

**DESIGN AND DEVELOPMENT OF A CAR MAINTENANCE SYSTEM**

**BY**

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This Report Presented in Partial Fulfillment of the Requirements for the  
Degree of Bachelor of Science in Computer and Engineering

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**DAFFODIL INTERNATIONAL UNIVERSITY**

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**JANUARY 2023**

## APPROVAL

This Project titled “**Design and Development of a Car Maintenance Mobile System**”, submitted by Md. Mobin Hosen Chowdhury to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B Sc. In Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 19 January 2023.

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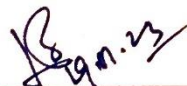
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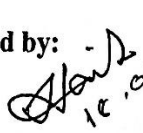
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## DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Dr. Sheak Rashed Haider Noori, Professor, Department of CSE** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

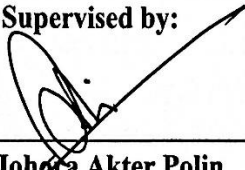
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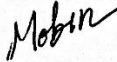
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Finally, we must acknowledge with due respect the constant support and patients of our parents.

## **ABSTRACT**

In our daily life, mobile applications are becoming increasingly vital. Now, mobile is one of the most important parts of technology. Developers try to make the best application that makes life easier. There are many mobile applications available in different types of application stores. I have developed this application through Flutter because this application runs on Android and iOS two operating systems. The Car maintenance application provides full access to the customer, with all types of vehicle emergency services in just a click, and also, they can add their paper to set reminders for up to date. The customers can log in with their email and password. After login in, customers can find two options. The first option helps to save important papers like a Driving license, Car fitness, and Tax token they can also set a reminder to make their paper up to date. Another option provides various services like Oil, Engine, Wheel, Gas, and Brake services for the customer. The customer can select which service they want. Customers can also describe the service that is needed for the vehicle. According to the service selected, the cost of booking has to be paid. They can move on to the payment gateway where the payment is done. The service provider will contact the customer for confirmation. Then the service man locates the customer and provides the service.

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# CHAPTER 1

## Introduction

### 1.1 Introduction

Smartphones are now providing us with advanced technologies similar to a desktop or laptops. Smartphones have many features and software. We can get easy access to this software. In the morning most people check first their smartphone. Nowadays most people carry smartphones everywhere in our country. Like smartphones, people are now very interested in using cars and there are many car users in every corner of our county. Our country is improving day by day and people's lifestyles have changed so people are also showing interest in using cars. Car plays a very important role in our life in terms of transportation. It is impossible that the driver did not face the problem of a car breakdown.

I am trying to make a car maintenance app. This app helps hair mechanics just click to repair any four-wheeler vehicle and save personal documents like a driving license, tax token, and fitness paper. The application will send a reminder to the user to make the paper up to date. Many people forgot to renew their personal car important documents. Many times, cars stop working in travel time, meanwhile, people can't find any mechanic. It was a very problematic situation for travelers. Using the app people can easily get a hair mechanic for repairs.

### 1.1 Motivation

Many times, people forget to remember the expiry date of documents like driving licenses, Tax tokens, and Car fitness. A car needs proper maintenance. If you do not remember all who think you will face many problems. You will get punished by the traffic police. Because you don't have up-to-date papers.

Many times, the car stops on the way due to mechanical problems. It is not clear what caused the car to stop. For this situation, you need a mechanic to solve this problem but many times a mechanic is not available, and a good mechanic is suspected of not being able to do the job properly. For these kinds of problems, I try to make a car maintenance

app. It will help people to hire mechanics and keep their car's relative personal documents up to date.

## **1.2 Objective**

The main objective of this project is to help vehicle users to find mechanics for services and also help their vehicle relative paper up to date. The purpose of this project is to connect the vehicle users with the vehicle serviceman. We can write our project objectives as follows.

- Providing service information.
- Finding vehicle necessary services.
- Know about the document expiration date.
- Connecting vehicle users with the mechanic.
- Know about new offers and discounts.
- Get your location with one click.
- Vehicle mechanics get more servicing work.
- Customers can find mechanics more easily.

## **1.3 Expected Outcome**

The expected outcomes of my mobile application are discussed below:

With this application, users can find their vehicle services and make their car relative papers up-to-date. This will help to make users' vehicles easier to use. Users will get vehicle service faster. Users can know about those services in detail. Users can find their location and hair near mechanics easily. Users can see mechanic information which helps them to find mechanics. Users can get an easy payment system for paid service charges. The application user interface is simple so users can easily use this application.

