Vehicle Maintenance and Mileage Tracker App

By

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ACKNOWLEDGEMENTS

I would like to express my sincere thanks and appreciation to my supervisor, Miss Ana Nabilah Binti Sa'uadi, who has offered me this golden opportunity to engage in the Flutter mobile application project. It is my first step to establishing a career in the Flutter mobile application field. A million thanks to you.

Most important, I must say thanks to my parents and my family for their love, support, and continuous encouragement throughout the course.

ABSTRACT

Nowadays, it is affordable for most families to own their automobile to reach or fetch their family members to their destination. Therefore, the quantity of vehicles is increasing along the time, resulting in a skyrocketing demand for maintenance services for the vehicles, which has become a necessity. During the celebration of the festival, a huge quantity of additional services was demanded that the service center could not handle at once. Furthermore, all vehicles that are bought will come with a user manual that includes suggestions for maintenance schedules from the manufacturer. But norms such as the owner regularly forgetting their maintenance appointment or even ignoring the maintenance might probably place themselves at risk of accidents. It is especially difficult for women to remember the scheduled tasks, such as oil changes and brake repairs, as there is a lot of stuff going on in life. Hence, it is great to have a comprehensive vehicle management tool for tracking vehicle data for multiple vehicles that could help the users keep track of all historical vehicle maintenance. This project's expected outcome is intended to help with vehicle maintenance and information tracking by providing regular maintenance and containing a vehicle logbook to keep track of all historical vehicle maintenance. The vehicle owner needs a software application to remind them of the service schedule so that they won’t miss the appointment of services and increase the safety of their vehicle and efficiency in dealing with maintenance.

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LIST OF ABBREVIATIONS

CMMS	Computerized Maintenance Management System
CMMIS	Computerized Maintenance Management Information System
CRUD	Create Read Update Delete
Q&A	Question and Answer
FAQ	Frequently Asked Questions
#System1	Vehicle Maintenance Tracker (VMT)
#System2	Car Maintenance Reminder
#System3	Autosist
#System4	Fuelly
#System5	Drivvo
#System6	Simply Auto

CHAPTER 1 INTRODUCTION

1.1 Introduction

The main vehicles, such as cars, are one of the most common and significant forms of transportation that people use in their routine lives, as well as for their mobility needs. Nowadays, the human population is increasing every year, which directly contributes to the quantity of people who own vehicles and has increased the confidence of auto ancillary units and the vehicle servicing sector. From another perspective, it indicates that car owners must pay attention to and concentrate on their vehicles to carry out routine maintenance and services to preserve their vehicle's top-notch condition and performance for their handling experience and safety purposes.

There is a possibility that every family can afford to buy and own at least a car, and there is some news that shows the vehicles in our country are compared to the human population. According to the New Straits Times, there were 33.3 million registered vehicles among the human population, and 47.3% were cars, which means almost half of the total [1]. In other words, the booming vehicle registration over the past few years will greatly increase the demand for maintenance services handled by the workshop or service center. In fact, the staff or mechanics are incapable of dealing with the huge demand for services in the short term, especially during the festival celebration session.

According to automotive research, there are a few reasons for delayed maintenance, including an unavailable time schedule, unaffordable maintenance costs, ignoring the importance of maintenance, an intended abundance of vehicles, inconvenience, an unavailable spare part, and other reasons. People always forget or put behind the vehicle routine maintenance [2]. The other reason is probably that the owner forgets the maintenance service schedule due to a lack of notification and service history.

Currently, modern people are oblivious to and forget about the services that were originally scheduled and supposed to carry out maintenance when certain mileages have been incurred and reached their maximum. Because a minority of them have the mindset that rescheduling the services is troublesome and they need to pay extra effort, in consequence they might continue delaying the maintenance or, even more crucially, ignore the trouble as they assume that part of the car is broken or malfunctioning would not affect or create a huge problem on their understanding. Moreover, our country, Malaysia, has not implemented regulations such as those in Singapore that limit the life of cars to a maximum of 10 years, so relatively new cars are driving on the road. Besides, their intention with the car scrap regulations is to achieve well-conditioned cars on the road rather than breakdown, maintain the automotive market active, and control the potential amount of car congestion on the road [3]. Therefore, the number of cases of car malfunctions or breakdowns in Singapore is lower than in Malaysia.

As the situation in Malaysia is, it might increase the risk of accidents if Malaysians do not follow the expected services and excessively regular maintenance, or even if the age of the car is older without consistently doing a maintenance check-up. Hence, they need an application to examine the number of vehicles and list any renewals or maintenance by utilizing this system or application. The user can manage to add and update vehicle details, mileage, and fuel details in the application. For instance, by uploading the vehicle documents and labeling them with the expiration date, the system will follow up on the documents, and users will be notified when certain parts need to be maintained, documents need to be renewed, and services need to be scheduled.

Nowadays, CMMS software is helping vehicle owners perform routine maintenance tasks when needed to reduce the number of accidents caused by vehicular malfunctions. But along with the current advanced technology trend, more and more huge countries or developing countries are utilizing the 3 CMMS to facilitate the processes of maintenance operations. Areas or industries such as manufacturing, oil and gas production, power generation, construction, transportation, and others can be organized with the CMMIS, or computerized maintenance management information system [4].

Hence, relevant authorities should invoke the relevant vehicle industry, and vehicle owners should start digitalizing their maintenance tracker method because transforming to a computerized maintenance management system (CMMS) might take time to fully adapt and use in a variety of areas or industries. We can see how important the CMMS application is, as in this early year 2022, the former Transport Minister Datuk Seri Dr Wee Ka Siong, along with the Autonest founder David Bong and Puspakom Sdn Bhd marketing and advisory head Datuk Ooi Win Juat, have launched the Autonest application that acts as a platform to help car owners service and maintain their vehicles [5]. Through this effort, it is enough to prove that changes are occurring, and the approaches are being practiced by businesses to adapt or foster a new life cycle with digitalization trademarks.

1.2 Problem Statement and Motivation

In this era of advanced technology, Malaysia still heavily relies on the manual reminder of the car maintenance schedule, which is the service sticker. The sticker is labeled with the current service oil change and the next service oil change details to help the owner schedule the maintenance when the figures are reached. We cannot deny that a windshield sticker reminder could be a good and suitable approach to alerting and reminding the car owner. Nonetheless, this technique is ineffective, and only limited information or details can be displayed on the sticker. Apart from this, the sticker may flake off or fade, causing a loss of information or blurry details regarding the next service assignment. On the other hand, it indirectly causes the car owner to delay the services due to an unclear next service mileage and leave them untended until they realize or discover there really is a malfunctioning problem and fix it later. Obviously, those pieces of evidence or statements show that the vehicle owner needs some application to remind them when maintenance miles are achieved and when appointment services are around the corner so that they will not miss the services and endanger themselves.

One of the factors that triggers the motivation to conduct research and develop the app is that people easily neglect trivial things that normally occur around us and need some reminder to recall them to memorize the task list. The objective of the research and developments proposed is to create an effective and efficient algorithm to retrieve the maintenance record from the database and utilize the notification to alert the users. Although the car service sticker is one of the approaches that people mutually and often adopt, there is still a problem that the user might overlock the sticker, as people usually won't place their view on the right top of the sunscreen shelter.

1.3 Objectives

There are three objectives that will be proposed to improve the vehicle maintenance and mileage tracking apps that exist on the market currently. The first objective is to increase the performance speed by providing an efficient algorithm to keep track of incoming maintenance with the notification schedule and retrieve all the maintenance record histories that have been stored. The second objective is to provide the user with a simpler interface architecture to operate and enter the new maintenance record or modify maintenance records according to their own preferences, such as color labels and dual theme modes such as light mode and dark mode. The third objective is to provide support and assist the user when they encounter any difficulties in using the application by providing guidelines or a user manual such as Q&A to solve their inquiry or provide alternative contact information so that they can get in touch with the support team.

1.4 Project Scope and Direction

In this project that was proposed, the beneficial group that concentrated were women and office workers, as they were often busy with their daily stuff until they overlooked the maintenance schedule. To memorize all kinds of maintenance tasks will be difficult for them to memorize, especially for the women who are not familiar with the car parts that need to be replaced. Therefore, it is necessary to have a comprehensive vehicle management tool for tracking the vehicle data for all vehicles and tracing back the previous vehicle maintenance history. In addition, adding the alert timeline and frequency are the significant elements that needed to be included to effectively remind the user of the maintenance that was scheduled. Another critical limitation that needs to be overcome is solving the application usage puzzle or guiding them through communication, which means adding chatbot features. For instance, the service application or website such as Lazada, Shopee, or Banking and Finance will provide a chatbot or customer care hotline to assist the user and solve the difficulties that arise from their organization's products or services.

1.5 Contribution

Most of the vehicle maintenance tracker systems focus only on the application features and functionality instead of considering the elements of communication and interaction. This app development is able to benefit women and working adults who are busy with their stuff or oblivion by alerting them and notifying them of the maintenance schedule that was set up earlier. Besides, the application will provide users with a Q&A section with further features, such as chatbot to help customers overcome the usage problem. Developing this Vehicle Maintenance and Mileage Tracker App may be quite complicated and complex from the analysis phase until the end product, but it will be able to hone my problem-solving skills, enhance my critical thinking, and learn the operation of reminder applications with the new programming language and framework.

1.6 Report Organization

This report is organized into seven chapters: Chapter 1 Introduction, Chapter 2 Literature Review, Chapter 3 System Methodology/Approach, Chapter 4 System Design, Chapter 5 System Implementation, Chapter 6 System Evaluation and Discussion and Chapter 7 Conclusion and Recommendation. The first chapter is the introduction of this project which include problem statement, objective, motivation, project scope and direction, contribution, report organization and conclusion. The second chapter is literature review that carried out on 6 existing Vehicle Maintenance Tracker applications which are System1, System2, System3, System4, System5 and System6 to analysis their features and weaknesses. Third chapter is about system methodology or approach which included framework, use case diagram, system design diagram, system architecture diagram and timeline. Forth chapter is system design which included system block diagram. The fifth chapter is implementation which included setting up software, virtualization, and preliminary work results. Sixth chapter is about the system testing metrices and result, project challenges and concluding remark. Lastly is conclusion and recommendation for future enhancement of the project.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

In this literature review, we are going to discuss how the application helps the owner keep track of the vehicle's maintenance record in terms of its efficiency and effectiveness. In addition, we will review a few applications, such as Vehicle Maintenance Tracker, Car Maintenance Reminder, Autosist, Fuelly, Drivvo, and Simply Auto (Milage Tracker), from various elements and aspects. This includes the strengths and limitations of the application system and suggests appropriate solutions for them to overcome the limitations.

2.2 Vehicle Maintenance Tracker (VMT)

Vehicle Maintenance Tracker (VTM) main development concept is focus on simplicity and equip with helpful utilities that helps users store records and histories for all of their vehicles' maintenance. It features consist of inserting, updating and deleting vehicle information such as photo, car's vehicle identification number (VIN), plate number, model year, tire size, oil filter type, current odometer, annual maintenance cost. Setting the due date for maintenance, searching for maintenance record. The highlight is exporting the vehicle's data in CSV format for printing and sharing purposes rather than screenshotting or using snipping tool to capture the photo of information.

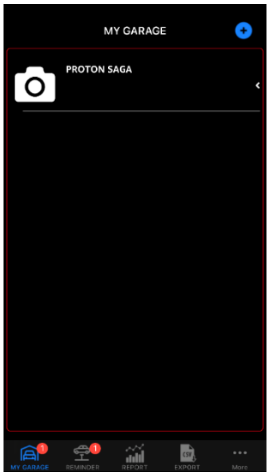
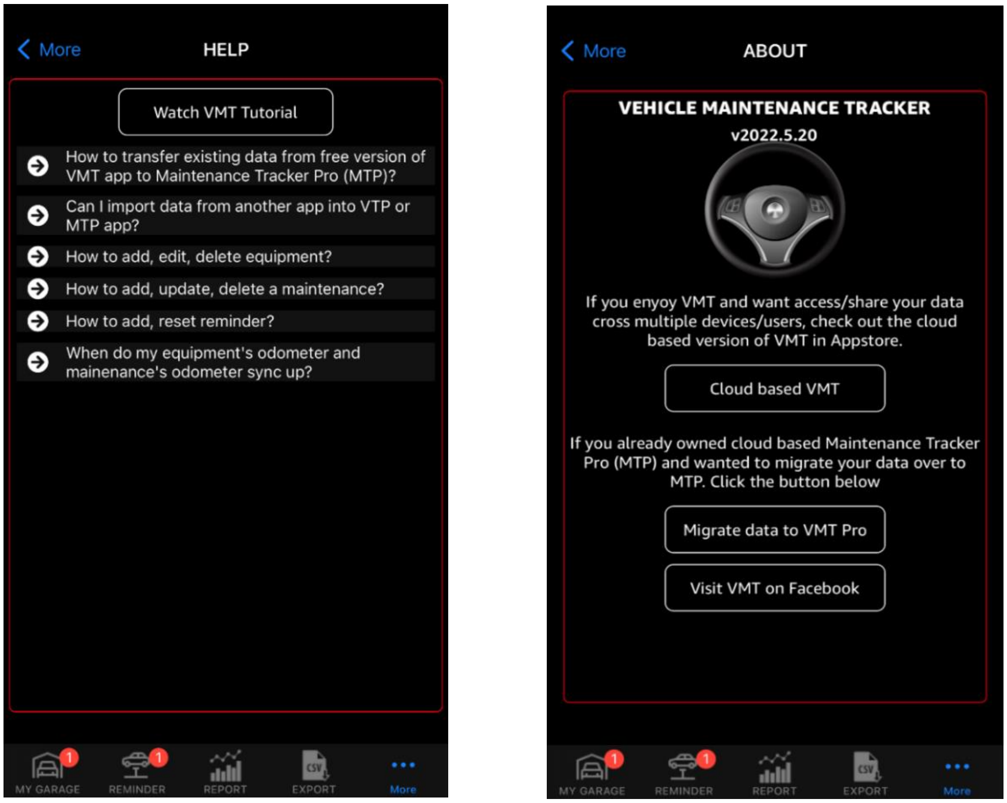


Figure 2.2 Main Page of VMT

2.2.1 Strength of Vehicle Maintenance Tracker (VMT)

- Easier navigate to other interface as it only consist of my gadget, reminder, report, export, achieved, help and about and easier to adapt and hand on quickly.
- Help function that offer with tutorial video on the usage of application and understand on how to operate with the application.
- Cloud based provided for access and sharing data across multiple devices.
- Help setting by finding their main page group on Facebook that attached in the About page.



How to transfer existing data from free version of VMT app to Maintenance Tracker Pro (MTP)?

Can I import data from another app into VTP or MTP app?

How to add, edit, delete equipment?

How to add, update, delete a maintenance?

How to add, reset reminder?

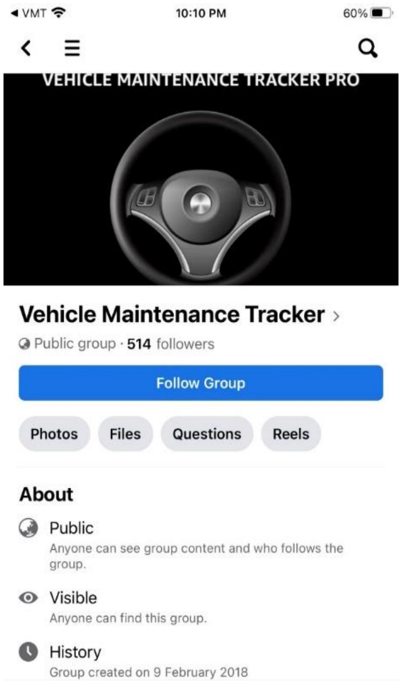
When do my equipment's odometer and mainenance's odometer sync up?

VEHICLE MAINTENANCE TRACKER
v2022.5.20

If you enyoy VMT and want access/share your data cross multiple devices/users, check out the cloud based version of VMT in Appstore.

If you already owned cloud based Maintenance Tracker Pro (MTP) and wanted to migrate your data over to MTP. Click the button below

Figure 2.2.1 (a) Vehicle Maintenance Tracker (VMT) Help and About



Vehicle Maintenance Tracker ›

Public group · 514 followers

About

Public

Anyone can see group content and who follows the group.

Visible

Anyone can find this group.

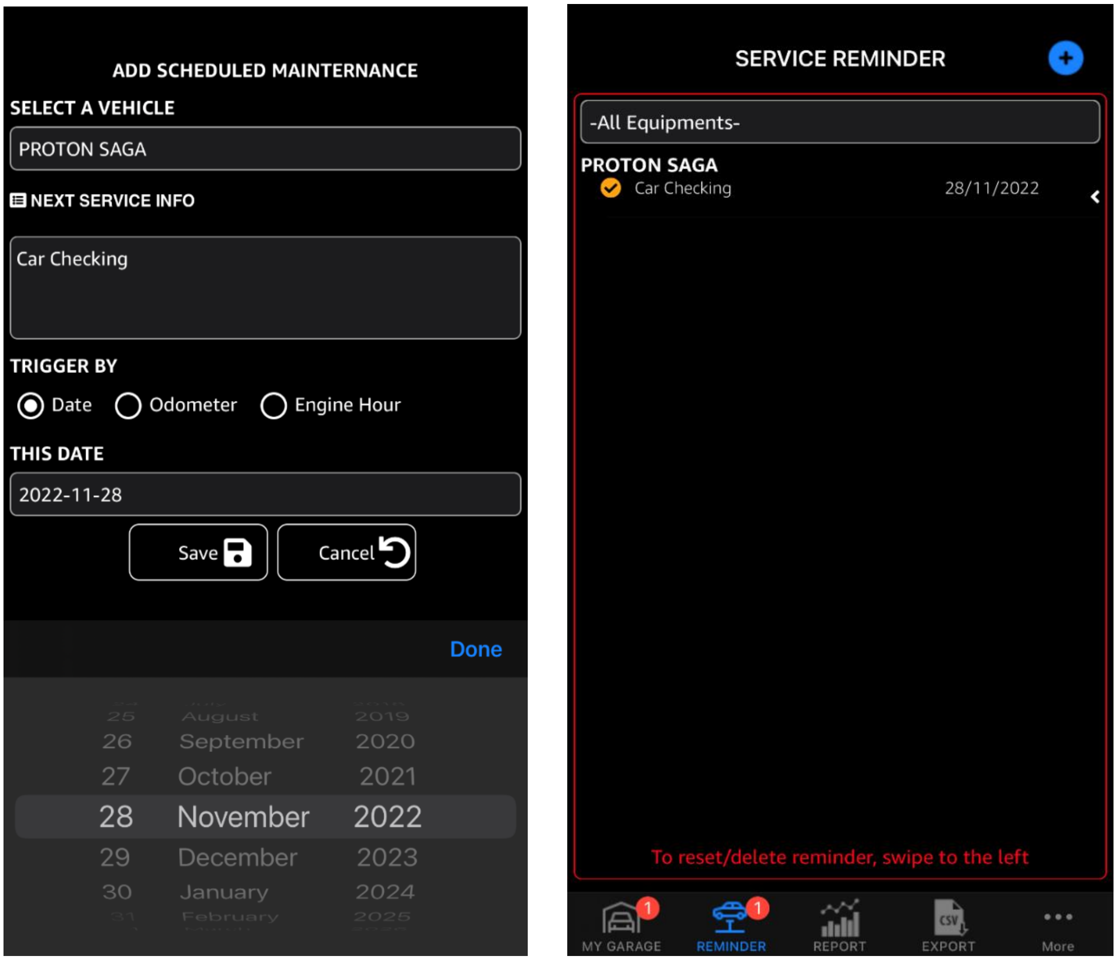
History

Group created on 9 February 2018

Figure 2.2.1(b) Vehicle Maintenance Tracker (VMT) Facebook Support

2.2.2 Limitation of Vehicle Maintenance Tracker (VMT) – Notification timeline lacking accurately and frequency

- Defectiveness in the timeline of notification. We can discover that date column is only can be input or select by the actual date only, the timeline might be too broad as notification normally is only push for one time only. According to the Nirvana of PushEngage, it better to push the notification twice per day at most and the highlight is the application permit to notify them, but smartphone owner is not necessary or have the intention to read all the message [6]. Therefore, the notification or reminder effort might be in vain because of once notification per day and owner is busying on their stuff and incidentally ignoring it.



ADD SCHEDULED MAINTERNANCE

SELECT A VEHICLE: PROTON SAGA

NEXT SERVICE INFO: Car Checking

TRIGGER BY: ● Date ○ Odometer ○ Engine Hour

THIS DATE: 2022-11-28

SERVICE REMINDER

-All Equipments-

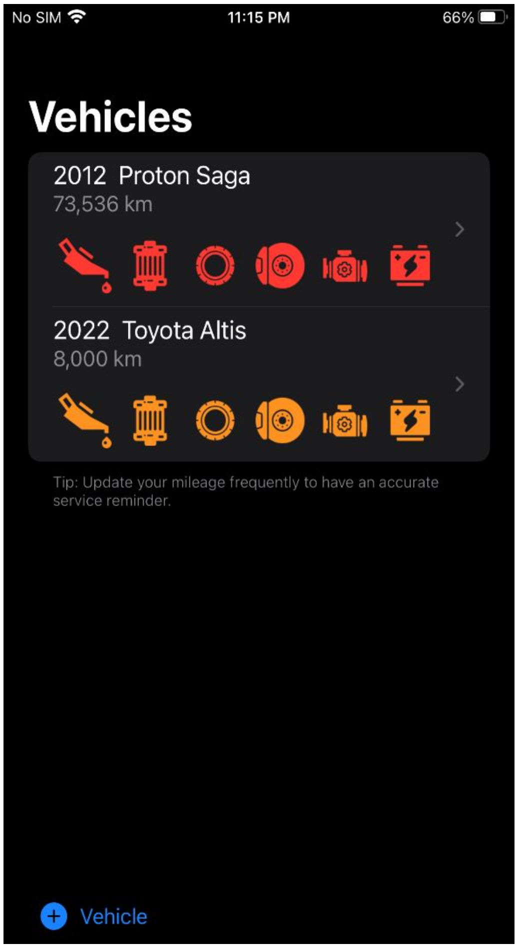
PROTON SAGA
Car Checking 28/11/2022

To reset/delete reminder, swipe to the left

Figure 2.2.2 Vehicle Maintenance Tracker (VMT) add details and service reminder

2.3 Car Maintenance Reminder

Car Maintenance Reminder is application that able to store the car maintenance history and making preparation process for vehicle servicing. The reminder changing areas are including the fluid change, air filter, tires rotation, balancing alignment, break and replacement of brake. While for the inspection functions will be focus on battery and timing belt. It also offering the maintenance record in PDF or CSF files for the information tracking.



Vehicles

2012 Proton Saga
73,536 km

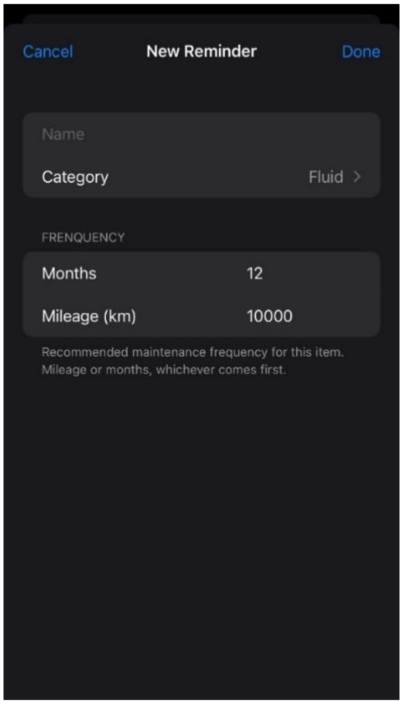
2022 Toyota Altis
8,000 km

Tip: Update your mileage frequently to have an accurate service reminder.

Figure 2.3 Main Page of Car Maintenance Reminder

2.3.1 Strength of Car Maintenance Reminder

- Able to list out a variety of maintenance status of the vehicle such as inspection of battery, brake condition, timing belt, oil change and others with recognizable symbol.
- Estimation on average month and mileage that user usual incurred and provide the predictive period to the user to send their vehicle to workshop to repair or service.



New Reminder

Name

Category Fluid

FRENQUENCY

Months 12

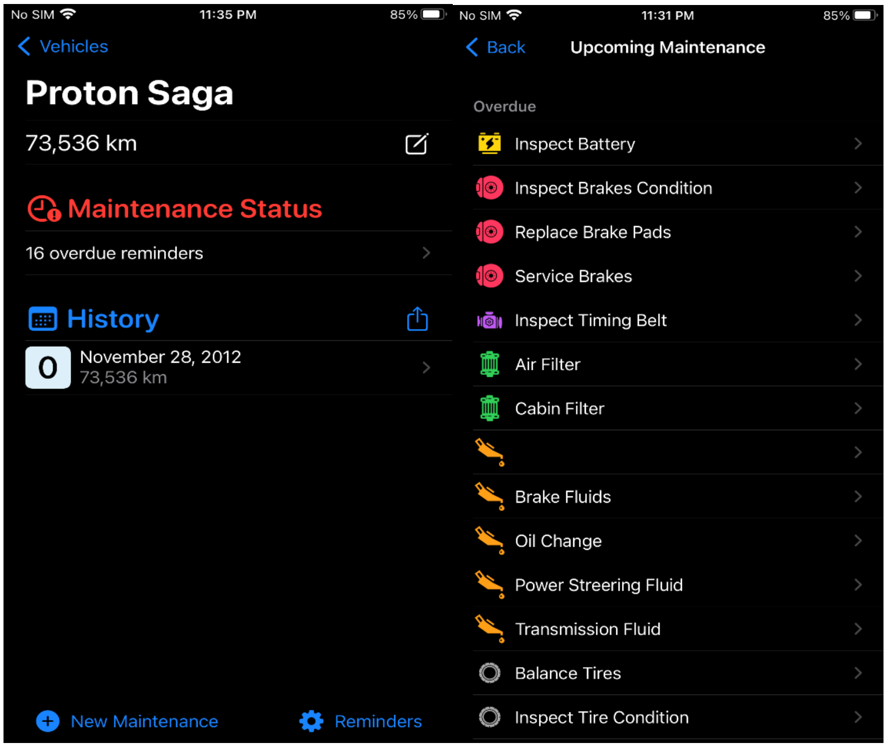
Mileage (km) 10000

Recommended maintenance frequency for this item.
Mileage or months, whichever comes first.

Figure 2.3.1 Car Maintenance Reminder Average Reminder page

2.3.2 Limitation of Car Maintenance Reminder – Inconsistency of reminders

- The Car Maintenance Reminder is lacking the pragmatic notification or reminder to the user for the maintenance schedule instead of alerting the user in the lock screen, notification center and banner. It is causing inconsistent of reminders as it seems a non-existence to notify and user able to know the maintenance status when the login to the app. The application can’t help user much in recall the service schedule that made and repair it or regular checking consistently or on time to ensure the functionality and performance.



No SIM 11:35 PM 85%

Vehicles

Proton Saga

73,536 km

Maintenance Status

16 overdue reminders

History

0 November 28, 2012
73,536 km

New Maintenance Reminders

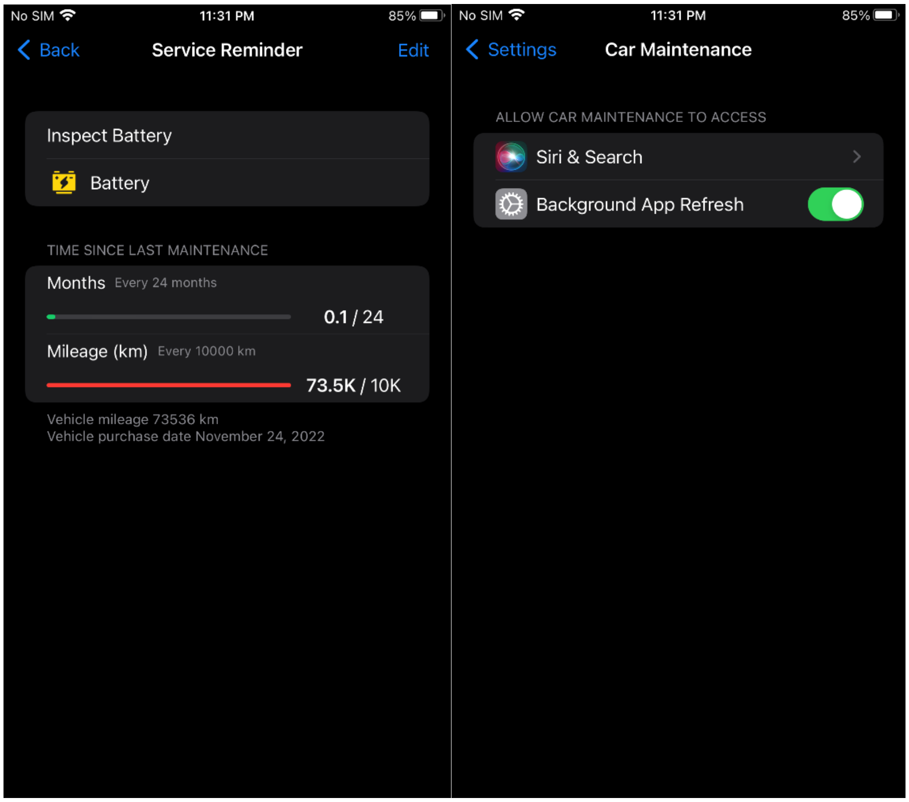
No SIM 11:31 PM 85%

Back Upcoming Maintenance

Overdue

- Inspect Battery
- Inspect Brakes Condition
- Replace Brake Pads
- Service Brakes
- Inspect Timing Belt
- Air Filter
- Cabin Filter
- Brake Fluids
- Oil Change
- Power Streering Fluid
- Transmission Fluid
- Balance Tires
- Inspect Tire Condition

Figure 2.3.2 (a) Car Maintenance Reminder Upcoming Maintenance



No SIM 11:31 PM 85%

Back Service Reminder Edit

Inspect Battery

Battery

TIME SINCE LAST MAINTENANCE

Months Every 24 months 0.1 / 24

Mileage (km) Every 10000 km 73.5K / 10K

Vehicle mileage 73536 km
Vehicle purchase date November 24, 2022

No SIM 11:31 PM 85%

Settings Car Maintenance

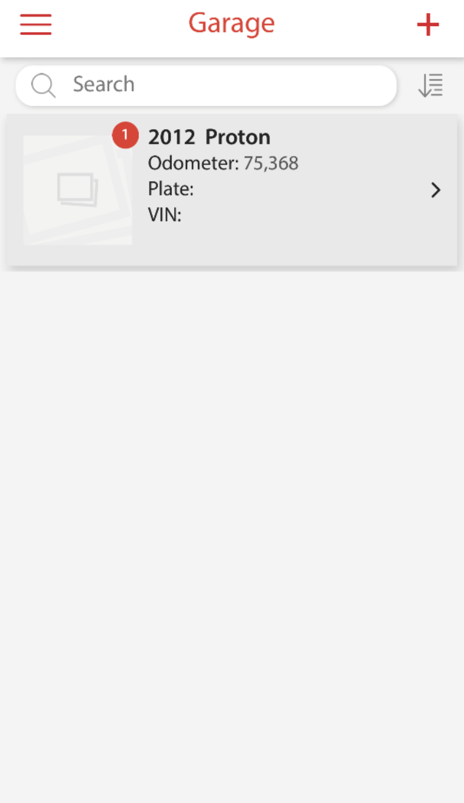
ALLOW CAR MAINTENANCE TO ACCESS

- Siri & Search
- Background App Refresh

Figure 2.3.2 (b) Car Maintenance Reminder Notification

2.4 Autosist

Autosist is offering simple and practical way to business owners and fleet managers in vehicle maintenance record in term of service and fuel. They also offering Fleet Maintenance and Management plans and tools to the organization manage the business fleets to improve the efficiency, reduce downtime and minimize the cost.



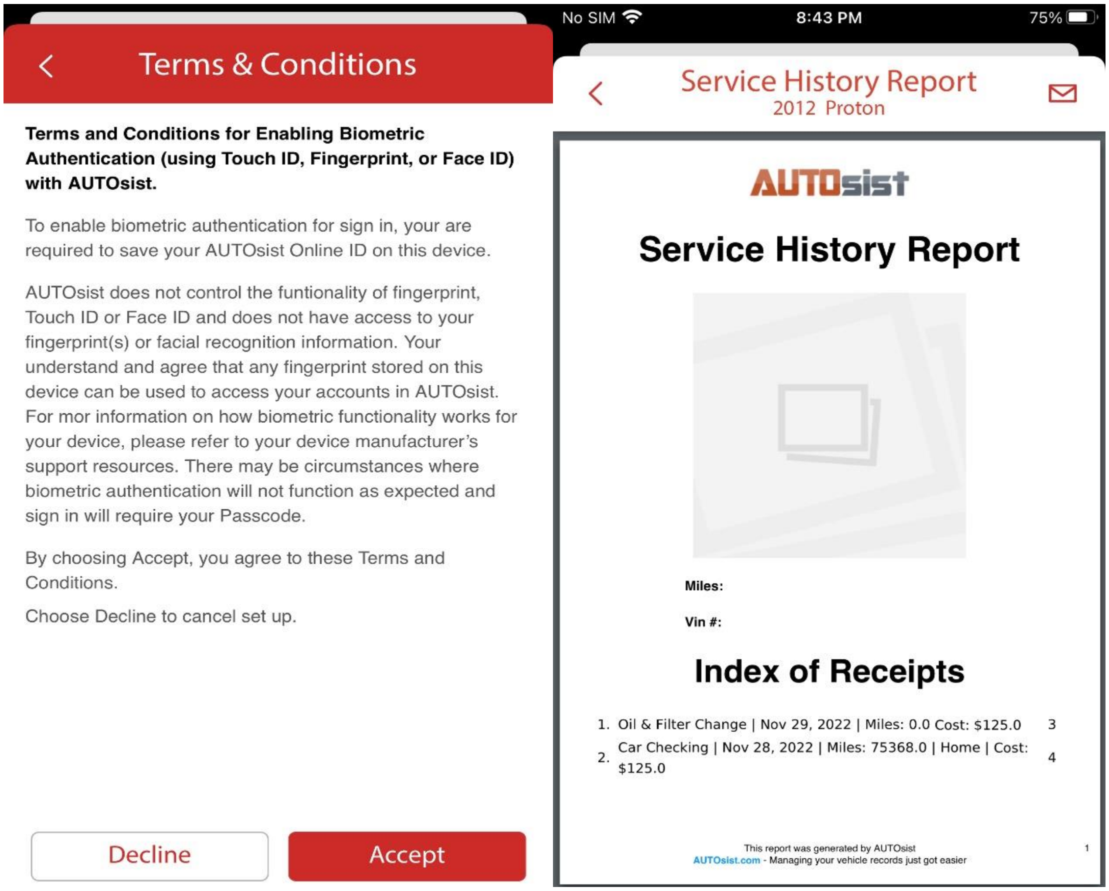
2012 Proton
Odometer: 75,368
Plate:
VIN:

Figure 2.4 Main Page of Autosist

2.4.1 Strength of Autosist

- Emphasizing on the security by including the biometrics approach such as Touch or Face ID for IOS and Face recognition and fingerprint for Android.
- Maintenance record only able view by the owner or the authorization access that permitted.

- Recorded service and fuel cost for owner's calculation on the accumulated total amount.
- Offering the spend analysis report with car part that spend on and service history that fulfilled with receipt details such as title, date, millage before service and the cost.
- Storing the critical document and receipt in cloud-based system.



Terms and Conditions for Enabling Biometric Authentication (using Touch ID, Fingerprint, or Face ID) with AUTOsist.

To enable biometric authentication for sign in, your are required to save your AUTOsist Online ID on this device.

AUTOsist does not control the funtionality of fingerprint, Touch ID or Face ID and does not have access to your fingerprint(s) or facial recognition information. Your understand and agree that any fingerprint stored on this device can be used to access your accounts in AUTOsist. For mor information on how biometric functionality works for your device, please refer to your device manufacturer's support resources. There may be circumstances where biometric authentication will not function as expected and sign in will require your Passcode.

By choosing Accept, you agree to these Terms and Conditions.

Choose Decline to cancel set up.

