# RTG CARPOOLING APPLICATION

Project report submitted in partial fulfilment of the requirements for the degree of

Bachelor of Technology

in

**Computer Science and Engineering**

by

Anusheel Priyam (161301)

Under the supervision of

**(Dr. Geetanjali)**

to



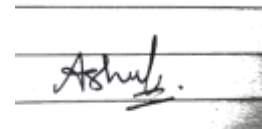Department of Computer Science & Engineering and Information Technology

**Jaypee University of Information Technology Waknaghat, Solan-173234,**

**Himachal Pradesh.**

# CERTIFICATE
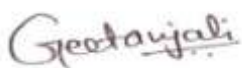
I hereby declare that the work presented here in this report entitled "RTG Carpooling Application"inpartialfulfilmentoftherequirementsfortheawardofthedegreeof**Bachelor of Technology** in **Computer Science and Engineering** submitted in the department of Computer Science & Engineering and Information Technology, Jaypee University of Information Technology Waknaghat is an authentic record of my own work carried out over a period from August 2019 to May 2020 under the supervision of **Dr. Geetanjali** (Assistant Professor in the department of Computer Science & Engineering and Information Technology).

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

Anusheel Priyam (161301)

This is to certify that the above statementmade by the candidate is true to the best of my knowledge.

Dr. Geetanjali
Assistant Professor
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Dated:May 24th,2020.

# ACKNOWLEDGEMENT

I would like to thank everyone who had contributed to the successful completion of this project.Iwouldliketoexpressmygratitudetomyfinalyearprojectsupervisor,Dr.Geetanjali forherinvaluableadvice,guidanceandherenormouspatiencethroughoutthedevelopmentof theresearch.

In addition, I would also like to express my gratitude to my loving parents and friends who had helped and given me encouragement and support towards the final year project.

# ABSTRACT

RTG Carpooling Application is an application explicitly for white collar class individuals. It fillsinasastageforitsclientstoaskfororofferridestodifferentclients,inwantstoadvance the way of life of carpooling. So as to facilitate the procedure of carpooling, this application hasafewhighlightsincludingsendingmessages,recommendsteering,andascertainassessed voyagingcosts,whichwillassistclientswitharrangingtheirexcursionallthemoreeffectively.

Polls, meetings, and writing audit are actualized as a feature of blended system as the undertaking's examination strategy. Prototyping is executed as the product advancement approach.TheapplicationmustbeutilizedonAndroidgadgetswithInternetConnection.The front-finish of the application is created with Java and Android Studio. The back-end administrations of the application are created with PHP. The database used to store the application's information is MySQL. The server used to give the administrations is Apache web server. The task executes the product advancement life cycle, notwithstanding creating models during the improvement stage. Charts including use case graph, class outline, substance relationship graph, action chart, and succession chart are drawn before the improvement stage. Each time an element in the application is created, unit testing is done. After the application is finished, combination testing is done.

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## LIST OF SYMBOLS / ABBREVIATIONS

RTG        Ready To Go

GPS        Global Positioning System

OS         Operating System

ARC        Automatic Referencing Counting

HTML5      HyperText Markup Language 5

CSS3       Cascading Style Sheets 3

.ipa       File extension for iOS application

.apk       File extension for Android application

.xap       File extension for Windows application

SQL        Structured Query Language

IDE        Integrated Development Environment

SD         Secure Digital

API        Application Program Interface

SDK        Software Development Kit

HTML       HyperText Markup Language

CSS        Cascading Style Sheets

| | |
|---|---|
| XMT | Cross-Platform Mobile Development Tools |
| GCRMA | Genetic-based Carpool Route and Matching Algorithm |
| ICS | Intelligent Carpool Services |
| CSP | Carpool Service Problem |
| MC | Mobile Clients |
| CGCS | Cloud Global Carpool Services |
| EI | Evolution Initialization |
| GE | Genetic Evolution |
| DSDM | Dynamic Systems Development Method |
| XP | Extreme Programming |
| ASD | Adaptive Software Development |
| FDD | Feature-Driven Development |
| RAD | Rapid Application Development |
| LRT | Light Rail Transit |
| RAM | Random-Access Memory |
| UML | Unified Modelling Language |
| HTTP | Hypertext Transfer Protocol |
| GCM | Google Cloud Messaging |

## LIST OF APPENDICES

# CHAPTER 1

# INTRODUCTION

## 1.1    Background

Indians travel around by driving their very own vehicle, open vehicles, or strolling. Strolling is tiring and it requires some investment and vitality to walk further, and there is a limit about howfaranindividualcanwalk.Openvehiclesaremodest,yetawkwardasitnormallyoccupies  a  ton of time to hang tight for people in general transport. In addition, as indicated by The Economic Times, the general population transport probably won't go directly to the goal, so individualsarerequiredtotakemorethanonemethodofopenvehicletolandatthegoal(The Economic Times, 2018). In this manner, individuals like to drive as it is progressively advantageous andadaptable.

An optimistic and developing white collar class has prompted a huge expansion of autos to Indian streets from 6.3 million out of 2000 to 30.5 million of every 2016, as per information fromMinistryofRoadTransportandHighways.Consequently,trafficclogregularlyhappens, particularly during top hours, for example, the time individuals get down to business or finish work. In addition, it is elusive a spot to leave as the quantity of vehicle leaves areconstrained, it isn't sufficient to make up with the quantity of autos. Like each drop in the sea, eachvehicle outandabouttallies.Alongtheselines,TheIndianExpressexpressesthatafewpeoplewillin  general park  unlawfully,  for  example,  park  along  the  edge  of  the  street  which  is  one  of  the fundamental motivation behind why traffic blockage happens in the city (The Indian Express, 2019). Not just that, individuals will in general twofold park by leaving behind different vehicles, blocking them when they need to leave the vehicleleave.
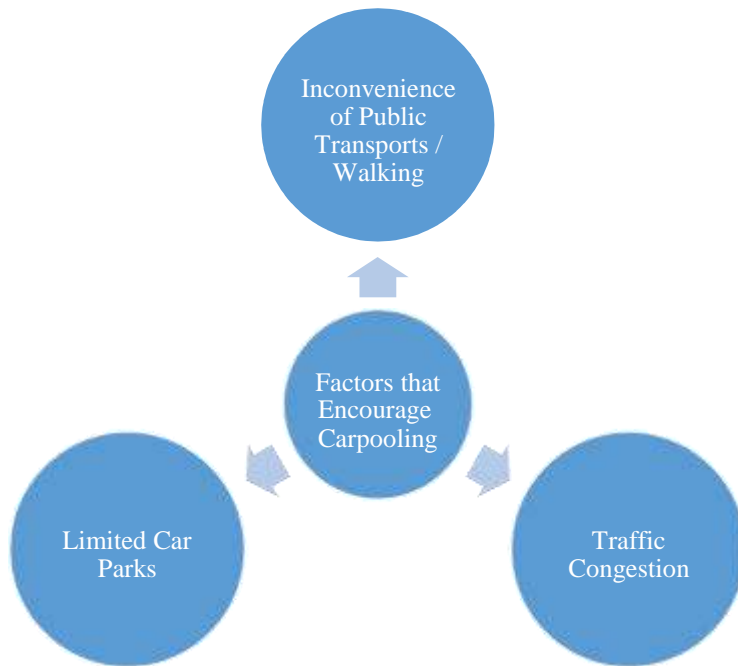
**Figure 1.1 Factors that Encourage Carpooling**

In this way, so as to limit the issue, individuals are urged to vehicle pool as appeared in the above figure. This is on the grounds that numerous autos going in the street are vacant and there are seats empty. In the event that every one of the autos are full, at that point the quantity of vehicles out and about will diminish thus will the clog as well.

Be that as it may, individuals are not willing to carpool because of a couple of components. In this manner, this venture, RTG carpooling application, will evacuate the greater part of the carpooling issues and urge individuals to take on a carpooling way of life.

**Current Workflow**

At present individuals are either taking taxi or driving their very own vehicle or they ask their companions or anybody they know whether they are eager to get them .

•Askanybodyonthebusstationortrainstationintheeventthattheyareeagertotake the taxi together and split theexpenses.

## 1.2    ProblemStatements

The challenges of carpooling are shown in Figure 1.2.
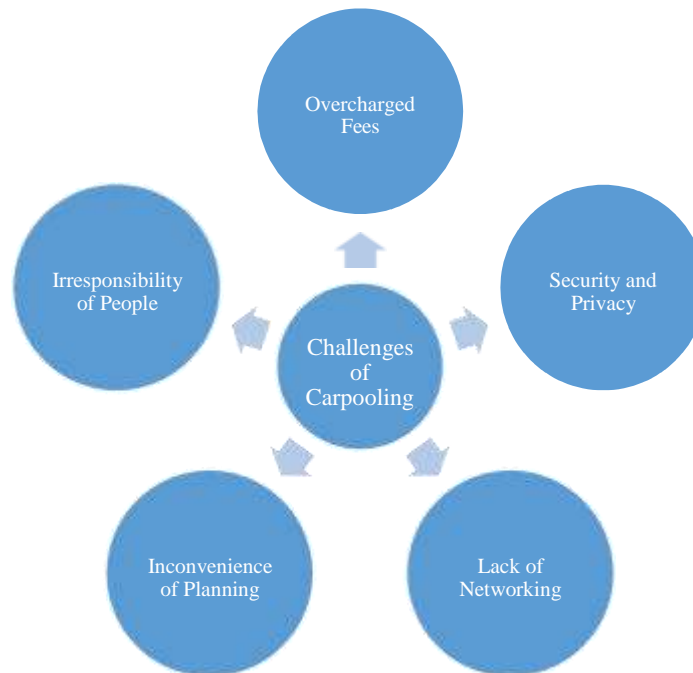


**Figure 1.2 Challenges of Carpooling**

**Overcharged Fees**

Driving is very costly and specially for the middle class as car owners have to payfor petrol,maintenancefees,roadtax,toll,andadditionalcharges.Somedriversthinkthat driving takes up a lot of their expenses, especially when travelling a lot or long distance. Thus, in order to reduce the cost, some drivers would fetch other people togethertothedestinationtheywanttogoandchargethepassengerswhichisthesame concept of carpooling.

However, some drivers tend to see this as an advantage to earn money and they cheat passengers by overcharging them. Passengers who are not aware of how much it'll actually cost to travel to the destination will blindly pay the drivers and enjoy theride because it is much convenient than publictransport.

Thus, some people are unwilling to carpool as they think that they are being cheated, because there is no proper way of charging people. So, the driver can charge any random amount of money to charge.

**Security and Privacy**

Whenanyonebuysanything,theylookatthesecurityandprivacyaspectofthethings they get involved in. It is difficult to encourage the public to carpool due to the safety concern and loss of privacy. Carpooling involves information about the driver aswell asthepassengers.Itincludescarplatenumber,addressorlocationofeachperson,and contactnumber.Whenpersonalinformationisinvolved,thereisalwaysethicalissues such as security andprivacy.

People may carpool with strangers, sometimes the driver is someone you never met before. It can be dangerous, especially for the female passengers as well as thedriver. The driver may impersonate as anyone but is actually a human trafficker, a robber, or a rapist. If a passenger goes missing, it is very hard to find the passenger, especially when there are no clues as to what car the passenger rode or who picked up the passenger.
Thus, the lack of information available is a security issue.

Moreover, the driver will know the house address of the passengers he or she has to fetch. Everyone carpooling will have the contact number of the driver and vice versa. Itmightnotbeappropriateasthisinformationshouldnotbegivenupsoeasilytoother people. People tend to misuse this information such as stalking, burglary, and spams. Thus, some personal information should not be revealed as it might cause privacy issues.

Thus, carpool causes discomfort for some people as they feel unsafe, or they are unwilling to expose too much about themselves to other people.
**Lack of Networking**

Sometimes people stay in an area without knowing any friends staying nearby them. For example, there might be 10 people staying at certain place, but all of them travel

tothesameplaceeverydaybydrivingtheirowncar.Theydonotcarpoolbecausethey do not know eachother.

## Inconvenience of Planning

Before carpooling, people have to plan their trip. There are many factors involved in carpool, which are the people involved, who to pick up first, time to meet up, and venue to meet up at. The process may take a long time and it can be very tedious.

Sometimes problems occur during planning. Some people might agree to the timing but not everyone might agree. It is very hard to find a time where everyone is able to make it so that the driver can pick up all of them. Thus, a lot of time is spent while trying to negotiate with everyone.

Duetothelongprocessofplanningandmiscommunicationduringtheplanning,some people prefer not tocarpool.

## Irresponsibility of People

After agreeing to carpool, the driver will fetch the passenger to the destination. However, sometimes this might not go as plan. People might show up late, or might not show up at all, which leaves people frustrated.

Forexample,studentAmightwanttofetch4otherstudents.HetellsstudentBthathe will pick him up at 4PM. However, after that student A changed his plan and he will bepickinghimupat5PMinstead.Despitethat,studentAdidn'tinformstudentBand hewaitedatthevenueat4PM.Afteronehour,studentAarrives.Itisactuallyawaste of time for student B while standing therewaiting.

Another scenario is a driver might agree to fetch his friend. He tells him that he will pick him up from his house at 3PM. Then the driver drives to his house and calledhis friend. Instead, he told him that he doesn't want to go to class anymore. It is a waste of time and petrol for the driver because he could've gone straight todestination.

Thus, to avoid these kind of troublesome people, some people just do not want to get involved in carpool.

## 1.3      ProposedSolution

In order to solve the problems currently faced by people when carpooling, a mobile application based RTG carpooling application is proposed. This application can be used by anyone. Almost every person is a target user. The user will install this application into their respective phones.

There are two types of users, driver and the passenger. Drivers can offer rides, and passengers can request rides. These can be done by filling up the request or offer ride form which will then store the information on the database.

Both driver and passengers will fill up the form by providing departure address, destination, date or day, time. Driver provide information regarding the number of seats available.

Userswillbeabletoseepostsofrequestandofferridesbyotherusers.Afterbrowsing through the posts, if a user found a ride that he or she wants, he or she can request to join the ride. For drivers, they can accept multiple passengers depending on the number of seats of his or her car. For passengers, he or she can accept rides from drivers.

After accepting rides, both drivers and passengers may contact each other by using this application. They can send messages to each other.

