

My Car Service Application (MCaSeP) - Application for Smart Reminder of Car Service

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Abstract: Malaysians continue to develop in all technical fields, especially in the area of information technology (IT), but there are still some people who may not understand the internal functions of the car, especially the car engine, and need the IT department to develop applications to help the community overcome this problem. Project-related issues, will improve the efficiency and capabilities of the car service application for all vehicle users and track the latest updates on their vehicle performance. Therefore, the main objective is to analyze, design, develop, test, and evaluate the performance of the smart car service mobile application that related to the project scope for this application is mainly targeting the vehicle user among the teenager, women, students, and any parties that has less basic knowledge regarding the car purpose. The method used in this project is the Object-Oriented System Development Phase for planning the mission, commanding, and post-flight analysis which describes the fundamentals of software and system development. Based on the observation, the service application that provided the smart reminder for car service does not yet exist and the community needs the application that could help them to keep car maintenance useful for the long term. Therefore, this project is really important for vehicle users. MCaSeP application was successfully developed. In general, all stages of the application development process have been completed to achieve satisfactory objectives. To get the best performance of the application, the project needs to enhance the modules and maximize the functionality of the application.

Keywords: Smart Reminder, Car Service, Mobile Application

1. Introduction

Several problems occur for the current platform/medium, where the main problem is the limited module in the application. The module in an existing application is not suitable for all types of vehicles which means the existing application is just for certain vehicle users only. For example, one application is just specification for car users only, not for another type of vehicle mainly used by the community like a motorcycle.

The second problem is less exposure to the application to the community. For example, especially women and students need to expose to this application that could help them if their vehicle broke down and they can trace what is the problem by checking the due date of some engine tools that need serviced or searching for the nearest workshop and contact details.

Lastly, some people always forget when their last service was. For example, when a car is over the due date to change the engine oil, it may harm the cycle process of the car's engine and the life term of the car. Not only is engine oil to take care of but also need to always check the temperature balance. The same goes for another part of the engine, all part of it is important to look over at least two times in six months.

2. Literature Review

This part discussed in the investigation has been done throughout the application development of the smart reminder system. This literature survey also helps in a way to get an idea of knowledge about multiple types of facilities that can be implemented and provided in this application. Thus, there is a way to find any knowledge to enhance innovations that make the Smart Reminder system different and more interesting than the existing application.

2.1 Study on Smart Reminder System

The study's analytical approach allowed all developers to expose and identified all possibilities to enhance the existing application. The highlighted feature in this car service application which is the push messages will be related to notification alerts that are used to notify users of some important date regarding car service. This feature will ask the user to enter the information of the car and the date of service. The notification will be displayed a month before the date with a frequent reminder for a time per every week. This could help the user to keep tracing the important data and keep alert with the performance of the car.

As Shilpa et al. [2] said that the backbone of all technologies is the internet. The car service application is one of progressive and dual interaction between humans and technology. Any vehicle user can make use of the application for car mechanic reference through the information entered from the user and can make use for user reference through the car manual book provided in the application. This proposed application can be used for all automobile users such as cars, motorcycles, lorries, and some more. Thus, this project car service application is one of the improvements from an existing application in the online platform by enhancing the features inside.

2.2 Technology Approach

2.2.1 Mobile Operating System

As in the technology era, the mobile communication device must need various types of mobile operating systems to run the services like short message service, voice calls, camera functionality, and many more. Anyhow, current modern smartphones have implemented many advanced features of full-grown computers which contain the graphic processing unit (GPU), large store space, high-speed central processing units (CPU), multipurpose communication hardware, and high-resolution cameras, and screens. In other words, Android itself is supported by the enhancement of features like storage, connectivity, flash support, web browser, media support, multi-tasking, and touch [3]

2.2.2 Firebase

Firebase is a platform for the development of mobile and web applications which is the Backend-as-a-Service (Baas). Majorly, it provides the developer with various tools and services in a way to help the developer to develop quality applications. Initially, the firebase product was the real-time database. To the Wikipedia description, the real-time database provides an API that allows the developer to synchronize and store data across various clients.

2.2.3 Android Studio

Android studio is a platform for developers to build applications for Android devices like phones, tablets, Android TV, Android Wear, and many more. This platform is the official integrated development environment (IDE) specifically for Google's Android operating system that builds on JetBrains' IntelliJ IDEA of software. The accomplishment of IDE is for native Android application development. It helps developers to enhance their creativity and productivity when building Android Apps with a variety of features provided.

2.2.4 Visual Studio

Visual Studio is one of the IDE (integrated development environments) which is the software program to write and edit a developer's code. The user interface display for the developer works for software developers to build, edit and debug code. It can bring out both managed code and native code as well. This platform is built on open-source and includes support for debugging and embedded Git control.

2.3 Method Comparison of Existing System

When coming to the application, there has many existing and various types, categories, and scopes of application. No one type of application for all users but a user needs a different type of application for daily use, especially for communication activities. [4] There have a few basic applications, which are the classical application, online application, unsolicited application, and brief application. [5] While, there have three types of applications, which is native applications for android, iOS, and Windows phones, hybrid applications like with react native and ionic, and web applications that link to the website version on the mobile device to work.