Service History Report

Miles:

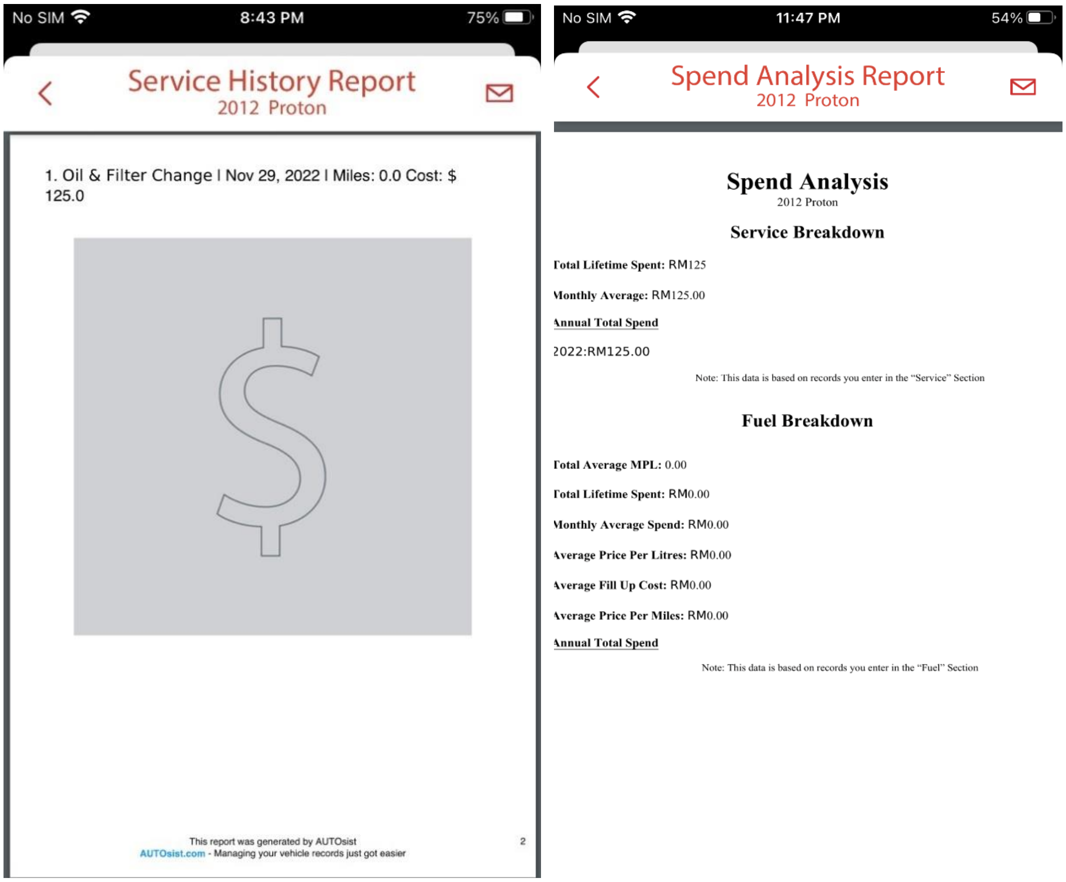
Vin #:

Index of Receipts

1. Oil & Filter Change | Nov 29, 2022 | Miles: 0.0 Cost: $125.0 3
2. Car Checking | Nov 28, 2022 | Miles: 75368.0 | Home | Cost: $125.0 4

This report was generated by AUTOsist 1
AUTOsist.com - Managing your vehicle records just got easier

Figure 2.4.1 (a) Autosist Application Security Page and Service History Report



Service History Report
2012 Proton

1. Oil & Filter Change I Nov 29, 2022 I Miles: 0.0 Cost: $ 125.0

This report was generated by AUTOsist
AUTOsist.com - Managing your vehicle records just got easier

2

Spend Analysis Report
2012 Proton

Spend Analysis
2012 Proton

Service Breakdown

Total Lifetime Spent: RM125

Monthly Average: RM125.00

Annual Total Spend

2022:RM125.00

Note: This data is based on records you enter in the "Service" Section

Fuel Breakdown

Total Average MPL: 0.00

Total Lifetime Spent: RM0.00

Monthly Average Spend: RM0.00

Average Price Per Litres: RM0.00

Average Fill Up Cost: RM0.00

Average Price Per Miles: RM0.00

Annual Total Spend

Note: This data is based on records you enter in the "Fuel" Section

Figure 2.4.1 (b) Autosist Spend Analysis Report

2.4.2 Limitation of Autosist – Defectiveness of help or contact details

- Providing the help and support through email increase the user's difficulty to get contact with the support team to tackle the enquiry and puzzle.
- Enquiry is needed to send through request with details and await the response from the tech support.
- Exclude other contact information inside the application which caused user to get frustrated when encounter problem such as occasionally forcing logout and application malfunction.

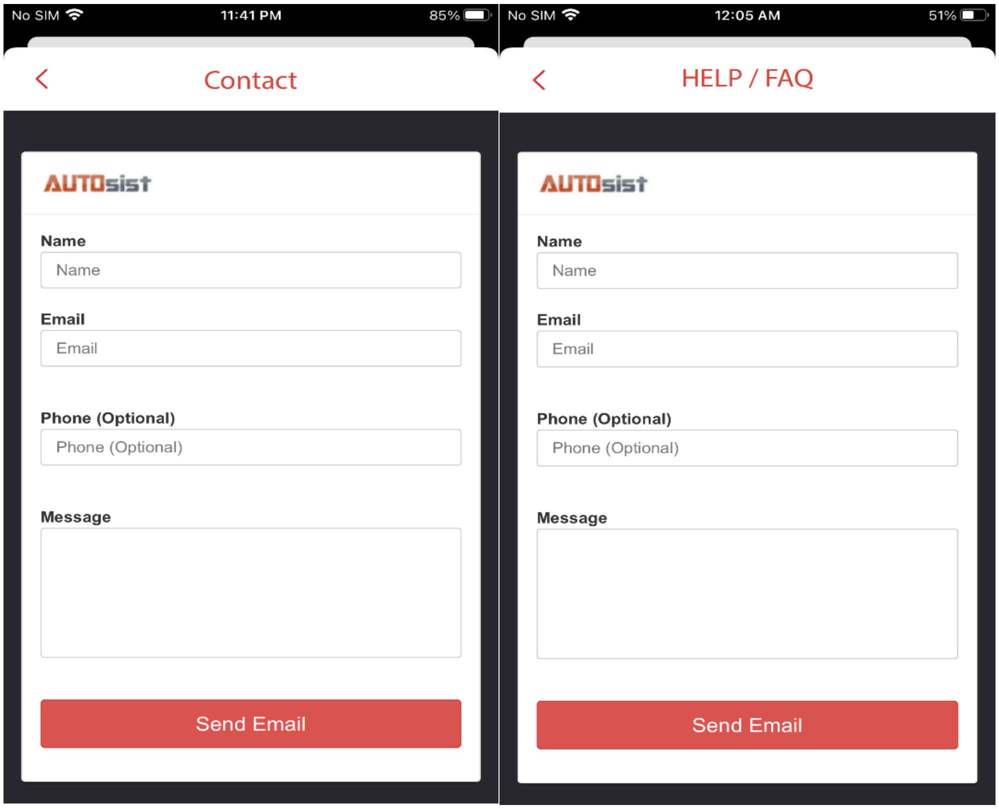
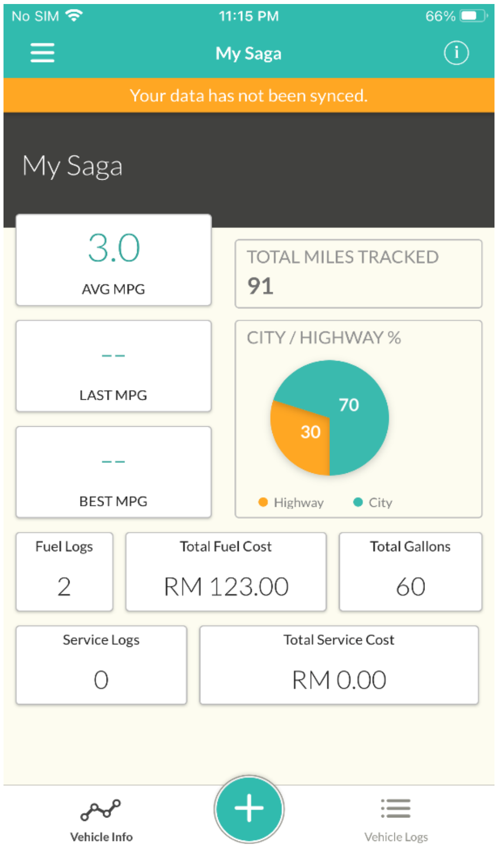


Figure 2.4.2 Autosist Contact, Help and FAQ

2.5 Fuelly

Fuelly is a vehicle's fuel economy and maintenance record tracking application. It able to set up reminder for variety of maintenance task such as oil change, tire alignment and other service rotations. It also equip with features of storing the vehicle-related expenses, accidents, replacement part of vehicle and able to upload the receipt of expenses with receipt in form of PDF or photo. It also able generate CSV attachment and sent to the email if needed.



Your data has not been synced.

My Saga

3.0 AVG MPG

TOTAL MILES TRACKED 91

-- LAST MPG

CITY / HIGHWAY %

70

30

● Highway ● City

-- BEST MPG

Fuel Logs 2

Total Fuel Cost RM 123.00

Total Gallons 60

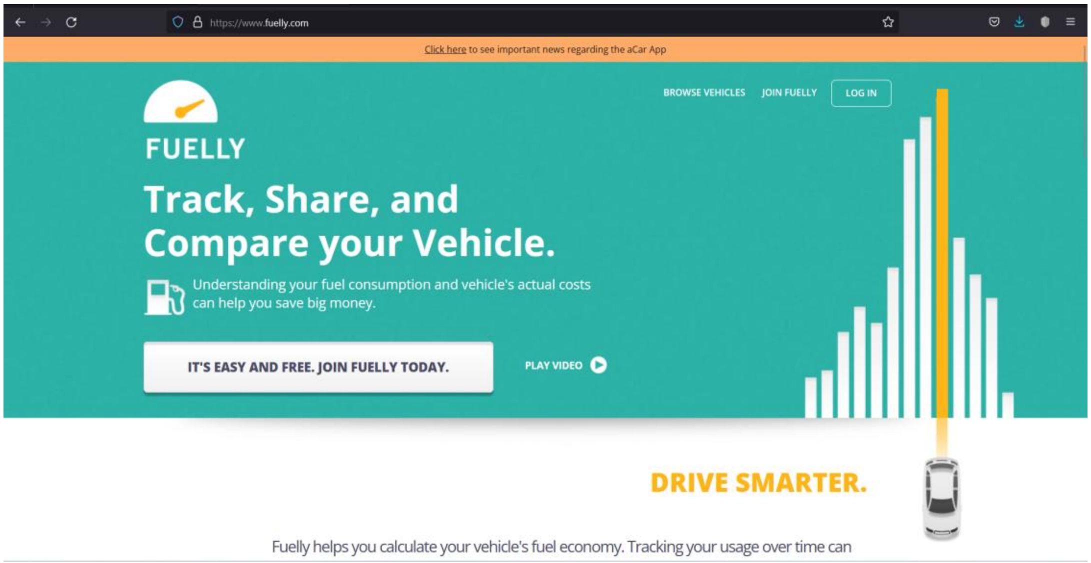
Service Logs 0

Total Service Cost RM 0.00

Figure 2.5 Main Page of Fuelly

2.5.1 Strength of Fuelly

- Data synchronization with the desktop website version on Fuelly.com
- Alternative options to use in smartphone or browser which making the powerful accessible to gain their own's vehicle information.
- Calculation on the fuel expenses for each time petrol filled up and accumulative it.
- Able to attach the receipt photo of fuel cost for own proof and future recalculation.



https://www.fuelly.com

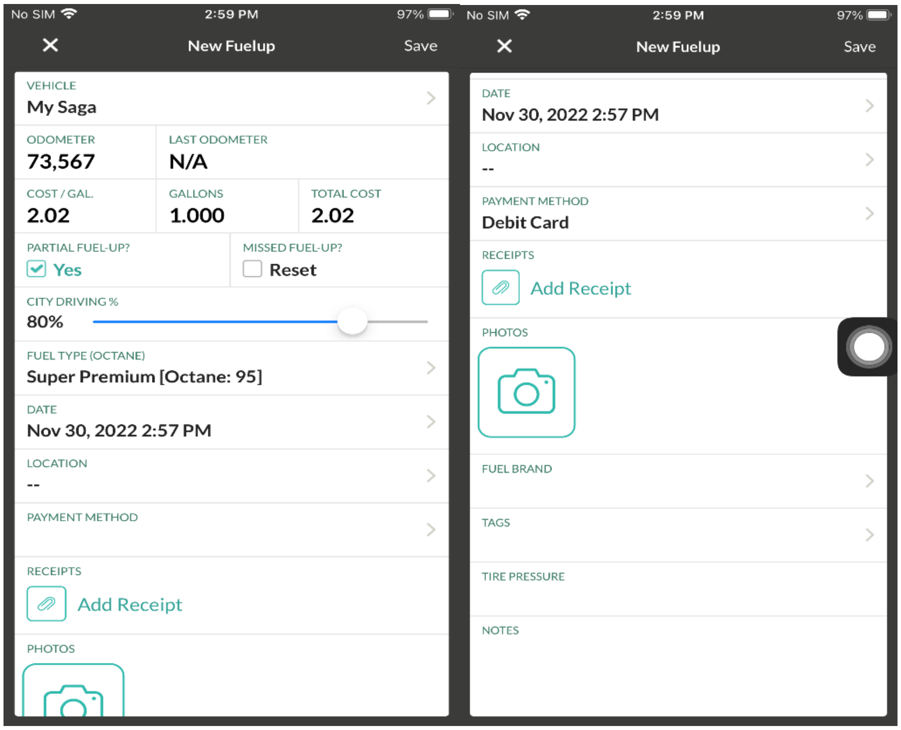
Click here to see important news regarding the aCar App

Track, Share, and Compare your Vehicle.

Understanding your fuel consumption and vehicle's actual costs can help you save big money.

Fuelly helps you calculate your vehicle's fuel economy. Tracking your usage over time can

Figure 2.5.1 (a) Fuelly Web Version



VEHICLE
My Saga

ODOMETER 73,567
LAST ODOMETER N/A

COST / GAL. 2.02
GALLONS 1.000
TOTAL COST 2.02

PARTIAL FUEL-UP? ☑ Yes
MISSED FUEL-UP? ☐ Reset

CITY DRIVING % 80%

FUEL TYPE (OCTANE)
Super Premium [Octane: 95]

DATE
Nov 30, 2022 2:57 PM

LOCATION
--

PAYMENT METHOD

RECEIPTS
Add Receipt

PHOTOS

DATE
Nov 30, 2022 2:57 PM

LOCATION
--

PAYMENT METHOD
Debit Card

RECEIPTS
Add Receipt

PHOTOS

FUEL BRAND

TAGS

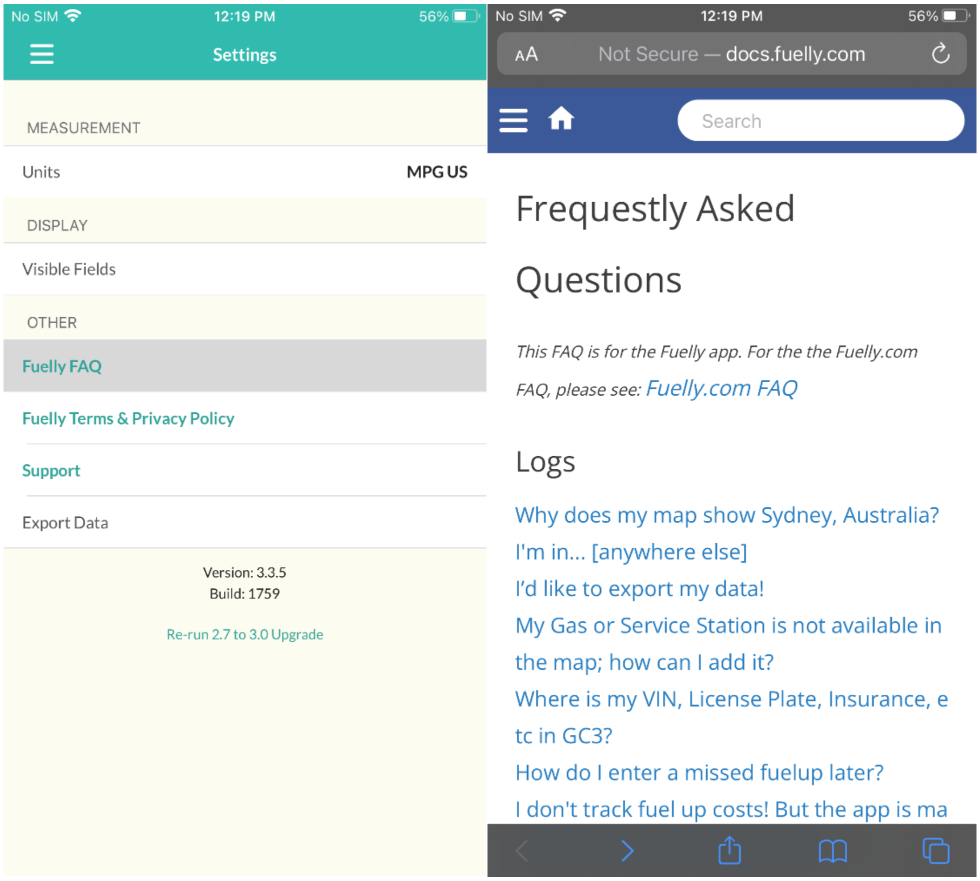
TIRE PRESSURE

NOTES

Figure 2.5.1 (b) Fuel Calculation

2.5.2 Limitation of Fuelly – Inconvenience of FAQ and support

- Annoying and inconvenience for user as the FAQ section is invisible and user need to find it in setting page.
- FAQ section in application will redirect to their own webpage that means user need to ensure using it in connection for viewing purpose.
- Contact and support is only available in the web and need to email the specific question to them and wait for their reply as the mentioned mostly the question is answered in the FAQ.



Frequestly Asked Questions

This FAQ is for the Fuelly app. For the the Fuelly.com FAQ, please see: Fuelly.com FAQ

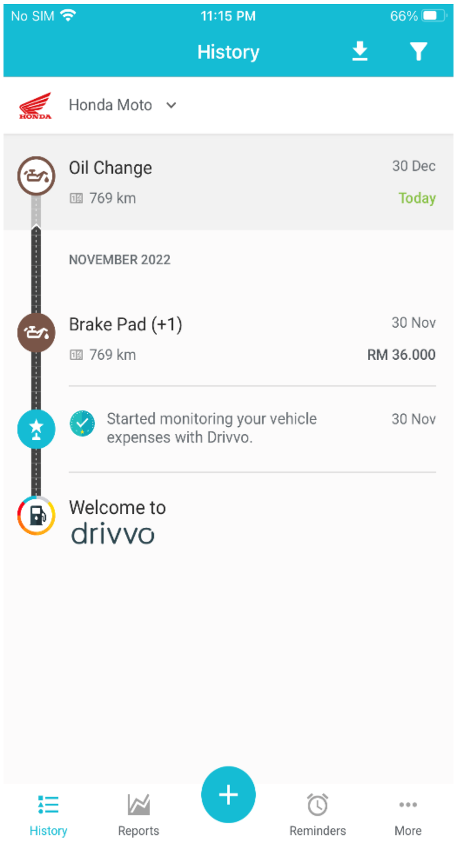
Logs

Why does my map show Sydney, Australia?
I'm in... [anywhere else]
I'd like to export my data!
My Gas or Service Station is not available in the map; how can I add it?
Where is my VIN, License Plate, Insurance, e tc in GC3?
How do I enter a missed fuelup later?
I don't track fuel up costs! But the app is ma

Figure 2.5.2 Fuelly FAQ and Support

2.6 Drivvo

Drivvo originally is designed for the personal and company fleet management on the vehicle. It mainly purposes is to control fuel or refueling, maintenance and expenses of registration and financing and the fuel or gas consumption calculation. In addition, it not only fleet management application for the personal automobile but also included motorcycle, bus, and truck.



Oil Change 769 km 30 Dec Today

NOVEMBER 2022

Brake Pad (+1) 769 km 30 Nov RM 36.000

Started monitoring your vehicle expenses with Drivvo. 30 Nov

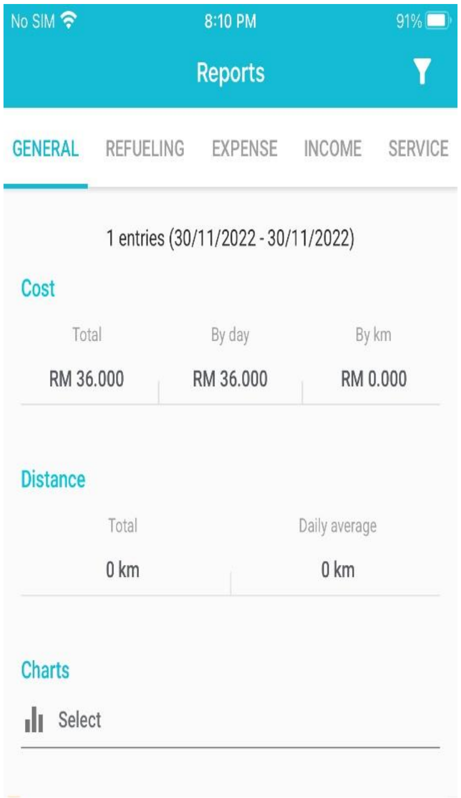
Welcome to drivvo

Figure 2.6 Main Page of Drivvo

2.6.1 Strength of Drivvo

- Support multiple type of vehicle and automobile management for car, motorcycle, bus, and truck at once time.
- Displaying multiple range of manufacturer information

- Diversification wide range of area such as fuel consumption, type of services, types of expenses and type of income.
- Separately distribution of record and report for clearer view.
- Different data of vehicle can be store in cloud.
- Synchronization among multiple devices.



1 entries (30/11/2022 - 30/11/2022)

Cost

Total	By day	By km
RM 36.000	RM 36.000	RM 0.000

Distance

Total	Daily average
0 km	0 km

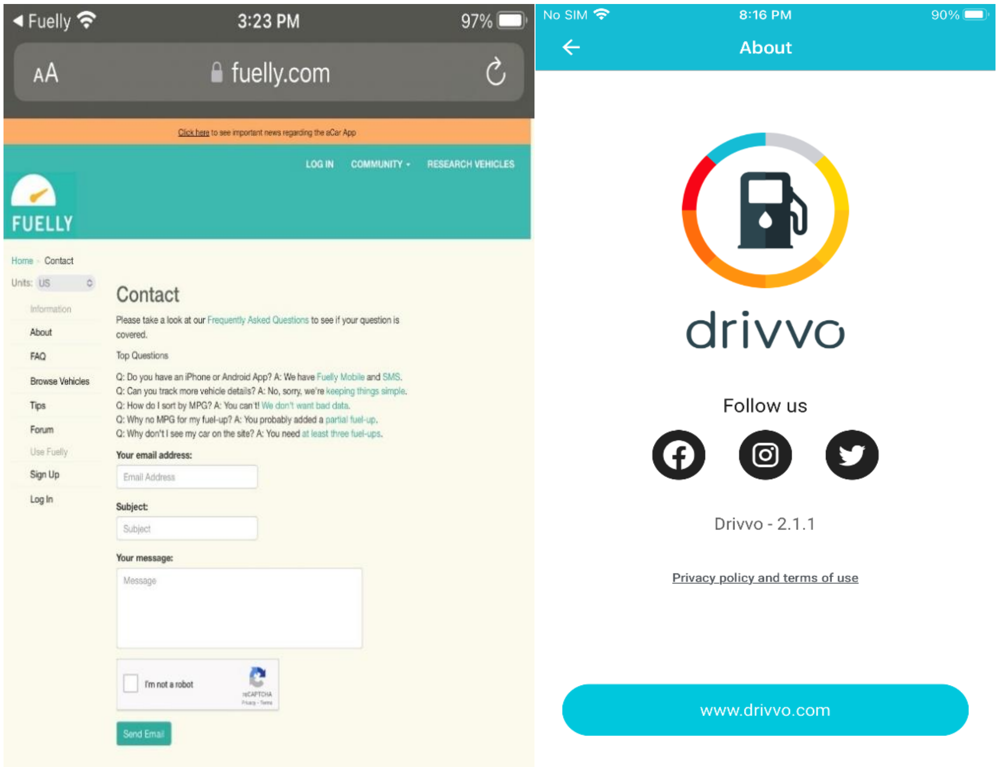
Charts

Figure 2.6.1 Segmentation of report section

2.6.2 Limitation of Drivvo – Lacking FAQ and proper contact

- Can’t find the FAQ section to overcome when they are facing difficulties or error that trigger by the application.
- Difficult get help through email based approach to get user’s feedback and problem that encounter.
- Can’t solve problem immediately by waiting reply from the support team within 24 hours.

- Own organization Facebook, Instagram and Twitter in the About page but it did not clearly mention the usage and placing with the contact page.



Click here to see important news regarding the aCar App

Contact

Please take a look at our Frequently Asked Questions to see if your question is covered.

Top Questions

Q: Do you have an iPhone or Android App? A: We have Fuelly Mobile and SMS.
Q: Can you track more vehicle details? A: No, sorry, we're keeping things simple.
Q: How do I sort by MPG? A: You can't! We don't want bad data.
Q: Why no MPG for my fuel-up? A: You probably added a partial fuel-up.
Q: Why don't I see my car on the site? A: You need at least three fuel-ups.

Your email address: Email Address

Subject: Subject

Your message: Message

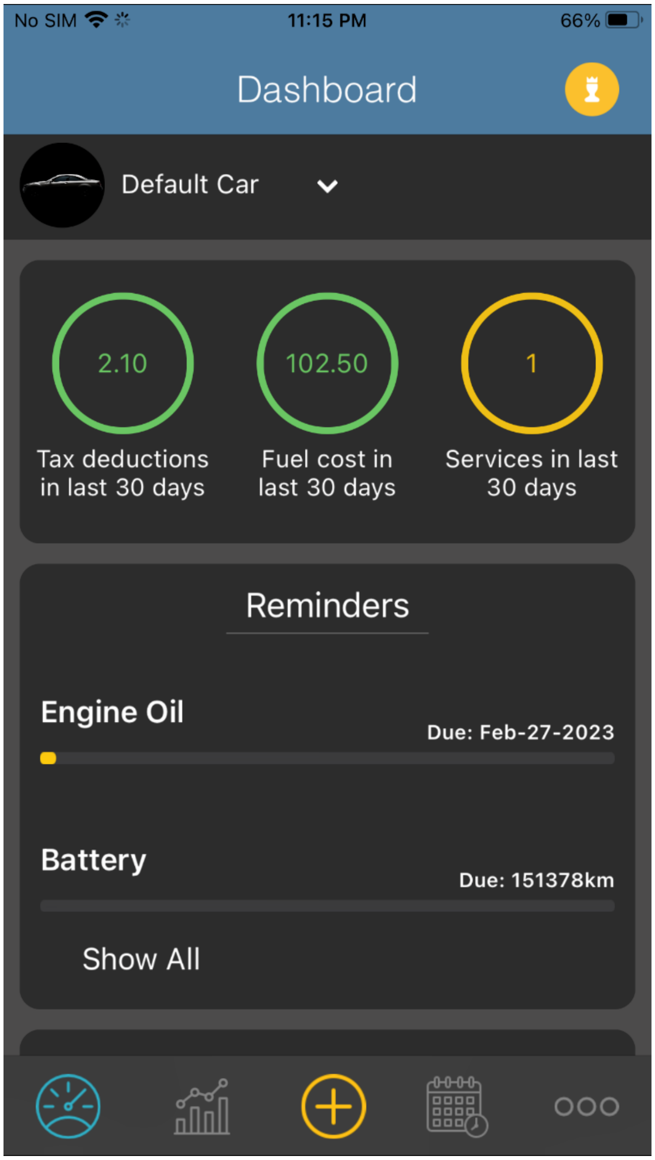
□ I'm not a robot

Drivvo - 2.1.1

Figure 2.6.2 Contact and About page

2.7 Simply Auto: Milage Tracker

Simply auto is vehicle management application for variety type of vehicle such as car, motorcycles and tucks that equip with maintenance reminders, mileage consumption, and expenses that consumed by each vehicles. It also able perform function such as uploading receipts, exporting the report with mileage logs, back-up on cloud and data synchronization on website and data can be share and accessing by multiple devices.



Dashboard

Default Car

2.10
Tax deductions in last 30 days

102.50
Fuel cost in last 30 days

1
Services in last 30 days

Reminders

Engine Oil
Due: Feb-27-2023

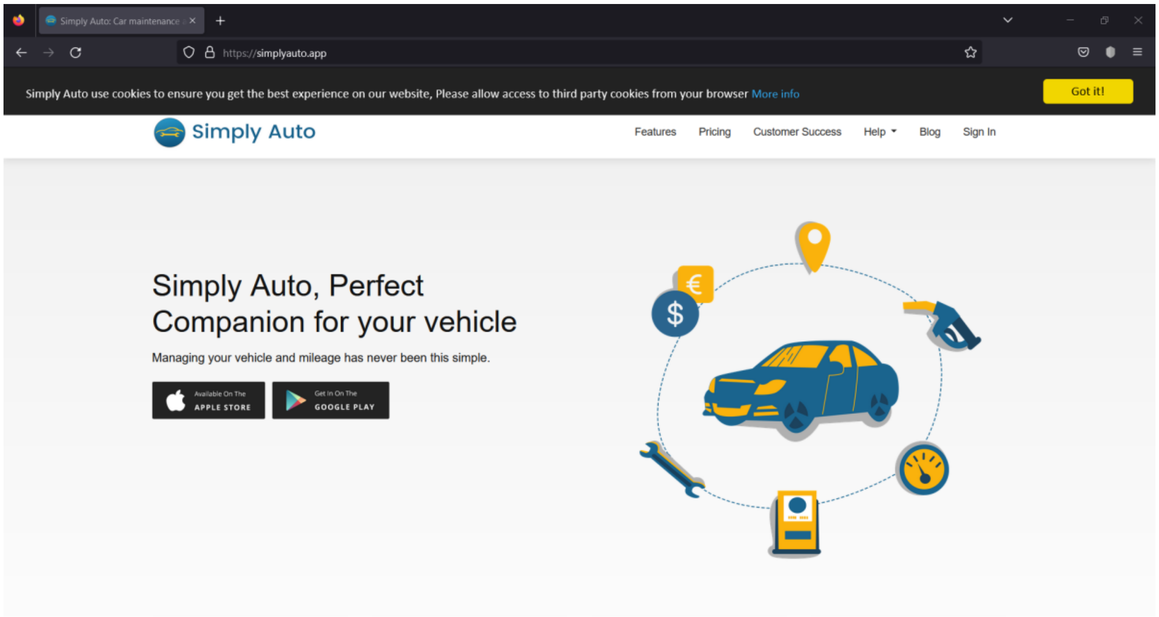
Battery
Due: 151378km

Figure 2.7 Main Page of Drivvo

2.7.1 Strength of Simply Auto: Milage Tracker

- Strong help support such as support, FAQs, user guide, help and feedback.
- Illustration of user guide with function description and screenshot every step for clearer clarification and guidance to the user.

Accessible through: https://simplyauto.app/. [7]

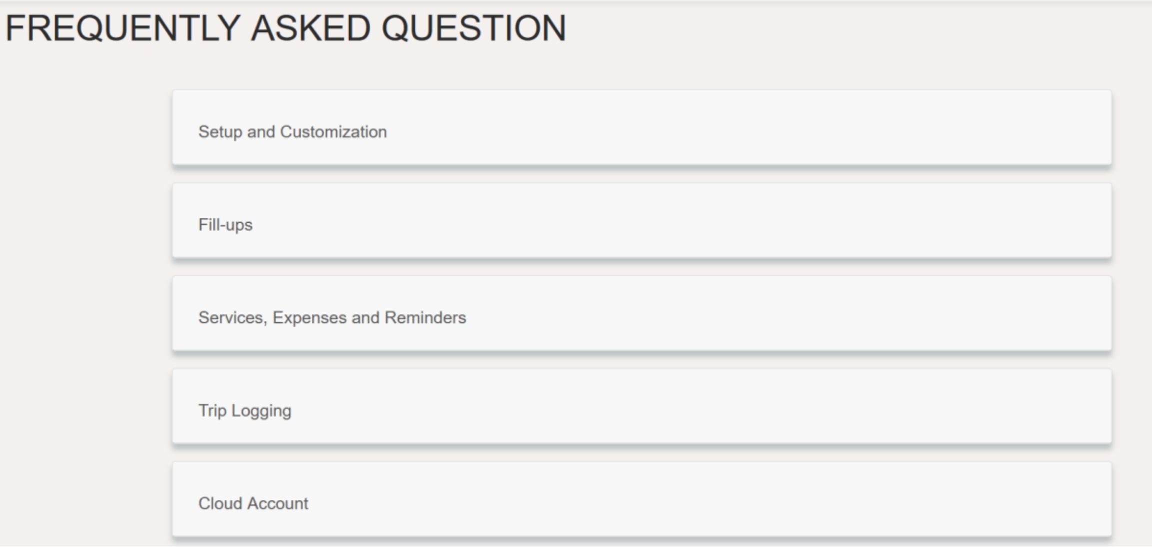


Simply Auto use cookies to ensure you get the best experience on our website, Please allow access to third party cookies from your browser More info

Simply Auto, Perfect Companion for your vehicle

Managing your vehicle and mileage has never been this simple.

Figure 2.7.1 (a) Simply Auto Web Version



FREQUENTLY ASKED QUESTION

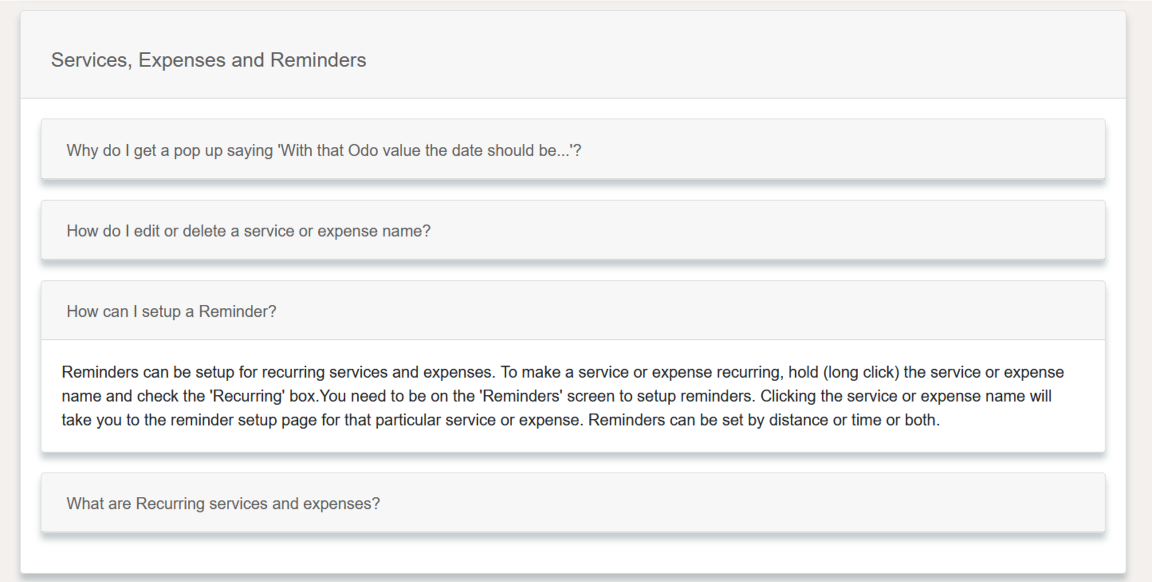
Setup and Customization

Fill-ups

Services, Expenses and Reminders

Trip Logging

Cloud Account



Services, Expenses and Reminders

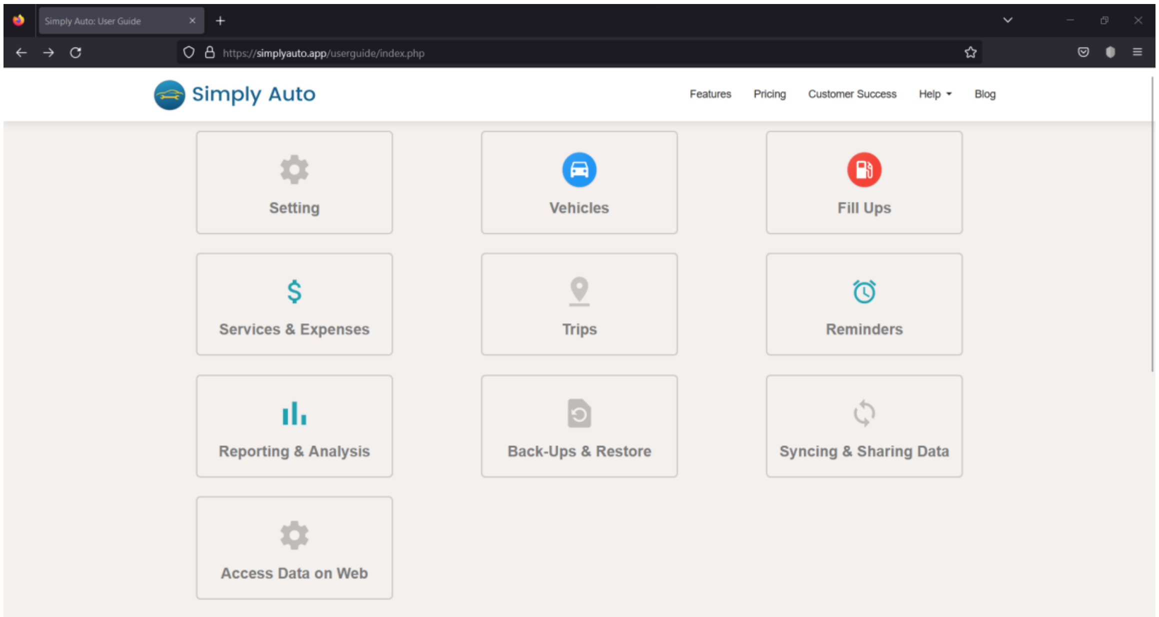
Why do I get a pop up saying 'With that Odo value the date should be...'?