Before picking up the passengers, the application will calculate the shortest route to pickupthepassengers.Thismeansthatthesequenceofpickingupthepassengerswill      be calculated. After that, the driver will fetch the passengers to thedestination.
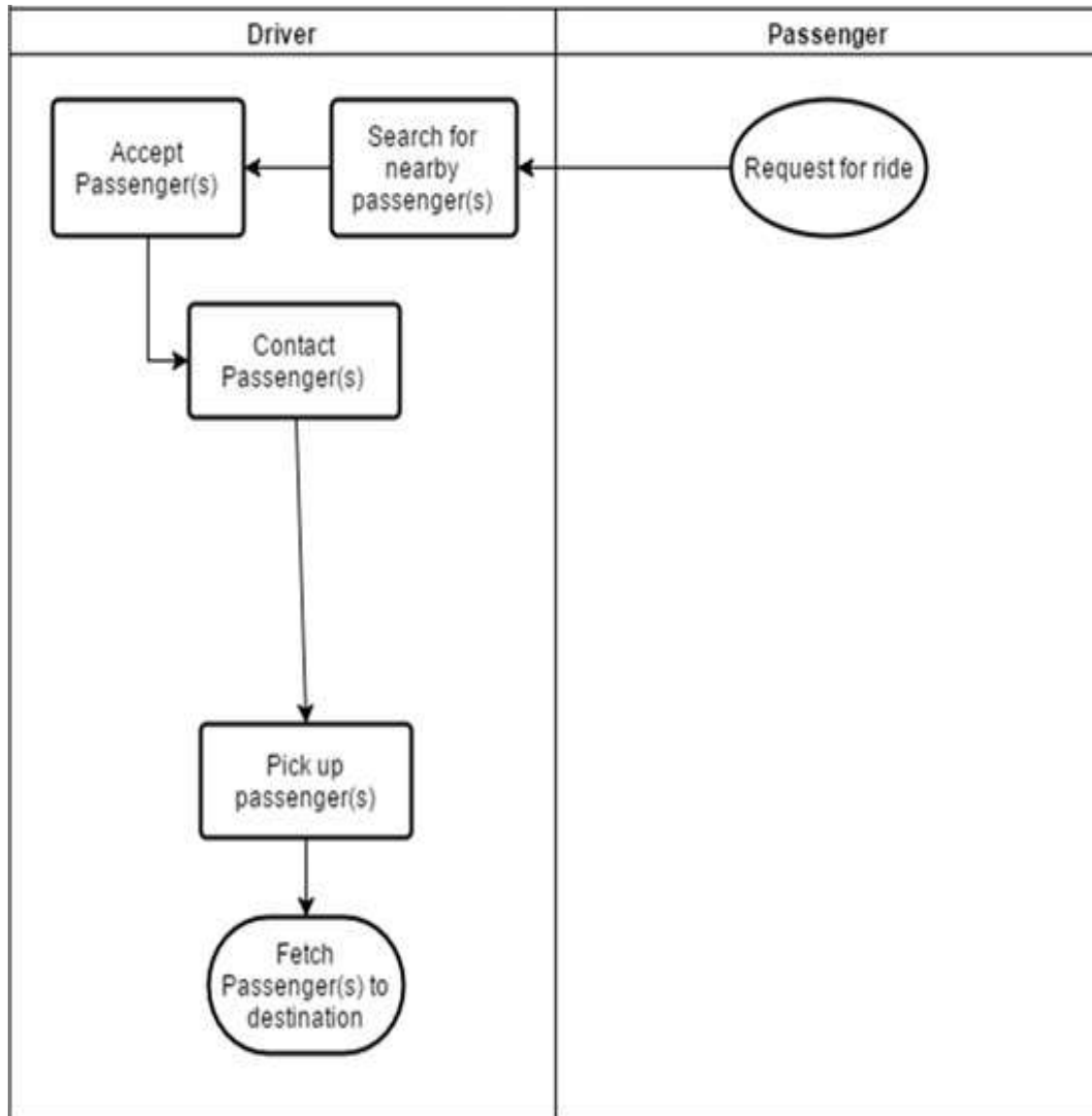
**Figure 1.3 Proposed Solution Workflow for Driver**
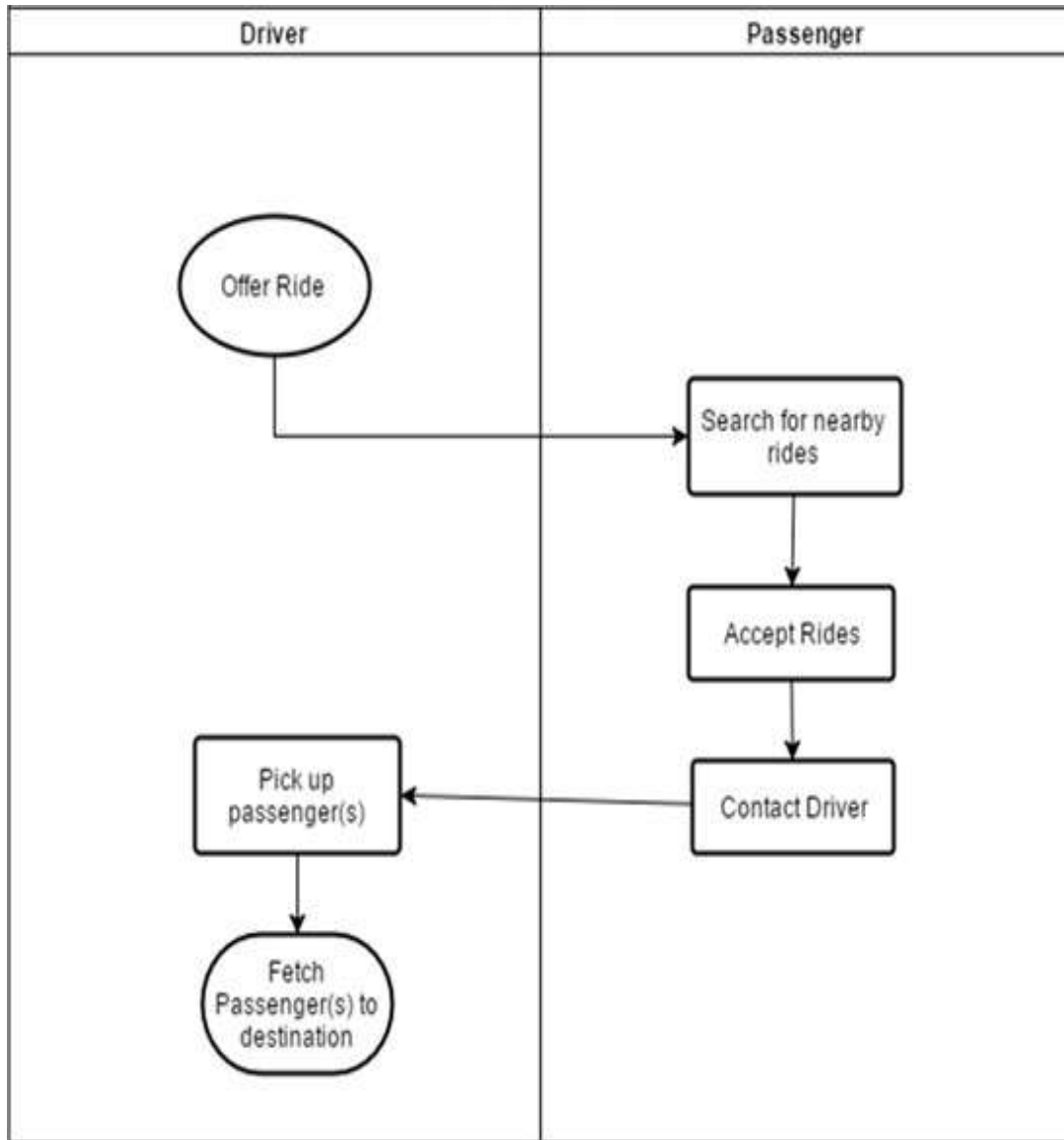
**Figure1.4    Proposed Solution Workflow forPassenger**

**1.4     Goals andObjectives**

 This project, RTG Carpooling Application, has the following objectives:

•To propose and develop a platform specifically for people to request or offer rides tothose from the same livingarea.

•To critically access and implement an algorithm that helps calculate estimatedtravelling fees.

•To propose and develop a basic communication means foreveryone.

•To critically access and implement an algorithm that helps calculate passengerpick-up sequence.

**1.5    ProjectScope**

**1.5.1    Project Scope Covered**

**TargetUsers**

This application is used by everyone and anyone travelling alone can use it either as a driver or a passenger.

**Platforms**

This application is an Android application which can be installed on Android devices with Android version 4.1 and above.

**Location**

The pick-up point and destination for ride is only applicable for all locations in India.

**Create New Ride (Driver)**

Only users with vehicles are allowed to be drivers. The vehicle registration number should be verified by RTG before it can be added into the profile of the user. The information below must be provided by the driver:

a.    Startingpoint

b.    Destination

c.    Type of Ride (Weekly / CustomDate)

d.    Day /Date

e.    Time ofArrival

f.    Role in Ride Group (Passenger /Driver)

g.    Number of SeatsAvailable.

**Create New Ride (Passenger)**

The information below must be provided by the passenger: Starting point

Type of Ride (Weekly / Custom Date)

a. Day /Date

b. Time ofArrival

c. Role in Ride Group (Passenger /Driver)

**Join Ride (Passenger)**

There must be at least one car seat available in the driver's vehicle in order for the passenger to join the existing carpool group.

**Join Ride (Driver)**

Thecarpoolgroupmusthaveavacantdriverpositioninorderforthedrivertojointhe existing carpoolgroup.

**Send Message**

After users are added into a carpool group, the users may use this application to send message to any other users in the carpool group. Although one of the user may leave the carpool group, but if other users have previously sent messages the user who has left the carpool group, they may continue send messages to the user.

**Calculate pick-up route**

Inthecarpoolgroup,theremustbeaminimumoftwopassengers.Theapplicationwill calculatewhichrouteisthebestroutethatshouldbetakenbythedriverwhenpicking up eachpassenger.

**Calculate Estimated Travelling Fees**

The evaluated voyaging expenses will be determined dependent on the equation:

Complete Traveling Fees = Distance * RM 2.15

The separation will be the good ways from the driver's beginning stage to the goal.

RM2.15 depends on the vehicle repayment rate 2016 - 2017 of rotary.org. Since RM2.16 depends on the rate in 2016 – 2017, the application's rate might be changed by the developer in a later time.

**Provide Rating**

Client more likely than not joined a carpool gathering.

Clients may give rating to every individual client in the carpool gathering.

**1.5.2    Project Scope Not Covered**

**TargetUsers**

Everybody is an objective client who is venturing out alone and needs to drive all the more conviniently.

**Platforms**

This application cannot be installed on Android devices below Android version 4.1.
This application cannot be installed on iOS and Windows device.

**Location**

The territory of inclusion for this application isn't pertinent for different nations with the exception of India.

The application enables clients to carpool to and fro any spots with no special case. For instance, a couple of clients from Delhi might want to carpool to Gurgaon, this application permits it.

**Create New Ride (Driver)**

Clientswithoutvehiclesarenotpermittedtobedrivers.         Inthe         eventthatRTGdoesn'tconfirm thevehicleenrollmentnumber,thedrivercan'tmakenewrides.Cruisersarenotacknowledged  to  be included as vehicles in this application as it is perilous to ride a bike. The quantity of seats accessible can't be multiple seats, in light of a standard vehicle's number of seats, as this application doesn't have the usefulness to distinguish the quantity of seats dependent on the model of thevehicle.

**Join Ride (Passenger)**

Ontheoffchancethatthequantityoftravelersinthecurrentcarpoolbunchisequivalenttothe quantity of seats accessible in the driver's vehicle, the traveler can't join the carpoolgathering. On the off chance that there is no driver in the carpool gathering, however the quantity of travelers in the carpool bunch is equivalent to 4, the traveler can't join the carpoolgathering.

**Join Ride (Driver)**

If the existing carpool group has a driver, the drivers cannot join the carpool group.

**Send Message**

Usersarenotallowedtousethisapplicationtosendmessagetoanyotherusersunless they are in the same carpoolgroups.

**Calculate pick-up route**

This component isn't pertinent when there is just a single traveler in the carpool gathering. The get course just shows the game plan of which traveler to get first, and nothowtogotothepassenger(s)getpoint.TheapplicationwoexcludeaGPSinclude.

**Calculate Estimated Travelling Fees**

The application doesn't compute the absolute separation went by the driver. It just figures the goodwaysfromthebeginningstageofthedrivertothegoallegitimatelywithoutincludingthe separation went to get thetravelers.

The application just ascertains the voyaging expenses that every traveler should pay to the driver. It doesn't deal with the exchange of the expenses from the traveler to the driver. The traveler should utilize different intends to pay the driver.

# CHAPTER 2

# LITERATURE SURVEY

## 2.1    Technology

### 2.1.1    Popularity ofSmartphones

InviewofFigure2.1,theoffersofAndroidhaveaconsistentincrementallthrough2018,with an exponential jump in beginning from 2019. Despite the fact that Android had a moderate beginning toward the start of 2019 when contrasted with BlackBerry and Apple iOS,however toward the finish of 2019, Android figures out how to stand apart among every one of them. Android drives the market andowes

39% of the piece of the pie on the third quarter of 2010 as appeared in Figure 2.2.
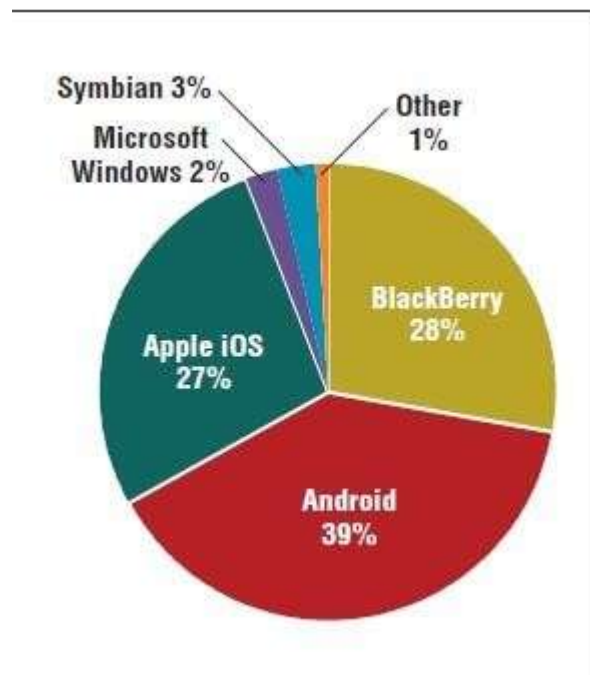


**Figure 2.1 Market share of smartphones in 2019**

As indicated by Figure 2.2, the greater part of complete cell phones made and disseminated to the world are Android telephones, while iOS telephones are just not exactly a fourth of the all out cell phones. As per Google (2019), there are more than 800, 000 outsider applications in both Android and iOS's application store on May 2019. In the start of 2019, the greater part of the complete portable applications downloaded are Android based, though in excess of a quarter are iOS applications as appeared in Figure 2.3
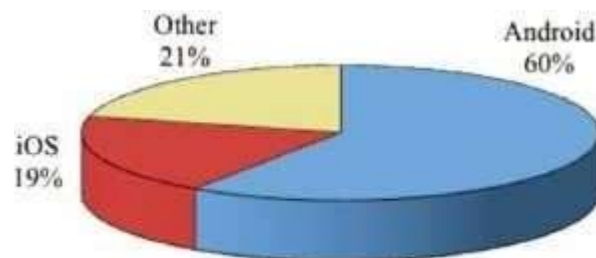


**Figure 2.2 Smartphones shipped in 2019**
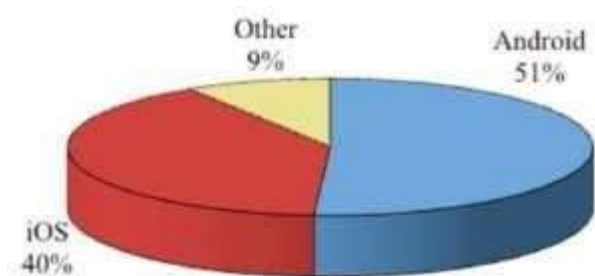


**Figure 2.3 Apps downloaded in Q1 2019**

This shows that among all of the smartphone operating system, Android is the most popular among user and is widely used among users.

## 2.1.2 Aspects of Mobile Applications toConsider

This section describes the factors of mobile application, as shown in Figure 2.4.

Factors of Mobile Applications

Requirements Energy Security Development Testing Maintenance Devices & Platforms Information Presentation
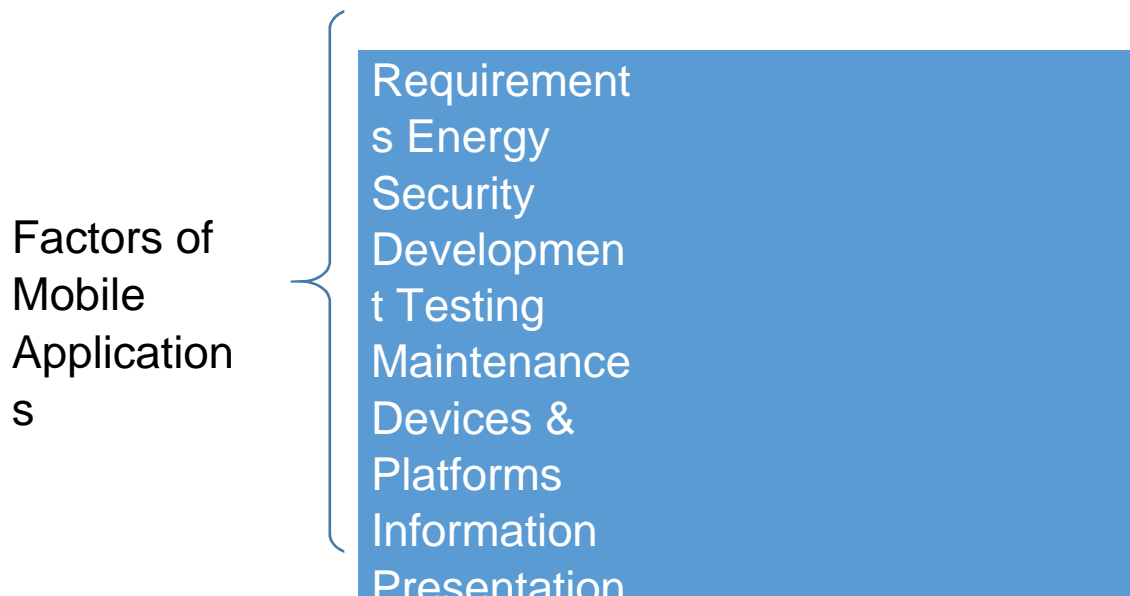
**Figure 2.4 Factors of Mobile Applications to Consider**

When intending to build up a versatile application, we should take into
thought of prerequisites, vitality, security, improvement, testing, support, gadgets and stages, data, and introduction.

**Requirements**

Necessities gathering is imperative to decide the usefulness, assignments, work process, and how the end-clients need the framework to be, notwithstanding whether the framework is a site, work area application or versatile application.A inquire about by The Economic Times expressesthatinportableapplication,prerequisitesareaccumulatedbyexaminingclientaudits of existing applications and perusing discharge notes of an application. Be that as it may, the issue is the quality and amount of client audits of an application, as client survey probably won'tgivevaluabledata,oranapplication'sclientauditislimitedtobeseen,forexample,

Android's Google Play just enables general society to see a limit of 500 client audits of an application.

**Energy**

Like each other apparatus, cell phones require vitality for it to work, for this situation, battery. The issue is the means by which to limit vitality utilization and spare battery by improving vitality use by applications. The Economic Times (2019) proposes two arrangements that will helpcellphones'vitality,whichareestimatingbatteryutilizationandinvestigatingvitalitybugs (TheEconomicTimes,2019). Itishardtoexpandthelifeofthegadgetwithamodestquantity of vitality.

**Security**

AsperTheEconomicTimes,securityisasignificantviewpointinportableapplicationasthere is a sure degree of trust that the clients put on the application, touchy data included, and these applications are gotten to effectively and constantly (Unhelkar and Murugesan, 2019). Contrasted with different gadgets, for example, PC, cell phones need protection because of their inclination as a remote correspondence medium. A couple of measures taken to expand security is secret phrase insurance, validation, cryptography, secure interchanges andversatile installment techniques (Unhelkar and Murugesan, 2019). So as to build security, ID of utilization vulnerabilities and scanning for noxious applications are being completed every nowandagain(NagappanandShihab,2019).Oneoftheissuesconfrontedisthatthemalignant applications are continually changing and adjusting to abstain from getting captured by security at an extremely quick pace, so it is hard for security examiners to recognizethem.

**Development**

There are numerous portable stages, the most famous ones are Android and iOS. In this way, designers who need to convey their applications to different stages will in general create in cross-stage. Be that as it may, in spite of the fact that there are structures for cross-stage advancement,thenatureofthepresentationandUIareinfluenced.Inaddition,sincethestages are continually updating, it is difficult to create with cross-stage as it is difficult to keep up (The Economic Times,2019).

**Testing**

Testing is constantly completed before sending the application to the end-clients so as to discover however many bugs as could be allowed so as to fix them. In any case, it is hard to test a portable application because of a couple of reasons. Right off the bat, a significant level ofcodeinclusionisextremelydifficulttoaccomplishastherearenumerouspotentialoutcomes of client input, particularly complex applications which requires heaps of client inputs. Additionally, if the application is based on cross-stage, it may take a shot at this gadget however not another, along these lines the testing procedure turns out to be progressively dreary (The Economic Times,2016).