One problem with the existing application is the limitation module in it. The specification is not for all types of users but only for specific users. Car service application has existed on the online platform. The application can get from the Google Play Store for Android users or App Store for Apple users. Therefore, the existing application that has to choose is the Proton application called the MyProton application, and the Perodua application called Owner's Manual application. Thus, this section will briefly explain two existing applications. Thus, a table comparison has been made to reveal the summary of the review as shown below:

Table 1: Comparison of features between existing applications with the current project.

Application	Proton Application	Perodua Application	My Car Service Application (MCaSeP)
Features			
Sign up	/	X	/
Log in	/	X	/
Multi-Language	X	/	X
Catalog	/	/	/
Loan Calculator	/	X	X
Warning manual	X	/	/
Engine Manual	X	/	/
Car Manual	X	/	/
Help Centre	/	/	/
Social Media	/	/	X
Search button	X	/	X
MyCar (List of user's vehicles)	/	X	/
Highlight segment (For advertisement)	/	/	/

Table 1: Cont.

Feedback segment	/	X	/
Media (Video related to the company)	/	/	X
Smart Reminder	X	X	/

As table 1 shows the features between two existing applications and the current project of My Car Service Application (MCaSeP). There have 16 features that can be concluded to make the comparison between the three applications.

Table 2: Comparison of characteristics between existing applications with the current project.

Application	Proton Application	Perodua Application	My Car Service Application (MCaSeP)
Characteristics			
Access mode	Online access	Offline access	Online access
Booking system	As booking system, such as: - Service appointment	There has no booking system.	There has no booking system.
Framework Architecture	Model-view-controller (MVC)	Model-view-controller (MVC)	Model-view-controller (MVC)
Admin Panel	Available	Available	Available
Application Template	Available for download	Available for download	Available for download
Remote Deployment	Available	Available	Available
Calculation System	Has calculation system, such as: - Loan Calculator	There has no calculation system.	Smart reminder system.
Security Used in Registration Form	Username and password	None	Username, password, and mobile number

As shown in table 2, the main focus to develop any application is the usability for all users to access the application. The characteristic of usability of the mobile application may approach various sub-categories such as learnability, operability, contextuality, and interaction [6]. Therefore, the need of consumers’ demand with an endless requirement for mobile application designers and developers is a challenge for posing serious constraints with usability issues in the mobile application.

3. Methodology

This section will briefly explain how the process, act, or methodology used for this My Car Service Application (MCaSeP) project of finding the perfect, effective and functional of the best solution. The methodology is the explanation of the flow or way of how the project will be done systemically solve the problem and one of the methods to apply to a field of study in systematic purpose that is related to theoretical analysis [7]. This methodology process could help the developer manage the progress and reach the target of the project that is to be done successfully and effectively.

3.1 Waterfall Methodology Phase

The purpose of this My Car Service Application (MCaSeP) project is to use the Waterfall Methodology as the preferred model. Since the Waterfall Model is a linear application development model, the process will be continuing right after the one phase ends and if unmodified, the waterfall methodology will occur in sequence and not allow developers to get back to the previous step. The Waterfall methodology application development phases are allocated into six phases which are Planning, Requirement Analysis, System Design, Implementation, Testing, and Maintenance. Figure 1. shows the waterfall model used for developing the proposed application.

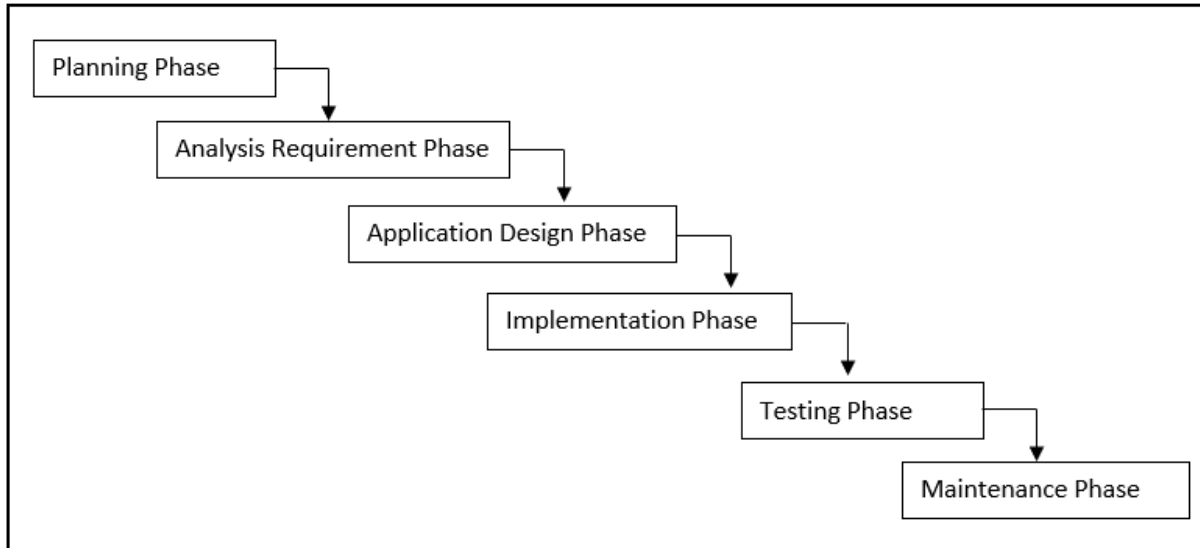


Figure 1: Object Oriented System Development Phase

3.2 Project Description

This project description will briefly describe the specific details regarding the project or the proposed application. Table 3 illustrate the methodology and a brief description of the system development phases and technology used in the development of the proposed application.