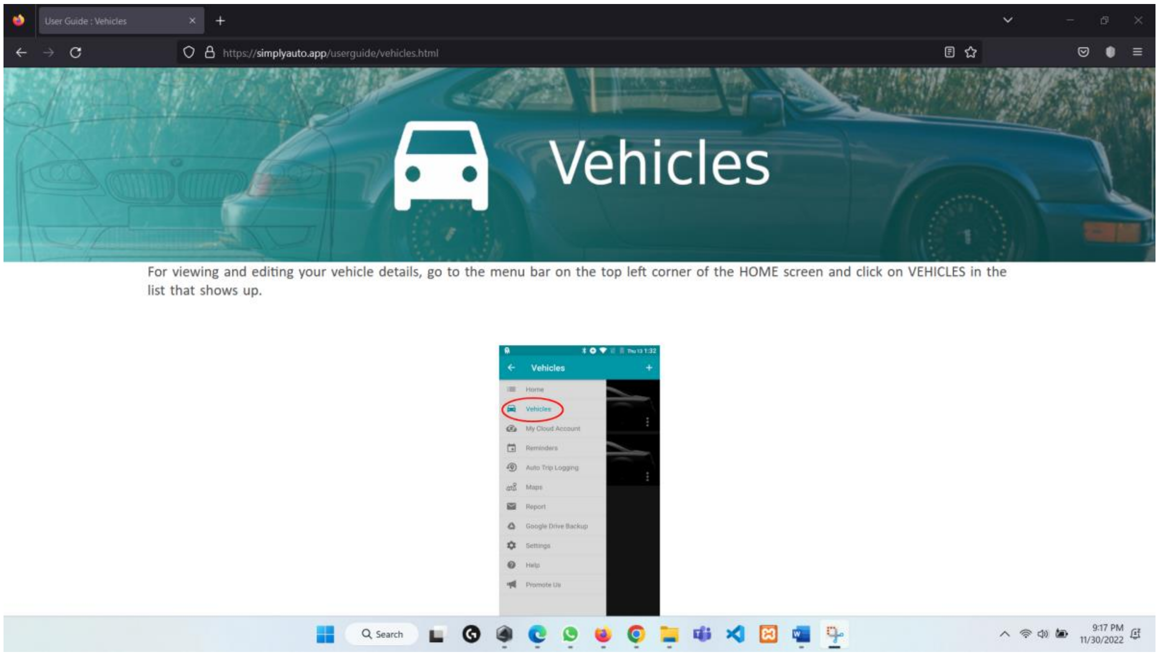
How do I edit or delete a service or expense name?

How can I setup a Reminder?

Reminders can be setup for recurring services and expenses. To make a service or expense recurring, hold (long click) the service or expense name and check the 'Recurring' box.You need to be on the 'Reminders' screen to setup reminders. Clicking the service or expense name will take you to the reminder setup page for that particular service or expense. Reminders can be set by distance or time or both.

What are Recurring services and expenses?



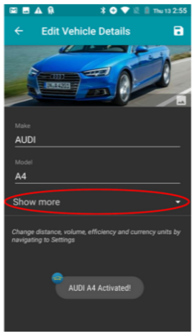


Vehicles

For viewing and editing your vehicle details, go to the menu bar on the top left corner of the HOME screen and click on VEHICLES in the list that shows up.

This screen will let you see and edit the vehicles you want to track using SimplyAuto. A default vehicle called 'Default Car' is created by the app initially. You can add more vehicles by clicking on the "+" sign on the top right corner of this screen.

For each vehicle that you enlist on the app, you can add a picture (of the vehicle) as well as the MAKE and MODEL details. You can add more details like the YEAR, LICENSE NO., VIN, and INSURANCE NO. under ADD MORE SPECIFICATIONS.

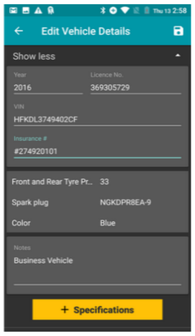


Make
AUDI

Model
A4

Change distance, volume, efficiency and currency units by navigating to Settings

AUDI A4 Activated!



Year: 2016
Licence No.: 369305729
VIN: HFKDL3749402CF
Insurance #: #274920101

Front and Rear Tyre Pr...	33
Spark plug	NGKDPR8EA-9
Color	Blue

Notes
Business Vehicle

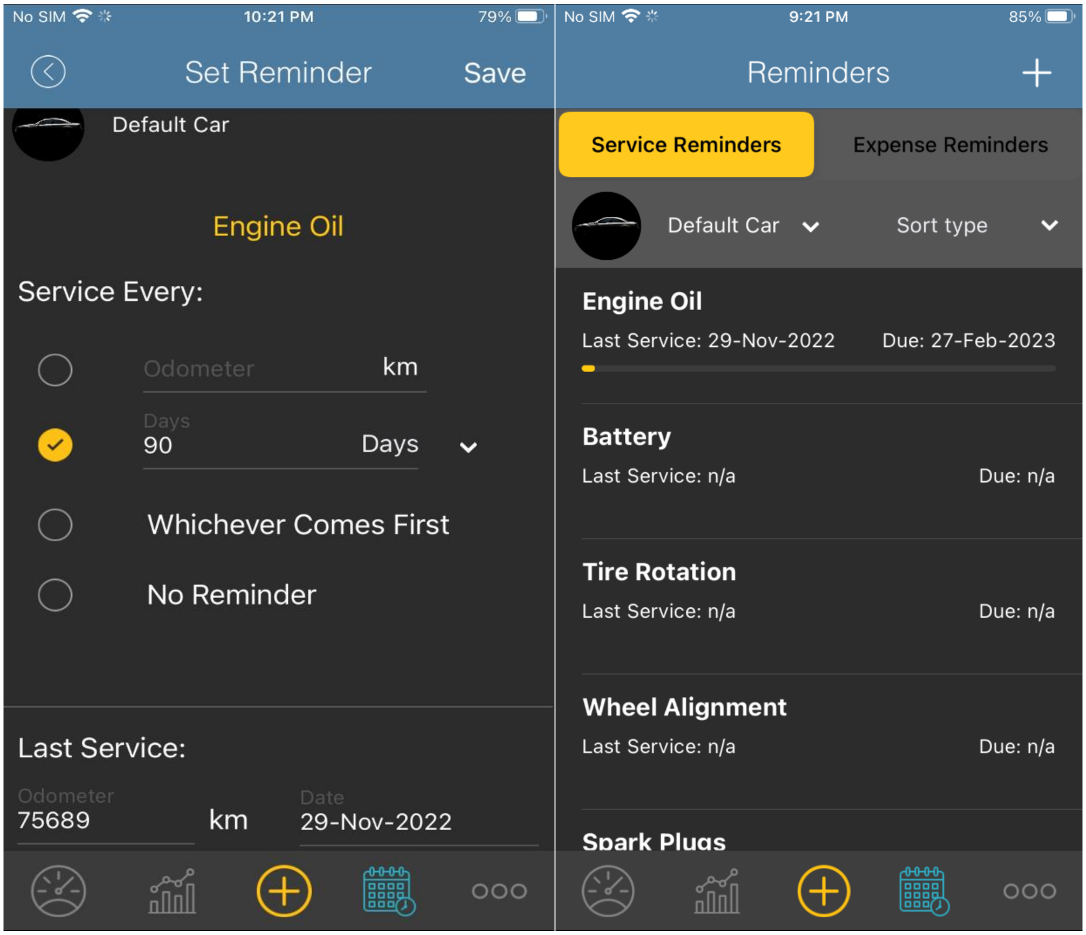
If you wish to add further information about the spark plug, oil, filter oil, color, front & rear tyre pressure, etc., click on the yellow button that says "+ SPECIFICATIONS". This will open a window where you can enter the "Name" and "Value" of the vehicle details. Here, you can add any number of specifications with the corresponding values. For example:

1.) Name: Spark plug, **Value:** NGKDPR8EA-9

Figure 2.7.1 (b) FAQs and User Guide

2.7.2 Limitation of Simply Auto: Milage Tracker – Unclear of timeline of reminder

- The reminder is based on day can be randomly figure that user input and provided the due date of maintenance for them to schedule but quantity of notification and interval period of the alerting reminder is not supported.
- Unclear declaring which might causing user easily ignoring or overlooked the maintenance or services schedule on that day if it only displaying or alerting once time only.
- Decreasing the effectiveness and the user experience on application.



Default Car

Engine Oil

Service Every:

○ Odometer km

● Days 90 Days

○ Whichever Comes First

○ No Reminder

Last Service:

Odometer 75689 km

Date 29-Nov-2022

Default Car

Engine Oil
Last Service: 29-Nov-2022 Due: 27-Feb-2023

Battery
Last Service: n/a Due: n/a

Tire Rotation
Last Service: n/a Due: n/a

Wheel Alignment
Last Service: n/a Due: n/a

Spark Plugs

Figure 2.7.2 Simply Auto reminder page

Table 2.8 Comparison Features Between #System1, #System2, #System3, #System4, #System5, #System6 and Proposed System

Application Features	Vehicle Maintenance Tracker (VMT) #System1	Car Maintenance Reminder - #System2	Autosist #System3	Fuelly -#System4	Drivvo #System5	Simply Auto (Milage Auto) -#System6	Success Auto (Proposed System)
Inserting vehicle details	✔	✔	✔	✔	✔	✔	✔
Setting up reminder	✔	✔	✔	✔	✔	✔	✔
Setting up notification interval timelines			✔		✔	✔	✔
Pushing Notifications	✔		✔	✔		✔	✔
Service Cost Labelling		✔	✔		✔	✔	
Calculation on average millage usage		✔					

Calculation on expenses consumption				✔	✔		
Cloud Database Storing	✔		✔	✔	✔	✔	✔
Tutorial Video Assistance	✔						✔
Support Tech/Customer Careline	✔						✔
FAQs				✔		✔	✔
User Guideline						✔	✔
Spend Analysis Report			✔				
Create Maintenance Record Report	✔		✔				✔
Export CSV	✔		✔				
Website Synchronization					✔	✔	
Dual Theme Support							✔

Live Chat Support							✔
Service Centre Recommendation							✔

#Success Auto as my proposed application, will include functionality such as inserting vehicle details, setting up reminders, setting up notification interval timelines, pushing notifications, tutorial video assistants, support tech or customer care lines, FAQs and user guideline, dual theme support, live chat support, and service center recommendations, as those functions are much useful to be utilized and included as a vehicle maintenance and mileage tracker application.

2.9 Proposed Solution

The solution that recommended will based on the limitation that exist in each application system. Some of the application system will adapt same approach to overcome it as it have the same characteristic that trigger it and lacking some significant trait.

2.9.1 Setting Up More Frequency of Notification Timeline

#System1 and **#System6** propose to adapt the reminder with date modification and improve the frequency of notification per maintenance that planned in order it manage to notify users in time and without delay the schedule to increase the safety and performance of vehicle. For instance, calendar from the apple able to perform add New Event and it can clearly label with title, location or video call and time. It accurately timeline can be all day even datetime of starts and ends to proper alignment. The most important element is the alert, it can place two reminder by scheduling different timeline form the option that offering by the system. Two alert is enough to recall the owner as probably will schedule the time with intervals.

2.9.2 Designing a Systematic Notification with Permission

#System 2 propose to apply the notification from internal to external to increase the efficiency of delivery information to the owners, If the notification only acting as internal note that jot down the daily routine instead of activity reminder, the effort of functionality of informing the schedule is in vain. To achieve the systematic notification, the developer need seek the permission from owner to push the notification from the application user interface until the operating system (OS) to ensure the schedule is alerting them. For example, displaying the notification message all rounded and can adding vibrate motion when delivering to ensure they keep alert with the maintenance schedule.

2.9.3 Labelling the Contact Information, Help and Q&A

#System 3 and **#System4** is mandatory criteria to propose to have clear in describing and labelling the contact information of the developer or organization technical tech team to support the enquiry that lend out by the user to improving the user experience. All day assist (24 hours support) might not be available for most of the app except the critical information system that needed to be monitoring the situation all the time, so Q&A pages commonly to seen in every app or web pages to solve the users' puzzle in short term. Q&A is playing significant role in tackle the most frequently problem or error that encounter by them and suggesting the approach to overcome and it more likely a user guide manual that leading user' usability step by step to familiar with it.

2.9.4 Proper segmentate and placing the FAQ and Support

#System 5 criteria is proposed to place and gather the FAQ that mostly facing by the user so that they will have some idea to solve or tackle it temporally without needed huge support from the organization. The support page such as organization Facebook, Instagram, Twitter, email and hotline should be placing together so that user can view the support in one shot and having more option to seeking recommendation for assistant and drop the feedback to the support team. With the feedback and condition that reflected by the user, organization can have the opportunity to track the root cause of error and improve the features of application.

CHAPTER 3 SYSTEM METHODOLOGY/APPROACH

3.1 Introduction

In this chapter, the type of hardware and specification that applied for the application development will be discussed. Additionally, the framework, methodology, system design illustrations, and timeline were also addressed.

3.2 Methodology

The agile methodology is applied as it is primary selection to develop the small and medium system or application. The selection is based on the size of the system that is being developed, incremental delivery strategy, type of system to be developed and expected system lifetime. In this approach will be including the planning, analysis, design and implementation. Another benefit of using this method is because specification, development, and validation phase and each phase are interleaved. Whenever there is a changes, it more easily to refine and accommodate the changes.

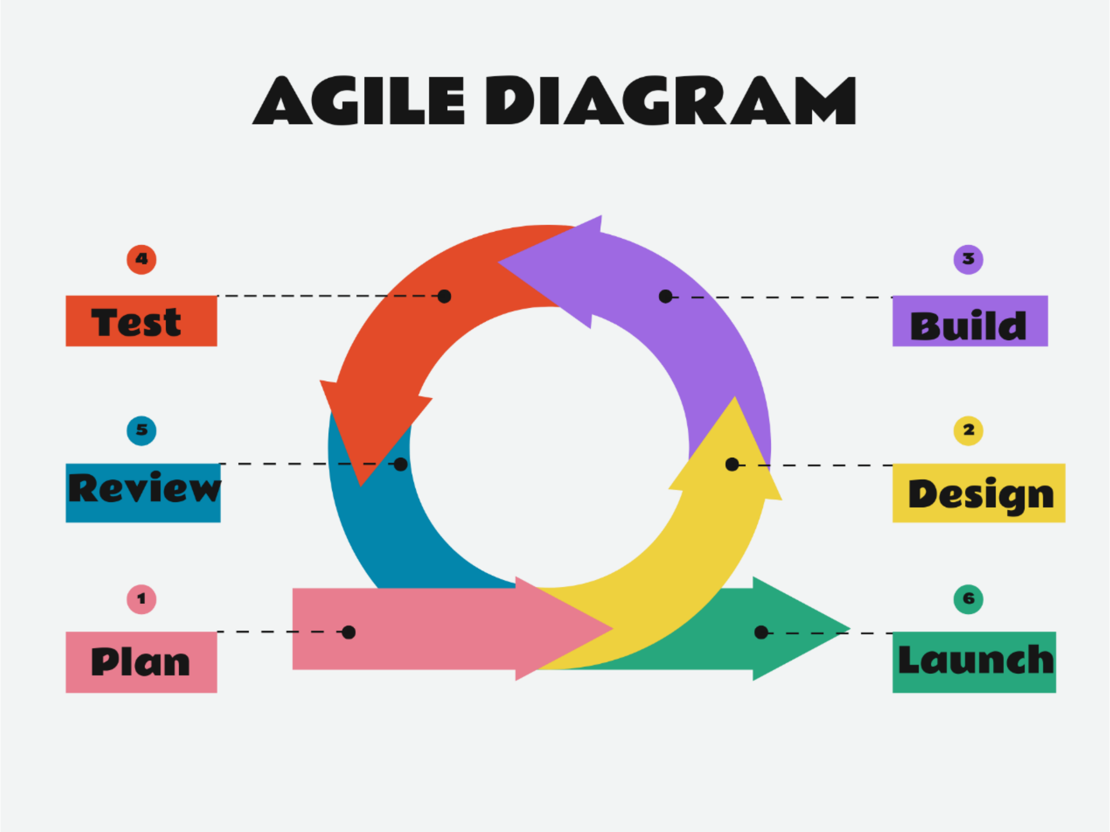


Figure 3.2 : Agile Development Process Diagram

1st Phase: Planning

In planning phase, gathering the requirements, functions and other details are required for system analysing purposes. Besides, plan, arrange and schedule the time comprehensively are implemented in order to achieve the project objectives. Therefore, feasibility studies through research and existing system studying are mandatory to identify the strengths and weaknesses of the existing systems. Those studies will help in evaluating our system requirement proposal and accessing whether it is realistic.

2nd Phase: Design

In the design phase, an overview of the system design was defined and provided through use case diagrams, activity diagrams, and wireframes which help in building the system more systematic and in structured concise manner. Use case diagram able to visualize the role of users and representative activities that able performed by them with the system. While activity diagram provides the workflow of each available activity to be perform. Wireframes provided ideas of sketches of user interface and how the system should look and developed.

3rd Phase: Build

In building phase, the system interface and function will be developed accordingly based on the design that gathered from earlier stages. This process included the defining of program language and IDE platform that used to complete the project. Additionally, this stage will be iterated as requirement can be defined or newly after receiving the feedback. Improvement were made accordingly to ensure the system fulfilled the defined requirements and user's expectation.

4th Phase: Test

In testing phase, the scope of the testing was defined to ensure the system final result is workable and meet user requirements. All the testing result will be recorded accordingly, bug or error that occurred during the process will be discover addressed it immediately to ensure the system functioned properly as expected. Testing was carrying out thoroughly the development each time requirements has been refined or newly added.

5th Phase: Review

In review phase, developer met with users or sponsors to demonstrate the system functioning and get feedback from them for enhancement or improvement if necessary.

6th Phase: Launch

In launch phase, the application will be officially released for public usage after completion of development and sponsor signed off the completion agreement.

3.3 System Design Diagram

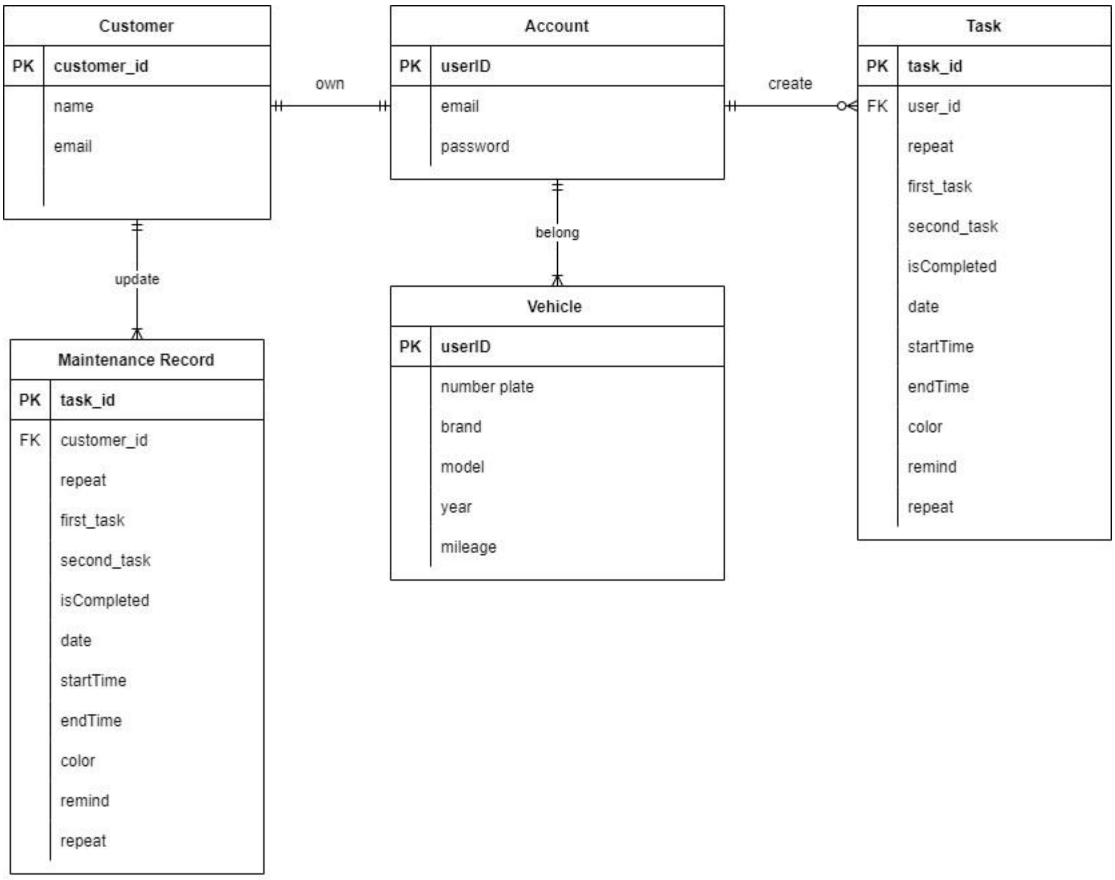


Figure 3.3: Vehicle Maintenance and Mileage Tracker App ERD

3.4 Use Case Diagram

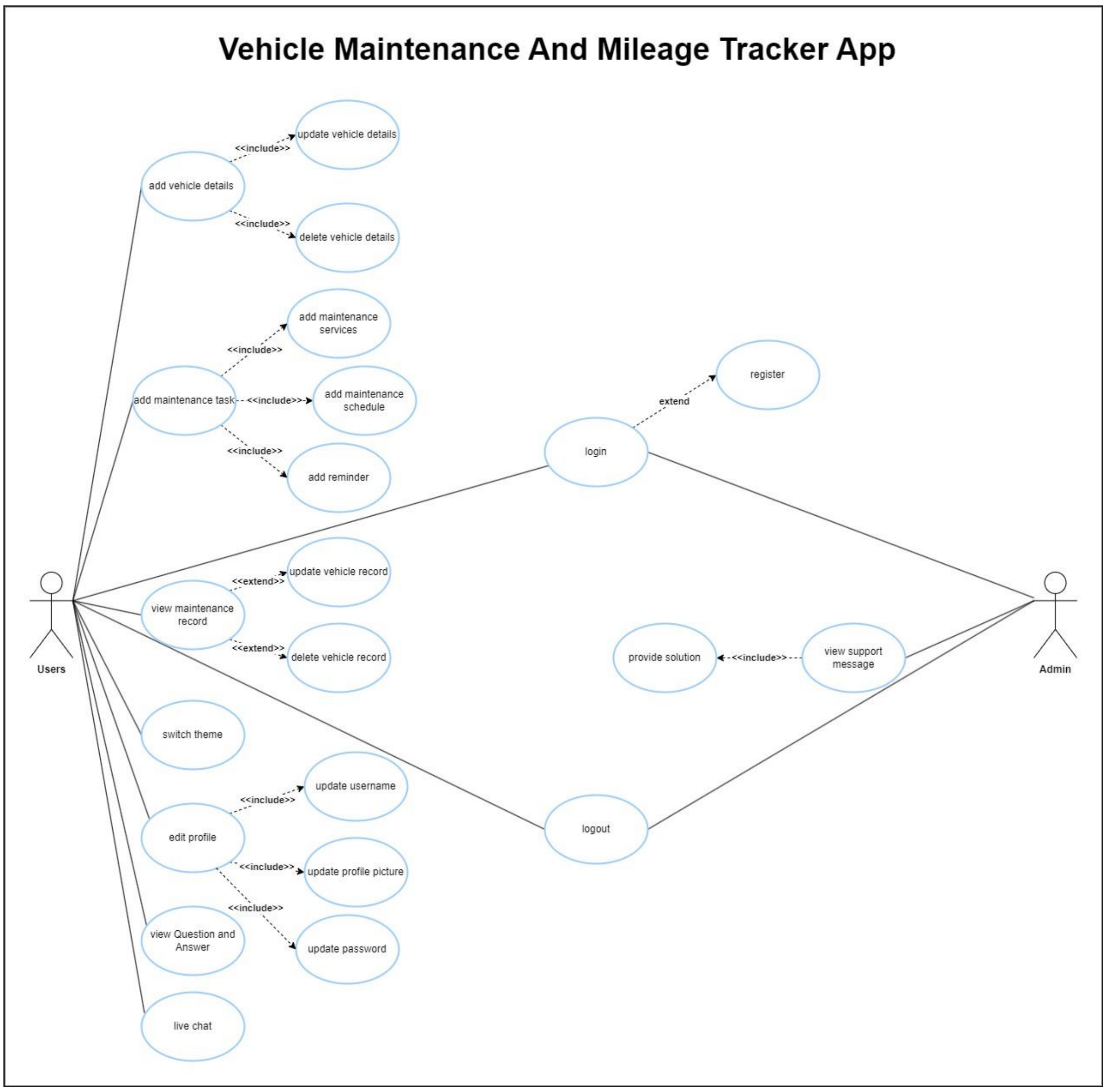


Figure 3.4: Vehicle Maintenance and Mileage Tracker Application

3.4.1 Functionality of User

- **login** – User can login to their account to perform the action according to privilege and access control that provided and retrieve back their own maintenance records.

- **add vehicle details -** User able to add the vehicle details such as car model, year, plate number, current odometer (mileage) and others.

- **update vehicle details –** User able to update vehicle details that previously entered.

- **delete vehicle details** – User able to delete vehicle details to remove the information to get the latest list when select vehicle in add maintenance task later.
- **add maintenance task** – User can add the maintenance task to keep tack the details of the coming soon maintenance task or appointment.

- **add maintenance schedule** – User can add the services schedule to for further maintenance reminder.

- **add reminder -** User can add reminder for each task with different interval period of time whether repeat daily, weekly, or monthly.

- **view maintenance record** – User manage to view the maintenance record that have completed or undone for tracking purpose.

- **update maintenance record** – User can update the existing maintenance record if enter wrongly the details previously.

- **delete maintenance record** – User can delete the existing maintenance record if the reminder if not needed to store.

- **switch theme** – User can switch the application theme whether light theme or dark theme for own application usage.

- **edit profile** – User can edit their own account profile whether update username or profile picture.

- **view Question and Answer** – User can solve their common problem on the application usage on Q&A section with the details explanation.

- **live chat** – User can seek help and assistant if encounter any difficulties through email, or WhatsApp and chatbot platform that provided according to own preferences.

- **logout** – User can perform logout action after finish using to keep the account confidential and privacy.

3.5. Activity Diagram

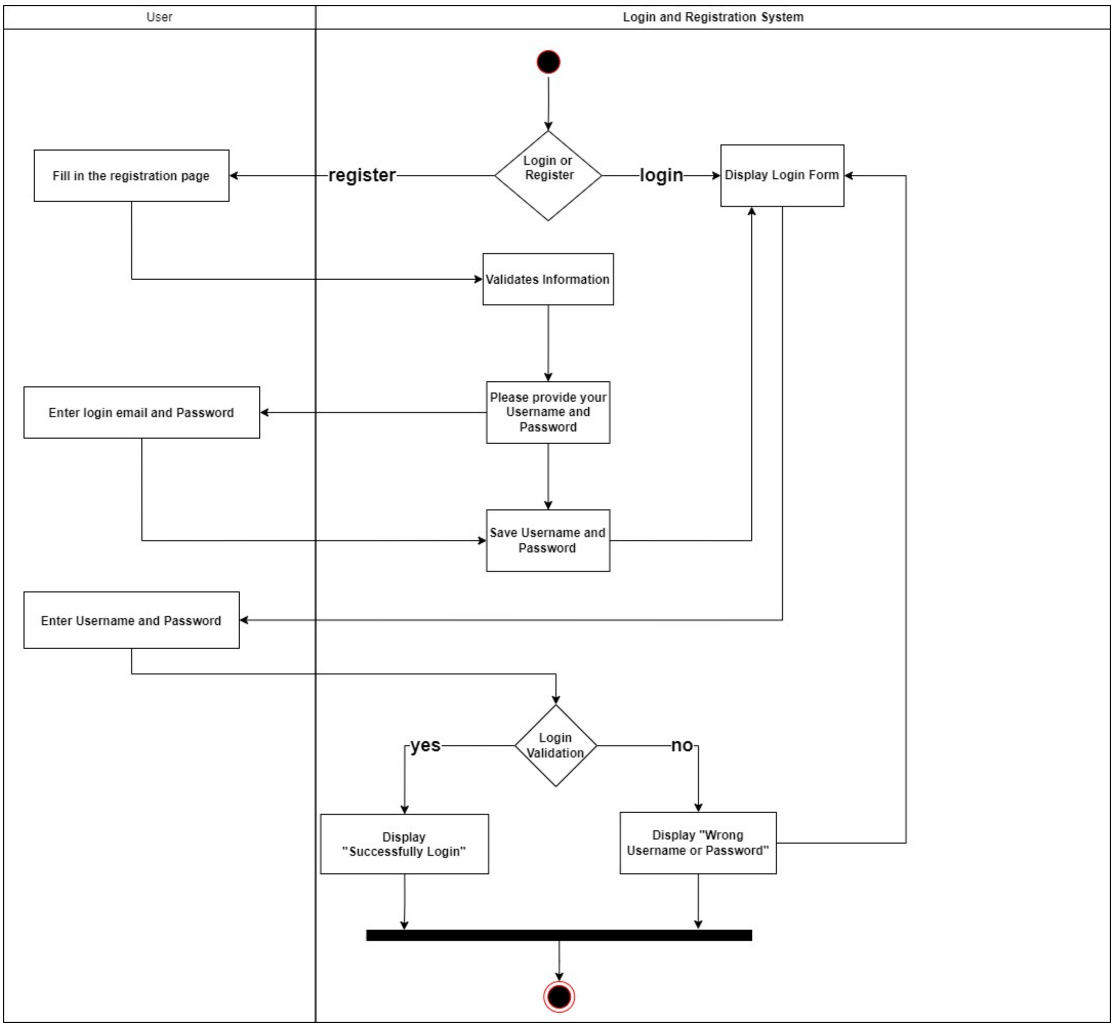

User
Login and Registration System
Login or Register
register
login
Fill in the registration page
Display Login Form
Validates Information
Please provide your Username and Password
Enter login email and Password
Save Username and Password
Enter Username and Password
Login Validation
yes
no
Display "Successfully Login"
Display "Wrong Username or Password"

Figure 3.5.1: Login and Registration System Activity Diagram

Explanation:

When the user enters the application, it will redirect to the login page first, and the user is required to enter their account email and password in order to login. If the user not yet owing any account, they might go to the registration page to sign up for an account. The system will validate the username and password that the user enters; if the information is correct, the system will display the message “Successfully Login"; otherwise, it will display the message “Wrong Username or Password.”.

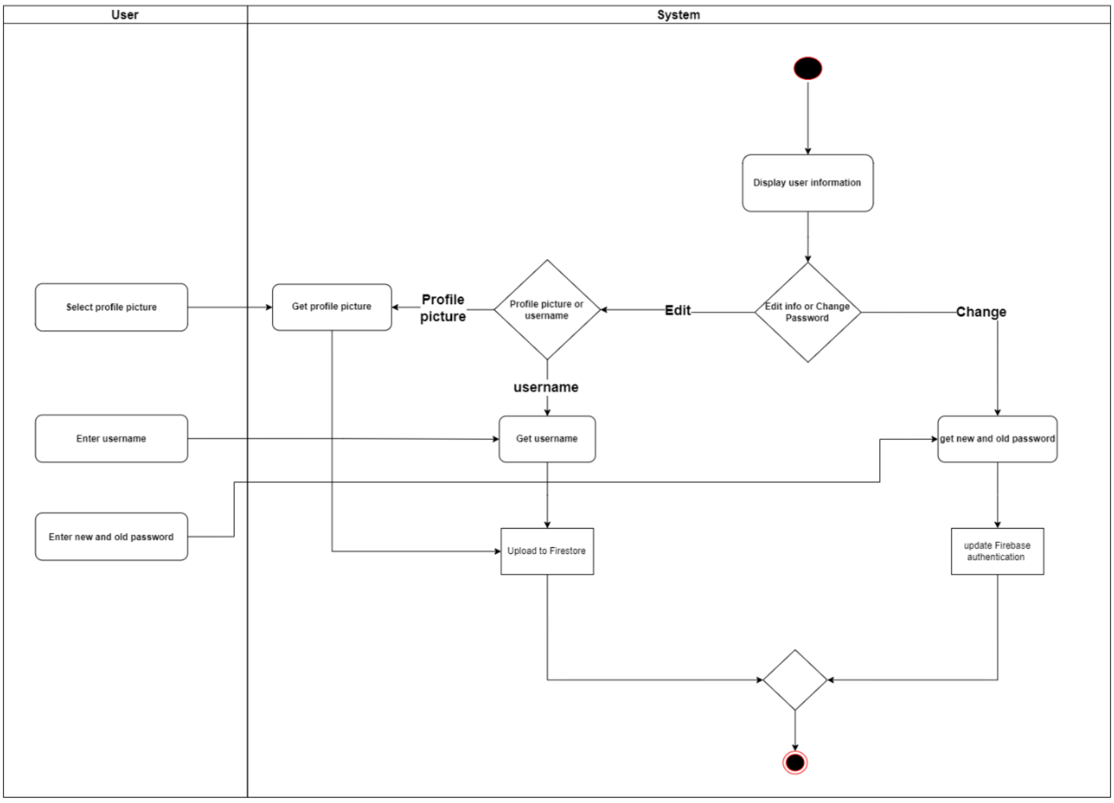


Figure 3.5.2: Profile Page System Activity Diagram

Explanation:

When the user enters the profile page, the system will display the user's information, such as their image profile and username. The user can select a new profile picture and upload it to the system to update the data, while for the username part, the user can enter the input and send it to the system to update. Lastly, to change the password, the user is required to enter the old and new passwords in order to update the authentication information provided by Firestore.

