also help one purchase a vehicle. This helped in understanding on the functions of the Sacco that needs to be included in the application to simplify the process. Features such

as getting helped to purchase vehicle need to be added. It also calls for addition of a module to link the saccos with the legal authorities dealing with public service vehicles to ease the process.

Q7: The question wanted to get features to be used in the version two of the application. The matatu owner proposed a cheap smart tracking and monitoring device.

Q8: This is a question to elicit more requirements from the interviewee. New requirement on user account to have my vehicles feature was added. A non-functional requirement on security was also emphasized.

Requirements from Interview Two:

- Login
- Simple Registration process
- Vehicle status
- Registration Approval
- Sacco Vehicle Acquisition
- Trip details
- Enhanced Security
- Report Generation
- User accounts
- Smart tracking

Interview Three:

Participants:

Software developer

Interview Questions and Answers:

Based on your understanding of the application, would it be possible to develop the application of different platforms?

Developing this application on a cross platform is very possible. It is good since it will not involve extra work of developing two different applications for android and then for iOS. Though developing in cross platform will have some restrictions in terms of technology compatibility it is better to develop one application that can apply in all platforms. This will

require developing in React Native though the back end is not device specif. So, this will be achievable.

Will it be possible for the application to store this mass records of data and how will this be achieved?

The application is about big data therefore needs huge storage of facilities. For this application I would recommend using SQL Database which will be compatible with a cloud facility. It is wise to have a cloud-native SQL database for an effortless elastic scale in terms of risk management and disaster recovery.

From your professional point of view how will the application generate and send the reports to respective persons via mail?

From a professional point of view reports are very important in this application. The data stored in the database will provide the reports once requested for. This means that when a user queries reports, the system should be able to fetch the required data from the database and display it before downloading it. There will be a reports module that will have get data from the database. However, in the front end it will just be a button to generate reports. There will be a download feature. A share button can also be included on the page if one wants to share the reports.

In the application, what technologies will be most suitable for tracking the movement of the vehicles without involving costs of installing new GPS trackers on the vehicles?

Tracking of vehicles most of the time requires the use of smart devices. However, since the drivers will be using smartphones in their day to day operations in the system, maps can be used. We can turn on location on the devices and use it in the application as live location. This cam be used to track and monitor the movement of the vehicles throughout the day.

Is it possible to implement the subscription criteria, prompting the user to pay on expiry?

The application subscription is easy to implement using a billing functionality. This functionality can be introduced as a module on the users account. Setting of the dates of expiration of the subscription on the system, it will trigger an update on the user account as a reminder notification. Renewal of subscription will automatically update in the system and service will be extended.

How long would it take to implement this solution and what costs would it take?

Developing the application on cross platforms can take up to 4 weeks. There are some functionalities such as security, tracking and linkage with other module would take two more than. Testing the application is also included in the tome line. Both front and backend development can cost 50k.

What processes will the maintenance process of the application be?

There will be minimal maintenance in terms of code optimization and backend maintenance. This can be done once a month since the system is already backed up in the cloud sql server. The upgrade of the application into a newer version will be planned and the implementation done in a procedural way. The upgrade will be involving advanced features, improved User Interface and Performance of the application as agreed with stakeholders.

What are some of the ways will be used to ensure security of data and passwords in the application?

Security is paramount in this application. The first way will be to ensure users create strong password as per the password requirements. We can use One Time Password to ensure that a user is authenticated and verified before using the application. The passwords used in the application must be encrypted to ensure the safety and security of passwords. The application will not be developed on GitHub to avoid attracting hackers which will ensure data security.

Interview Three Conclusion:

Q1: This question aimed at understanding whether it would be possible to satisfy the needs of our users since they appeared to be using both android and iOS according to the survey. The developer confirmed it was very possible to develop this application on across platform which meant the app is compatible with multiple platforms.

Q2: The question sought to understand how data will be stored as well as the database in use. The developer recommended the use of a SQl database with a cloud-native recovery plan. This would act as backup which assures the stakeholders of information security in the application.

Q3: This question brought understanding on the requirement of report generation and sharing. The developer brought in the features of viewing reports, downloading reports and a provision to share the reports. The question brought in clarity on how to do prioritization on matters reports.

Q4: This question confirmed that tracking can be implemented without necessarily using hardware. A new feature of using Google Maps Live location was introduced for vehicle tracking.

Q5: This question aimed at understanding how the money-making ways can be implemented in the application. The developer confirmed it is achievable and proposed a new feature for billing module.

Q6: The developer explained that the developing and testing journey would take three months at a cost of 50k.

Q7: Maintenance of the application was stated to be planned. The application would require minimal maintenance since its data is in a disaster recovery plan. Code optimization would be done once a month and app upgrade would be planned.

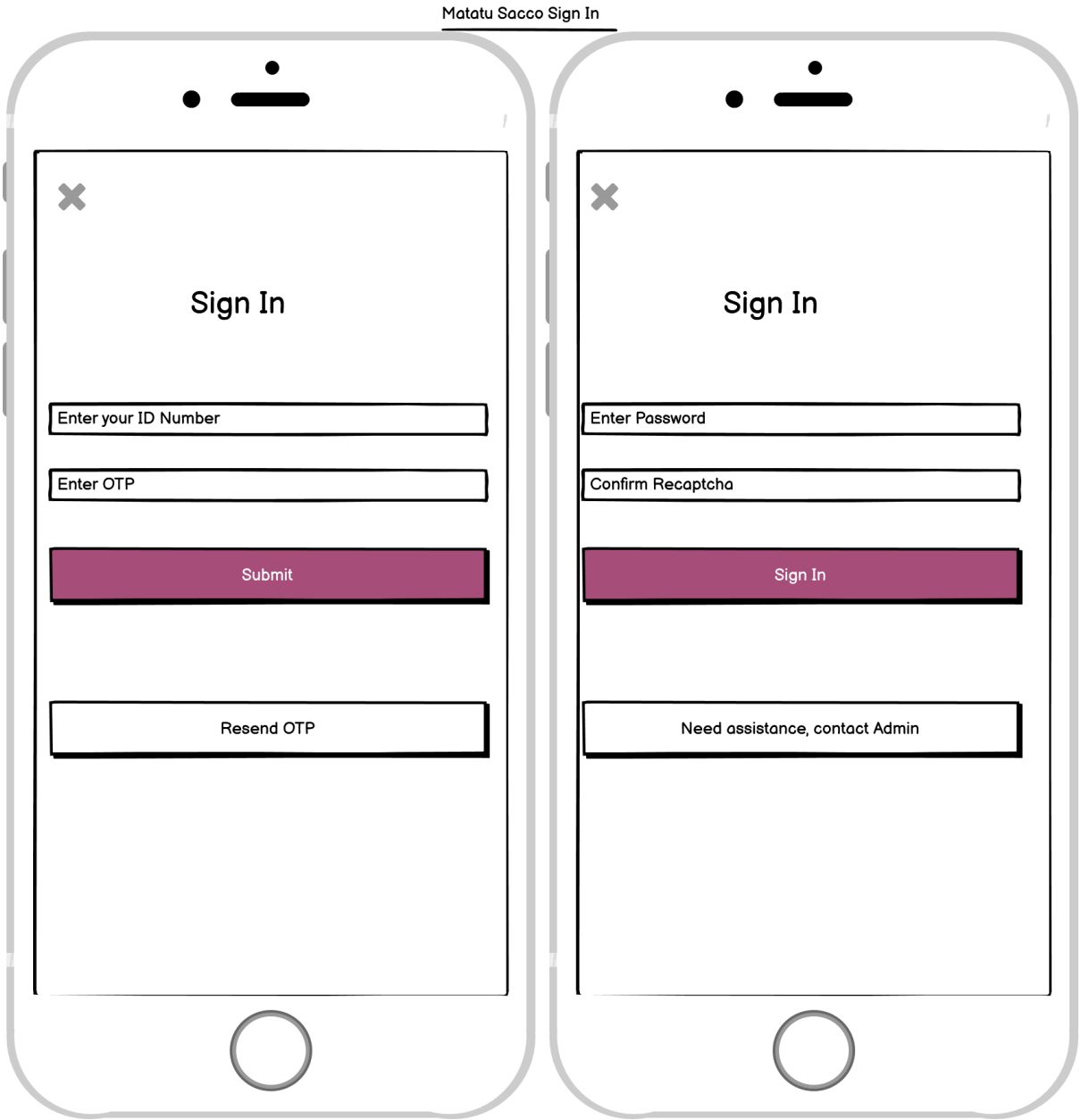
Q8: This was closing question and brought in security features in the application. Implementation of One-Time passwords and encryption would help increase security. A non-functional feature of not using GitHub during development emerged.

Requirements from Interview Three:

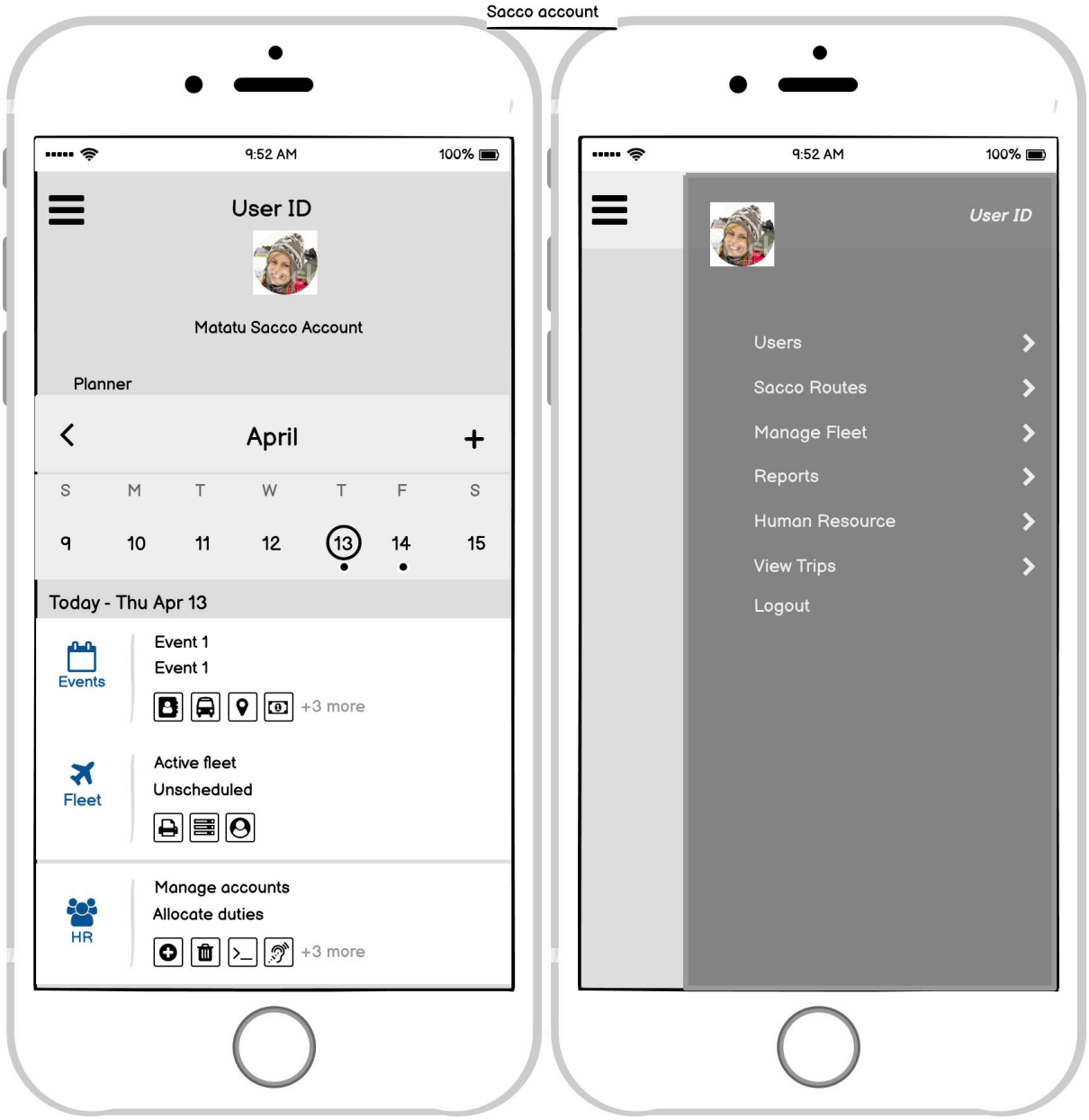
- Cross-platform app
- Technologies
- SQL Server
- viewing report
- Downloading reports
- Share Reports
- Live Location Tracking
- Billing
- One Time Passwords
- Encryption Algorithms
- SQL cloud Server
- Password requirements
- Optimized app performance
- Availability of app store and play store.
- System update and upgrade

3.4 Prototyping

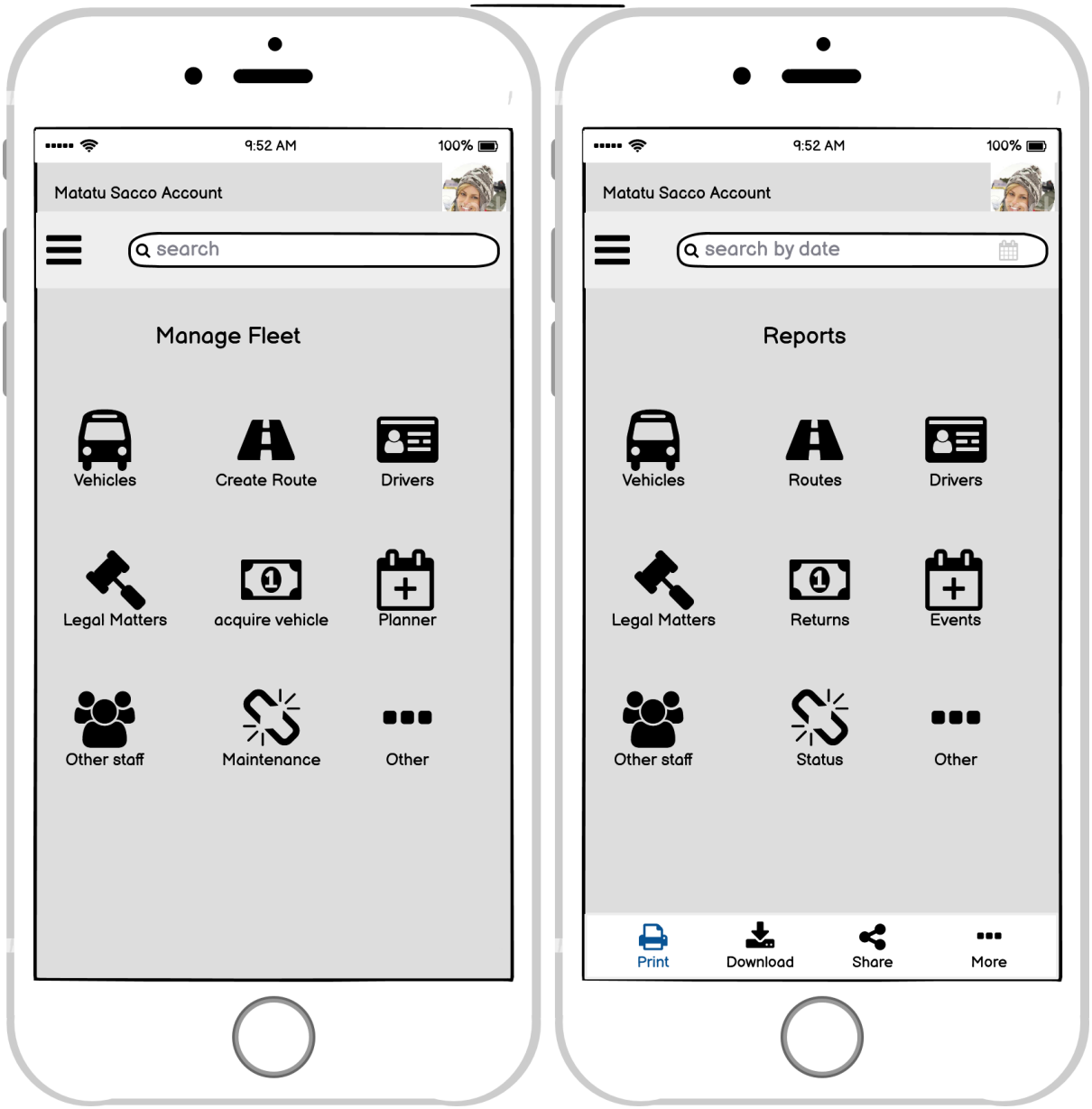
Prototyping Version One:



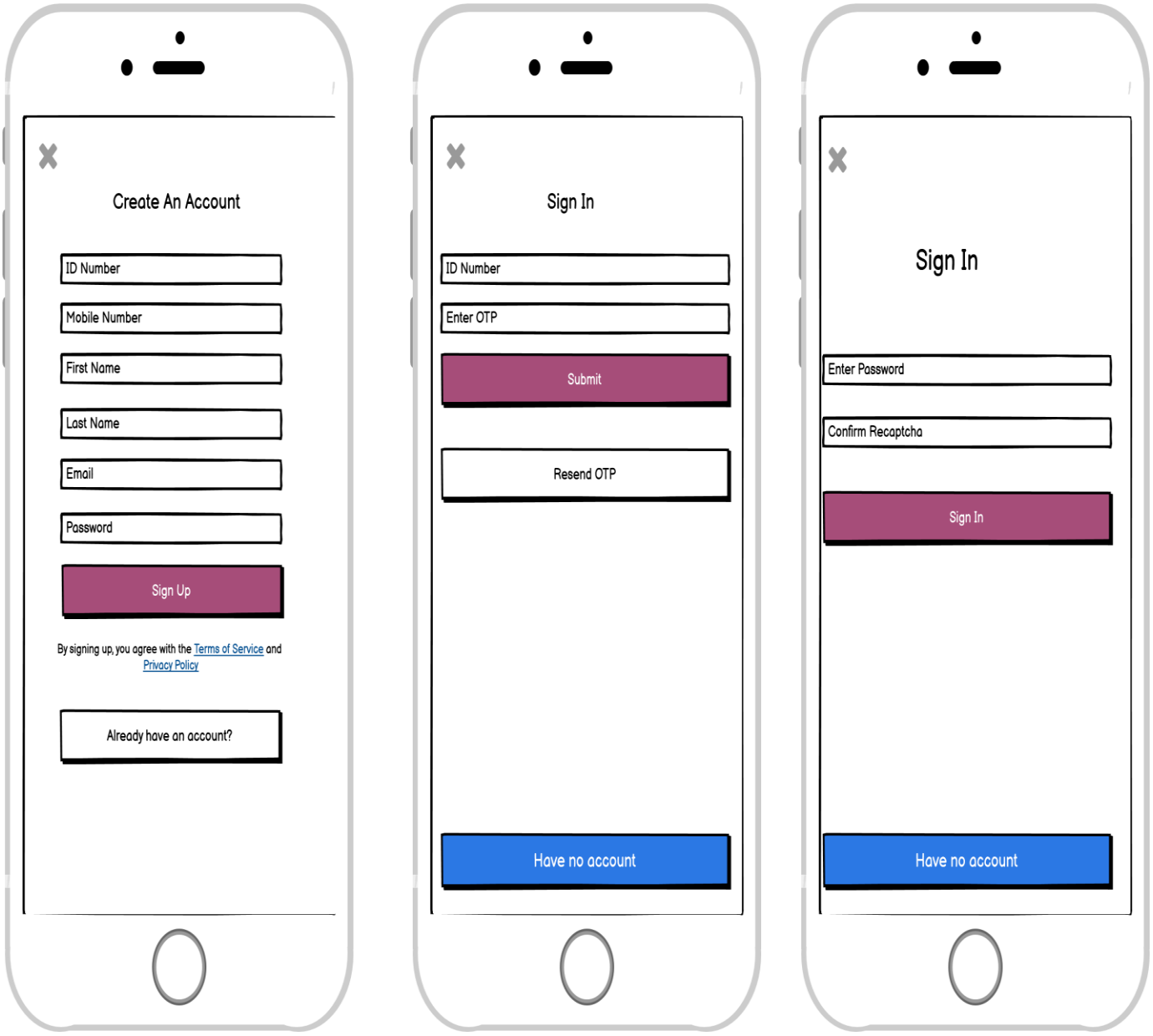
Sacco account



Fleet and Reports

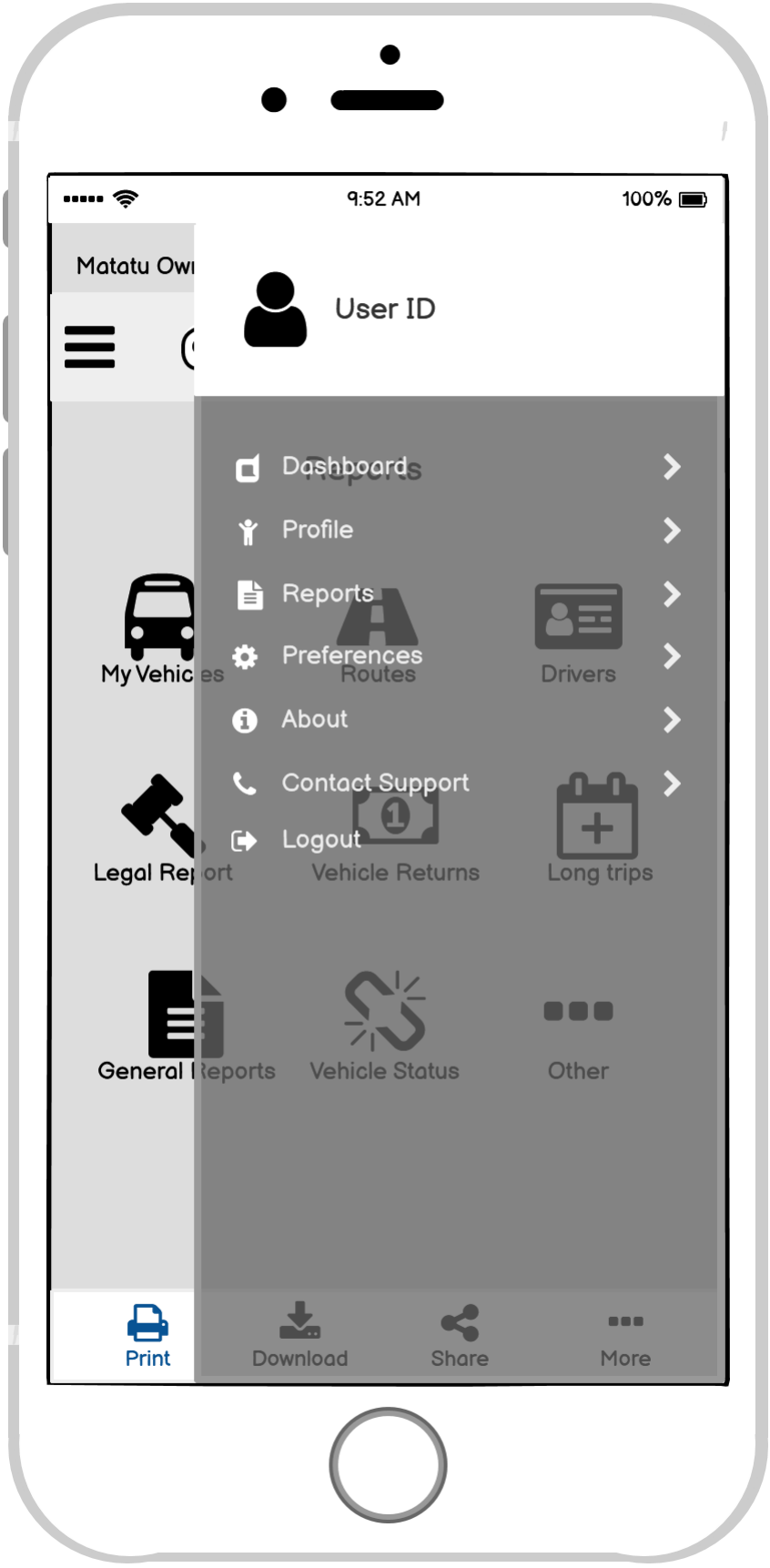


Matatu Owners Sign Up, Authentication and Sign In



Matatu Owner Account

Sign Out

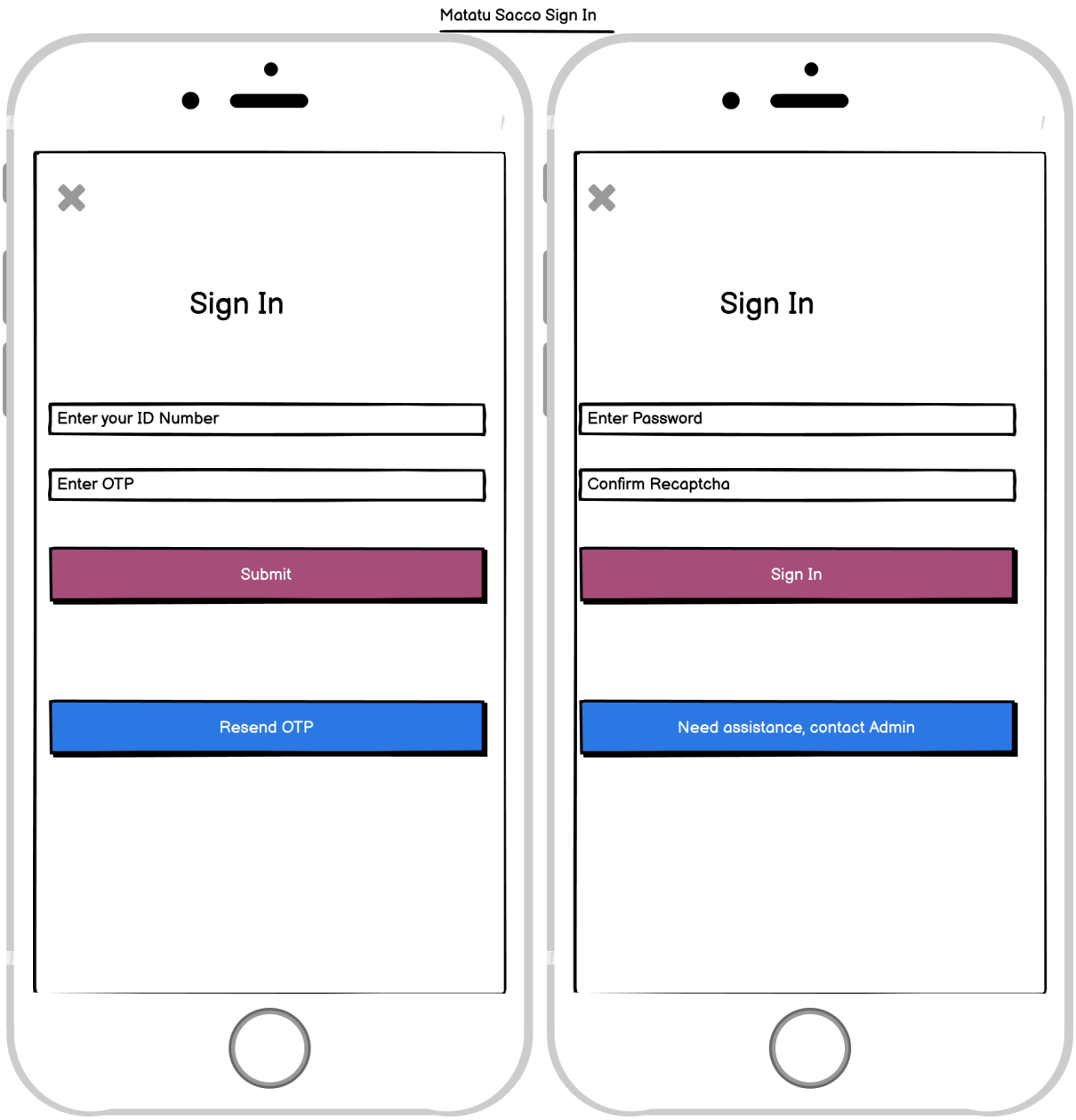

9:52 AM
100%
User ID
Dashboard
Profile
Reports
Preferences
About
Contact Support
Logout
Drivers
Routes
Vehicle Returns
Long trips
Vehicle Status
Other
Print
Download
Share
More

Prototype Version One Conclusion:

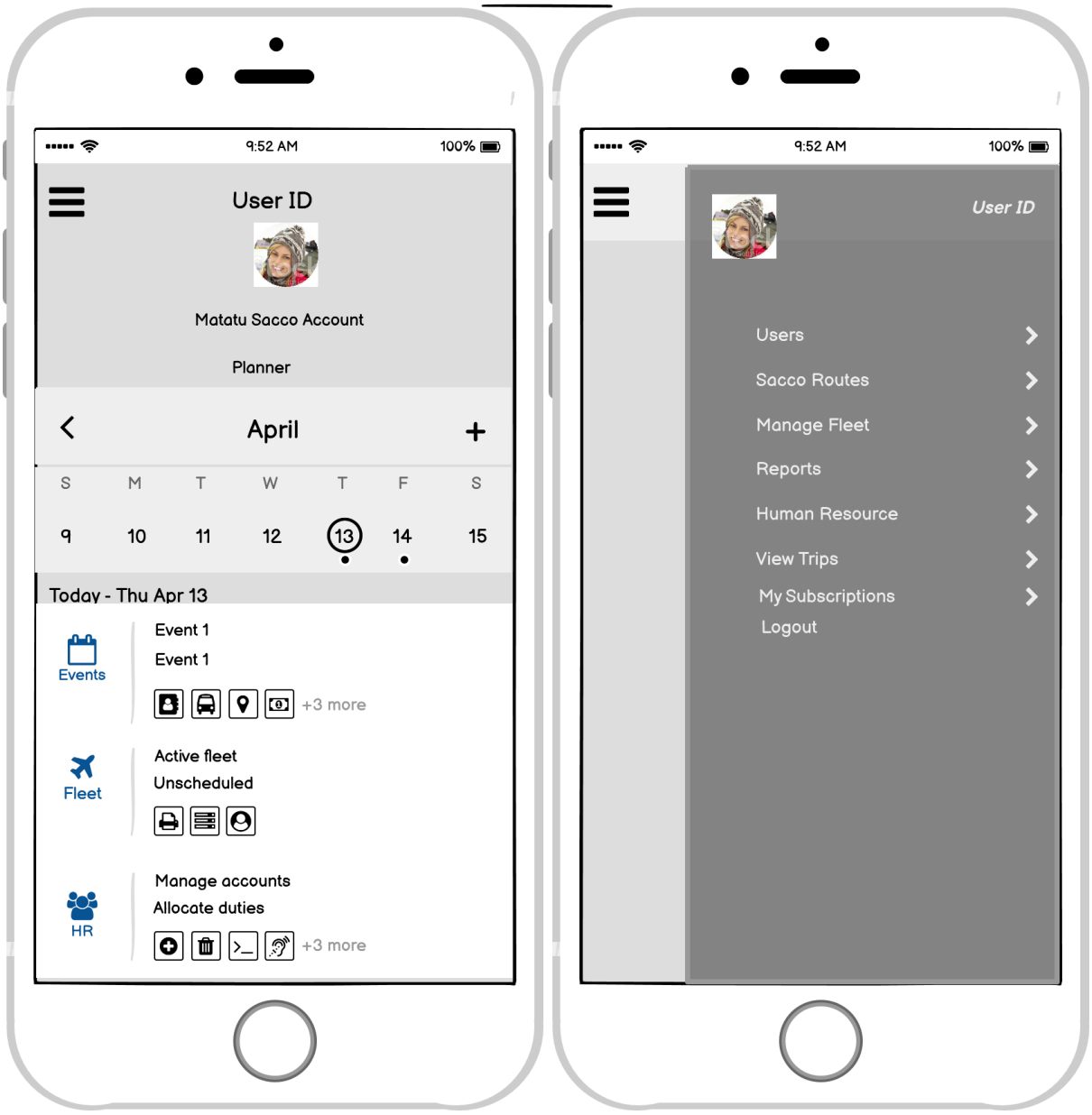
The prototype was developed using blasmiq software. The prototype took in place the requirements that were elicited during the previous brainstorming, survey and the three interviews conducted with the stakeholders. The requirements gathered where amalgamated and prioritized to produce the ones in the prototype.

The prototype has 12 pages due to its simple to understand and use nature. All the features and modules a user needs to use are all located under one dashboard to avoid complex designs. This prototype will be evaluated during the requirements workshop to come up with recommendations and critiques that can be applied on the next version of the prototype. The workshop will give an opportunity to check the missing features and to explain deeply to the stakeholders how the application is structured to work.

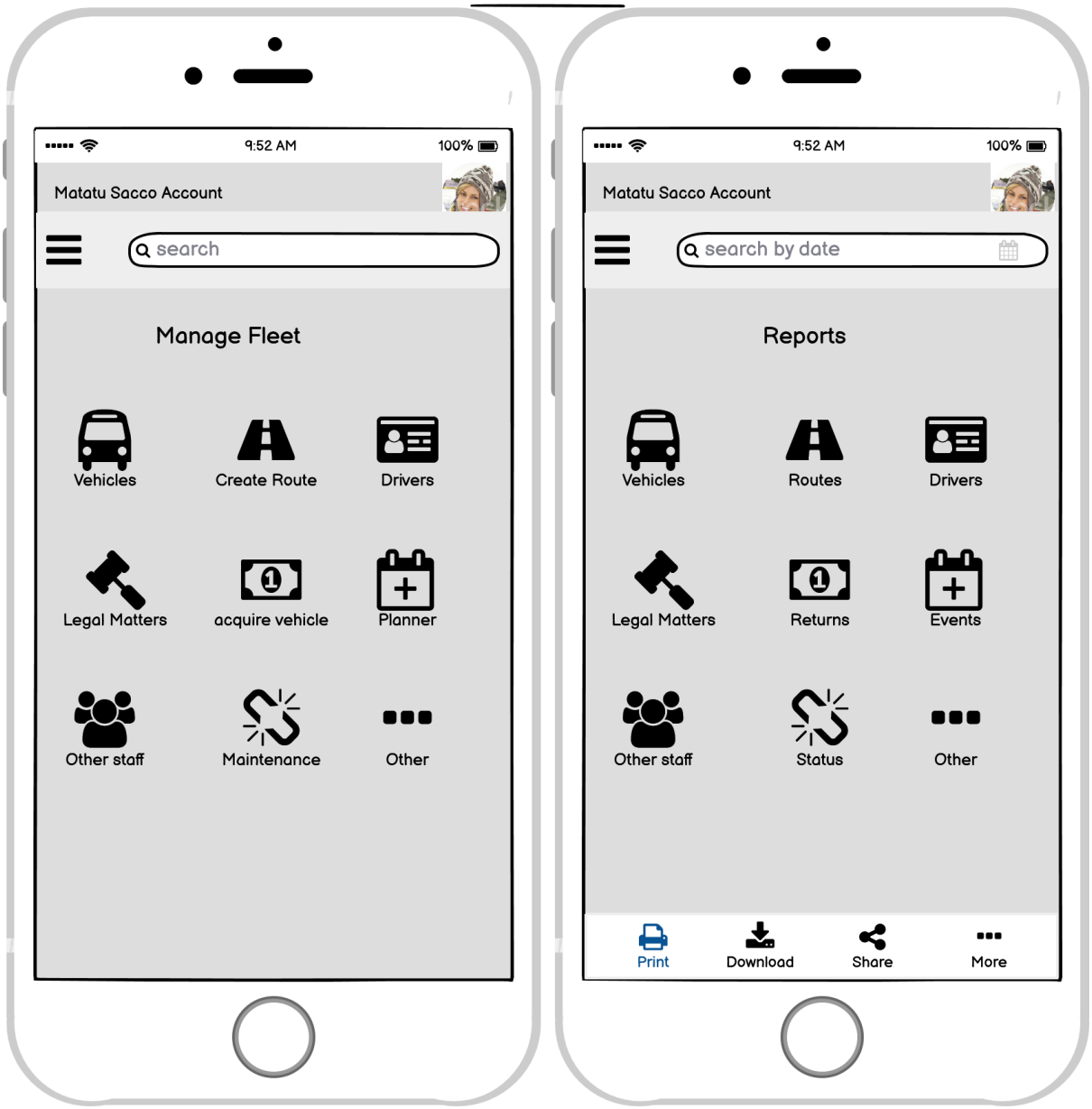
Prototype version two:



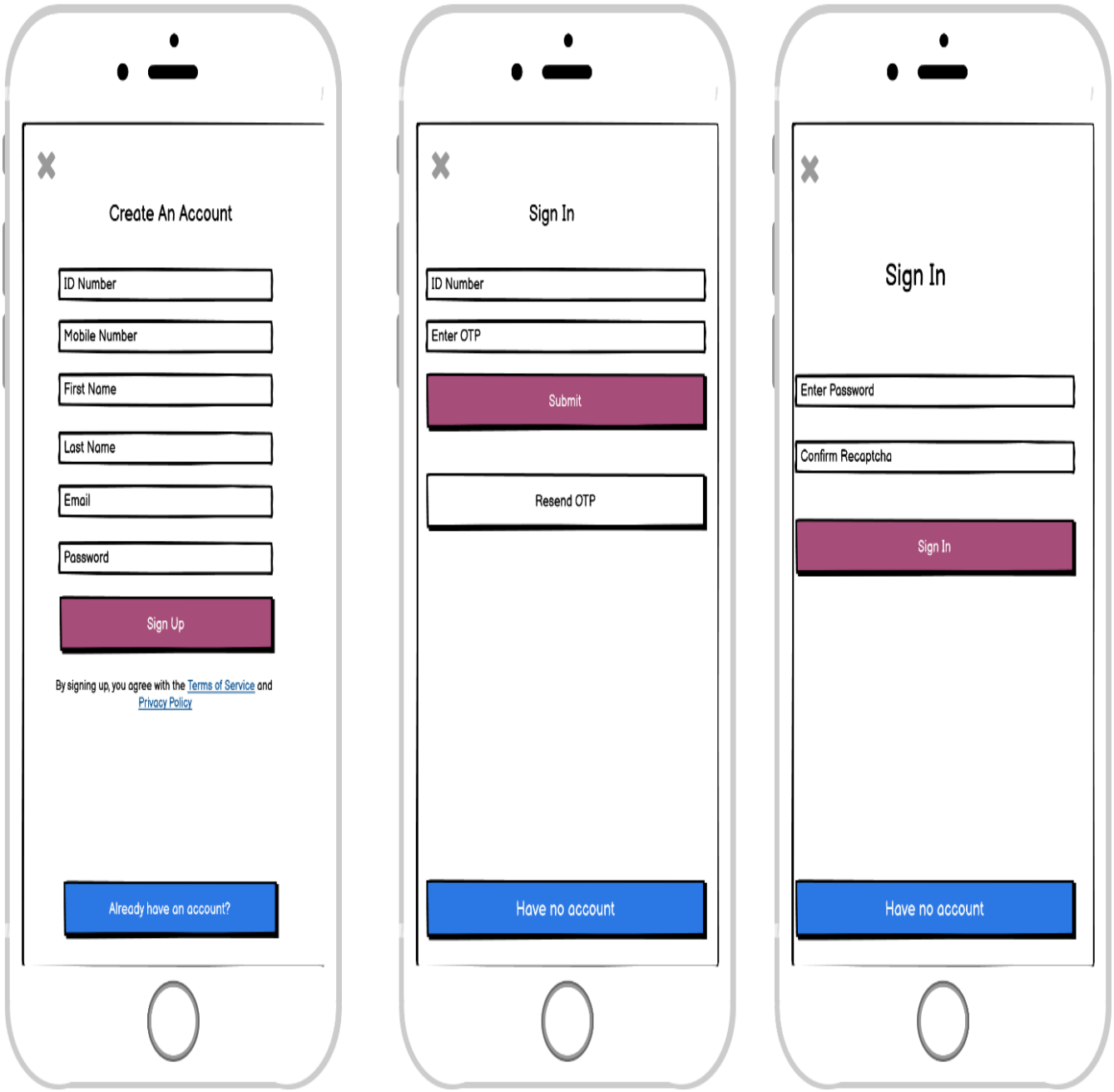
Sacco account



Fleet and Reports

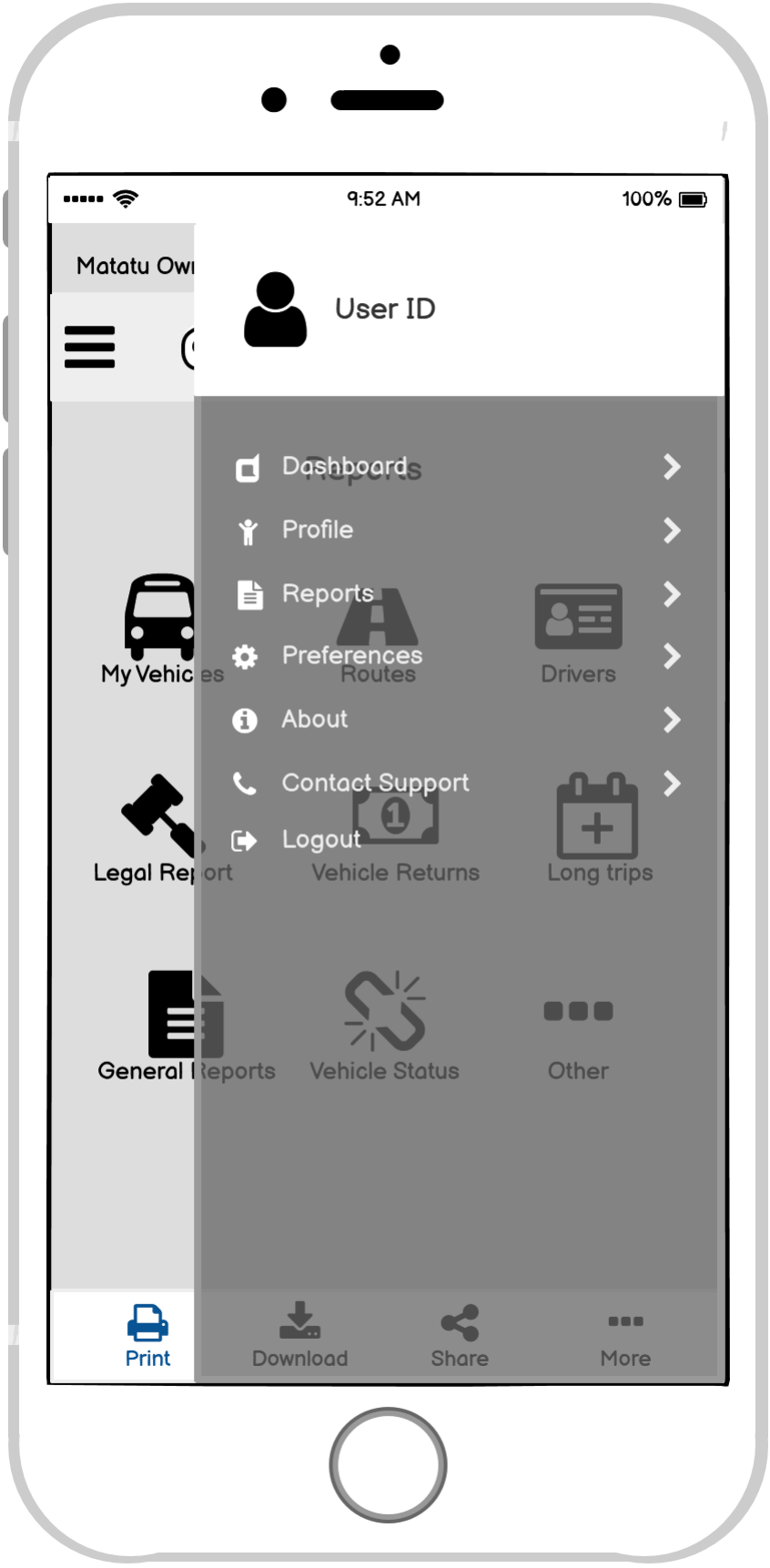


Matatu Owners Sign Up, Authentication and Sign In



Matatu Owner Account

Sign Out


9:52 AM
100%
Matatu Owi
User ID
Dashboard
Profile
Reports
Preferences
About
Contact Support
Logout
My Vehic es
Routes
Drivers
Legal Rep ort
Vehicle Returns
Long trips
General Reports
Vehicle Status
Other
Print
Download
Share
More

Prototype Version Two Conclusion:

This is the second version of the prototype. It was done after the online requirements workshop. The recommendations and critiques made by the stakeholders were incorporated.