A service provider gets more customers for this application. Service providers can also add new mechanics and edit their information. Service providers can find the request that the user sent. Service providers can update their service information. All things will help to

make their service easy to provide and all the users of this application will get the best services.

## **1.5 Report Layout**

Here on this project, I try to explain my full project report in six (6) layouts. For better understanding, I have discussed the full project in six layouts with clarity. Given below:

First Layout: The first layout is about the introduction to a project, the motivation for the project, the objective of this project, and expected outcomes. In this layout, I was trying to explain the overview of my application in short. I have explained the motivation behind the application.

Second Layout: In this layout, I will explain the background of my project. How I get ideas for my project and what challenges I have faced when trying to implement them. I also explain related work for my application and comparative analysis for this application.

Third Layout: I have explained in this layout in detail the business processing model, requirements collection and analysis, use case modeling, logical data modeling, and design requirements.

Fourth Layout: I have explained in this layout in detail about the front-end design, back-end design, interaction with the system, and user and implementation requirements.

Fifth Layout: I have explained in this layout in detail about the implementation of the database, and testing implementations, and also give testing results and reports of my application.

Sixth Layout: I have explained in this layout this project report's conclusion and scope for future works and modifications.

## CHAPTER 2

### Background Study

#### 2.1 Introduction

Nowadays car users are increasing day by day. Cars have an important role in transport. Many people use it daily. Cars occasionally need service and repair. Car owners face a lot of problems when their car suddenly breaks down while traveling and there is no mechanic garage nearby. Now, most people use smartphones and if their car breaks down anywhere, they can contact a mechanic through this mobile application and fix any problem with their car. Car owners can save car relative documents in this application. This application will help the car owner to faceless car-related problems.

#### 2.2 Related Works

##### A. Drivvo

This application is free. It is a service like tracking fuel how much in your car, services, and registration cost in one place. It shows different types of category expense information in a graph. Users gave feedback for this application that “Support is super-fast, professional.”

##### Related Image:



Figure 2.2.1 Drivvo

## B. CARFAX Car Care

This application is free. This application provides services to just 8 vehicles. It helps to set service reminders based on your car model and sends alerts for services. Users can save documents here. Users gave feedback for this application that “they love this application because it automatically uploads when you have service done.”

### Related Image:



Figure 2.2.2 CARFAX Car Care

## C. Fuely

This application is also freely available in the play store. This application helps user wants their car servicing information in multiple places. This application automatically collects information about cars to your account on Fully.com. This application also offers users vehicle customization.

### Related Image:

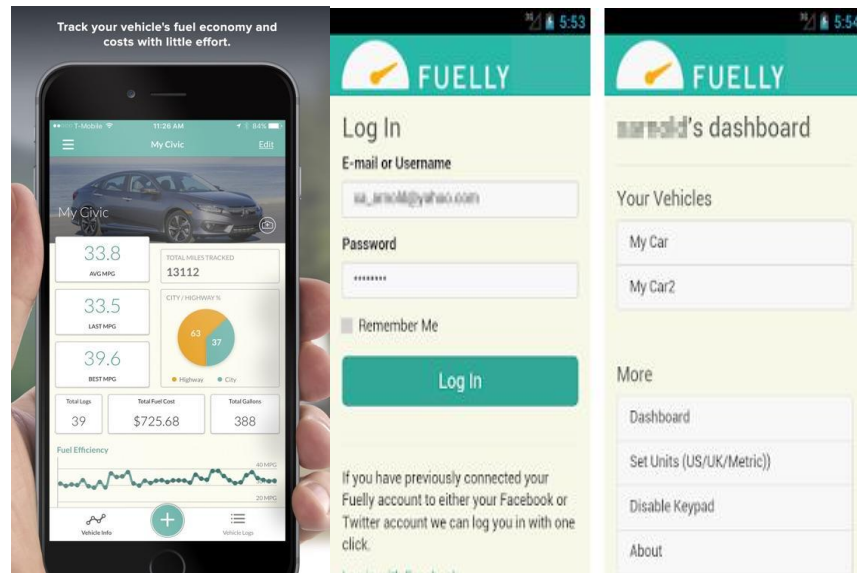


Figure 2.2.3 Fuely

## 2.3 Comparative Studies

I found some applications in different types of application stores all about car services. These applications provide different services for different vehicles. Another application helps the car owner to see how much oil is in a car by sending reminders related to various services. Another application helps to provide servicing recommendations and records. These applications provide car owner service costs at different locations. But those applications cannot provide accurate information about car services in Bangladesh. Those applications have limitations to provide accurate service information to Bangladeshi users. Those applications do not have any mechanic hiring facility. In my mobile application, Users will get service relative notifications and they can set the reminder of the car relative papers and if necessary, they can hire the mechanic for the car service.