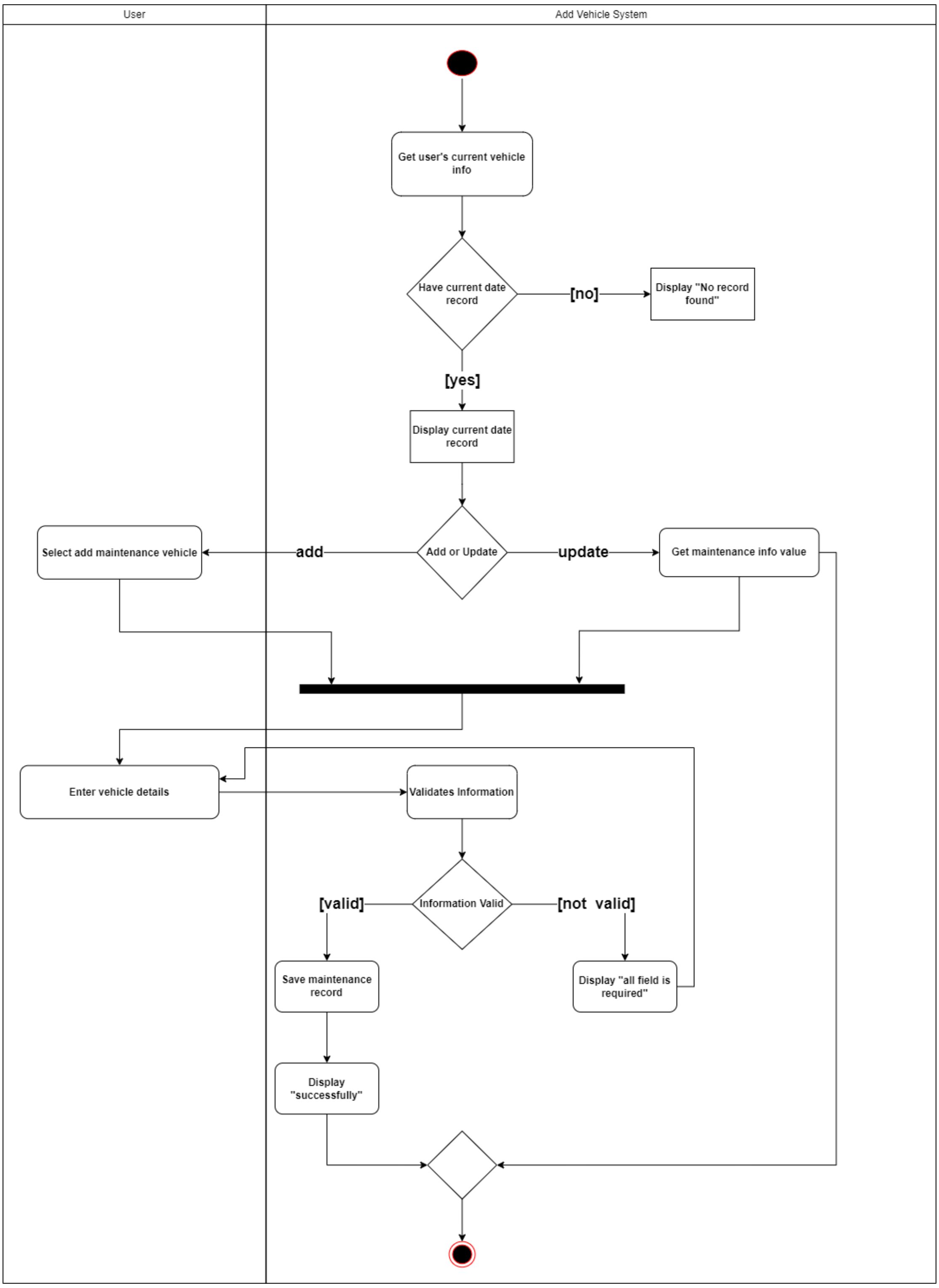


Figure 3.5.3: Add Vehicle List Page System Activity Diagram

Explanation:

On the Add Vehicle List Page, the system will display the existing vehicle list if it is available; if the list is not available, it will display the message “No record found." The user can choose to add or update the vehicle list. The system will validate the data that was inserted by the user, and it will only add a new record or update the existing details if it is valid. If the input is invalid, the system will display the “successfully” message and the message “All fields are required” for invalid input.

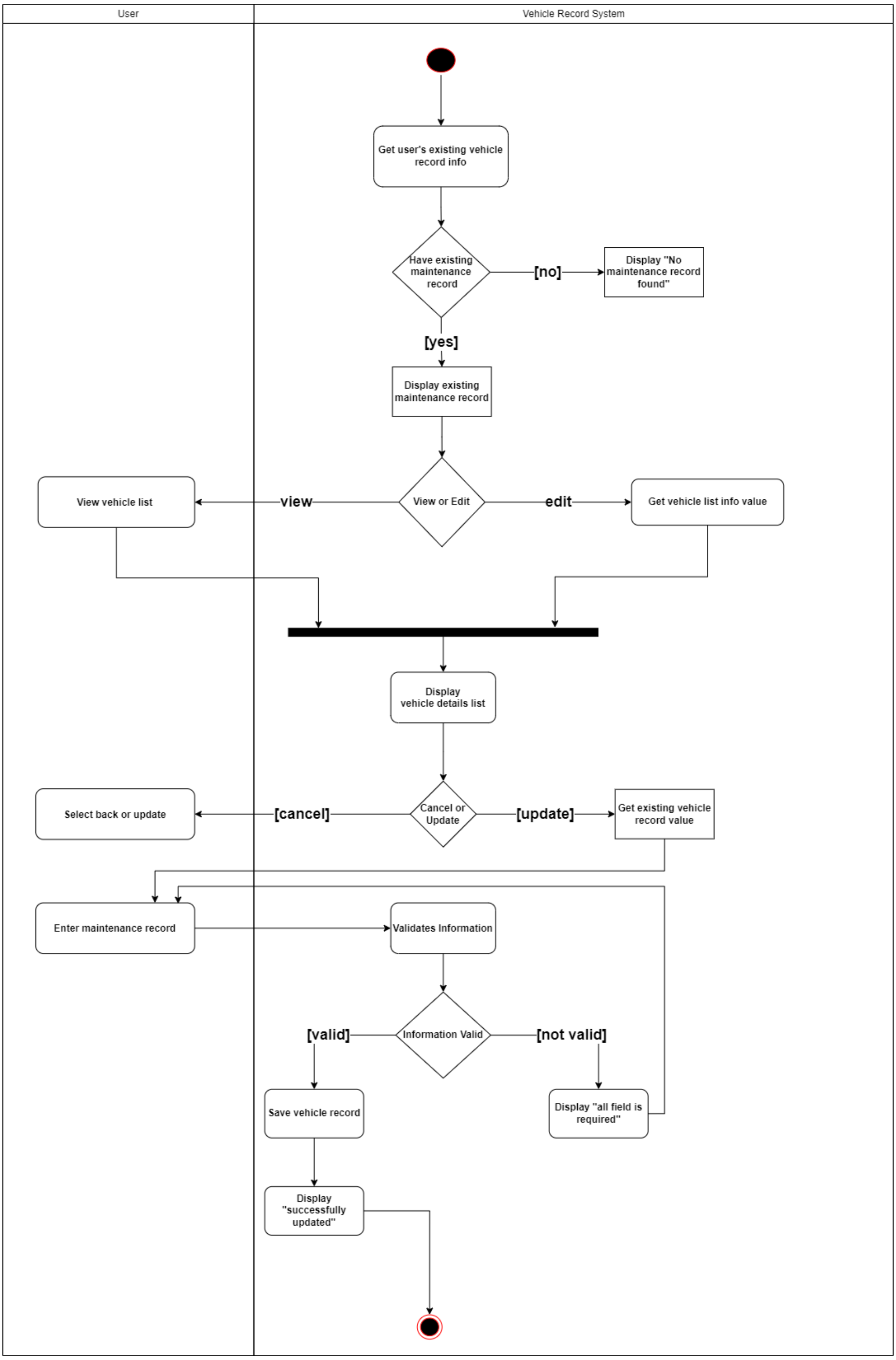

User
Vehicle Record System
Get user's existing vehicle record info
Have existing maintenance record
[no]
Display "No maintenance record found"
[yes]
Display existing maintenance record
View vehicle list
view
View or Edit
edit
Get vehicle list info value
Display vehicle details list
Select back or update
[cancel]
Cancel or Update
[update]
Get existing vehicle record value
Enter maintenance record
Validates Information
[valid]
Information Valid
[not valid]
Save vehicle record
Display "all field is required"
Display "successfully updated"

Figure 3.5.4: Update Vehicle List Page System Activity Diagram

Explanation:

On the vehicle list page, the system will display all the existing vehicle list tiles if they are available; if the task is unavailable, it will display the message “No record found." The user might choose the available vehicle record from the list to view or update the existing vehicle record. After the user enters all the vehicle information for updating and saves it, the system will validate and only allow saving if they have finished filling up all the fields; otherwise, it will display the “all fields are required” message.

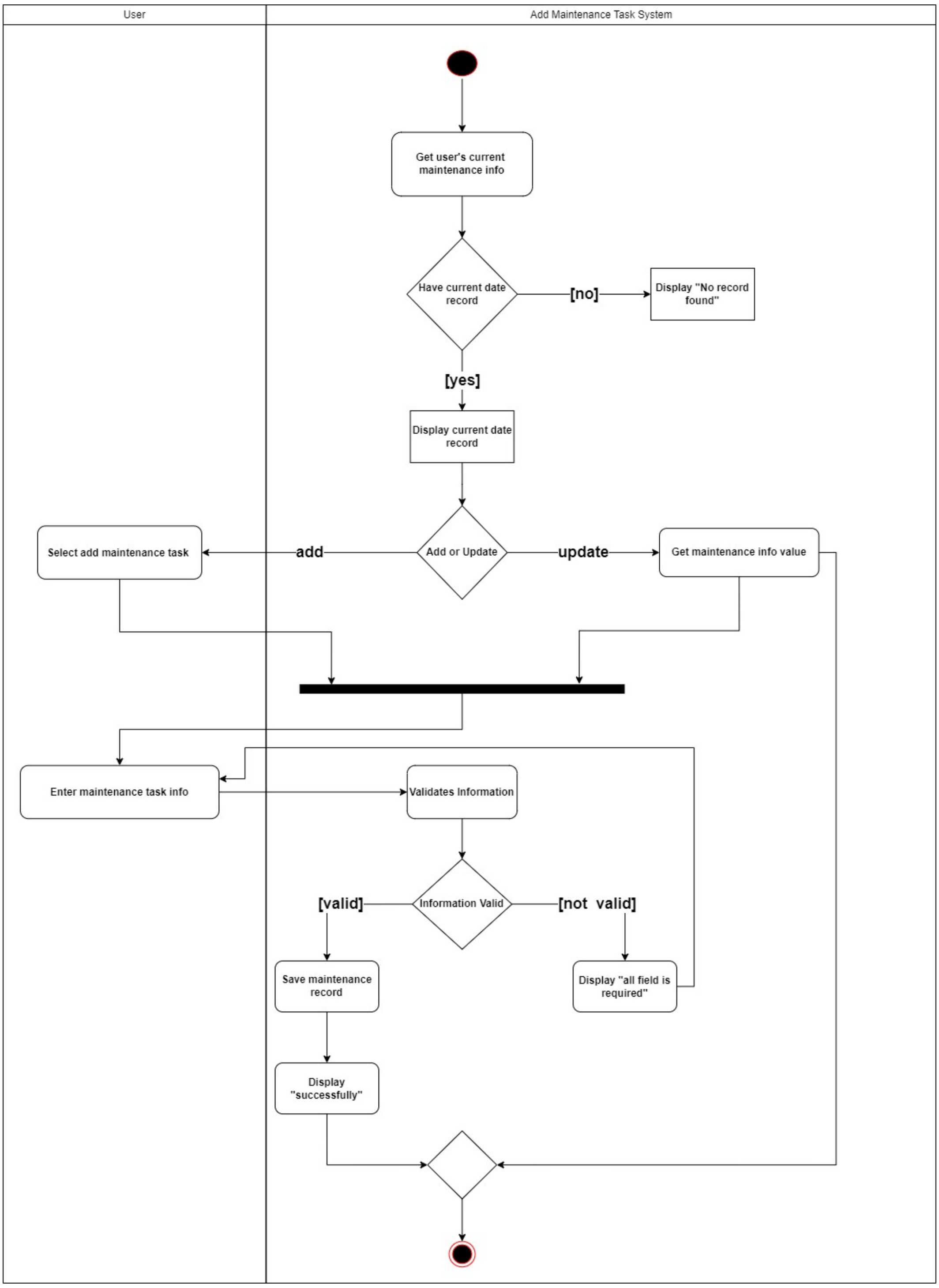

User
Add Maintenance Task System
Get user's current maintenance info
Have current date record
[no]
Display "No record found"
[yes]
Display current date record
Add or Update
add
update
Select add maintenance task
Get maintenance info value
Enter maintenance task info
Validates Information
Information Valid
[valid]
[not valid]
Save maintenance record
Display "all field is required"
Display "successfully"

Figure 3.5.5: Add Maintenance Task System Activity Diagram

Explanation:

On the main page, the system will display the current date (today) of a maintenance task if it is available; if the task is not available, it will display the message “No record found." On the page, the user might choose the available maintenance task according to the calendar date that is available to update the existing maintenance record. If the user wants to add the record, they can click on the add maintenance task button and perform. After the user enters all the maintenance task information, the system will validate and only allow saving if they have finished filling up all the fields; otherwise, it will display an “All fields are required” message.

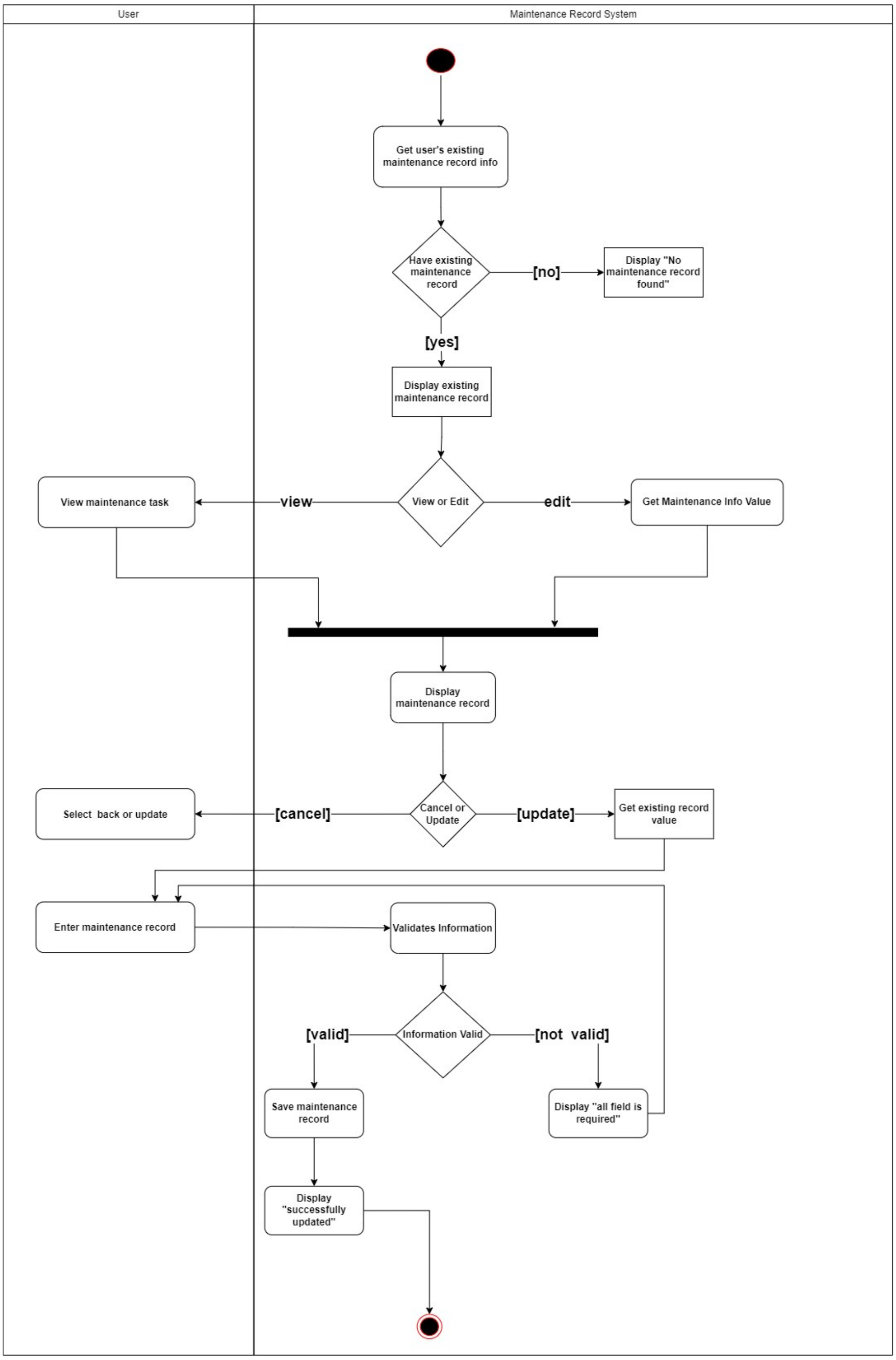

User
Maintenance Record System
Get user's existing maintenance record info
Have existing maintenance record
[no]
Display "No maintenance record found"
[yes]
Display existing maintenance record
View maintenance task
view
View or Edit
edit
Get Maintenance Info Value
Display maintenance record
Select back or update
[cancel]
Cancel or Update
[update]
Get existing record value
Enter maintenance record
Validates Information
[valid]
Information Valid
[not valid]
Save maintenance record
Display "all field is required"
Display "successfully updated"

Figure 3.5.6: Update Maintenance Task System Activity Diagram

Explanation:

On the update maintenance record page, the system will display all the existing maintenance tasks if they are available; if no task is available, it will display the message “No record found." The user might choose the available maintenance task from the list to view or update the existing maintenance record. After the user enters all the maintenance task information for updating and saves it, the system will validate and only allow saving if they have finished filling up all the fields; otherwise, it will display the “all fields are required” message.

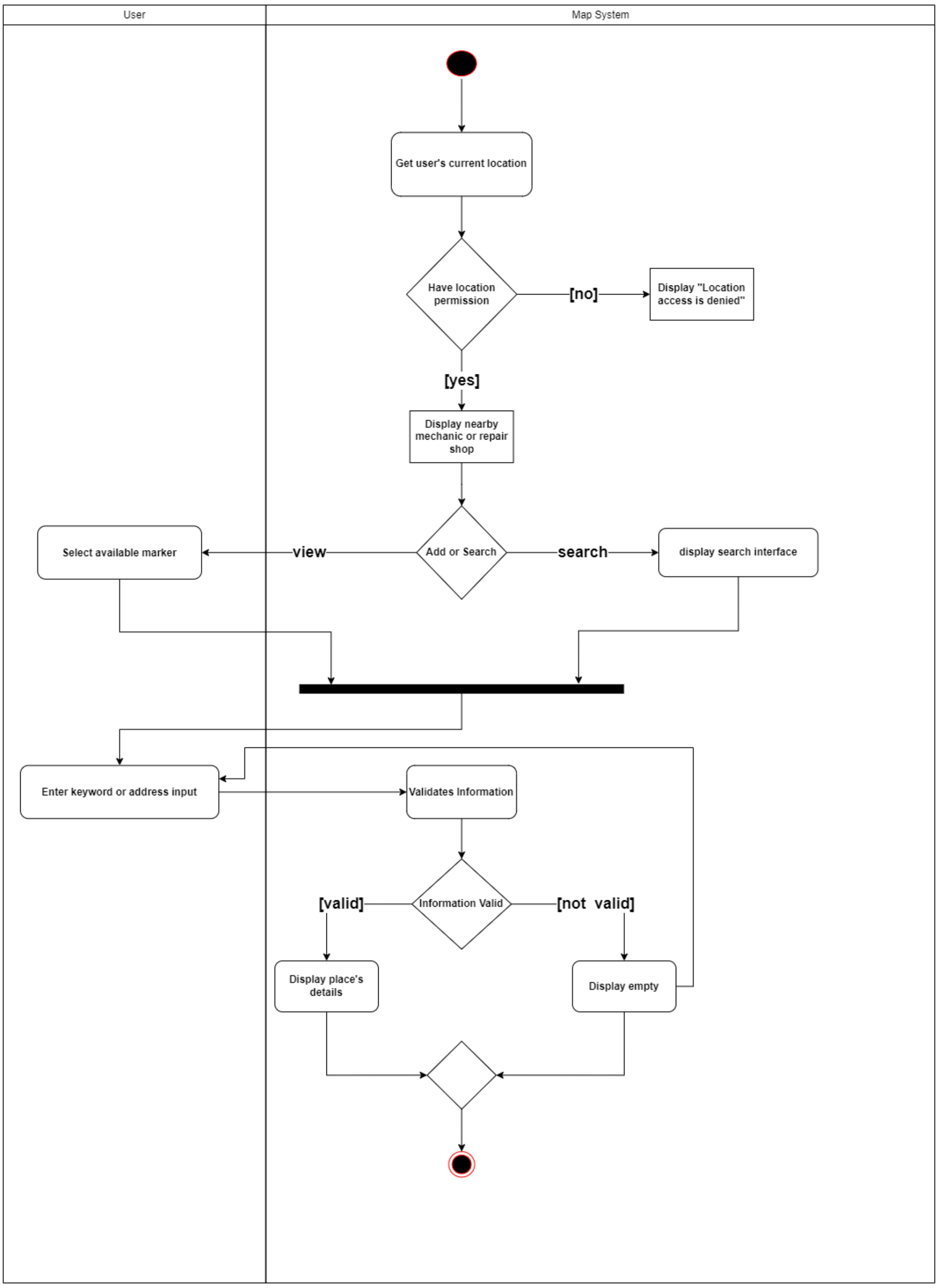


Figure 3.5.7: Map System Activity Diagram

Explanation:

On the map page, the system will seek the user's location permission to get the current location before displaying all the nearby mechanics or repair shops with a red marker; otherwise, the display message of location access is denied. The user can select the available marker to view the comprehensive details of the selected place. In addition, the page also consists of search features where users can enter keywords or address input to search for place details. The system will validate the input and return recommendations and place details if they are valid.

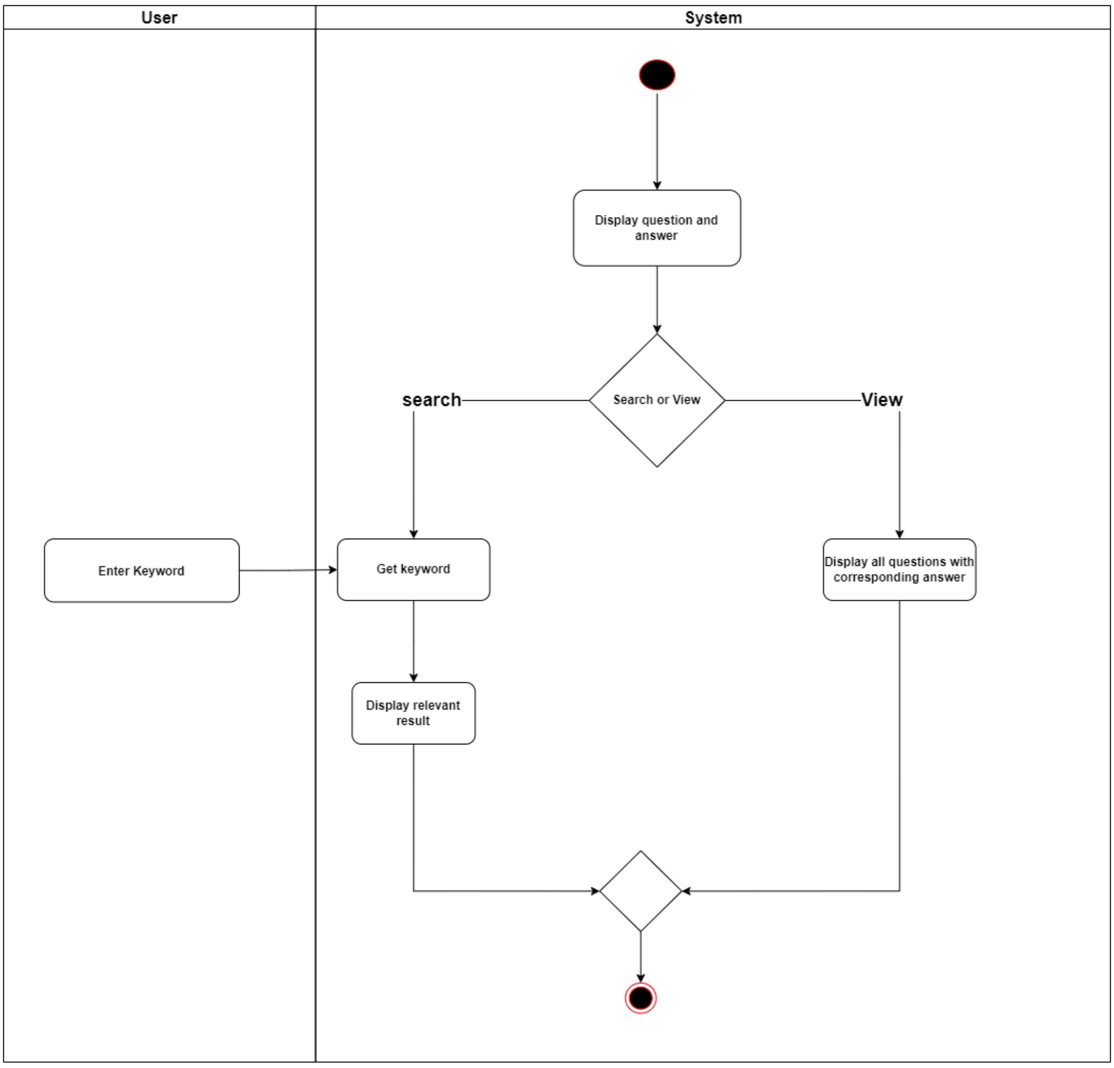


Figure 3.5.8: Q&A System Activity Diagram

Explanation:

On the Q&A page, the system will display all the questions about the difficulties that might face during application usage with corresponding answers. The user is provided the search feature to search the question and answer with the keyword. The system will return the relevant Q&A search result view if it is available.

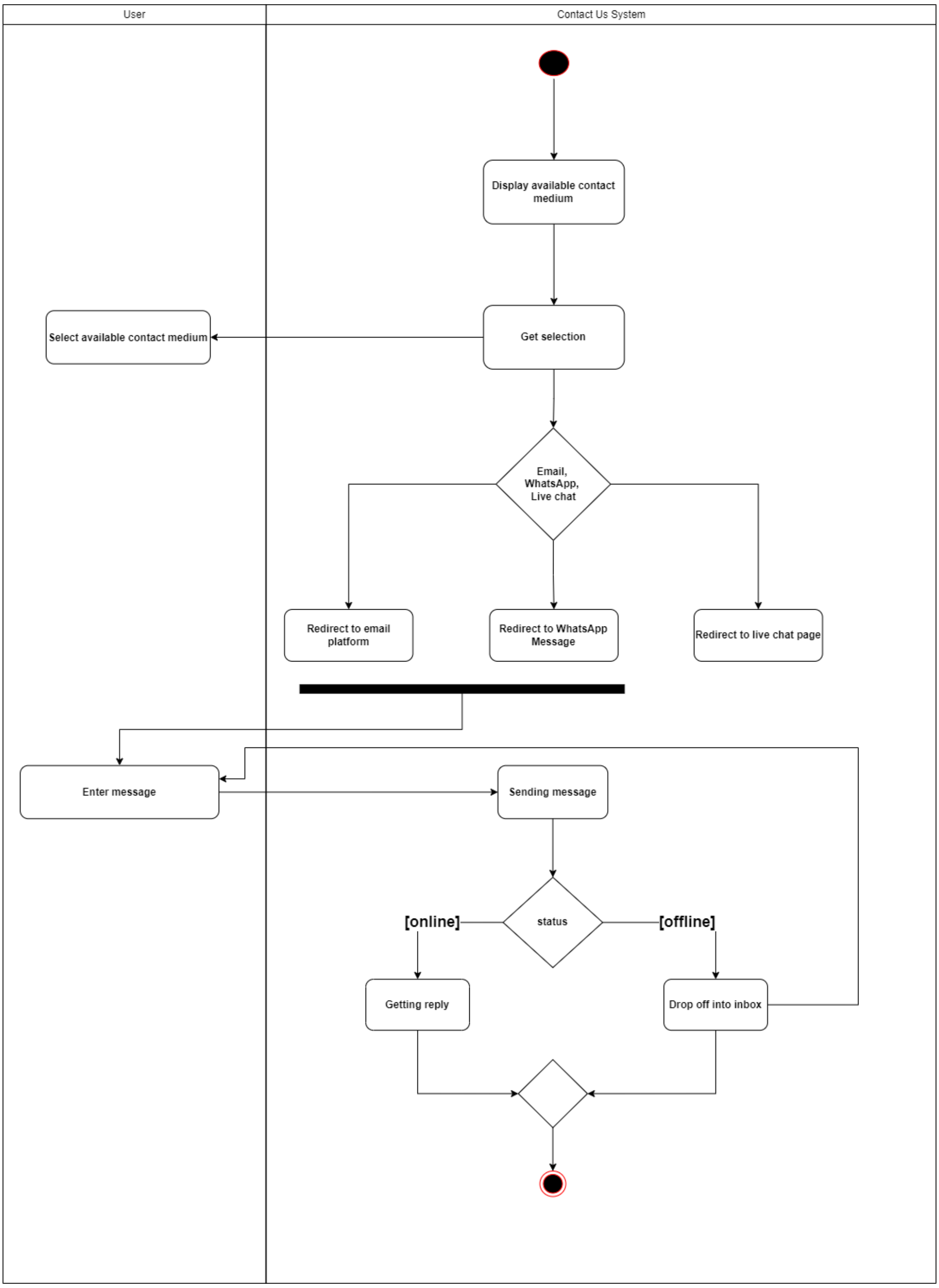

User
Contact Us System
Display available contact medium
Select available contact medium
Get selection
Email, WhatsApp, Live chat
Redirect to email platform
Redirect to WhatsApp Message
Redirect to live chat page
Enter message
Sending message
[online]
status
[offline]
Getting reply
Drop off into inbox

Figure 3.5.9: Contact Us System Activity Diagram

Explanation:

On the contact us page, the system will provide email, WhatsApp, and live chat as communication platforms for the user to get in contact with the support team and address their inquiry. The system will redirect the user to a selected platform, and the user can start to send the message. The system will check the status of customer service, and customers will get a replay on time if the status is indicated online. The message will be dropped off in your inbox if customer service is offline.

3.6 System Architecture Diagram

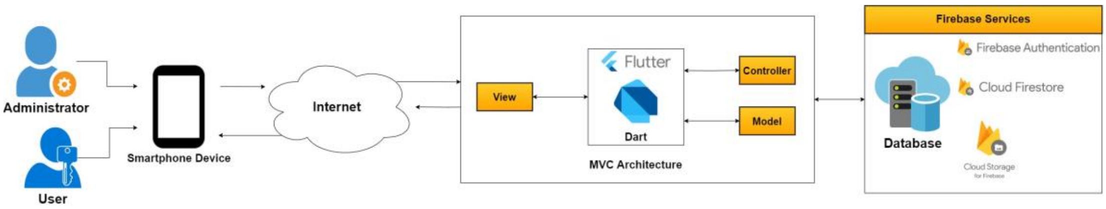


Figure 3.6: System Architecture Diagram

Explanation:

In this application, the MVC (model-view-controller) architecture pattern was adopted to develop the whole structure of the of the application. The reason for choosing this architecture pattern is because it is suitable for use when there are multiple ways to view and interact with data. Furthermore, it should be used when the future requirements for interaction and presentation of data are unknown. The view section will include all the interfaces, which are the login page interface, main page interface, profile page interface, add task page interface, Q&A page interface, help page interface, and contact us page interface. While the controller part will include CRUD (create, read, update, delete) functionality for all the interfaces, While for the model part (database), we will use Firebase Firestore as our database to save and retrieve the data services.

There are two roles inside the application, which are administrator and user, that need to access the application through smartphone devices. When administrators access their account, they will be able to view the user's account information to update or delete their account, understand the help inquiry that was sent, and provide support to them. For users, when they login to their account, the data will be retrieved from the database and displayed back to their interface if and only if it is available. They will be able to perform CRUD for inserting maintenance tasks and updating the profile page.

3.7 Development Software and Languages Used

Development Software:

Flutter: Flutter is cross-platform software that is available for different operating systems (OS). The developer only needs to write the code once, and it is able to run on desktop, mobile, and web platforms. It can also work across other platforms compared to Android Studio. It only consists of one programming language, which is Dart, which is written in plain English, which is easier to understand and starts with hands-on practice.

Text Editor:

1. Notepad: use to draft the fundamentals of mobile application design, functions, and features. Listing down the idea and the innovation and making use of them when necessary.

2. Visual Studio Code: use to debug the programming code that is written, as it can view the error line much easier. It supports the majority of the programming languages, and the built-in the debugger helps accelerate editing, compiling, and debugging. Use to run and execute the Flutter application.

Database Management Software:

Firestore Firebase – Using Firestore Firebase, a flexible and scalable NoSQL cloud database, to store and sync data for client and server-side development. Cloud Firestore is a flexible, scalable database for mobile, web, and server development from Firebase and Google Cloud. Like Firebase Realtime Database, it keeps your data in sync across client apps through real-time listeners and offers offline support for mobile and web, so you can build responsive apps that work regardless of network latency or Internet connectivity.

3.7.1 Hardware Requirements

The hardware that is required in this project is a laptop, mobile devices, or Android emulator. A Windows operating system laptop is used for the programming and coding processes of the application. The mobile devices that operate with IOS will be used for application installation, testing functionality, and evaluation of the effectiveness of the Vehicle Maintenance and Millage application in the mobility of alerting and notification maintenance schedule information to users. Most of the testing will be done using an Android emulator to validate, as the performance can be responded to more rapidly and with an indication of an error message if any unexpected situation occurs.

Table 3.7.1 (a) Specifications of laptop

Description	Specifications
Model	Asus A456U series

Processor	AMD Ryzen 7 4800H
Operating System	Windows 10 / Windows 11
Graphic	NVIDIA GeForce GT 930MX 2GB DDR3
Memory	16GB DDR5 RAM
Storage	1TB HHD

Table 3.7.1 (b) Specifications of mobile

Description	Specifications
Model	Xiaomi Mi Mix 2S
Processor	Qualcomm Snapdragon 845 with Adreno 630
Operating System	Android
Graphic	2-core GPU
Memory	6-core CPU
Storage	64GB

Table 3.7.1 (c) Specifications of android emulator

Description	Specifications
Model	Pixel 6 Pro
Processor	AMD Ryzen 7 4800H
Operating System	Android API Upside Down Cake
Graphic	4-core GPU
Memory	6-core CPU
Storage	32GB

3.7.2 Framework

Dart – The Dart language will be utilized to develop the overall application as it supports multi-platform development of the app framework. In addition, it contains a rich set of libraries that are beneficial for essential programming tasks and are able to execute code in multiple ways with their own compiler technology [8].

Flutter – Flutter is a UI framework for creating a variety of types of mobile applications. Developers manage to build mobile apps quickly for iOS and Android apps using a single code base. It also helps to support the developers in creating high-performance, high-fidelity applications for iOS, Android, Linux, Mac, Windows, and other [9].