Table 3: Project Description

Phase	Description	Findings	Techniques/Technology
Planning	To investigate the application requirement and create the planning schedule process for the project.	<ul style="list-style-type: none"> Gantt Chart 	<ul style="list-style-type: none"> Wondershare EndrawMax V 10.5
Requirement Analysis	Analysis of issue through interview and questionnaire of user experience on the proposed application.	<ul style="list-style-type: none"> Research Interview Questionnaire 	<ul style="list-style-type: none"> Microsoft Word 16
Design	Designing the proposed application and logical design of the project	<ul style="list-style-type: none"> UML Diagram ERD 	<ul style="list-style-type: none"> Wondershare EndrawMax
Implementation	<ul style="list-style-type: none"> Program the system using Flutter 	<ul style="list-style-type: none"> Interface of the system 	<ul style="list-style-type: none"> Visual Studio Code Google Firebase

	<ul style="list-style-type: none"> • To ensure the credibility of the application • For project purpose in developing the application 	<ul style="list-style-type: none"> • Database design • System Functionality
Table 3: Cont.		
Testing	To investigate and discover the proposed application.	-
Maintenance	To make any changes in software, hardware, and documentation to help the functionality of the operational application.	-

4. Analysis & Design

The results and discussion section presents data and analysis of the study. This section can be organized based on the stated requirement analysis related, the chronological test plan, different case groupings, and different logical order as deemed appropriate.

4.1 Requirement Analysis

Requirement analysis is the one analysis for identifying, analyzing, and modeling the functionality of a prospective software system. After the analysis requirement is completed, the information will be modeled using various structure plans. This is to manage software or system requirements systematically before starting to implement the development of software applications. This requirement analysis is divided into two categories which are the functional requirement and non-functional requirement.

4.1.1 Functional requirement

A functional requirement is the must requirement to be developed which is part of what the system should do for the application. This requirement will describe a particular behavior of the system's function when any condition is met which includes the administration functions, external interface, reporting requirement, authentication, and many more types of functional requirements.

Table 4: Functional Requirement of My Car Service Application (MCaSeP) system

No	Data	Functionality
1	User Signup	This function allows users to make registration of their account with input the user details such as email, name, phone number, and password.
2	User Login	This function allows users to access the mobile application of the system by inserting the correct user login credentials.
Table 4: Cont.		
3	Vehicle's Information	This function allows users to fill in their vehicle information as their reference and update for further action. The system will keep the data and send it to another function for the next action.

4	Vehicle's Manual	This function will allow the user to access for referring the vehicle's manual and update the date for any components of the car being changed or upgrade.
5	Smart reminder	This function allows the user to edit the reminder date for highlighted part of the vehicle and the user will receive the notification date and information.

4.1.2 Non-functional requirement

A non-functional requirement is a part of how the system performs a certain function on the behavior of functionality and the limits on it. It will specify the criteria operation of the system rather than the specific behavior even if the non-functional requirement has not met the basic functionality, it will not be impacted by each other. Thus, if the non-functional requirements are executed well, it will help the system easy to use and enhance its performance. Table 5 shows the non-functional requirement of the My Car Service Application (MCaSeP) system.

Table 5: Non-functional Requirement of My Car Service Application (MCaSeP) system

No	Data	Functionality
1	Usability	The general appearance and flow of the application are easily understood by all types of users. Users no need to learn the whole process of the system specifications.
2	Security	The physical installation and from a cyber perspective are protected from unauthorized parties. The login module will verify the correct user account and if not verified the login information will be denied access to the system.
3	Performance	A reasonable operation and response time of the operating system should be expected.
4	Availability	The system is sure readily can be operated and available to use at all times.
5	Maintainability	Maintenance will be done for certain intervals of time to minimize failure and maximize the smooth performance of the system.
6	Integrity	The database of the system will be kept properly and secured by the system from any corruption and non-readable.

4.2 Testing

4.2.1 Test Plan

To evaluate the user experience toward the development of the system, the user acceptance testing form is one way to gather information about the functionality of the proposed system. This form has been through survey activity among the vehicle's users including cars and motorcycles of various gender and age. Table 6 shows the user acceptance testing form of the My Car Service Application (MCaSeP) system. The Likert scale method is used for purpose of evaluating the range from 1-strongly dissatisfied to 5-strongly satisfied.

Table 6: User acceptance testing form of My Car Service Application (MCaSeP) system

System Testing		Test (Scale from 1 to 5)				
No	Acceptance Requirement	1	2	3	4	5
1	The system can execute from start to end.					
2	The user can register the account successfully with strong password verification.					
3	The user can successfully log in to the system.					
4	The system can direct the user to module selection.					