## 2.4 Scope of the Problem

This is a car maintenance application. While making this application I have to face many problems and the problem is given below:

**Large size:** The size of the application has increased due to adding some image files and animation to make the application look nice and cool. Another reason behind the increase in the size of the application is its unnecessary features. Due to the increase in the size of the application in many cases the application may or may not run on older version smartphones. So, I changed unnecessary features and used backend storage to store images, and animation files. It helps me to reduce application size.

**Time management:** The application takes too much time to load. Many times, applications take a long time to find a mechanic. Because the mechanic information comes from the database. Then I set after matching the address a mechanic is selected and shown to the user.

## **2.5 Challenges**

Working on a new project is very challenging. Working with Flutter in mobile app development is much more challenging. In the beginning, I was facing many problems due to having very little work knowledge and experience. This app has to be developed slowly by learning. The user interface is very important in developing an app and it took me a lot of time to develop it. App user account authentication. And when the user sends a request to hire a mechanic, presenting the mechanic with the mechanic's information from the database was a very difficult task. It took a lot of time and effort to figure out how a user's information and requests would go into the database and show that information back to the user interface. All in all, the whole project was a big challenge to build.



# CHAPTER 3

## Requirement Specification

### 3.1 Business Process Model

Business Process Modelling (BPM) is a modern term and methodology which gives the administration a simple way to understand and optimize the efficiency of connecting activities in the supplying of a product or service. Business Process Modelling techniques are concerned with 'mapping' and 'workflow' to facilitate understanding, analysis, and positive change. Diagrams essentially 'flow diagrams' - are a main characteristic of the methodology.[2]

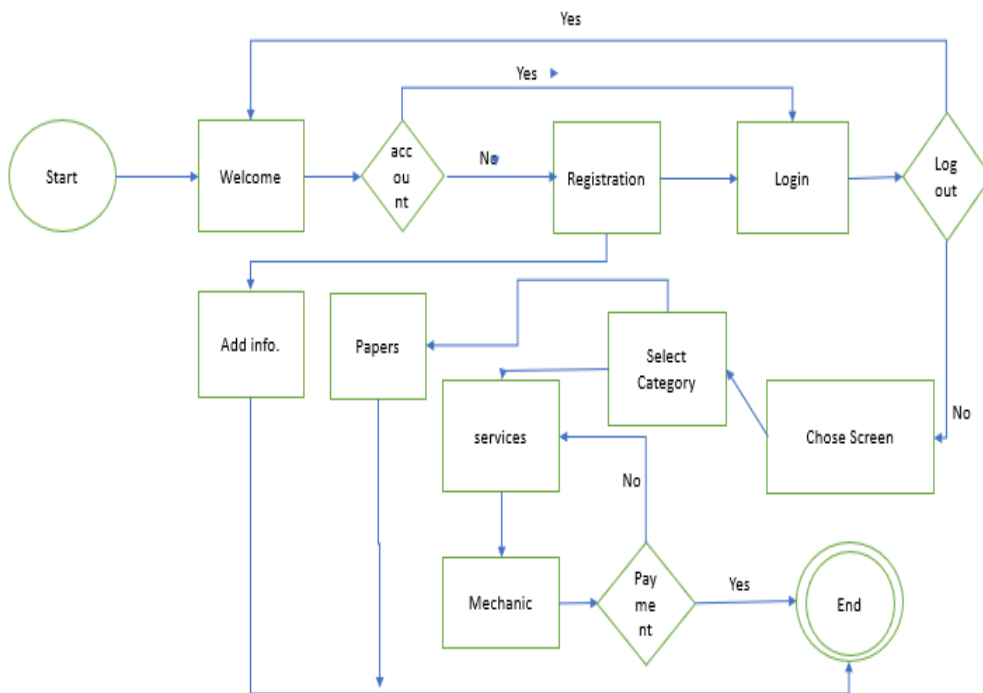


Figure 3.1.1 Business Process model for user and service provider

### **3.2 Requirements Gathering and Analysis**

I had to do a lot of study and analysis on the service of my car because what services can be offered to the user and how to communicate with them were very complex. Similar applications have to be studied on what services they can provide and what services they cannot provide. A lot of study and knowledge about what services the user needs and how they want to get these services has made it possible to build this application well. Below are the many things that are required to build a mobile application:

- To use this mobile application, you need to install this application from the app store.
- An Internet connection is required to download the application and access all the features of this application.
- This application is not large so does not need too much internal space.