**Maintenance**

Aftertheapplicationisbeingsent,itiscriticaltokeepuptheapplicationbyfixingbugsfound by clients and overhauling application to make it increasingly powerful. In any case, issue emerge when the application absence of documentation, particularly when the application is passed to someone else to deal with (The Economic Times, 2019). Along these lines, documentation issignificant.

**Devices & Platforms**

The distinction between cell phones and work area is the size. In this manner, the UI is significant. It must be made to suit the gadget and enable the client to utilize it effectively, particularly with the different sizes of screen (Unhelkar and Murugesan, 2019). Besides, not exclusively are there numerous cell phones, there are likewise a wide range of stages. Every portable stage has its own style of UI, so we need to think about how we plan the application to suit every stage (Unhelkar and Murugesan, 2019).

**Information**

Data and information is the thing that an application predominantly comprises of. A few applications, for example, a following application ought to give data continuously, the data should be refreshed extremely quick. Also, the data ought to be solid and accessible to get to more often than not. The technique for putting away information and recovering information oughttobethoughtabout,particularlywhilerecoveringinformationtakesagreatdealoftime,     for example, on account of mixed media substance (Unhelkar and Murugesan,2019).

**Presentation**

The way the layout is presented to the user is important. This was mentioned previously when discussing about device and platforms.

### 2.1.3    Comparison of Android and iOS in terms ofSecurity

Security is a significant perspective in versatile applications, yet for all items and administrations. Table 2.2 looks at the security of Android and iOS as far as application sandboxing, memory randomization, encryption, information stockpiling design, antivirus, application provenance, application authorizations, and vulnerabilities and malware.

**Table 2.2 Comparison of Security Aspects ( Harish & et. al.., 2018) (Google, 2015)**

| Security Aspects / Mobile Platform | Android | iOS |
|---|---|---|
| **Application Sandboxing** | 1 App implements unique Sanbox ( Harish & et. al.., 2018) (Google, 2019) (Butler, 2016) | All Apps implements sameSandbox (Harish & et. al.., 2018) (Google, 2015) (Butler, 2016) |
| **Memory Randomization** | Since Jelly Bean (Harish & et. al.., 2018) | Since 4.3 with code signingtechnology ( Harish & et. al.., 2018) |

| Encryption | Disk Encryption (Harish & et. al.., 2018) (Google, 2015) | Hardware Encryption ( Harish & et. al.., 2018) (Google, 2015) |
|---|---|---|
| Data Storage Format | External and Internal ( Harish & et. al.., 2018) | Internal ( Harish & et. al..,2018) |
| Antivirus | Available in Google Play ( Harish & et. al.., 2018) | Not available as it is unecessary ( Harish & et. al., 2018) |
| Application Provenance | In Google Play, but not other places (Google, 2015) | In App Store (Google, 2019) |
| Application Permissions | Limited (Google,2019) (Butler,2016) | Full access (Google,2019) (Butler, 2016) |
| Vulnerabilities & Malware | 79% (Google,2015) | 0.7%(Google,2015) |

As indicated by Google (2015), application sandboxing is the procedure whereby an application is encased in its very own reality, condition, or compartment. By sandboxinganapplication,theapplicationisseparatedfromeverythingelse,including different applications and the working framework, which avoids alteration, for example, putting a rootkit on the working framework (Google, 2015). Harish and et. al..(2018)statesthatinAndroid,everyapplicationrunsinitsownsandboxwhichhas authorizations set by the engineers, though iOS applications all sudden spike in demand for a similar sandbox characterized by Apple ( Harish and et. al.., 2018). ClientscancontrolwhetherAndroidapplicationscangettoinformationfromdifferent applications, increasing greater security and protection. In any case, iOS' consentsare set to default, subsequently client has no influence over it (Butler, 2016). Therefore, iOS applications have less opportunity when contrasted with Android applications as Android applications can get to more assets contrasted with iOS. The disadvantage is that programmers can utilize this to invade the gadget by simply setting the authorizations of the sandbox (Google, 2015). Clients will succumb to this on the off chance that they permit these authorizations by downloading the applications without recognizing what they aredoing.

Harish and et. al.. (2018) states that memory randomization whereby the area of memory wherein the application runs in, shared library and different segments of a cell phone are set haphazardly ( Harish and et. al.., 2018). Because of the way that programmers will in general target gadgets as they have information with respect to the area of the focused on application, this security viewpoint functions admirably to guard against them. Both Android and iOS executed memory randomization in their working framework in Jelly Bean and 4.3 individually, yet iOS is in front of Android in the usage. Besides, notwithstanding the update of 4.3, iOS included code marking innovation, which demonstrates that all applications must be approved and affirmed by Apple with the end goal for it to run on iOS.

Harish and et. al.. (2018) states that encryption is the way toward changing a plain book information into a figure content which can't be perused except if decoded by utilizing a key ( Harish and et. al.., 2018). Encryption is utilized to secure touchydata that is in the cell phone. In iOS, information in the gadget's blaze memory are being encoded by utilizing equipment Advanced Encryption Standard (AES) cryptographic quickening agent (Google, 2015). iOS additionally actualizes information security innovation and remote cleaning. Information security innovation keeps the cellphone from unscrambling information while the telephone is caught up with getting transmission. Remote cleaning is the way toward rendering the entire gadget's information to get indiscernible with only one direction. Regardless of that, iOSfaces a few burdens as the working framework has a copy decoding key that can beutilized to unscramble foundation applications. iOS likewise face the issue of jailbreaking, which opens limitations of the working framework. In Android, information is scrambled in the working framework or the piece with the utilization of secret key. This procedure is called record framework based encryption. In addition, Android KeyChainencodesqualifications,forexample,Wi-Fipasswordsthatarebeingutilized byanapplication.Inanycase,Android'ssecurityismoreclientsituated,givingclients    the decisions of what limitations ought to be executed, so if clients don't know about these, it may make issues (Google, 2015).

There are two kinds of arrangements for information stockpiling, which is inside in the working framework, or remotely in the SD card. The two kinds are relevant to

Android, yet iOS just stores information inside ( Harish and et. al.., 2018). The issue with SD card is that there are no consents expected to get to the information. Android attempts to take care of this issue by utilizing standard crypto libraries with secret phrase. Notwithstanding, the encryption keys can be found by means of root get to,in this manner the information stockpiling can at present be penetrated. The favorable position iOS has is that consents are required so as to access the information as it is putawayinside.InAddition,iOShasDataProtectionAPIsandacomplexpassphrase for extra insurance for the informationstockpiling.

Antivirusprogrammingfillsinasasafeguardagainstmalware,forexample,infection, spyware and Trojan as these malwares can do a ton of harm to the working arrangement of the cell phone. Antivirus programming are found in Google Play accessible for download. It is significant for Android clients to introduce antivirus programmingintotheircellphonesinlightofthefactthatdespitethefactthatGoogle Play checks and confirms that the applications are reasonable to be utilized, however clients can download applications from different places, for example, site with no confirmation of wellbeing ( Harish and et. al.., 2018). On account of iOS, the main spot applications can be downloaded is in the App Store which is checked by Apple, along these lines there is no requirement for an antivirusprogramming.

Application provenance is the procedure wherein the versatile working framework suppliers approve the portable applications as far as usefulness and security first previously permitting the designers of the portable applications to present the applications on the working framework's separate application stores (Google, 2015). Both Google Play and App Store, the commercial center for portable applications for Android and iOS separately, will perform application provenance and it is a vital procedure for all applications that any designers need to post in these stores. In any case, the gigantic distinction among Android and iOS is that Android applicationsare notreallypresentedonGooglePlaytobedisseminated,asengineerscanlikewisepost them in different places, for example, sites, while applications for iOS must be downloaded at App Store. This is on the grounds that Android's store is open, when contrasted with the gated App Store of Apple (Butler, 2016). The bit of leeway isthat the production procedure of uses in Android is simpler, however the nature of utilizations in Android arebad.

Assetsneedauthorizationstogetopen.iOShasasetnumberofauthorizationsthatare given to designers to use in its versatile application. Besides, it doesn't give the client a chance to deal with the decisions of permitting these consents as client probably won't comprehend what they are allowing the to application do. Be that as it may, a few consents expect clients to permit them, for example, getting to area (Google, 2015). This isn't the situation for Android as the consents are in the hands of the endusers, and Android approaches a greater number of authorizations thaniOS.

Vulnerabilities and malware exists in all product, including cell phones and its applications. As per Google (2015), from 2010 to 2019 there are around 408 vulnerabilities found in a few adaptations of iOS working framework, yet the greater part of the vulnerabilities are at a low basic level. While in Android, from 2019 to 2018 there are 30 vulnerabilities found in a few adaptations of Android working framework, however the basic level extents from low to high. With respect to the malware, in 2018, iOS has just 0.7% of all the malware assaults focusing on it, when contrasted with 79% which is Android's (Google, 2015).

In this manner, iOS has more security highlights than Android. Be that as it may, Android is progressively adaptable and gives more opportunity when contrasted with iOS. The exchange off of opportunity is security. Thus, there ought to be a harmony between these two.

### 2.1.4    Comparison of Type of MobileApplications

Portable applications can be separated into two kinds, which are incorporated applicationsandnon-coordinatedapplications.Thiscanbeadditionallyseparatedinto local applications, web applications, and cross breed applications. Incorporated applications are SDK subordinate, yet not non-coordinated applications. Nonintegrated applications don't should be introduced on the cell phone, dissimilarto coordinated applications. Thus, since the coordinated applications are introduced into the cell phone, it will show up on the rundown of uses introduced. In addition, incorporated applications can get to framework functionalities, for example, GPS, Bluetooth,camera,andsoon.,thoughnon-coordinatedapplicationscan't.Thesortsof

incorporated applications are local applications and half and half applications,though web applications have a place with non-coordinated applications classification (Ohrt and Turau,2019)
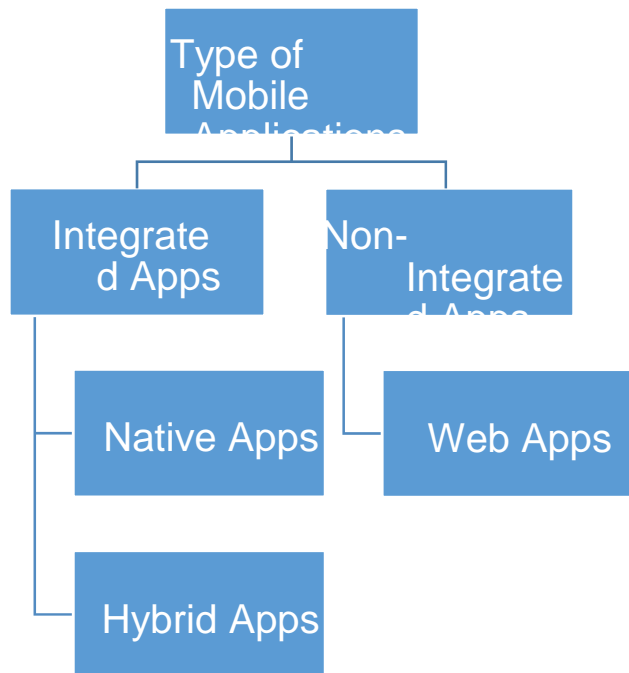


**Figure 2.5 Types of Mobile Applications**

### 2.1.5    Cross-Platform Mobile ApplicationDevelopment

So as to make a versatile application that can completely utilize a stage's usefulness, for example,havingtheoptiontoutilizetheGPS,yetworkwellonanotherstage,engineersdecide        to create half breed applications, or cross-stage applications, as it just requires the designer to code an application once and have the option to run it on different stages (Lin and Lee,2015). The motivation behind creating half breed applications is to focus whatever number stages as could be expected under the circumstances with least exertion (Ohrt and Turau,2019).

Therearemanycross-stageversatileimprovementinstruments(XMT)accessiblefordesigners tocreatecrossoverapplications.Notwithstanding,extraordinaryXMTbolstervariouskindsof versatile applications. Simply local shows incorporated applications while Partly deciphered demonstrates non-coordinated applications. The kind of portable applications upheld by each XMT is appeared in Table 2.4 (Ohrt and Turau,2019).

**Table 2.2 XMT application structure and GUI elements (Ohrt & Turau, 2019)**

| Table 1. XMT application structure and GUI elements. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Application structure | | | | GUI elements | | |
| | | Purely native | | (Partly) interpreted | | | | |
| XMT | Version | (1) | (2) | (3) | (4) | Native | Web-based | Custom |
| Flash Builder | 4.5 | | | ✓ | ✓ | | | ✓ |
| Illumination Software Creator | 4.0 | ✓ | | | | ✓ | | |
| LiveCode | 4.6.4 | | | ✓ | | | | ✓ |
| Marmalade | 5.1.5 | | | ✓ | | | | ✓ |
| MoSync | 2.6 | | ✓ | ✓ | | ✓ | | ✓ |
| OpenPlug Studio | 3.0.9 | | | ✓ | | ✓ | | ✓ |
| PhoneGap | 1.1.1 | | | | ✓ | | ✓ | |
| RhoStudio | 3.0.2 | | | ✓ | ✓ | ✓ | ✓ | |
| Titanium | 1.7.1 | | | ✓ | | ✓ | | |

XMT's principle reason for existing is to create half and half applications which spread however many stages as could reasonably be expected. Table 2.5 shows the versatile working frameworks or stages upheld by each XMT. (1) speaks to applications that can get to the framework's API straightforwardly, (2) speaks to applications that entrance the framework throughalibrarywhichgivesadeliberationlevel,(3)speakstoapplicationswhichincorporates

virtual machines, (4) speaks to applications which requires a virtual machine to be introduced in the gadget independently. Tragically, there is no single XMT which underpins all versatile working frameworks, accordingly engineers ought to decide to which working frameworks to concentrate on (Ohrt and Turau,2019).

**Table 2.3 XMT support of various mobile operating systems (Ohrt & Turau, 2019)**

| Table 2. XMT support of various mobile operating systems. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mobile operating system | | | | | | | | |
| XMT | Android | bada | BlackBerry | iOS | MeeGo | Symbian | webOS | WP7 | WinMob |
| Flash Builder | ✓ | | | ✓ | | ✓ | | ✓ | ✓ |
| Illumination Software Creator | ✓ | | | ✓ | | | | | |
| LiveCode | ✓ | | | ✓ | | | | | |
| Marmalade | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | |
| MoSync | ✓ | | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| OpenPlug Studio | ✓ | | ✓ | ✓ | | ✓ | | | ✓ |
| PhoneGap | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| RhoStudio | ✓ | | ✓ | ✓ | | ✓ | | ✓ | ✓ |
| Titanium | ✓ | | | ✓ | | | | | ✓ |

Distinctive XMT have various highlights and functionalities as appeared in Table 2.6. Each XMT have distinctive programming dialects that the designer can create applications with. SomeXMTenablesengineerstogatherapplicationswithoutSDK,sodesignersnocompelling reason to download, introduce and register for different SDK so as to create applications for numerous stages. Like a great deal of Integrated Development Environment (IDE), a large portion of the XMT offers code culmination, in which when the engineer types some portion of the watchword, the word will consequently be finished without the need of composing the entire word. Another element which a run of the mill IDE may have is GUI architect which assists speed with increasing the way toward making a graphical UI by executing draganddrop, however a large portion of the XMT don't have GUI originator. Debugger is an instrument in IDE which encourages designers to discover bugs and test the applications, howeveraportionoftheXMTdon'thaveadebugger.TheentiretyoftheXMThaveemulator includedsoengineersdon'tneedtopurchasethegenuinetelephonetotesttheapplicationwith.    The entirety of the XMT with the exception of LiveCode can broaden local code. A large portion of the XMT don't bolster Bluetooth (Ohrt and Turau, 2019). In this way, designers oughttopicktheXMTdependentontheprogramminglanguagethattheyknowaboutandthe instruments accessible in the XMT to assist speed with increasing the advancementprocedure forapplications.