On the matatu Sacco sign in page, the buttons to resend OTP and contact admin buttons were given a blue filling colour to ensure that they are visible and remain uniform. A provision to view and manage subscriptions was added on the matatu Sacco navigation page. This is centrally located for easy access. On the matatu owner signup page, the resend OTP and already have an account buttons to be changed to blue for uniformity. On the create account page of the matatu owners, the already have account button was placed at the bottom of the phone as it appears in the login page for consistency. On the Sacco account, the design on the landing page of planner should was revised to remove the boarder and ensure consistency and uniformity. The stakeholders said the appearance would be top-notch.

The other parts and pages of the prototype remained the same since they received a positive compliment from the stakeholders.

3.5 Requirements Workshop

The requirements workshop was held online with a number of stakeholders attending the meeting. The meeting was successful and aimed at elaborating what the application is doing, gathering feedback and identifying missing features and functionalities in the application as well as building trust and teamwork among the stakeholders. The requirements gathered in the previous sessions were prioritized using MOSCOW technique. The requirements that lied in the MUST and SHOULD section be considered and included in the pages of the version one of the application prototype. The wireframes were displayed and explained to the stakeholders for discussion.

The stakeholders expressed their like for the work that was already done in the wireframes stating that they looked pleasing. They also stated that the prototype displayed a simple to understand and use application. The matatu saccos login page was seen to be simple and secure since it involved the multi-factor authentication process. The said that this would build more trust in the system since it already showed a level of cyber security. The matatu owner sign up and sign in pages also received positive compliments for the fact that were secure and easy to understand and navigate around. The dashboard was also seen to be of a high benefit since the

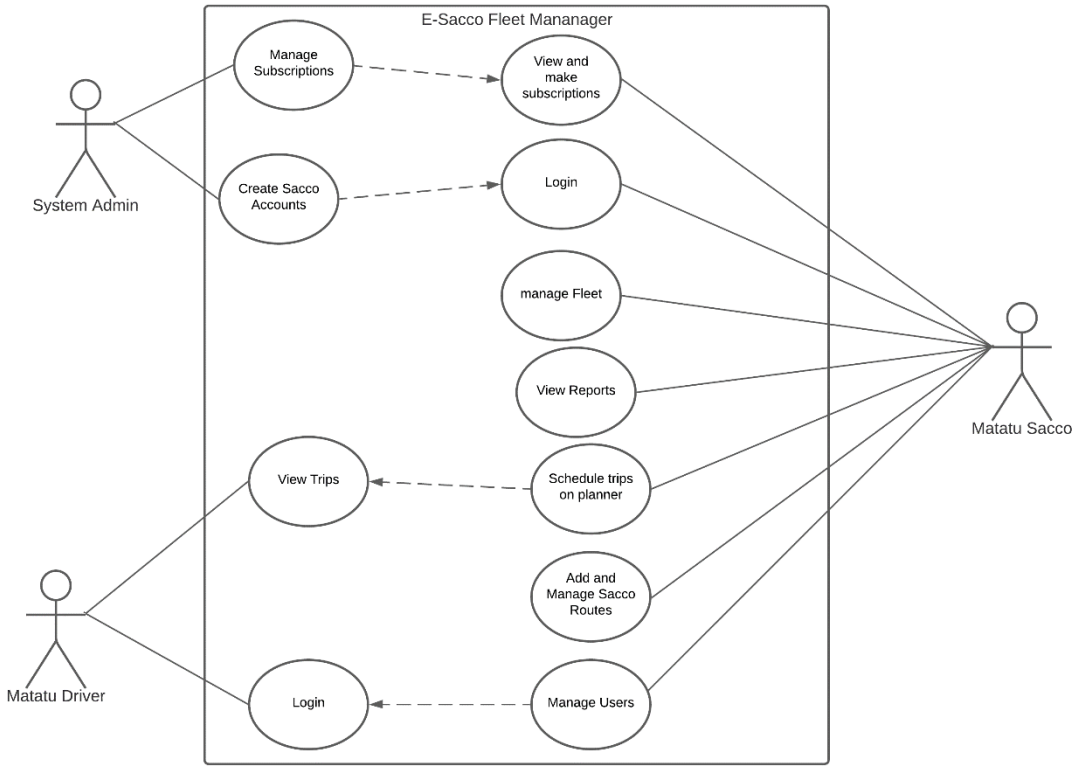
user did not have to move around multiple pages to access data. This complimented to be easy and straight forward. The layout of these pages also looked appealing to the eye.

The window for recommendations and critiques was then opened. The recommendations made were to be fixed in the next version of the app prototype. The critiques and recommendations are as follows:

- On the matatu Sacco sign in page, the buttons to resend OTP and contact admin buttons to be highlighted with a blue background colour.
- The navigation bar on the matatu Sacco page should contain a provision to manage subscriptions.
- On the matatu owner signup page, the resend OTP and already have an account buttons to be changed to blue.
- On the create account page of the matatu owners, the already have account button to be placed at the bottom of the phone as it appears in the login page.
- On the Sacco account, the design on the landing page of planner should be similar without boarder and centre align the topic planner.

The other parts and pages of the prototype would remain the same since they received a positive compliment from the stakeholders.

3.6 Interface Analysis



Name:

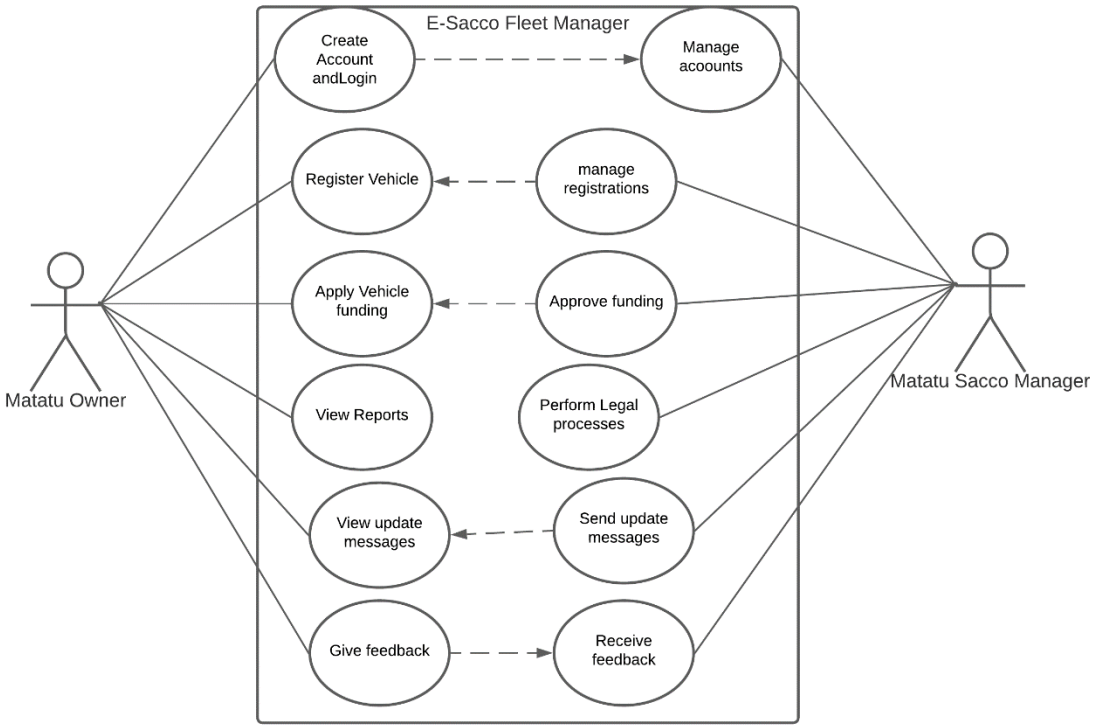
Sacco management Use Case Diagram

Goal:

The aim of this use case diagram is to display the main activities performed by the matatu Sacco manager in the system. The main actor in this diagram is the matatu Sacco management. The other actors are matatu driver and system admin. It shows how the system admin regulates the users after acquisition of the system. It also shows how the matatu driver interacts with the system and get approvals from the Sacco management.

Actors:

- Primary Actor: Matatu Sacco Management
- Secondary Actors: System Admin and Matatu driver



Name:

Matatu Owner Activities Use Case Diagram

Goal:

The aim of this use case diagram is to display the main activities performed by the matatu Owner in the system. It shows the process from the creation of an account to the viewing of different reports. The matatu owner gets approvals from the Sacco on different levels and activities carried out.

Actors:

- Primary Actor: Matatu Owner
- Secondary Actors: Matatu Sacco Management

3.7 Moscow Analysis

MOSCOW analysis and prioritization technique was used to prioritize the requirements gathered during the elicitation stage. The requirements were elicited during:

- The Online survey conducted
- The brainstorming session
- Interview One done with the project Client; MSL Matatu Sacco Manager

- Interview Two done with a renown matatu owner
- Interview three done with a software dsssveloper.

All the requirements elicited were prioritized and included clearly in the mobile application prototype shown in the prototyping section. They were prioritized as per the levels of importance shown by the stakeholders during the gathering stage. They are mapped in the chart below.

MUST HAVE	SHOULD HAVE
R1 R2 R3 R5 R11 R12 R15 R17 R20 R21 R22 R24 R25 R26 R31 R34 R35	R6 R7 R8 R13 R14 R18 R23 R28 R29 R30 R32 R36
COULD HAVE	**WON'T HAVE**
R4 R10 R16 R27 R33	R9 R19

4.0 IEEE REQUIREMENTS SPECIFICATION

4.1 Introduction

4.1.1 Purpose

The requirements specification document is developed to clearly identify the functional, non-functional and technical requirements of the E-Sacco Fleet Manager mobile Application. It also aims at making sure that the needs and expectations of the project stakeholders are met in before development. The stakeholders usually view the document before it is handed over to the system developer to begin the coding work.

4.1.2 Scope

E-Sacco Fleet Manager is an application been developed for Matatu Saccos in Kenya. The first client of this mobile application solution is MSL Matatu Sacco. MSL Matatu Sacco is a registered public transport management Sacco that operates in different areas Nairobi, the capital city of Kenya. The Sacco is well Known for its route 17B Nairobi – Kasarani – Mwiki route. This Sacco and other saccos in the area have never had such a solution before. Therefore, the demand for this solution at an affordable price is very high. The need for the application emerged due to the increasing number of matatus in one Sacco and the inability to properly manage them manually. It has been difficult to schedule trips, manage the employees who are driver and touts, keep track of records and to monitor the operations of buses and matatus manually. The E-Sacco Fleet Manager application would provide a solution to these problems. The Matatu Saccos will now be able to manage and operate the saccos digitally via the application. Matatu owners will be able to register their vehicles and view reports on the same digitally.

4.1.3 Definitions, acronyms and Abbreviations

User: A person who is using the E-Sacco Fleet Manager. The user can register, login and access the services offered by the mobile app.

Stakeholder: Refers to the persons who may directly or indirectly interact with the Mobile Application Solution.

Matatu Sacco: The privately-owned managing companies of the public transport vehicles in a certain area.

Matatu Owner: The person who owns the vehicle. The buyer of the vehicle who aims at doing business with the matatu in public transportation industry.

Touts: These are persons who assist in a public transport vehicle to collect fares and help passengers alight at their destinations.

Legal Authorities: Refers to authorities set by law to oversee the transportation industry.

4.1.4 References:

IEEE Software Engineering Standards Committee, 1998. IEEE Std 830-1998, IEEE recommended practice for software requirements specifications. *Retrieved July*, *8*, p.2017

4.2 Functional Requirements

4.2.1 User Requirements

FUNCTIONAL REQUIREMENT 4.2.1.1	
Requirement Code:	R3
Requirement Title:	Fleet Allocation Module
Source:	Interview Session
Priority:	Must Have (High)
Requirement Description:	The application must have a fleet allocation module where routes are allocated and the responsible drivers/staff.
User Story:	It will really be of help when the application is allowing us to allocate trips via the application. Drivers can login and check such details other than calling them one by one.
Acceptance Criteria:	GIVEN a user is logged into the system. WHEN on the matatu saccos account THEN the Sacco can manage their fleet AND there is provision to do so by vehicle, routes etc
Justification	It was clearly stated during the interview session with matatu Sacco that this functionality is key and must be available.

FUNCTIONAL REQUIREMENT 4.2.1.2	
Requirement Code:	R4

Requirement Title:	Fleet Tracking Module
Source:	Interview Session
Priority:	Could Have
Requirement Description:	The application could have tracker or a way of tracking and monitoring vehicle movement.
User Story:	Though expensive, it would be good to include a way of detecting motion and tracking the vehicle everywhere it goes, like having a smart device.
Acceptance Criteria:	GIVEN the user is logged into the application WHEN on the manage fleet page THEN the user can click on the vehicles feature AND view its movement on a trip
Justification	The saccos said that sometimes drivers use vehicles for personal gain a way of tracking or monitoring them could be of a great advantage to them.

FUNCTIONAL REQUIREMENT 4.2.1.3	
Requirement Code:	R5
Requirement Title:	Report Generation
Source:	Interview Session
Priority:	Must Have (HIGH)
Requirement Description:	The application should have a provision for the users to view different reports based on different criteria in the system.
User Story:	Downloading the reports will be a big assistance in the application.
Acceptance Criteria:	Criteria 1: GIVEN the user is located in to the system WHEN on the matatu Sacco account navigation bar THEN click on the reports link to open reports page AND the matatu Sacco can view different reports as they so wish Criteria 2:

	GIVEN The user is logged into the system WHEN on the Dashboard THEN clicks on the navigation bar and select reports AND is bale to open the reports page and view the reports
Justification	The Sacco and matatu owner stated that reports are the major reason the application is needed thus must be included in the application.

FUNCTIONAL REQUIREMENT 4.2.1.4	
Requirement Code:	R6
Requirement Title:	Report Sharing
Source:	Interview Session
Priority:	SHOULD HAVE
Requirement Description:	The application should be able to print reports and share them in the application. A share button should be included to facilitate this.
User Story:	There will be a reports module that will have get data from the database. However, in the front end it will just be a button to generate reports. There will be a download feature. A share button can also be included on the page if one wants to share the reports.
Acceptance Criteria:	GIVEN the user is logged into the system WHEN on the reports page THEN click on the share button at the bottom of the secreen AND be able to share their reports via platforms of choice.
Justification	The developer stated that it is very possible to include a share functionality in the application.

FUNCTIONAL REQUIREMENT 4.2.1.5	
Requirement Code:	R7
Requirement Title:	Registration page

Source:	Interview Session
Priority:	SHOULD HAVE
Requirement Description:	The application should allow the matatu owners to apply for registration of their vehicles into a Sacco via the mobile application.
User Story:	As a matatu owner, the application should give me the privilege to login and register my vehicle.
Acceptance Criteria:	GIVEN a matatu owner is logged into the application WHEN on the dashboard THEN click on the register vehicle feature AND be able to apply for registration of their vehicles
Justification	The matatu owners stated that it is a hectic process registering their vehicles manually. It should be able to register their vehicles digitally.

