

GOODS IN TRANSIT TRACKING SYSTEM

Student No:102360

Group A

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Information Technology in partial fulfilment of the requirements for the award
of the Bachelor's Degree in Business Information Technology of
Strathmore University**

**Faculty of Information Technology
Strathmore University
Nairobi, Kenya**

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Declaration

I declare that this work has not been previously submitted and approved for the award of a Bachelor's degree by this or any other University. To the best of my knowledge and belief, the proposal contains no material previously published or written by another person except where due reference is made in the proposal itself.

Student's signature:

..... [Signature]

..... [Date]

Approval

The Information System Project 2 proposal of write your name here was reviewed and approved (*for examination*) by:

Supervisor's signature:

..... [Signature]

..... [Date]

Abstract

Transportation is essential in a person's life. In this area, road transport is the most used way to go to work, pray, have fun, etc it is essential.

This transport has been developed to become an industry, especially by long transport which is done from region to region or from country to country. It is important because it ensures the economic development that many countries seek.

Unfortunately, the long-distance transportation industry faces certain problems that are holding back its peak. This transport is provided by trucks traveling long distances. It is often the owners of these trucks and also the companies providing this transport who encounter problems with the drivers such as time lost on the road, not knowing where and when the truck will arrive, the maintenance costs of the trucks following a bad driver behaviour that the owner would like to know, etc

This project is to develop a system to reassure the owners of these trucks who encounter these problems, ensure a better future for drivers, and thereby develop the long-distance transport industry.

This project indicates the methodology to take to develop this system and the reasons which lead to choose it.

Table of Contents

Declaration	ii
Abstract	iii
List of Figures	vii
Chapter 1: Introduction	9
1.1 Background	9
1.2 Problem Statement	9
1.3 Aim.....	10
1.4 Specific Objectives.....	10
1.5 Justification	11
1.6 Scope and Limitations.....	11
1.6.1 Scope	11
1.6.2 Limitations	11
Chapter 2: Literature Review	12
2.1 Introduction	12
2.2 Challenges experienced in the long distance transport industry.	12
2.2.1 Wasted Fuel.....	12
2.2.2 Excessive damage and repairs.....	12
2.2.3 Wasted Time	12
2.2.4 Do not know the best or worst drivers	12
2.2.5 Challenge of Scheduling and Tracking trips.....	13
2.3 Existing tracking system in long distance transport industry	13
2.4 How to design and develop a mobile application that will mitigate the challenges of long distance logistics.....	14
Chapter 3: Methodology	15
3.1 Introduction	15
3.2 Waterfall Model Development Methodology	15
3.3 Analysis.....	16
3.3.1 Functional and Non Functional Requirements.....	17
3.4 Design	17
3.4.1 Design Diagrams that will be used.....	17

3.5 System Development Tools and Techniques	18
3.5.1 JAVA	18
3.5.2 XML	18
3.5.3 Android Studio	18
3.6 Method to be used to test the developed system	19
3.7 Proposed Modules and System Architecture	19
Chapter 4: System Analysis and Design Description	20
4.1 Introduction	20
4.2 Requirement gathering	20
4.3 System requirements	21
4.3.1 Functional Requirements	21
4.3.2 Non Functional Requirements	22
4.4 System Architecture	23
4.5 Analysis.....	24
4.5.1 ERD Diagram.....	24
4.5.2 Use Case Diagram.....	26
4.5.3 Sequence Diagram	28
4.5.4 Class Diagram	29
Chapter 5: System Implementation and Testing	30
5.1 Introduction	31
5.2 System Implementation.....	31
5.2.1 Installation Procedure.....	31
5.2.2 Home module	37
5.2.3 Sign Up module	38
5.2.4 Driver Registration.....	38
5.2.5 Login module	39
5.2.6 System Testing	45
Chapter 6: Conclusions, Recommendations and Future works	47
6.1 Introduction	47
6.2 Conclusion	47
6.3 Recommendation.....	47

6.4 Future works	47
References	48
Appendix A: Time Schedule	49

List of Figures

Figure 1: A Waterfall Model as represented by (L. Sharma, 2016).....	16
Figure 2: System architecture.....	23
Figure 3: ERD	24
Figure 4:Use case	26
Figure 5:Use case Driver.....	27
Figure 6: Sequence diagram.....	28
Figure 7:Sequence diagram.....	29
Figure 8:Class Diagram.....	30
Figure 9: Android studio installation	31
Figure 10:Android studio interface	32
Figure 11: About phone setting.....	33
Figure 12:build number setting	34
Figure 13:Developer option setting.....	35
Figure 14:USB debugging setting.....	36
Figure 15:Accept debugging setting	37
Figure 16:Home module	38
Figure 17:signup module	38
Figure 18: Driver registration module.....	39
Figure 19:login module	41
Figure 20: Add fuel module	43
Figure 21:Add service detail module.	45

List of Tables

Table 1: Functional requirement	22
Table 2: Non-functional requirement	23
Table 3: System testing	46

Chapter 1: Introduction

1.1 Background

Transport plays a very important role in the economic and social life of a region, a country, or a continent. Through the transport sector, trade takes place between regions, countries and even continents. As a result, relationships are formed between them.

Businesses rely on transportation, which allows them to obtain the raw materials to produce the manufactured goods and services they need.

Transport also makes our lives easier by allowing us to travel long distances. By this we save more time and money than we could use for other things.

According to the article in "Why is the transportation sector the heart of the development of any economy?" transport is the main reason for a positive development of a geographic area and a population on all levels, be it demographic, technical, industrial, health, cultural, social, etc. (Neuge T.,2017)

This project will focus on road transport, which represents 90% of the development of a region and of a population. The same study said that without road transport there would be a higher unemployment rate compared to the current figures. It is explained that the mere fact of buying a utility car indirectly leads to job creation. This purchase will create jobs because this car needs a car to drive it, gasoline therefore we will need pump attendants, etc ...

With the development of infrastructure or road transport means geographic areas continue to develop. Take for example in Africa when we build a road in any region, the latter develops because economic activities begin to be born in this region, the commercial markets are born, hospitals are built, schools are built, parks,

This project will talk about the problems that are often encountered in this sector of road transport which hamper the economic development of people, companies and even countries.

This project will also come up with solutions to considerably reduce these problems.

1.2 Problem Statement

Current road transport faces many problems. This transport is provided by trucks which transport goods from one region to another and are often driven by drivers

suitable for this type of locomotion. Most problems often happen to the owners of these trucks who do business or to companies that transport goods for customers.

The first problem is not knowing exactly where the driver is with the truck and how long it will take to provide this transport. It takes time to arrive and because of this will taint your company's profit, customers will no longer trust your business. According to an article ("What You're Missing When You Don't Use GPS Technology") the driver may be late to deliver the goods, you call but do not answer and immediately we start to invent excuses to tell clients. (Ashley P., 2018)

The second problem that can arise is that drivers ask for a lot of money for fuel. Because of ignorance their superior gives them huge sums for their transportation. They do not argue because they do not know how many kilometers they will travel to estimate the gasoline that will be used. According to the same article you are looking at your budget and you cannot believe how much you are spending on fuel and spare parts each month. And you do not even want to see how much you paid in overtime to your maintenance staff and drivers. Drivers decline to lie when they know exactly that there is a system that monitors their work. (Ashley P.,2018)

It will be difficult to give promotions to drivers who have worked well. Indeed, there are drivers who misbehave, treating the trucks in a neglected way and badly like driving in a high speed, harsh braking, ... which can damage the trucks.

According to an article bad driving habits like over speeding, harsh braking is extremely dangerous for drivers. (Jurica M., 2018). Therefore, without this system, we cannot even see the progress of drivers who want to change.

1.3 Aim

This project aims to develop a computerized information system that will help the road transport sector in all areas related to tracking and management of long distance trucks.

1.4 Specific Objectives

- i. To investigate the logistical challenges experienced in the long distance bn
- ii. To assess the already developed system that are used to manage long distance cargo transport.

- iii. To design and develop a mobile application system that will mitigate the challenge of long-distance logistics.
- iv. To test the system

1.5 Justification

This project involves several stakeholders listed below:

- i. Companies or owner of the trucks that only transport goods, whether in a region or from one country to another
- ii. Customers who benefit from this transport of goods. For example, a customer who is waiting for the delivery of a product bought abroad.
- iii. The drivers of these trucks will also benefit from this system and will help them improve their daily work.

1.6 Scope and Limitations

1.6.1 Scope

This project aims at attaining only one main deliverable that is a website. The mobile application is not going to be delivered, the project is focused on a web-based system because of lack of time or other situations such as data loss.