**Table 2.4 XMT features and functionalities (Ohrt & Turau, 2019)**

| Table 3. XMT features and functionalities. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| XMT | Version | Programming language | Compile without SDK | Code completion | GUI designer | Debugger | Emulator | Extensible with native code | Bluetooth support |
| Flash Builder | 4.5 | ActionScript and MXML | ✓ | ✓ | ✓ | ✓ | Own | ✓ | ✕ |
| Illumination Software Creator | 4.0 | None (drag-and-drop) | ✕ | ✕ | ✓ | SDK | SDK | ✓ | ✕ |
| LiveCode | 4.6.4 | LiveCode | ✕ | ✕ | ✓ | ✓ | Own | ✕, except iOS | ✕ |
| Marmalade | 5.1.5 | C++ | ✓ | ✓ | ✕ | ✓ | Own | ✓ | ✕, except iOS |
| MoSync | 2.6 | C++ | ✓, except iOS | ✓ | ✕ | ✓ | Own | ✓ | ✓, except WP7 |
| OpenPlug Studio | 3.0.9 | ActionScript and MXML | ✓ | ✕ | ✕ | ✕ | Own | ✓ | ✕ |
| PhoneGap | 1.1.1 | HTML and JavaScript | ✕ | ✓ | ✕ | ✕ | SDK | ✓ | ✕ |
| RhoStudio | 3.0.2 | Ruby | ✕ | ✓ | ✕ | ✓ | Own | ✓ | ✓, except WP7 and Symbian |
| Titanium | 1.7.1 | JavaScript | ✕ | ✓ | ✕ | ✓ | SDK | ✓ | ✕ |

Figure 2.5 shows the presentation of each XMT. The exhibition test is done by building up a straightforward application on all XMT. The application is assembled and run on both the genuine gadget and an emulator. The XMT are looked at as far as the application bundle size after it is being incorporated and assembled, how much memory or RAM is required by the application,andthemeasureoftimeexpectedtodispatchtheapplicationinthegenuinegadget     and furthermore in the emulator. Distinctive XMT influences the exhibition of the application it is based on (Ohrt and Turau,2019).
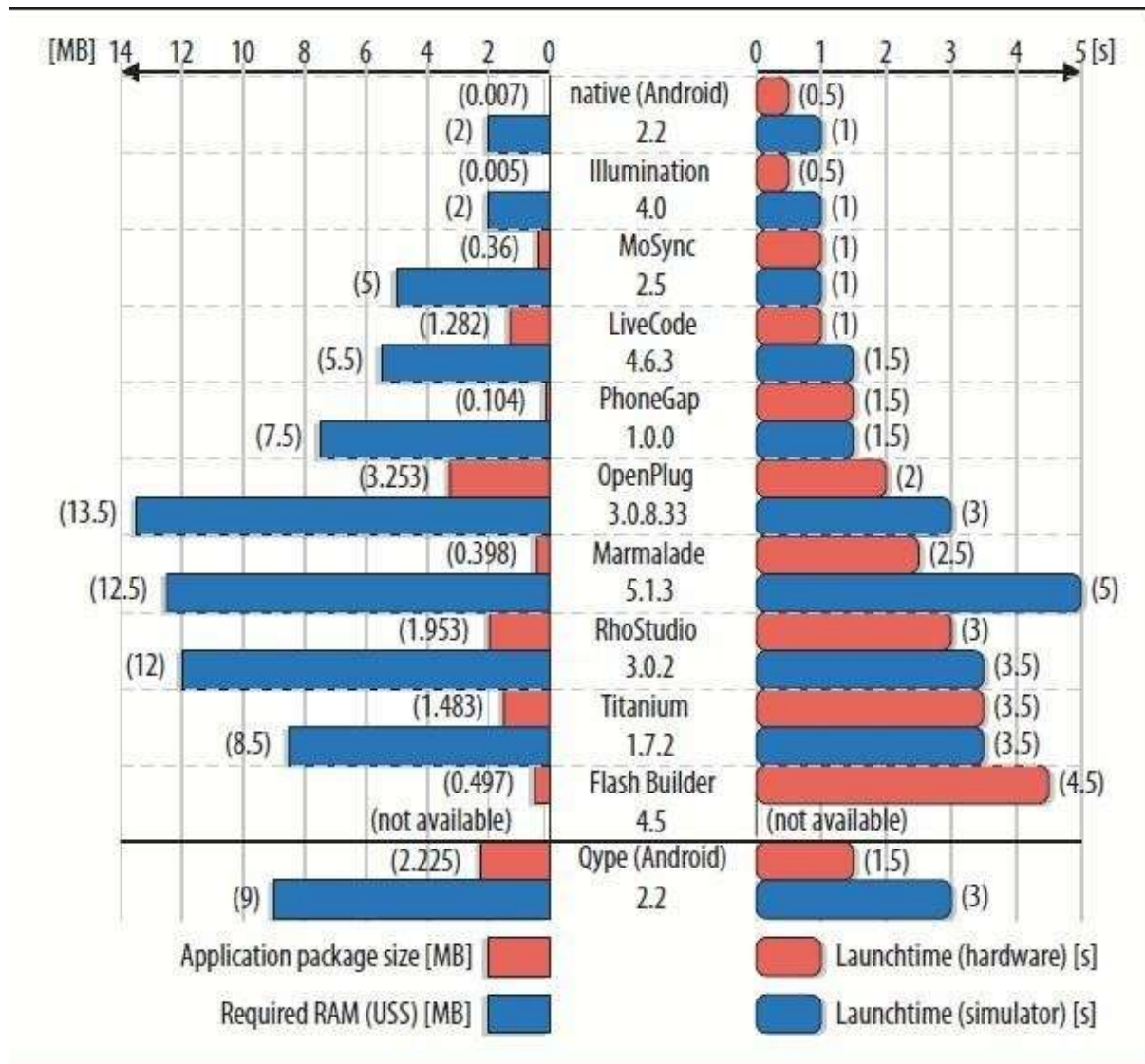
**Figure 2.6 Performance of XMT**

LinandLee(2015)statesthattheyutilizedPhoneGaptobuildupahalfbreedapplication(Lin and Lee, 2015). Web applications are mapped to local applications with the utilization of PhoneGap, and the size of the bundling turns littler in the wake of mapping. In addition, JavaScript API interfaces are accessible at PhoneGap, so the usefulness of thecell phones, for example, camera is accessible to be utilized. In the event that engineers need to utilize an elementwhichisn'tinPhoneGap,theycancharacterizetheirveryownmoduleandconsolidate it with PhoneGap. The half breed application made uses HTML5 and JavaScript for the front- end together with Sencha and PhoneGap. By and large the application is great as far as execution, cost and mix, yet not easy touse.

### 2.1.7 Carpooling RoutingApplication

Carpooling application causes individuals to orchestrate carpool quicker and proficiently. Clients can be sorted into two classifications: Drivers and Passengers. There are numerous arrangements on the most proficient method to assemble a carpooling application. For this situation, two kinds of approaches will be depicted in itemized.

**Hereditary Algorithm-Based Approach**

Harish, Harish and et. al.. (2019) proposes an answer for carpooling application by utilizing a geneticbased carpool course and coordinating calculation (GCRMA) (Huang, Harish and et. al.., 2015). Carpool Service Problem (CSP) is a coordinating of driver and passenger(s) and theplanorgroupingofpassenger(s)improvementissue.GCRMAexecutesIntelligentCarpool Services (ICS) so as to explainCSP.

There are two modules in ICS: Mobile Clients (MC) and Cloud Global Carpool Services (CGCS). MC handles the ask for and offer of rides by the clients. Since MC is introduced on the versatile working framework, it can utilize the framework's functionalities which incorporates GPS to get area, and portable correspondence. The clients are demonstrated the solicitations or offers dependent on the equivalent local range the solicitations or offers originate from. After drivers bring the travelers to the goal, clients will get notice and theyare allowedtorateeveryclientwhoareintheride(Huang,Harishandet.al..,2019).Peacefulweb administrationsaregivenbyCGCSwiththegoalthatMCcanutilizethem.TheRESTfulweb administrations incorporates OpenGIS supplier which gives computerized street data, atraffic screen which gives traffic data, a notoriety information supplier which gives social data, and anexchangeadministrationsbrokerwhichencouragestheexchangeofmoneybetweenclients.

The issue with carpooling application is it has two destinations: coordinate the driver with howevermanytravelersascouldbeallowed,andabbreviatetheseparationwentbythedriver. Enhancement is required. This is the thing that portrays CSP. While carpooling, drivers get travelers and drop them off to their goal. Notwithstanding, it is imperative to figure out which driver is reasonable to coordinate with which travelers ( Harish and et. al.., 2019). There are a couple of imperatives which are mulled over duringimprovement:

•     The number of seats accessible to travelers relies upon the quantity of seats in the driver's vehicle or the quantity of seats offered by thedriver.

•     Each traveler ought to be relegated to onedriver.

•     Thedriversmustgetthetravelersattheirareafirstbeforeheadingofftotheareaofthe goal.

•     The driver must start the voyage of the carpool from his flowposition.

•     The driver must end the adventure of the carpool at the area of thegoal.

•     The course of the carpool must be finished and kept up by thedriver.

There are two modules in GCRMA: Evolution Initialization (EI) and Genetic Evolution(GE). EIisthemodulewhichallotstravelerstoappropriatedriversdependentontheprerequisitesof    the drivers and travelers utilizing chromosomes. Chromosomes are gatherings of information speaking to data with respect to the carpool, including area, seat, and goal. GE is the module where an ideal arrangement is created for CSP by deciding getting or dropping off which traveler in which request is the quickest (Harish and et. al..,2019).

**Carpool Routing by Mining GPS Trajectories**

Harish and et. al.. (2019) proposes an answer for carpooling application by mining GPS directions

(Harishandet.al..,2019).ThisproposedarrangementactualizesaGPSTrajectoryandRouting Model,TrajectoryMiningAlgorithm,RankingofQualifiedRiders,andGeneratingtheShared Route.

The GPS Trajectory and Routing Model incorporates GPS-Assisted Carpooling

Model, and Route Splitting, Mapping, and Grouping. The GPS-Assisted Carpooling Model proceduresthedirectionlogofeveryclientwhichisrecordedattheGPSgadgetofthetraveler.

There is a database comprising of data about successive courses of clients which can be separated. Course parting parts the directions by disposing of the stay locale from the directions, getting two courses all the while. Mapping includes joining courses into similarly disseminated land lattice focuses. Gathering includes putting successive focuses which are mapped into a similar gathering together (Harish and et. al.., 2019).

Direction Ming Algorithm can be separated into a couple of parts: Trajectory Mining Steps, Mining Frequent Routes, and Recognizing Transport Modes. The means for direction mining steps are finding qualified edges which are the spots visited as often as possible in courses, finding qualified courses which are courses taken habitually, finding successive edges which are the spots visited much of the time in qualified courses, and refreshing qualified course by finding qualified courses and finding incessant edges again until the certified course doesn't change. Mining incessant courses is done by computing the course score for each certified edge, at that point killing qualified edges with low scores. Transport modes are the first voyaging techniques for travelers which is dictated by looking at the successive courses' stop area and figuring the speed of cruising by (He, Harish and et. al.., 2019).

Positioning of qualified riders is done with the assistance of rider inclination review, building matrix organized course table, and scanning for qualified riders. A study is completed so asto decide the travelers' inclinations in carpooling. A lot of qualified network focuses relatedwith visit courses in a set are recorded in a gridstructured course table. Drivers can discover reasonable travelers who remain close to the travelers and the time leaving and showing up ought not be quite a bit of a distinction among drivers and travelers (He, Harish and et. al.., 2019). There are a few factors that ought to be viewed as while picking the travelers to be included into the carpool ride:

• Total travel cost ought to be changed in accordance with thebase.

• The strolling separation among drivers and travelers ought to be acclimated to thebase.

• The alternate route separation to get different travelers ought to be acclimated to thebase.

• The advance time to begin a carpool ought to bediminished.

• The connection among drivers and travelers, the separation between them as far asaffection, ought to belimited

Atlonglast,amutualcourseiscreatedalongsideanassistancecost.Distinctiveassistancecost        is acquired relying upon the quantity of travelers in the carpool ride (He, Harish and et. al.., 2019)..

**Factors to Consider when Developing Carpooling Application**

Inviewofthetwomethodologiestalkedaboutpast,thereareacoupleofvariableswhichought  to  be contemplated when building up a carpoolingapplication.

The travelers and drivers ought to be in region of one another so it is helpful to carpool, and it would be far superior in the event that it is strolling separation so the temporary re-route separation is shorter when the driver is compelled to intentionally drive to somewhere else to get another traveler.

Additionally,thecoursetakenbythedrivertogettravelersislikewisesignificant.Therequest       for getting the travelers influences the alternate route separation. Appropriate arranging ought to be completed so as to limit the temporary re-routeseparation.

What's more, there are a few imperatives which must be pursued when carpooling. This incorporates set number of seats will influence the quantity of travelers a driver can have in a carpool session, and there must be in any event one traveler matched up with one driver so as to have a carpool session.

**2.2      ResearchMethodology**

Researchstrategyisaproceduretoacquiredataandunderstandingaboutaspecifictheme.All examinationproceduresprinciplereasonforexistingistoapproveactualitiesanddemonstrate    that all suspicions are legitimate (Priya,Harish and et. al.., 2019). There are three sorts of research system as appeared in Figure 2.8: Quantitative, Qualitative, and Mixed approach. Quantitative system centers around get-together and deciphering information which can be communicated quantitatively, for example, in numbers and figures (Rohan, Harish and et.al..,

2019). Subjective system centers around get-together information so as to see increasingly about the particular theme, which incorporates portrayals which are novel and subsequently can't be communicated in figures (Priya,Harish and et. al.., 2019). Blended technique is the mix of both quantitative strategy and subjective procedure (Harish and et. al.., 2019).
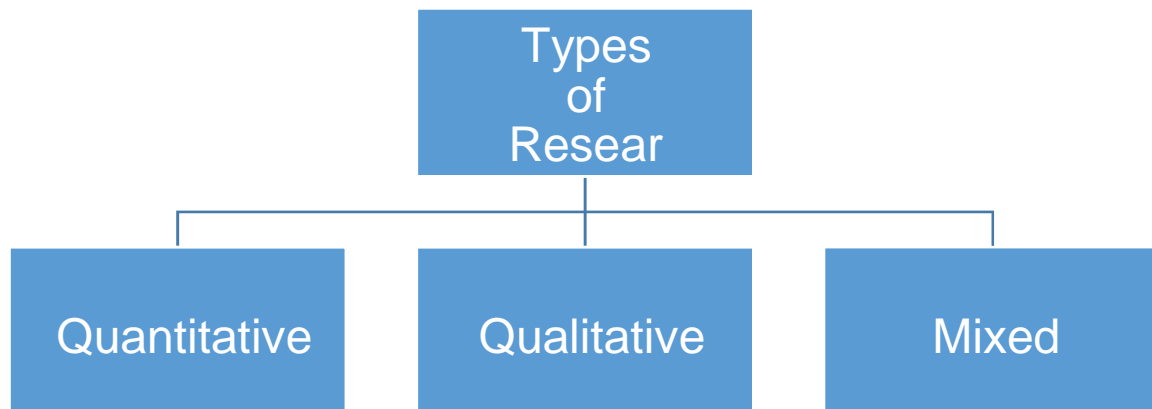
```
                    ┌─────────────┐
                    │   Types     │
                    │    of       │
                    │   Resear    │
                    └─────────────┘
        ┌──────────────────┼──────────────────┐
┌─────────────┐    ┌─────────────┐    ┌─────────────┐
│ Quantitative│    │ Qualitative │    │   Mixed     │
└─────────────┘    └─────────────┘    └─────────────┘
```

**Figure 2.7 Types of Research Methodology**

# CHAPTER 3

# SYSTEMDEVELOPMENT

## 3.1    ResearchMethodology

The exploration technique that is picked for this venture is blended procedure. This is on the groundsthatquantitativesystemaloneisdeficienttoassembleenoughdataaboutthepointthat    is being considered, though depending on subjective procedure just will take quite a while so as to examine about thetheme.

Inblendedprocedure,thefocalpointsandinconveniencesofbothquantitativephilosophyand subjective approach is offset. This is on the grounds that blended procedure is a mix of both quantitative philosophy and subjective system, subsequently it actualizes the best of the two philosophies. In quantitative system, the data accumulated is quick and gigantic, anyway the data is normally the equivalent for all reactions, there isn't sufficient detail. Subsequently, subjective approach adjusts the shortcoming of quantitative strategy on the grounds that subjective system accumulates data which contains more detail and knowledge. There is no compelling reason to do completely the subjective technique on the grounds that the quantitative procedure assists cut with bringing down the outstanding task at hand, so the subjective system is utilized to affirm and additionally improve the data accumulated during quantitativeapproach.

The information assortment techniques picked to do blended strategy are poll, meeting, and writing audit. This is on the grounds that different information assortment strategies are not appropriate to be completed for the point. Information assortment techniques are utilized to accumulate information important to build up a portable application for carpooling.

Poll is utilized on the grounds that the data can be gathered at an enormous scale, and the inquiries are just should have been conveyed once. The data will naturally be organized in an

Excel sheet by Google frames, and appeared in a pie diagram or bar graph to condense each question.Notwithstanding,thedataisn'tdefiniteastheindividualscan'tgivelongreplyorthey simply select the appropriate responses gave. In this manner, meet is utilized to take care of the issue that survey has as meeting can gather more data in itemized and top to bottom when contrasted with poll. There is no compelling reason to have numerous individuals for meet as a portion of the data has just been gathered in survey, in this way the data just should be additionallyrefinedbysolicitingsomefromtheindividualstodepictmoreinnittygrittyabout theinquiriesidentifiedwiththepoll.Thesetwotechniquesareutilizedtogatherdataaboutthe end-clients' sentiment aboutcarpool.

Writing audit is utilized to gather data from investigate papers, for example, diaries, meeting papersandarticleswhicharecomposedbyexperts.Theseexaminationpaperscanbefoundin the library or an online document. The data in the examination papers give a point by point clarification about the theme that is being contemplated, and the data is solid as it contains references and references from other research papers. In addition, discovering more research papers and looking at the data between them builds the unwavering quality of the data. An issue of writing survey is that it is tedious because of the way that a great deal of time isspent on perusing, yet the consequences of writing audit is justified, despite all the trouble. Writing audit is utilized to gather data about innovation, look into procedure, and programming improvement approach pertinent to build up a portable application forcarpooling.

Perceptionisn'tappropriatetobeutilizedtoassembledatasinceitiselusiveanindividualwho is carpooling, and watching the carpool procedure expects us to pursue the individual who is carpooling, which is improper. Also, a portion of the means in the carpooling procedure can't be watched certainly, for example, the arranging of the carpooltrip.

Verbally process is likewise not appropriate in light of the fact that there is not a lot that is required for the individual who is carpooling to state while they are carpooling as more often than not they are simply driving or sitting in the vehicle.

Documentation and journals are not appropriate to be utilized in this examination too. This is on the grounds that there isn't many composed data about carpool, subsequently it will be tedious to attempt to discover archives or journals about carpool.

In this task, a survey was picked as an information assortment strategy to accumulate more data about the foundation of JUIT staff and understudies, and their perspectives towards carpooling in a huge scale and in a short measure of time. These information are significantto create RTG CarpoolingApplication.

