



**GUJARAT TECHNOLOGICAL  
UNIVERSITY**



# **Sarvajani College of Engineering & Technology**

(Faculty of Computer Engineering, Computer Department)

A Project Report On

## **Car Service Notifier**

Under the course of

**DESIGN ENGINEERING – 2B (2160001)**

B. E. III, Semester – VI

**(Computer Engineering)**

*Submitted by:*

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**Academic Year:-2019-20**



**GUJARAT TECHNOLOGICAL UNIVERSITY**

Chandkheda, Ahmedabad  
Affiliated



**Sarvajnik College of Engineering & Technology**

## **CERTIFICATE**

**This is to certify that the students namely, Harshil Patel (170420107035), Aamir Gagan (180423107003), Rushabh Goghari (180423107004), Sagar Naik(180423107009.), Harshal Ptail (180423107011), of B.E. 3<sup>rd</sup> Year (Computer Engineering) Semester VI have successfully completed the course work and related tasks for the course of Design Engineering-(2B) (2160001) during the academic term ending in the month of May 2020.**

Date:

Place: SCET, Surat

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# CHAPTER 1: INTRODUCTION

## Abstract

Vehicles are now a day's most common transport utility. So we can say it requires proper care. Our application comes at this point, here user could view nearby service centers and in case of breakdown (of vehicle) user could order towing service. Further user could get custom slots and date for service.

This module enhances user ability to interact with system. Thus there are still possible modules that could be added in system and more.

This concludes our system and its use.

## Prior Art search

Vehicle requires maintenance too there are many issues with vehicles service industry, some of these have been solved by us:

This problems are related to service queue, custom time slot for service and many more.

Our system has solved some of these but there is furthermore which could be included.

This could be further added and made better.

Patent 1	
Patent Search Database Used	Google Patents
Keywords Used for Search	Car
Search String Used	Car maintenance
Number of Results/Hits Getting	25
Title of Invention	Autonomous vehicle maintenance and repair system
Patent No.	US8190322B2
Date of Application	13/01/2009
Name of Inventor(s)	William C. Lin, Bakhtiar Brian Liktohi
Limitation of Technique	It can't search mechanical part related problems
Brief about Invention	The system employs an on-board diagnosis and prognosis module that monitors one or more vehicle buses to identify trouble codes and other information indicating a vehicle problem.
How much this invention is related with your project	It notifies the owner about problem in a vehicle
Key Learning Point	Automatic detection of problem in vehicle

Table:1.2.1 Patent 1

Patent 2	
Patent Search Database Used	Google Patents
Keywords Used for Search	Vehicle maintenance
Search String Used	Car maintenance reminding
Number of Results/Hits Getting	60
Title of Invention	Automobile autonomous maintenance reminding device and system
Patent No.	CN102650882A
Date of Application	24/02/2011
Name of Inventor(s)	Yang Jinjun,Jiao Zhifeng, Min Min
Limitation of Technique	It only reminds, do not provide solution of a problem
Brief about Invention	The invention provides an automobile autonomous maintenance reminding device and system, which belong to the automobile diagnosis and detection
How much this invention is related with your project	It notifies owner about maintenance of a vehicle
Key Learning Point	Maintenance notification

Table:1.2.2 Patent 2



Patent 3	
Patent Search Database Used	Google Patents
Keywords Used for Search	Car
Search String Used	Car maintenance
Number of Results/Hits Getting	25
Title of Invention	Vehicle maintenance system on basis of instant messaging platform and control method
Patent No.	CN104270305A
Date of Application	27/10/2014
Name of Inventor(s)	Fang Tao, Tang Xinning, Liu Huaren, Wenchong
Limitation of Technique	It constantly notifies owner
Brief about Invention	The invention discloses a vehicle maintenance system on the basis of an instant messaging platform, which comprises a vehicle unit, a service platform and a user platform.
How much this invention is related with your project	Instant messaging about problem in a vehicle
Key Learning Point	Interactive(notify using picture and voice mail)

Table:1.2.3 Patent 3

Patent 4	
Patent Search Database Used	IEEE
Keywords Used for Search	Sensor Detection
Search String Used	Vehicle maintenance sensing
Number of Results/Hits Getting	2
Title of Invention	Tracking vehicle maintenance using sensor detection
Patent No.	US8543283B2
Date of Application	6/10/2008
Name of Inventor(s)	James W. SeamanKeith R. Walker
Limitation of Technique	Data is stored in external device which is not secured
Brief about Invention	Radio frequency identification is used in cooperation with the computer system aboard a motor vehicle to track service and maintenance activities relating to the vehicle. Each component or part of the vehicle that may require maintenance is provided with a unique passive identification tag.
How much this invention is related with your project	It senses maintenance time automatically using sensor
Key Learning Point	Sensors are used for detecting problem and maintenance

Table:1.2.4 Patent 4

## CHAPTER 2: OBSERVATION

## **A-E-I-O-U Frame Work**

### **Meaning**

**A:** Activity

**E:** Environment

**I:** Interaction

**O:** Objects

**U:** Users

### **Activity**

- Analysis (Men/Machine)
- Assigning Queue Number
- Car Service

### **Environment**

- Noisy
- Rush for Service
- High Temperature

### **Interaction**

- Customer and Staff
- Manager and Staff
- Manager and Customer
- Customer and Cashier

### **Objects**

- Vehicle
- Engine
- Oil
- Battery
- Wheel Alignment Machine
- Service Equipment
- Jet Spray
- Lift

### **Users**

- Customer
- Helper
- Mechanic
- Manager

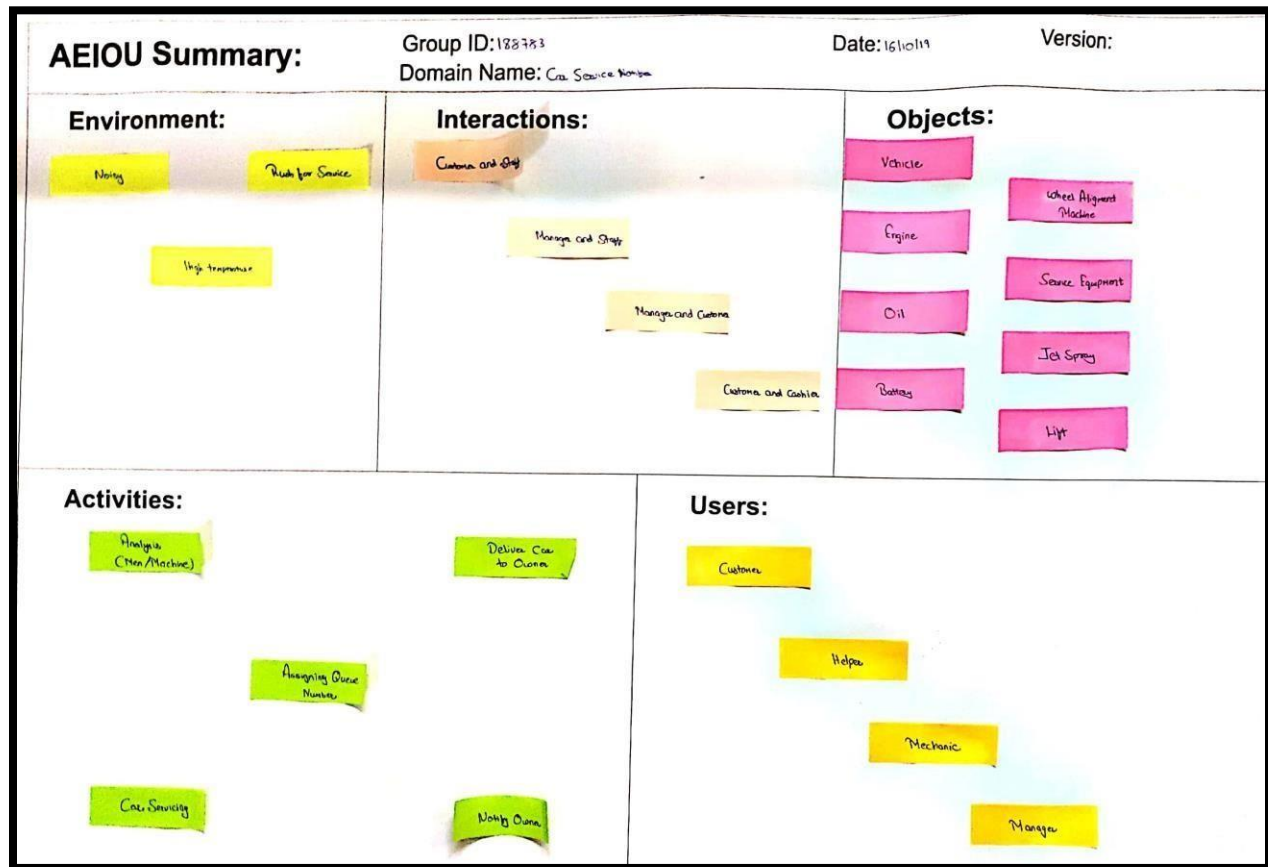


Fig:2.1.1 AEIOU Summary

## **CHAPTER 3: CANVASES/FRAMEWORK**

## Mind Map

A mind map is a diagram used to visually organize information. A mind map is often created around a single concepts, drawn as an image in the centre of a blank landscape page, words and parts of words are added. Major ideas are connected directly to the central concept, and other ideas branch out from those. Mind maps can be drawn by hand, either as “rough notes” during a lecture, meeting or planning session.