FUNCTIONAL REQUIREMENT 4.2.1.6	
Requirement Code:	R9
Requirement Title:	Analytics
Source:	Interview Session
Priority:	Won't Have
Requirement Description:	The system should have business analysis module where it can have graphically analysed business progress.
User Story:	The application should contain a way of searching for information regarding a certain business feature. It should be able to list for example all vehicles with pending legal issues.
Acceptance Criteria:	GIVEN a user is logged into the system WHEN On the reports page THEN Click on Business Analysis Link AND Get statistical and graphical analysis of business progress

Justification	The system will only be able to generate reports in the first version. However, the statistical formulas can be included in the next version.

FUNCTIONAL REQUIREMENT 4.2.1.7	
Requirement Code:	F10
Requirement Title:	Performance Evaluation
Source:	Interview Session
Priority:	Could Have
Requirement Description:	The mobile application to allow saccos view the performance of their employees.
User Story:	We have had a challenge over time of evaluating the performance of our staff especially the drivers and touts. If the system can allow a way of evaluating their performance will even make them work hard at work,
Acceptance Criteria:	GIVEN a user is logged in the system WHEN on the Sacco account THEN Click on the reports page AND View drivers reports which includes their performance in terms of trips
Justification	This requirement was stated it could be a good functionality. However, though no performance appraisal in the first version, the saccos can view driver reports which include number of trips in a day or as required

FUNCTIONAL REQUIREMENT 4.2.1.8	
Requirement Code:	R11
Requirement Title:	Login Page
Source:	Interview, Brainstorming
Priority:	MUST HAVE

Requirement Description:	The users should be able to create their accounts and login before accessing the apps services.
User Story:	A login page will be important for our staff to login and access the details registered under their level of user access. Make the login page simple for our users.
Acceptance Criteria:	Criteria 1: GIVEN a user is a matatu owner WHEN Given login details by the system admin THEN Clocks on the login page when app starts AND be able to login to the application with correct credentials Criteria 2: GIVEN the user has successfully downloaded the application and registered as a matatu owner WHEN then on the login page THEN Input the correct credentials AND access the application according to the approvals made by the Sacco
Justification	The application was required to allow users register and login to the system to access the necessary services.

FUNCTIONAL REQUIREMENT 4.2.1.9	
Requirement Code:	R14
Requirement Title:	Vehicle Status
Source:	Interview
Priority:	Should Have
Requirement Description:	The user should be able to view the physical condition reports of the vehicle. They should be able to view the pending cases or any other statuses of the vehicle in service
User Story:	Condition of the vehicle should also be visible in the application since some of these vehicles we acquire them on loans.

Acceptance Criteria:	GIVEN the user is logged into their account WHEN on the matatu Sacco account THEN click on the reports page AND on the status link, the reports of the same can be viewed.
Justification	Reports on the vehicle are a requirement that should be treated important as stated by the matatu owners.

FUNCTIONAL REQUIREMENT 4.2.1.10	
Requirement Code:	R15
Requirement Title:	Registration Approval
Source:	Interview
Priority:	Must Have
Requirement Description:	The system should allow the saccos to approve or decline the registration requests of the matatu owners.
User Story:	The process should be easy such that I can view the status of my vehicle registration to the Sacco online other than making calls and going through long processes.
Acceptance Criteria:	GIVEN a user is logged into the system WHEN on the matatu owner dashboard THEN click on my vehicles feature AND view the status of approvals as per vehicle
Justification	The approvals on registration is must have feature to allow the saccos deal with the said vehicles before approving requests to start registration process. This was stated by the stakeholders during the requirements workshop.

FUNCTIONAL REQUIREMENT 4.2.1.11	
Requirement Code:	R16
Requirement Title:	Sacco Vehicle Acquisition
Source:	Interview
Priority:	Could Have

Requirement Description:	The matatu owners should be given an opportunity to apply for funding through the application as per Sacco rules.
User Story:	The Sacco can also help you acquire a vehicle on loan. Doing this digitally would be good.
Acceptance Criteria:	GIVEN a user is logged in the mobile application WHEN on the matatu owner dashboard THEN click on the request funding feature AND apply for funding of a new vehicle
Justification	The stakeholders stated that saccos have ways and policies of assisting their existing clients in acquiring funding whenever they want to purchase new vehicles. Therefore, matatu owners stated that this would be good if done digitally.

FUNCTIONAL REQUIREMENT 4.2.1.12	
Requirement Code:	R17
Requirement Title:	Trip Details
Source:	Interview
Priority:	Must Have
Requirement Description:	The users should be able to view trips especially the long trips their vehicles are involved in.
User Story:	The application should at least show the drivers using my vehicle for the day and get informed when my vehicle is hired for long trips or events. It is also very crucial to be able to search for reports and download them.
Acceptance Criteria:	GIVEN the user is logged into the mobile app WHEN on the matatu owner dashboard THEN click on the navigation bar and go to reports AND on the events feature, view the trips and events attended by their vehicles
Justification	The matatu owners stated that been able to see where your vehicles are at is a desire of every vehicle owner. It therefore should be considered to satisfy their expectations.

FUNCTIONAL REQUIREMENT 4.2.1.13	
Requirement Code:	R19
Requirement Title:	Smart Tracking
Source:	Interview, Brainstorming, Survey
Priority:	Won't Have
Requirement Description:	The system to support smart technologies such as sensors to track the motion of vehicles.
User Story:	Having a cheap way automatic tracking of these vehicles will be good. Sometimes drivers can take advantage of your vehicles and use them for their own personal gains. A smart device to record how they drive will be good for monitoring.
Acceptance Criteria:	The users to be able to remotely monitor on a smart device
Justification	This requirement will not be implemented in the first version of the application. However, live location will be used for monitoring.

FUNCTIONAL REQUIREMENT 4.2.1.14	
Requirement Code:	R23
Requirement Title:	Live Location Tracking
Source:	Interview
Priority:	Should Have
Requirement Description:	The application to use Google Maps API to allow live location of a vehicle to be seen.
User Story:	Tracking of vehicles most of the time requires the use of smart devices. However, since the drivers will be using smartphones in their day to day operations in the system, maps can be used. We can turn on location on the devices and use it in the application as live location. This can be used to track and monitor the movement of the vehicles throughout the day.
Acceptance Criteria:	GIVEN the user is logged into the system WHEN on the matatu Sacco account

	THEN click on the reports on the navigation bar, then move to vehicles AND view the vehicles, a live location will be shown on the trip provision.
Justification	For easy management, the matatu saccos would require location to improve service delivery in terms of employee performance.

FUNCTIONAL REQUIREMENT 4.2.1.15	
Requirement Code:	R24
Requirement Title:	Billing
Source:	Interview
Priority:	Must Have
Requirement Description:	The user should be able to view and act on their subscriptions via the application.
User Story:	The application subscription is easy to implement using a billing functionality. This functionality can be introduced as a module on the users account. Setting of the dates of expiration of the subscription on the system, it will trigger an update on the user account as a reminder notification. Renewal of subscription will automatically update in the system and service will be extended.
Acceptance Criteria:	GIVEN the user is logged into the system WHEN on the Sacco account and click on the navigation bar THEN click on the subscriptions feature AND view or act on their subscriptions
Justification	The system must be cheap and affordable for the saccos. Therefore, a subscription feature must be present for users to make payments.

FUNCTIONAL REQUIREMENT 4.2.1.16	
Requirement Code:	R29

Requirement Title:	Start Page
Source:	Brainstorming
Priority:	Should Have
Requirement Description:	The application should have a landing page for its users
User Story:	A dashboard containing all the requirements should appear at the start of the app.
Acceptance Criteria:	GIVEN the user is logged into the application WHEN the login process is successful THEN the application should start AND the dashboard appears as the start page
Justification	A simple start page is needed in the application as emphasized by the stakeholders during brainstorming session.

FUNCTIONAL REQUIREMENT 4.2.1.17	
Requirement Code:	R30
Requirement Title:	Human Resource Page
Source:	Brainstorming
Priority:	Should Have
Requirement Description:	The application should be able to allow saccos to manage their staff members and allocate duties easily.
User Story:	The application should allow digital management of drivers and other staff.
Acceptance Criteria:	GIVEN the user is logged in to the application WHEN on the matatu Sacco account THEN click on the drivers or other staff feature AND be able to manage the employees as you so wish.
Justification	The stakeholders discussed that the saccos usually have huge numbers of employees whose management and allocation of duties is not easy while done manually. It is difficult to account for every staff member.

FUNCTIONAL REQUIREMENT 4.2.1.18	
Requirement Code:	R31
Requirement Title:	Drivers Page
Source:	Brainstorming
Priority:	Must Have
Requirement Description:	The application should have a page where all drivers are registered under.
User Story:	Drivers are very many and need their own module to register and manage them from.
Acceptance Criteria:	GIVEN that the user is logged into the mobile app WHEN on the matatu Sacco account THEN click on the drivers feature AND open the list of drivers, to register then and manage their duties.
Justification	The stakeholders discussed that dealing with vehicles requires drivers every day. This means that having a module for the drivers would be good for easy management.

FUNCTIONAL REQUIREMENT 4.2.1.19	
Requirement Code:	R33
Requirement Title:	Routes
Source:	Brainstorming
Priority:	Could Have
Requirement Description:	The application to classify trips as per routes.
User Story:	Sacco registered routes is where our business begins from. Been able to edit and act on the routes makes vehicle management easy.
Acceptance Criteria:	GIVEN a user is logged in as a Sacco WHEN on the Sacco account THEN click on the routes feature AND open routes or edit them

Justification	The stakeholders discussed that routes are very important ad it is where their business lies at. Therefore, this requirement was considered in the application prototype.

4.3 Non-Functional Requirements

4.3.1 Security Requirements

Non-Functional Requirement 4.3.1.1	
Requirement Code:	R12
Requirement Title:	Enhanced Security
Source:	Brainstorming, interviews, requirements workshop
Requirement Description:	The applications should contain advanced levels of data, information and cyber security. This will keep the application always safe for use by competitors in the industry

Non-Functional Requirement 4.3.1.2	
Requirement Code:	R25
Requirement Title:	One Time Passwords
Source:	Interview
Requirement Description:	The one-time password will be a user verification criterion. It will enable every user to get verified before proceeding to login the application. A one-time password will be sent via their registered mobile number for confirmation.

Non-Functional Requirement 4.3.1.3	
Requirement Code:	R26
Requirement Title:	Encryption Algorithms
Source:	Interview
Requirement Description:	Passwords will be encrypted in the system to ensure that they cannot be copied if landed on wrong persons. The SHA256

	encryption algorithm will be used to encrypt the passwords to a 256 bits long word.

Non-Functional Requirement 4.3.1.4	
Requirement Code:	R28
Requirement Title:	Password requirements
Source:	Interview
Requirement Description:	The passwords used in the application should be strong. The requirement should have upper and lowercase characters, numbers, symbols and a special character. The passwords must not contain year of birth, names or any other easily identifiable password.

4.3.2 Performance Requirement

Non-Functional Requirement 4.3.2.1	
Requirement Code:	R34
Requirement Title:	Optimization
Source:	Interview
Requirement Description:	Optimization will enable the application to function fast. This is achieved by compressing the server side and optimizing it to return results quickly.

4.3.3 Availability Requirements

Non-Functional Requirement 4.3.3.1	
Requirement Code:	R35
Requirement Title:	App store and play store
Source:	Interview

Requirement Description:	The application will be available for download in the play store and app store. They will cater for both android and iOS users.

4.3.4 Usability Requirements

Non-Functional Requirement 4.3.4.1	
Requirement Code:	R1
Requirement Title:	Understandability
Source:	Interview, Brainstorming
Requirement Description:	The application should contain features that are very easy to understand. The naming of the links should be easy for a user to understand the function of that link.

Non-Functional Requirement 4.3.4.2	
Requirement Code:	R2
Requirement Title:	Easy to Use
Source:	Interview, Brainstorming
Requirement Description:	The application should not be complex. All the features could be included in one dashboard or in few features to ensure that it is very simple for users to navigate.

Non-Functional Requirement 4.3.4.3	
Requirement Code:	R8
Requirement Title:	Easy Registration Process
Source:	Interview
Requirement Description:	The registration process for the matatu owners should be easy. Avoid long and complex processes that would have users give up the process.

Non-Functional Requirement 4.3.4.4	
Requirement Code:	R13
Requirement Title:	Minimalistic

Source:	Interview
Requirement Description:	The application should contain only the desired features and functionalities to avoid overcrowding of the features. The rest of the not frequently used features can be put i8n the more provision.

Non-Functional Requirement 4.3.4.5	
Requirement Code:	R32
Requirement Title:	Visible Action Buttons
Source:	Brainstorming
Requirement Description:	The action buttons must be displayed in a visible background colour to catch the eye of the user and avoid time wastage while looking for the buttons. They should also be placed strategically wherever they are needed.

Non-Functional Requirement 4.3.4.6	
Requirement Code:	R18
Requirement Title:	Display User Accounts
Source:	Brainstorming, Interview
Requirement Description:	The user account ID should be displayed on the page when they long in the system. This will help to avoid having a user use a colleague's phone especially in trips for the drivers.

4.3.5 Maintainability Requirements

Non-Functional Requirement 4.3.5.1	
Requirement Code:	R36
Requirement Title:	Update and Upgrade
Source:	Interview

Requirement Description:	The updating of the system will be done at least monthly for data backup. System upgrade to a newer version will be planned by the stakeholders.

4.3.6 Technical Requirements

Non-Functional Requirement 4.3.6.1	
Requirement Code:	R20
Requirement Title:	Cross platform Development
Source:	Interview
Requirement Description:	The application will be developed to be used in all platforms. This means that the one application must be compatible with other both iOS and android operating systems.

Non-Functional Requirement 4.3.6.2	
Requirement Code:	R21
Requirement Title:	Technologies
Source:	Interview
Requirement Description:	The technologies used in development of the application must allow for its compatibility with multiple mobile operating systems.

Non-Functional Requirement 4.3.6.3	
Requirement Code:	R22
Requirement Title:	SQL Server
Source:	Interview
Requirement Description:	To be used for the development of the database management system that will serve the backend of the mobile application.

Non-Functional Requirement4.3.6.4	
Requirement Code:	R27
Requirement Title:	SQL Cloud Server

Source:	Interview
Requirement Description:	This is a server to be used as the backup of the application data storage since the mobile app handles big amounts of data.

