UTM

UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

SECD2613-03

SYSTEM ANALYSIS AND DESIGN

PROJECT PHASE 3 – ANALYSIS AND DESIGN

Lecturer Name:

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1.0 Overview of the Project

In this project, we aim to enhance the current e-Hailing system to address its existing issues and improve user experience. E-hailing services allow users to book transportation via electronic applications, facilitating easy travel for students, workers, and the general public. Despite the convenience, the current systems have problems related to complexity, data security, and efficiency. Our goal is to enhance the current e-Hailing system to a user-friendly, secure, and efficient e-Hailing system that caters to a broad range of users, including older generations and to those who are less familiar with the current modernized technology.

While identifying the problem statement and feasibility studies along with the project objectives and scopes, we need to identify the users' feedbacks on the current issues of e-Hailing system in order for us to develop a more smoother and more user-friendly of the e-Hailing system, to ensure the system is applicable to everyone involved in booking public transportation online. Then, we need to arrive at a conclusion on the users' feedback and proceed with the project objectives.

2.0 Problem Statement

Based on our analysis of the current e-hailing systems, we have identified three main problems:

- Price and affordability:

  During peak hours or high-demand situations, e-hailing services often give high and unpredictable prices, making it not affordable at all to most users. This condition will also affect the accessibility and reliability of the e-hailing services

- Safety concerns:

  Whether driver or customer, e-hailing services face significant challenges regarding the safety aspect. Incidents of harassment, assault, and theft have been reported, causing an untrusted environment among people in the e-hailing community

- Inefficiency in Handling High User Traffic:

  The systems struggle with delays and inefficiencies, particularly during peak times. This leads to frustration among users who need timely transportation.

3.0 Proposed Solutions

To tackle these identified problems, we proposed the following solutions based on three aspects:

Price and affordability:

1. Implement a Cap on Surge Pricing

Introduce a maximum limit on how high surge prices can go during peak times. This cap can prevent exorbitant fare increases while still allowing for some flexibility to incentivize drivers.

2-Driver Incentives During Peak Times

Offer additional incentives to drivers during peak hours without passing the extra cost directly to passengers. Ex: give bonus for completing a certain number of rides during high-demand periods

Safety concerns:

1- Anonymous Reporting System

Create an anonymous reporting system within the app that allows users to report safety concerns without revealing their identity, encouraging more users to report issues without fear of repercussions.

2- In-App Emergency Button

Integrate an emergency button within the app that allows passengers and drivers to immediately notify local authorities or e-hailing service security teams in case of an emergency.

Inefficiency in Handling High User Traffic:

1- Real-Time Data Processing

Use real-time data processing technologies to ensure that user requests and driver availability are updated instantly, reducing delays.

2- Cloud-Based Infrastructure

Implement a cloud-based system to handle high volumes of data and user requests efficiently.

3- AI and Machine Learning

Utilize AI for demand forecasting and optimal driver allocation to improve response times and service reliability.

By addressing these key issues, the e-Hailing system will offer a more accessible, secure, and efficient service, enhancing overall user satisfaction.

4.0 Current Business Process/Workflow

4.1 Current Business Process

Here are the scenarios and workflow of the current system process for the **users**.

1) Login to the System
2) Main Menu Options
   The main menu displays options "Book a Ride", "Ride History", "Profile", "Settings", and "Help."

3) Book a Ride
   a) Enter Pickup and Drop-off Locations
      Users will decide their locations for pickup and drop-off.
   b) Select Ride Type
      Users choose the preferred ride type based on fare and vehicle availability that are able to tackle their urgent needs.
   c) Confirm Booking
      Users confirm the booking, and the system searches for available drivers. Estimated time of arrival (ETA) for the driver is displayed.
   d) Track Ride
      Users can track the driver's location in real-time on a map.

4) Ride History
   a) View Past Rides
      Users can view details of their past rides like date, time, fare, driver information, and route taken.