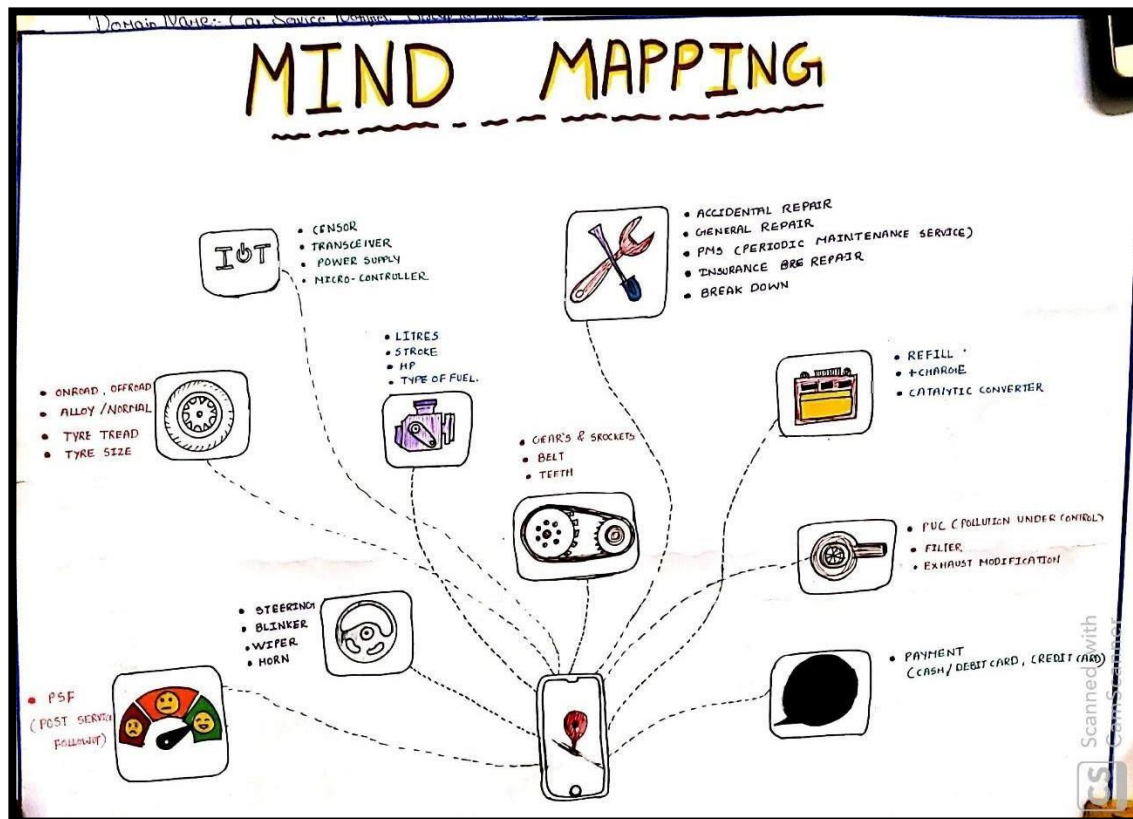


Fig:3.1.1 Mind Mapping

## Empathy Map

### Happy Story

Our group was on 1 day's trip, we were half way to our destination. When we had an issue with our car on analysis it was hard to find the problem. Luckily we had this app which found nearest repair shop for our vehicle. So without any issue problem was solved in a jiffy and we were on our way. This app turned out quite useful for us.

### Happy Story

The car we had was in a pretty good condition as we took care of it every day cleaning it and all. Where as in order to attend a place we took our car without proper maintenance, thus we had an issue with our car. During this time we use this app. It showed us nearest place on our way and without towing our car we took it to service station in a while and got the problem fixed. Thus this app turned more useful than we expected.

### Sad Story

Our car was in a bad shape as it needed an immediate service so we decided to head towards service station. Later on our arrival the service station turned out to have quite some queue. We turned our car in after spending some time for repair, later on we had an urgent place to attend and our car had just entered for service and we had to face problem for reaching our destination on time.

### Sad Story

On a group trip with my friends the vehicle which we had a breakdown, we found a place to get it checked, but on arrival we show a huge queue and we wasted most of our time in a queue other places were far from us. On checking a major issue was found, this caused further delay and demotivated us on our trip.

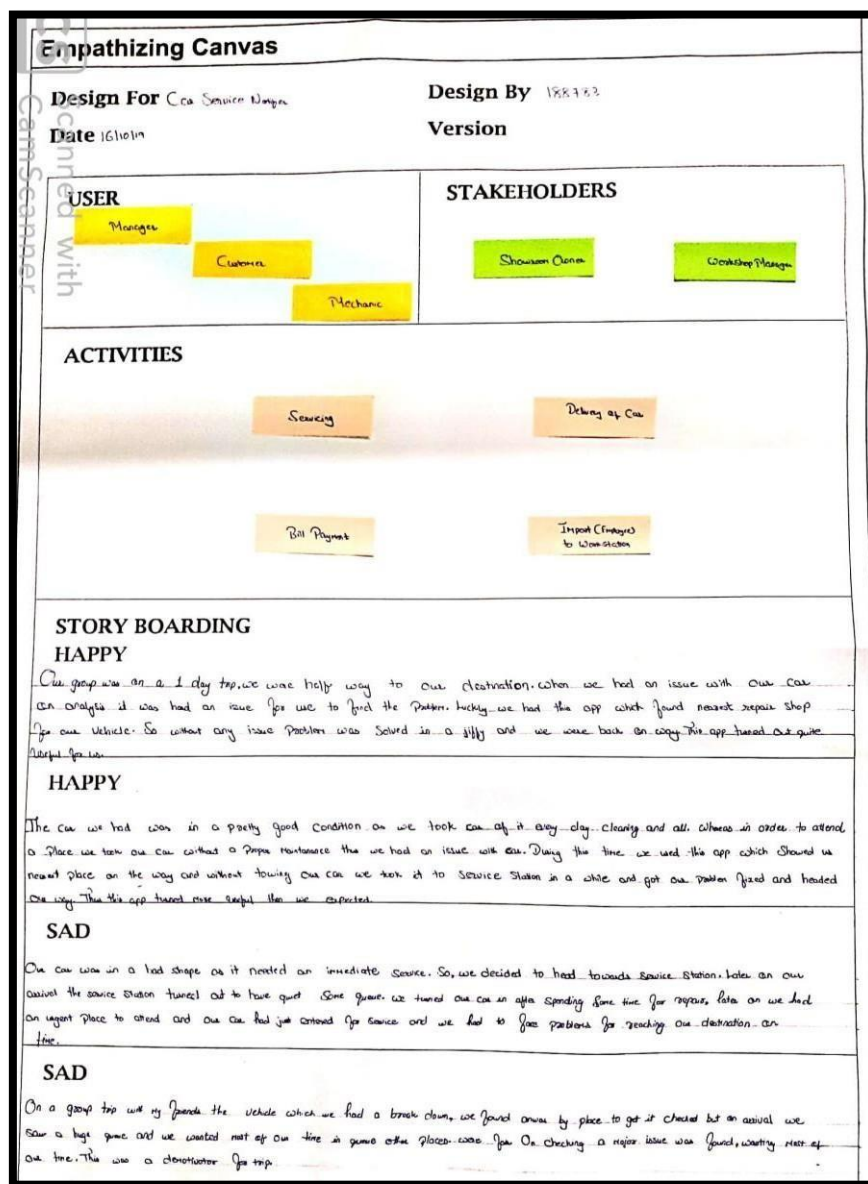


Fig:3.3.1 Empathy Map



## **Ideation Canvas**

Third task was to create “The ideation canvas”. We described activities of people and situation or locations where they are facing problem. This canvas is very helpful to reach near our goal. This canvas helped us to know what area need which focus.

### **People**

- Customer
- Manager
- Technician

### **Activities**

- Analysis
- Customer pay for service
- Import (Employee) to work station
- Customer arrives
- Delivery (Employee) of a car to owner
- Car servicing

### **Situation/Context/Location**

- Car need specific service
- Excessive queue
- Car need maintenance
- Urgent service