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6.0 Appendix

6.1 Project Proposal

6.1.1 Objectives

The main objective of this project is to come up with a project specifications document that contains detailed content, design, appearance and solution of the proposed fleet management software solution. This will be achieved through engaging a group of stakeholders to bring up a change in the existing way of fleet management by implementing a solution. I will utilize different techniques such as surveys, brainstorming, interviews, prototyping, requirements workshop and interface analysis to gather the requirements from the stakeholders. The gathered requirements will help to come up with an insight of coming up with the layout, design and performance of the proposed application prototype.

The objective of this project is to automate the fleet management of vehicles in the public transportation sector of Kenya. The project proposes to come up with a way of automating the functions performed by SACCOS which run matatus and buses in the public service vehicles. Managing different vehicles, drivers and the business they carry out on day to day. This will facilitate easy and smooth operation of the saccos/management. The proposed project also aims at enabling the process of submitting reports to the legal authorities governing the transport industry to flow easily. Moreover, the bus owners can check reports regarding their vehicles.

The proposed solution will be able to record all the vehicles, their activities throughout the day, the status or condition of the vehicle, vehicle owner, routes it flees to and the returns of the day in terms of amount of money it has raised. The details of drivers and conductors will also be captured and easily managed, daily, weekly, monthly and annual reports will easily be drawn for decision making. The reports can be shared to the legal authorities easily. Saccos will be able to submit reports to authorities as well as follow up on their pending issues.

The specific objectives of the proposed project are:

1. To research and evaluate the existing systems in the public transportation industry.
2. To gather requirements for the fleet management automation system.
3. To analyse, evaluate and prioritize the systems requirements gathered.
4. To implement and test the proposed system prototype with the users and stakeholders.

6.1.2 Background

In Kenya, the transport industry is mostly served by public transport vehicles which are owned by the private sector (Salon and Aligula, 2012). The mini buses which are commonly known as matatus is the leading mode of transportation in the country and is greatly growing both in the rural and urban areas (Ilo, 2021). The matatus and buses usually belong to a management company referred to as Saccos.

The project idea came up during a visit to Kenya where part of my family members lives. I participated in helping the family run their bus business. The family owns a number of matatus which are registered under a SACCO. I noticed it was difficult for my relative to account for every vehicle. Normally, the SACCO registers the vehicles on a sheet of paper or on a board and tick each time they go for a trip. This is difficult and unreliable since the records cannot be kept for long thus not useful in decision making (Data Integrated, 2021). This also make it difficult to submit reports to the legal authorities.

I there after thought of a better way to help in management of these vehicles. The idea which was to automate the operations of the Saccos through a mobile application. This will help the owners to access information regarding their vehicles from the saccos. It will also help the saccos to smoothly and easily run their business.

In this project, I intend to meet the objectives in different ways. The whole project will be guided by the Babok. The project will utilize agile methodology, where the whole project will be broken down into different phases and stages. I will gather requirements through brainstorming, questionnaires, surveys and focus groups. I will engage the Matatu Saccos, Matatu Owners, software developer and matatu drivers as stakeholders in this project. The matatu Sacco in this case MSL Matatu Sacco will play a role in helping me understand how the industry operate and above all they will be the client for this project. Matatu owner in this project will play a part as a user of the mobile application. The owners will also help in understanding the needs and expectation of users in the application. I will engage a software developer as part of the stakeholders list to help understand the process of software project and assist in actualizing the process. Matatu drivers will play a role in this project. They will help in understanding the day to day operations of a staff under the Sacco as users of the mobile application. Lastly, I will be the business analyst of this project.

6.1.3 Problem Statement

Lack of affordable and reliable fleet management system in the bus and matatus saccos in Kenya.

There is a big need for an affordable fleet management system in the public transportation industry. Saccos undergo difficult moments while managing their vehicles manually. There is a great risk in not been able to account for each and every vehicle registered in the Sacco. This makes it difficult for the matatu owners to get good business turnover due to the manual management of fleet by saccos. Employees misuse the vehicles since no close monitoring and evaluation system thus making it difficult for stakeholders to trust the management. Proper communication and reporting with the stakeholders are important for business growth thus the proposed system seeks to bridge the need for transparent and reliable business culture with the stakeholders.

6.1.3.1 Making Money

The mobile application will make money in different ways. Unlike the previous solutions which have proved to be expensive thus unable to thrive in the market, the proposed solution will be affordable. The Saccos do not have to purchase the application for their use since it may be expensive but rather pay a monthly subscription fee. Once the 30 days are over, the subscription elapses and the Saccos subscribe again to continue using the services. The other way of generating income will be through selling out the application to the big Sacco companies who can afford to buy the customized product. These two ways will see consistent flow of income in the business thus ensuring its continuity.

6.1.4 State of the Art

In this transportation industry, there are many systems that have been developed. There are applications such as the cab/taxi industry applications. These are specifically for the cab industries. There are some bus companies especially the ones operating on long distances which also own applications to help in fleet management. There has been a solution named epesi which focuses on integrating these vehicles with sensors and cameras for tracking of vehicles. The application which acts more like a trip planner involves the passengers to track vehicles (Data Integrated, 2021). This has faced challenges over time due to its costs which are high to install and difficult to maintain.

However, there is no any affordable application that has been developed to assist the local Matatu Saccos which control the largest and most essential vehicles in the country. There is no

a system which links the public transportation industry to the governmental legal authorities in control. Communication and meetings with the stakeholders will be done virtually via online meetings due to distance constraints.

6.1.5 Proposed solution

Therefore, the proposed project aims at bridging the existing need in the management of the saccos. This will be achieved through a mobile application to manage the operations of the saccos. To accommodate the mobile nature of the transportation industry, the solution is based on mobile application which can be used at any place while in transit. It aims at creating a very affordable solution which is easy to install and use. The stage managers will be able to use the mobile application while at the bus stop areas with ease. It aims at linking the saccos to the legal authorities. Linking the Saccos to the local authorities allows for easy communication and submission of required reports. The Saccos are able to view constituent reports regarding their fleet or particular vehicles relied by the local authorities. It aims at simplifying management and storing data necessary for decision making by stakeholders in the transportation industry.

The users of the application will be matatu saccos, matatu owners, drivers and touts. Matatu owners are the clients of the app and need the application to manage their day to day activities in their task of managing the fleet. They will use the application to manage fleet, schedule trips, schedule events, manage drivers (employees) and other human resource, generate and submit the reports to necessary stakeholders. Managing of employees will be achieved through planners, which will help schedule trips and allocate every driver the vehicle they will be using for the day. The drivers will also log into their devices for more duties. This will ensure that their trips are recorded in the application to ensure easy management. Matatu owners will use the application to register their vehicles in the saccos, view progress of their vehicles, access approvals on funding and generate important business reports. Drivers will use the mobile application to view their scheduled trips and any other required tasks by their employers. The application will help in tracking the activities of the matatus / busses throughout the day. Due to the large amounts of data the application will have I will seek advice on data storage and maintenance from the software developer during the scheduled interviews in the requirements elicitation stage.

6.1.5.1 Benefits of the proposed Mobile Application

1. Improved management of Saccos.

Saccos have been operating manually thus difficult to manage their employees and day to day activities. Automation of this system will enable these buses and matatu operators to manage their day to day activities via the system. This is an added value the system will have thus generate more business turnover.

2. Automated fleet management

The major goal of the proposed system is to automate the fleet management in Kenya. Automation of fleet management will ease the business in the public transportation industry. This will be a more reliable way of managing the vehicle in the business.

3. Improved and simplified decision making

Good decisions rely on Realtime data. This proposed project seeks to simplify decision making by availing reports for different vehicles, travel routes, employees and statistics of performance. These reports can be analysed and used to come up with long lasting decisions and solutions to needs in the public transport business in Kenya. The system proposes to also be providing reports to the legal authorities. These reports can be used for law making decisions.

4. Easy generation and submission of reports

The proposed systems seek to eliminate the manual way of submitting necessary reports to the local authorities. The system seeks to automatically generate reports which will be submitted to the necessary authorities. This will bring in a benefit of integrity and reliable reports for the authorities.

5. Increased profit margins

Managing matatus and buses digitally will help cut the costs incurred due to manual management ways. Improved monitoring and evaluation of the employees will call for transparency and hard work to prove their performance in the company. This will see higher profit margins since every employee will work to record good performance in the system.

6. Time saving

Managing saccos manually calls for lots of time wasted in decisions on which vehicles to attend to a given call of duty. Automation of fleet management will bring in easier and time saving ways of allocating vehicles duties and resources in terms of manpower.

7. Affordable services

The proposed solution unlike the others is affordable. The Saccos do not have to purchase the whole application but can pay a monthly subscription fee to access the services. This will ensure that the application is supporting every Sacco including those that cannot afford to purchase the application at once since many vehicles work to service loans used to purchase them.

6.1.6 Technical Approach

I will utilize a step by step approach to complete the development of this project. I will start by brainstorming to identify the major stakeholders their roles and responsibilities (Iba, Brennan and IIBA, 2009). The next stage will be requirements elicitation. It is at this stage that I will be required to gather the different requirements that will be used to develop the requirements specification document. This will be achieved through stakeholder engagement approach through brainstorming, questionnaires and focus groups (Iba, Brennan and IIBA, 2009). We will discuss the possible solution, features that will be in the application and functionalities of the application.

The next stage will involve coming up with the design. This is the prototyping stage. The gathered requirements after prioritization will come up with the most important ones. These will be used to come up with wireframe prototypes of the system solution.

The third stage will involve development. It is at this phase I will come up with a website to display my results. The website will display the outputs of the requirements gathering techniques, showing all the stages and how I came to arrive to the final solution I will have developed.

The last phase of this proposed project will involve getting feedback and comments regarding the work done from the supervisor, my stakeholders and users of the solution. This will give a verdict, evaluation and rating of my project.

6.1.7 Technical Details

In the first stage of the project, I will use different technologies to gather the requirements. Due to distance, I will prefer to use virtual means or online tools in conducting the meetings.

To start with, the requirements specification document will be done in Microsoft Word. In gantt charts, I will use Microsoft Excel to create them. A detailed Project Plan will be drawn in Microsoft Excel Project Management tool. The survey and interviews will be done online. I

will use google survey forms to do the surveys. This will make it easy to get timely responses. The google tool will also help in analysis of the feedbacks gotten in the surveys.

The brainstorming and workshop sessions will also be contacted online. I prefer to use Microsoft teams to create the virtual meetings. This is because teams have an unlimited access which will not cost me any money. I will be helping my stakeholders install the Microsoft Teams software or use google meet in their computers. This will be achieved by use of TeamViewer technology for those who will not be able to install. Once all the stakeholders have the software, I will create a meeting link which I will share with them. Meetings will be planned and created in advance to allow proper preparation and avoid time wastage before meetings.

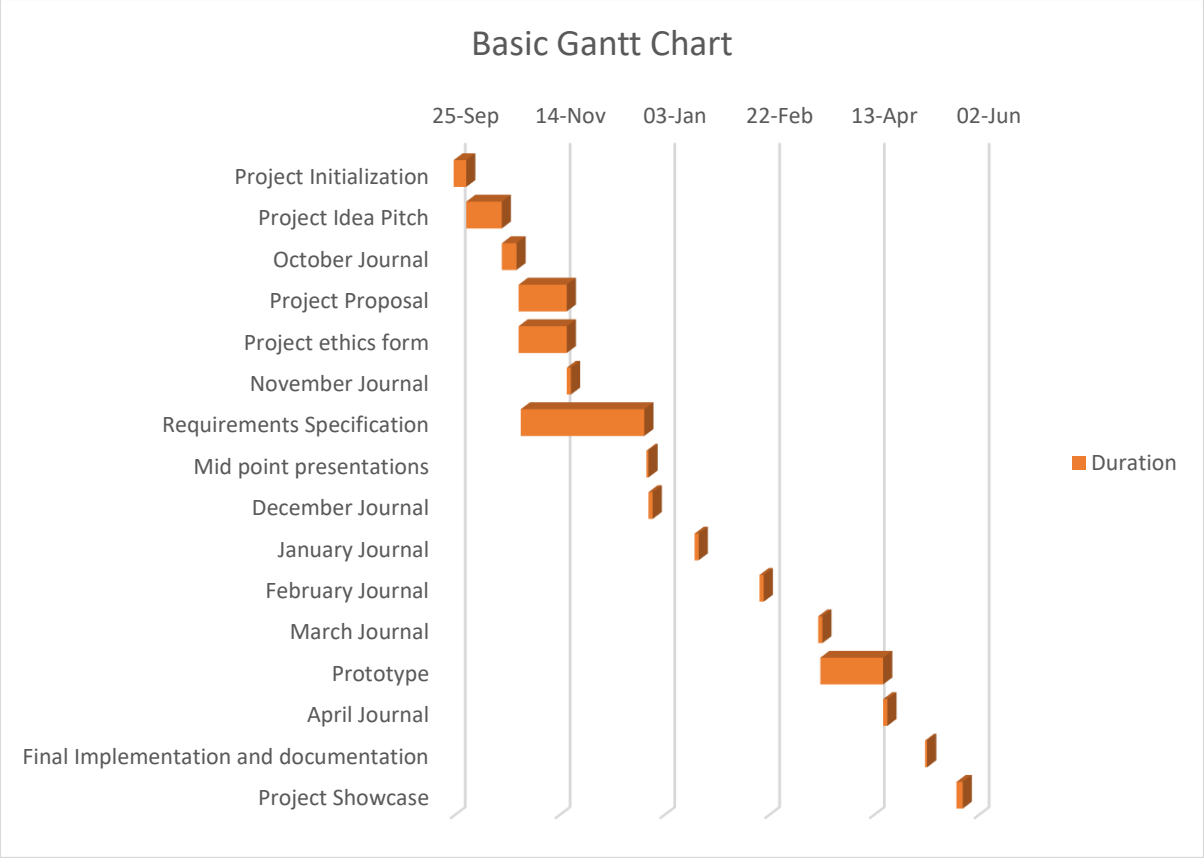
The prototyping phase will involve the application of many technologies. I will utilize MOSCOW technique to do requirements prioritization which will bring a common understanding on the importance of delivering a piece of value in the solution (Iba, Brennan and IIBA, 2009). Afterwards, I will use blasmiq software to make the wireframes. This will help in the prototyping phase. Moreover, figma software can be used in the prototyping phase. Having some knowledge of blasmiq software, I will use YouTube to learn more skills in the area.

In the project presentation phase, I will require to create a website to display the outputs of my previous stages. I am attending WordPress seminars in Moodle and therefor will gain skills for web development. However, having knowledge of basic web development, I will prefer to use HTML, CSS, JavaScript and php to develop the website. Html and CSS will be used for creating the website. I will use JavaScript for web scripting and php for the backend. I believe this will enable me create a good site to display my work.

6.1.8 Project Plan

6.1.8.1 Basic Gantt Chart

This chart shows the project flow from the start date to the finalization date. The proposed project started at the initialization stage on 25th September 2021 and will get finalized on May 26th 2022.