## 2. Experience inCarpool

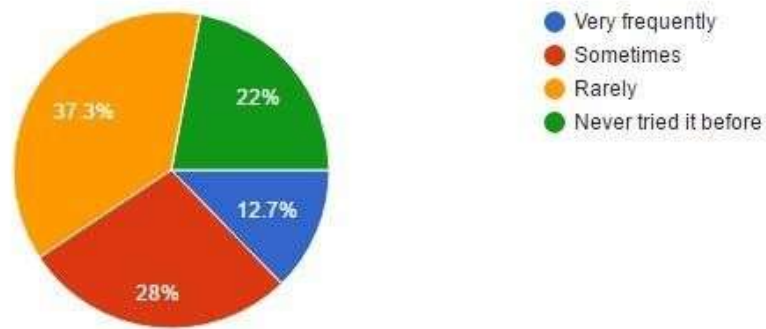How often do you carpool to anywhere? (118 responses)



**Figure 3.1 Peoples' carpool experience**

Figure3.1showsthePeople'involvementwithcarpooling,whichareassembledbeingreferred to5.Theindividualsarepartinto4distinctdegreesofexperience:everynowandagain,some of the time, once in a while, or never attemptedit.

A large portion of the individuals infrequently carpool. A fourth of the individuals at times carpool,nearlyequivalenttothequantityofindividualswhoneverhadagoatcarpooling.Just a minority of individuals carpool as often aspossible.

It is unmistakably indicated that the greater part of the individuals don't embrace the way of life of carpool, to the degree that a fourth of them have not in any case endeavored carpool previously.

### 3. Challenges ofCarpool

**Table 3.1 Challenges of carpooling faced by people**

| Challenges | Number of Responses |
|---|---|
| People don't know anybody living near their area who are going to the same place at the same time asthem | 84 |
| People feel unsafe in other people's car | 28 |
| People do not want to give out personal information | 17 |
| People feel cheated if charged with travelling fees | 11 |
| Irresponsible people | 35 |
| Inconvenience of planning a carpool trip | 46 |
| Personal or social issue | 3 |

Table 3.2 records every one of the difficulties looked by the individuals or the reasons why individuals are hesitant to carpool, accumulated being referred to 6. In the poll, there is an others choice for individuals to fill in if the decisions gave don't concern them. Be that as it may, I have consolidated the appropriate responses in others alternative gave by individuals and classified them into a progressively broad classification as some are very identified with the decisions gave. A portion of the appropriate responses have been precluded as the individuals didn't respond to the inquiry however rather discusses some different things. For this inquiry the individuals get the opportunity to pick more than one answer.

Alargerpartoftheindividualsdon'trealizeanyonelivingclosetotheirregionwhoareheading off to a similar spot simultaneously as them. This incorporates having no companions that are happy to get them since they are not living close to their companions. So the issue is that individuals are missing of companions close to their region or every one of them don't have a vehicle.

In addition, 46 individuals feel badly arranged to design a carpool trip. For instance, in the wake of arranging quite a while for a carpooling trip, travelers can't conform to the planning of the driver. The arranging procedure is extremely repetitive and tedious. 35 individuals experiencedflightyindividualswhilecarpooling.Thisincorporatesindividualswhoarelateor don't appear by any means. It is inconvenient and aggravating when thishappens.

A minority of the individuals have individual or social issue. These issues were consolidated from the others answers gave by individuals. This incorporates hostile to social conduct, prejudice, and experiences of impolite individuals.

Taking everything into account, the majority of the issues can be comprehended with an application or the issues can be limited. In any case, a few issues, for example, require the difference in mentality and frame of mind.

## 4. Smartphone

Figure 3.2 People' current cell phone shows the individuals' current cell phone which depends on question 7, while question 8 speaks to the individuals' criteria for choosing cell phone as appeared in Figure 3.2

Table 3.2These inquiries fill the need to gather information about the cell phones of the objective clients as it is essential to choose which stage to concentrate on building up the application.
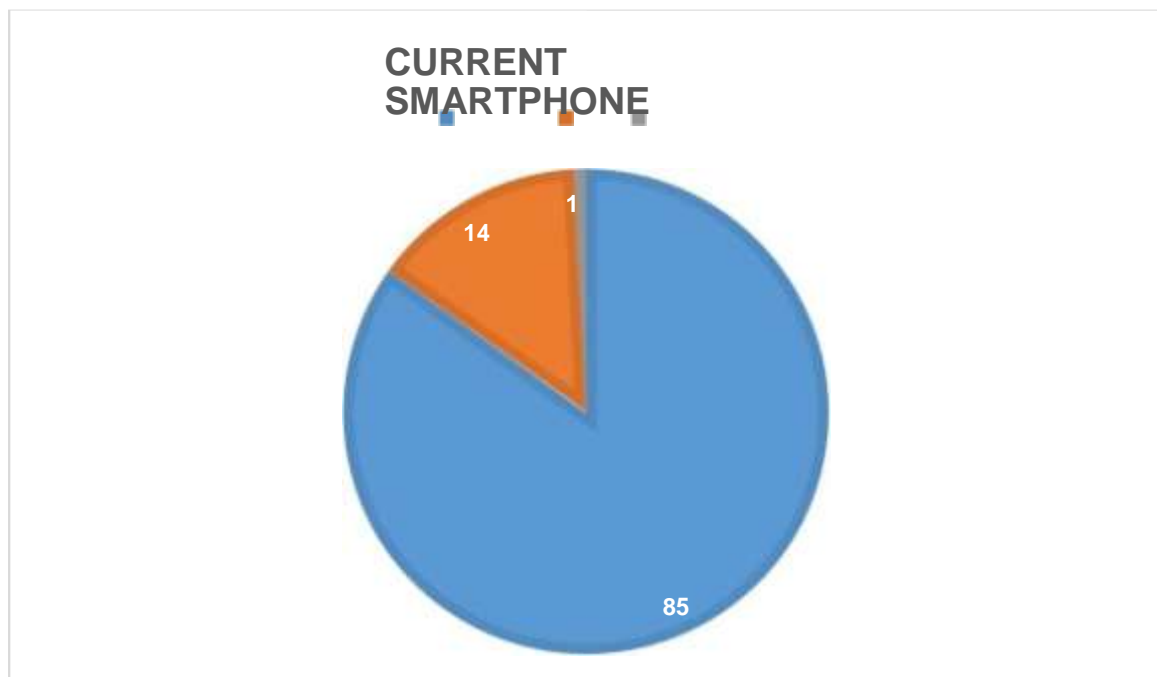


**Figure 3.2 People' current smartphone**

**Table 3.2 People' criteria for selecting smartphone**

| Smartphone criteria | Number of Responses |
|---|---|
| Cost | 94 |
| Hardware Capabilities | 82 |
| Operating System Functionalities | 73 |
| Brand and reputation | 43 |
| Number of Applications | 11 |
| Security | 18 |

For question 7 there is an others alternative for individuals to give their very own answers. In any case, those individuals who picked that really ought to pick Android as XiaoMi and Vivo are Android cell phones. Additionally, there is one respondent who expressed that he hasboth AndroidandiOStelephones.Inthisway,differentanswersarerepetitive.Theequivalentgoes to address 8, which are then being arranged into progressively broadcriteria.

InexcessofasecondfromlastquarterofindividualsareutilizingAndroidcellphones,though not exactly a fourth of individuals are utilizing iOS cell phones for exampleiPhone.

Costofthecellphoneistheessentialmotivationbehindwhyindividualspicktheircellphones. Asacolossalsegmentof theindividualsareRTGunderstudieswhohavenosteadysalaryand need to depend on guardians, it is clear concerning why the cost may impact the decision of the individuals.

Equipment abilities, for example, RAM and preparing speed and Operating System functionalities which incorporate performing multiple tasks capacities and smoothness of the working framework falls as the second most significant criteria of choosing a cell phone, particularly thinking about that youths these days are very educated.

Brand and notoriety is the third most significant criteria picked by the individuals. This incorporatesthebrand'sprevalenceandgenerallyspeakingauditbydifferentclients.Typically individuals will gaze upward on the web on what individuals state about the brand or model before purchasing a cellphone.

The quantity of uses coming up and the security are not so much significant when contrasted withothercriteriaaspertheindividuals.Inanycase,theruinofWindowscellphoneisbecause of the lacking of uses accessible. Security viewpoints incorporate unique finger impression scanner, ready to recover the telephone when its lost, and so on.

In this manner, it is clear concerning why many individuals use Android telephone when contrasted with iPhone as Android is commonly less expensive than iPhone. Nonetheless, not every person is utilizing Android.

**5. Impact of CarpoolApp**
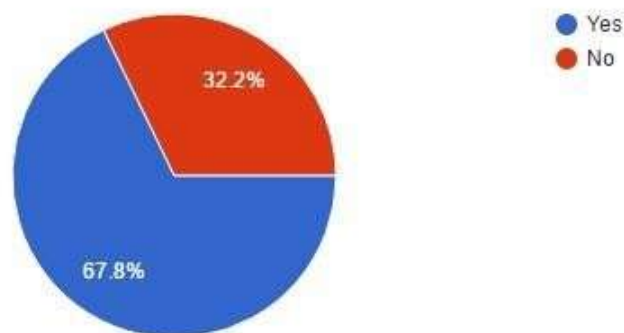


**Figure 3.3 Impact on carpooling mindset of users**

Figure 3.3 shows the effect on the carpooling mentality of the clients if there is a versatile carpooling application. Just about a second from last quarter of the individuals reacted decidedly yet there is a fourth of the individuals are as yet not willing to carpool. With the presence of versatile applications, it makes the procedure of carpooling significantly simpler. Consequently, it urges individuals to assume the way of life of carpooling.

**3.2    DevelopmentTools**

The development tools that is chosen for this project are Android Studio, WampServer, and Notepad++, as shown in Figure 3.9.

**Figure 3.4 Development Tools**

**Android Studio**

Android Studio (https://developer.android.com/studio/index.html) is an Integrated DevelopmentEnvironment(IDE)usedtodevelopapplicationsforAndroiddevices.Itincludes the followingfeatures:

- Multiple devices: Android Studio allows developers to develop applications for multiple Androiddevices,includingAndroidsmartphones,Androidtablets,AndroidTV,AndroidWear, and Android Glass. It also allows developers to develop Android applications from Android Version 1.0 to the latest Android Version, which is Android Version 7.0 (AndroidNougat).

- Drag-and-Drop: Developers may use XML to generate the user interface of the applications. However, Android Studio allows developers to just drag and drop the widgets to the screen to generate the user interface of theapplications.

- Gradle: Gradle is an automated build tool included in Android Studio. It allows build configurations and customizations of the project, such as including libraries into the project dependencies.

- Emulator: Android Studio includes emulators for different Android devices, which canbe used for testing the applications that have beendeveloped.

**Notepad**

Notepad++ (https://notepad-plus-plus.org/) is an editor. Unlike other editors such as notepad or wordpad, Notepad++ is developed specifically for developers. It supports many languages, including PHP and SQL. It functions like an editor in an IDE. An advantage of Notepad++ as compared to an IDE is that it is fast.

**3.3      ProjectPlan**

The project can be broken down into a few phases as listed below:

**1. Requirements**

Initially, a current issue is concentrated to recognize issue statement(s). For this situation, the issues proclamation is identified with why individuals by and large don't take part in a carpooling way of life. The present work process regarding how individuals by and large carpool is likewise distinguished through my own perception so as to become acquainted with progressively about the potential issues that happened during carpooling.

In the wake of recognizing the issue statement(s), we would have the option to limit our degree with respect to what prerequisites ought to be included into the application that will be created. The target of building up the framework would be clarified, as an answer for take care of a current issue, which is the absence of carpooling among individuals in India.

At first the necessities are assembled by thinking of thoughts and watching comparative applications, for example, Uber. In any case, Uber isn't a carpooling application, rather it capacities like a taxi administration. Notwithstanding that, the highlights of Uber can be considered and actualized in this application. From that point onward, an underlying proposed answer for carpooling is proposed.

During execution of the underlying proposed arrangement, if there are any extra highlights recommended by the partners or comes at the top of the priority list, the prerequisites will be mulled over and examined before it is affirmed to be actualized into the present framework.

**2. Analysis**

After the necessities are assembled and the underlying proposed arrangement is finished, top to bottom research will be completed to improve the prerequisites and dissect the techniqueto execute during development of theapplication.

Writingauditiscompletedsoastoaccumulatemoredataaboutversatileapplicationswhichis thesortofusethatwillbecreated,carpoolsteeringcalculation,investigatesystemwhichisthe technique used to assemble more data, and programming improvement approach which is the strategy that will be utilized during advancement of theapplication.

A few advancement apparatuses were examined so as to choose a specific instrument thatwill be utilized during the improvement of theapplication.

Inthewakeofchoosingtheproduct improvementstrategythatwillbeutilizedtobuildupthis application, a task plan is made.

## 3. Design

Afterextensiveresearch,theabstractrequirementsaredesignedproperly.Thisinclude drawing UMLdiagrams.

## 4. Development

During this stage, the application is being created. After the primary model is built and endorsed by the partners, the advancement stage begins while working at the same time in developedanothermodelwithadditionalhighlightsifvital.Thecyclegoesonuntilthepartners are happy with the present highlights that have beenexecuted.

Models are continually being built in this stage. The models will be appeared to the partners eachtimeafteritisbeing built.Ontheoffchancethatthereisanextraelementorprerequisite found, another model will bebuilt.

## 5. Testing

After each time an adaptation of the created application has been created, there are a few tests that will be led. A portion of the tests will be led by the engineer to attempt to break the application so as to find any current bugs with the goal that they can be fixed before sending theapplicationtotheend-clients.Additionally,thepartnerswilltesttheapplicationwithclient

acknowledgment testing to guarantee that the application satisfies every one of the prerequisites expressed already.

## 6. Deployment

After all phases has been completed and the stakeholder are satisfied with the application, the application will be deployed to the end-users.

## 3.4    FunctionalRequirements

Register Rider

o The application requires administrator's confirmation to continue to enlistment of newrider.

o TheapplicationrequiresRTGID,Name,ICNumber,Designation,ProfilePicture,andHome Address of the newrider.

•        Login

o        The application requires the RTG ID and secret key of therider.

o        The application enables rider to check RTG ID Card for the RTGID.

## 3.5    Non-FunctionalRequirements

## 3.5.1    QualityRequirements

 • The application runs on a mobile device, so it have a graphical user interface (GUI)and users interact with the application through touchscreen.

## 3.5.2    Platform Requirements

TheequipmentusedtobuilduptheapplicationisLenovoG50-3080G0workstationwith4GB RAM.

•      The equipment used to run the server is Lenovo G50-30 80G0 workstation with 8GB RAM.

•      The working framework used to run the server is Microsoft Windows10.

•      The working framework used to run the application isAndroid.

•      The programming dialects used to build up the application and server is Java and PHP individually.

•      The database the board framework utilized in this undertaking isMySQL.

### 3.5.3    ProcessRequirements

The advancement system to be utilized in building up this application is prototyping.

•      The term of work time used to finish the whole venture is 10months.

•      The whole undertaking is planned to be finished in April21st,2020.

### 3.6    UseCase

### 3.6.1    Use CaseDiagram

Figure 4.1 is the utilization case outline of RTG Carpooling Application which shows the on-screen characters and use instances of the application. The on-screen characters speak to the sort of clients and the utilization cases speaks to what the clients can do with the application.
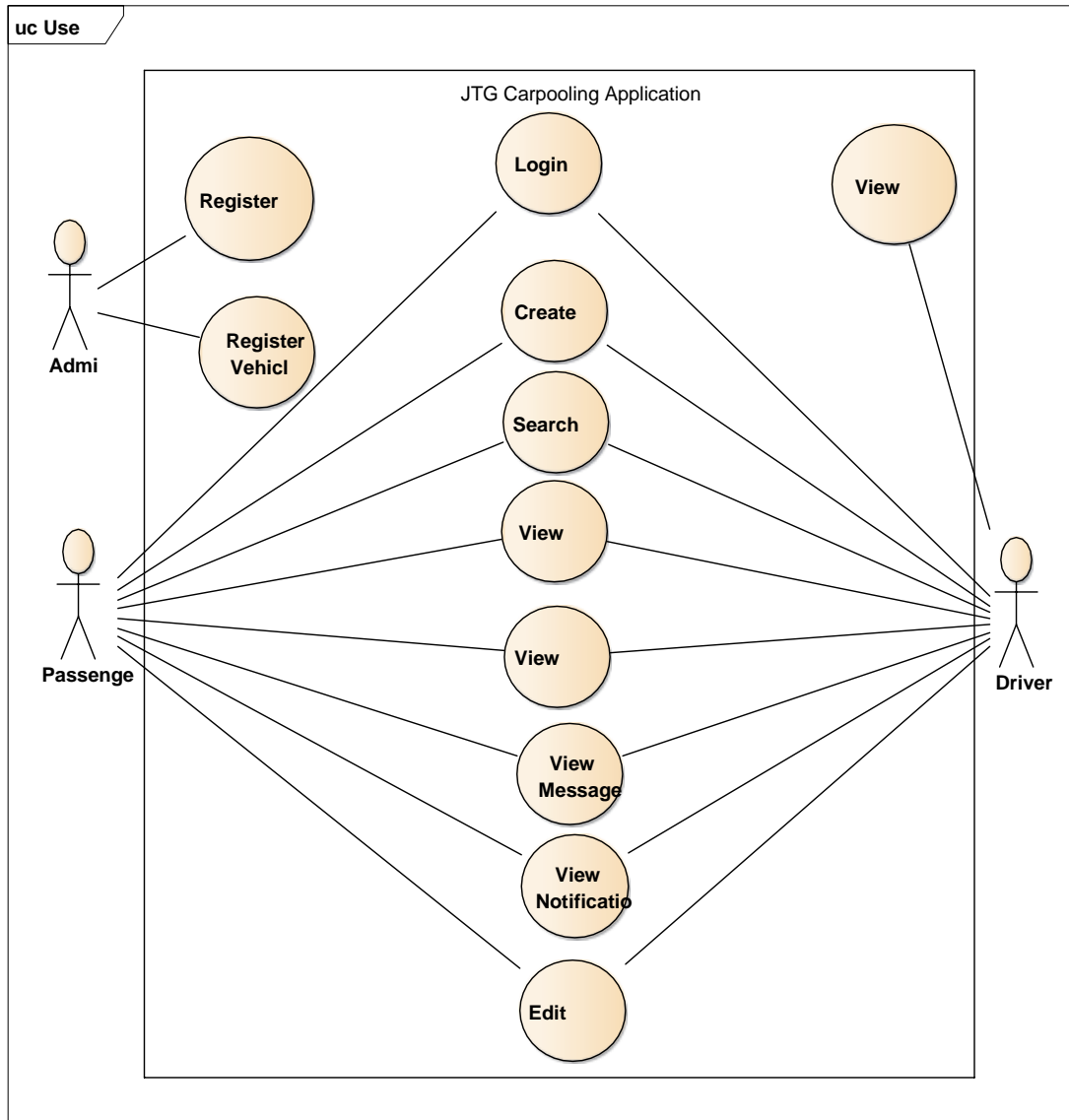
**Figure 3.5 Use Case Diagram**

### 3.6.2    Use CaseDescription

**Table 3.1 Use Case Description: Register Rider**

| Use Case Name: Register Rider | ID: 1 | Importance Level: High |
|---|---|---|
| Primary Actor: Admin | Use Case Type: Detail, essential | |
| Stakeholders and Interests: | | |

Admin – want to register as a new rider.