### **3.3 Use Case Modeling and Description**

Use case models have a vital role in software development. Use case models help to understand how a system achieves a specific target. A use case defines the interaction between an anchor and a system. Anchors could be human. A use case is a description of the ways in which a user interacts with a system or product. A use case may establish the success scenarios, the failure scenarios, and any critical variations or exceptions. A use case can be written or made visual with the help of a use case model tool. Use case models have only 4 major elements: The actors that the system you are describing interacts with, the system itself, the use cases, or services, that the system knows how to perform, and the lines that represent relationships between these elements. The diagram is given below:



Figure 3.3.1 Use Case Diagram for User and Service Provider

### 3.4 Logical Data Model

This application's logical data model is given below:



Figure 3.4.1 Logical data model

### 3.5 Design Requirements

Design requirements are a major part of an application. If the design is not efficient and user-friendly then no one wants to use the application. This application is designed to be user-friendly. No complex features are kept here. The user can easily understand what needs to be pressed to go to the next step.

User design requirement:

- Able to register.
- Able to log in.
- They can add pictures and dates.
- Able to select services.
- Can add location, Number, and Description.
- Able to contact the serviceman.
- Can give payment.
- Exit application.

Service provider design requirement:

- Able to log in.
- Can update information.
- Can see user services requests.
- Able to contact users.
- Exit application.

## CHAPTER 4

### Design Specification

#### 4.1 Front-end Design

For front-end design, I use Dart language. I design this application through flutter, so I had to import some packages.[2]

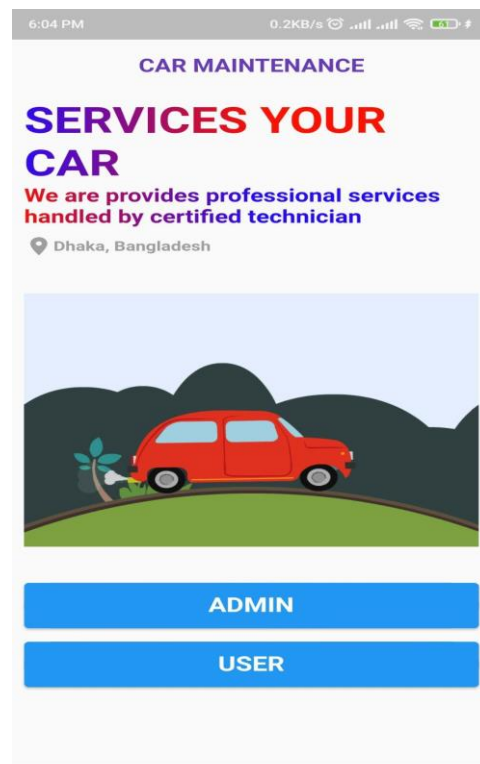
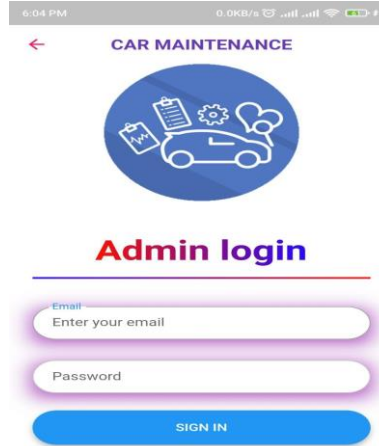


Figure 4.1.1 Welcome screen

This screen is the opening screen. Here below two options are available one is for admin and the other is for users.