3.8 Wireframe

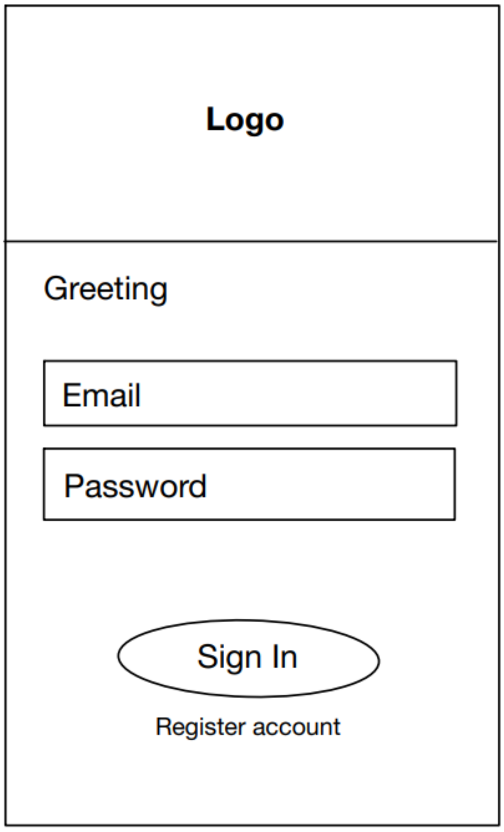


Figure 3.8.1: Sign In Page Wireframe

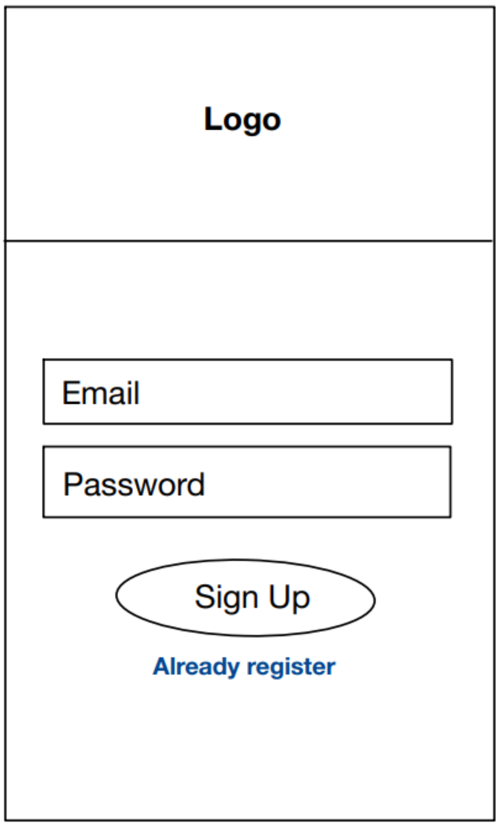


Figure 3.8.2: Sign Up Page Wireframe

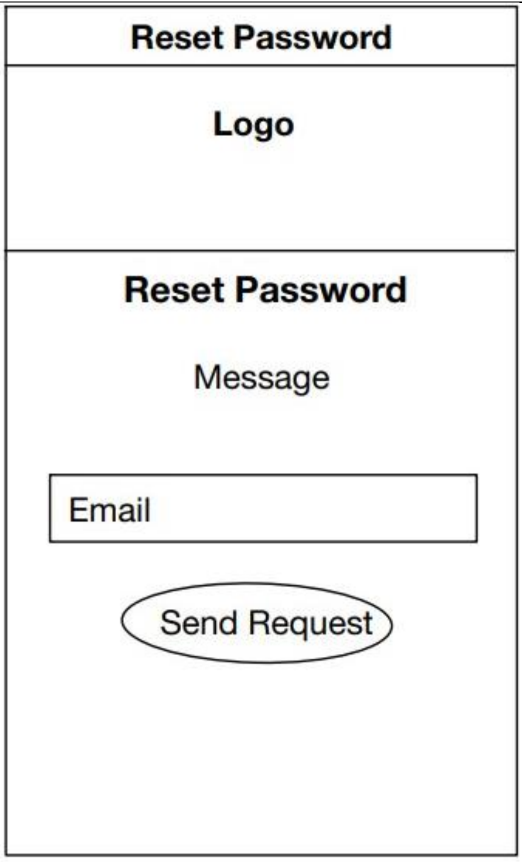


Figure 3.8.3: Reset Password Page Wireframe

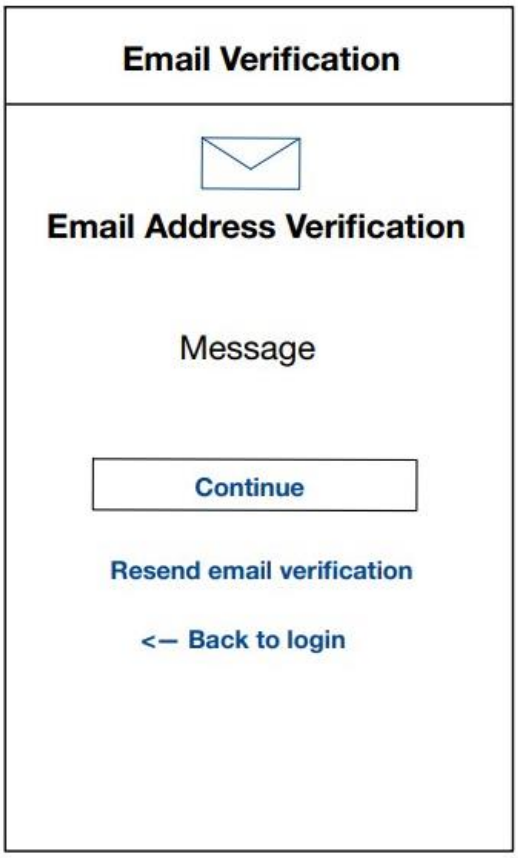


Figure 3.8.4: Forget Password Page Wireframe

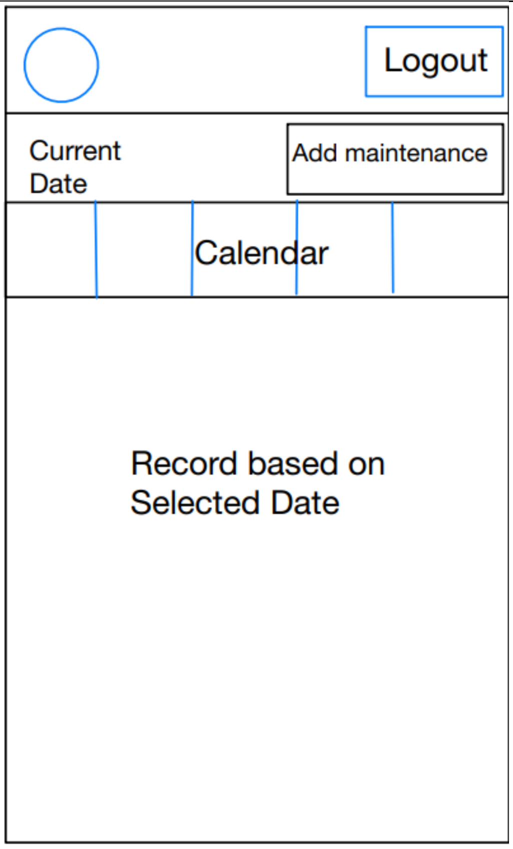


Figure 3.8.5: Home Page Wireframe

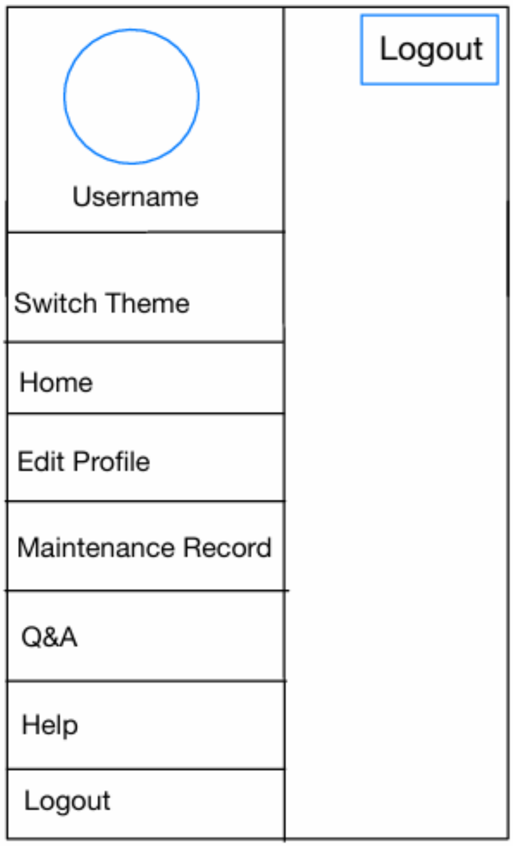


Figure 3.8.6: Drawer Wireframe

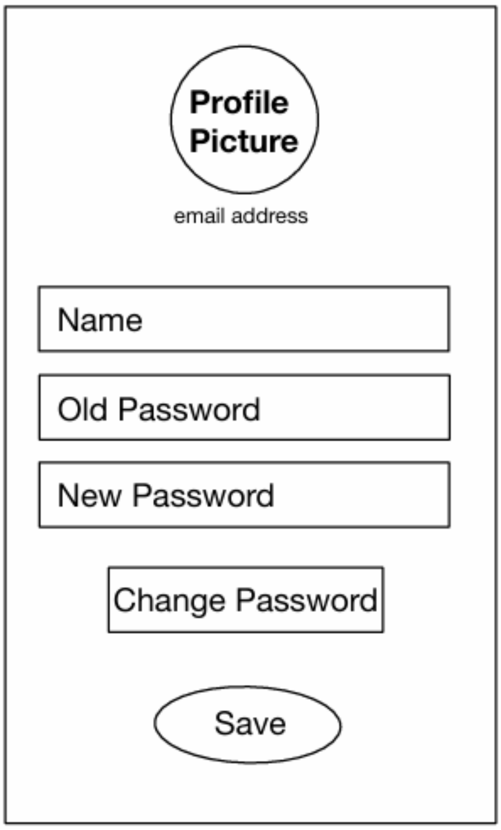


Figure 3.8.7: Profile Page Wireframe

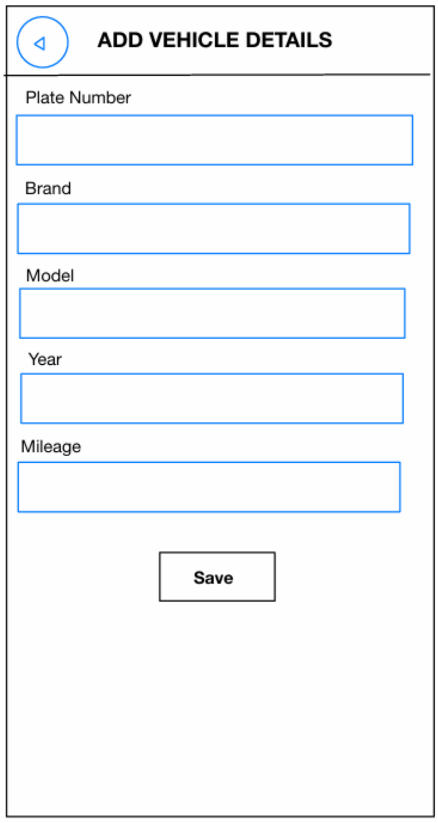


Figure 3.8.8: Add Vehicle Page Wireframe

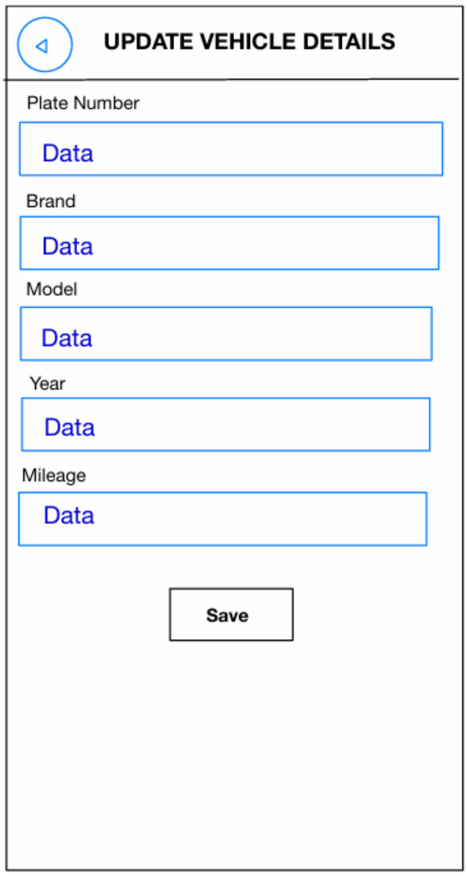


Figure 3.8.9: Update Vehicle Details Wireframe

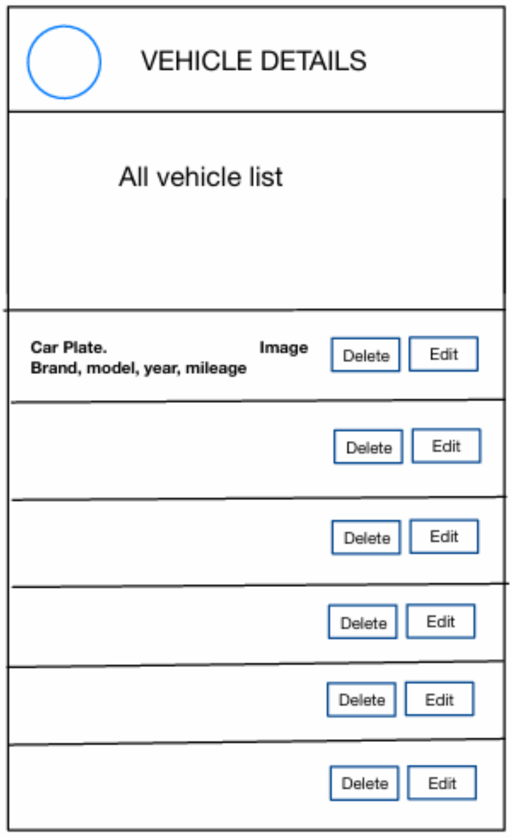


Figure 3.8.10: Vehicle List Page Wireframe

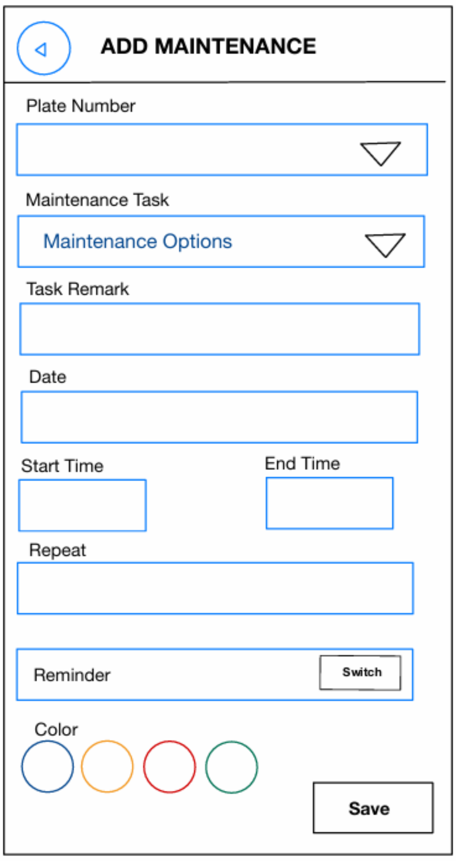


Figure 3.8.11: Add Maintenance Page Wireframe

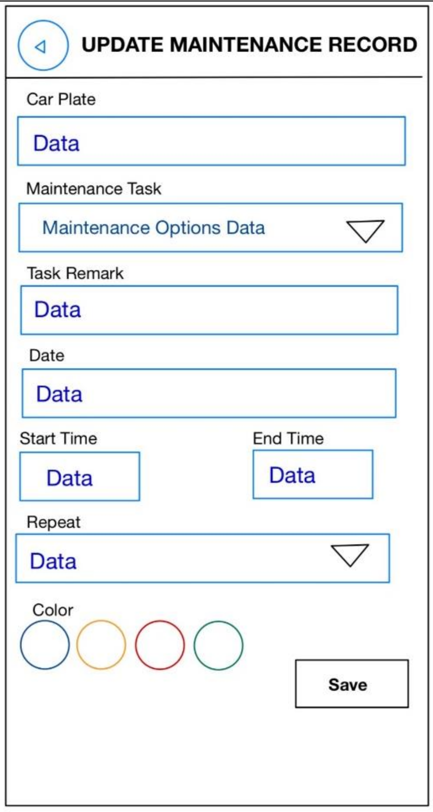


Figure 3.8.12: Update Maintenance Record Page Wireframe

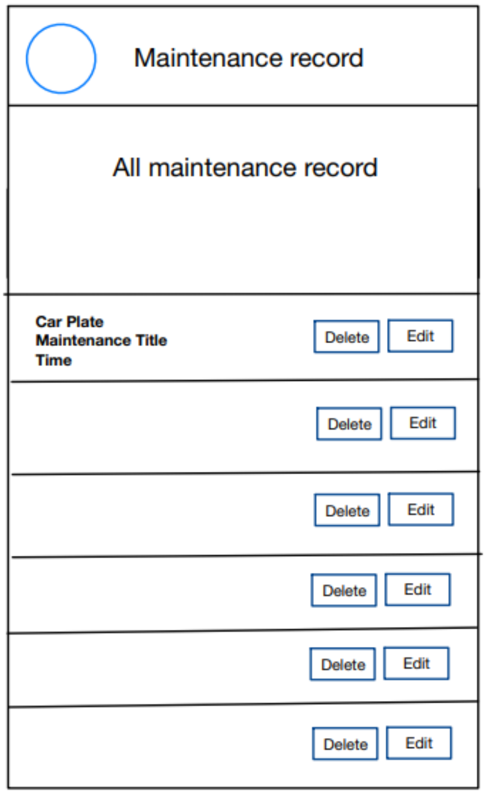


Figure 3.8.13: Maintenance Record Page Wireframe

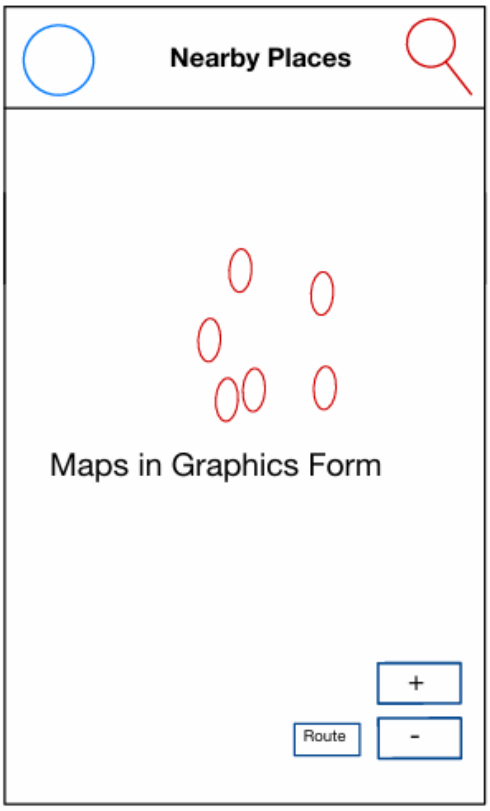


Figure 3.8.14: Map Page Wireframe

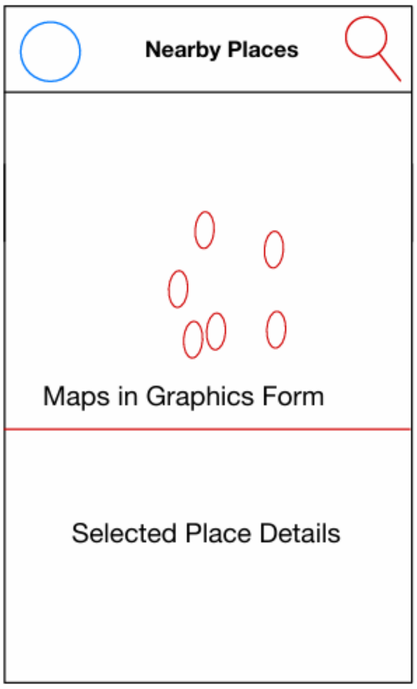


Figure 3.8.15: Mechanic Shop Page Details Wireframe

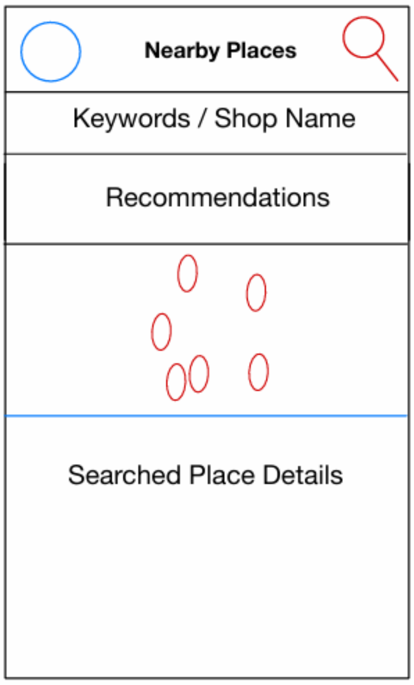


Figure 3.8.16: Place Searching Feature Wireframe

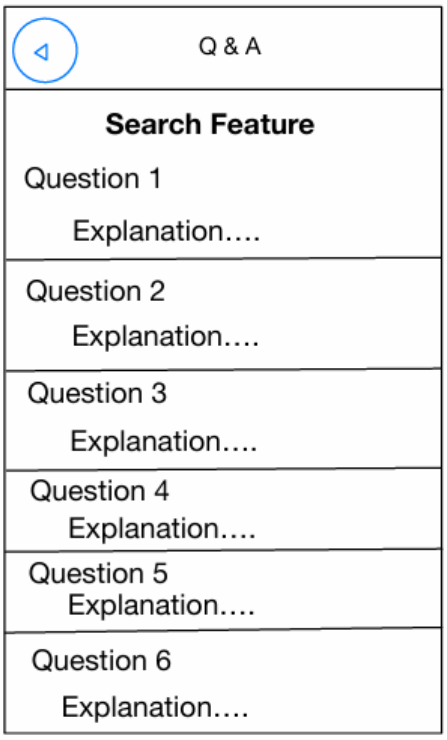


Figure 3.8.17: Question and Answer Page Wireframe

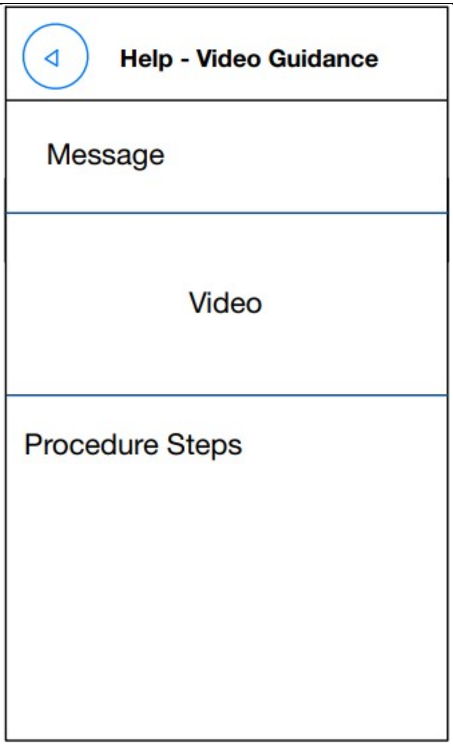


Figure 3.8.18: Help – Video Guidance Page Wireframe

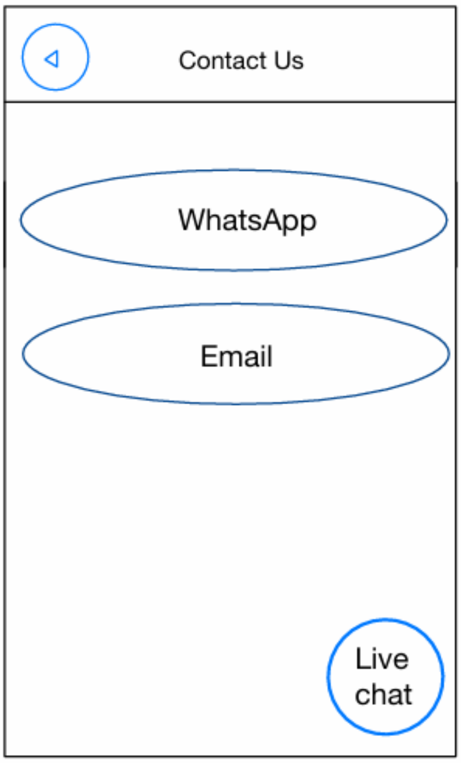


Figure 3.8.19: Contact Us Page Wireframe

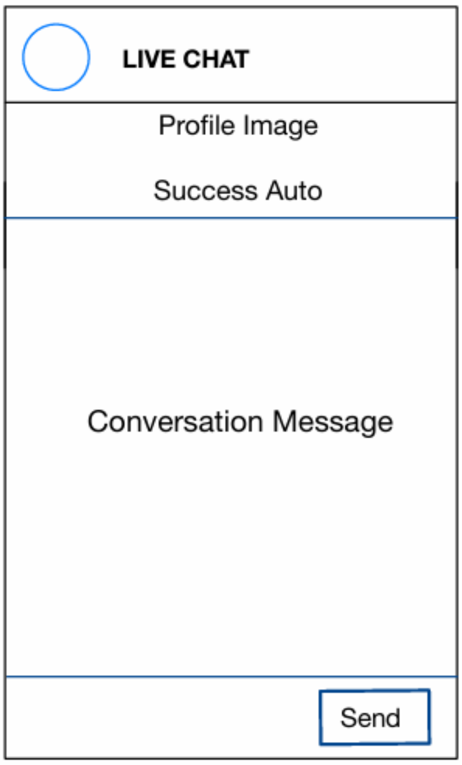


Figure 3.8.20 : Live Chat Page Wireframe

3.9 Testing Plan

No	Verification Activity	Result Description
1	User authentication	• User email and password is correct and valid • User can login into the system
2	User registration	• Input of user email and password is correct and valid • Return error message if input value is null or wrong
3	Password Changing and Reset	• User can change the old password to new password • User fills in the password input before submitting • User can receive reset password link from their registered email
4	Logout	• User can logout and required to re-input their email and password for later access
5	Firebase Firestore CRUD	• Firebase Firestore stores the information input by the user

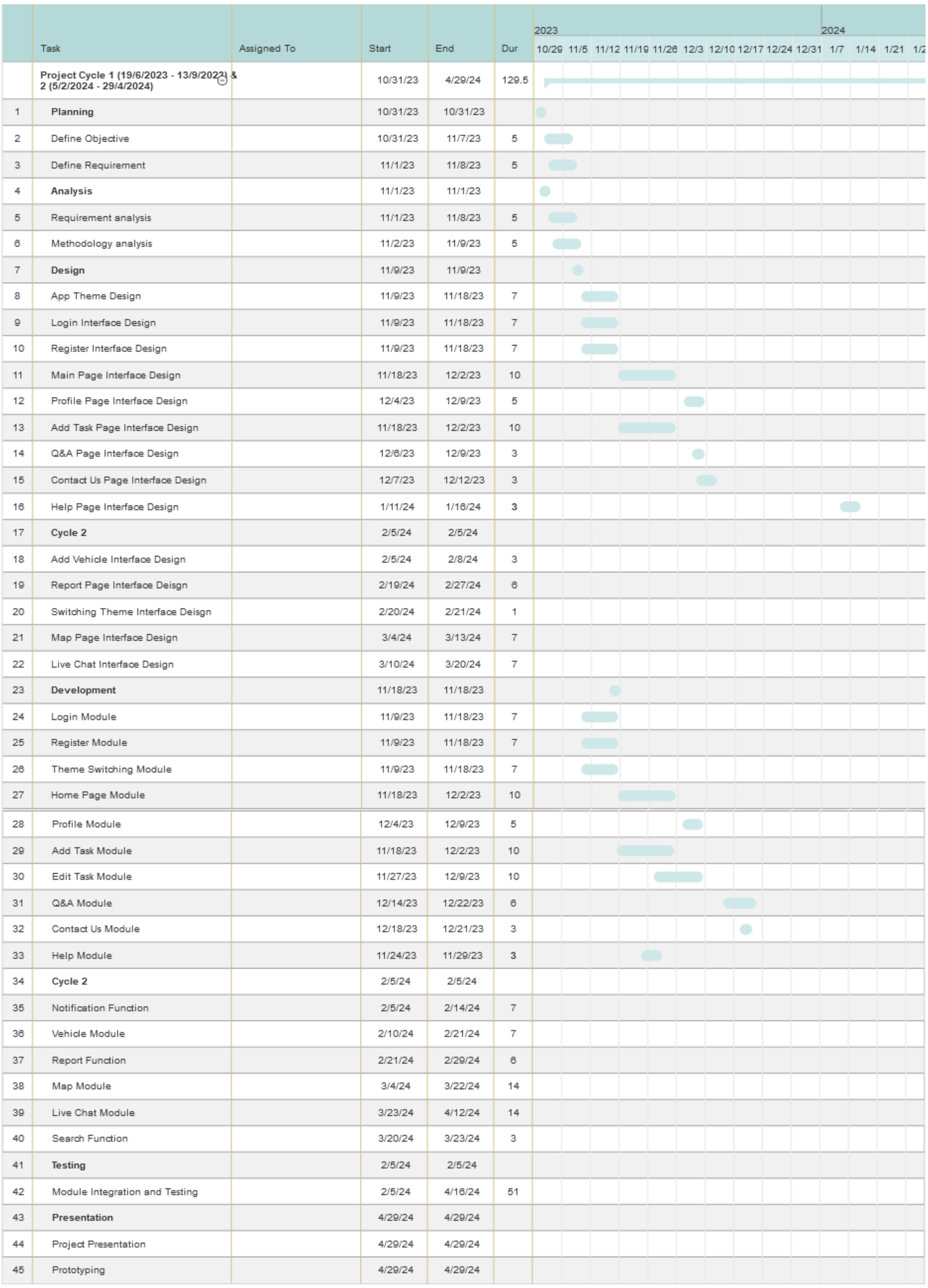
		• Can read the specific information or data that stored • Can update the selected information • Can deleted the selected information
6	Inserting Vehicle Record	• User can input and store the number plate options • User can insert the car details such as brand, model, year, and mileage.
7	Viewing Vehicle Record	• User can view all inserted vehicle details in list form
8	Updating Vehicle Record	• User can select and update previous number plate options • User can update the car details such as brand, model, year, and mileage.
9	Inserting Maintenance Record	• User can select car plate from the option that inserted earlier • User can enter the maintenance record such as maintenance task, remark • User can schedule the maintenance reminder by selecting the date with start time and end time • User can select the task tile color to indicate the criticalness of the maintenance
10	Viewing Maintenance Record	• User can view list of today's maintenance record that retrieved from Firebase in Home Page • User can view full list of maintenance record that retrieved from Firebase in Maintenance Record Page

11	Updating Maintenance Record	• User can update car plate from the option that inserted earlier • User can update the maintenance record such as maintenance task, remark • User can update the scheduled maintenance reminder by re-selecting the date with start time and end time • User can update the task tile color to indicate the criticalness of the maintenance
12	Updating profile	• User can upload and update their preference profile picture • User can update their initial username
13	Switching Theme	• User can select whether operate the app in Light Theme or Dark Theme
14	Map Location	• User can get the nearest mechanic shop based on current location • User can tap on the red marker to get the shop details such as address, shop image and operating hours if available • User can search any places through the location search feature that provided
15	Question and Answer	• User can obtain some answer regarding problem during the application usage • User can search based on the keyword and get the return result that contained input that inserted

16	Help – Video Guidance	• User can view and follow some application operating instruction to implement • User can view the tutorial video and perform actions such as mute, full screen, pause
17	Contact Us	• User can seek help by either click on WhatsApp or Email button to redirect to specific platform • User can click on the live chat support button to get help
18	Live Chat Support	• User can drop down their enquiries in the chat • User can view whether the support staff is online or offline • User can live chat with staff for more information

Table 3.9 Testing Plan

3.10 Timeline



	Task	Assigned To	Start	End	Dur
	Project Cycle 1 (19/6/2023 - 13/9/2023) & 2 (5/2/2024 - 29/4/2024)		10/31/23	4/29/24	129.5
1	**Planning**		10/31/23	10/31/23	
2	Define Objective		10/31/23	11/7/23	5
3	Define Requirement		11/1/23	11/8/23	5
4	**Analysis**		11/1/23	11/1/23	
5	Requirement analysis		11/1/23	11/8/23	5
6	Methodology analysis		11/2/23	11/9/23	5
7	**Design**		11/9/23	11/9/23	
8	App Theme Design		11/9/23	11/18/23	7
9	Login Interface Design		11/9/23	11/18/23	7
10	Register Interface Design		11/9/23	11/18/23	7
11	Main Page Interface Design		11/18/23	12/2/23	10
12	Profile Page Interface Design		12/4/23	12/9/23	5
13	Add Task Page Interface Design		11/18/23	12/2/23	10
14	Q&A Page Interface Design		12/6/23	12/9/23	3
15	Contact Us Page Interface Design		12/7/23	12/12/23	3
16	Help Page Interface Design		1/11/24	1/16/24	3
17	**Cycle 2**		2/5/24	2/5/24	
18	Add Vehicle Interface Design		2/5/24	2/8/24	3
19	Report Page Interface Deisgn		2/19/24	2/27/24	6
20	Switching Theme Interface Deisgn		2/20/24	2/21/24	1
21	Map Page Interface Design		3/4/24	3/13/24	7
22	Live Chat Interface Design		3/10/24	3/20/24	7
23	**Development**		11/18/23	11/18/23	
24	Login Module		11/9/23	11/18/23	7
25	Register Module		11/9/23	11/18/23	7
26	Theme Switching Module		11/9/23	11/18/23	7
27	Home Page Module		11/18/23	12/2/23	10
28	Profile Module		12/4/23	12/9/23	5
29	Add Task Module		11/18/23	12/2/23	10
30	Edit Task Module		11/27/23	12/9/23	10
31	Q&A Module		12/14/23	12/22/23	6
32	Contact Us Module		12/18/23	12/21/23	3
33	Help Module		11/24/23	11/29/23	3
34	**Cycle 2**		2/5/24	2/5/24	
35	Notification Function		2/5/24	2/14/24	7
36	Vehicle Module		2/10/24	2/21/24	7
37	Report Function		2/21/24	2/29/24	6
38	Map Module		3/4/24	3/22/24	14
39	Live Chat Module		3/23/24	4/12/24	14
40	Search Function		3/20/24	3/23/24	3
41	**Testing**		2/5/24	2/5/24	
42	Module Integration and Testing		2/5/24	4/16/24	51
43	**Presentation**		4/29/24	4/29/24	
44	Project Presentation		4/29/24	4/29/24	
45	Prototyping		4/29/24	4/29/24	

Figure 3.10: Project Gantt Chart

Explanation:

<u>Project Cycle One</u>

The project cycle 1 includes the planning phase, analysis phase, design phase, development phase, testing phase, and presentation phase. The project cycle 1 starts on June 19, 2023, and ends on September 13, 2023.

The planning phase will include defining objectives (19/6/2023–26/6/2023) and defining requirements (20/6/2023–27/06/2023). The analysis phase will include requirement analysis (20/6/2023–27/6/2023) and methodology analysis (21/6/2023–28/6/2023).

The design phase will include app theme design (28/6/2023–7/7/2023), login interface design (28/6/2023–7/7/2023), register interface design (28/6/2023–7/7/2023), main page interface design (7/7/2023–21/7/2023), profile page interface design (23/7/2023), add task page interface design (7/7/2023–21/7/2023), Q&A page interface design (25/7/2023–28/7/2023), contact us page interface design (26/7/2023–29/7/2023), and help page interface design (30/8/2023–2/9/2023).

The development phase will include the login module (28/6/2023–7/7/2023), register module (28/6/2023–7/7/2023), theme switching module (28/6/2023–7/7/2023), home page module (7/7/2023–21/7/2023), profile module (23/7/2023–29/7/2023), add task module (7/7/2023–21/7/2023), edit task module (16/7/2023–29/7/2023), Q&A module (2/8/2023–5/8/2023), contact us module (6/8/2023–10/8/2023), and help module (30/8/2023–2/9/2023).

The testing phase will include module integration and testing (28/6/2023–2/9/2023), and the testing will be implemented from the beginning until the beginning as each new function or requirement added will be tested.

Lastly, the project presentation with prototyping will be demonstrated to the moderator, which will be carried out on September 13, 2023.

<u>Project Cycle Two</u>

In the design phase, we have added new interface designs for the add vehicles page (19/6/2023), report page (19/2/2024–27/2/2024), switching theme (20/2/2024–21/2/2024), map page (4/3/2024–13/3/2024), and live chat page (10/3/2024–20/3/2024).

For the development phase, the notification function (5/2/2024–14/2/2024), vehicle module (10/2/2024–21/2/2024), report function (21/2/2024–29/2/2024), map module (4/3/2024–22/3/2024), live chat module (23/3/2024–12/4/2024), and search function (20/3/2024–23/3/2024) have been added to the application.

The testing phase will include module integration and testing (5/2/2024–16/4/2024), and the testing will be implemented from the beginning until the beginning as each new function or requirement added will be tested.

Lastly, the project presentation with prototyping will be demonstrated to the moderator, which will take place on April 29, 2024.

CHAPTER 4 SYSTEM DESIGN

4.1 Introduction

This chapter will include a system block diagram that provides a holistic view of the system by listing its module categories and corresponding functions or methods that can be performed by the user.

4.2 System Block Diagram

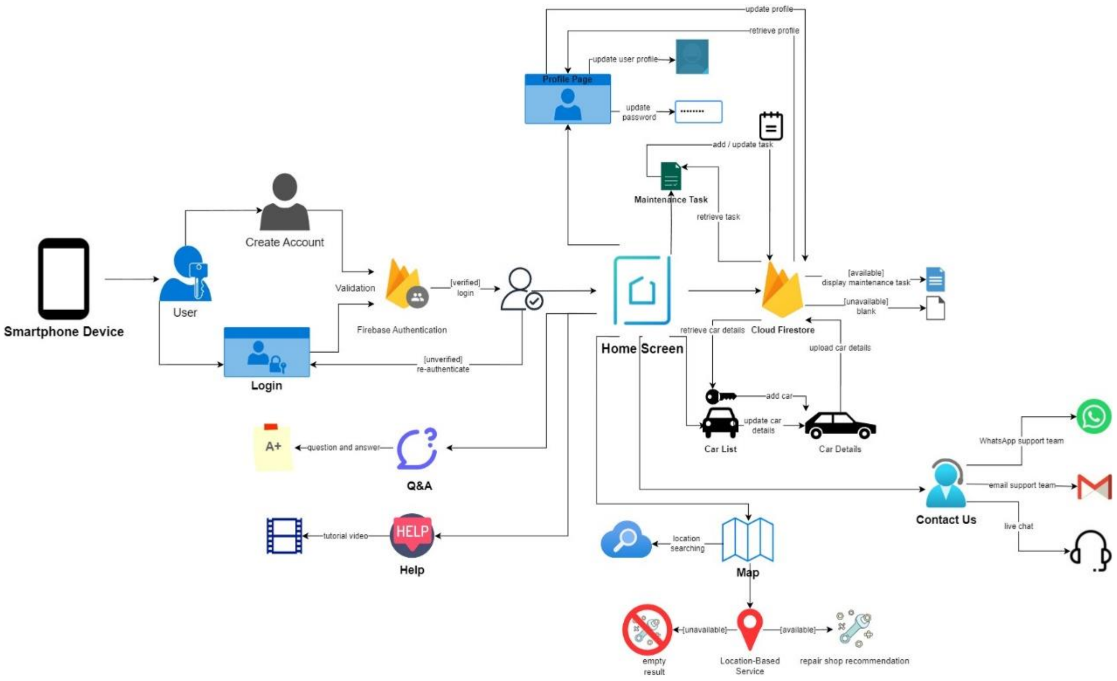


Figure 4.2: System Block Diagram

Basically, there are several parts that are included in the system block diagram, which are the login module, profile module, vehicle record module, maintenance record module, map module, Q&A module, help module, and contact us module.