Driver – want to register as a rider to use the application.

Passenger – want to register as a rider to use the application.

Brief Description:

This use case shows how the admin register rider.

Trigger: Anyone can approach the admin at RTG for registration.

Type: External

Relationships:

Association: Admin

Include:-

Extend:-

Generalization: -

Normal Flow of Events:

The person can approach the admin at FGO for registration.

The admin login the application as admin.

2.1 Admin Login is performed. (S1)

The admin requests for ID Card and IC.

The admin login RTG portal to add home address and profile picture.

The admin select designation.

The admin upload the profile picture of the person.

7.      The admin register the person as a newrider.

SubFlows:

S-1 : Admin Login

The admin is required to type the Login ID.

The admin is required to type the Password.

The admin login and proceed to registration.

Alternate/Exceptional Flows:

S-1,1a: If the Login ID is incorrect, an error message will beshown.

S-1,2a: If the password is incorrect, an error message will beshown.

**Table 3.2 Use Case Description: Register Vehicle**

| Use Case Name: Register Vehicle | ID: 2 | Importance Level: High |
|---|---|---|
| Primary Actor: Admin | Use Case Type: Detail, essential | |
| Stakeholders and Interests: <br> Admin – want to register a driver's vehicle <br> Driver – want to register his or her vehicle | | |
| Brief Description: <br> This use case shows how the admin register a driver's vehicle. | | |
| Trigger:The person can approach admin for registration. <br> Type: External | | |
| Relationships: <br>     Association: Admin <br>     Include:- <br>     Extend:- <br>     Generalization: - | | |

## 3.7 Design Class Diagram

Figure 5.1 is the design class diagram for RTG Carpooling Application. Unlike analysis class diagram, design class diagram includes operations. The operations include constructors, get and set methods. The constructors of all the classes have empty parameters and definitions as the initialization of the attributes will be done by using the set methods. All classes have only

constructors,getandsetmethods,withtheexceptionoftheRideclass.TheRideclasshastwo methods, compareTo and sortDayOfWeek. These methods are used for Collection.sort to sort the Ride bydate.
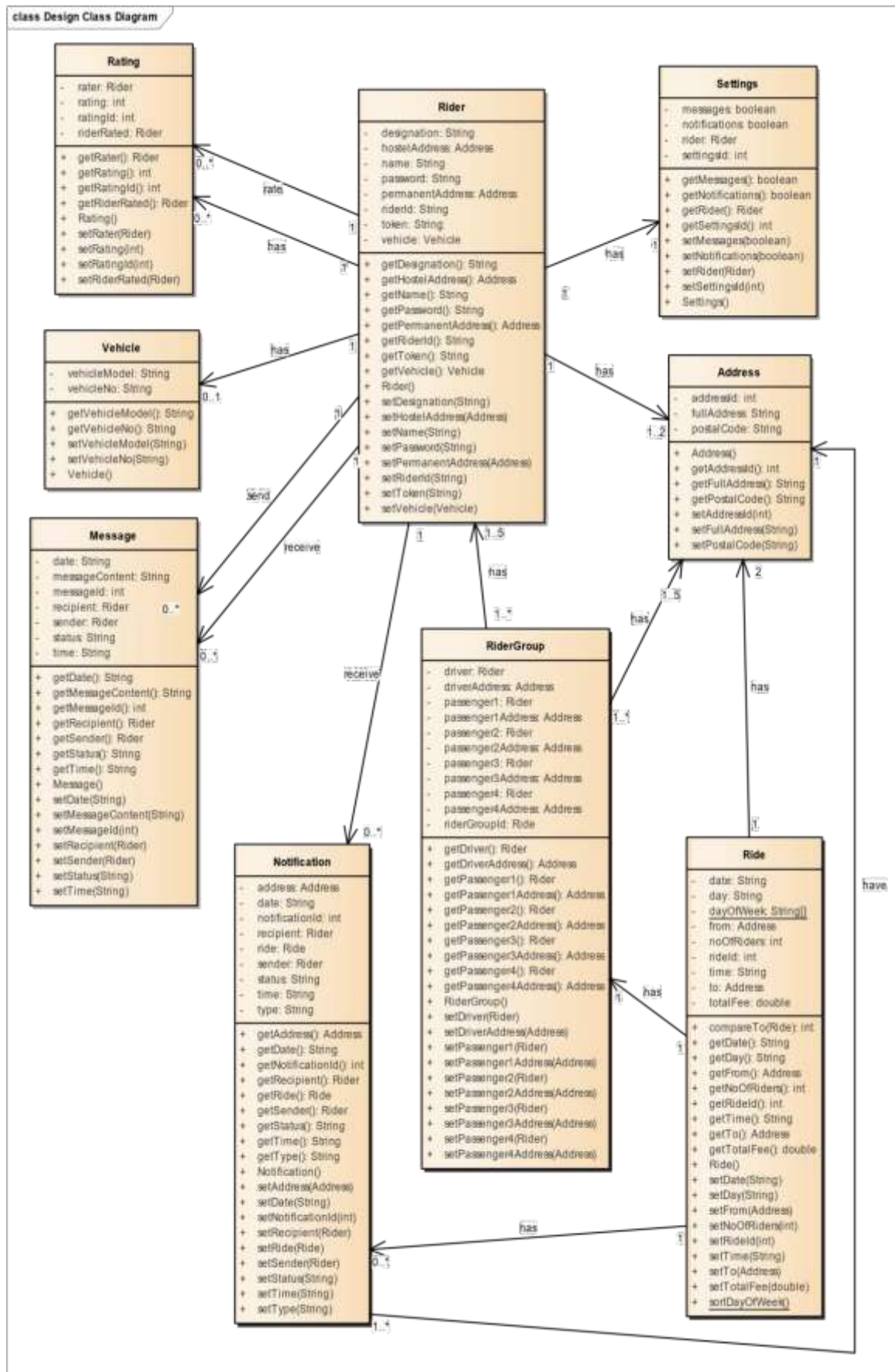
**Figure3.6    Design ClassDiagram**

# CHAPTER 4

# PERFORMANCE ANALYSIS

## 6.1    Prototype

This project uses prototyping software development methodology. Prototypes are used to ensure the requirements of the project are correct and discover more requirements. Thus, prototypes are created and presented to the supervisor of this project. Comments of the supervisor are taken into consideration and another prototype is created until the supervisor is satisfied with the requirements of the project. The final product will be created and refined from the final prototype.

## 6.1    FirstPrototype

The first prototype allows users to login (Figure 6.1), view joined rides at home page (Figure 6.2), search for rides (Figure 6.3 & Figure 6.4), view ride details (Figure 6.5), create ride (Figure 6.6 & Figure 6.7), view alerts (Figure 6.8), view notification (Figure 6.9), view message (Figure 6.10), send message (Figure 6.11), view profile (Figure 6.12 & Figure 6.14) and edit profile (Figure 6.13).

**Figure 4.1 First Prototype: First Page**
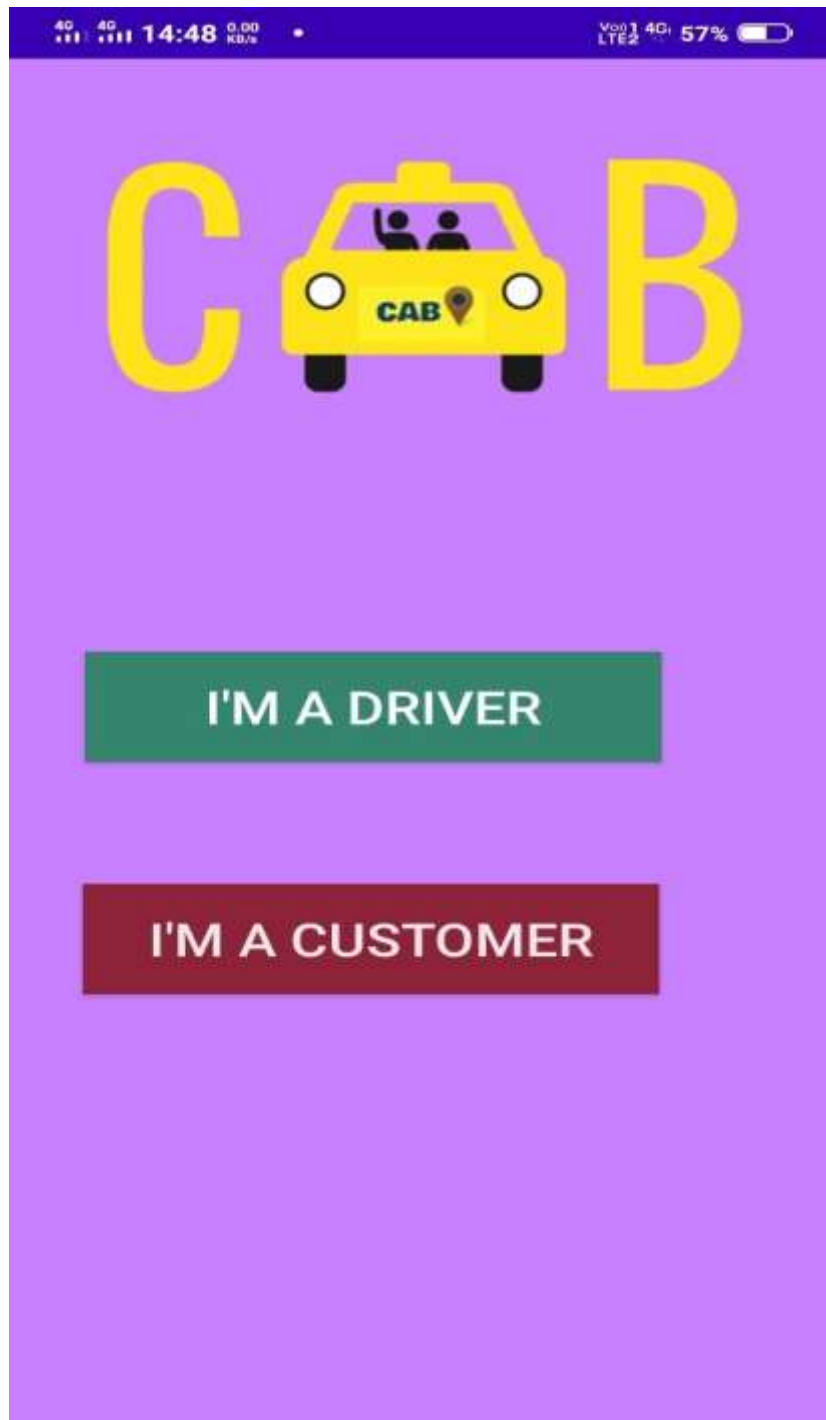
**Figure 4.2 First Prototype: Home Page**
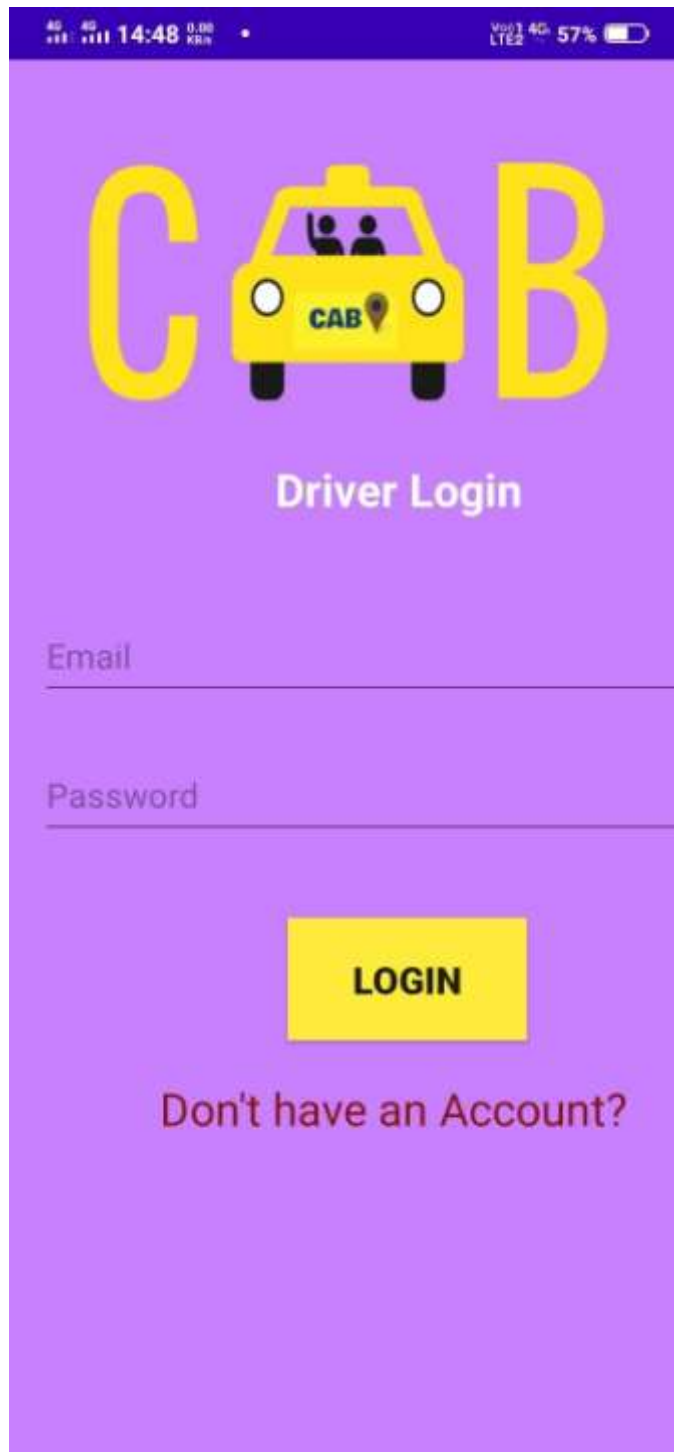
**Figure 4.3 First Prototype: Login App(Driver)**
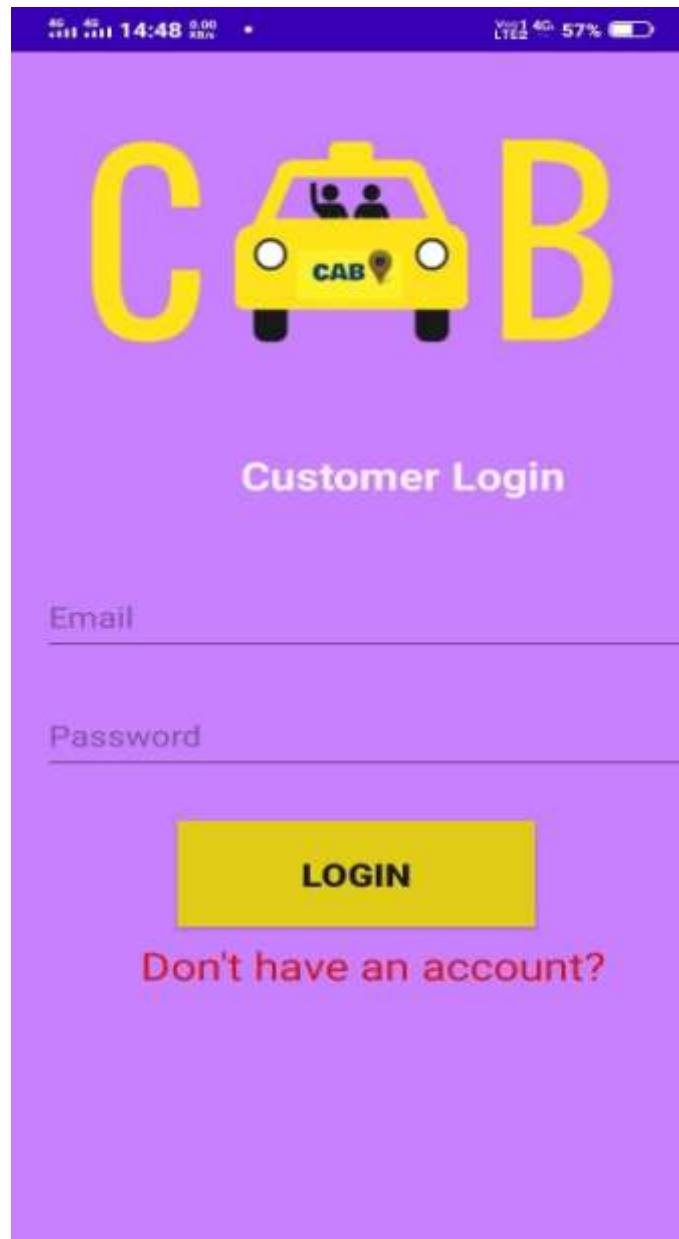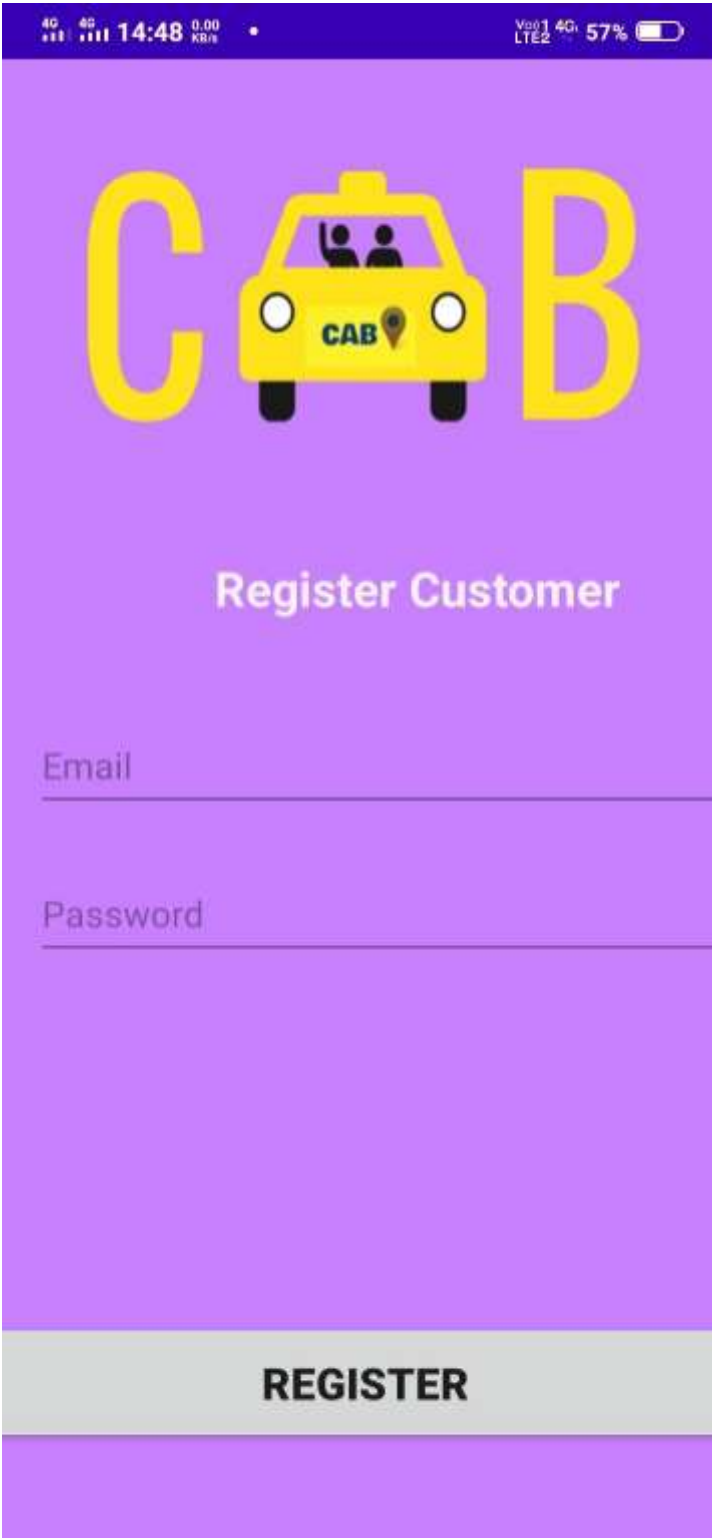
**Figure 4.4 First Prototype: Login App(Customer)**