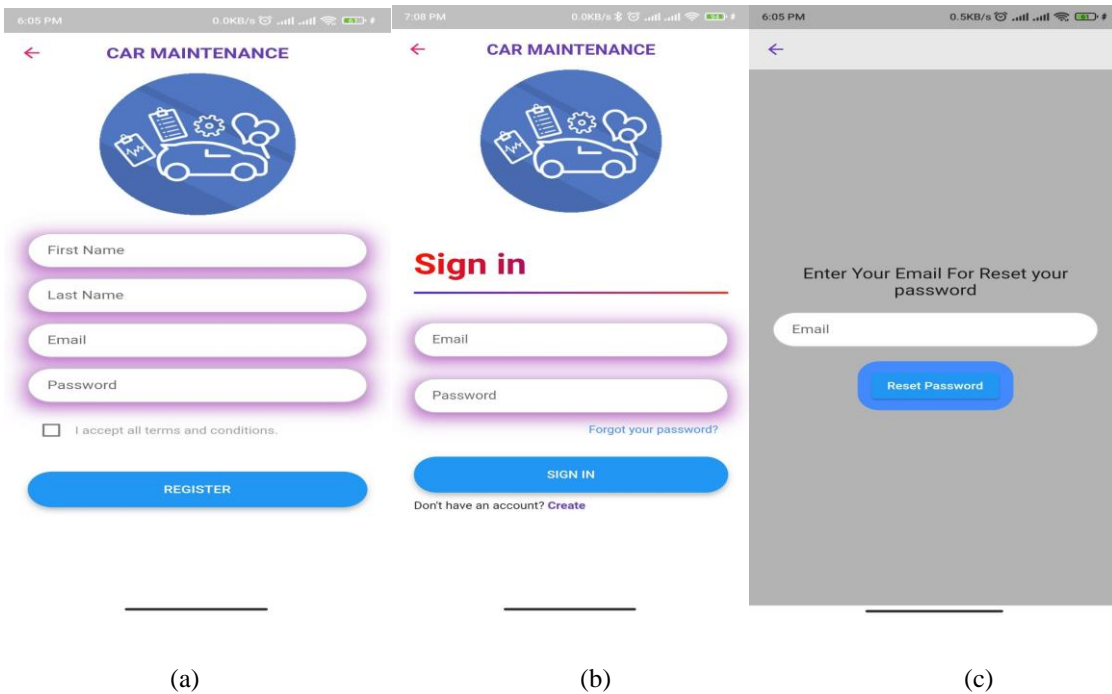
(a)



(b)

Figure 4.1.2(a) Request screen (b) admin log-in screen

Admin can log in through this login screen(b) with his email and password, after login he will enter the request screen(a) and see the user's request in list form. In the request, what is the problem with the user's car, the user's phone number, and address will be there.



(a)

(b)

(c)

Figure 4.1.3(a) Registration screen (b) User log-in screen (c) Forget password screen

Users can log in with their email and password through the user log-in screen(b) and if they don't have a registered account then they can click Create text and they can register through the registration screen(a). User sometimes forgets their password if the user even forgot their password, they can reset the password through forget password screen(c).