6.1.8.2 Detailed Project Plan

Deliverables	Duration	Start Date	End Date
Fleet Management System	**243**	**25-Sep**	**26-May**
Project Initialization	5	25-Sep	30-Sep
Reading and understanding about software project	1	25-Sep	26-Sep
Brainstorming Project Ideas	2	27-Sep	29-Sep
Documenting project Idea	1	29-Sep	30-Sep
Project Idea Pitch	16	01-Oct	17-Oct
Pitch Video recording	15	01-Oct	16-Oct
Upload in the moodle	1	16-Oct	17-Oct
October Journal	7	18-Oct	25-Oct
Gather Feedback from supervisor on Project Pitch	4	19-Oct	23-Oct
Write the Reflective Journal	1	23-Oct	24-Oct
Upload in the moodle	1	24-Oct	25-Oct
Project Proposal	23	26-Oct	18-Nov
Research more on the project idea	10	26-Oct	05-Nov
Write the proposal	9	06-Nov	15-Nov
Create project plan and gantt	1	16-Nov	17-Nov
Upload in the moodle	1	17-Nov	18-Nov
Project ethics form	23	26-Oct	18-Nov
Research and write the ethics form	22	26-Oct	17-Nov
Upload in the moodle	1	17-Nov	18-Nov
November Journals	2	18-Nov	20-Nov

Create requirements specifications	34	11-Nov	15-Dec
Submit to lecturer for corrections	1	16-Dec	17-Dec
Do corrections as per lecturere	4	17-Dec	21-Dec
Upload in the moodle	1	21-Dec	22-Dec
Start preparing for presentation	5	22-Dec	27-Dec
Mid point presentations	1	26-Dec	27-Dec
Make my presentation	1	26-Dec	27-Dec
December Journals	2	27-Dec	29-Dec
Gather Feedback from supervisor on Project Pitch	0	27-Dec	27-Dec
Write the Reflective Journal	1	27-Dec	28-Dec
Upload in the moodle	1	28-Dec	29-Dec
January Journals	2	18-Jan	20-Jan
Gather Feedback from supervisor on Project Pitch	0	18-Jan	18-Jan
Write the Reflective Journal	1	18-Jan	19-Jan
Upload in the moodle	1	19-Jan	20-Jan
February Journals	2	18-Feb	20-Feb
Gather Feedback from supervisor on Project Pitch	0	18-Feb	18-Feb
Write the Reflective Journal	1	18-Feb	19-Feb
Upload in the moodle	1	19-Feb	20-Feb
March Journals	2	18-Mar	20-Mar
Gather Feedback from supervisor on Project Pitch	0	18-Mar	18-Mar
Write the Reflective Journal	1	18-Mar	19-Mar
Upload in the moodle	1	19-Mar	20-Mar
Prototype	31	19-Mar	19-Apr
Create wireframes	7	19-Mar	26-Mar
Meet witrh stakeholders for discussions	1	27-Mar	28-Mar
Do corrections as per stakeholders discussions	8	28-Mar	05-Apr
Do a presentation for testing by stakeholders	0	06-Apr	06-Apr
Finish the wireframes creation	12	07-Apr	19-Apr
April Journal	2	18-Apr	20-Apr
Gather Feedback from supervisor on Project Pitch	0	18-Apr	18-Apr
Write the Reflective Journal	1	18-Apr	19-Apr
Upload in the moodle	1	19-Apr	20-Apr
Website creation	15	21-Apr	06-May
Create my showcase project website	13	21-Apr	04-May
Do reviews with supervisor	2	04-May	06-May
Final Implementation and documentation	1	07-May	08-May
Submit documentation, poster and website	1	07-May	08-May
Project Showcase	3	23-May	26-May
Prepare for presentations	2	23-May	25-May
Do my project showcase	1	25-May	26-May

6.1.9 Validation/Verification

I will use different requirements elicitation techniques such as brainstorming, focus groups and questionnaires to gather the user requirements. The requirements will be combined from the different stakeholders and users. A project management tool will be used for prioritization of these requirements gathered. Logical arguments in the focus groups will help understand the different requirements.

I intend to continuously demonstrate the requirements to the different stakeholders. This will call for discussing these features with the stakeholders and users to reach an agreement point. The wireframe prototypes that will contain different features according to the prioritization stage. The stakeholders will review the prototypes and make comments to validate my features and requirements with the users will help arrive to the final prototype. Analysing the requirements every time before moving to the next stage of development will help me verify if I am flowing with what is discussed with stakeholders.

The final prototype will be validated and verified in different ways. I intend to do a simulation with the users. The users will have the prototype and confirm if I have met them as agreed at different stages of discussion through pout the process. Any corrections made, will call for redoing the prototype to make sure it meets all requirements as per the stakeholders and users. This will help to ensure that we arrive to a business solution in agreement with the stakeholders, application users and possible clients.

Moreover, my supervisor will help in verifying by giving an expert review towards achieving the user requirements. This is through continuous meet ups that will help him have track of my progress throughout the project development phases. I will also update my monthly reflective journals to track my project progress and ensure that I do not miss any important details discussed with my supervisor. I intend to integrate all the changes requested and suggested by the supervisor.

6.2 Reflective Journals

6.2.1 October Reflective Journal

During this month of October, I have managed to brainstorm different project ideas and spotted an existing business niche in Democratic Republic of Congo on matters microfinance in areas struck by disaster. The idea was inspired by the most recent disaster that affected the people of Goma town after the Volcanic eruption of Mount Nyiragongo.

I managed to do a brainstorming research by consulting the affected persons and the residents of Goma to gather knowledge of the problems they experienced during and after the eruption of the mountain. This has enabled me to identify the persons and parties I would engage for surveys as a way of doing my research and brainstorming meetings in my next chapter of the project.

Having identified the existing problem and a possible way to solve the issue at hand, I documented and recorded my project pitch video. I then submitted it via Moodle. I was assigned a supervisor Mr. David.

The first progress I made in my project was been able to identify a business gap and thinking around on possible way of solving the same. Secondly, I have managed to identify possible stakeholders and who I would engage in questionnaires and surveys for requirements gathering for the project.

However, my main challenge still remains that my project pitch was rejected. The supervisor sited that my project was not clearly understood. The supervisor advised I select a different topic from the ones proposed by the lecturers.

This been a major challenge and a hindrance to proceed to next level, I wrote to my lecturer asking for assistance with the project pitch. I forwarded a written document containing an explanation of my project idea which I believe is more elaborate and will help to understand my project idea. I am waiting for feedback regarding the same from my lecturer.

6.2.2 November Reflective Journal

In the month of November, it has been a challenging month for me. The previous project idea was rejected and I had to look for a different one. My supervisor shared a list of projects proposed by the lecturers and I had to choose one from it. My Lecturer Frances, advised that I could also come up with my own idea from the existing ideas.

I came up with a different project idea that was inspired by the car parking management system. My idea that draws its roots from Africa, in a country known as Kenya is about public transportation automation. The idea focuses on automation of fleet management, something that is not yet implemented in the country.

I have managed to draft the project idea which I submitted but still my supervisor insisted it was not clear. His advice was to I should expound more on the idea or choose a different one. I chose to expound on my idea since I believe it is an innovation that would assist the public service vehicles and also bring in returns in terms of business.

In the month of November, I also managed to write my project ethics form and submitted it In Moodle. I also developed my project proposal and I believe I will be able to Proceed. I will submit the same to my supervisor Mr. David.

In this new project idea, I was able to spot an existing niche that was inspired b one of the project ideas given by the lecturers. I have done my proposal and started with requirements elicitation as per my project plan. I have managed to identify stakeholders and schedule for meet ups to discuss on the project idea. This will help in my requirements gathering. I have also managed by the help of Babok be able to identify the different techniques use in this project.

However, the main problem remains that I am not sure if my supervisor will understand my project idea. The other challenge is in terms of time, since I started the new idea late.

This been the major challenges, I have written a simple and elaborate proposal that I believe my lecturer will understand my project idea. On matters time, I have tried to work on my project daily to make sure I will not lag behind but beat the deadlines as I produce quality work.

6.2.3 December Reflective Journal

The month of December was the most challenging month for me. It is the month when my supervisor accepted my project idea but advised that I needed to expound more on my objectives. I worked on my proposal to ensure it meets my supervisor’s expectation. It was a month where I learnt a lot.

I managed to make correction as per the recommendations made by the supervisor. Some changes in my proposal came in especially in the requirements elicitation techniques I had thought of changed due to the criteria of selection.

I finalized on requirements elicitation, requirements analysis, prototyping and developed the requirements specification document. All the stakeholder meetings were done virtually via googles meet. It was challenging at first due to time differences and distance constraints. However, I managed to overcome the challenge and learnt working as a team to see the elicitation activities a success.

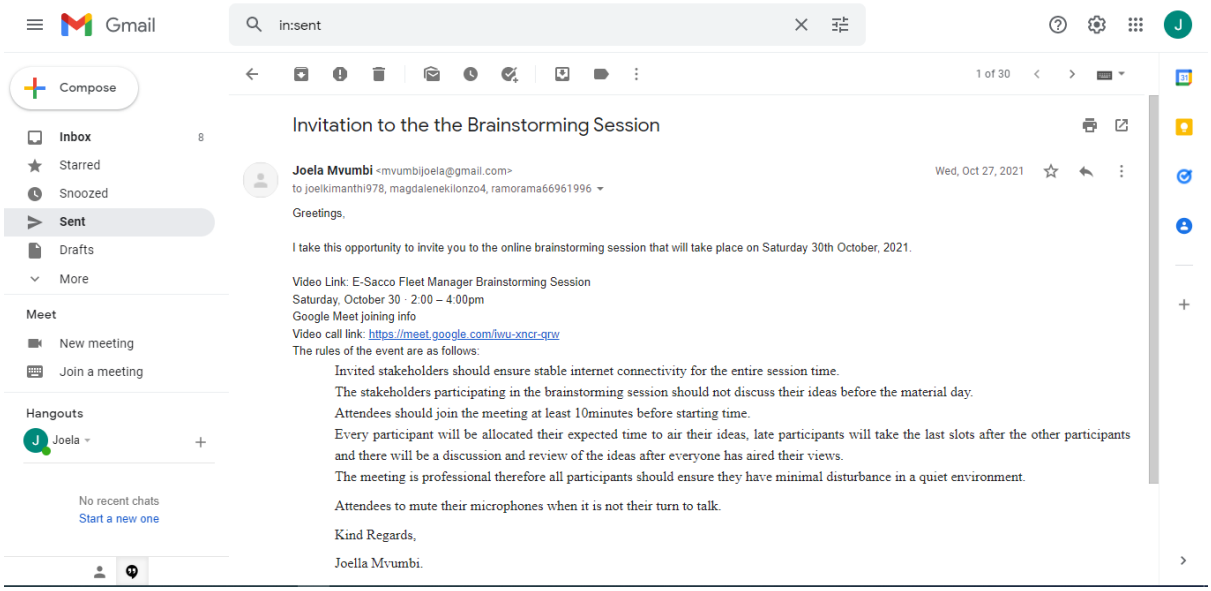
I have managed to draft an IEEE specifications document and prepared for midpoint presentation. For midpoint presentation I managed to design a simple webpage to display my work using bootstrap. I believe I will submit my work and wait for grading and feedback from my supervisor David. For my project this far, I have worked tirelessly to make sure I do not tamper with my project plan and await midpoint presentation

There was a challenge of the timeliness but I managed to work extra hard to get back to the rail since I had started late. Time difference is a challenge so far.

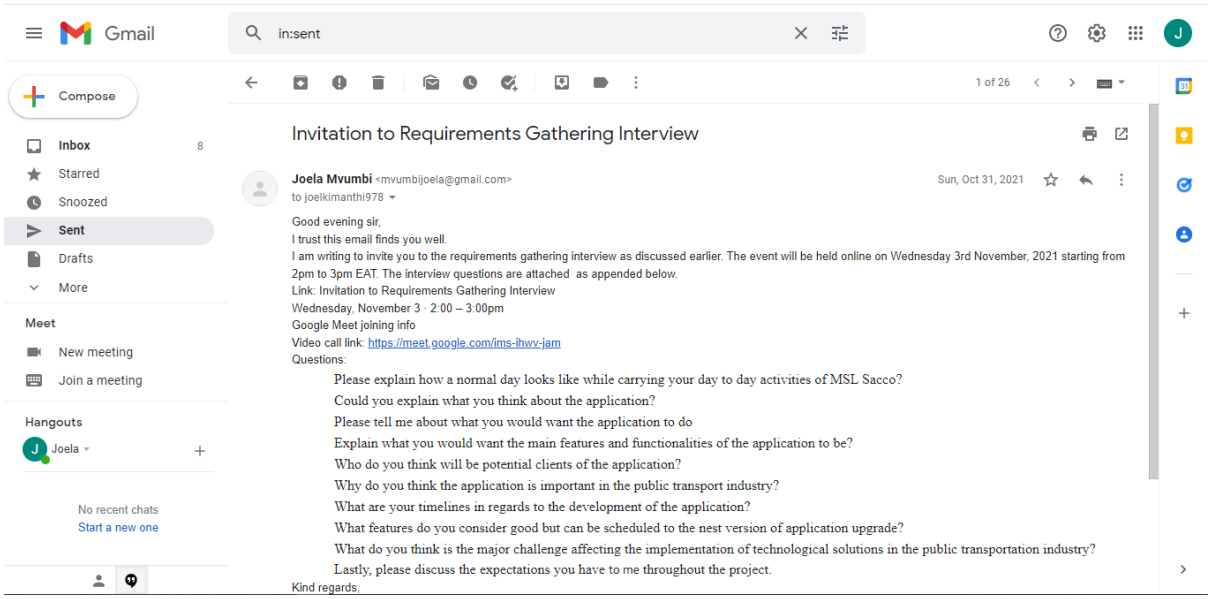
Working extra hard to make sure I get back to my documented timeliness has helped to catch up. The time difference issue, we have agreed with stakeholders to work on it as a team. This has proved to work well.