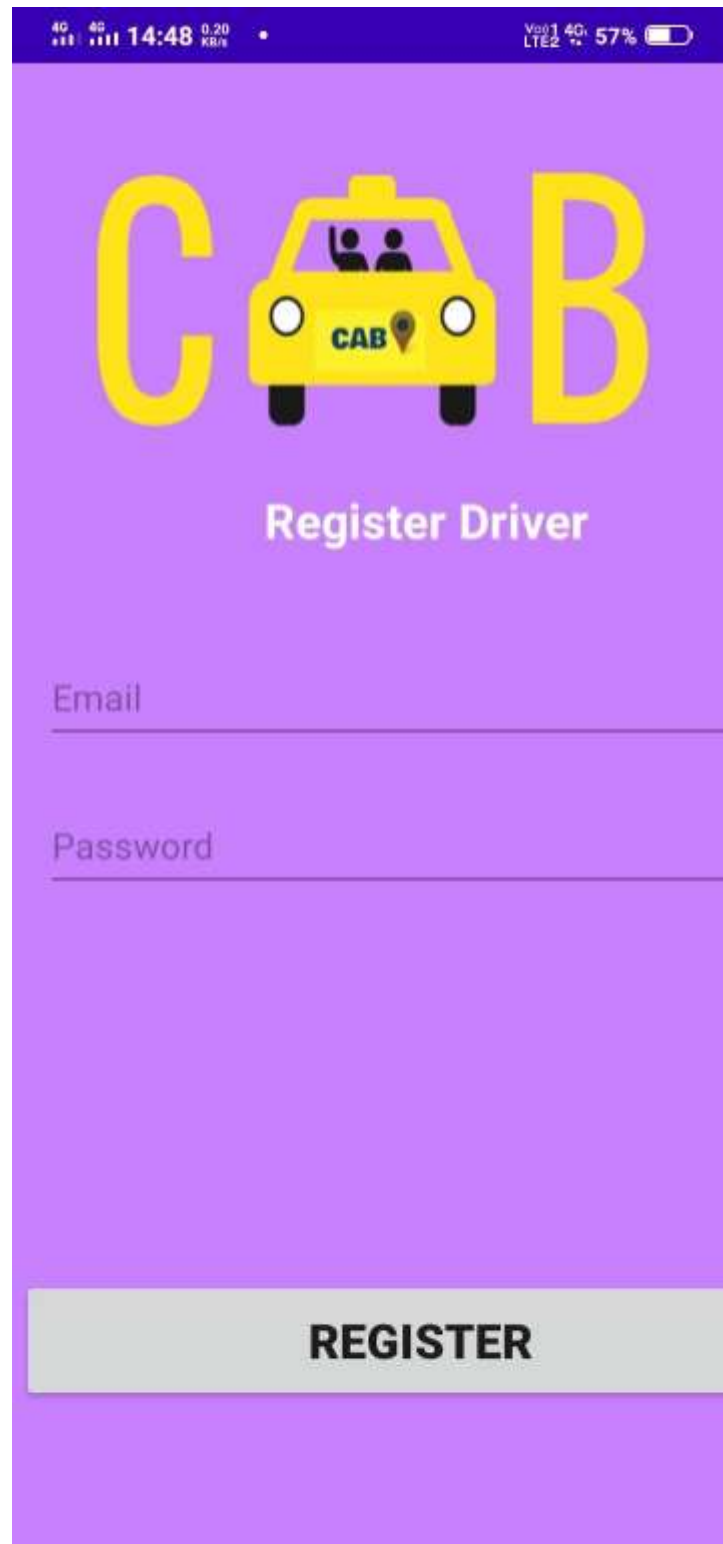**Figure 4.5 First Prototype: Register(Customer)**

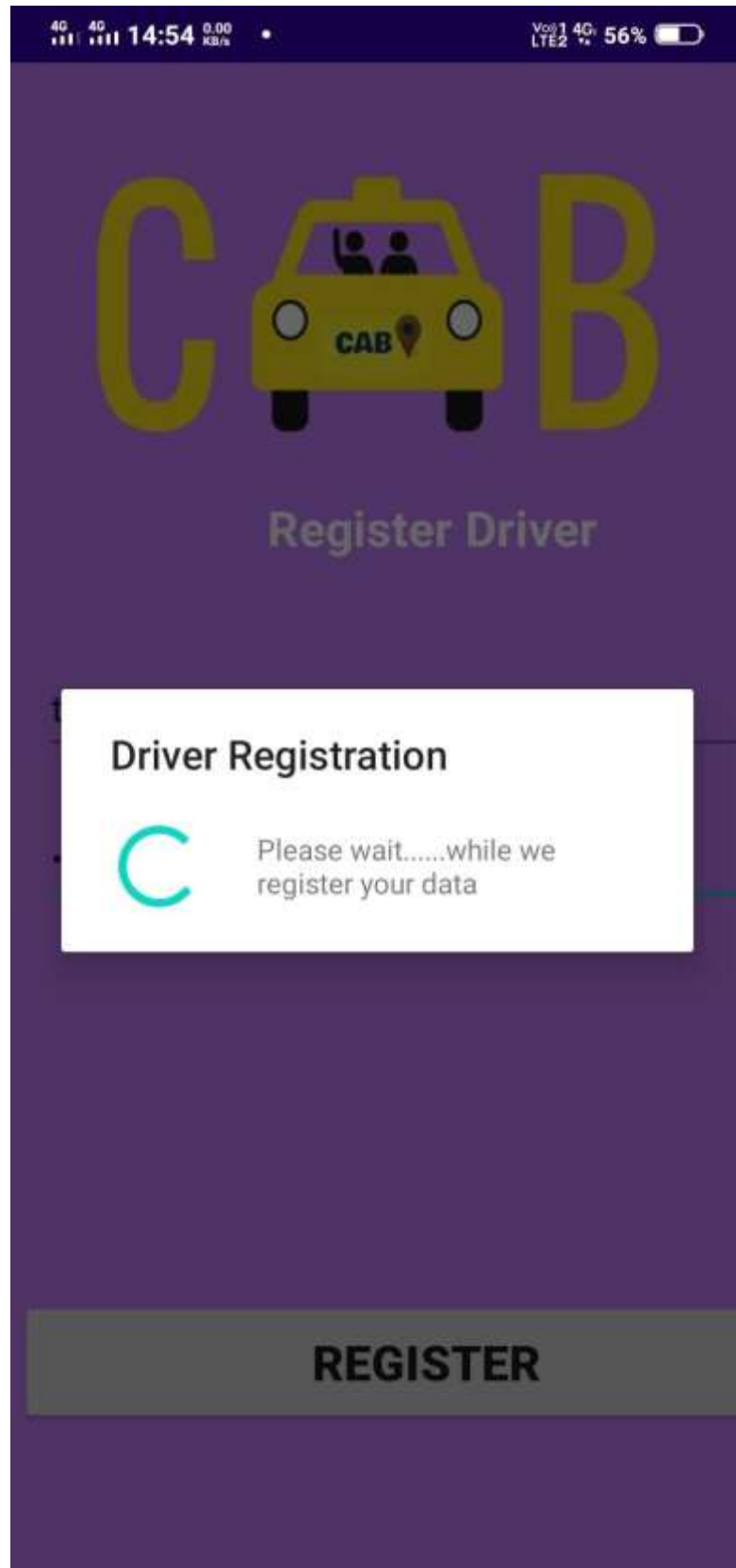**Figure 4.6 First Prototype: Register(Driver)**

**Figure 4.7 First Prototype: Driver registration progress**

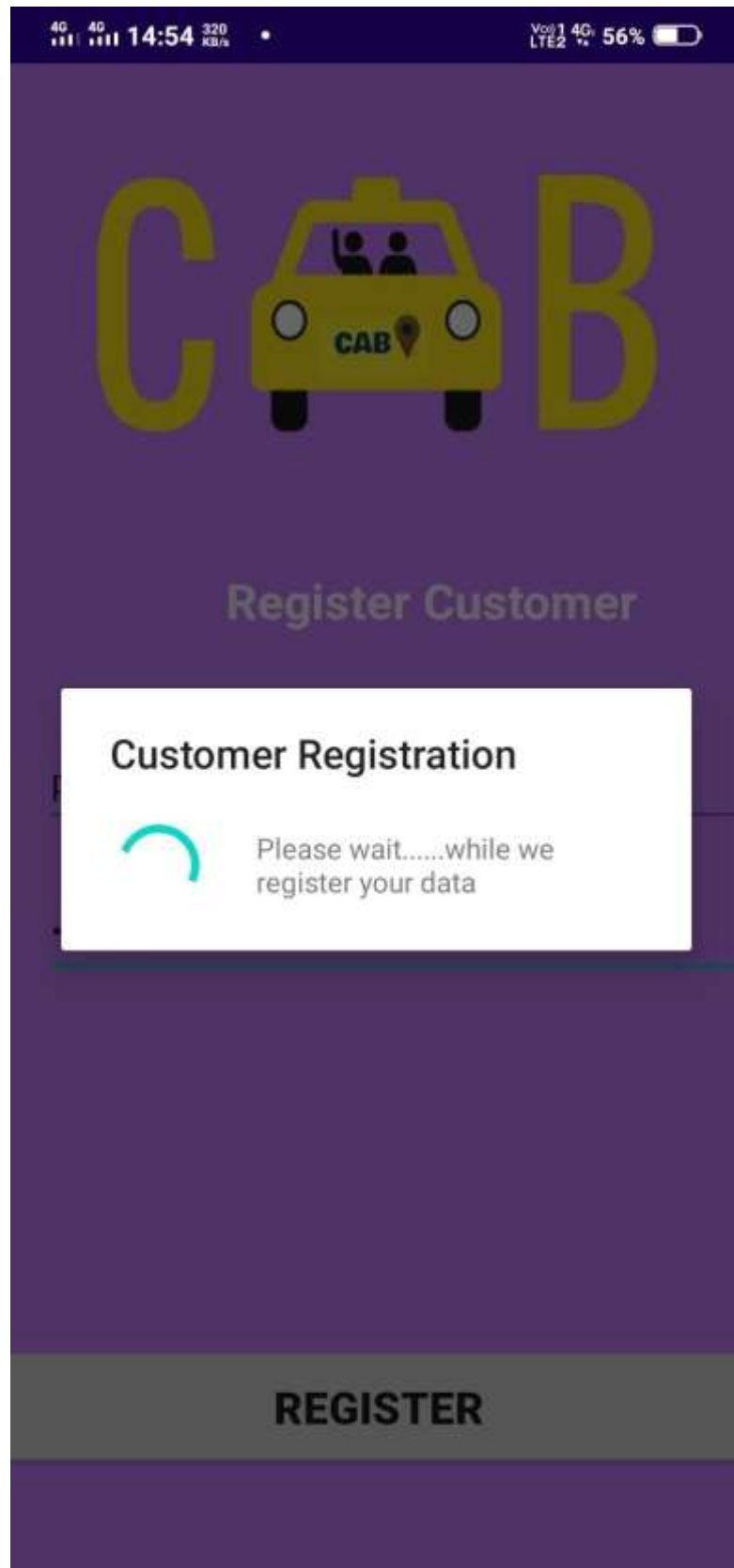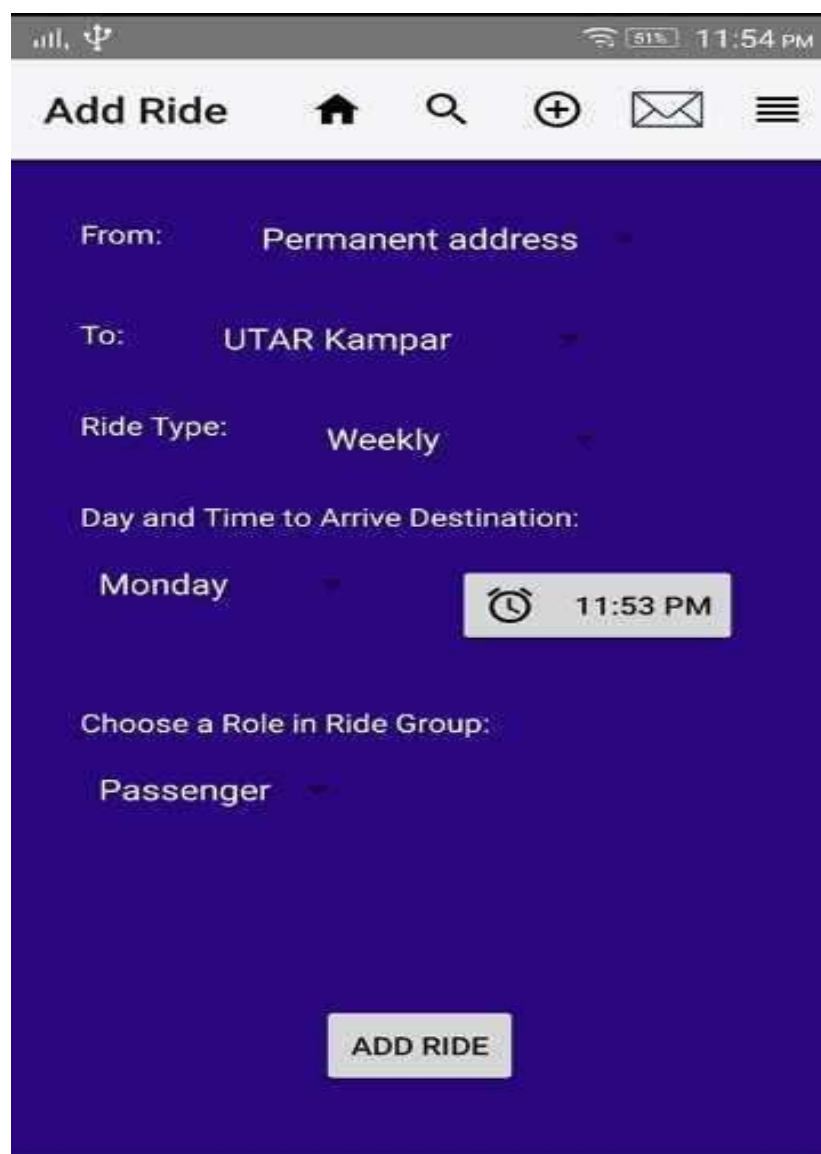**Figure 4.8 First Prototype: Customer registration progress**

Afterpresentingthefirstprototypetothesupervisor,thesupervisorsuggestedtoallowuserto create weekly rides instead of just rides on specificdates.