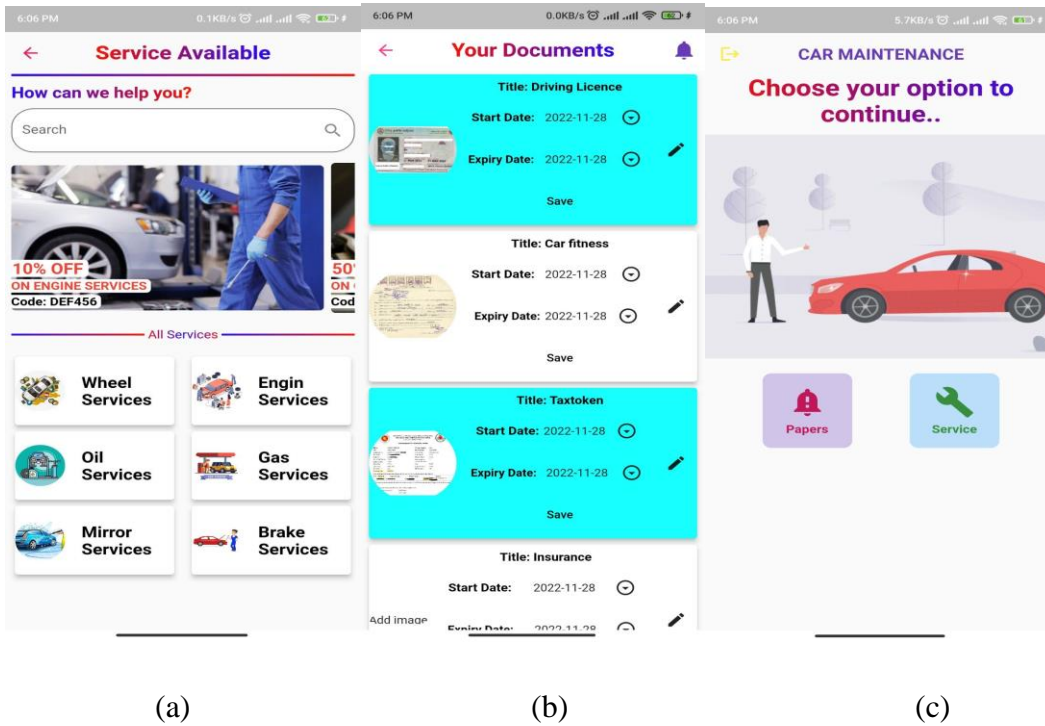
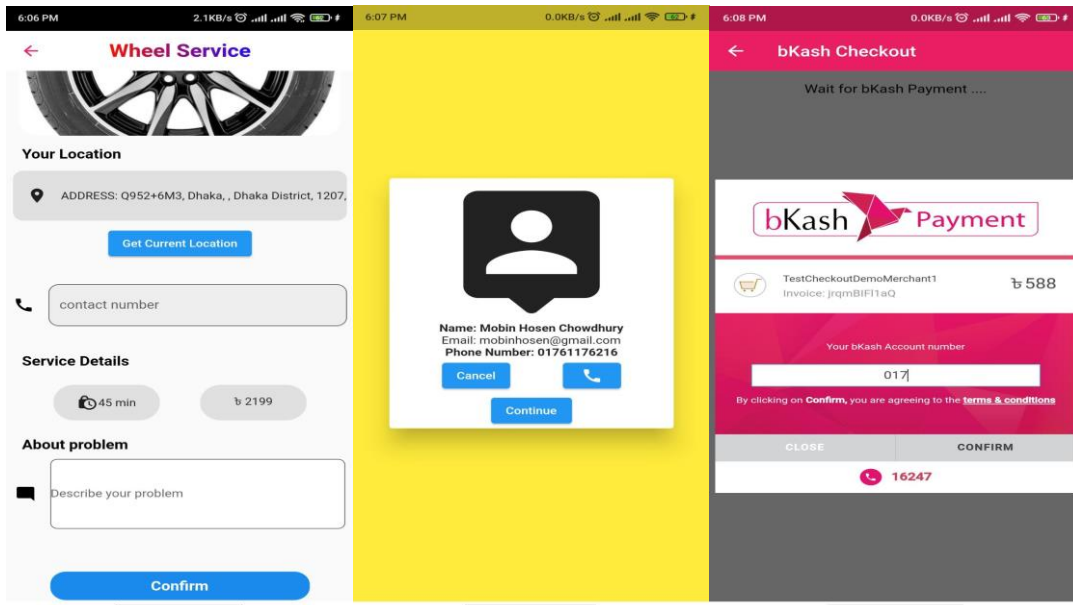


Figure 4.1.4(a) Services screen (b) Documents screen (c) Chosen screen

User will enter the chosen screen(c) after logging in with their valid password and email. In choose screen(c) they will get two options one is Papers and another is Service. After clicking on Papers, they will go to the document screen(c). Where they can select images from their gallery or camera. Also, they can select the registration date and expiry date of their documents. If the user clicks on the services button, they will enter the service screen(a) and get a list of different services. There they can select any service they like.



(a) (b) (c)

Figure 4.1.5(a) Wheel screen (b) Mechanic screen (c) Payment screen

After choosing the service user will get a wheel service screen(a) or other select screens. Where they have to fill in three things. One is their current location the second one is their contact number and the last one is the problem to be told about. Then after clicking on confirm button mechanic(b) will get found. In mechanic screen(b) they will find the option to call the mechanic directly and cancel option and if continue they will go to the payment screen(c). After completing the payment, they will get the service.

## 4.2 Back-end Design

Firestore is used for the back-end design of the application. Firestore is a real-time database because any change of application became a direct change in Application. No application update is required for change. User request data and admin email passwords are stored here in firestore. User login and registration authentication are done within the firestore. And if any image is uploaded by the user then firestore storage is used to store that image as well.