1.6.2 Limitations

The limitation could be the integration with the other systems based on country policies and regulations that are country specific. For example, the ICT related laws as regards cybersecurity laws in the various countries as the trucks move in and out of countries.

Chapter 2: Literature Review

2.1 Introduction

The objective of this chapter is to review the obstacles that the current long distance transport system encounters, the problems encountered by the companies that do this business as well as the users of these trucks. This chapter will also review how to minimize these obstacles for a better transport system and for these users.

2.2 Challenges experienced in the long distance transport industry.

2.2.1 *Wasted Fuel*

This type of problem is often encountered in the long-distance transport industry, because truck drivers take advantage of the ignorance of their bosses by asking them for large sums of money for fuel. They are scammed this way because they have no idea about the distance that will be covered.

Fuel loss can also be caused by poor driver behaviour such as speeding, braking and aggressive driving by these drivers.

2.2.2 *Excessive damage and repairs*

It is difficult to track the condition of your trucks after long journeys. Do they need new tires? Do they need an oil change for the next transport? According to GPS Heroes (2020) this kind of information is difficult to keep in mind especially for those who have many trucks.

2.2.3 *Wasted Time*

In the long distance transport industry time is money. Fast and accurate transport must be ensured. It is therefore difficult for those who have a lot of trucks how to prepare their route, find them shorter routes or which are passable. This will take more time before transport starts and will also get customers impatient.

2.2.4 *Do not know the best or worst drivers*

It is important to reward good drivers to motivate their work and make their lives easy with bonuses. It is difficult to recognize the good from the bad drivers because it is practically impossible unless you take a tour with each of them to assess their behaviour which is practically impossible and could take a long time. (A. Preston, 2018)

2.2.5 Challenge of Scheduling and Tracking trips

The problem is not planning the trips that will be made by these trucks. Indeed, it is not only a question of having trucks, it is also necessary to plan and align their journeys in a such a way that it meets the times and costs specified by the customers.

The article “4 Major Freight Management Challenges Faced by the Trucking Industry” says that making efforts to keep the costs and efforts as optimal as possible is necessary to achieve minimum time and competitive billing to the customers (L. Nitin, 2018)

2.3 Existing tracking system in long distance transport industry

The systems for tracking trucks in the long distance transportation industry have been around to date but are not doing their job fully. They do not do their job in the right ways there are always downsides that hold them back. Most of the GPS designed so far is the Satellite-based GPS.

The first problem that the systems encounter is the disappearance of the map when one finds oneself in an isolated place. It is a localization error which is caused by the failure to maintain the satellite signal. This occurs for a Satellite-based GPS which uses the signal of the satellite to track the trucks. (A. Thomas,2019)

This type of tracking system can also develop measurements which are influenced by errors introduced by the satellites. In this case the driver receives errors transmitted by the signal from the antenna of the satellite which causes errors such as confusion on the map of the regions. A truck driver was guided by a GPS to a factory where he was to deliver his cargo. During the journey, instead of considering the warning signs of non-entry that should have dissuaded him, the driver continued to follow the GPS until the truck found himself stuck in the cradle of a cherry tree. He could not move it anymore. (L. Hansen, 2013)

The weak GPS signal can cause a sudden location movement even if the device is still on. This is due of the weak reception of the device’s antenna. (A. Thomas, 2019)

Another type of tracking system is Cell-based GPS which use the data of any device in the truck. The concept is to use any device in the truck. The system records the data of this device which it converts to find the exact location of the truck.

This system has its disadvantages which have slowed down the long-distance transport industry such as the driver forgetting or losing this device. Indeed, the device can be small, and it becomes very easy to lose it. (Mcyar, 2018)

2.4 How to design and develop a mobile application that will mitigate the challenges of long distance logistics

This project is to develop a system to track trucks during their long distance transport. This system will use a mobile application which is the most simple and easy to use. The concept is that the driver is on his phone when the driver is working as well as the owner of the truck who is monitoring his actions. This system is equipped with a map of the regions and their distances so that there is no more confusion. With these distances the owner could estimate the liters of fuel that would be needed for the driver. This system will also help travel companies to plan transportation for owners who have a lot of trucks. The system will also be able to indicate the speed at which the truck is to differentiate between good and bad drivers to allocate them bonuses for motivation

Chapter 3: Methodology

3.1 Introduction

This chapter is to review the methodology applied to develop this system. This methodology will be explained and developed step by step. The proposed methodology will help us to limit the obstacles encountered in the long distance transport system. This chapter will justify the methodology, functional and non-functional system requirements as well as tools and techniques.

3.2 Waterfall Model Development Methodology

Waterfall Model is a methodology used for the success of a project. It is the oldest model for the system methodology and is understood in stages. To reach a step, the previous one must have succeeded so it depends on the input of the previous one. The choice of this model for this system is encouraged by the way to develop the system in a systematic way and allows us to understand what we are doing.

The steps of Waterfall Model as illustrated in figure 3.1 include:

- i. Requirement Analysis: This step is to identify all possible requirements that are needed for the development of the system
- ii. System Design: This step is to review all the requirement specified in the last step so that the system design can be prepared. It involves the hardware and system requirement as well as the overall architecture of the system
- iii. Implementation: After the system design comes the implementation and here the system is divided into sub system and each part is tested and developed for its functionality in the next step
- iv. Integration and Testing: After testing all the subsystems from the previous step, they are arranged together to form a system again.
- v. Deployment of the system: In this step the product is deployed in the customer environment after all the functional and non-functional testing

- vi. **Maintenance:** This step is needed in case of issues occurred with the system in the customer environment. Some changes are needed to ensure the proper functioning of the system.

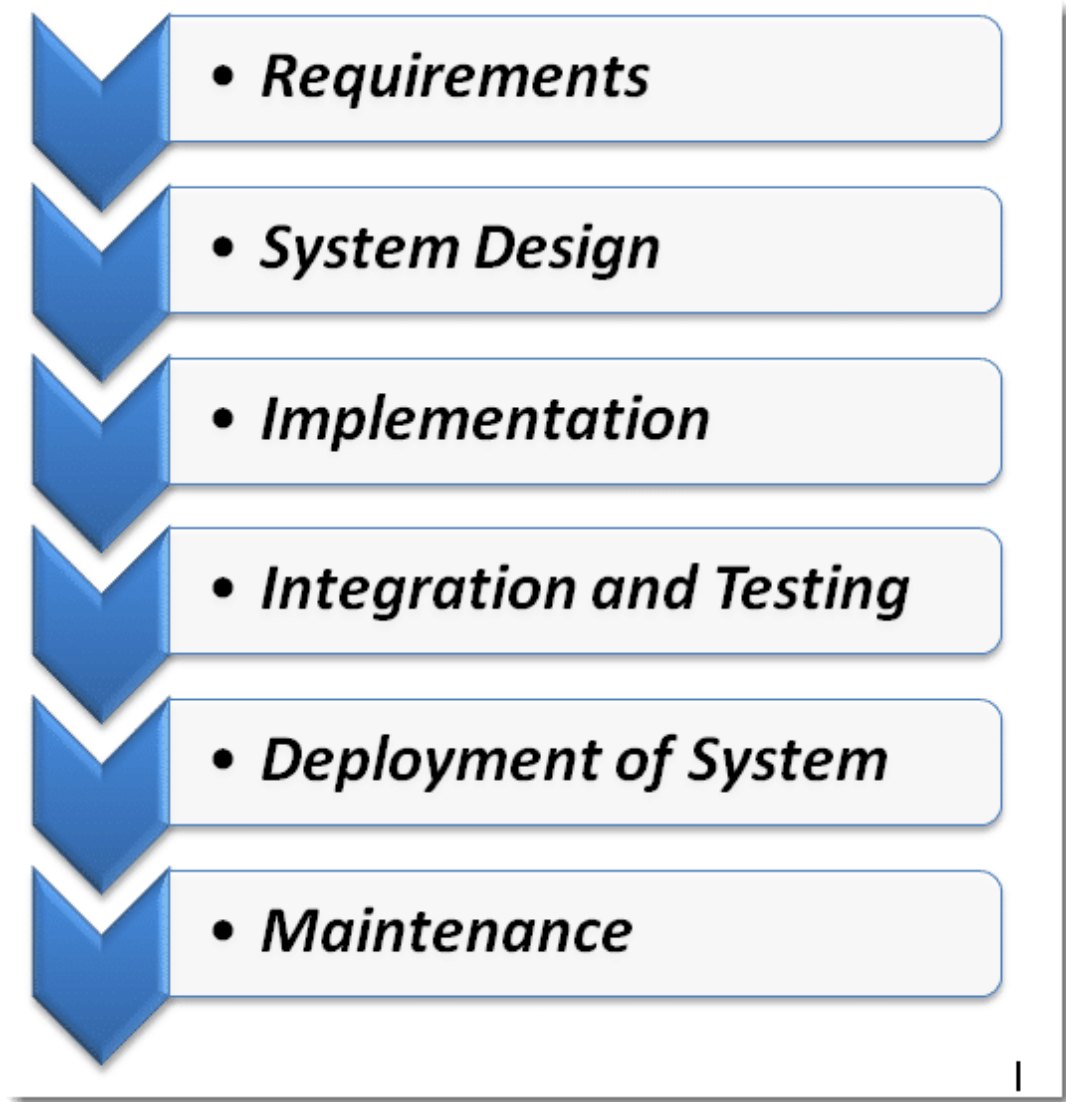


Figure 1: A Waterfall Model as represented by (L. Sharma, 2016)

3.3 Analysis

Software requirements analysis are the functional and non-functional requirements that are needed to implement the system. The requirements analysis is to define what are the expectations for the user for the system that is being developed. All the tasks that are used to identify the needs of different stakeholders are included.