5) Settings
   a) Notification Preferences
      Manage notification settings for ride updates, promotions, and account alerts.
   b) Security Settings
      Update password and enable two-factor authentication.
   c) Privacy Settings
      Review and manage data sharing preferences and permissions.

6) Help
   a) FAQs and Support
      Access FAQs, contact support via chat or email, and report issues or provide feedback.

Here are the scenarios and workflow of the current system process for the **driver**.

1) Login to the System
   Drivers open the e-Hailing app.

2) Main Menu Options
   The main menu displays options such as "Availability", "Ride History", "Profile", "Earnings", "Settings", and "Help."

3) Availability
   a) View Ride Requests
      Drivers will see available ride requests such as pickup and drop-off locations.
   b) Accept Ride
      Drivers accept a ride request, and the system provides navigation to the pickup location.
   c) Start Ride
      Upon reaching the pickup location, drivers start the ride after confirming the passenger's identity.
   d) Complete Ride
      Drivers navigate to the drop-off location and complete the ride.

4) Ride History
   a) View Past Rides
      Drivers can view details of past rides, including date, time, fare, and passenger feedback.

5) Profile
   a) View and Edit Profile
      Drivers can view and edit personal information, vehicle details, and documents.
   b) Availability Hours
      Drivers can set up their preferred availability hours to the users or their journey of pickup and drop-off.

6) Earnings
   a) Earnings Breakdown
      Detailed breakdown of earnings, including daily, weekly, and monthly summaries.
   b) Payment Settings
      Manage payment methods and review payout schedules.

7) Settings
    a) Notification Preferences
    Manage notification settings for ride requests, system updates, and account alerts.
    b) Security Settings
    Update password and enable two-factor authentication.

8) Help
    a) FAQs and Support
    Access FAQs, contact support via chat or email, and report issues or provide feedback.

4.2 Functional Requirement (Input, Process, and Output)

4.2.1 Context Diagram

PROCESS	INPUT	OUTPUT
Current E-Hailing System	• Customer Order • Customer Data • Payment • Driver Info	• Booking Report • Customer Information • Payment Receipt • Driver Assignment

4.2.2 Diagram 0

PROCESS	INPUT	OUTPUT
Booking Online	• Customer Order • Customer Data	• Booking Information • Customer Data
Making Payment	• Payment • Customer Data • Booking Information	• Payment Receipt • Customer Details
Allocating Driver	• Customer Information • Driver Info	• Driver Info • Customer Information
Driving	• Driver Info	• Driver Assignment
Making Report	• Booking Information • Customer Information • Driver Info	• Booking Report

4.2.3 Child Diagrams

4.2.3.1 Child Diagram for Process 1: Booking Online

PROCESS	INPUT	OUTPUT
Entering Drop-off Location	• Customer Order • Canceled Order	• Customer Order
Entering Pick-up Location	• Customer Order	• Customer Order
Confirming Booking Order	• Customer Order • Customer Data	• Unconfirmed Order • Confirmed Order • Customer Data
Canceling Order	• Unconfirmed Order	• Canceled Order

4.2.3.2 Child Diagram for Process 3: Allocating Driver

PROCESS	INPUT	OUTPUT
Finding Driver Vacancies	• Customer Information • No Assigned Drivers	• Customer Information • Available Driver Vacancies • No Driver Vacancies
Finding Assigned Drivers	• No Driver Vacancies	• Available Assigned Drivers • No Assigned Drivers
Waiting Driver Sequentially	• Available Assigned Drivers	• Driver finished
Assigning Driver	• Customer Information • Available Driver Vacancies • Driver finished • Driver Info	• Driver Info • Customer Information

4.3 Non-functional requirement

4.3.1 Security

- The E-hailing system should employ multi-factor authentication (MFA) for user accounts, especially for administrators and drivers.
- Regular security audits and vulnerability assessments must be conducted every month to ensure data integrity online.