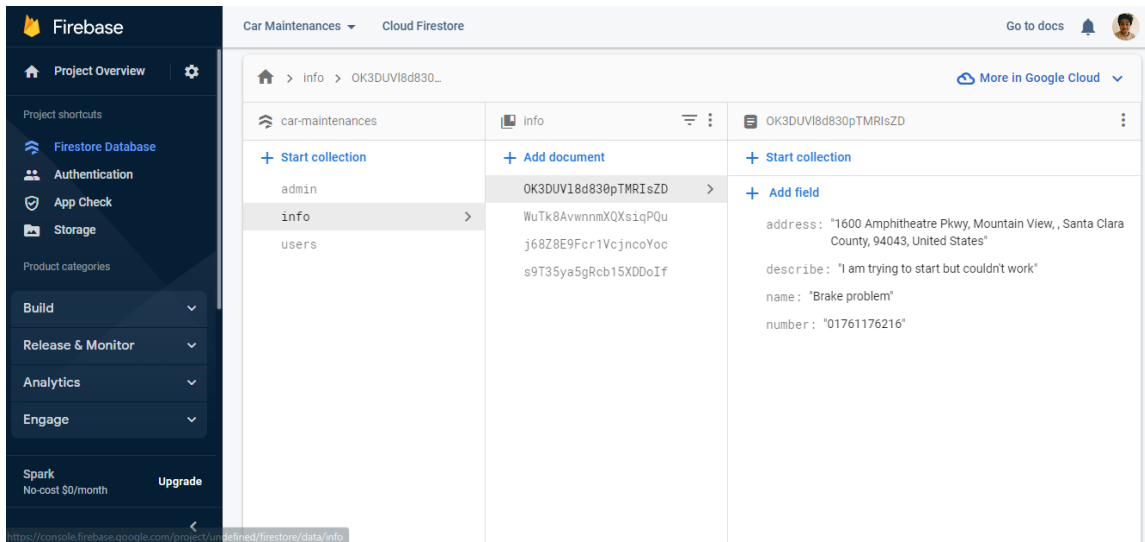


Figure 4.2.1 Firebase

### 4.3 Interaction Design and UX

Interaction design and UX are very important in the field of design. If the interaction design is not good then the user does not interact with the application. As a result, the popularity of the application does not increase and users feel bored using the application. Developers cannot reach their goals. I have made this application very colorful with guardian text to increase user interaction and in some cases using animation using git files to make the user interact more with the application. For them the application, I have used a light theme, it is very popular and users like it a lot. By using the application, users will also get a very good experience and they can be said to be user-friendly. In using the application, the user will not waste much time, they can easily understand all the options and use them.

### 4.4 Implementation Requirements

Below are the tools I used for the implementation:

- Flutter SDK
- Android Studio
- Programming Language: Dart
- Firebase Real-time Database for storing data.

## Hardware requirements

- Operating System: Anywhere run android studio and flutter SDK
- Ram: 8GB above
- An Android emulator or device to run this application.

## CHAPTER 5

### IMPLEMENTATION AND TESTING

#### 5.1 Implementation of Database

There are many popular databases. For this application, I have used firebase real-time database. Firebase is very easy to use for me. In firebase, it is very easy to pass data from an application's backend to the application's interface. All user and important document file images are stored in this firebase. Here the structure of the database is pre-created in JSON format.[4]

#### 5.2 Implementation of Front-end Design

Front-end design is important for mobile applications. The front design of the mobile application has to be adapted to the screen size as the mobile screen size is small. I used Dart language for front design and development through Flutter, many designs had to be incremented by default and had to be imported from the library. In terms of design, many buttons have to be used and the buttons are beautifully designed. The call icon button is designed to call the mechanic away. And the text file is used to input the data to the user so that the user can easily understand and send the data.[3]

#### 5.3 Testing Implementation

Testing is very important after an application implementation. Without testing it is impossible to understand where the application is going wrong. There are three testing methods in software testing, black hat testing, white hat, and gray hat testing. Testing will tell if the application is running on all versions of mobile phones and if any error is found then it needs to be re-fixed.

Table 5.3.1 Test Cases of the Project

No	Test case	Input	Expected outcome	Actual output	Result
1	Installation of the Application	Tested on different versions of Android 6.0, 7.0, 8.0, 11	Installation Successful	Installation Successful	Passed
2	Registration	User Info.	Registration Successful	Registration Successful	Passed
	Email	Input Email	Successfully Added	Successfully Added	Passed
3	Password	Input Password	Successfully Added	Successfully Added	Passed
4	Pick date	Date	Successfully Added	Successfully Picked	Passed
5	Take Image	Image	Successfully Added	Successfully Added	Passed
6	Current Location	Address	Location Successful	Location Successful	Passed
7	Add info. For services	Problem Text	Successfully Added	Successfully Added	Passed

8	Finding Mechanic	Mechanic	Successfully Find	Successfully Find	Passed
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#### **5.4 Testing Result and Reports**

This application has passed all the tests. In all cases, the input and output were working perfectly and all the cases were fine. I am very happy that the application passed in all respects. The application is now ready for use by the user as everything is fine. The user can now install and run the application and use all the features of the application easily.