For the login module, users are required to register an account to login to the application. The system will validate the authentication of the user's email by requesting that the user verify the email address that was provided. After being verified, the user will be redirected to the home page, where they can view the task tile that is available at the current date; otherwise, it will be empty. Besides, the home page will have an add maintenance button for the user's convenience to add the task.

In the profile module, user is able to view their profile details, such as their username and profile picture. Both items can be updated by the user, and the information will be uploaded to the Firestore and overwritten with the existing values. Additionally, users are provided with a change password section if they wish to perform the action.

For the vehicle record module, the user is able to add vehicle details, which include number plate, brand, model, year, and mileage. All the records will be inserted into Firestore. The interface will be displayed with an existing list of vehicle tiles, if available. The user can choose to update or delete the existing record.

For the maintenance module, the user is able to add maintenance task details such as number plate, maintenance task, remark, date, start time, end time, reminder notification, and color that indicate the critical level. All the records will be inserted into Firestore. If the existing record is available and retrieved from the Firestore, it will be displayed in the interface. All the records are provided with update and delete features.

For the map module, the system will ask the user to grant current location access permission before tracking the user’s current location and getting the available vehicle mechanic and repair shop names, images, addresses, and operating hours to display in the interface. Search features are available for users; the search places are based on keywords, and the system will provide the suggestion input.

For the Q&A module, the system will display some questions about the user's common usage problems that they might encounter in the application with corresponding answers. The user can use the search feature by inserting keywords, and the system will return any result that contains the input if it is available; otherwise, no result will be displayed.

For the help module, the system will provide the whole tutorial video on the usage of the application. The user can pause and perform device view configuration to watch the video.

For the contact us module, there are two ways to get in contact with customer support directly: either through WhatsApp or email medium redirect. If the user seeks a real-time response, they can opt for the live chat button and start the conversation with the support agent.

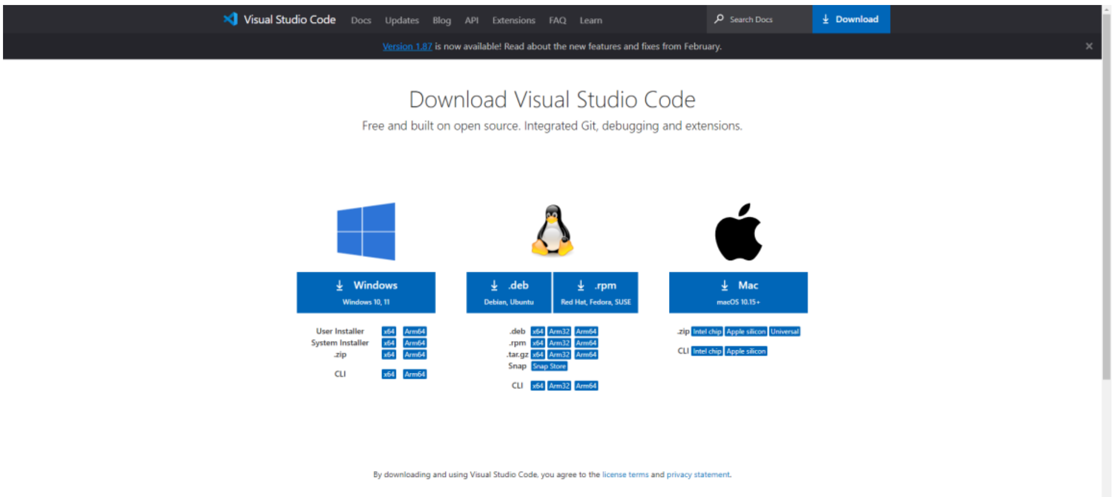
CHAPTER 5 SYSTEM IMPLEMENTATION

5.1 Introduction

In this chapter, we will discuss and visualize the steps and procedures for setting up the software and project configuration before executing the software.

5.2 Software Setup

5.2.1 Installation of VS Code



Version 1.87 is now available! Read about the new features and fixes from February.

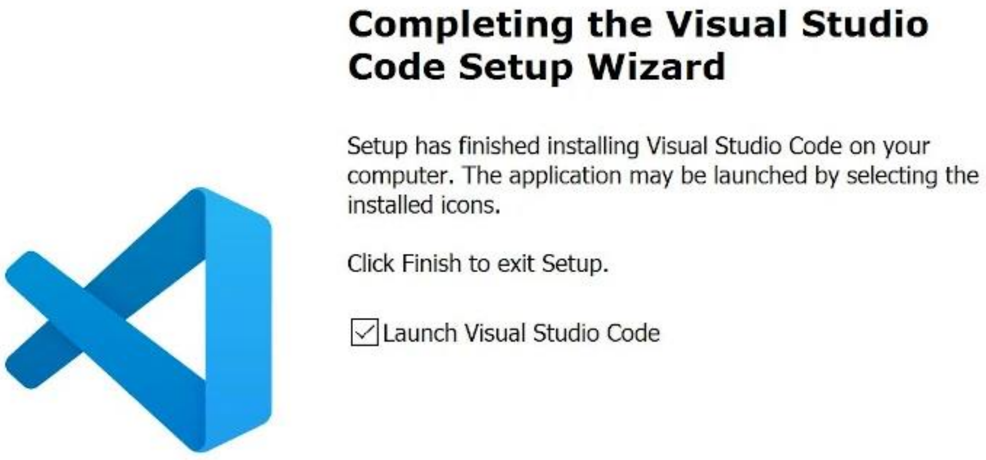
Download Visual Studio Code

Free and built on open source. Integrated Git, debugging and extensions.

By downloading and using Visual Studio Code, you agree to the license terms and privacy statement.

Figure 5.2.1 Visual Studio Home Page

Download the Visual Studio Code according to your OS.



Completing the Visual Studio Code Setup Wizard

Setup has finished installing Visual Studio Code on your computer. The application may be launched by selecting the installed icons.

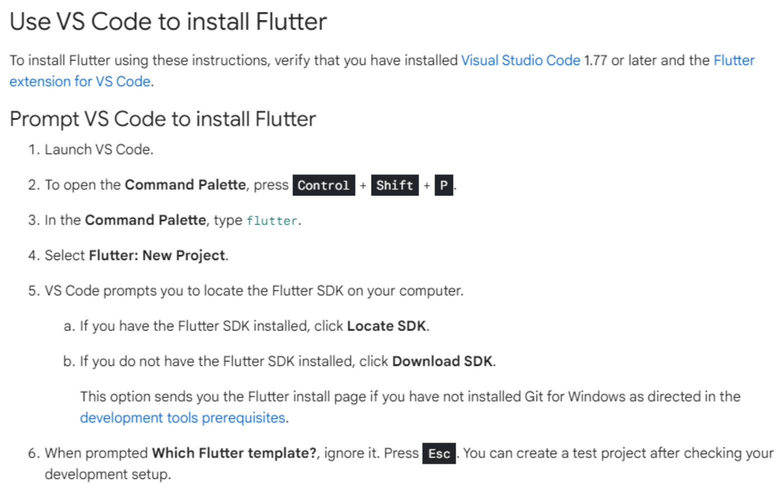
Click Finish to exit Setup.

☑ Launch Visual Studio Code

Figure 5.2.2 Visual Studio Code Setup

After successfully installing, click finish and launch it.

5.2.2 Flutter Setup



Use VS Code to install Flutter

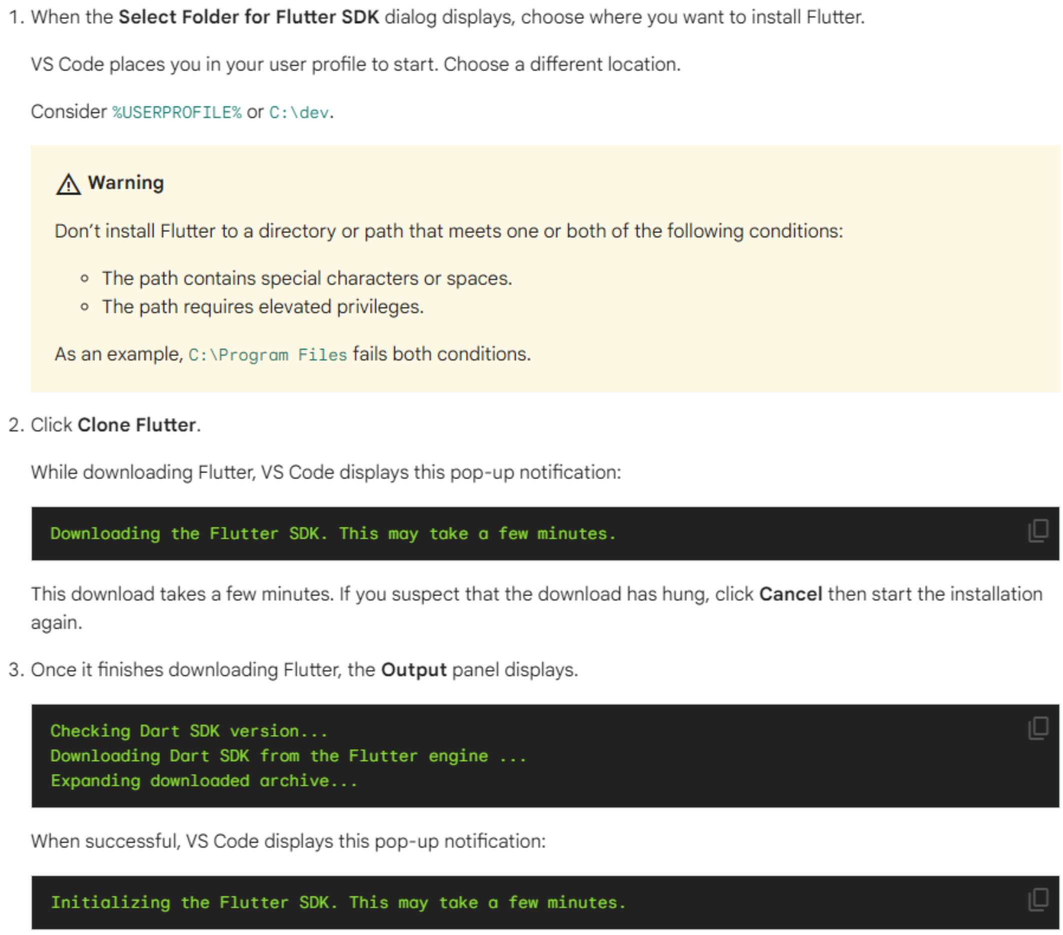
To install Flutter using these instructions, verify that you have installed Visual Studio Code 1.77 or later and the Flutter extension for VS Code.

Prompt VS Code to install Flutter

1. Launch VS Code.
2. To open the **Command Palette**, press `Control` + `Shift` + `P`.
3. In the **Command Palette**, type `flutter`.
4. Select **Flutter: New Project**.
5. VS Code prompts you to locate the Flutter SDK on your computer.
   a. If you have the Flutter SDK installed, click **Locate SDK**.
   b. If you do not have the Flutter SDK installed, click **Download SDK**.

   This option sends you the Flutter install page if you have not installed Git for Windows as directed in the development tools prerequisites.
6. When prompted **Which Flutter template?**, ignore it. Press `Esc`. You can create a test project after checking your development setup.

Figure 5.2.2.1 Install Flutter in VS Code



1. When the **Select Folder for Flutter SDK** dialog displays, choose where you want to install Flutter.

   VS Code places you in your user profile to start. Choose a different location.

   Consider `%USERPROFILE%` or `C:\dev`.

   ⚠ **Warning**

   Don't install Flutter to a directory or path that meets one or both of the following conditions:

   - The path contains special characters or spaces.
   - The path requires elevated privileges.

   As an example, `C:\Program Files` fails both conditions.

2. Click **Clone Flutter**.

   While downloading Flutter, VS Code displays this pop-up notification:

```
Downloading the Flutter SDK. This may take a few minutes.
```

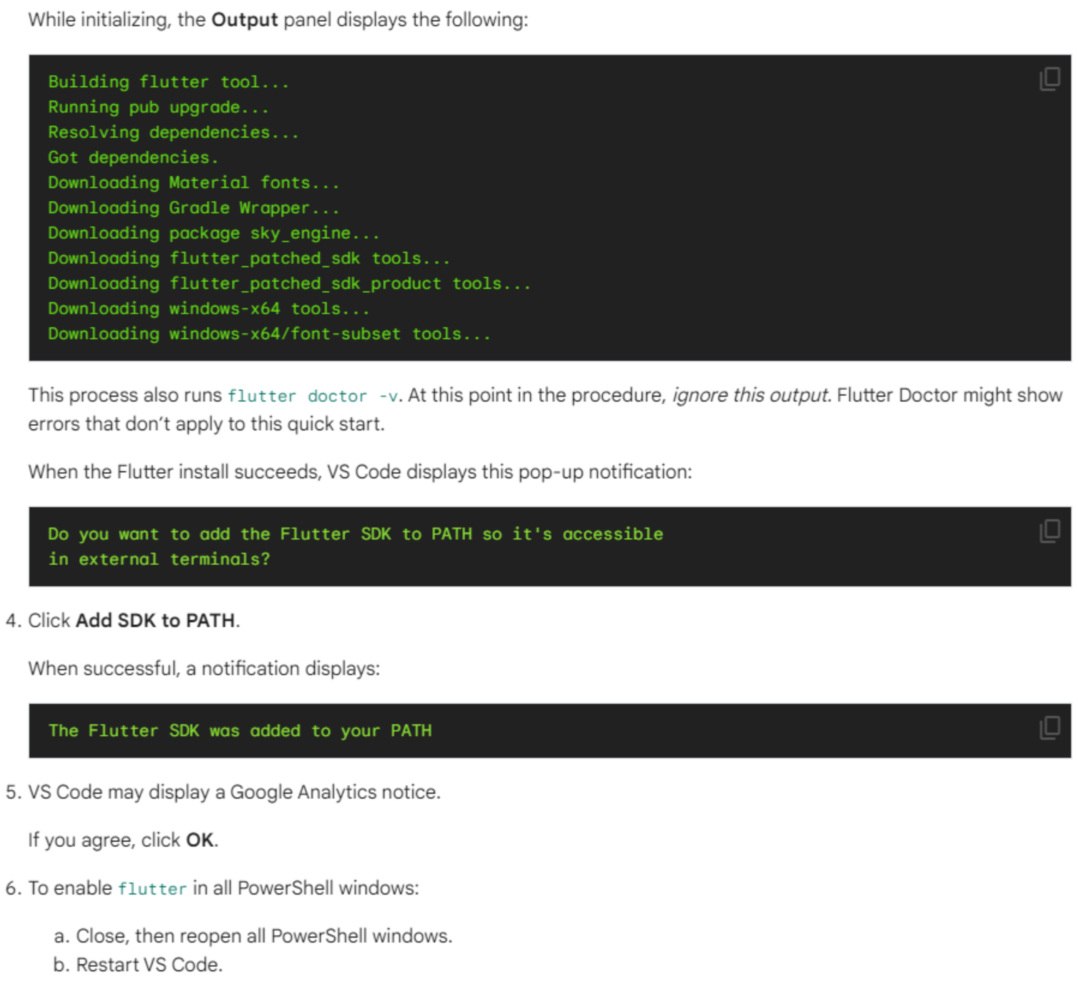
   This download takes a few minutes. If you suspect that the download has hung, click **Cancel** then start the installation again.

3. Once it finishes downloading Flutter, the **Output** panel displays.

```
Checking Dart SDK version...
Downloading Dart SDK from the Flutter engine ...
Expanding downloaded archive...
```

   When successful, VS Code displays this pop-up notification:

```
Initializing the Flutter SDK. This may take a few minutes.
```



While initializing, the **Output** panel displays the following:

```
Building flutter tool...
Running pub upgrade...
Resolving dependencies...
Got dependencies.
Downloading Material fonts...
Downloading Gradle Wrapper...
Downloading package sky_engine...
Downloading flutter_patched_sdk tools...
Downloading flutter_patched_sdk_product tools...
Downloading windows-x64 tools...
Downloading windows-x64/font-subset tools...
```

This process also runs `flutter doctor -v`. At this point in the procedure, *ignore this output.* Flutter Doctor might show errors that don't apply to this quick start.

When the Flutter install succeeds, VS Code displays this pop-up notification:

```
Do you want to add the Flutter SDK to PATH so it's accessible
in external terminals?
```

4. Click **Add SDK to PATH**.

   When successful, a notification displays:

```
The Flutter SDK was added to your PATH
```

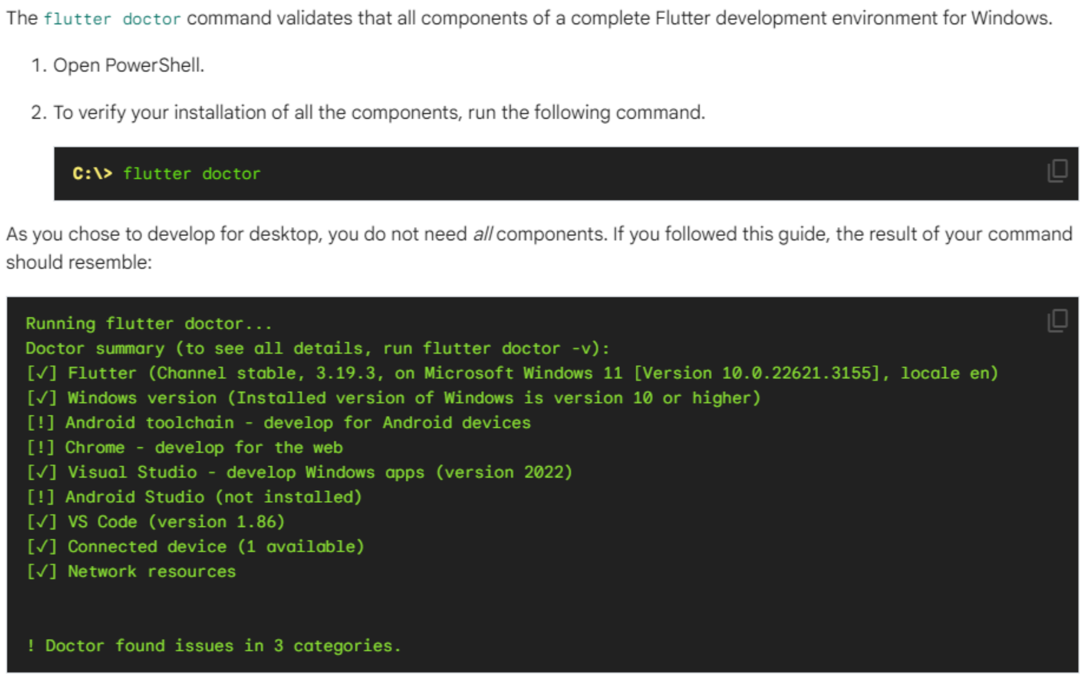
5. VS Code may display a Google Analytics notice.

   If you agree, click **OK**.

6. To enable `flutter` in all PowerShell windows:

   a. Close, then reopen all PowerShell windows.
   b. Restart VS Code.

Figure 5.2.2.2 Download Flutter SDK Step



The `flutter doctor` command validates that all components of a complete Flutter development environment for Windows.

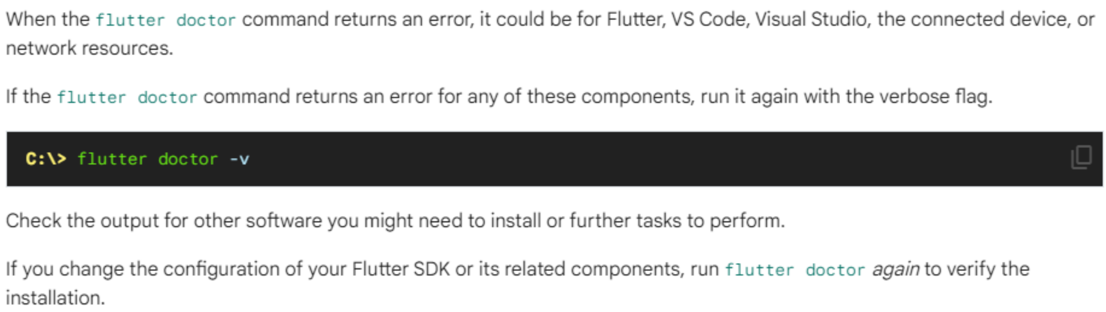
1. Open PowerShell.
2. To verify your installation of all the components, run the following command.

```
C:\> flutter doctor
```

As you chose to develop for desktop, you do not need *all* components. If you followed this guide, the result of your command should resemble:

```
Running flutter doctor...
Doctor summary (to see all details, run flutter doctor -v):
[✓] Flutter (Channel stable, 3.19.3, on Microsoft Windows 11 [Version 10.0.22621.3155], locale en)
[✓] Windows version (Installed version of Windows is version 10 or higher)
[!] Android toolchain - develop for Android devices
[!] Chrome - develop for the web
[✓] Visual Studio - develop Windows apps (version 2022)
[!] Android Studio (not installed)
[✓] VS Code (version 1.86)
[✓] Connected device (1 available)
[✓] Network resources


! Doctor found issues in 3 categories.
```

Figure 5.2.2.3 Check Your Development Setup



When the flutter doctor command returns an error, it could be for Flutter, VS Code, Visual Studio, the connected device, or network resources.

If the flutter doctor command returns an error for any of these components, run it again with the verbose flag.

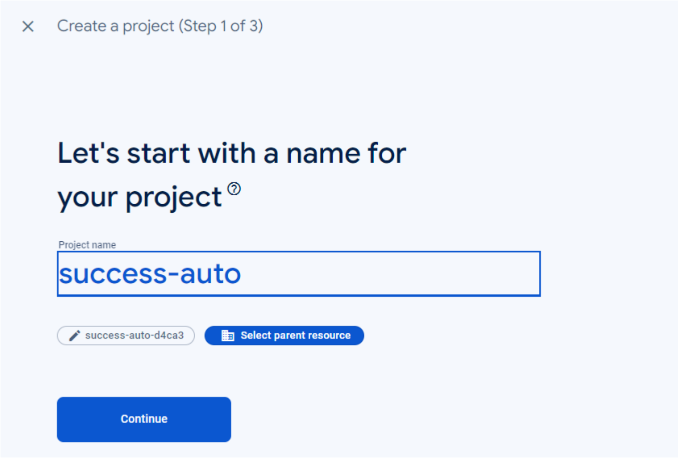
```
C:\> flutter doctor -v
```

Check the output for other software you might need to install or further tasks to perform.

If you change the configuration of your Flutter SDK or its related components, run flutter doctor *again* to verify the installation.

Figure 5.2.2.4 Troubleshoot Flutter doctor issues

5.3 Project Configuration (Firebase Firestore Configuration)



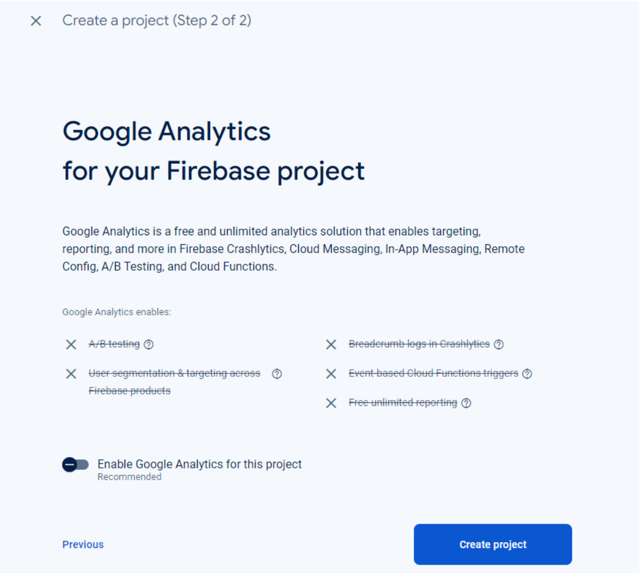
Create a project (Step 1 of 3)

Let's start with a name for your project

Project name: success-auto

Figure 5.3.1 Project Setup

Enter the project name and click “Continue”.



Create a project (Step 2 of 2)

Google Analytics for your Firebase project

Google Analytics is a free and unlimited analytics solution that enables targeting, reporting, and more in Firebase Crashlytics, Cloud Messaging, In-App Messaging, Remote Config, A/B Testing, and Cloud Functions.

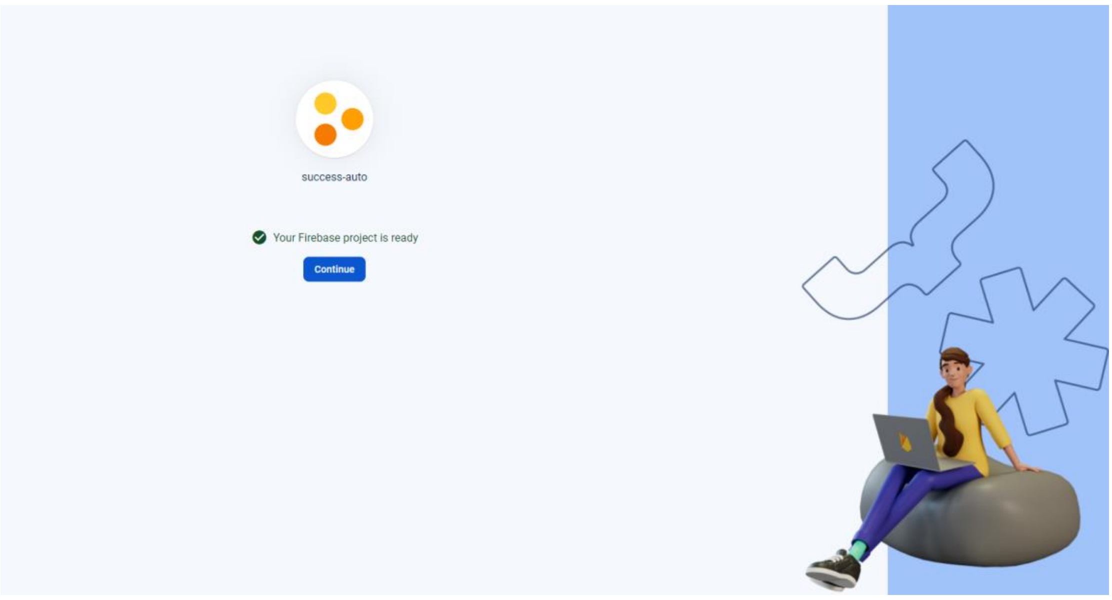
Google Analytics enables:

- ~~A/B testing~~
- ~~User segmentation & targeting across Firebase products~~
- ~~Breadcrumb logs in Crashlytics~~
- ~~Event-based Cloud Functions triggers~~
- ~~Free unlimited reporting~~

Enable Google Analytics for this project
Recommended

Figure 5.3.2 Google Analytics Setup

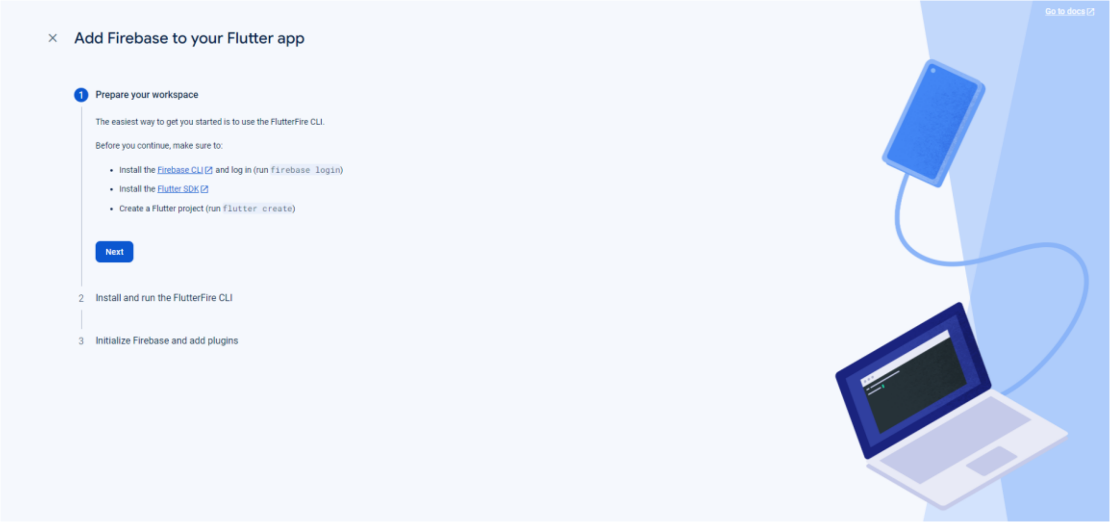
Disable google Analytics and click on Continue.


success-auto

Your Firebase project is ready

Figure 5.3.3 Project Ready to Use

Click “Continue” to carry out next step.



Add Firebase to your Flutter app

1 Prepare your workspace

The easiest way to get you started is to use the FlutterFire CLI.

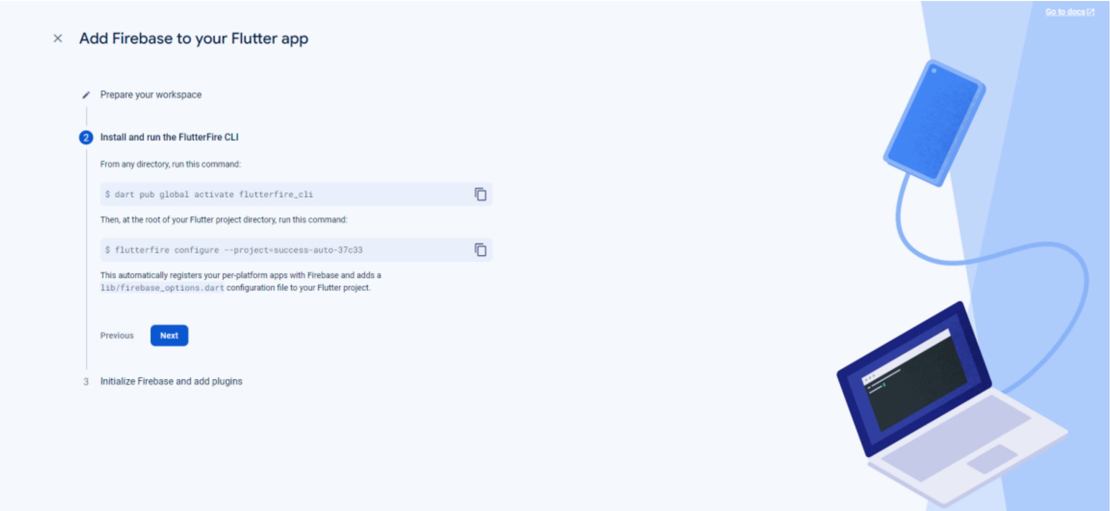
Before you continue, make sure to:

- Install the Firebase CLI and log in (run `firebase login`)
- Install the Flutter SDK
- Create a Flutter project (run `flutter create`)

2 Install and run the FlutterFire CLI

3 Initialize Firebase and add plugins

Figure 5.3.4 Connect to Firebase 1st Step



Add Firebase to your Flutter app

Prepare your workspace

2 Install and run the FlutterFire CLI

From any directory, run this command:

```
$ dart pub global activate flutterfire_cli
```

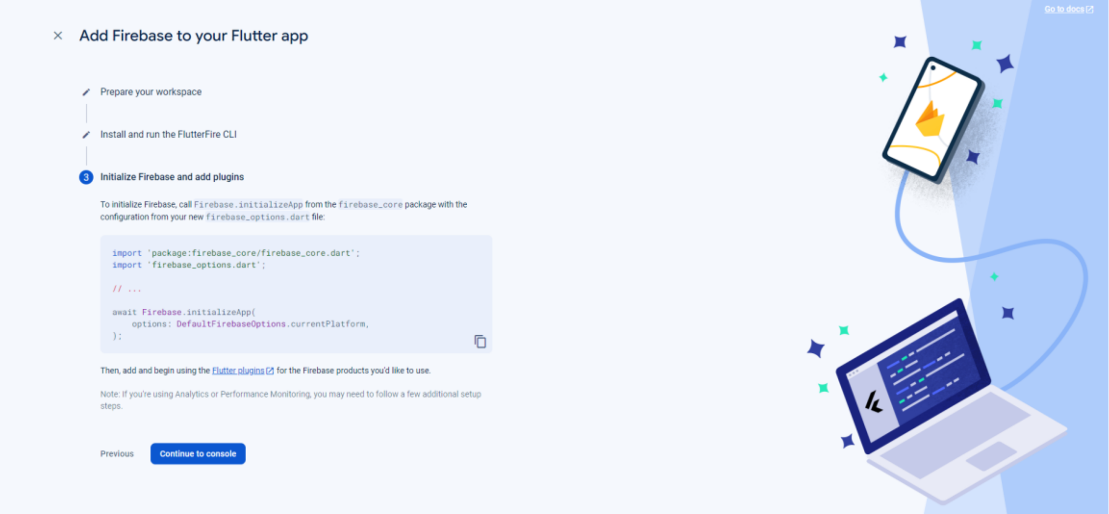
Then, at the root of your Flutter project directory, run this command:

```
$ flutterfire configure --project=success-auto-37c33
```

This automatically registers your per-platform apps with Firebase and adds a `lib/firebase_options.dart` configuration file to your Flutter project.

3 Initialize Firebase and add plugins

Figure 5.3.5 Connect to Firebase 2nd Step



Add Firebase to your Flutter app

- Prepare your workspace
- Install and run the FlutterFire CLI
- 3 Initialize Firebase and add plugins

To initialize Firebase, call `Firebase.initializeApp` from the `firebase_core` package with the configuration from your new `firebase_options.dart` file:

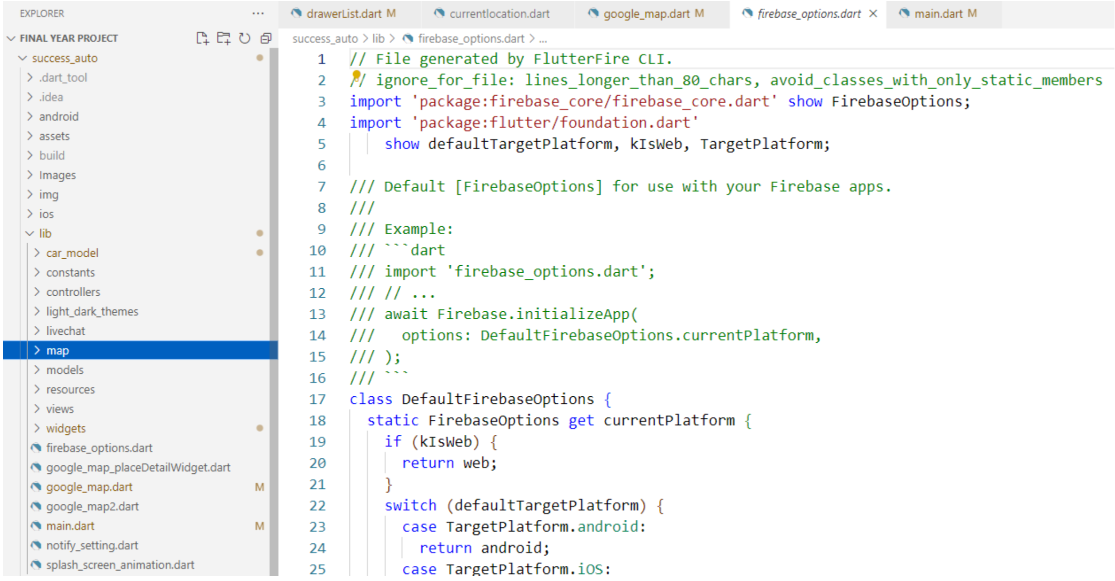
```
import 'package:firebase_core/firebase_core.dart';
import 'firebase_options.dart';

// ...

await Firebase.initializeApp(
    options: DefaultFirebaseOptions.currentPlatform,
);
```

Then, add and begin using the Flutter plugins for the Firebase products you'd like to use.

Note: If you're using Analytics or Performance Monitoring, you may need to follow a few additional setup steps.