### **Props/Tools/Objects/Equipment**

- Smart phone
- Android application
- Car
- Website
- Laptop
- Service equipment

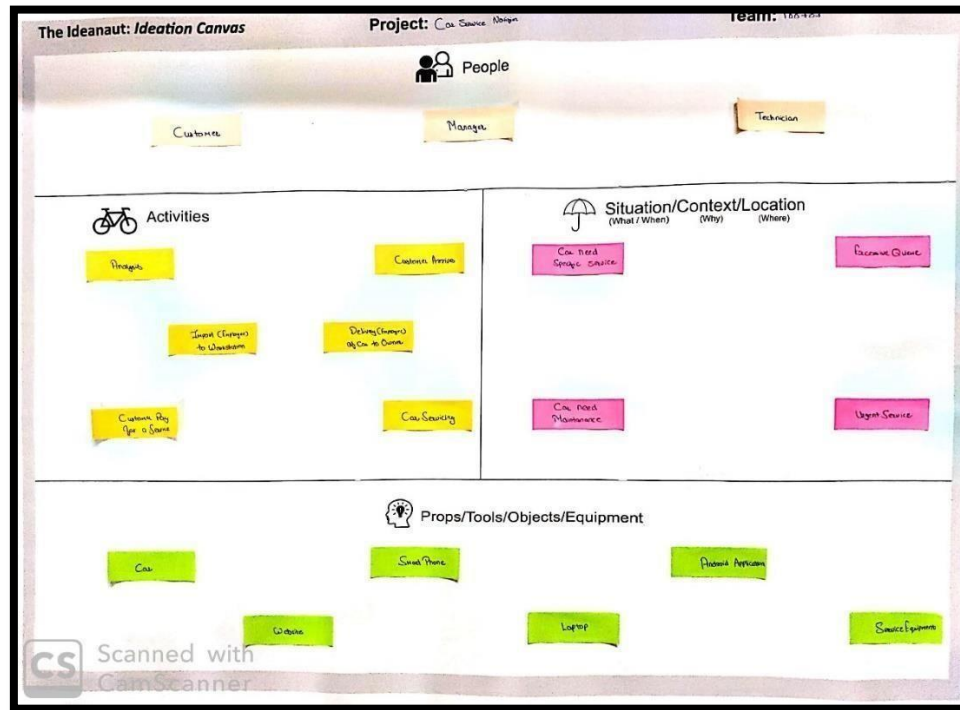


Fig:3.3.1 Ideation Canvas

## E-R Diagram

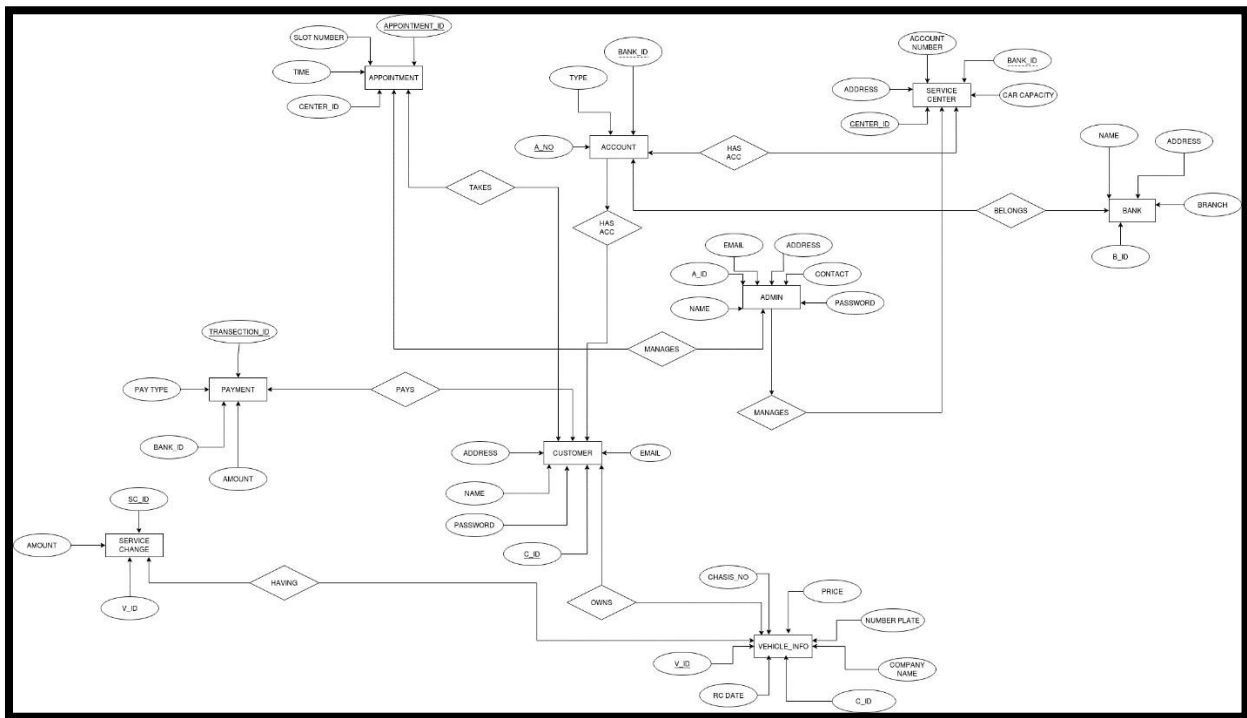


Fig:3.4.1 E-R diagram iteration 1

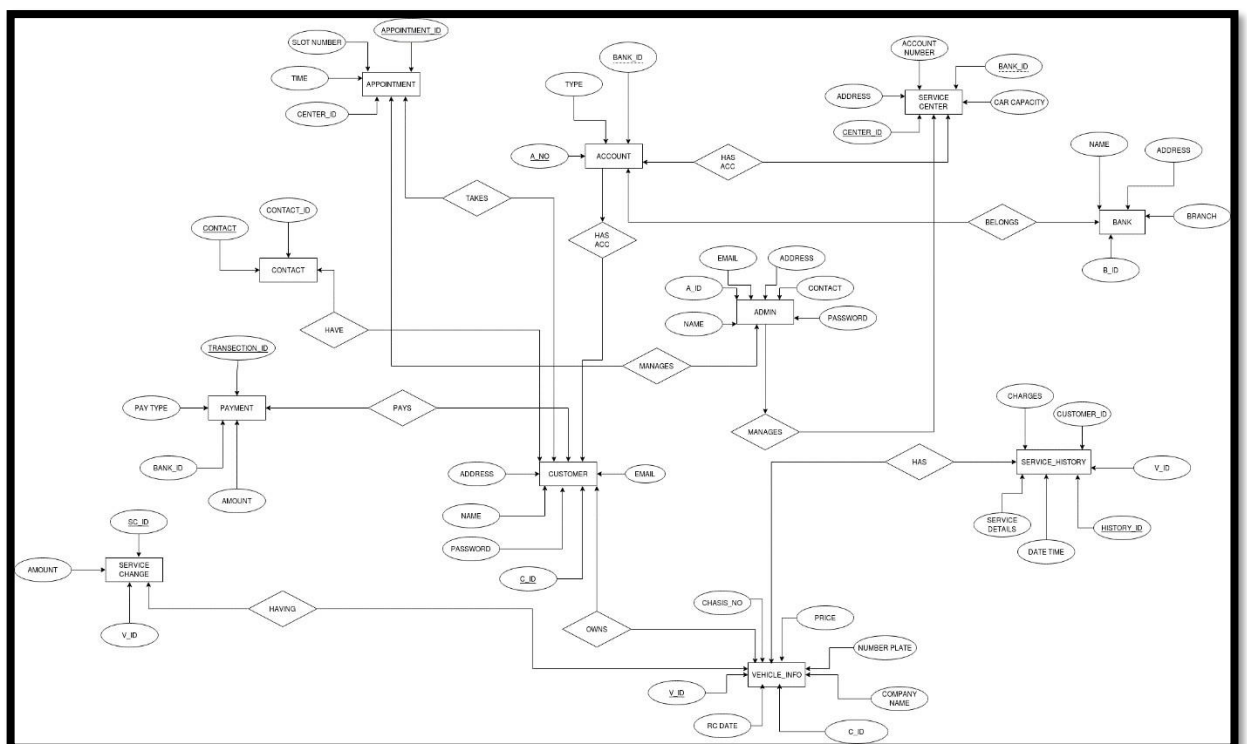


Fig:3.4.2 E-R diagram iteration 2

## Use CaseDiagram

Iteration 1:

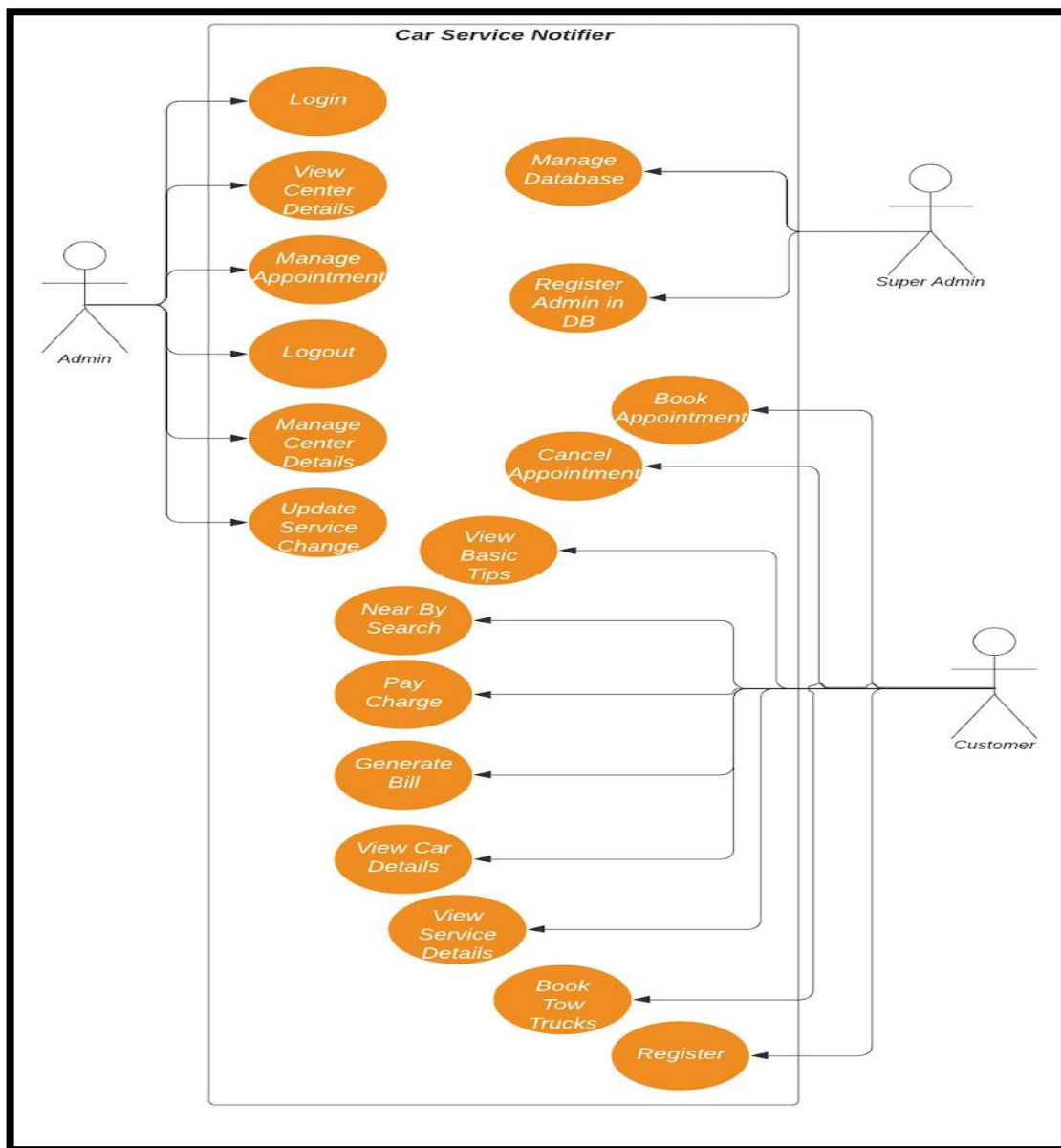


Fig:3.5.1 Use case diagram iteration 1

## Iteration 2:

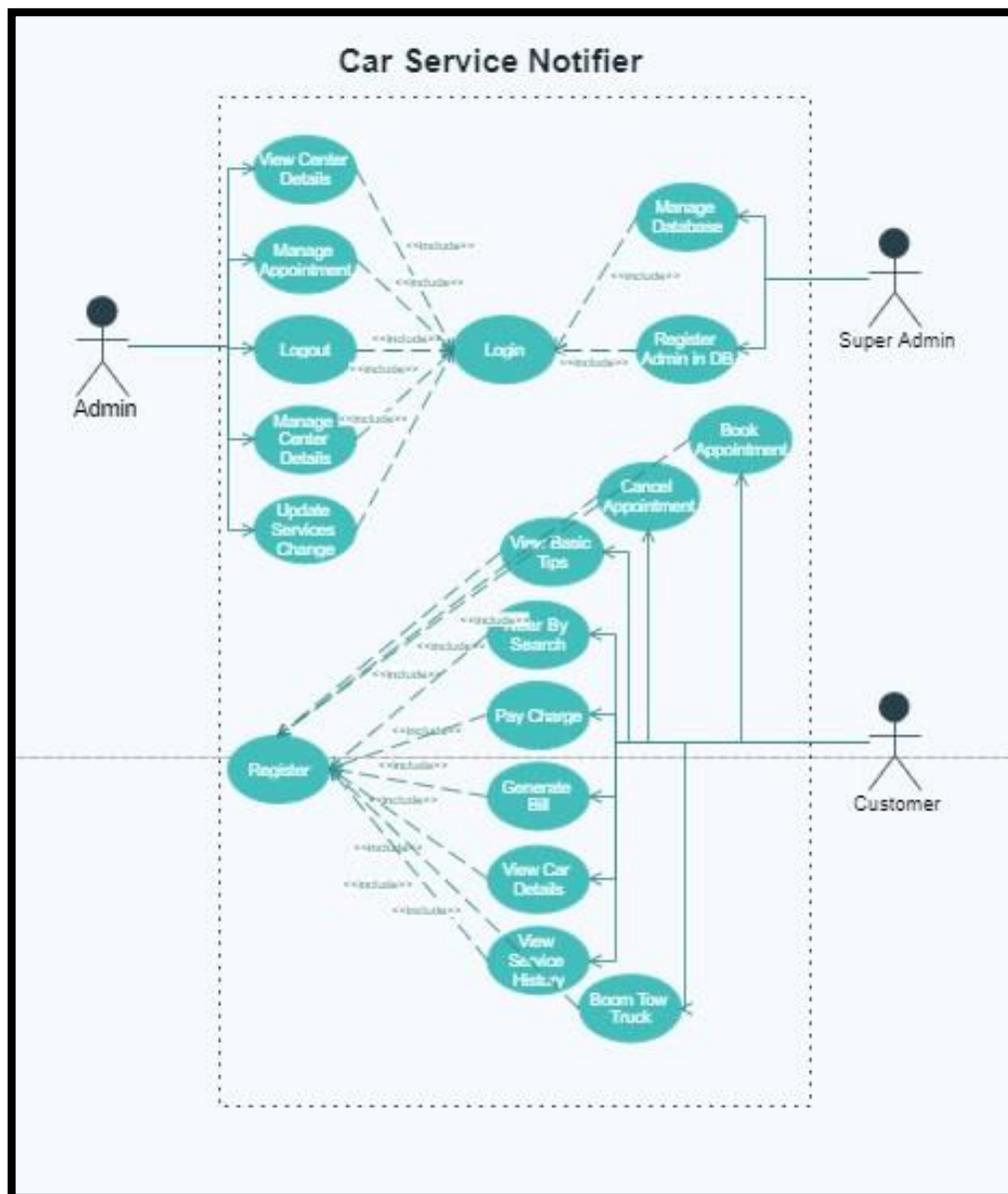


Fig:3.5.2 Use case diagram iteration 2

## Class Diagram

Iteration 1:

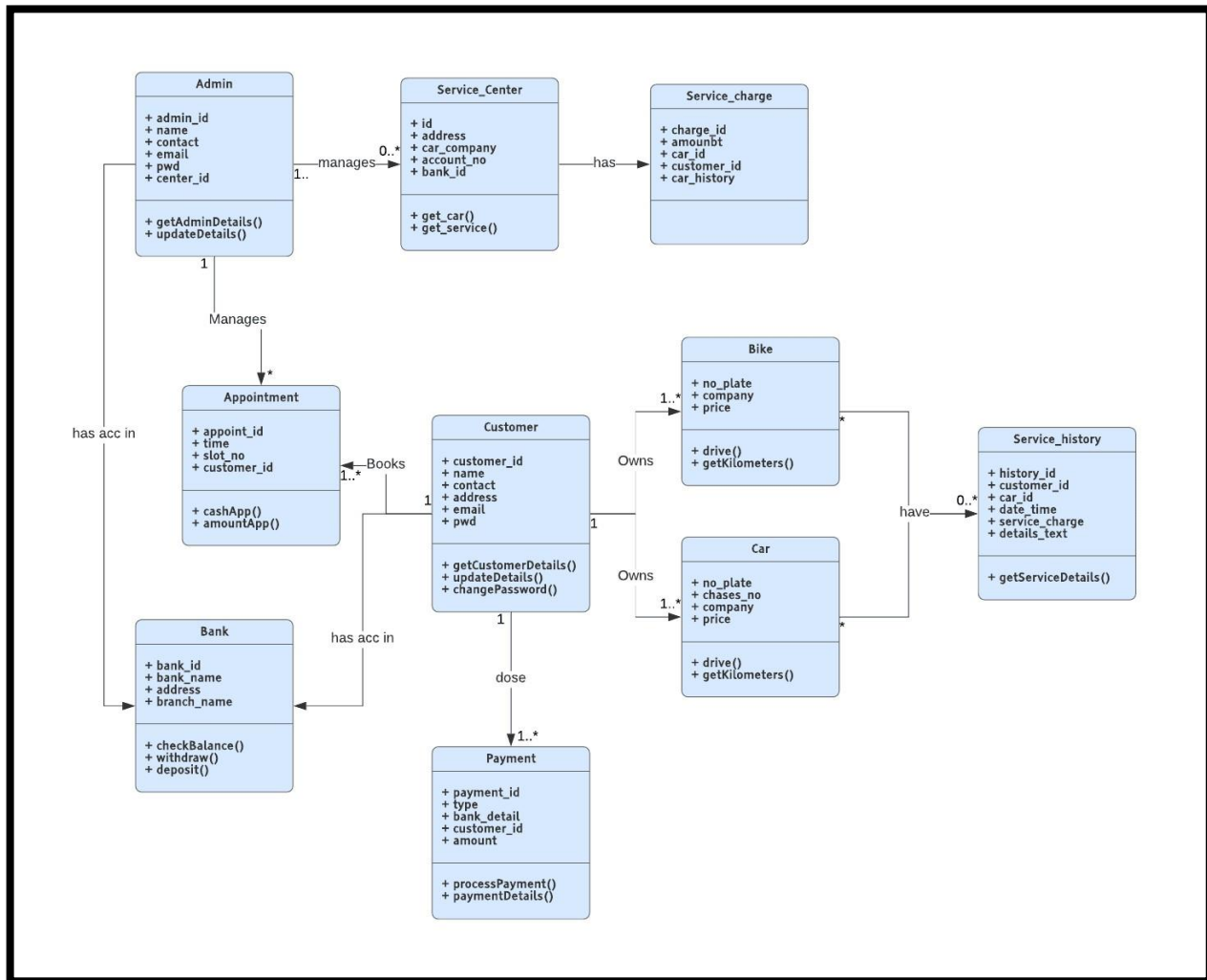


Fig:3.6.1 Class diagram iteration 1

## Iteration 2:

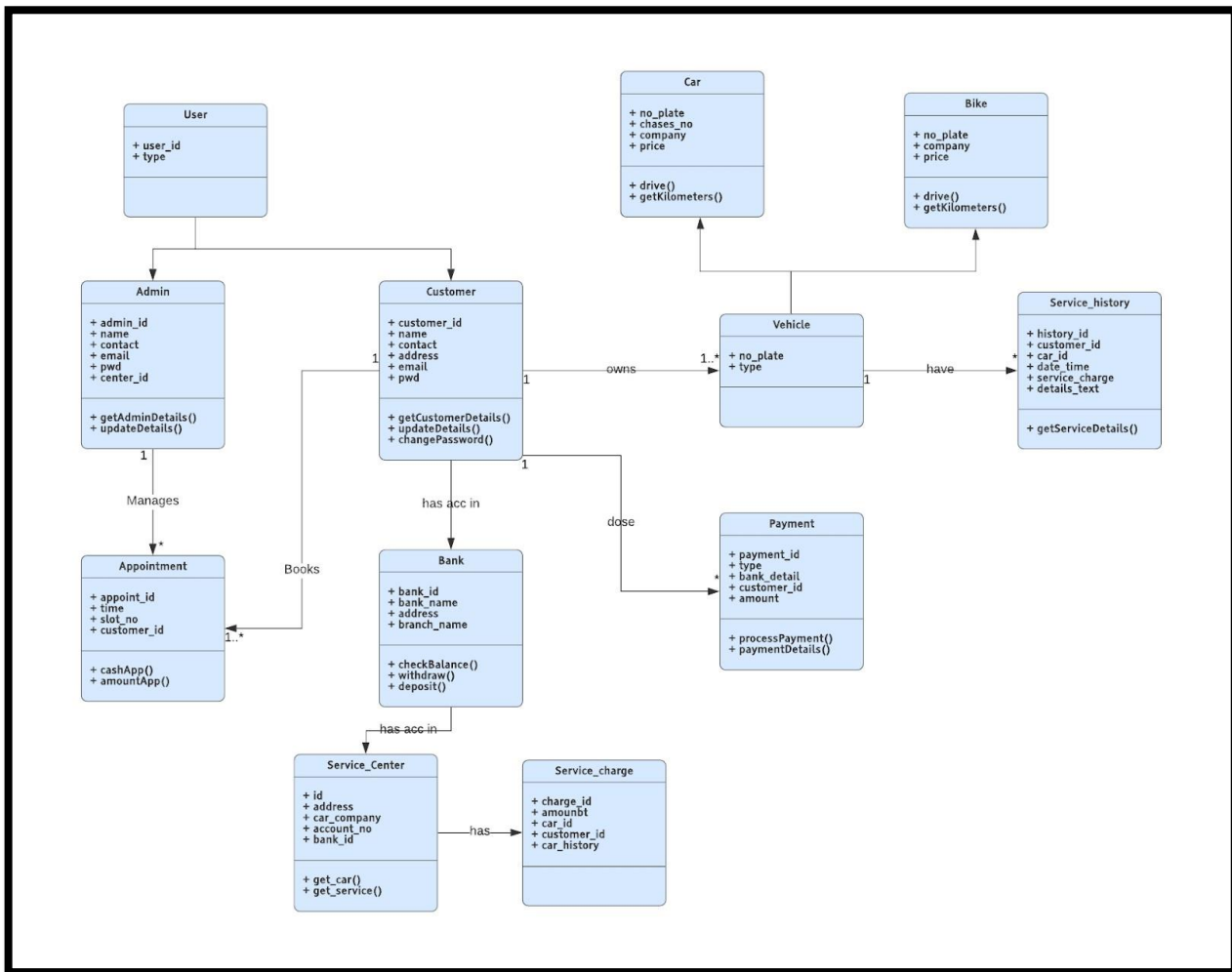


Fig:3.6.2 Class diagram iteration 2

## **Product Development Canvas**

This exercise is meant for giving strategic orientation to the project of each team so that it achieves its true goal as defined by previous canvas exercise. This exercise is more about developing strategy for the proposed product/solution design, after the team has successfully attempted the ideation process and has incorporated inputs from all stakeholders. A product development canvas is the ground where the best possible ideas after the ideation session are pitched and nurtured to develop.