3.3.1 *Functional and Non Functional Requirements*

A system that is being developed includes functional and non-functional requirements. A functional requirement defines what the system must accomplish, functions that must be performed and its components. While a non-functional requirement defines the criteria used to judge the specific operation of a system.

Those requirements are gathered using many methods and techniques but in our case interviews, questionnaires, or surveys

Interviews are among most common techniques used to gather informations and is known as the primary sources of requirements. In this case interviews are going to be conducted after identifying the different stakeholders such as owners of the trucks, companies performing the business of the long distance transport also the drivers of those trucks.

Interviews can be hard to conduct in case the identified stakeholders are not showing up for it.

Questionnaires are also a type of collecting informations from many people in a shortest time specially when the identified stakeholders are spread out geographically. Questions should focus and related to the project objectif.

This technique has the advantage to collect informations from the drivers that are spread out geographically. The disadvantage is that the informations are not accurate.

3.4 Design

System design is defining the elements of the system such as modules, architecture, components, interfaces, and data of the system according to specified requirements.

System design is what how data will be flowing through the system.

Since this system will focus on the mobile application it will be suitable to use an Object-Oriented Analysis and Design approach.

The system developed is a mobile application more precisely a native application. The choice of a native application is because it is more easily to use since the only condition is to have a cell phone and being able to download it.

3.4.1 *Design Diagrams that will be used*

The design diagrams that will be used are the following: Use Case Diagram, Class Diagram, Sequence Diagram, Database Schema, GUI Design.

3.4.1.1 Use Case Diagram

Use Case Diagram is needed to gather all the specific requirements. It shows what the system needs to have. It also gathers all the functionalities of the system that is developed.

3.4.1.2 Class Diagram

This diagram is a graphical method that helps to visualize and to construct the object oriented systems. It guides the developer to implement the code of the system being developed.

3.4.1.3 Sequence Diagram

This diagram details how the different operations of the system being developed are ordered in a sequence manner. It helps to see the various steps of the system.

3.4.1.4 Database Schema

A database schema is used to store the data for the system. It provides a simplified way to view the database.

3.4.1.5 GUI Design

Graphical User Interface Design allows to interact with the system through graphical icons. It helps to understand how the system works.

3.5 System Development Tools and Techniques

This are tools and techniques that will help to implement the system according to the specified requirements.

3.5.1 JAVA

Since this system is a mobile application it is suitable to use Java Script. It is a dynamic computer language used to implement systems in an efficient manner.

3.5.2 XML

This is a markup language used to display the content on how data is being described. It also needed since we are developing a mobile application. It is more efficient with more results.

3.5.3 Android Studio

It helps in building application in our phones. It is an integrated development environment for Google's Android. It is chosen because it is fast and easy to use.

3.6 Method to be used to test the developed system

The testing method to use is White box testing. This method is efficient to find errors and all the implementation that must be done are known by the developer of the system.

3.7 Proposed Modules and System Architecture

The proposed modules are the following:

- i. Admin registration
- ii. Driver Registration
- iii. Home page
- iv. Login module
- v. Add service module.
- vi. Add fuel details module.
- vii. The map module

System allows admin to manage the system by adding the details such as driver/truck details, driver registration and view driver details.

Driver need to open the android application and login into it. The android application will start sending location co-ordinate after every five seconds. Driver can also enter the fuel and service details wherever he has filled the fuel or had Truck serviced.

Chapter 4: System Analysis and Design Description

4.1 Introduction

The aim of this chapter is to provide all the functional and non-functional requirements that will be developed by the requirements gathering methods that will be mentioned in the next point. In addition to this, the system will provide the system architecture of the application and the different diagrams.

4.2 Requirement gathering

It exists many methods of gathering the requirement of a system, but my project will only focus one the 2 methods which are Interviews and Questionnaires.

Interviews is one of the best methods and most popular that is used to gather requirements. It is a primary source in the case that it helps to be in contact with the targeted stakeholders such as drivers, users of the application and to know what is really needed for the application. Interviews were used to the owners of the trucks in the business environment where this type of application is the most needed. The business environment that was used is for example the transportation of Brarudi's drinks (Burundi) which is the first industrial company that produces drinks in Burundi. They need such application to monitor the drivers of their trucks which are transporting their drinks inside the country.

Questionnaires was used to the drivers that were needing improvement in the working area. Questionnaire and Interviews were used to get information from many perspectives of the user and to get their personal comments from their daily experience such as what are they are facing, in what they want the application to be improved, the problems they are facing with the current systems that are used, etc...

4.3 System requirements

4.3.1 Functional Requirements

ID	Description
FRQ1	The system should allow the user to sign up
FRQ2	The system should allow the admin to log in
FRQ3	The system should allow the admin to add drivers and trucks details.
FRQ4	The system should allow the admin to use the map
FRQ5	The system should allow the admin to track the truck
FRQ6	The system should allow the driver to login
FRQ7	The system should allow the driver to register in
FRQ8	The system should allow the driver to get notifications from the admin

FRQ9	The system should allow the admin to input trucks details
FRQ10	The system should allow the drivers to start or stop the trip
FRQ11	The system should allow the driver to get the trips details
FRQ12	The system should allow the driver to use the map

Table 1: Functional requirement

4.3.2 Non Functional Requirements

ID	Category	Description
NFRQ1	User friendly	The system should give a user friendly approach
NFRQ2	Easy to access	The system should be easy to access and store information
NFRQ3	Performance	The system should be fast to respond

NFRQ4	Reliability	The system should provide security for the information it stores
NFRQ5	Efficient	The system should be provide improvement.