4.3.2 Performance

- The E-hailing system should be able to handle thousands of ride requests per second to ensure smooth operation during peak hours.
- Average response time for user requests should be less than 2 seconds. This will minimize the delays during peak hours whenever users are in urgency.

4.3.3 Scalability

- The E-hailing system must be able to scale horizontally to accommodate increased load without significant degradation in performance.
- The system should support scaling up to 100 000 simultaneous users to ensure everyone can apply for public transportation online easier.

4.3.4 Accessibility

- The E-hailing system must comply with accessibility standards such as WCAG 2.1 to ensure it is usable by people with disabilities.
- Features such as voice commands, screen readers, and adjustable text sizes should be supported as well.

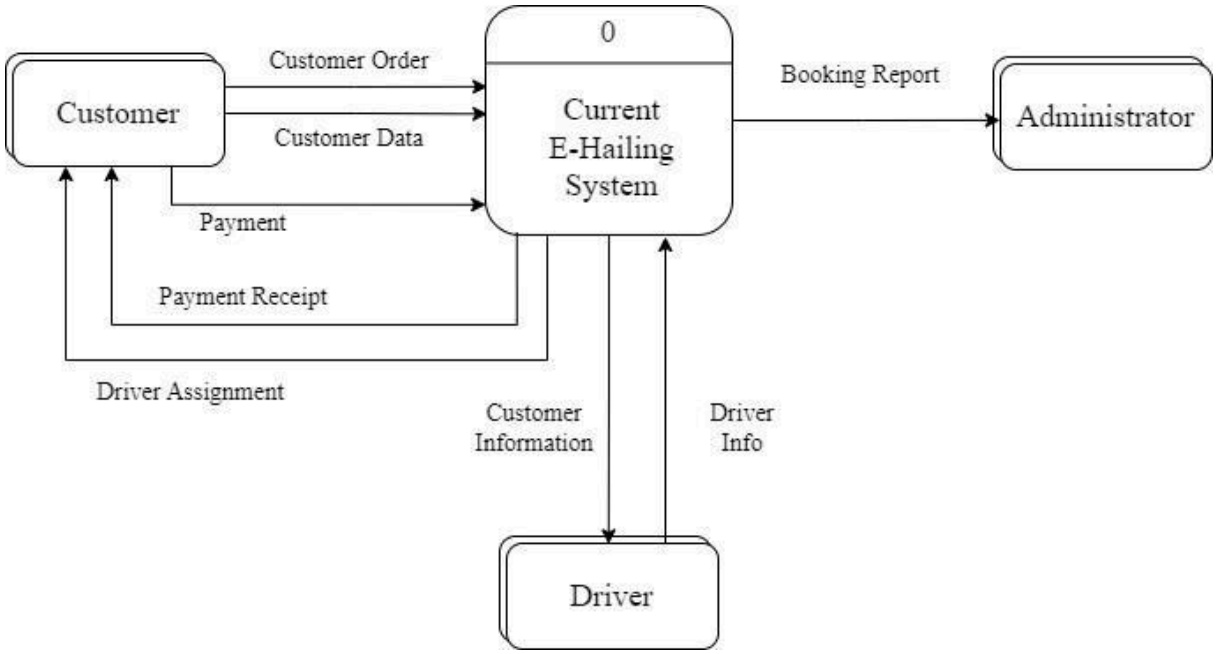
4.3.5 Resilience

- The E-hailing system must be able to recover from failures periodically.
- Disaster recovery plans should be in place, with data recovery tests conducted periodically.