**6.1.2**        **SecondPrototype**

Thesecondprototypeisthesameasthefirstprototype,inadditiontotheweeklyridesfeatures added. The second prototype allows user to create weekly rides (Figure 6.15) or custom date (Figure 6.16), and search rides by day (Figure6.17)



**Figure 4.9 Second Prototype: Create Ride (Weekly)**

**Figure 4.10 Second Prototype: Create Ride (Custom Date)**
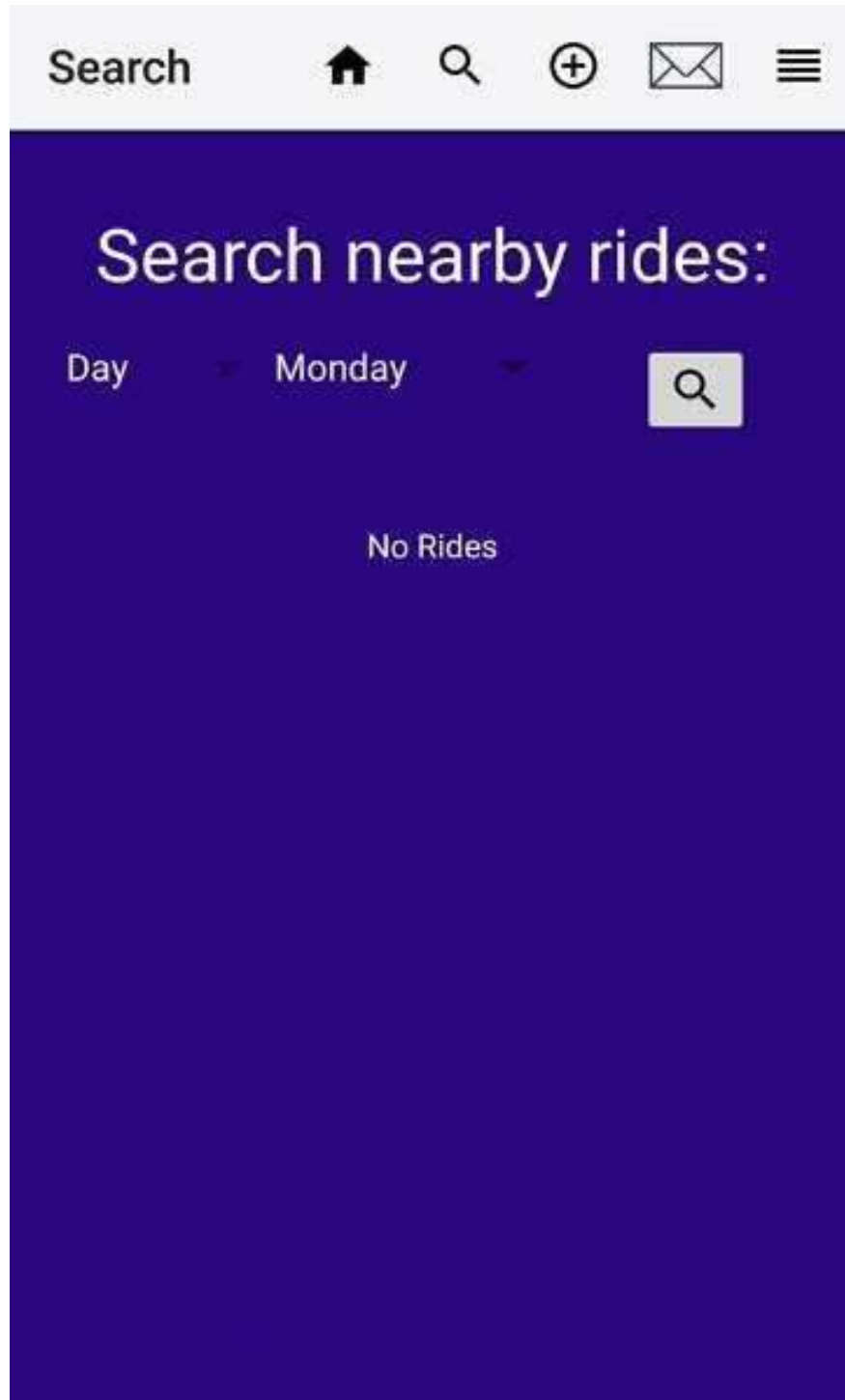
**Figure 4.11 Second Prototype: Search Rides (Day)**

After presenting the second prototype to the supervisor, the supervisor asked if the user will receive reminders from the app about the rides. After discussion, it is decided the user will not be reminded abouttheridesastheappdependsonInternetConnectiontoretrievedataabouttheride,thusitcomplicates theprocessofremindingtheuser.However,theusershouldreceivealertsfrommessagesandnotifications.

### 6.1.3    ThirdPrototype

The third prototype is the same as the second prototype, in addition to allowing user to edit settings for alerts (Figure 6.18).
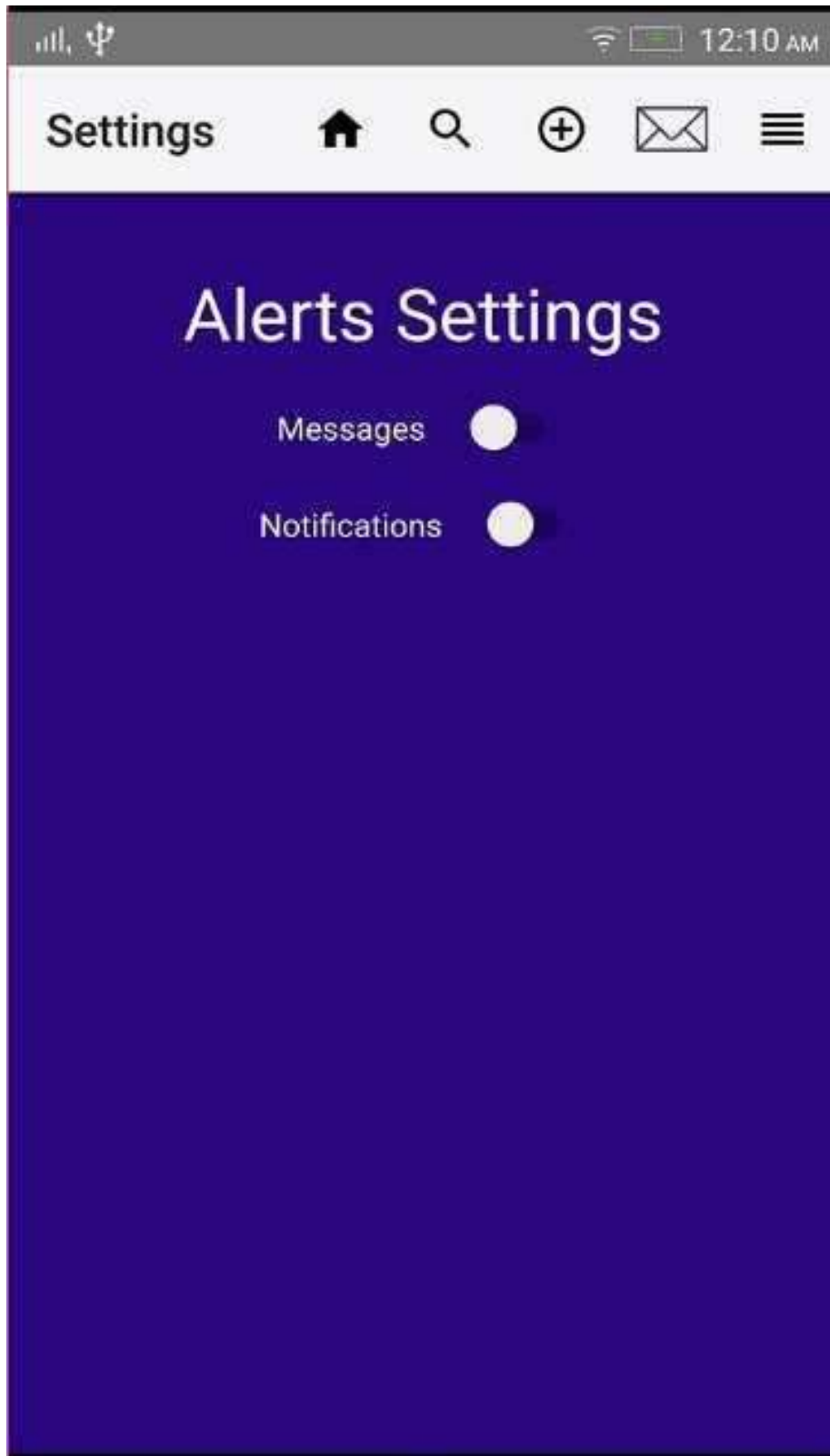
**Figure 4.12 Third Prototype: Alerts Settings**

# CHAPTER 5

# CONCLUSION

## 6.1    Achievement

The objectives of the project are shown below:

- To propose and develop a platform to offer rides to those from the same livingarea.
- To critically access and implement an algorithm that helps calculate estimated travellingfees.
- To propose and develop a basic communication between individuals.
- To critically access and implement an algorithm that helps calculate passenger pick-upsequence.

The project has successfully achieved the objectives, as shown below:

- The app developed calculates the estimated travelling fees of each ride based on distance andthe automobile reimbursement rate ofIndia.
- The app developed allows passengers to send messages to eachother.
- The app developed allows drivers of the ride to view the suggested pick-up sequence of the passengers of the specific ride. The passengers are sorted based on the distance between thestarting point and the passenger's pick up point.

The primary objective of developing the RTG Carpooling Application is to overcome the challenges of carpooling as shown below:

- OverchargedFees
- Security andPrivacy
- Lack ofNetworking
- Inconvenience ofPlanning
- Irresponsibility ofPeople

The project has successfully overcome the challenges of carpooling, as shown below:

- The app automatically calculates estimated travelling cost from the departure point to thedestination based on the distance and automobile reimbursement rate of India.Thus, drivers cannot cheat the passenger(s) by overcharging them with unreasonable amount offees.

- The app does not need users to provide contact number in order to contact each other. Moreover, only users in the same carpool group may contact each other. Thus, harassment and spamming of messages or phone calls areminimized.

- This app helps users to carpool with nearby users without the need to have a broad networkof friends.

- The app helps the driver to plan the trip by suggesting the pick-up sequence of passengers. Moreover, drivers and passengers may discuss on the time of pickup by sending messages toeach other.

- The app allows the users to provide rating to other users. The rating of the user will serve as the reputation of theuser.

`

## 6.2    Limitation

The application relies upon great web association. On the off chance that the cell phone's web association is terrible, at that point the application will stack information more slow or not recover any information at all.

•       TheapplicationreliesuponGoogle'sAPIincludingGoogleCloudMessaging(GCM),Google Maps Geocoding API, and Google Maps Distance Matrix API. Thus, the server requires great web association just as the server utilizes these administrations from Google. The precision of the outcomesreliesuponGoogle.OntheoffchancethatGooglerestoresawrongoutcome,theapplication    will give erroneous outcomesalso.

•       The proposed get grouping of the travelers sets aside a long effort to process contrasted with different highlights in the application. This is because of the arranging calculationexecuted.

## 6.3    FutureEnhancement

Reduce the size of the outcomes returned by the server to decrease information should have been recovered by the application from the server.

• Develop possess API for sendingnotices.

• Develop possess API to get the directions of alocation.

• Develop possess API to compute the driving separation between twodirections.

• Experiment with other arranging calculations to decide the most appropriatearranging calculation to be actualized on computing recommended get succession of thetravelers.

• Switch from sending messages to a continuous talkapplication.

• Additional highlights to educate traveler the evaluated appearance time of thedriver.

• Improvement of the expense of figuring of venturing out charges to be increasinglysensible and reasonable. The count ought to be founded on real voyaging separation yet not just good ways from driver flight point togoal.

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# APPENDICES

## APPENDIX A: Automobile Reimbursement Rate

# Rotary

## FY2016-17 Automobile Reimbursement Rates
(Rates effective as of 1 Jan 17*)

| Country | Reimbursement Rate per Mile | Reimbursement Rate per KM | Country | Reimbursement Rate per Mile | Reimbursement Rate per KM |
|---|---|---|---|---|---|
| Argentina | ARS 12.19 | ARS 7.58 | Malaysia | MYR 3.46 | MYR 2.15 |
| Australia | AUD 1.06 | AUD 0.66 | Mauritius | MUR 37.10 | MUR 23.05 |
| Austria | EUR 0.68 | EUR 0.42 | Mexico | MXN 7.98 | MXN 4.96 |
| Bahamas | USD 0.54 | USD 0.34 | Nepal | NPR 95.44 | NPR 59.31 |
| Bangladesh | BDT 77.55 | BDT 48.19 | Netherlands | EUR 0.64 | EUR 0.40 |
| Belgium | EUR 0.64 | EUR 0.40 | New Zealand | NZD 1.17 | NZD 0.73 |
| Benin | XOF 498.95 | XOF 309.91 | Nigeria | NGN 169.86 | NGN 105.54 |
| Bolivia | BOB 3.41 | BOB 2.12 | Norway | NOK 8.79 | NOK 5.46 |
| Brazil | BRL 2.75 | BRL 1.71 | Pakistan | PKR 92.96 | PKR 57.76 |
| Bulgaria | BGN 1.27 | BGN 0.79 | Panama | USD 0.59 | USD 0.37 |
| Burkina Faso | XOF 498.95 | XOF 309.91 | Paraguay | PYG 4,543.20 | PYG 2,823.02 |
| Canada | CAD 0.87 | CAD 0.54 | Peru | PEN 2.44 | PEN 1.52 |
| Chile | CLP 450.63 | CLP 280.01 | Philippines | PHP 37.85 | PHP 23.52 |
| Colombia | COP 1,700.55 | COP 1,056.68 | Poland | PLN 2.70 | PLN 1.68 |
| Croatia | HRK 5.93 | HRK 3.69 | Portugal | EUR 0.83 | EUR 0.52 |
| Cyprus | EUR 0.66 | EUR 0.41 | Puerto Rico | USD 0.54 | USD 0.34 |
| Czech Republic | CZK 18.24 | CZK 11.34 | Romania | RON 3.12 | RON 1.94 |
| Denmark | DKK 5.84 | DKK 3.63 | Russia | RUB 31.26 | RUB 19.42 |
| Dominican Republic | DOP 45.15 | DOP 28.06 | Serbia | RSD 65.50 | RSD 40.70 |
| Ecuador | USD 0.50 | USD 0.31 | Singapore | SGD 1.98 | SGD 1.23 |
| Egypt | EGP 4.07 | EGP 2.53 | Slovakia | EUR 0.62 | EUR 0.39 |
| Finland | EUR 0.69 | EUR 0.43 | Slovenia | EUR 0.83 | EUR 0.51 |
| France | EUR 0.72 | EUR 0.45 | South Africa | ZAR 8.26 | ZAR 5.13 |
| Gabon | XAF 794.25 | XAF 493.53 | Spain | EUR 0.66 | EUR 0.41 |
| Germany | EUR 0.79 | EUR 0.49 | Sri Lanka | LKR 123.43 | LKR 76.69 |
| Ghana | GHS 3.88 | GHS 2.41 | Sweden | SEK 6.74 | SEK 4.19 |
| Greece | EUR 0.79 | EUR 0.49 | Switzerland | CHF 1.13 | CHF 0.70 |
| Guatemala | GTQ 5.58 | GTQ 3.46 | Taiwan | TWD 28.68 | TWD 17.82 |
| Hong Kong | HKD 10.99 | HKD 6.83 | Tanzania | TZS 1,384.29 | TZS 860.16 |
| Hungary | HUF 185.09 | HUF 115.01 | Thailand | THB 34.42 | THB 21.39 |
| Iceland | ISK 110.46 | ISK 68.64 | Togo | XOF 498.95 | XOF 309.91 |
| India | INR 45.69 | INR 28.39 | Tunisia | TND 1.35 | TND 0.84 |
| Indonesia | IDR 9,799.20 | IDR 6,088.96 | Turkey | TRY 1.91 | TRY 1.19 |
| Ireland | EUR 0.88 | EUR 0.55 | Uganda | UGX 3,228.30 | UGX 2,005.98 |
| Israel | ILS 4.37 | ILS 2.71 | Ukraine | UAH 13.99 | UAH 8.69 |
| Italy | EUR 0.83 | EUR 0.51 | United Kingdom | GBP 0.45 | GBP 0.28 |
| Japan | JPY 118.40 | JPY 73.57 | United States | USD 0.535 | USD 0.34 |
| Kenya | KES 112.10 | KES 69.65 | Uruguay | UYU 24.64 | UYU 15.31 |
| Korea, Republic of | KRW 883.08 | KRW 548.72 | Zambia | ZMW 5.64 | ZMW 3.51 |
| Lebanon | LBP 1,329.03 | LBP 825.82 | | | |
| Lithuania | EUR 0.63 | EUR 0.39 | | | |
| Luxembourg | EUR 0.64 | EUR 0.40 | | | |

*Old mileage rate charged as of 1 Jan 17 has 0.535/mile to 0.535/mile
- Rates are based upon a moderate sedan.
- When a lower government rate is available, it is recommended that the government rate be used so as to avoid creating a personal tax liability.
- If the country of travel is not listed, please contact Accounts Payable at ExpenseReports@rotary.org and a rate will be calculated.
- Rates are listed in local currencies however reimbursements may not be payable in that specific currency. For more information, please consult Rotary's Payment Guidelines.

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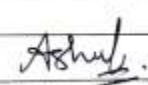
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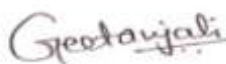
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