Figure 5.3.6 Connect to Firebase 3rd Step

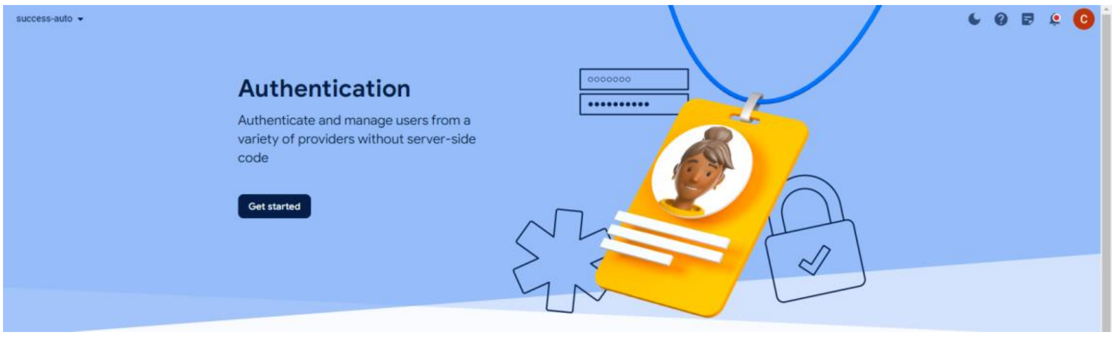
Follow three steps that indicate above to add Firebase to project.



```
// File generated by FlutterFire CLI.
// ignore_for_file: lines_longer_than_80_chars, avoid_classes_with_only_static_members
import 'package:firebase_core/firebase_core.dart' show FirebaseOptions;
import 'package:flutter/foundation.dart'
    show defaultTargetPlatform, kIsWeb, TargetPlatform;

/// Default [FirebaseOptions] for use with your Firebase apps.
///
/// Example:
/// ```dart
/// import 'firebase_options.dart';
/// // ...
/// await Firebase.initializeApp(
///   options: DefaultFirebaseOptions.currentPlatform,
/// );
/// ```
class DefaultFirebaseOptions {
  static FirebaseOptions get currentPlatform {
    if (kIsWeb) {
      return web;
    }
    switch (defaultTargetPlatform) {
      case TargetPlatform.android:
        return android;
      case TargetPlatform.iOS:
```

Figure 5.3.7 Successfully connect to Firebase to Project

After successfully setup Firebase, inside the project folder will have new file call “firebase_options.dart” and you can start to use the services now.

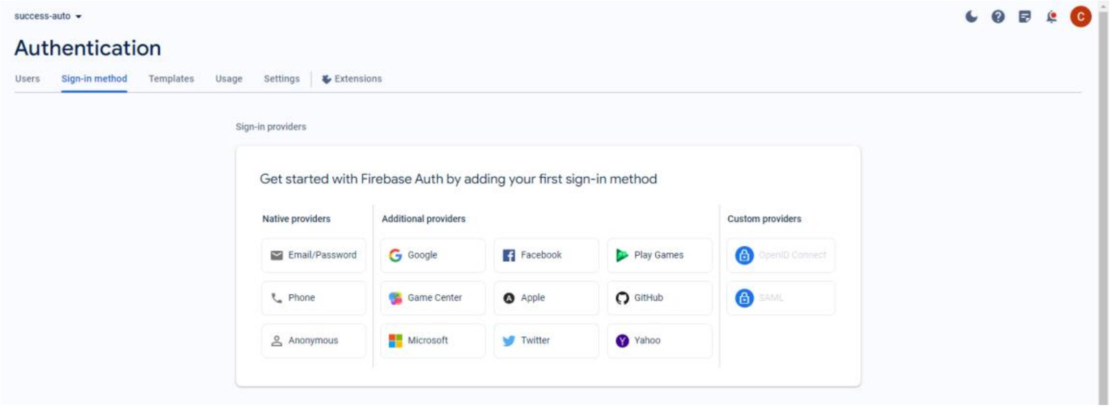

success-auto ▾

Authentication

Authenticate and manage users from a variety of providers without server-side code

Figure 5.3.8 Firebase Authentication Homepage

Click “Get started” on the authentication homepage to configure authentication usage for creating register and login function.


success-auto ▾

Authentication

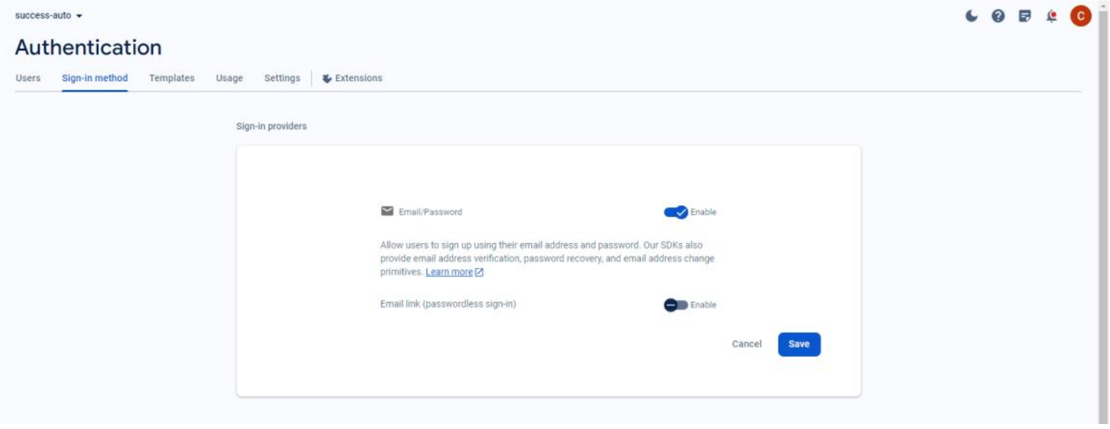
Sign-in providers

Get started with Firebase Auth by adding your first sign-in method

Native providers	Additional providers			Custom providers
Email/Password	Google	Facebook	Play Games	OpenID Connect
Phone	Game Center	Apple	GitHub	SAML
Anonymous	Microsoft	Twitter	Yahoo	

Figure 5.3.9 Select Sign-in Method

Select email-password sign-in method for this project.


success-auto ▾

Authentication

Sign-in providers

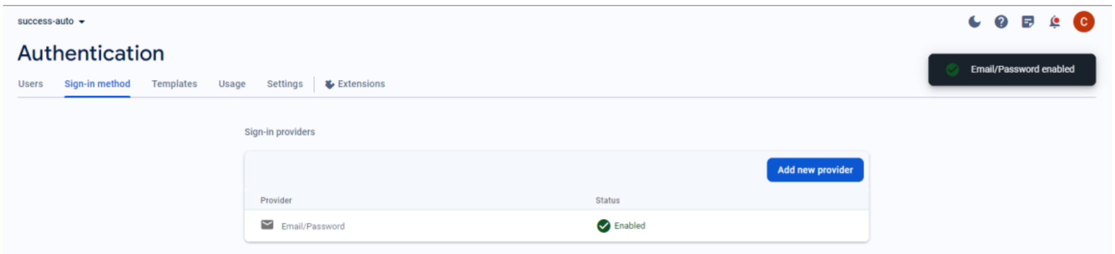
Email/Password ● Enable

Allow users to sign up using their email address and password. Our SDKs also provide email address verification, password recovery, and email address change primitives. Learn more

Email link (passwordless sign-in) ○ Enable

Figure 5.3.10 Enable Sign-in Method

Enable email and password to allow user to sign in using email and address by using Firebase Authentication to verify the account validation. Click on “Save”.



Email/Password enabled

Sign-in providers

Provider	Status
Email/Password	Enabled

Figure 5.3.11 Successfully Enabled

After finishing setup, the status will turn into “Enabled”.

5.4 Implementation (Preliminary Work Result)

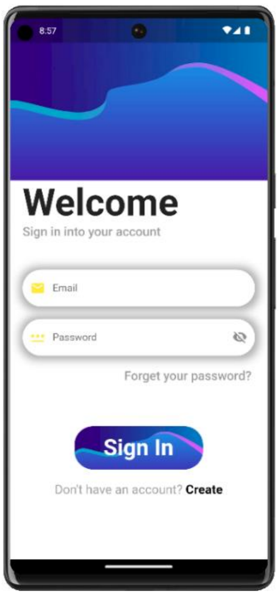
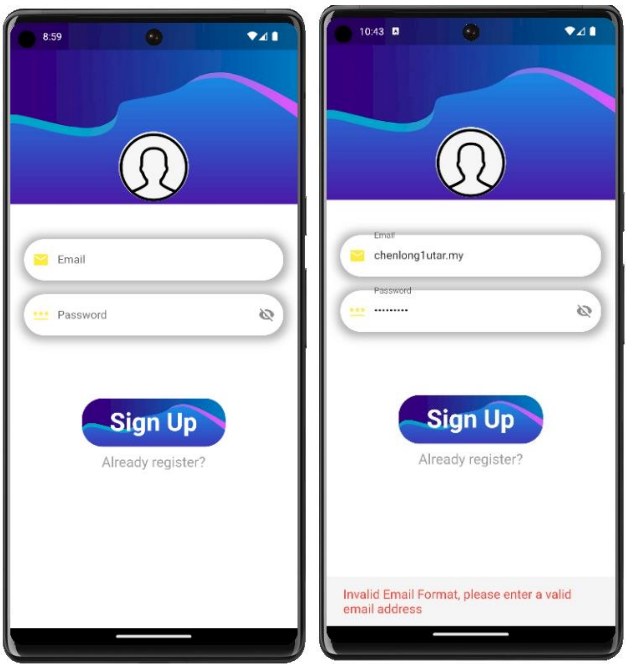


Figure 5.4.1 : Login Page Interface

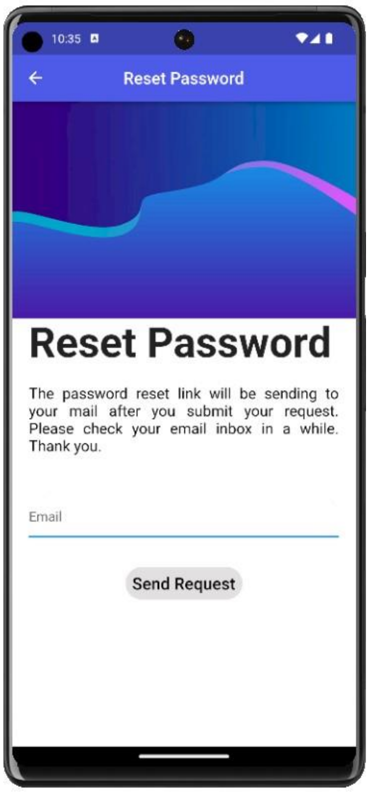
This is the login page interface which user required to enter their account email address and password that registered previously. Only valid account with correct password that authenticated will be allowed to login.



Invalid Email Format, please enter a valid email address

Figure 5.4.2: Sign Up Page Interface

This is the account registration or sign up page which allow new user to sign up new account in order to use the application. And for the email field, it will have the validator to ensure the user is entering the correct email format to register else it will display the error message to user.

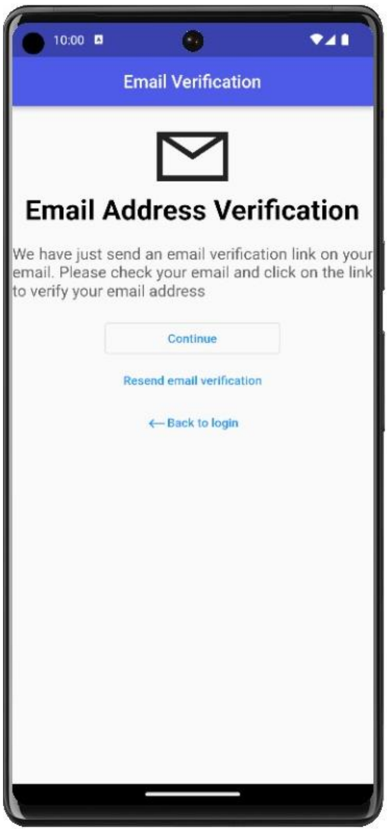


Reset Password

The password reset link will be sending to your mail after you submit your request. Please check your email inbox in a while. Thank you.

Figure 5.4.3: Password Reset Page Interface

This is the password reset page for those user that forget their password to login. The user might enter the email address that they registered on the application account to get the password reset link to reset it.



10:00

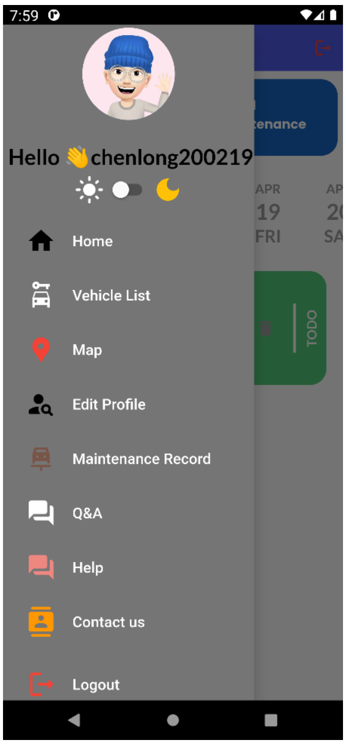
Email Verification

Email Address Verification

We have just send an email verification link on your email. Please check your email and click on the link to verify your email address

Figure 5.4.4: Email Address Verification Page Interface

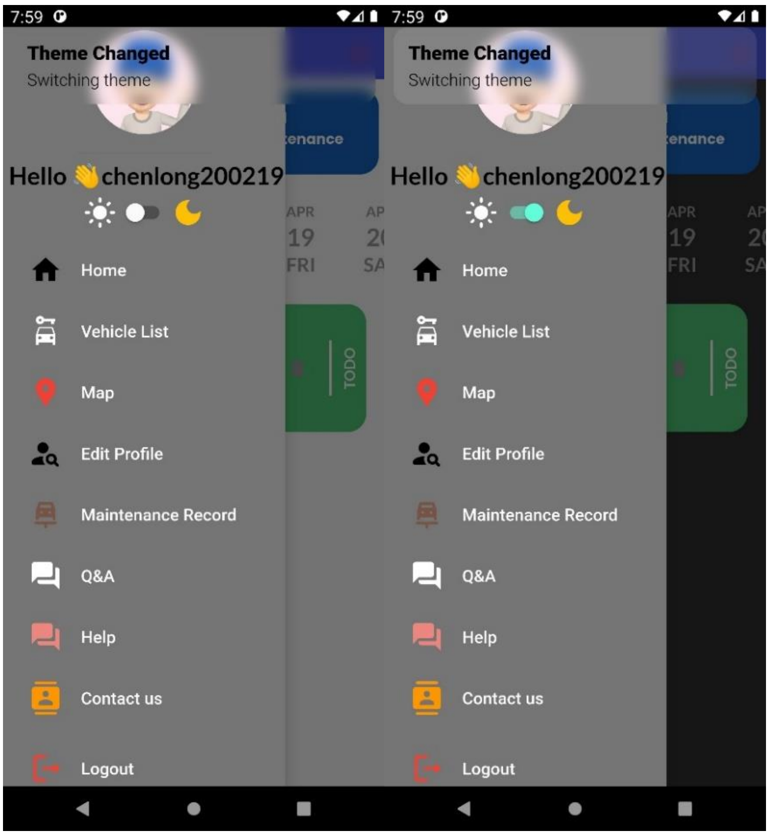
This is email address verification page that require all the new user verify their email address is authentic before they able to create the account to login and use the application. If user not receive the verification mail in their inbox, they might click the resend email verification button. While the back to login button is let user back to the login page if the application did’t not automatically redirect user to the main page of aappliation after verified.



Hello 👋 chenlong200219

Figure 5.4.5: Drawer Interface

This is the drawer interface which including home page, profile page, switch theme, maintenance record page, Q&A page, help page, contact us page and logout functionality. This drawer enable user to switch to other page according to own preferences and action that need to perform.



Theme Changed
Switching theme

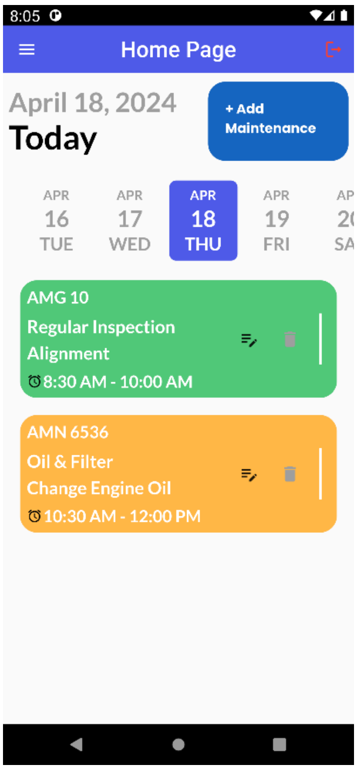
Hello 👋 chenlong200219

Theme Changed
Switching theme

Hello 👋 chenlong200219

Figure 5.4.6: Theme Switching Interface

User can switch light theme to dark them or dark theme to light theme according to own preferences interface design by tapping the Switch Theme functionality inside the expandable drawer.



8:05

Home Page

April 18, 2024

Today

+ Add Maintenance

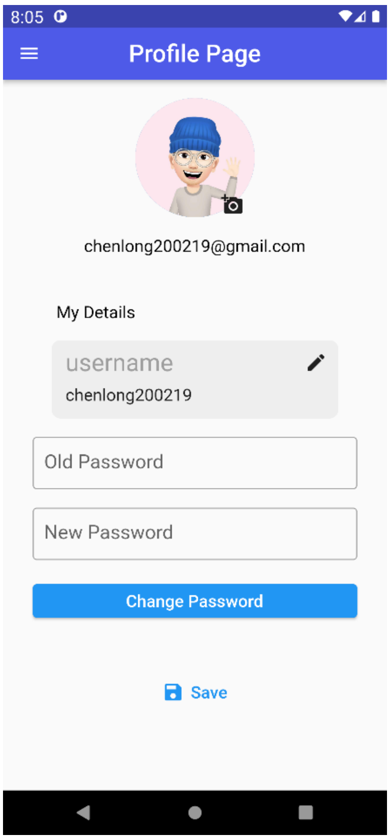
APR	APR	APR	APR	AP
16	17	18	19	2(
TUE	WED	THU	FRI	SA

AMG 10
Regular Inspection
Alignment
8:30 AM - 10:00 AM

AMN 6536
Oil & Filter
Change Engine Oil
10:30 AM - 12:00 PM

Figure 5.4.7: Home Page Interface

This is home page interface which also is the main page when user login into the application. In the home page interface will displaying the current date, a simplify calendar, maintenance task on that day, add maintenance functionality that can redirect to add maintenance task page and logout functionality in the app bar.



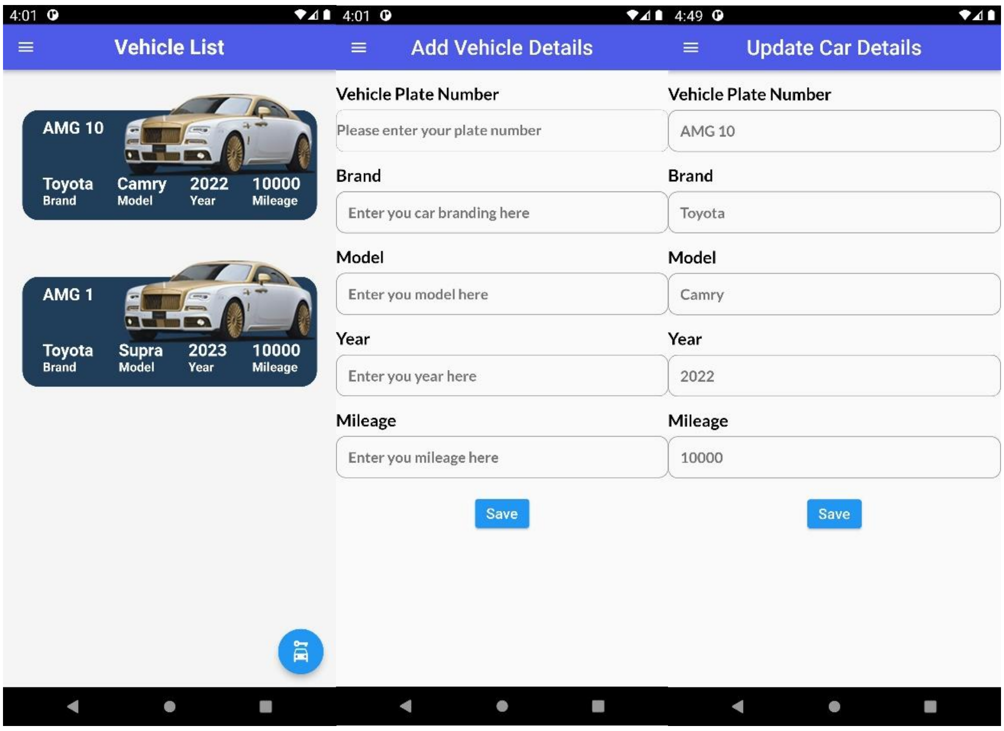
chenlong200219@gmail.com

My Details

username: chenlong200219

Figure 5.4.8: Profile Page Interface

This is profile page interface that provide user to change or edit their profile image and the nickname in the application. All the changes will reflect in the application and store into the Firebase Firestore and Firebase Storage.



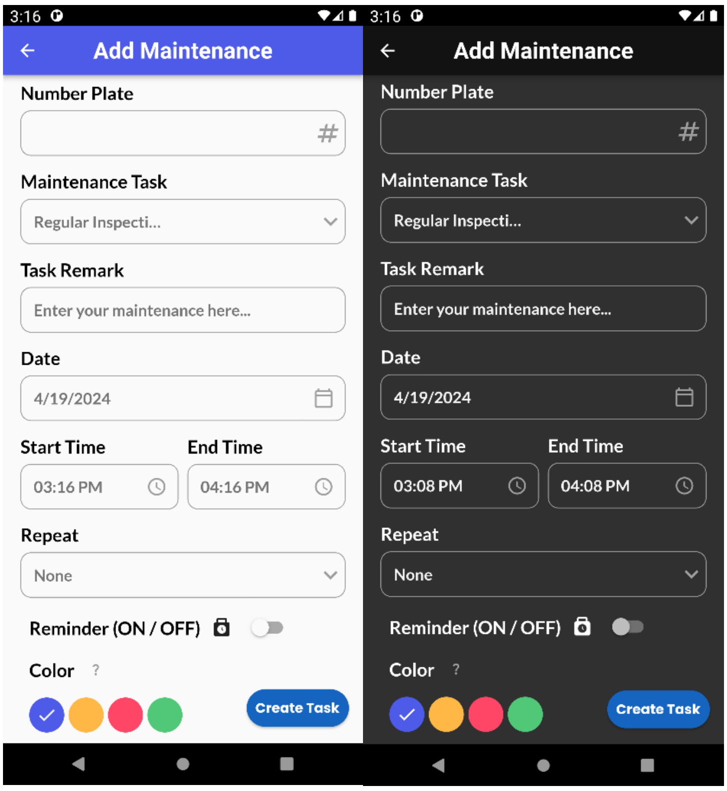
AMG 10	Toyota Brand	Camry Model	2022 Year	10000 Mileage
AMG 1	Toyota Brand	Supra Model	2023 Year	10000 Mileage

Vehicle Plate Number: Please enter your plate number
Brand: Enter you car branding here
Model: Enter you model here
Year: Enter you year here
Mileage: Enter you mileage here

Vehicle Plate Number: AMG 10
Brand: Toyota
Model: Camry
Year: 2022
Mileage: 10000

Figure 5.4.9 : Vehicle List Page

In vehicle list page, there will be a list of vehicle tile that consist with vehicle own corresponding details such as number plate, brand, model, year, and mileage. User are provided to add new vehicle or update existing vehicle details capability.

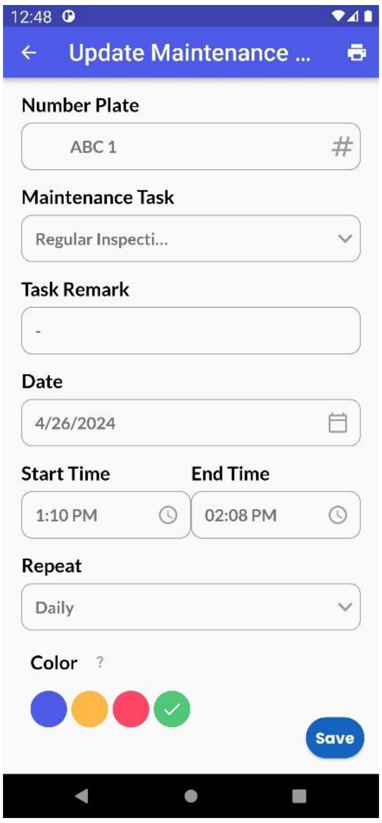


Number Plate:
Maintenance Task: Regular Inspecti...
Task Remark: Enter your maintenance here...
Date: 4/19/2024
Start Time: 03:16 PM
End Time: 04:16 PM
Repeat: None
Reminder (ON / OFF)
Color ?

Number Plate:
Maintenance Task: Regular Inspecti...
Task Remark: Enter your maintenance here...
Date: 4/19/2024
Start Time: 03:08 PM
End Time: 04:08 PM
Repeat: None
Reminder (ON / OFF)
Color ?

Figure 5.4.10: Add Maintenance Task Page Interface (Light and Dark Mode)

In add maintenance page, user will need to enter all the information or select the option value which includes plate number, maintenance task, task remark, date, start time, end time, alert, repeat and color to create the maintenance record. User will be required to enter all info before able to create task else the error validation message will pop up.



Number Plate

ABC 1

Maintenance Task

Regular Inspecti...

Task Remark

-

Date

4/26/2024

Start Time: 1:10 PM

End Time: 02:08 PM

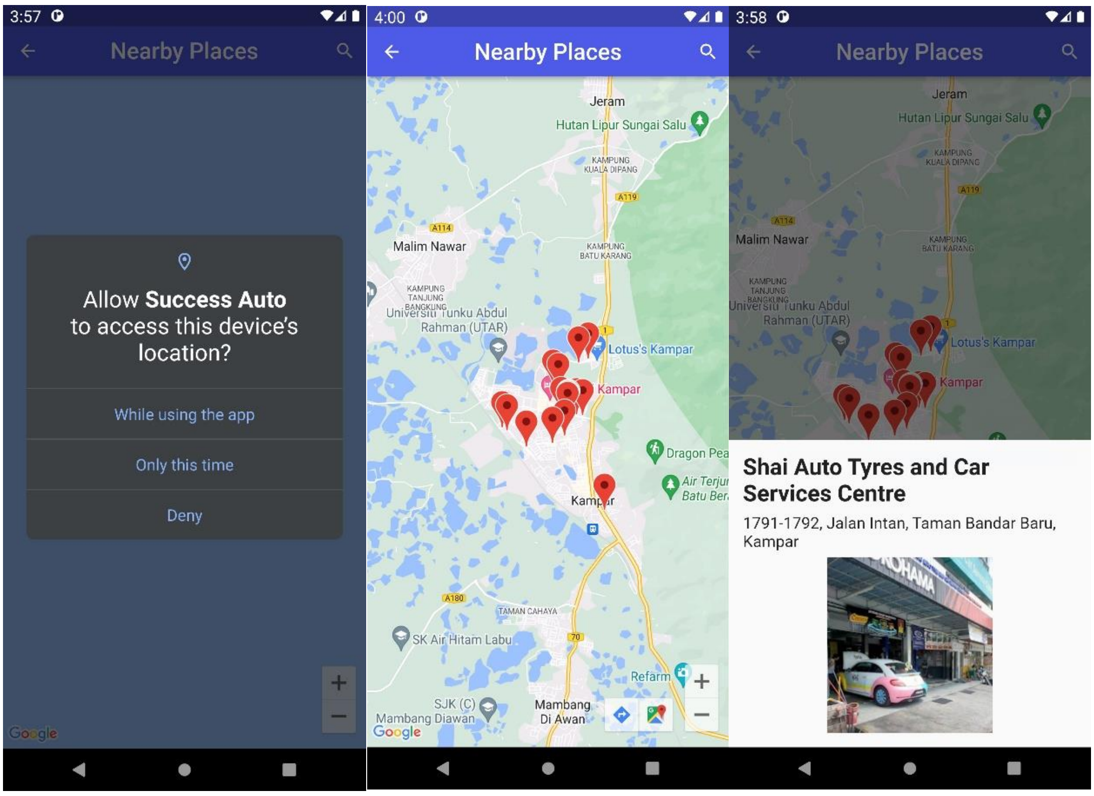
Repeat

Daily

Color ?

Figure 5.4.11: Update Maintenance Task Page Interface

This is updating maintenance task page which all the value for each fields are retrieved from previous record, user can edit the value accordingly to update the record. All the changes will reflect in application and store into Firebase Firestore.



Allow **Success Auto** to access this device's location?

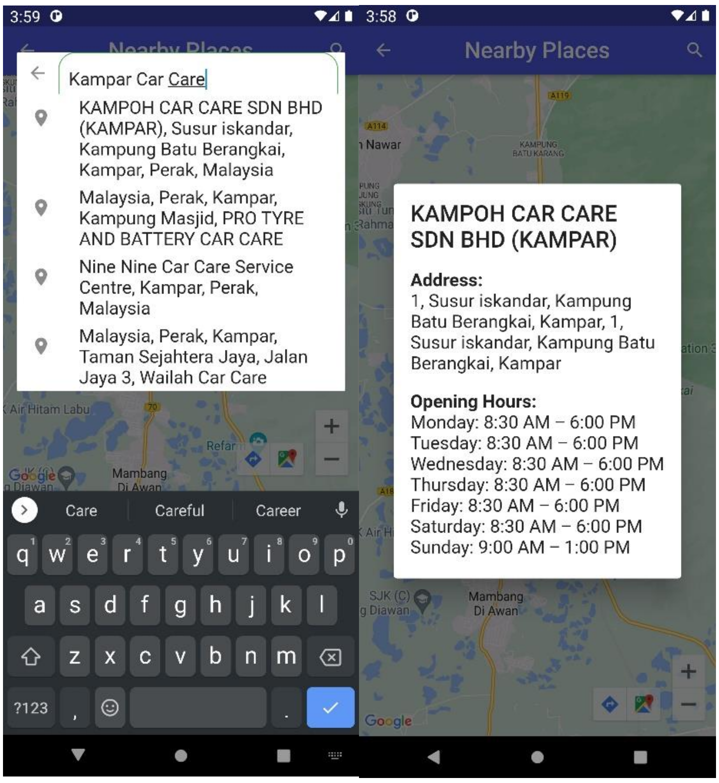
While using the app

Only this time

Deny

Shai Auto Tyres and Car Services Centre

1791-1792, Jalan Intan, Taman Bandar Baru, Kampar



Kampar Car Care

KAMPOH CAR CARE SDN BHD (KAMPAR), Susur iskandar, Kampung Batu Berangkai, Kampar, Perak, Malaysia

Malaysia, Perak, Kampar, Kampung Masjid, PRO TYRE AND BATTERY CAR CARE

Nine Nine Car Care Service Centre, Kampar, Perak, Malaysia

Malaysia, Perak, Kampar, Taman Sejahtera Jaya, Jalan Jaya 3, Wailah Car Care

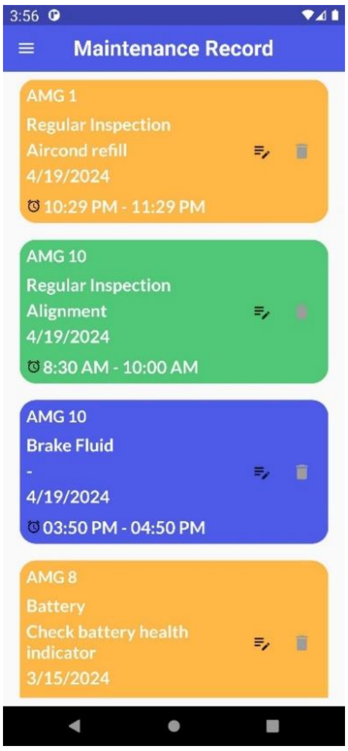
KAMPOH CAR CARE SDN BHD (KAMPAR)

Address:
1, Susur iskandar, Kampung Batu Berangkai, Kampar, 1, Susur iskandar, Kampung Batu Berangkai, Kampar

Opening Hours:
Monday: 8:30 AM – 6:00 PM
Tuesday: 8:30 AM – 6:00 PM
Wednesday: 8:30 AM – 6:00 PM
Thursday: 8:30 AM – 6:00 PM
Friday: 8:30 AM – 6:00 PM
Saturday: 8:30 AM – 6:00 PM
Sunday: 9:00 AM – 1:00 PM

Figure 5.4.12: Map Page Interface

This is map page interface which will displaying all the vehicle mechanic or repair shop that are nearby user current location. All the red mark can be tapped and the details such as shop name, address, image, and operation hours will be display on the screen. Besides, user are provided with search feature to search for their desired shop for repairing the vehicle or doing maintenance.



Maintenance Record

AMG 1
Regular Inspection
Aircond refill
4/19/2024
10:29 PM - 11:29 PM

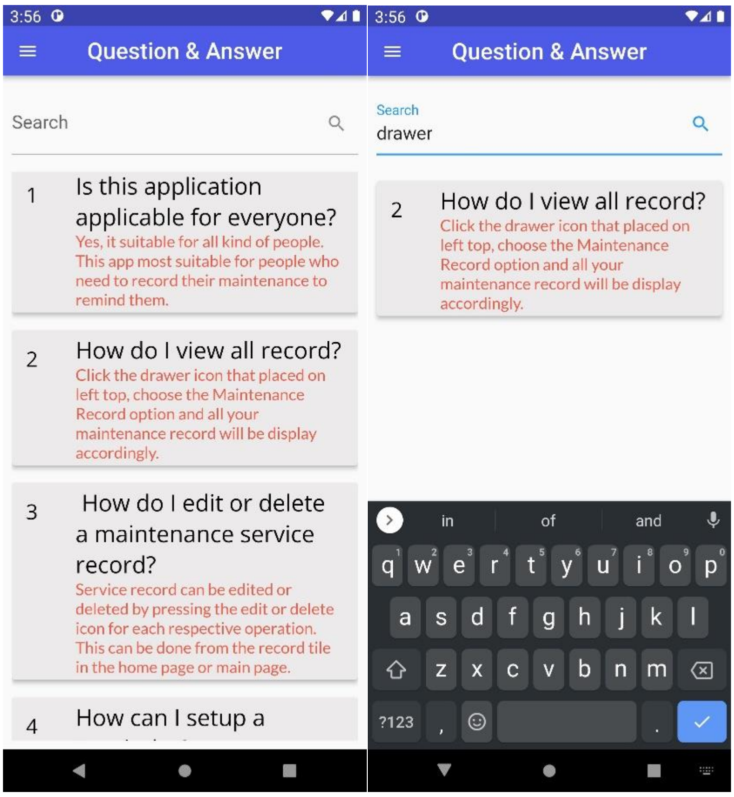
AMG 10
Regular Inspection
Alignment
4/19/2024
8:30 AM - 10:00 AM

AMG 10
Brake Fluid
-
4/19/2024
03:50 PM - 04:50 PM

AMG 8
Battery
Check battery health indicator
3/15/2024

Figure 5.4.13: Maintenance Task Page Interface

This is maintenance task page which enable user to retrieve all the recorded maintenance tasks that previously entered from the database whether the maintenance task in coming or passed.



3:56

Question & Answer

Search

1 Is this application applicable for everyone?
Yes, it suitable for all kind of people. This app most suitable for people who need to record their maintenance to remind them.

2 How do I view all record?
Click the drawer icon that placed on left top, choose the Maintenance Record option and all your maintenance record will be display accordingly.

3 How do I edit or delete a maintenance service record?
Service record can be edited or deleted by pressing the edit or delete icon for each respective operation. This can be done from the record tile in the home page or main page.

4 How can I setup a

3:56

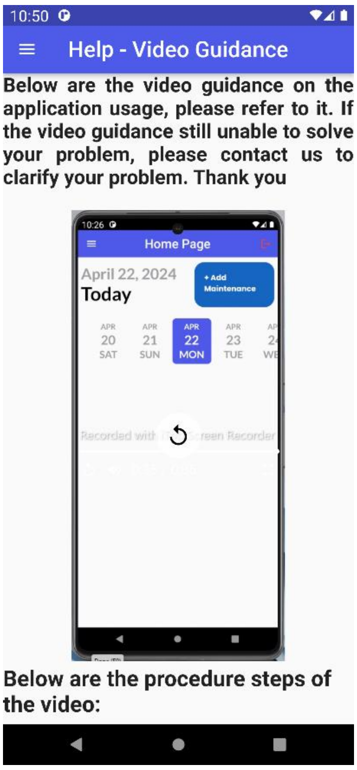
Question & Answer

Search
drawer

2 How do I view all record?
Click the drawer icon that placed on left top, choose the Maintenance Record option and all your maintenance record will be display accordingly.