### **Purpose**

- Searching for service center is easy
- Reduce workload of customer/service provider
- Saving time

### **People**

- Manager
- Mechanic
- Customer

### **Product Experience**

- Reliable
- Easy way to submit request
- Notification as response (time)
- User friendly

### **Product Function**

- Submit request (anywhere, anytime)
- Enter service time manually
- Service slot time as notification
- Payment through (online/cash)

### **Product Feature**

- Manually set service time
- Notification for car service
- Searching car service center

### **Components**

- Laptop
- Android studio
- Micro controller
- Smart phone
- Sensors



Iteration 1:

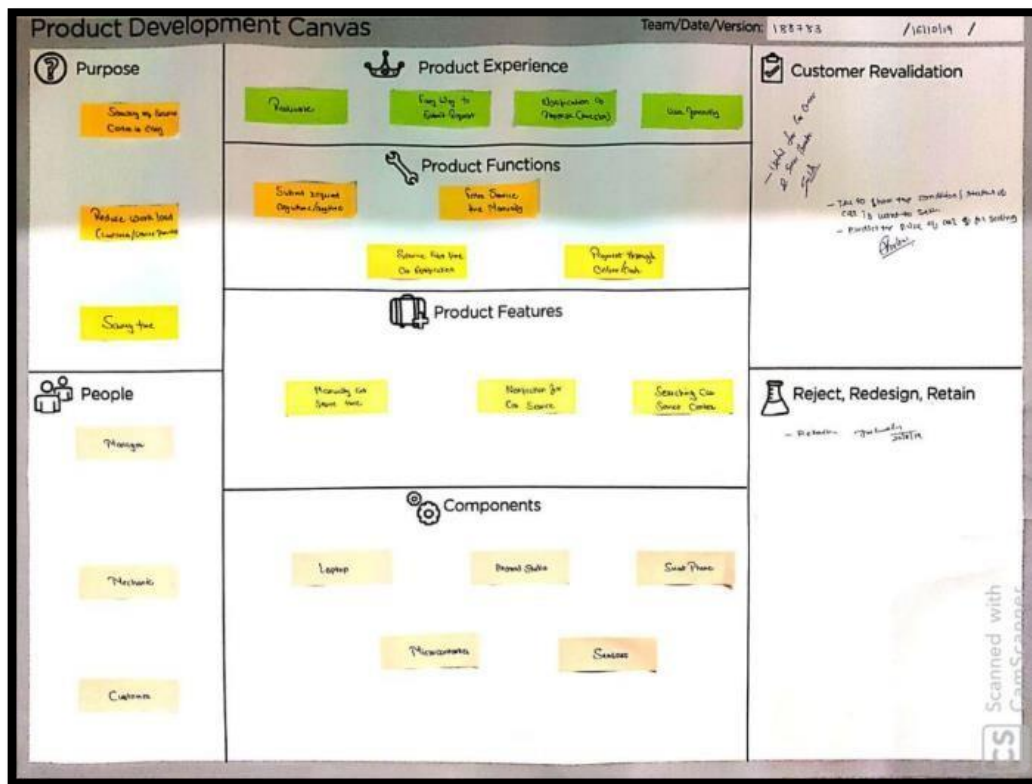


Fig:3.7.1 PDC Canvas iteration 1

Iteration 2:

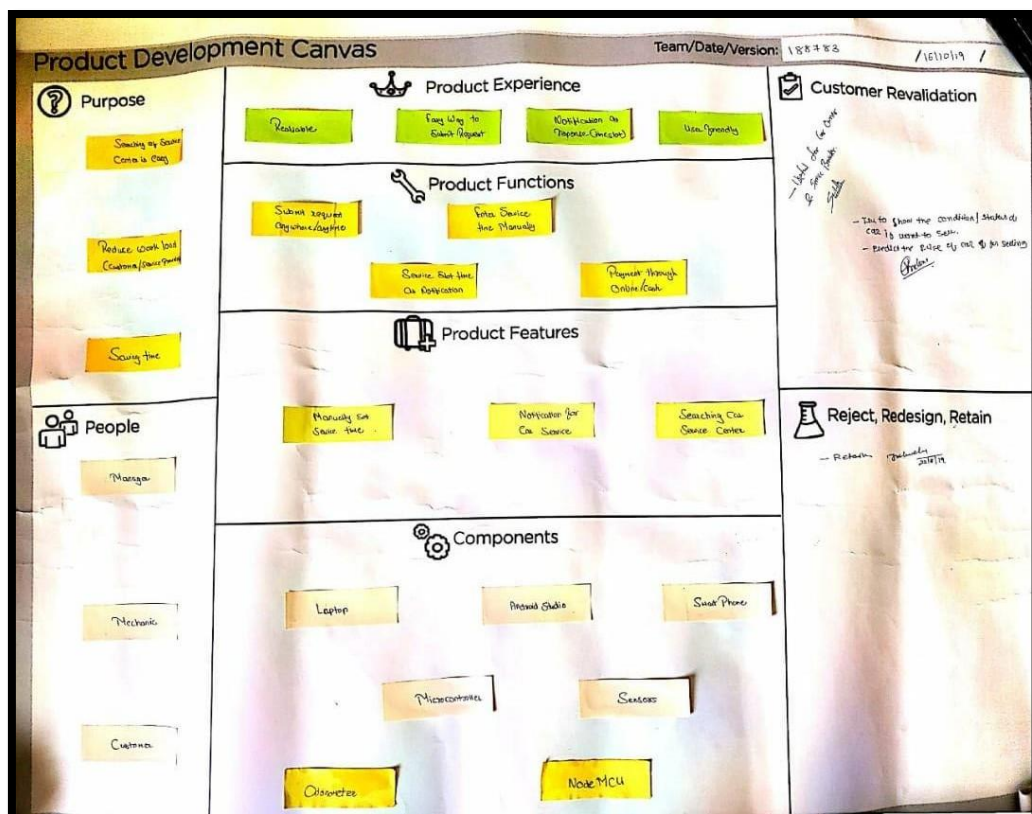


Fig:3.7.2 PDC Canvas iteration 2

## **CHAPTER 4: FEEDBACK ANALYSIS**

## Feedback Analysis

- Try to show the condition/status of car while servicing.
- Predict the price of a car for selling.
- Useful for car owner and service provider.
- Give some suggestions about how to maintain your car/bike.

## CHAPTER 5: DETAIL DESIGN CALCULATION

## Design Performance, Safety and Reliability

### Performance

- Better than online car service system with more efficiency .

### Safety

- Our system uses payment gateway for transaction and if any vehicle broke down then our system provides nearest service center locations.

### Reliability

- Failure: Due to sensor breakdown or electricity failure.
- Reliable: It would work in any other situations except in one of the above mentioned situations.

## Design For Ergonomics And Aesthetics

### Ergonomics

#### Physical:

- Physical ergonomics is concerned with human anatomy, and some of the anthropometric, physiological and bio-mechanical characteristics as they relate to physical activity.
- Since our idea is basically related to a movie ticket generator, the app won't give any additional trouble, as people would be able to access the vending machine normally just as they access vending machine for railway tickets.

#### Cognitive:

- As this project deals in showing the ticket details just storing and providing information, it doesn't make any significant cognitive impact upon the user.

#### Organizational:

- For an app as this, there are sections like front end, designing, back end, database management, etc. which need to be handled. The project brings in proper work system, team-work and cooperative work as each sector is dependent on one or the other sector.

## Design for Manufacturability and Assembly

- Ease of manufacture and ease of assembly are ensured by usage of strong back end languages which provide a better framework for assembling the back end and front end on various platforms. As we are dealing with hardware equipment, so we will be required to manufacture and assemble the parts to complete the project.

## Design for Cost and Environment Cost

- **COCOMO model:**

COST : Our project lies in semidetached type of cocomo model

$$KLOC = 120K$$

$$\text{Effort} = a_1 * (KLOC) a_2 \text{ PM}$$

$$= 3.0(120)1.12 \text{ PM}$$

$$= 730 \text{ PM}$$

$$\begin{aligned}\text{Time} &= b_1 * (\text{efforts}) b_2 \text{ Months} \\ &= 2.5(730)0.35 \text{ Months} \\ &= \mathbf{14 \text{ Months}}\end{aligned}$$

• **Function point metric:**

Number of External Inputs(EI) :

- |           |          |
|-----------|----------|
| • Simple: | 30x3=30  |
| • Average | 25x4=100 |
| • Complex | 50x6=300 |

Number of External Output (EO):

- |           |       |
|-----------|-------|
| • Simple  | 1x4=4 |
| • Complex | 1x7=7 |

Number of external inquiries (EQ) :

- |           |        |
|-----------|--------|
| • Complex | 2x6=12 |
|-----------|--------|

Number of internal file (ILF) :

- |           |         |
|-----------|---------|
| • Simple  | 1x7=7   |
| • Average | 1x10=10 |
| • Complex | 2x15=30 |

Number of external interfaces (EIF):

- |           |         |
|-----------|---------|
| • Complex | 1x10=10 |
|-----------|---------|

<b>Total</b>	<b>510</b>
--------------	------------

F1. Data Communication	3
F2. Distributed Data Processing:	0
F3. Performance:	3
F4. Heavily Used Configuration:	5
F5. Transaction Role:	0
F6. Online Data Entry:	5
F7. End-User Efficiency:	3
F8. Online Update:	5
F9. Complex Processing:	4
F10. Reusability:	0
F11. Installation Ease:	3
F12. Operational Ease:	3
F13. Multiple Sites:	0
F14. Facilitate Change:	0
<b>Total</b>	<b>34</b>

$$\begin{aligned}\text{FP} &= \text{Total\_count} * [0.65 + (\text{fi}) * 0.01] \\ &= 510 * [0.65 + 34 * 0.01] \\ &= \mathbf{504.9}\end{aligned}$$

### Modelling and Analysis using Software

- The project consists of 2 main actors, customers and the admin who would be interacting with the system maintaining the statistics and look into the smooth functioning of each and every

vehicle service details. The simple use cases involved would be of viewing service history details, checking for timings of service slots and allocate service slots to the customer for his/her vehicles , calculate costs and provides online payment options.