6.3 Requirements Verification

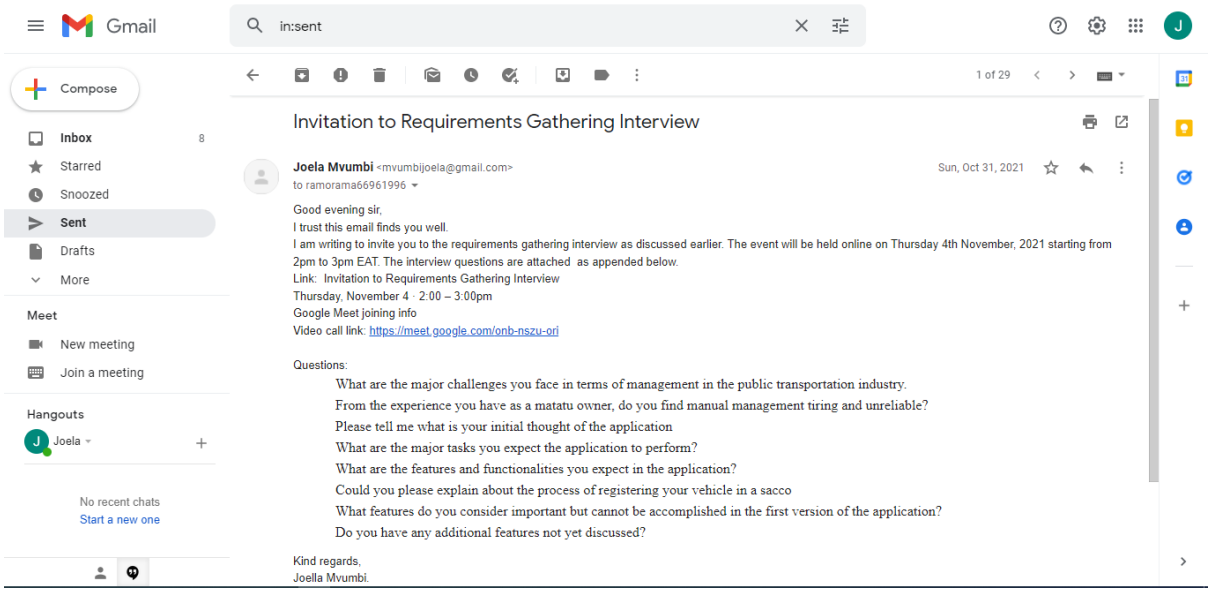
6.3.1 Brainstorming



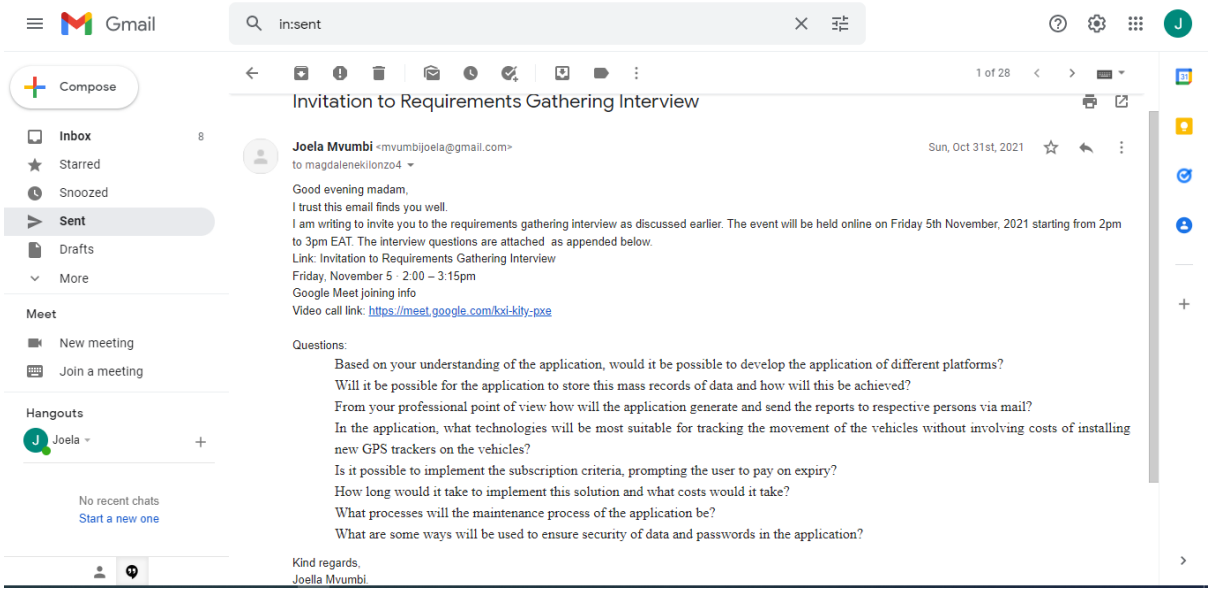
6.3.2 Interview One



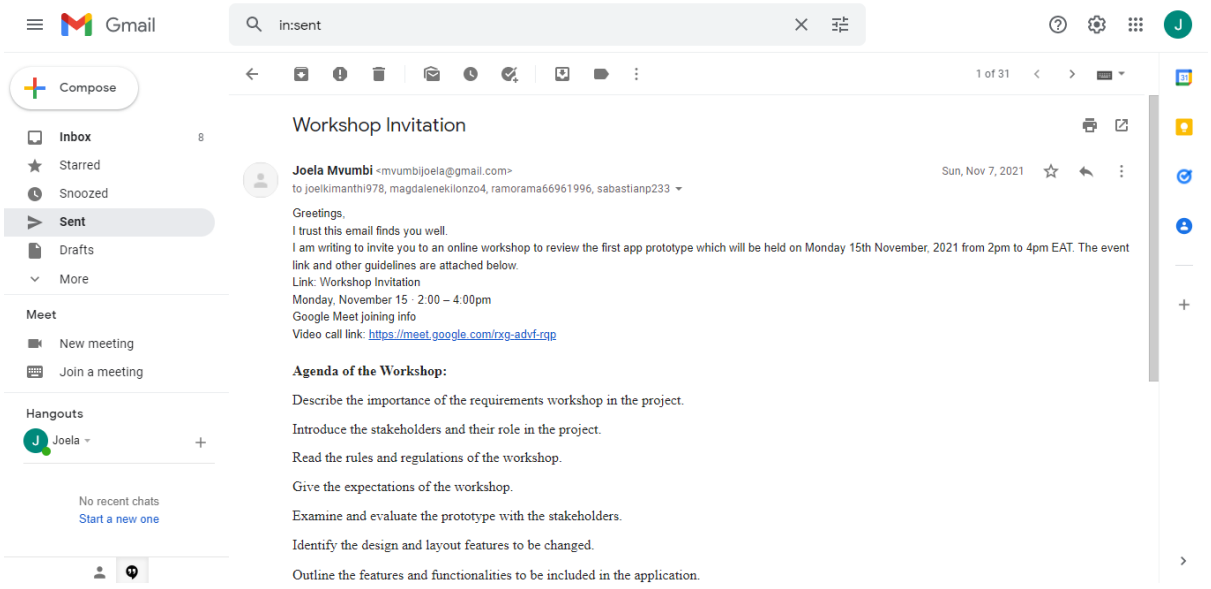
6.3.3 Interview Two:



6.3.4 Interview Three:



6.3.5 Requirements Workshop:

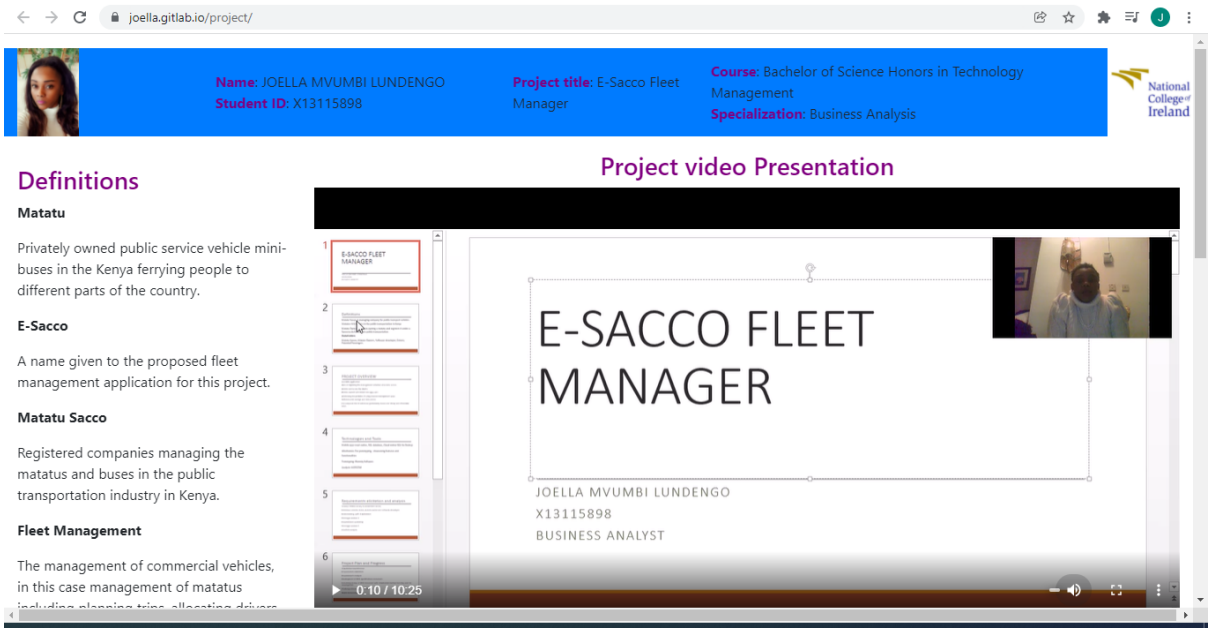


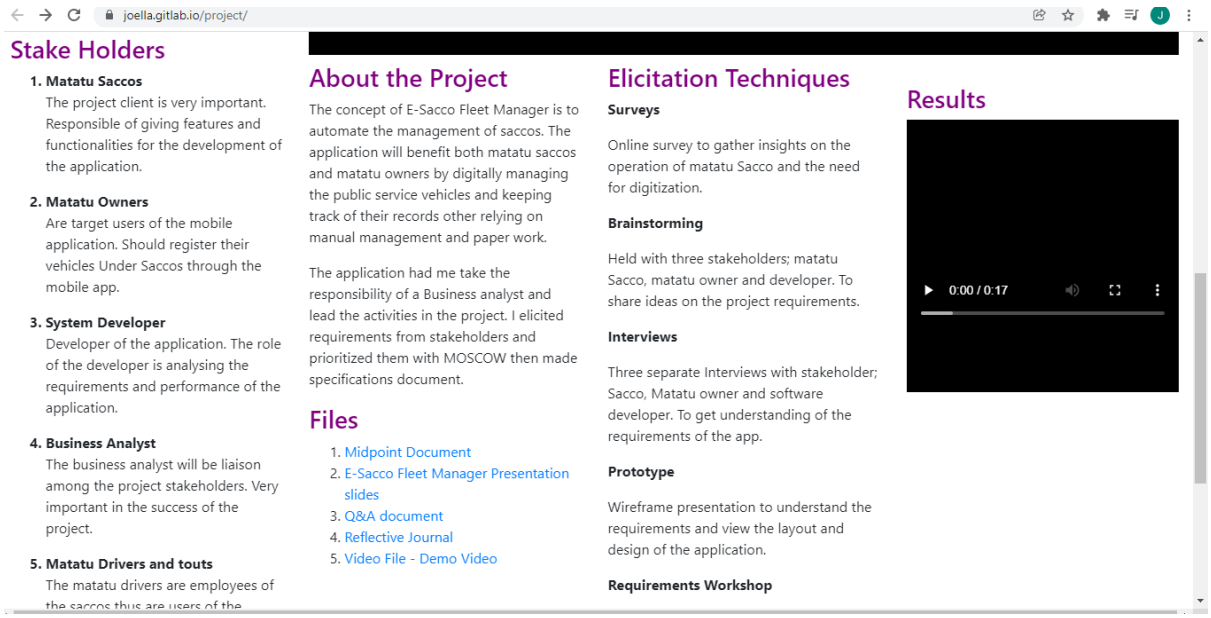
6.4 Website Screenshots

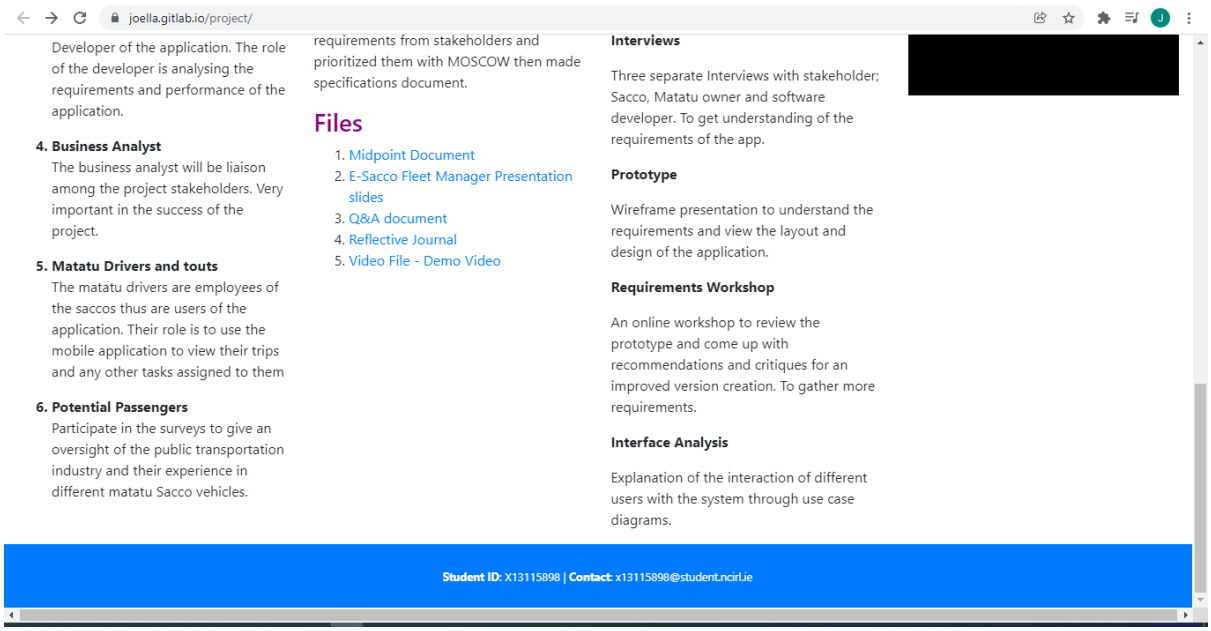
Website Link:

https://joella.gitlab.io/project/

The website is a one-page application build for the purpose of project show case.






joella.gitlab.io/project/
Developer of the application. The role of the developer is analysing the requirements and performance of the application.
4. Business Analyst
The business analyst will be liaison among the project stakeholders. Very important in the success of the project.
5. Matatu Drivers and touts
The matatu drivers are employees of the saccos thus are users of the application. Their role is to use the mobile application to view their trips and any other tasks assigned to them
6. Potential Passengers
Participate in the surveys to give an oversight of the public transportation industry and their experience in different matatu Sacco vehicles.
requirements from stakeholders and prioritized them with MOSCOW then made specifications document.
Files
1. Midpoint Document
2. E-Sacco Fleet Manager Presentation slides
3. Q&A document
4. Reflective Journal
5. Video File - Demo Video
Interviews
Three separate Interviews with stakeholder; Sacco, Matatu owner and software developer. To get understanding of the requirements of the app.
Prototype
Wireframe presentation to understand the requirements and view the layout and design of the application.
Requirements Workshop
An online workshop to review the prototype and come up with recommendations and critiques for an improved version creation. To gather more requirements.
Interface Analysis
Explanation of the interaction of different users with the system through use case diagrams.
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