5	The user can get the right module once chooses the module.
6	The user can fill in the vehicle's information.
7	The user can view all vehicle manuals.
8	The system can keep the date change for smart reminders correctly.
9	The system is able successfully to prompt the notification.
10	The user can view the list of all information of smart reminders that have been collected.

4.3 Unified Modelling Language (UML)

Unified Modelling Language or commonly known as the UML diagram is a language for standardized modeling that consists of an integrated set of diagrams, visualizing, constructing, and documenting the artifact of the software system, specifying the development of software and system. It is used to develop diagrams and provide users with ready-to-use expressive modeling examples. Thus, this UML diagram will help to define a standard way to visualize how the system has been designed as a visual language, not as a programming language. Meanwhile, the UML diagram will describe the system structure by showing the system's classes, operations, methods, attributes, and the relationship between the objects.

4.3.1 Use Case Diagram

The use case diagram is used to provide the summary of some relationships between actors, use cases, and the system as well. It is to capture the dynamic aspect of a system which shows in the simplest and graphical representation of the functionality of the system. Figure 2 shows the User use case diagram for the My Car Service Application (MCaSeP) system.

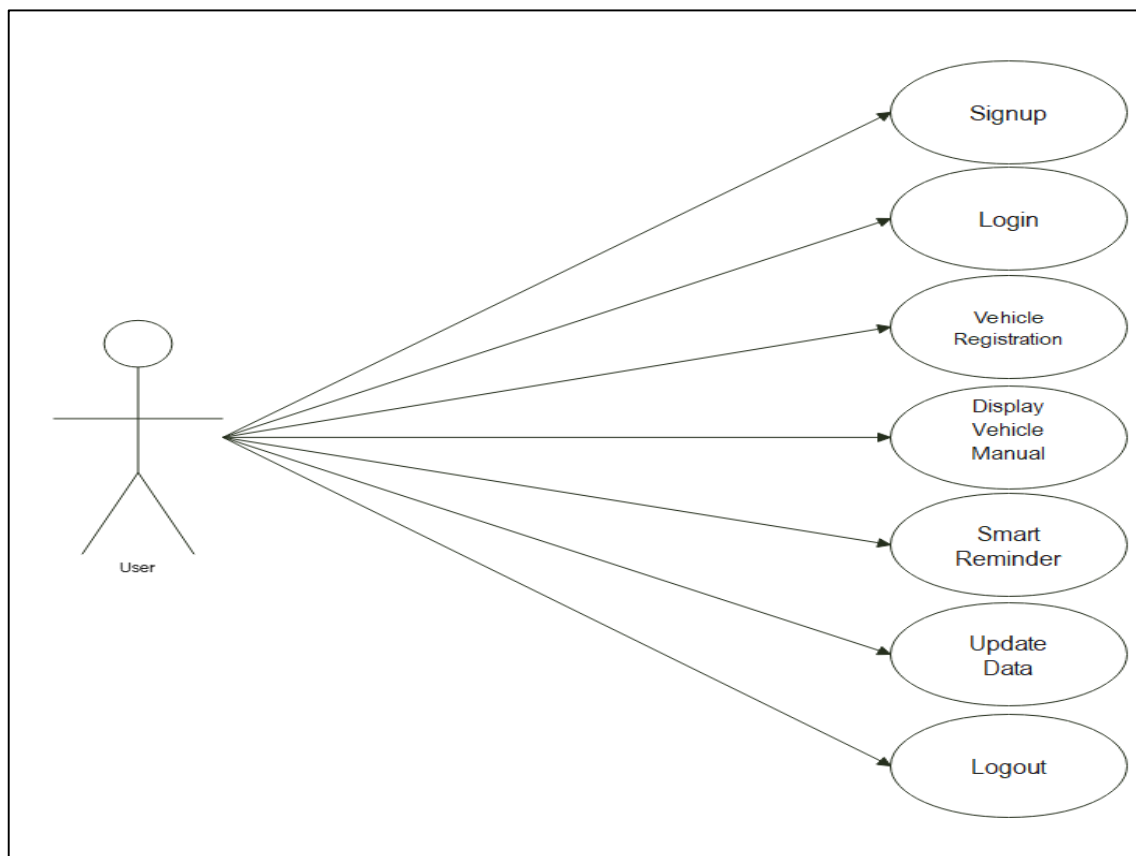


Figure 2: Use Case Diagram

4.3.2 Class Diagram

The class diagram is the general conceptual modeling of structure in the application which is the main building block of object-oriented modeling. It is for detailing the model translating into programming code as data modeling. This diagram will show the different objects in the system, their attributes, relationship, and their operation among them. The inheritance of the attributes may occur when the system is related to multiple similar modules which the relationship will imply the aggregation where the child can exist independently of the parent. Figure 3 shows the class diagram of the My Car Service Application (MCaSeP) system.