### **Prototyping and Proofing of Concepts**

- We created a system to provide the functionalities and working of the objectives we want to apply at large scale.
- By prototyping we acquired the working of the project at small scale

### **Engineering Economics Of Design**

- By using engineering economics we analyzed the procedure .
- It assisted us in decision making within the engineering design process

### **Design For Use, Reuse And Sustainability**

#### **Use**

- How long this design will work.
- As long as proper maintenance is provided, our system will work efficiently and effectively for years.

#### **Reuse**

- The system can be reused until its functionalities work properly and we can even modify or upgrade the functionalities.

#### **Sustainability**

- The system is sustainable because it reduces paper work and all the details are maintained digitally.

### **Test the Prototype**

- Testing the prototype is an important step in designing process.
- We tested our prototype to see if any issues or bugs existed and made the necessary changes.

### **Ethics in Design**

- Engineering design ethics concerns issues that arise during the design of technological products, processes, systems, and services. This includes issues such as safety, sustainability, user autonomy, and privacy. Ethical concern with respect to technology has often focused on the user phase.

## CHAPTER 6: PROTOTYPE AND TESTING



## Prototype

This system consists of two users:

- Customer
- Service provider

For customer we will be providing mobile application which has following:

- Searching for nearest service station
- Custom time slot selection for servicing a car
- Alert for car servicing on regular intervals
- Basic tips for car to maintain its state

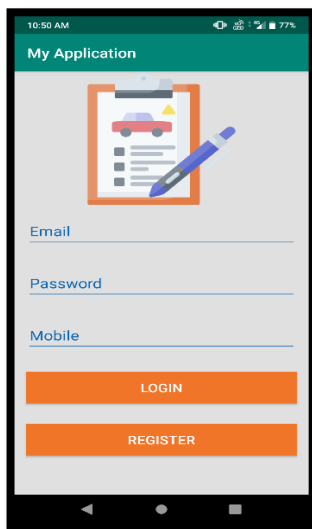


Fig: 6.1.1 Application screenshot 1

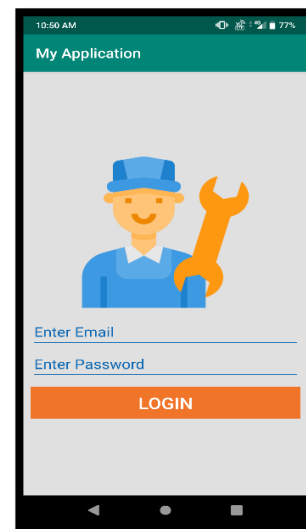


Fig: 6.1.2 Application screenshot 2

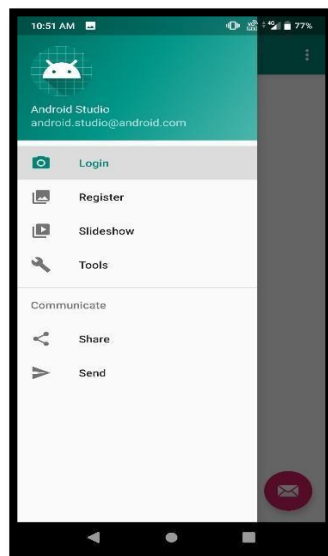


Fig: 6.1.3 Application screenshot 3

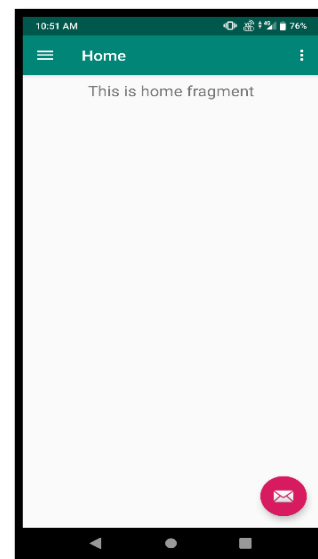


Fig: 6.1.4 Application screenshot 4

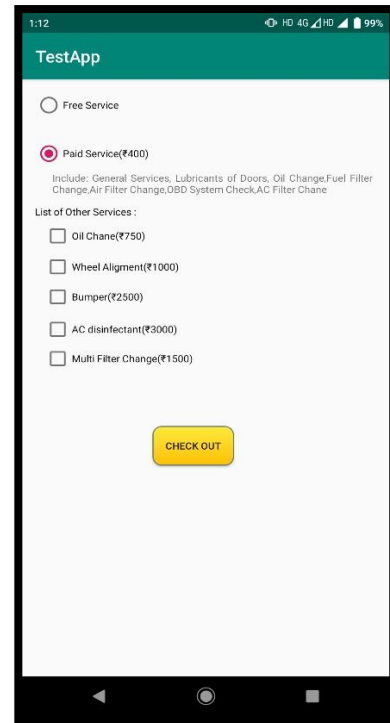
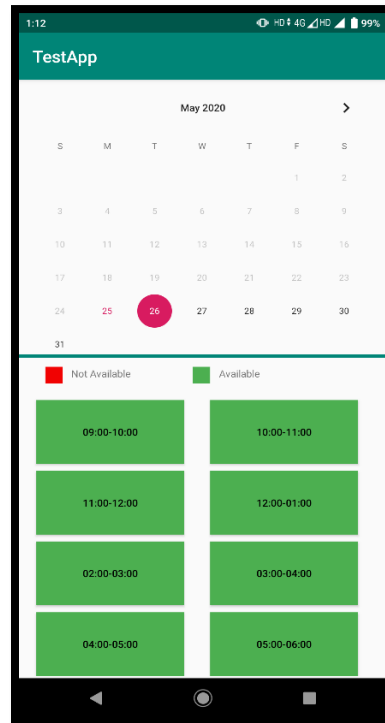
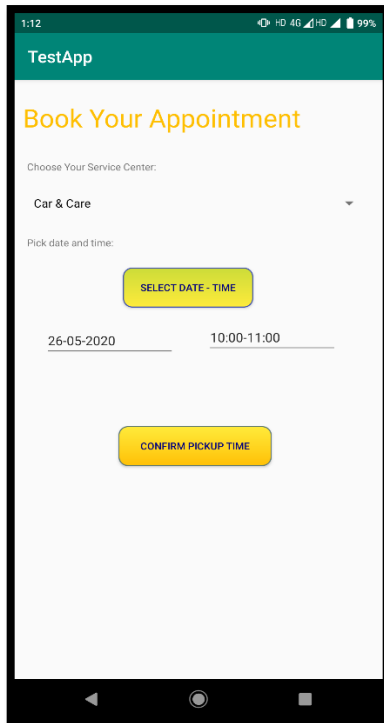


Fig: 6.1.5 Application screenshot 5    Fig: 6.1.6 Application screenshot 6    Fig: 6.1.7 Application screenshot 7

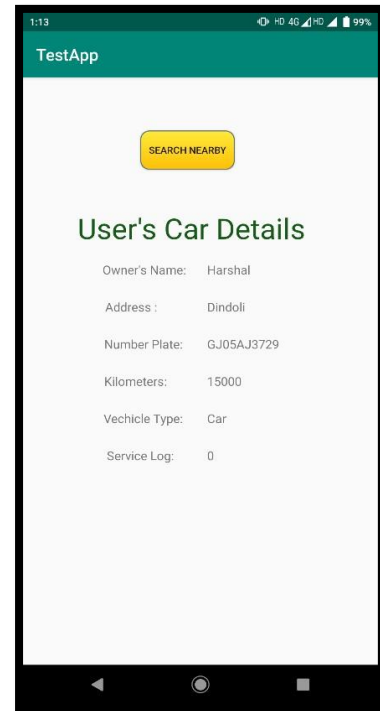
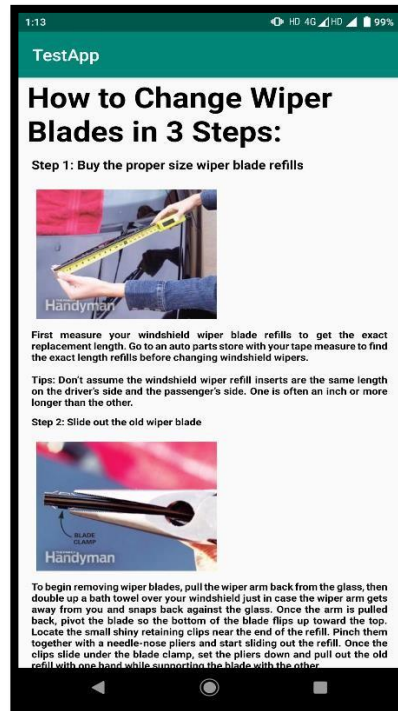
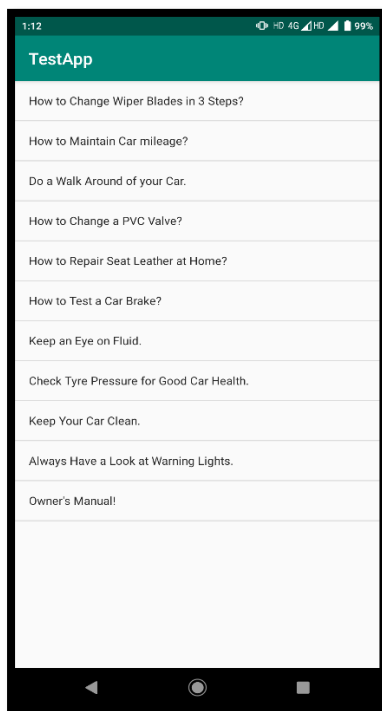


Fig: 6.1.8 Application screenshot 8    Fig: 6.1.9 Application screenshot 9    Fig: 6.1.10 Application screenshot 10

For service provider we will be providing website (Admin panel) which includes:

- Information of all cars in workshop
- Information of customer
- Status of car
- Vehicle maintenance log
- Manually allocating mechanic to a car