5.0 Logical DFD (AS-IS)

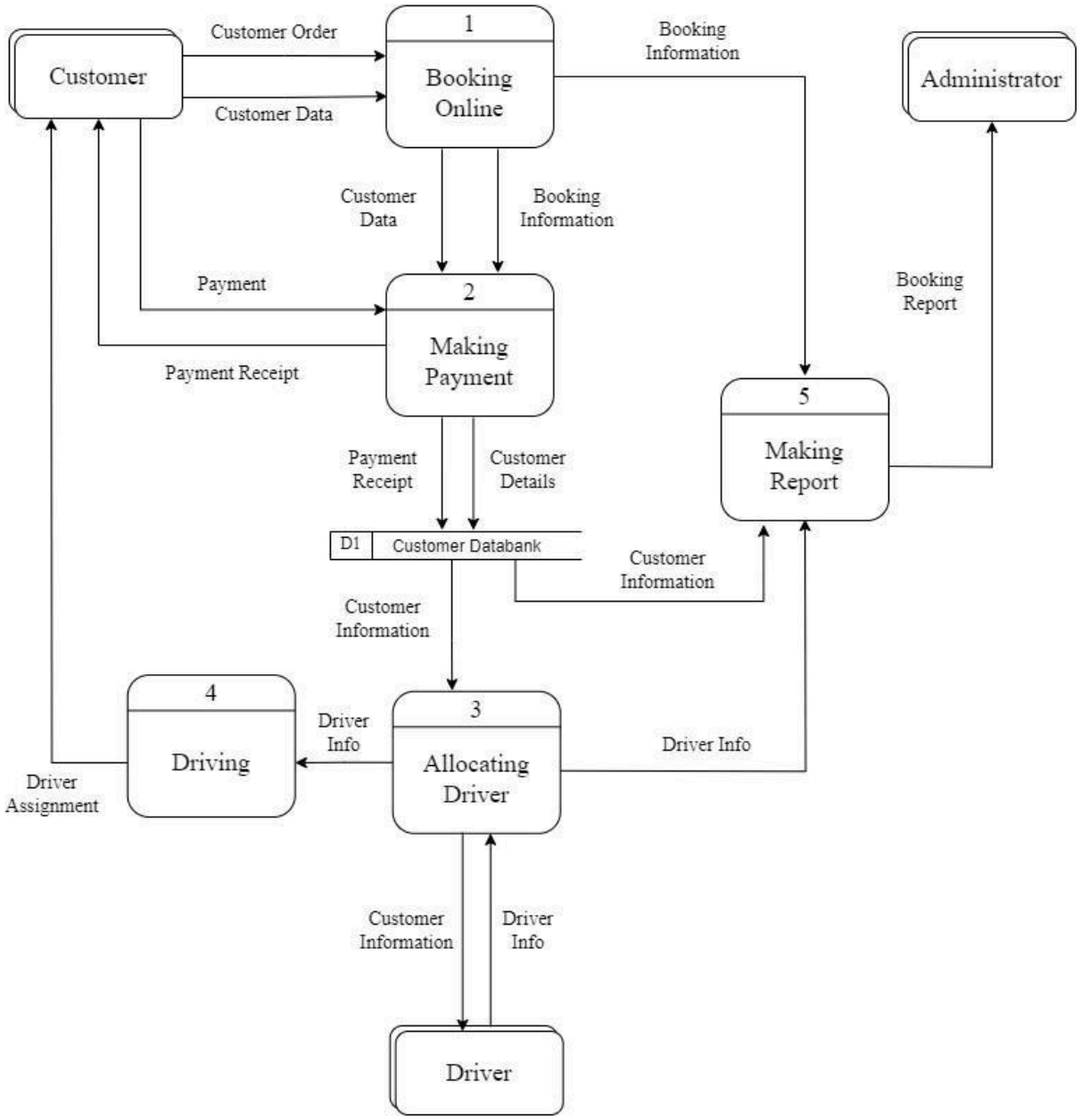
Logical Data Flow Diagram (DFD) for the current e-Hailing system.