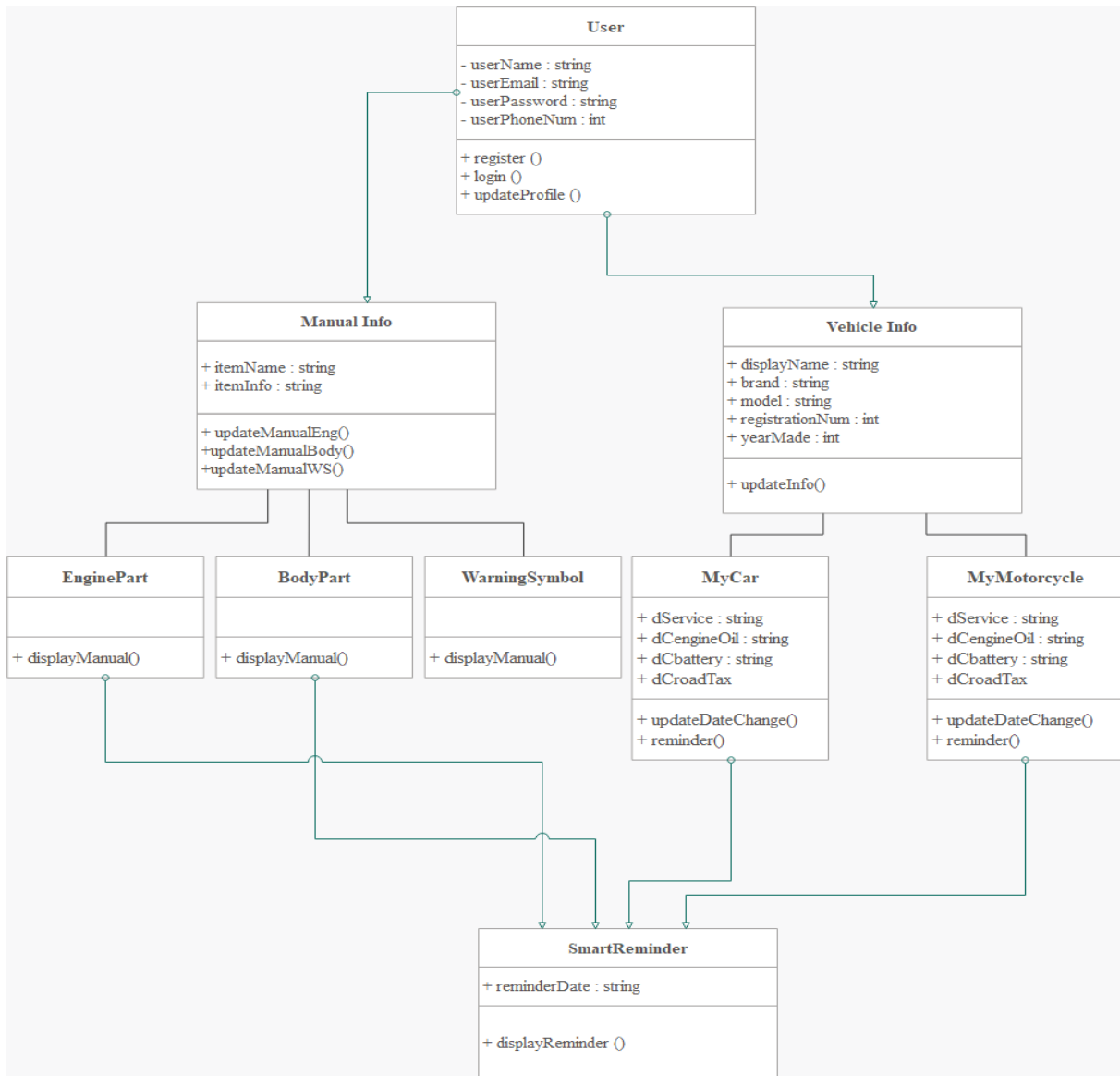


Figure 3: Class Diagram

4.3.3 Activity Diagram

An activity diagram is commonly called the flow chart diagram which describes the dynamic aspect of the system. It represents the flow from one activity to another activity that is related to the operation of the system. The control flow roughly will be drawn from one operation to another. Meanwhile, the activity diagram usually will be related on describe the steps of the use case diagram in

which the activities modeled could be concurrent and sequential. Figure 4 shows the activity diagram of My Car Service Application (MCaSeP).