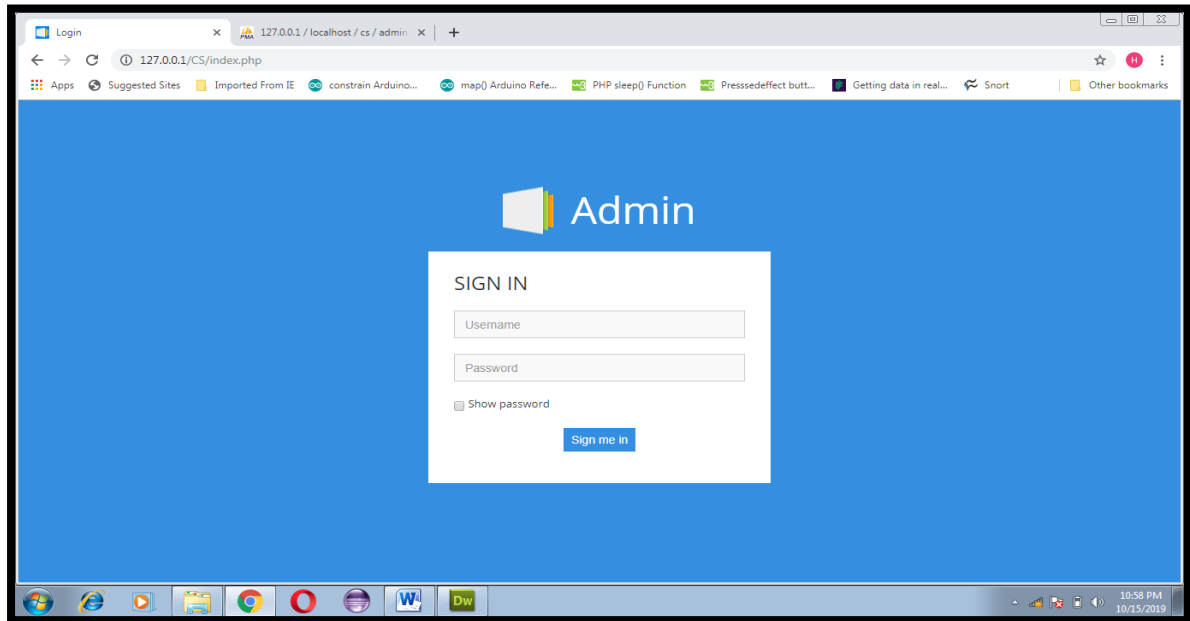


Fig:6.1.11 Website screenshot 1

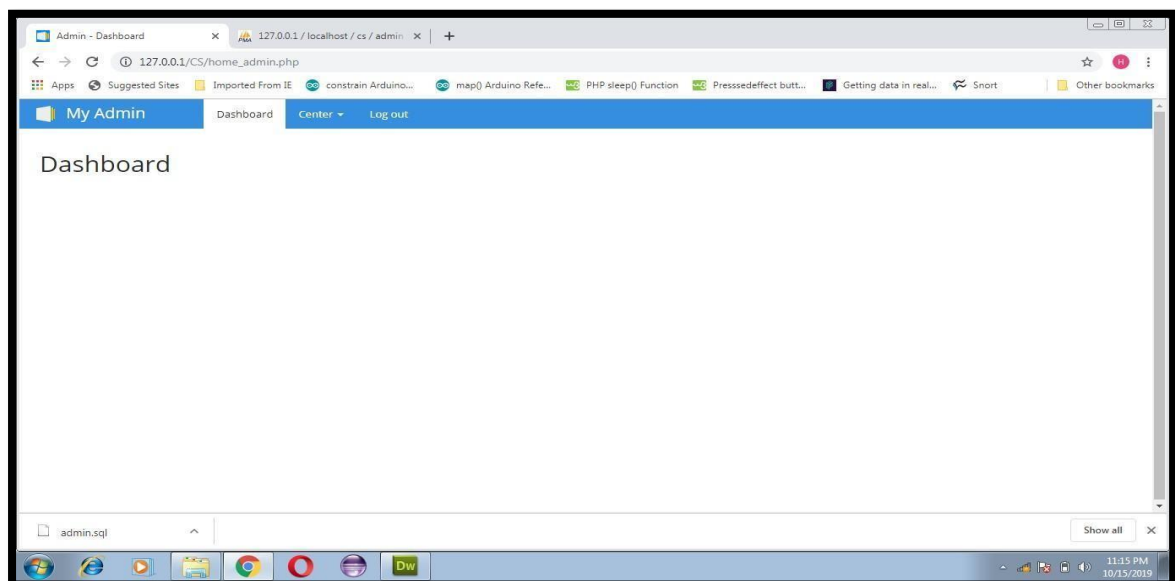


Fig:6.1.12 Website screenshot 2

The screenshot shows a web browser window with the URL `127.0.0.1/CS/add_center.php`. The page has a blue header with 'My Admin' and navigation links: 'Dashboard', 'Center', and 'Log out'. A dropdown menu under 'Center' shows 'Add Center' (selected) and 'Update Center'. The main content area is titled 'Add Center' and contains a form with the following fields:

Center Name	<input type="text"/>
Center address	<input type="text"/>
Center Account	<input type="text"/>
Confirm Account	<input type="text"/>
Selectr Bank	<input type="text" value="Bank Of Baroda"/>
Center Contact	<input type="text"/>

At the bottom of the form are 'Submit' and 'Cancel' buttons. The browser's taskbar at the bottom shows the time as 11:16 PM on 10/15/2019.

Fig:6.1.13 Website screenshot 3

The screenshot shows a web browser window with the URL `127.0.0.1/CS/update_center.php`. The page has a blue header with 'My Admin' and navigation links: 'Dashboard', 'Center', and 'Log out'. A dropdown menu under 'Center' shows 'Add Center' and 'Update Center' (selected). The main content area is titled 'Update Center' and contains a form with the following fields:

Center Name	<input type="text" value="Service center"/>
Center Address	<input type="text" value="dindoli"/>
Center Contact	<input type="text" value="56565"/>
Center Account	<input type="text" value="35346544937"/>
Center Bank	<input type="text" value="State Bank OF India"/>

At the bottom of the form are 'Update' and 'Cancel' buttons. The browser's taskbar at the bottom shows the time as 11:16 PM on 10/15/2019.