Table 2: Non-functional requirement

4.4 System Architecture

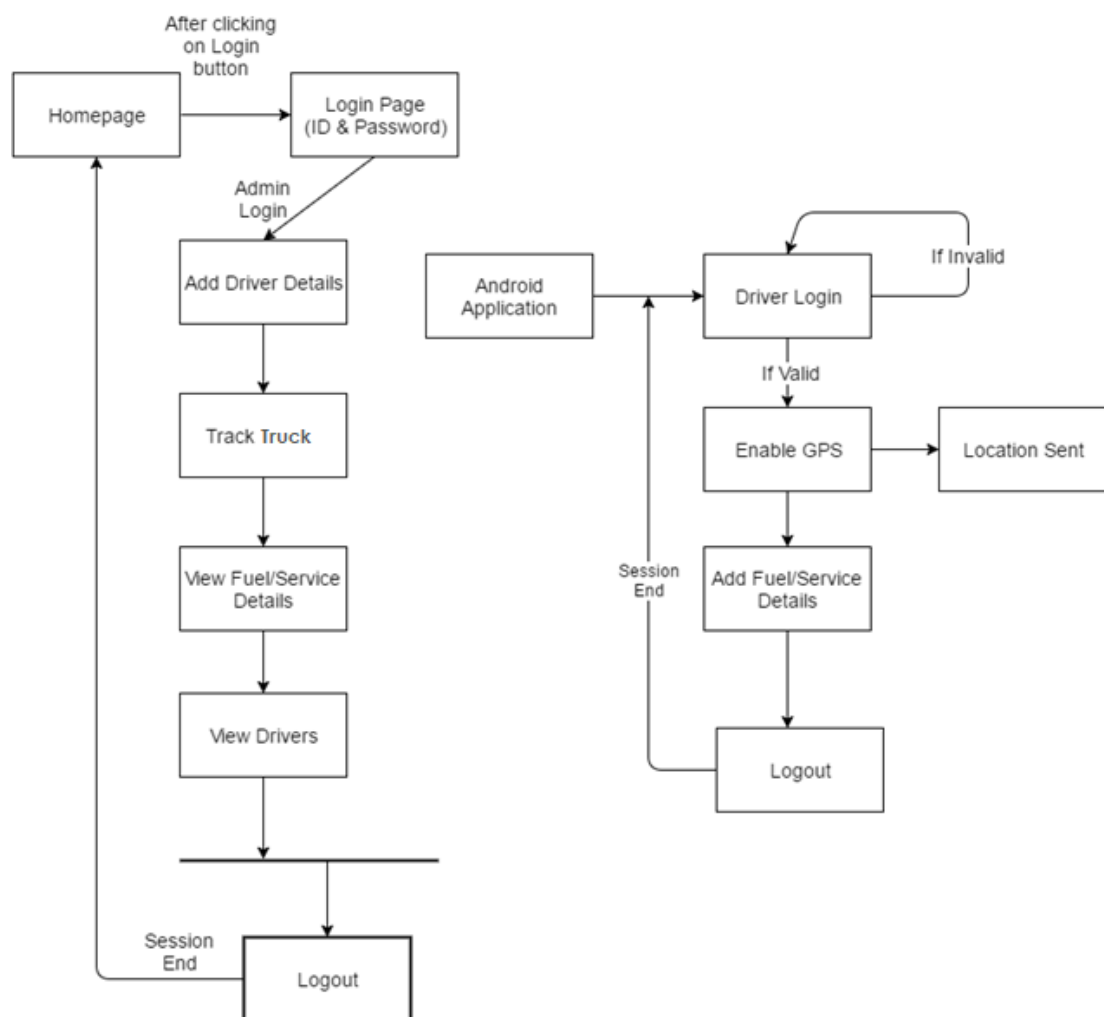


Figure 2: System architecture

4.5 Analysis

4.5.1 ERD Diagram

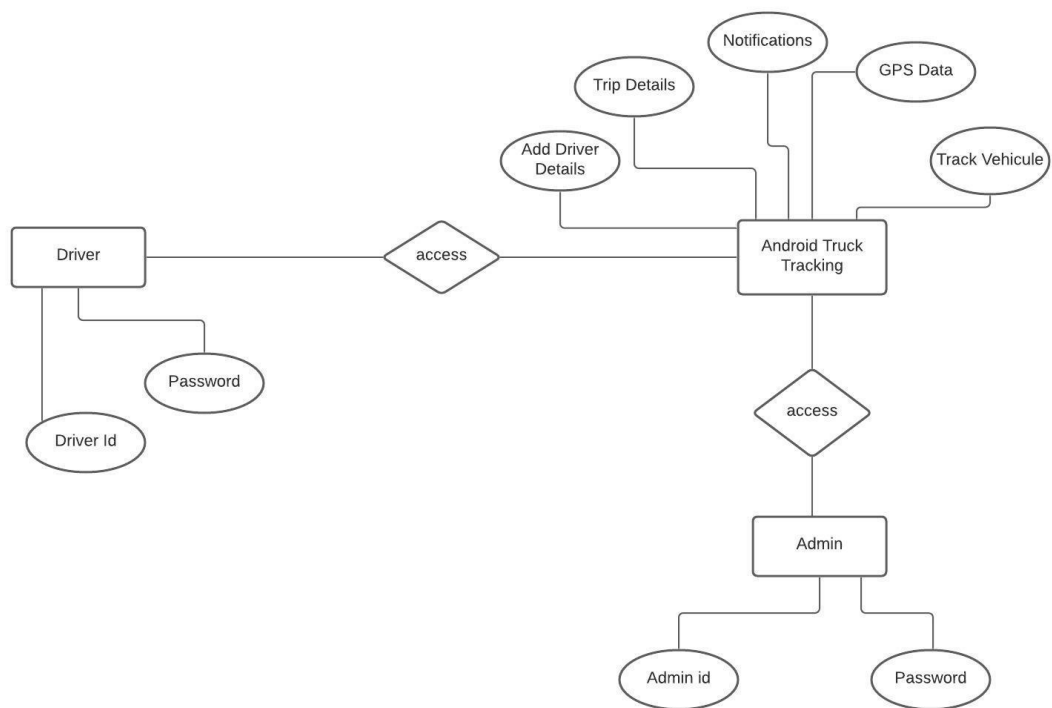


Figure 3: ERD

4.5.2 Use Case Diagram

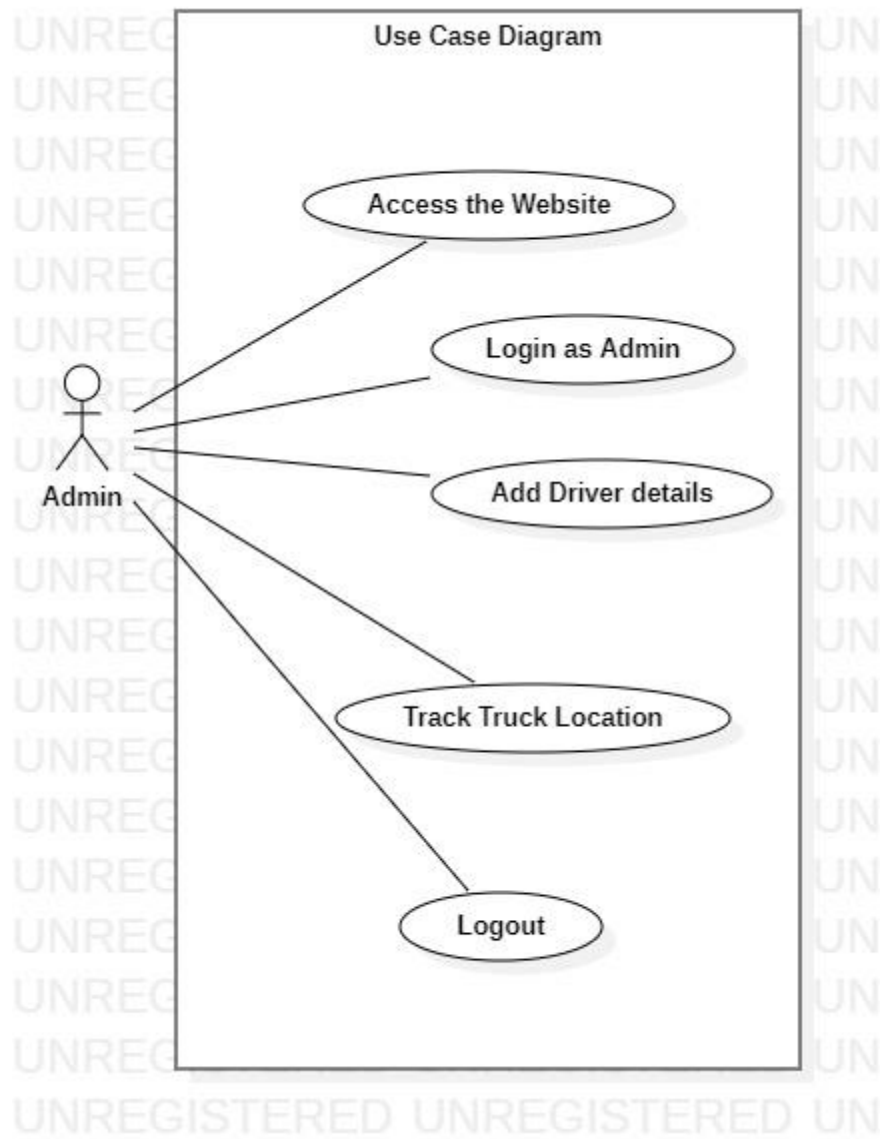


Figure 4: Use case

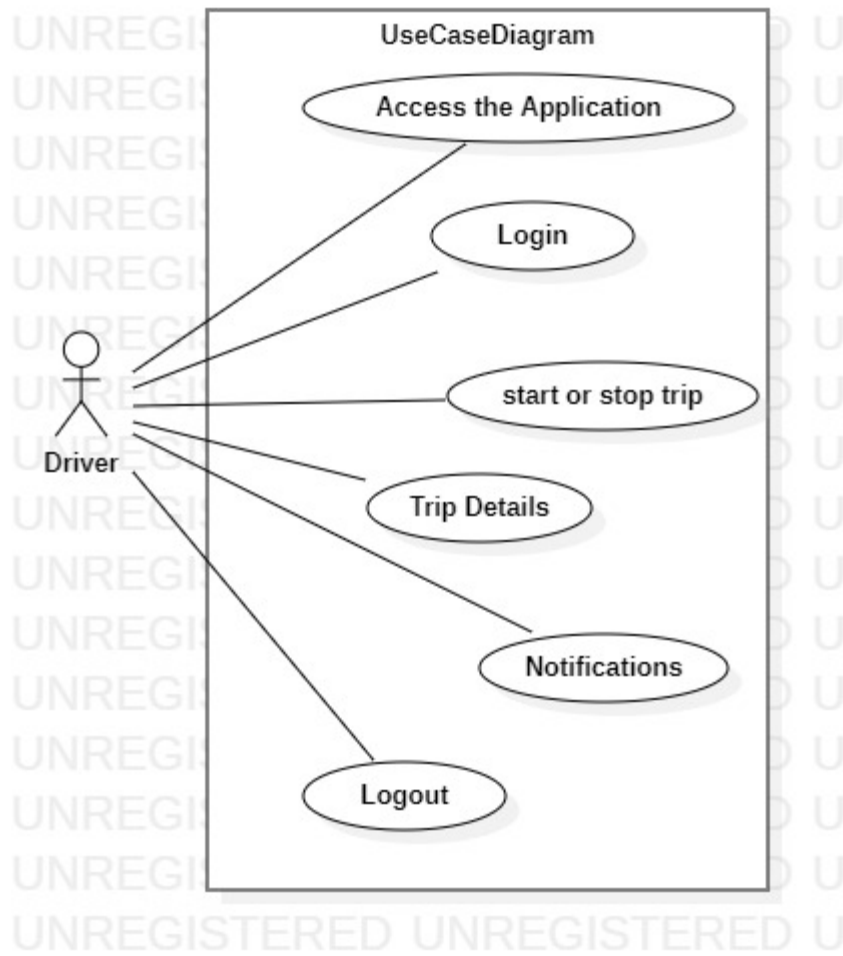


Figure 5: Use case Driver

4.5.3 Sequence Diagram

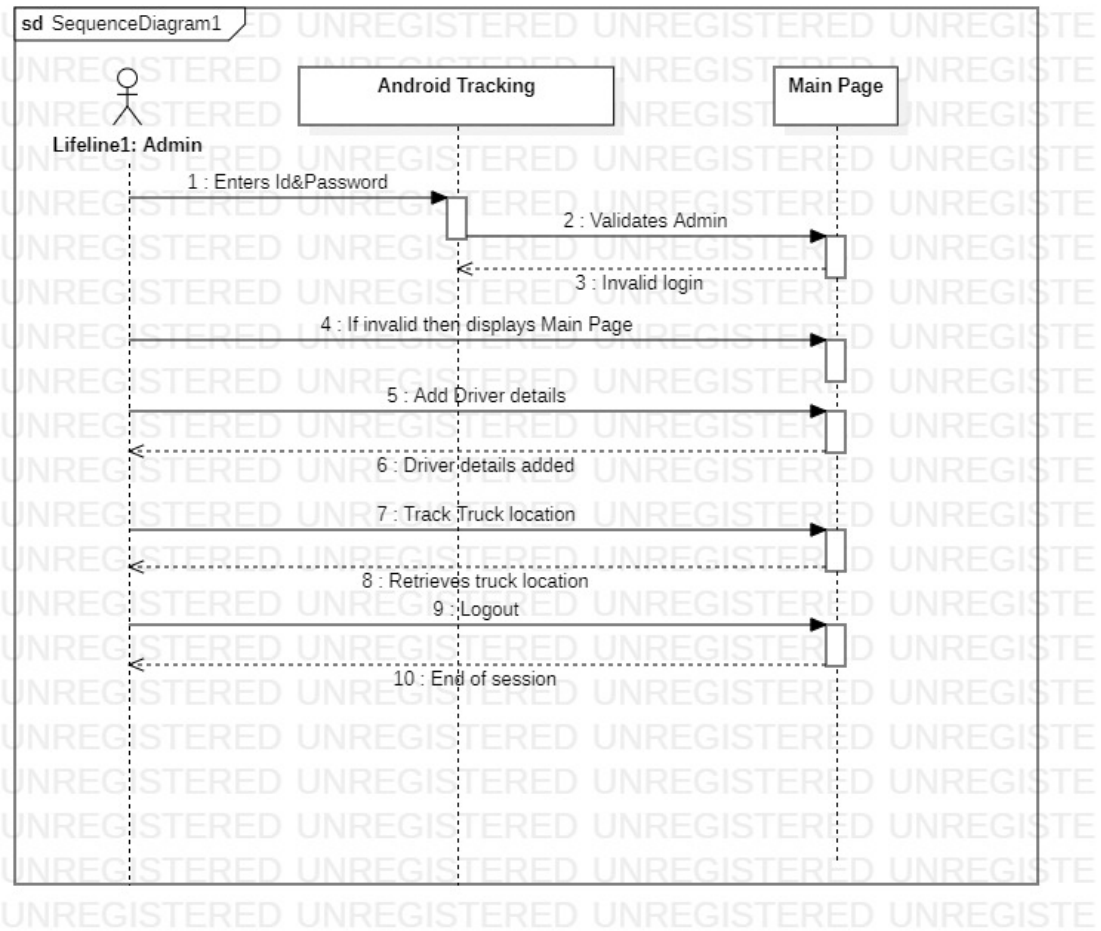


Figure 6: Sequence diagram

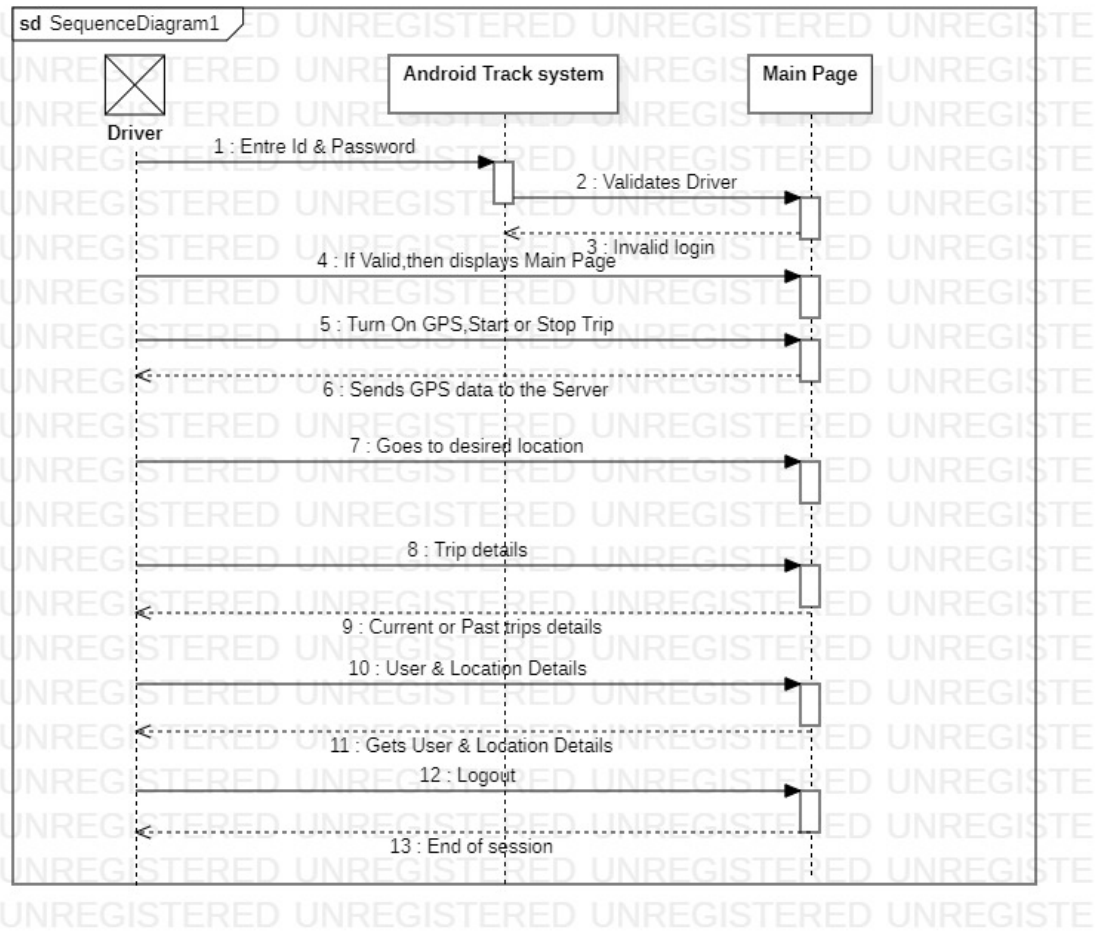


Figure 7:Sequence diagram

4.5.4 Class Diagram

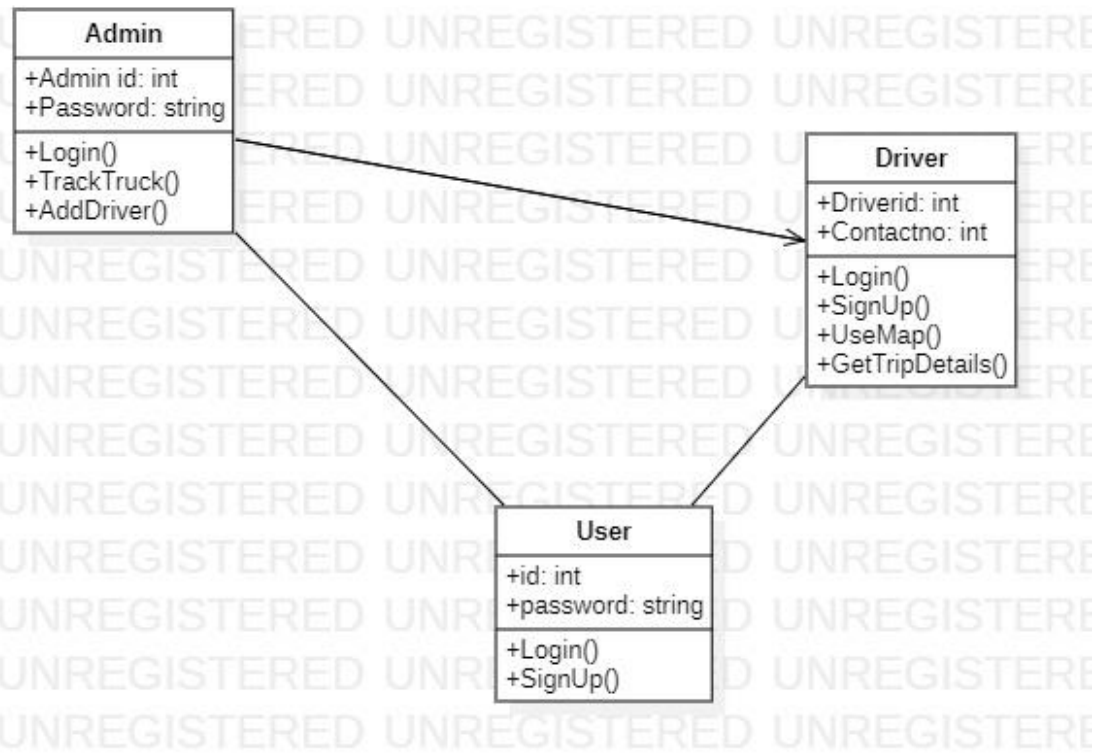


Figure 8:Class Diagram

Chapter 5: System Implementation and Testing

5.1 Introduction