## **CHAPTER 6**

### **Conclusion and Future Scope**

#### **6.1 Discussion and Conclusion**

This application development is complete and ready for user use. I have given too much effort to develop this application. This application will be useful for those who use their own car for transportation and often face car-related problems. This application will help to keep the user's car relative papers up to date. Users can easily hire mechanics for their needs through this application and can communicate with mechanics. Users can handle service-related problems easily. The application can be easily downloaded from Play Store.

#### **6.2 Scope for Further Developments**

There will be efforts to make the application better in the future. And here's what else might be added in the further:

- Users can rate and report on the mechanic's performance and usability.
- Google Maps will be added so that mechanics and users can track and view their location.
- More services will be added as needed.
- Various payment options will be provided. So that the user can easily select the payment method of their choice.
- All types of vehicles will get services and car parts will be sold along with the service.

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<<[https://en.wikipedia.org/wiki/Business\\_process\\_modeling](https://en.wikipedia.org/wiki/Business_process_modeling)>> Last visited Date: 22 October 2022
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- [5] Use Case Modeling is available at  
<<[https://en.wikipedia.org/wiki/Use\\_case](https://en.wikipedia.org/wiki/Use_case)>> last accessed on 11 October 2022 at 10:34 AM
- [6] Payment option is available at  
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- [7] Flutter information is available at  
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- [8] Flutter SDK is available at  
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- [9] Android SDK is available at  
<<[https://developer.android.com/studio?gclid=Cj0KCOiA\\_P6dBhD1ARIsAAGI7HDcrkEHtfeY0u3y0om9\\_EviCcYwUuhgChmFoRUZoAnNGvdfn38A7AYaAt8-EALw\\_wcB&gclid=aw.ds](https://developer.android.com/studio?gclid=Cj0KCOiA_P6dBhD1ARIsAAGI7HDcrkEHtfeY0u3y0om9_EviCcYwUuhgChmFoRUZoAnNGvdfn38A7AYaAt8-EALw_wcB&gclid=aw.ds)>> last accessed on 1 October 2022 at 10:00 PM

## APPENDICES

### User Payment Code:

```
BkashPayment(  
  // amount of your bkaash payment  
  amount: '20',  
  // intent would be (sale / authorization)  
  intent: 'sale',  
  // accessToken: "", // if the user have own access token for verify payment  
  // currency: 'BDT', // bkaash url for create payment, when you implement on you project  
  // then it be change as your production create url  
  createBkashUrl: 'https://merchantserver.sandbox.bka.sh/api/checkout/v1.2.0-  
beta/payment/create',  
  // bkaash url for execute payment, , when you implement on you project then it be  
  // change as your production create url  
  executeBkashUrl: 'https://merchantserver.sandbox.bka.sh/api/checkout/v1.2.0-  
beta/payment/execute',  
  // for script url, when you implement on production the set it live script js  
  scriptUrl: 'https://scripts.sandbox.bka.sh/versions/1.2.0-beta/checkout/bkash-checkout-  
sandbox.js',  
  
  // the return value from the package  
  // status => 'paymentSuccess', 'paymentFailed', 'paymentError', 'paymentClose' // data  
=> return value of response paymentStatus: (status, data) {  
  dev.log('return status => $status');  
  dev.log('return data => $data');  
  
  // when payment success  
  if (status == 'paymentSuccess') {  
    if (data['transactionStatus'] == 'Completed') {  
      Style.basicToast('Payment Success');  
    }  
  }  
  
  // when payment failed  
  else if (status == 'paymentFailed') {  
    if (data.isEmpty) {  
      Style.errorToast('Payment Failed');  
    } else if (data[0]['errorMessage'].toString() != 'null'){  
      Style.errorToast("Payment Failed ${data[0]['errorMessage']}");  
    } else {  
      Style.errorToast("Payment Failed");  
    }  
  }  
}
```



```
    }  
  }  
  
  // when payment on error  
  else if (status == 'paymentError') {  
    Style.errorToast(jsonDecode(data['responseText'])['error']);  
  }  
  
  // when payment close on demand closed the windows  
  else if (status == 'paymentClose') {  
    if (data == 'closedWindow') {  
      Style.errorToast('Failed to payment, closed screen');  
    } else if (data == 'scriptLoadedFailed') {  
      Style.errorToast('Payment screen loading failed');  
    }  
  }  
  // back to screen to pop()  
  Navigator.of(context).pop();  
},  
)
```

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