Fig:6.1.14 Website screenshot 4

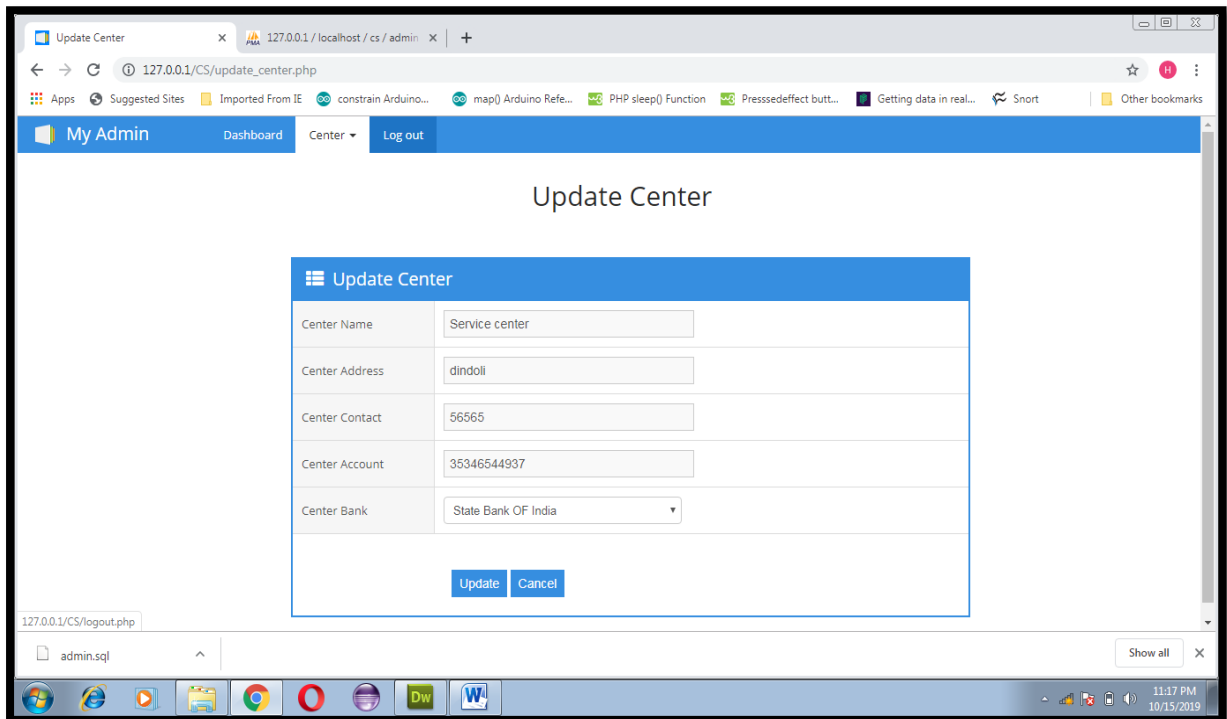


Fig:6.1.15 Website screenshot 5

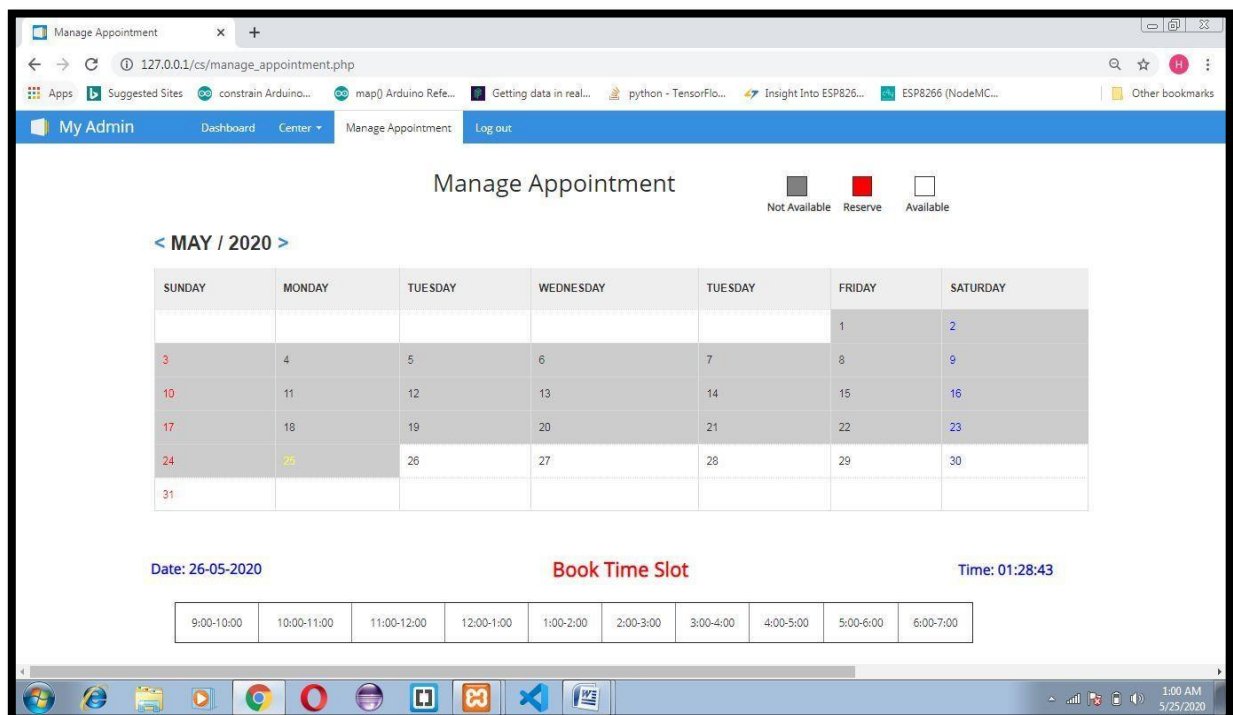


Fig:6.1.16 Website screenshot 6

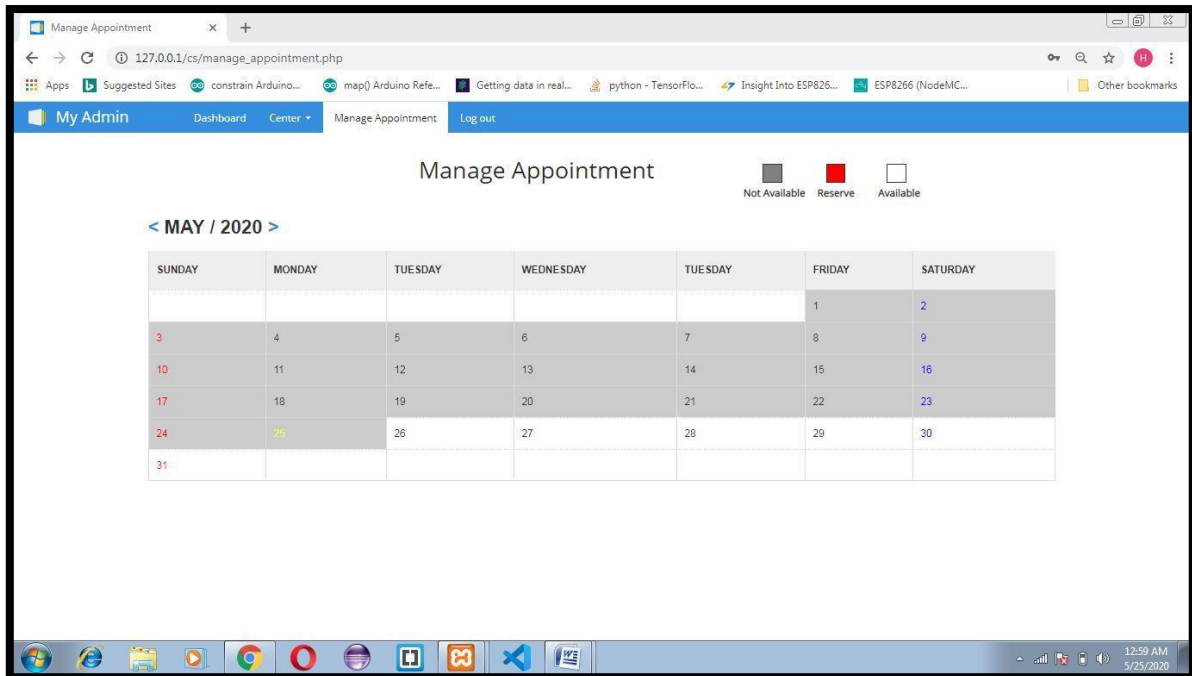


Fig:6.1.17 Website screenshot 7

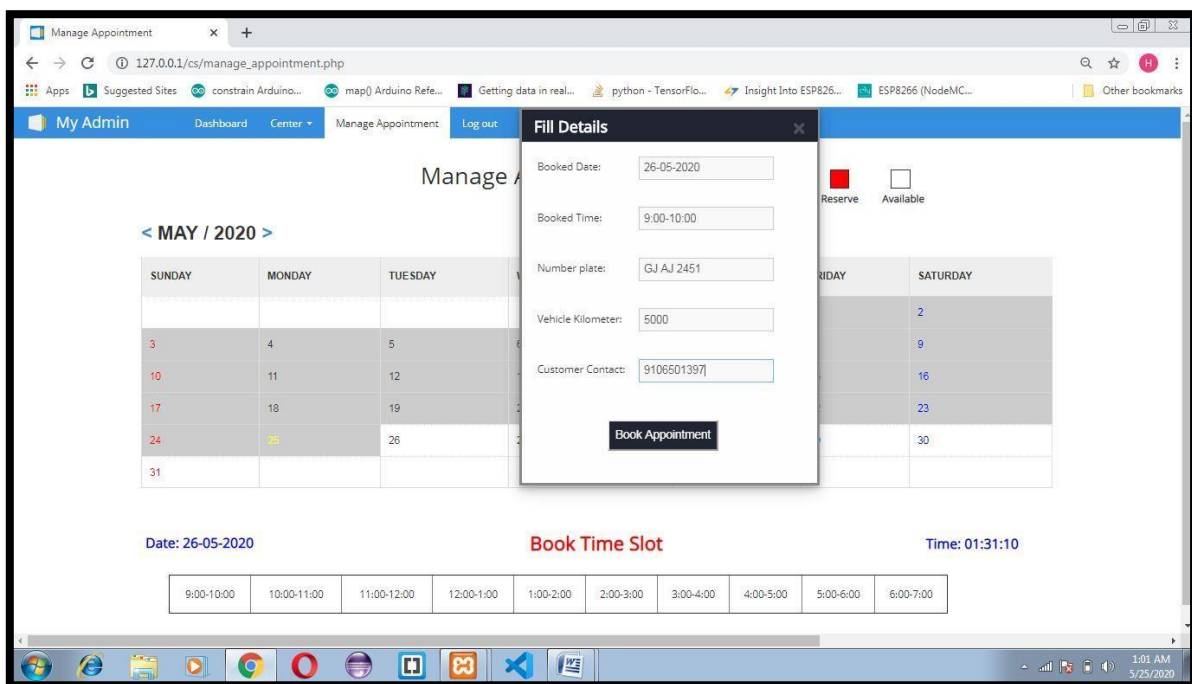


Fig:6.1.18 Website screenshot 8

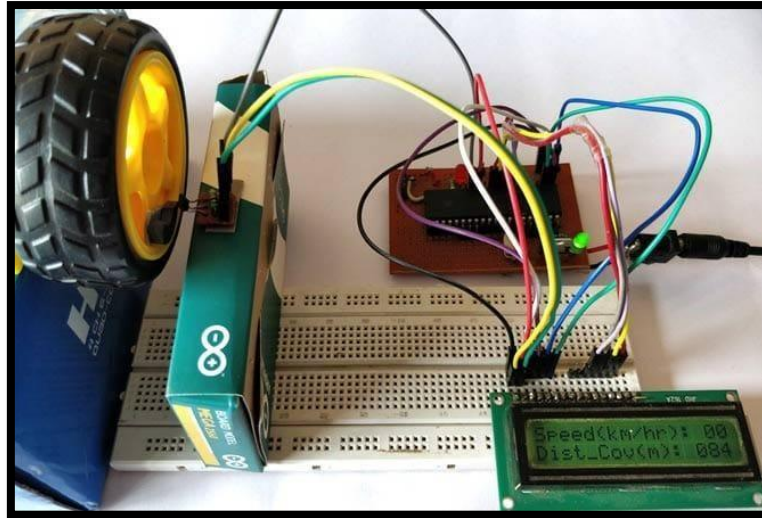


Table:6.1.19 Hardware interface

### Testing

Sr. No.	Functional Test Cases	Type-Negative/ Positive Test Case
1	Verify if a user will be able to login with a valid username and valid password.	Positive
2	Verify if a user cannot login with a valid username and an invalid password.	Negative
3	Verify the login page for both, when the field is blank and Submit button is clicked.	Negative
4	Verify the messages for invalid login.	Positive
5	Verify the 'Remember Me' functionality.	Positive
6	Verify if the data in password field is either visible as asterisk or bullet signs.	Positive
7	Verify if a user is able to login with a new password only after he/she has changed the password.	Positive
8	Verify if the login page allows to log in simultaneously with different credentials in a different browser.	Positive
9	Verify if the 'Enter' key of the keyboard is working correctly on the login page.	Positive
10	Verify if a user cannot enter the characters more than the specified range in each field (Username and Password).	Negative
11	Verify if a user cannot enter the characters more than the specified range in each field (Username and Password).	Positive
12	Verify the login page by pressing 'Back button' of the browser. It should not allow you to enter into the system once you log out.	Negative

Table:6.2.1 Test cases

## CHAPTER 7: CONCLUSION



## Conclusion

Hereby we conclude that this system not only suffices customer/owner of car, but also helps service industry with better work efficiency instead of handling customers personally and with this project we have also learned to solve real time problems, even with this there are still possible solutions which could further enhance the system.

## Future scope

- Customer will be able to track his/her car while sending/receiving (by employee) from work station.
- By installing specific sensors in a car, system will be able to detect some specific faults in a car by itself.

## CHAPTER 8: REFERENCES

## 8.1 References

- <https://patents.google.com/patent/US8190322B2/en?q=Autonomous+vehicle&q=maintenance&q=repair&q=system&oq=Autonomous+vehicle+maintenance+and+repair+system>
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