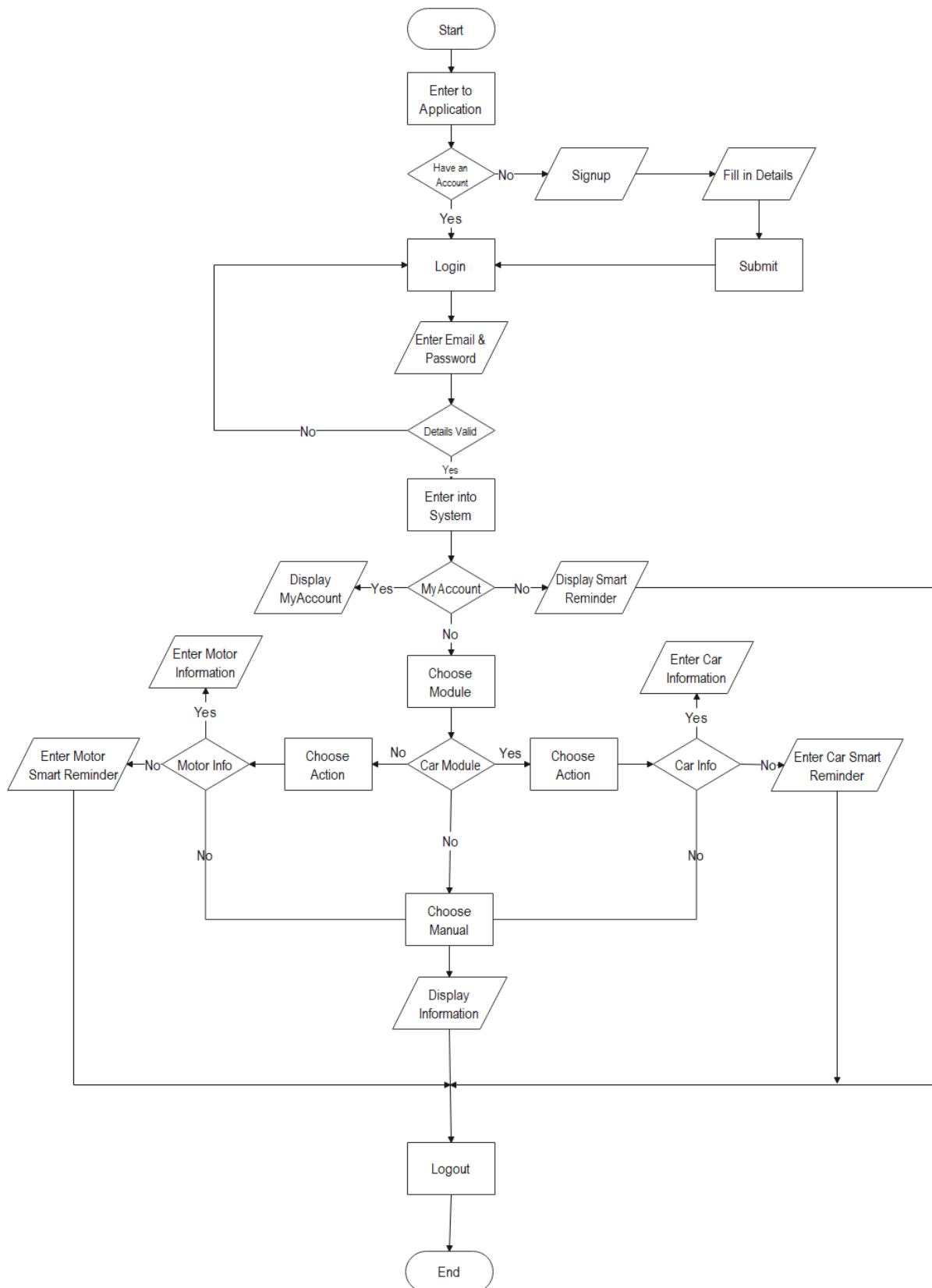


Figure 4: Activity Diagram

5. Implementation and Testing

This section is focusing on the description of the implementation stage of the development system. The database design was previously built in a way to implement the interface which is the software that needs to be installed in Android Studio and firebase console. The main process in this phase is programming where the writing code program is part of the activity that will be realized to run the executing process for all the designs and plans that have been made before. This phase is to ensure the system is developed in line with the project planning guidelines in the Object-Oriented Requirements and Design Object Oriented phase.

5.1 Database Connection

The authentication of the proposed application has been chosen which is the firebase. Firebase authentication is used on the register and login side as well. Figure 5 and Figure 6 show the firebase database connection for the proposed application in Android Studio.

```
import React, { Component } from 'react'
import { StyleSheet, View, TextInput, TouchableOpacity, StatusBar, Text, Image, SafeAreaView } from 'react-native';
import { auth, database } from '../firebase';
import SuccessSignup from './SuccessSignupScreen';

class SignupScreen extends Component{

  state = {
    name: "",
    phoneNumber: "",
    email: "",
    password: ""
  }

  registertoFirebase() {
    if(this.state.name !== "" && this.state.phoneNumber !== "" && this.state.email !== "" && this.state.password !== "")
    {
      database.collection("user_signup").add({
        name: this.state.name,
        phoneNumber: this.state.phoneNumber,
        email: this.state.email,
        password: this.state.password,
      }).then((res) => {
        alert("Sign Up Success!");
        this.props.navigation.navigate("SuccessSignup");
      }).catch((error) => {
        console.log("Error", error)
      })
    }
    else
    {
      alert("Please complete all sign up form");
    }
  }
}
```

Figure 5: Source code for firebase database connection

```

1  import firebase from 'firebase';
2
3  import "firebase/firestore";
4  import "firebase/auth";
5
6  //Use Your Own Firebase
7  const firebaseConfig = {
8      apiKey: "AIzaSyBNfy9WTnsZ-4L1H0a2ni-rM4_IODpY1wI",
9      authDomain: "mcasep-8949d.firebaseio.com",
10     projectId: "mcasep-8949d",
11     storageBucket: "mcasep-8949d.appspot.com",
12     messagingSenderId: "401946057773",
13     appId: "1:401946057773:web:1a03dda850da3753b1aca4",
14     measurementId: "G-GZVDXSRP47"
15 };
16
17 //firebase.initializeApp(firebaseConfig);
18
19 firebase.initializeApp(firebaseConfig);
20
21 if(firebase.app.length ===0){
22     firebase.initializeApp(firebaseConfig);
23 }else{
24     firebase.app();
25 }
26
27 const auth = firebase.auth();
28 const database = firebase.firestore();
29
30 export {auth,database}

```

Figure 6: Source code for firebase database connection

5.2 Application Interface

This section will show the interface of the application system.