5.0 Context Diagram



Logical Context Diagram for the current E-Hailing system

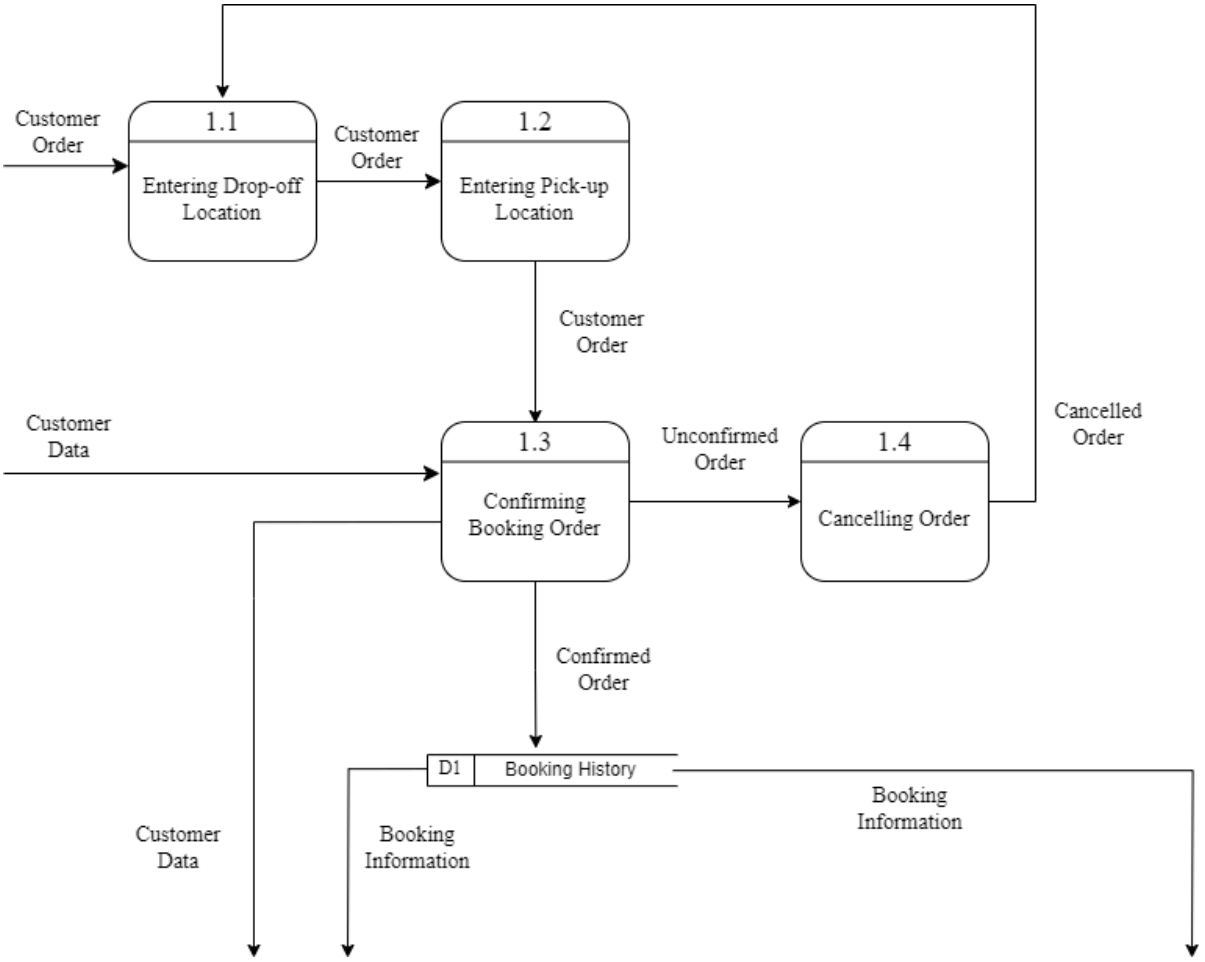
5.1 Diagram 0



Logical Diagram 0 for the current E-Hailing system