This chapter aims to show the evidence that the system is working according to the requirements stated in the previous chapters. The testing here was System testing to check the system requirements were satisfied. The code has been written completely using Android Studio Developer with C# and Java coding language, Visual studio, and the Android studio as the interface for front-end designing.

This chapter also shows how the application was installed in the android device with the specific steps taken.

Briefly it proves that the system has been tested well with the help of the users and everything have been verified from every nook and corner of the user.

5.2 System Implementation

5.2.1 Installation Procedure

The first step in the installation process of the application in the android device.

You first download the Android studio software from

<https://developer.android.com/studio.com>

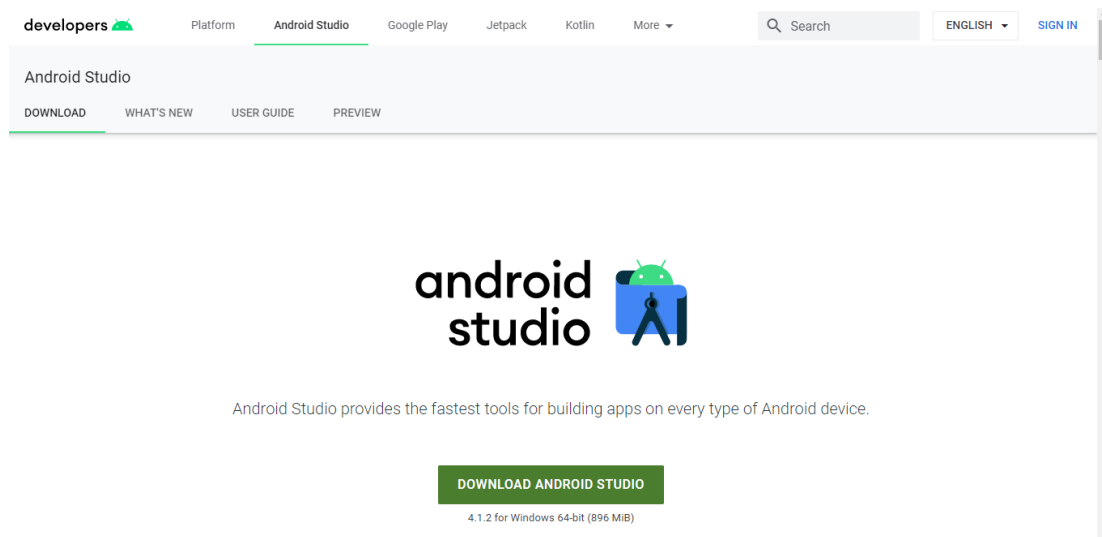


Figure 9: Android studio installation

Then after running the codes that have been written you run the application in the android device. You connect the android device through a usb to the laptop and run using the green triangular button in android studio.

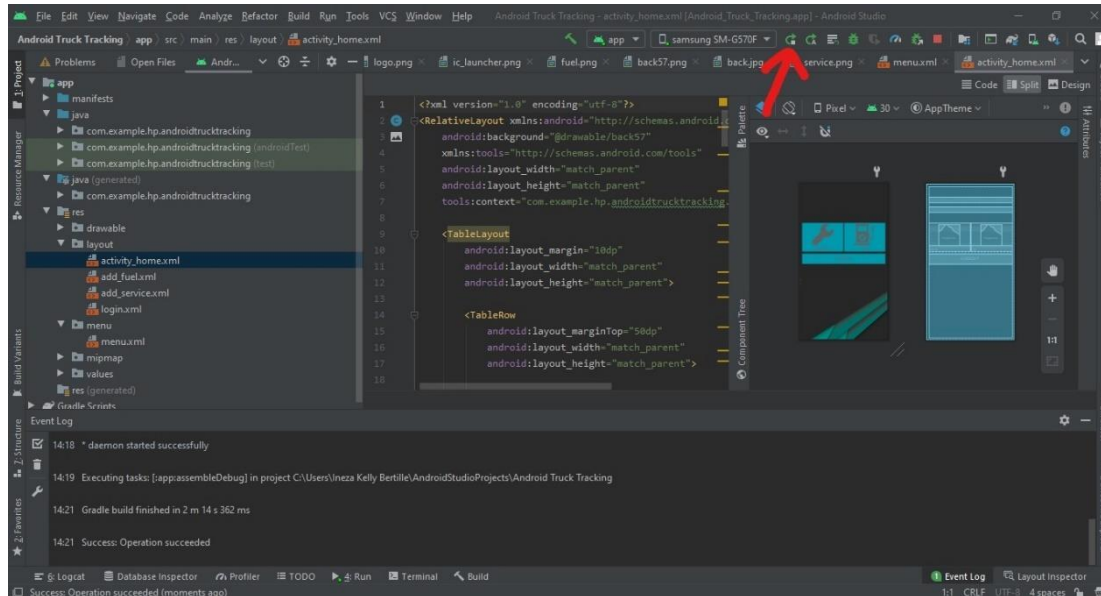


Figure 10:Android studio interface

You also need to enable the developer mode in the android studio by following these steps:

1. Open the settings screen and tap “About phone”.

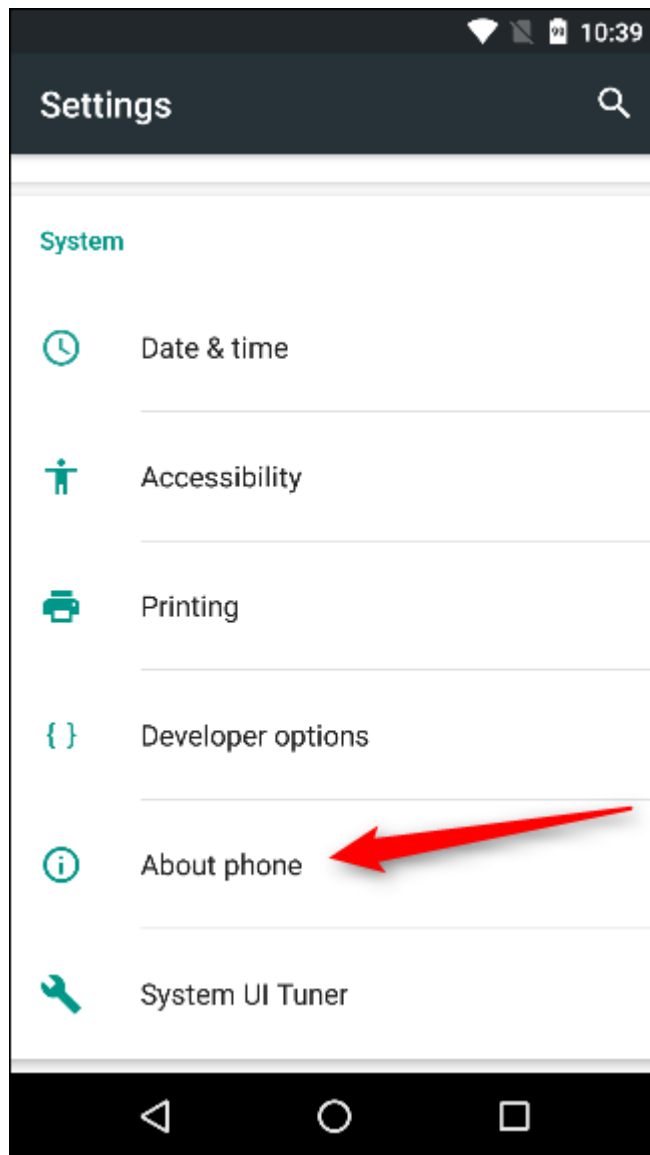


Figure 11: About phone setting

2. Scroll down to the Bottom and tap on “Build number”.

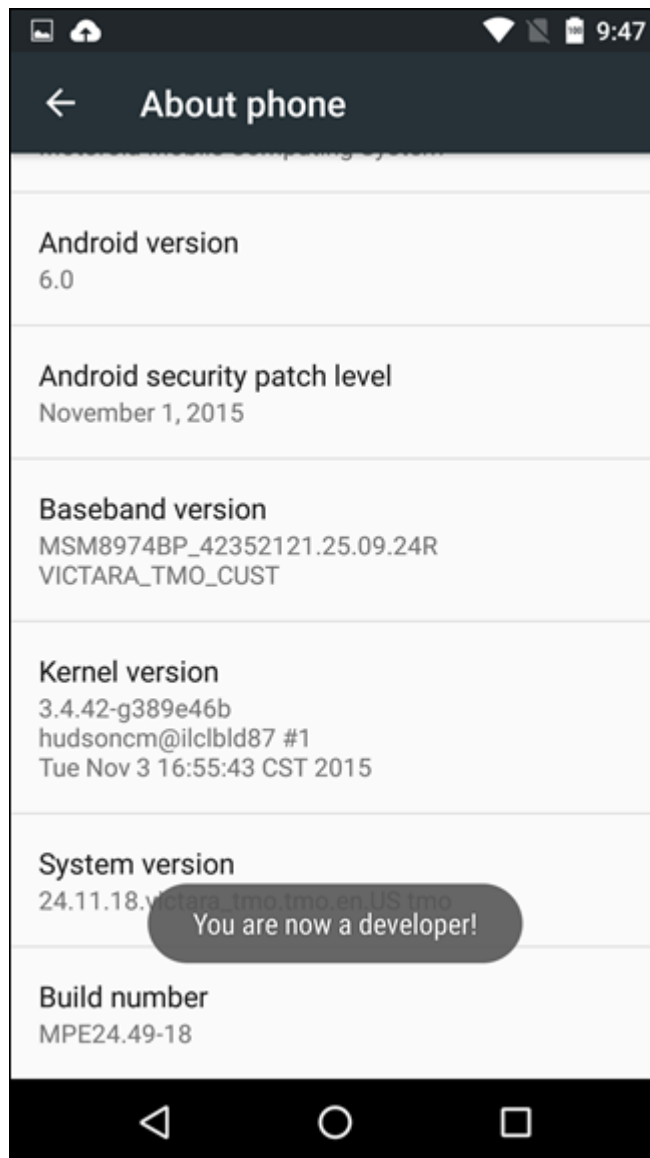


Figure 12:build number setting

Tap the Build number seven times so that you can enable Developer options. After you get a toast notification with a countdown that reads “You are a developer”

In case you do not want to repeat the same process, you go back to be menu and tap “Developer options” and enable it in your device.