5.2.1 Registration Module Interface

The first module of the proposed application is the register module which is the sign-up. Users need to register for the first time to use this application. Users need to enter their names, email addresses, numbers phone, and passwords to continue to the login page. The user's data will be saved into the Firebase Authentication cloud database. Therefore, an internet connection is required for this application to function properly and access the cloud firebase. Figure 7 shows the Signup interface.

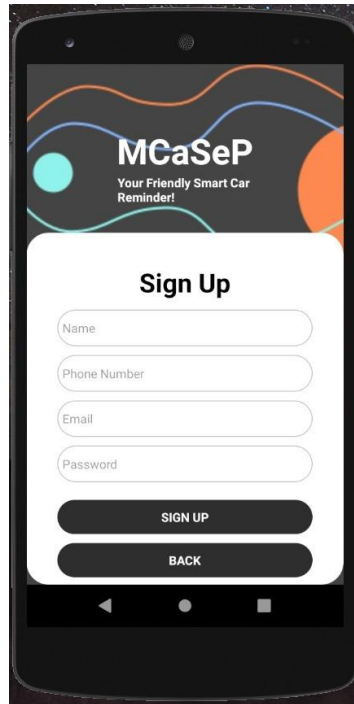


Figure 7: Sign-up module for the mobile application of My Car Service Application

5.2.2 Login Module Interface

Figure 8 shows the login module of the proposed application which is the login interface. The user sign in using the registered email address and password. The verification is successful after entering the correct details and the user will be redirected to the home page of the proposed application.

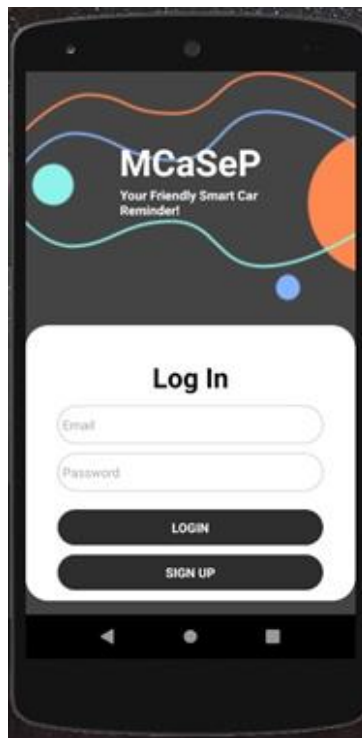


Figure 8: Login module for the mobile application of My Car Service Application

5.3.3 Success Register Module Interface

Figure 9 shows the Successful Register Module Interface of the proposed application. The system will show the user that the registration process is complete and successful.

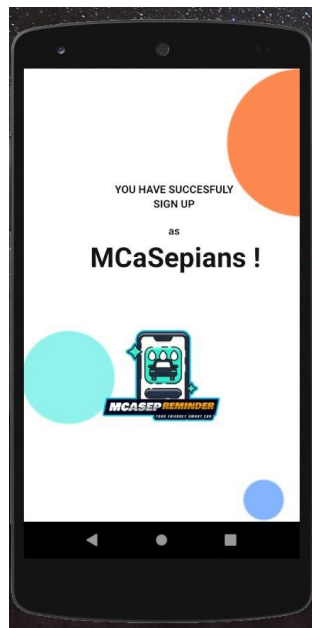


Figure 9: Success Register module for the mobile application of My Car Service Application

5.3.4 Homepage Module Interface

Figure 10 shows the Homepage Interface of the proposed application. This module contains the drawer navigation, button-to-car module, motorcycle module, and logout. Users can view the details of the car module and motorcycle module by clicking on them.

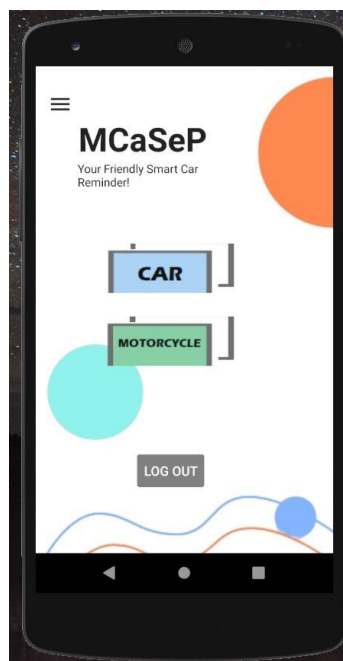


Figure 10: Homepage module for the mobile application of My Car Service Application

5.3.5 Drawer Navigation Module Interface

Figure 11 shows the Drawer Navigation Module Interface of the proposed application. This module will list all the navigation paths in the system. Users will directly go to any module by clicking on any path.