Figure 5.4.14: Question and Answer Page Interface

This Question and Answer (Q&A) page which display and provide some solution or answer of for user to refer and solve it when encounter some difficulties on the application usage. Search feature is provided for user to search the question and answer based on the keyword and the system will return the relevant result.



10:50

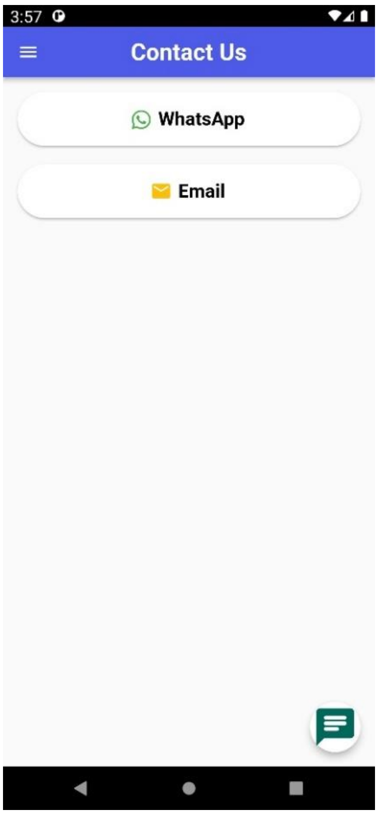
Help - Video Guidance

Below are the video guidance on the application usage, please refer to it. If the video guidance still unable to solve your problem, please contact us to clarify your problem. Thank you

Below are the procedure steps of the video:

Figure 5.4.15: Help – Video Guidance Page Interface

This is the help page that provide video guidance on the usage of the application and teach user step by step how to perform the functionality or features that provided in the application. Below the video is provided with the procedure steps in words so that user able to read it directly if necessary, instead of playing a tutorial video.

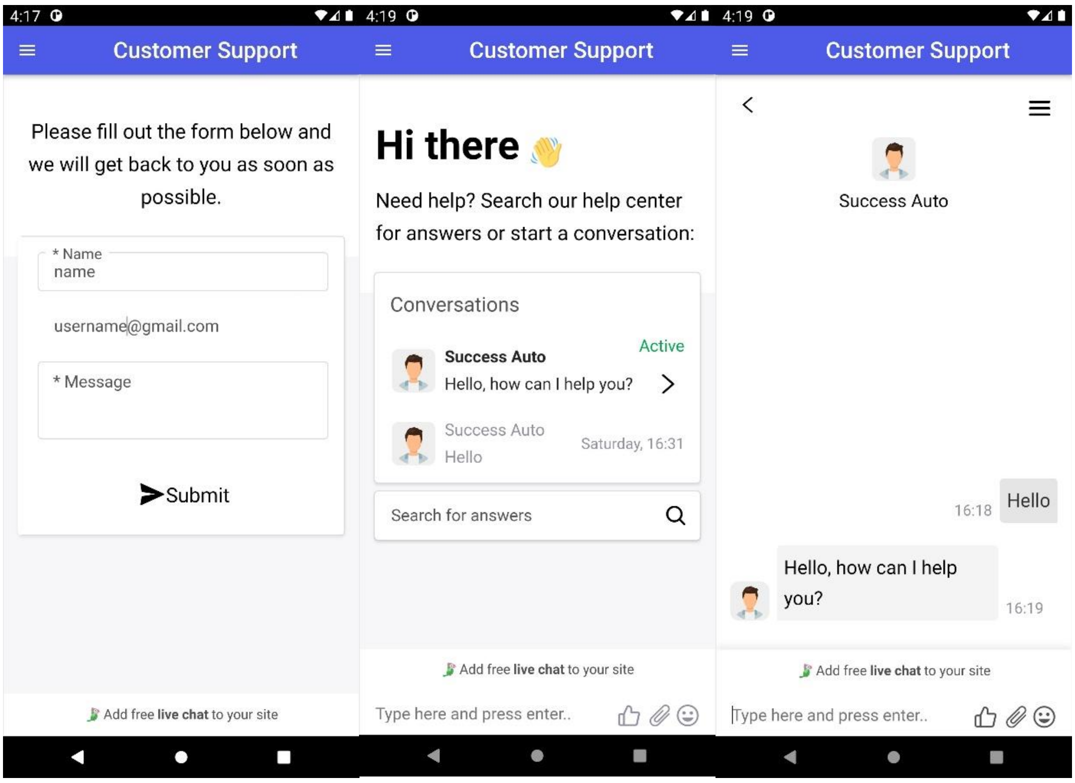


3:57

Contact Us

Figure 5.4.16: Contact Us Page Interface

This is contact us page which provide few alternative approach for user to get in touch with the support team to seek for help. The approach is including WhatsApp, email and live chat button that on the right bottom for user to contact and seek for help from the support team.



4:17

Customer Support

Please fill out the form below and we will get back to you as soon as possible.

* Name
name

username@gmail.com

* Message

Submit

Add free **live chat** to your site

4:19

Customer Support

Hi there

Need help? Search our help center for answers or start a conversation:

Conversations

Success Auto — Active
Hello, how can I help you?

Success Auto — Saturday, 16:31
Hello

Search for answers

Add free **live chat** to your site

Type here and press enter..

4:19

Customer Support

Success Auto

Hello 16:18

Hello, how can I help you? 16:19

Add free **live chat** to your site

Type here and press enter..

Figure 5.4.17 : Live Chat Customer Support Page

In live chat customer support page, it will display email drop off inbox first if the agent is offline or unavailable and they will get back reply when the support team available. User can track back the existing conversation history and content or start new conversation to seek for live assistance.

5.4 Concluding Remark

This chapter basically covered the procedures for software installation and configuration. Those application modules and features had been developed and implemented on the Android simulator device and the real device, as shown in the implementation part.

CHAPTER 6 SYSTEM TESTING AND EVALUATION

6.1 Introduction

This part will include each test case scenario for each module with expected input and results to evaluate the functionality of the overall application.

6.2 Unit Testing Matrices and Result (Unit Testing)

6.2.1 Authentication Module

Test ID	Test Case Description	Test Data	Expected Result	Actual Result	Pass / Fail
Sign Up					
1	Validating format email is entered during registration	Email: us2000@gmail.com (valid email) Password: us@123456 (valid password)	Registration should be successful	As expected	Pass
2	Validating account registered successfully	-	Send email verification link and	As expected	Pass
3	Check when invalid format email registered	Email: us2000 (invalid email)		As expected	Pass
Login and Forgot Password					
4	Check valid account with password login	Email: chenlong200219@1utar.my (valid & verified)	Show “Login Successfully” and Redirect to Home Page	As expected	Pass

		Password: 12345678			
5	Check when invalid email login	Email: chenlong2002191utar.my (valid & verified) Password: 12345678	Show error message and stay at login page	As expected	Pass
6	Check when wrong password entered when login	Email: chenlong200219@1utar.my (valid & verified) Password: 123456	Show error message and stay at login page	As expected	Pass
7	Check response when user tap forgot password	-	Redirect to forgot password page	As expected	Pass
8	Check response when user entered their valid email and press reset button	Email: chenlong200219@1utar.my	Send reset link to the email	As expected	Pass
9	Check response when pressing have account	-	Redirect back to login page	As expected	Pass
10	Check invalid email address entered during forgot password	Email: chenlong2002191utar.my	No response	As expected	Pass
11	Check response when account not verified email	Email: chenlong200219@1utar.my	Redirect to verification page	As expected	Pass

Table 6.2.1 Authentication Module Unit Testing

6.2.2 Profile Page Module

Test ID	Test Case Description	Test Data	Expected Result	Actual Result	Pass / Fail
Personal Profile					
1	Upload profile picture		Able to select new profile picture and upload it	As expected	Pass
2	Check response which user enter the new username	Username: Leong	Show successfully updated message	As expected	Pass
3	Check response when user enter the new password not same during confirmation to reset their password	New Password: 123456789 Confirm Password: 123456789	Successfully change the password	As expected	Pass
4	Check response when user enter the new password not same during confirmation to reset their password	New Password: 123456789 Confirm Password: 12345678	Show "Wrong Password" and unable to reset the password	As expected	Pass
5	Check respond when tap on delete account	-	Show confirmation dialog	As expected	Pass

Table 6.2.2 Profile Page Module Unit Testing

6.2.3 Theme Switching Module

Test ID	**Test Case Description**	**Test Data**	**Expected Result**	**Actual Result**	**Pass / Fail**
Theme Switching					
1	Check the response when clicking them toggle button	-	Light mode to Dark mode or Dark mode to Light mode	As expected	Pass

Table 6.2.3 Theme Switching Module Unit Testing

6.2.4 Vehicle Record Page Module

Test ID	**Test Case Description**	**Test Data**	**Expected Result**	**Actual Result**	**Pass / Fail**
Sign Up					
1	View vehicle details	-	Display the information in list form if available	As expected	Pass
2	Add vehicle details	Plate Number: ABC 1 Brand: Toyota Model: Camry Year: 2023 Mileage: 26000	Save and successfully inserted into Firebase Firestore	As expected	Pass

3	Update vehicle details	Plate Number: ABC 2 Brand: Toyota Model: Altis Year: 2023 Mileage: 26060	Save and successfully updated specific fields in Firebase Firestore	As expected	Pass
4	Delete vehicle list	-	Successfully delete data from Firebase Firestore	As expected	Pass

Table 6.2.4 Vehicle Record Page Module Unit Testing

6.2.5 Maintenance Record Page Module

Test ID	Test Case Description	Test Data	Expected Result	Actual Result	Pass / Fail
Viewing and Inserting Maintenance Record					
1	View maintenance record	-	Display the information in list form if available	As expected	Pass
2	Add maintenance record without empty column	Number Plate: ABC 1 Maintenance Task: Regular Inspections Task Remark: - Date: current date	Save and successfully inserted into Firebase Firestore	As expected	Pass

		Start time: 12.30 PM End Time: 1.30 PM Repeat: None Colour: Green			
3	Add maintenance record with empty column	Number Plate: ABC 1 Maintenance Task: Regular Inspections Task Remark: Date: current date Start time: 12.30 PM End Time: 1.30 PM Repeat: None Colour: Green	Show message “all fields are required ” and unable to save		
3	Update maintenance record	Number Plate: ABC 2 Maintenance Task: Battery Task Remark: Date: current date Start time: 12.30 PM End Time: 1.30 PM Repeat: None	Save and successfully updated specific fields in Firebase Firestore	As expected	Pass

		Colour: Green			
4	Delete maintenance record	-	Successfully delete data from Firebase Firestore	As expected	Pass
Maintenance Task Reminder Scheduling					
5	Setup present or future of date and time	Date: current date Start time: 12.30 PM End Time: 1.30 PM	Successfully display notification message	As expected	Pass
6	Setup with past date and time	Date: 31/3/2023 Start time: 12.30 PM End Time: 1.30 PM	No response	As expected	Pass

Table 6.2.5 Maintenance Record Page Module Unit Testing

6.2.6 Map Page Module

Test ID	Test Case Description	Test Data	Expected Result	Actual Result	Pass / Fail
Map Near By Location					
1	Get current map location	-	Successfully obtain the location	As expected	Pass

2	Check the response of getting nearest machinic shop	-	Display marker of the available shop result	As expected	Pass
3	Check response when user tap on the marker	-	Display the details such as shop name, address, image and operating hours if available	As expected	Pass
Places Searching					
4	Enter the address or shop name	Shop Name: Kampar	Get the shop details	As expected	Pass

Table 6.2.6 Map Page Module Unit Testing

6.2.7 Question and Answer Page Module

Test ID	**Test Case Description**	**Test Data**	**Expected Result**	**Actual Result**	**Pass / Fail**
Question and Answer					
1	View the question with answer details	-	Successfully display the question with answer details	As expected	Pass

2	Search keyword that contain in question or answer range	Keyword: applicable	Successfully get the question or answer details that contain the keyword	As expected	Pass
3	Search keyword that outside range of question or answer	Keyword: repair	Show empty result	As expected	Pass

Table 6.2.7 Question and Answer Page Module Unit Testing

6.2.8 Help Page Module

Test ID	**Test Case Description**	**Test Data**	**Expected Result**	**Actual Result**	**Pass / Fail**
Help Page					
1	View the steps, procedure description and video in using the application	-	Successfully display all the info and video	As expected	Pass
2	Video action	-	Mute, Pause, Start and entering full screen mode	As expected	Pass

Table 6.2.8 Help Page Module Unit Testing

6.2.9 Contact Us Page Module

Test ID	Test Case Description	Test Data	Expected Result	Actual Result	Pass / Fail
Contact Us					
1	Click on WhatsApp button	-	Redirect to WhatsApp application with customer support profile	As expected	Pass
2	Click on Email button	-	Redirect to Email application with customer support email	As expected	Pass
3	Click on Live Chat button	-	Redirect to Live Chat Page	As expected	Pass

Table 6.2.9 Contact Us Page Module Unit Testing

6.2.10 Live Chat Page Module

Test ID	Test Case Description	Test Data	Expected Result	Actual Result	Pass / Fail
Contact Us					
User					
1	Drop message to customer support	-	Support staff able to receive the message well	As expected	Pass

2	Check whether user can see reply from the customer support	-	Successfully display the response	As expected	Pass
Customer Support					
3	Check message that sent by customer	-	Able to see the message that sent by user	As expected	Pass
4	Reply to customer enquiries	-	Successfully reply and response to user	As expected	Pass

Table 6.2.10 Live Chat Page Module Unit Testing

6.3 Project Challenges

Application dependencies and device compatibility will be the most important issues to be aware of and deal with during development. The dependencies package version will be periodically updated throughout the development process to meet user requirements and ensure safety. As a result, the supported device may crash, in which case the developer will need to reconfigure the setup and add the necessary permissions to resolve any glitches or bugs.

6.4 Concluding Remark

Every module included in the application is able to function and operate according to plan. Unit testing has been utilized for testing all components and the function flow of the application, which can be deployed or distributed for user use.

Chapter 7: Conclusion and Recommendation

7.1 Conclusion

Automobile repairs and sending vehicles for servicing are common occurrences, users who are oblivious of services might realize that they ought to utilize the Vehicle Maintenance and Mileage Tracker App to log the maintenance task on their own smartphone. Nevertheless, the majority of apps that are on the market have unintuitive interfaces that make it difficult for users to set up reminder notifications for upcoming maintenance. The most concerning problem is that there aren't enough efficient channels of communication for users to seek justification on any issues they're encountering using the applications. During peak hours, users may have to wait a moment for a response from customer service, or customer service may unintentionally ignore their help requests via email or an incoming calls.

The Vehicle Maintenance and Mileage Tracker App aims to address those issues by providing a user-friendly platform for tracking and recording the maintenance record. With the help of this application, users may add maintenance tasks with selected the car number plate already inserted and schedule the notification service. To guarantee that the information and notification period are accurate, users can periodically update their maintenance details and plan appropriately. The user is also given access to map features, which include a detailed list of auto repair and mechanic shops that are nearby to their current location. Last but not least, this app has live chat capabilities that enable users communicate to customer service representatives for assistance through issues related to usage.

7.2 Recommendation

It is suggested additional functions be added to the Vehicle Maintenance and Mileage Tracker App in order to boost the user experience. For instance, in order to make the application more dynamic and reduce its size, developers could consider about shifting some of the user interface's content to real-time. To expand the variety of application usage, developers may additionally include other role assertions, such as mechanic, seller, or distributor of automotive replacement parts. For example, the vehicle's part-seller role can include the function of promoting the product and services to other users. In another manner, the approach that is advantageous to both parties through the integration of an e-commerce idea with the digitalization of the physical store operation.

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APPENDIX

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	**Study week no.: 2**
Student Name & ID: LEONG CHEN LONG & 20ACB03366	
Supervisor: Cik Ana Nabilah Binti Sa'uadi	
Project Title: Vehicle Maintenance and Mileage Tracker App	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Preparing the questions and enquiry regarding demonstration of the application system the recommendation improvement of system.

2. WORK TO BE DONE

Fixing the existing bug or function that malfunction or incomplete (notification). Adding vehicle function that used for providing option of number plate to user during adding maintenance task.

3. PROBLEMS ENCOUNTERED

Notification malfunction after setting up regardless of testing with android simulator device or real devices after configuring the code setting.

4. SELF EVALUATION OF THE PROGRESS

Progress as expected and need do more research study to fix the malfunction.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	**Study week no.: 4**
Student Name & ID: LEONG CHEN LONG & 20ACB03366	
Supervisor: Cik Ana Nabilah Binti Sa'uadi	
Project Title: Vehicle Maintenance and Mileage Tracker App	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Successfully solving the notification issues and it will pop out the notification details after user selecting the time and successfully adding the maintenance task. Have added vehicle page and provide number plate option that added by user early to use in adding maintenance task.

2. WORK TO BE DONE

Including the report additional features. Switching the theme switching design from column to switch mode.

3. PROBLEMS ENCOUNTERED

The theme switching interface has changes and the function is working but the switch value (left to switch) when tap is stored after refreshing or leaving the app.

4. SELF EVALUATION OF THE PROGRESS

Keep on finding the part that trigger this issue and solve it promptly.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	**Study week no.: 6**
Student Name & ID: LEONG CHEN LONG & 20ACB03366	
Supervisor: Cik Ana Nabilah Binti Sa'uadi	
Project Title: Vehicle Maintenance and Mileage Tracker App	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Storing theme switching value consistently solved. Had included the report features in maintenance task page.

2. WORK TO BE DONE

Adding chatbot features
Adding search features for the existing Q&A page
Recommended to add map features that recommend nearby mechanic or repair shop.

3. PROBLEMS ENCOUNTERED

Chatbot features has added but the auto capture keyword and reply is limited, and user might need to select other communication channel to communicate with customer support.

4. SELF EVALUATION OF THE PROGRESS

Need to find more reference and familiar with how chatbot or messaging application is working. Have to find alternative solution if can't solve thoroughly. Keep on working on other recommendation and suggestion features.

Supervisor's signature

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3S3	**Study week no.: 10**
Student Name & ID: LEONG CHEN LONG & 20ACB03366	
Supervisor: Cik Ana Nabilah Binti Sa'uadi	
Project Title: Vehicle Maintenance and Mileage Tracker App	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Replacing the existing limited chatbot features into real-time live chat. Successfully adding the map features that grant user's current location and display available mechanic and repair shops and place search feature in the page. Search feature has added into Q&A page.

2. WORK TO BE DONE

Focus on report content and adding those new part and refine if necessary.

3. PROBLEMS ENCOUNTERED

No problem is encountered.

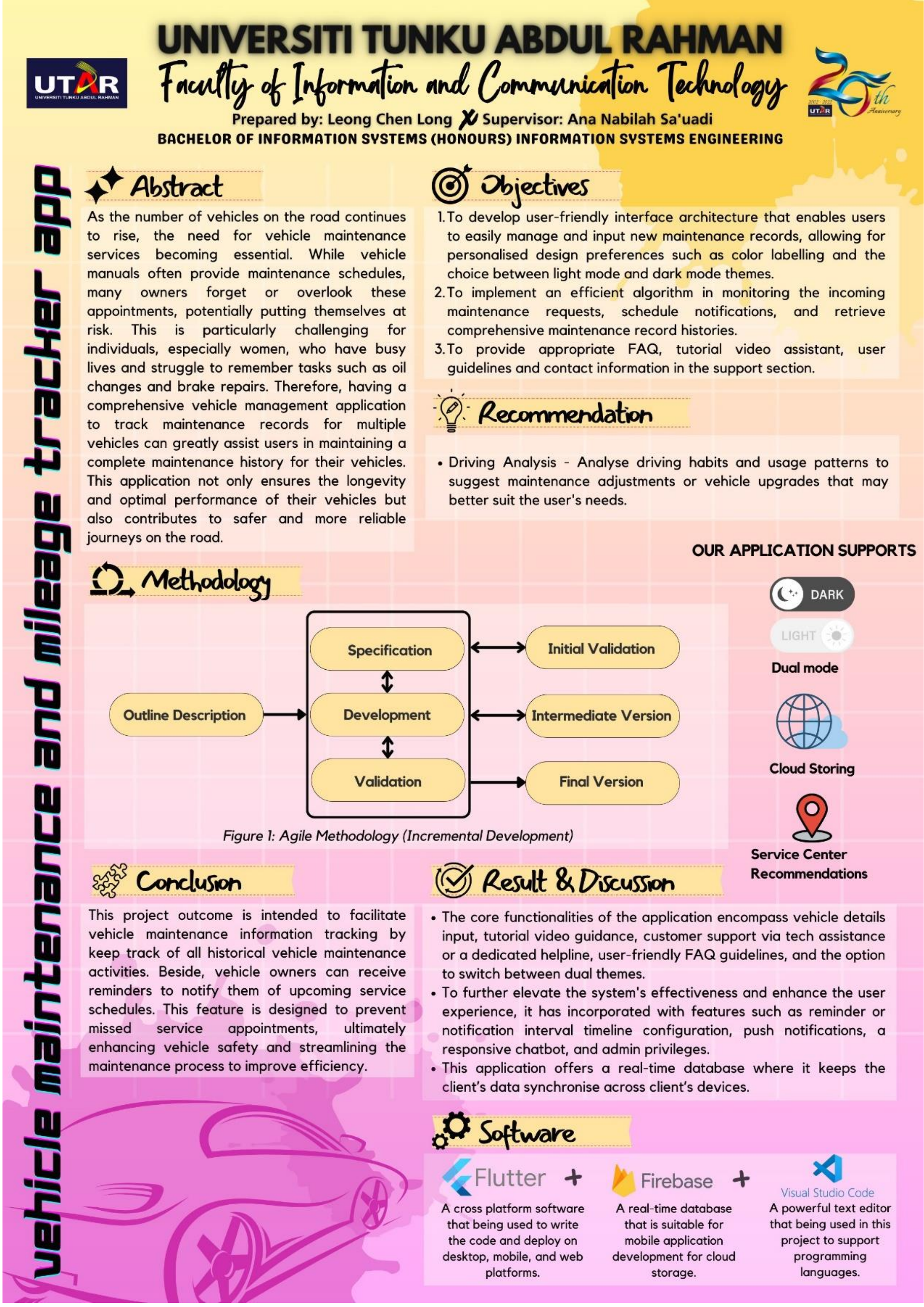
4. SELF EVALUATION OF THE PROGRESS

Can complete it on time.

Supervisor's signature

Student's signature

A.2 Poster



UNIVERSITI TUNKU ABDUL RAHMAN

Faculty of Information and Communication Technology

Prepared by: Leong Chen Long X Supervisor: Ana Nabilah Sa'uadi

BACHELOR OF INFORMATION SYSTEMS (HONOURS) INFORMATION SYSTEMS ENGINEERING

vehicle maintenance and mileage tracker app

Abstract

As the number of vehicles on the road continues to rise, the need for vehicle maintenance services becoming essential. While vehicle manuals often provide maintenance schedules, many owners forget or overlook these appointments, potentially putting themselves at risk. This is particularly challenging for individuals, especially women, who have busy lives and struggle to remember tasks such as oil changes and brake repairs. Therefore, having a comprehensive vehicle management application to track maintenance records for multiple vehicles can greatly assist users in maintaining a complete maintenance history for their vehicles. This application not only ensures the longevity and optimal performance of their vehicles but also contributes to safer and more reliable journeys on the road.

Objectives

1. To develop user-friendly interface architecture that enables users to easily manage and input new maintenance records, allowing for personalised design preferences such as color labelling and the choice between light mode and dark mode themes.
2. To implement an efficient algorithm in monitoring the incoming maintenance requests, schedule notifications, and retrieve comprehensive maintenance record histories.
3. To provide appropriate FAQ, tutorial video assistant, user guidelines and contact information in the support section.

Recommendation

- Driving Analysis - Analyse driving habits and usage patterns to suggest maintenance adjustments or vehicle upgrades that may better suit the user's needs.

OUR APPLICATION SUPPORTS

DARK

LIGHT

Dual mode

Cloud Storing

Service Center Recommendations

Methodology

Outline Description

Specification

Development

Validation

Initial Validation

Intermediate Version

Final Version

Figure 1: Agile Methodology (Incremental Development)

Conclusion

This project outcome is intended to facilitate vehicle maintenance information tracking by keep track of all historical vehicle maintenance activities. Beside, vehicle owners can receive reminders to notify them of upcoming service schedules. This feature is designed to prevent missed service appointments, ultimately enhancing vehicle safety and streamlining the maintenance process to improve efficiency.

Result & Discussion

- The core functionalities of the application encompass vehicle details input, tutorial video guidance, customer support via tech assistance or a dedicated helpline, user-friendly FAQ guidelines, and the option to switch between dual themes.
- To further elevate the system's effectiveness and enhance the user experience, it has incorporated with features such as reminder or notification interval timeline configuration, push notifications, a responsive chatbot, and admin privileges.
- This application offers a real-time database where it keeps the client's data synchronise across client's devices.

Software

Flutter +

A cross platform software that being used to write the code and deploy on desktop, mobile, and web platforms.

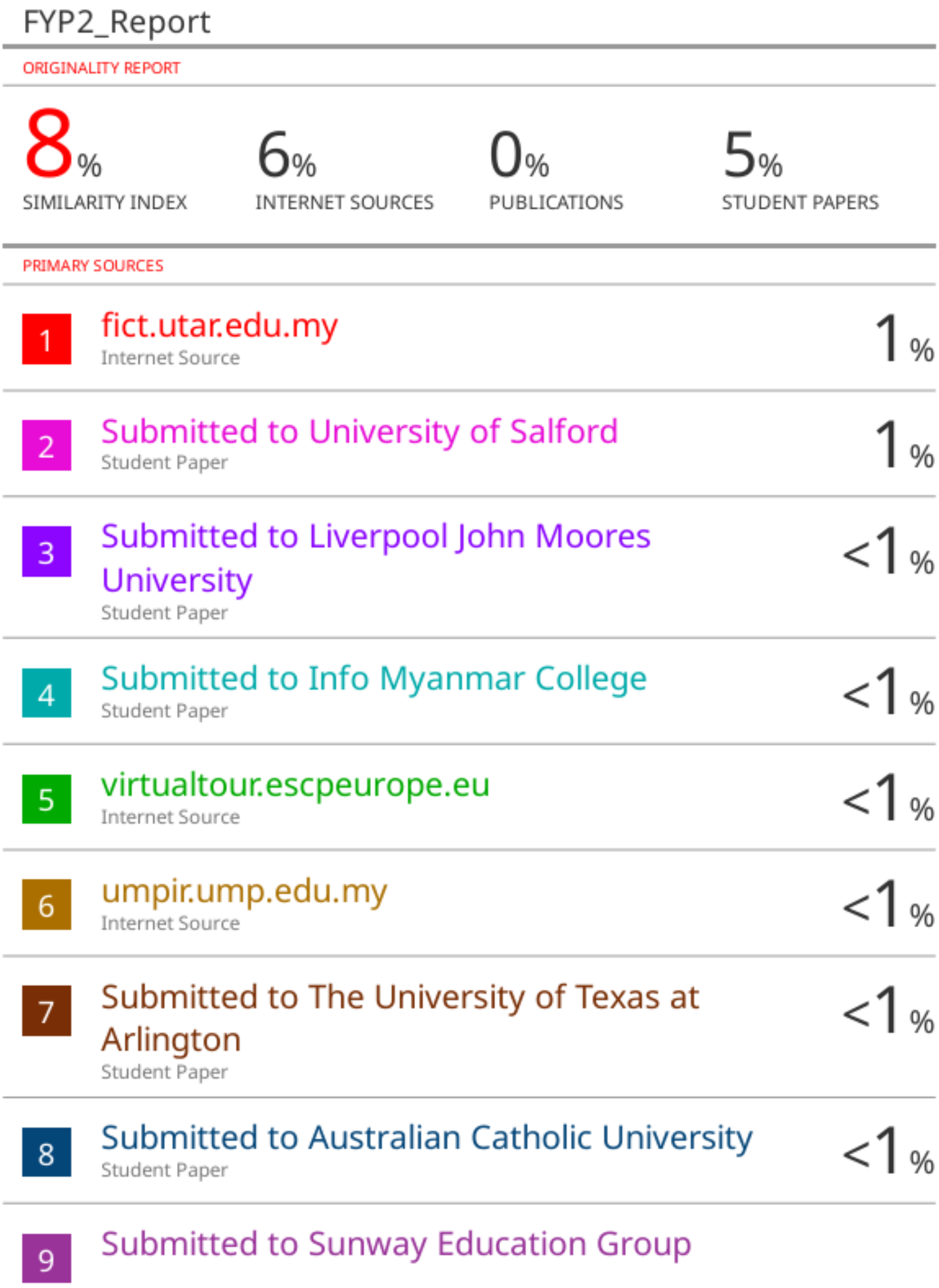
Firebase +

A real-time database that is suitable for mobile application development for cloud storage.

Visual Studio Code

A powerful text editor that being used in this project to support programming languages.

PLAGIARISM CHECK RESULT



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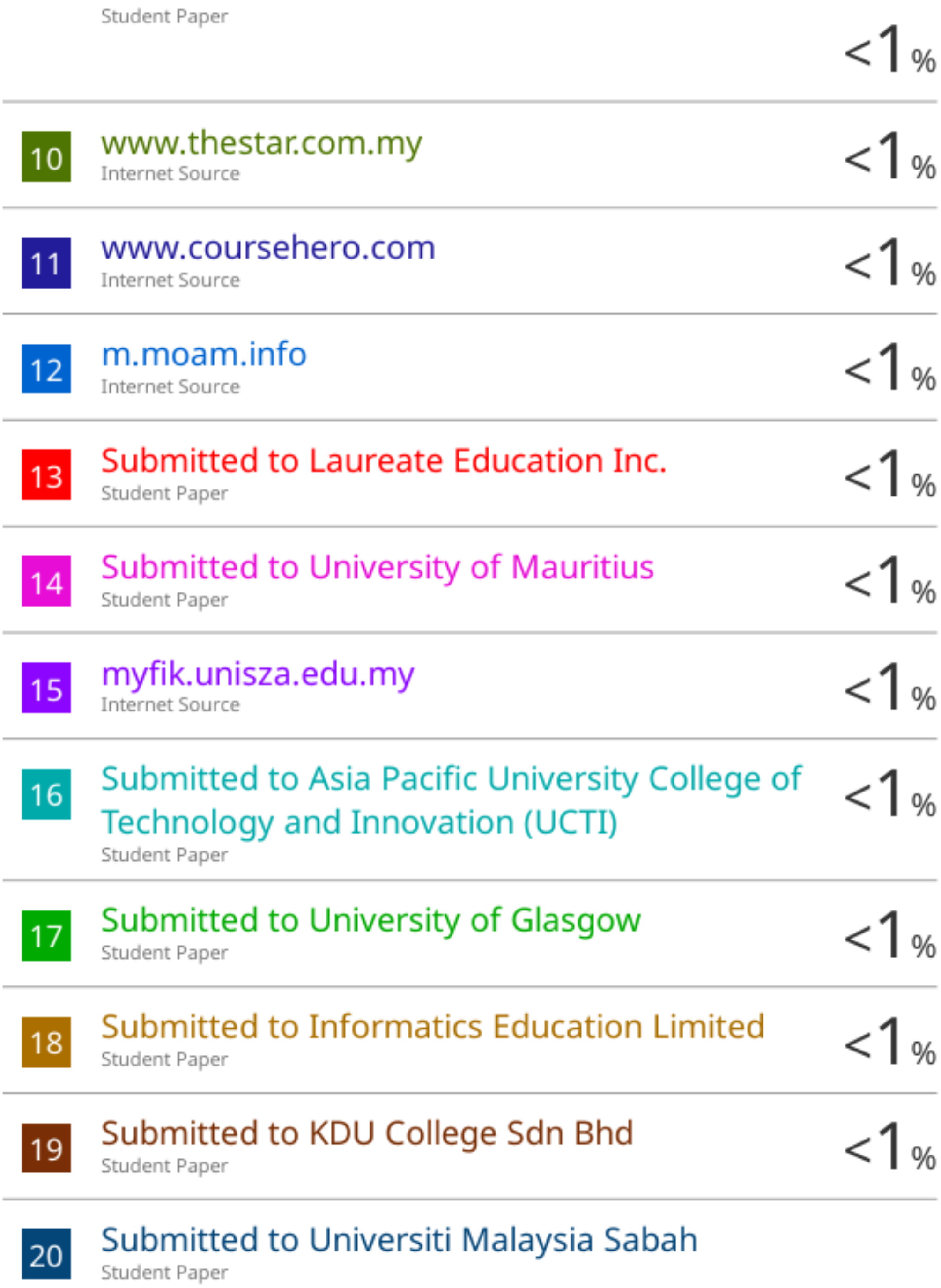

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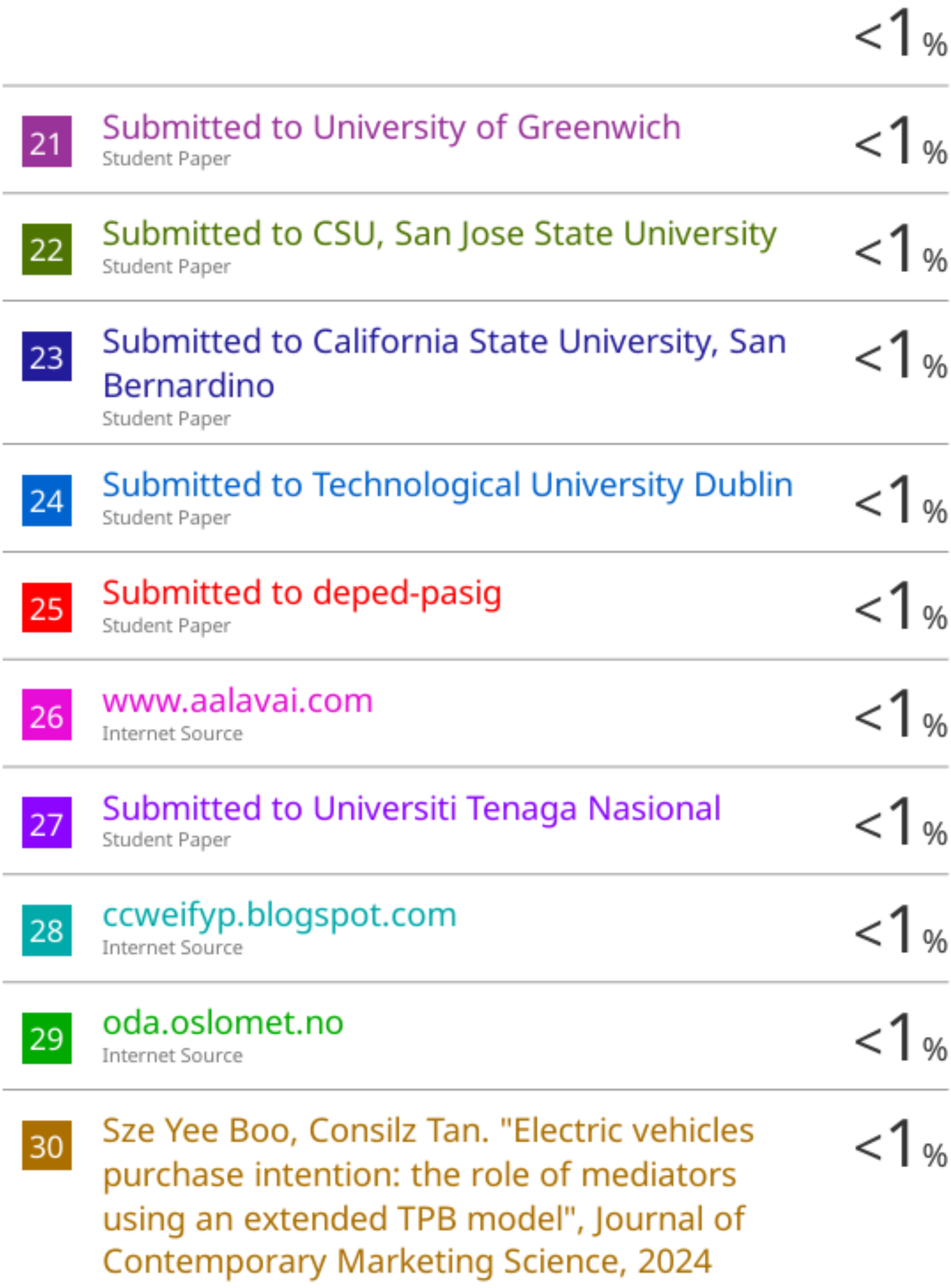

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Programme / Course	IA
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Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Signature of Supervisor

Name: Ana Nabilah Binti Sa’uadi

Date: 26/04/2024

Signature of Co-Supervisor

Name: ____________________

Date: ____________________

FYP 2 CHECKLIST

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FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

CHECKLIST FOR FYP2 THESIS SUBMISSION

Student ID	20ACB03366
Student Name	LEONG CHEN LONG
Supervisor Name	Cik Ana Nabilah Binti Sa'uadi

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