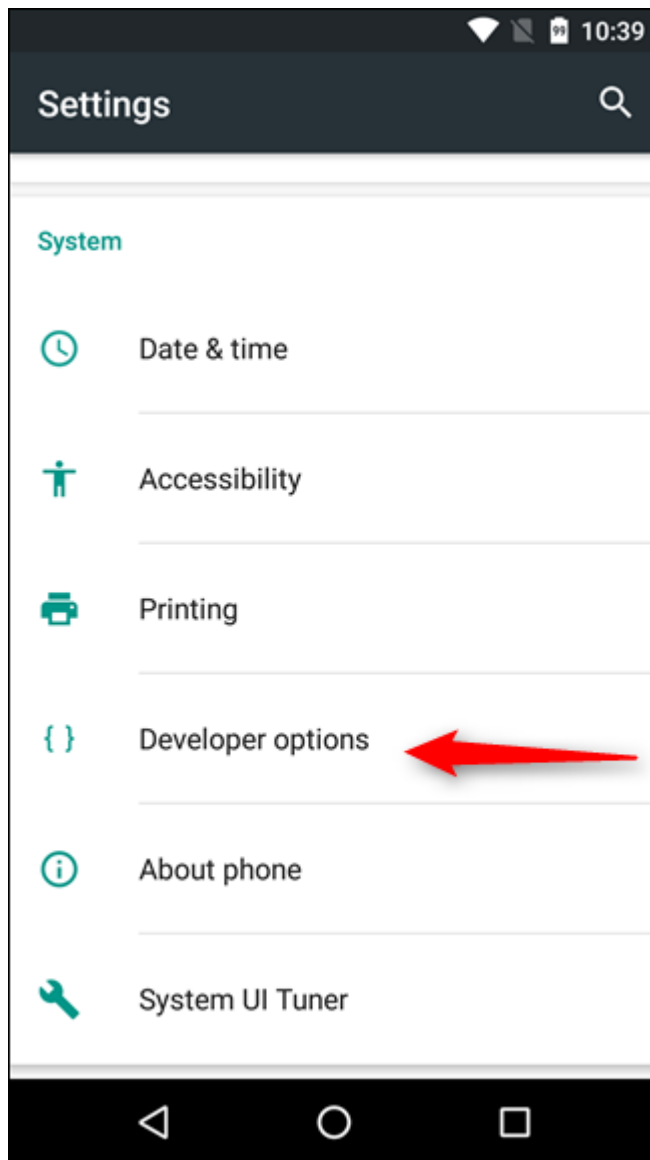


Figure 13:Developer option setting

After you will need to toggle the USB Debugging slider

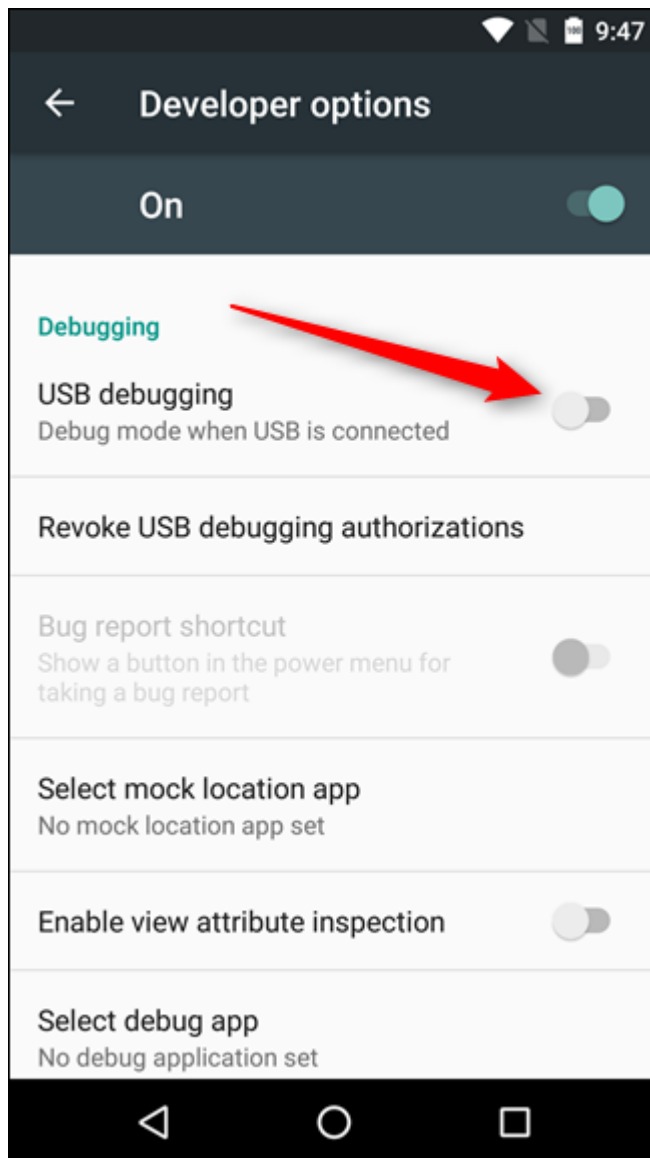


Figure 14:USB debugging setting

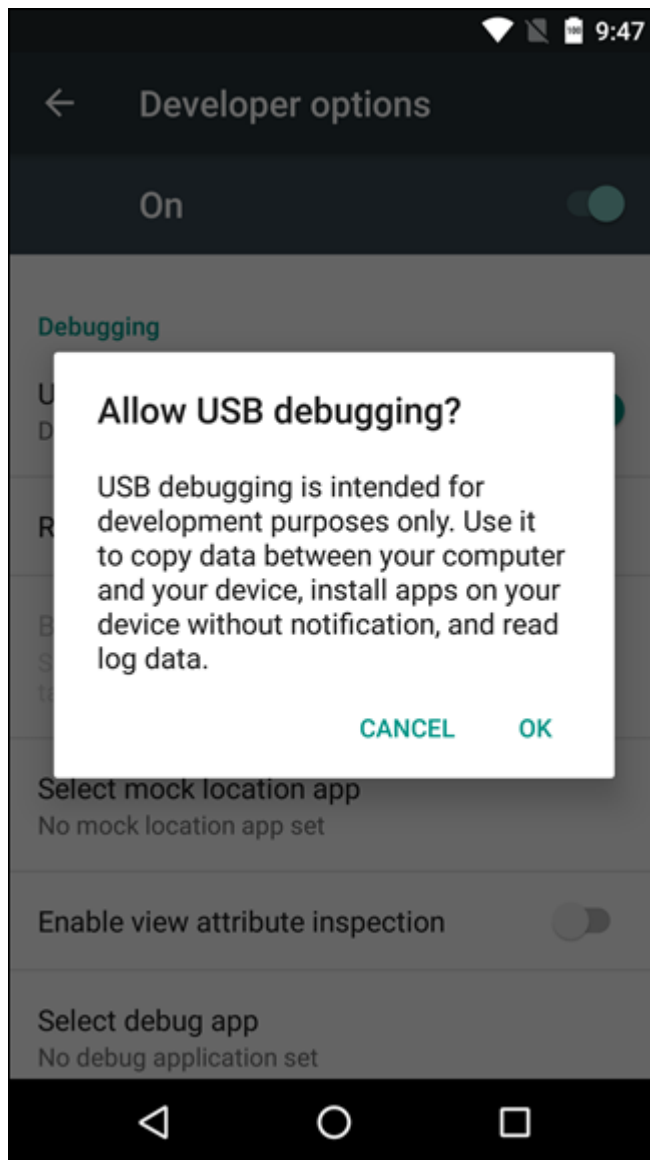


Figure 15:Accept debugging setting

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5.2.2 Home module

This module displays the whole interface of the application and give access to other modules.

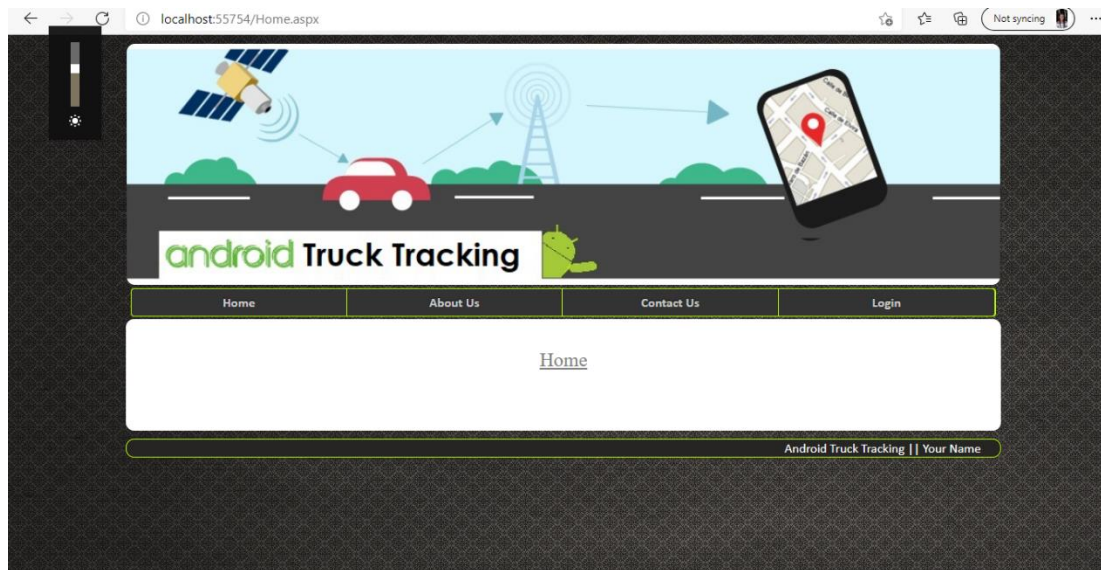


Figure 16:Home module

5.2.3 Sign Up module

This module allows the user of the application to register in the application so he can be known by the system.

Figure 17:signup module

5.2.4 Driver Registration

This module allows the driver to sign in in the application by providing all his details that will be used by the admin.

The screenshot shows a web browser window with the address bar displaying 'localhost:55754/AddDriver.aspx'. The page title is 'android Truck Tracking' with a green Android logo. A navigation bar at the top contains links for 'Home', 'About Us', 'Contact Us', and 'Login'. The main content area is titled 'Driver Registration' and contains a form with the following fields:

- Name :
- Contact No. :
- Address :
- Age :
- Truck No. :
- Salary :

A 'Submit' button is located at the bottom of the form.

Figure 18: Driver registration module

5.2.5 Login module

This module is for users who have already signed in the application by providing the user id and contact number.

Android Truck Tracking

Login

User Id

Contact No

LOGIN

Figure 19:login module

5.2.5.1 Add fuel module.

This module is for the driver who is willing to add fuel in the needed case.

After adding the driver must specify the bill number, the litres he added and the amount of money he spent.





94% 2:34 pm



Add Fuel Details

Bill No.

Litre.

Amount.

SUBMIT

CANCEL

Figure 20: Add fuel module

5.2.5.2 Add service module.

This module allows the driver to perform the reparations that truck need and to input all details in the application.





94% 2:34 pm



Add Service Details

Bill No.

Status

Amount.

SUBMIT

CANCEL

Figure 21: Add service detail module.

5.2.6 System Testing

Test ID	Related requirement	Inspection check	Pre-condition	Test data	Priority level
1)	FR1	Does the system allow to log in?	User is already registered in the system	User id:117 Contact number:9555555556	High
2)	FR2	Does the system allow the drive to register?	Driver has already the application installed	Name: Sammy Contact No:9786534978 Address: Madaraka Age: 25 Truck no:20Salary: 50k	medium

3	FR3	Does the system allow the admin to track the truck?	Admin must have the truck no	Truck no:2016	High
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Table 3: System testing

Chapter 6: Conclusions, Recommendations and Future works

6.1 Introduction

The aims of this chapter are to provide a summary of all the work that was developed in the previous chapters. It also situation that can improve the weaknesses that the system can face.

6.2 Conclusion

The Technology of the Global Positioning is allowing for huge changes in the society. The application using GPS are constantly growing. The cost of the receivers is dropping while at the same time the accuracy of the system is improving.

This affects everyone with things such as faster internet speed and safer plane landings. This system can also be used for personal as well as for company purpose to track truck location in real-time.

The only challenge that the system can face is in case of a network failure due to the environment hazardous, application will fail to send location of the truck.

6.3 Recommendation

For this project. I highly recommend an improvement in the network side which is always behind the failure of the system.

6.4 Future works

A real time system where the owner can track the location of the truck and has the advantage of running multiple tasks simultaneously and facilitate the switch between them based on the priorities.

A real time system is easy to use and are available in all type of sector for the rapidity, easy of use and are very powerful.

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Appendix A: Time Schedule