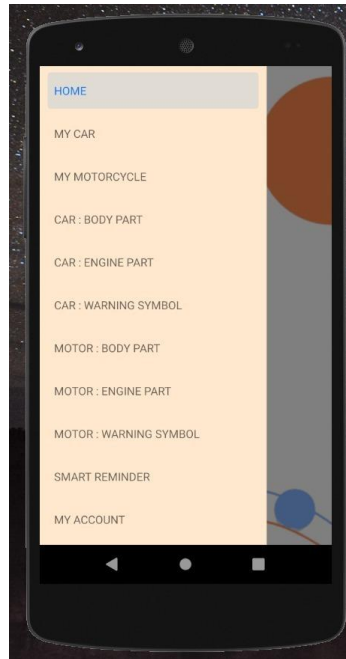


Figure 11: Drawer navigation module for the mobile application of My Car Service Application

5.3 Testing

5.3.1 Functional Testing

Functional testing is the process to test the function of all the features and components of this application. This is to make sure the system performance and functions will run smoothly as expected. The test plan is referred to as an integrated system for testing elements based on different test cases of each module. The following subsections show the test reports for the functional testing which run on every module in the system.

5.3.2 Test Plan

A test plan is one of the testing phases once the testing will be done for system modules. The module will be tested by referring to the detailed document that describes the objectives of the project proposed and the test strategy. This user acceptance testing is successfully done with real-life users which leads to identifying the user experience when using the system. Throughout this testing, the feedback is taken from the user in a way to identify areas that require improvements in the future. A total of 20 users are chosen as the respondents for testing and any feedback is collected for the analysis phase. Table 7 shows the test plan of the system module to test and ensure each system module is successfully working.

Table 7: Test plan of the system module

	Test	Expected Result	Actual Result
Sign up Module			
1	User input suitable password with strong criteria of password.	The system will accept the data of passwords for account registration.	Pass
	User input unsuitable password with strong criteria of password.	The system will deny the data of password for account registration and requires the user to re-insert the strong criteria of password.	Pass

Login Module			
2	User input valid email and password.	The system will bring the user to the main page of the application.	Pass
	User input invalid email and password.	The system will detect the wrong user login credential is inputted and require the user to fill it in again.	Pass
	The user does not input any data during login.	The system will indicate the text field is empty.	Pass
Main Menu: Type of Vehicle Registration Module			
3	User fill in the vehicle information.	The system will collect the data and keep it in the database for user reference.	Pass
	User input the important date in the smart reminder segment.	The system will collect the data and keep it in the database for the notification module.	Pass
Vehicle's Manual Module			
4	User attempt to view the vehicle manuals.	The system properly displays the manuals in the simplest interface with relevant information.	Pass
	User input the important date in the smart reminder segment.	The system will collect the data and keep it in the database for the notification module.	Pass
Notification Module			
5	Users attempting to view the notification from data collected for the smart reminder system.	The system will extract the information and prompt into the notification module.	Pass

6. Conclusion

In conclusion, My Car Service Application (MCaSeP) has been successfully developed. Overall, all phases of the application development process have been carried out to reach the target of achieving satisfaction. This application is eventually playing a role in facilitating those who majorly use a vehicle which is a vehicle type of car or motorcycle. But there are several limitations found in the application. Firstly, only the vehicle user of cars and motorcycles can use this application. Secondly, this application can only support the Android platform. Lastly, users are not able to filter and search any keywords in the application such as the name of the car's components.

Thus, there are some improvements on enhancing the limitation features of the application that can be implemented. Firstly, this application is suggested adding modules for other vehicle types like lorry, bus, ambulance, van, and many more. Next, this application is proposed to be able to support others operating systems such as Windows and iOS platforms. Lastly, a sort and search feature which can able to look through the vehicle's manuals should be considered. Thus, this application is also expected to be enhanced by making improvements to the quality of the system shortly. The improvement can be enhanced by optimizing the usability and performance of the application.

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References

- [1] Sarita Choudhury, I. Indira, G. Rakesh, T. Rakesh (2016). "E-Mechanic Service using Android Programming and Messaging Service" from the International Journal of Advanced Research in Computer Science and Software Engineering
- [2] Prof. Shilpa Chavan, Saket Adhav, Rushikesh Gujar, Mayur Jadhav, Tushar Limbore (2014). "Automobile Service Center Management System" from International Journal of Scientific and Research Publications.
- [3] H. R. Esmael, "Apply android studio (SDK) tools." in International Journal of Advanced Research in Computer Science and Software Engineering, 2015
- [4] Öffentlichkeitsarbeit, G. (n.d.). Different kinds of applications. Retrieved November 23, 2020, from [https://www.uni-goettingen.de/en/different kinds of applications/81345.html](https://www.uni-goettingen.de/en/different+kinds+of+applications/81345.html)
- [5] Types of apps, different categories of mobile applications - 2020. (2020, October 28). Retrieved November 23, 2020, from <https://thinkmobiles.com/blog/popular-types-of-apps/>
- [6] Shamsudeen Rabi'ua , Akanmu Semiub* , Okere P. Hectorc (2012). "Usability characteristics of mobile applications" from First International Conference on Behavioural and Social Science Research (ICBSSR 2012)
- [7] Mimansha Patel1, Nitin Patel2 (2019) "Exploring Research Methodology: Review Article" from International Journal of Research and Review