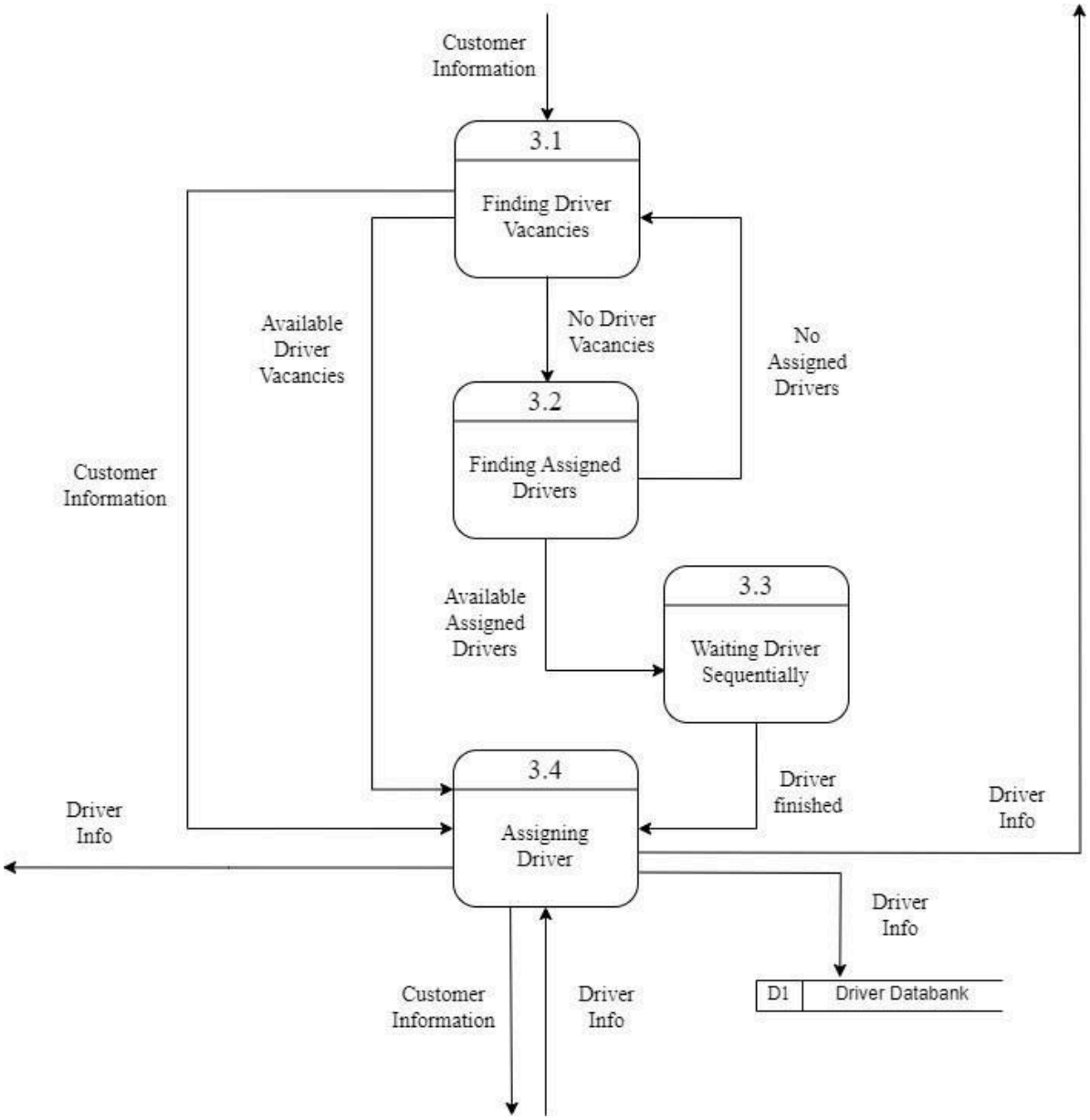
5.2 Child Diagrams

Process 1: Booking Online



Logical Child Diagram for Process 1 (Booking Online) for the current E-Hailing system

Process 3: Allocating Driver



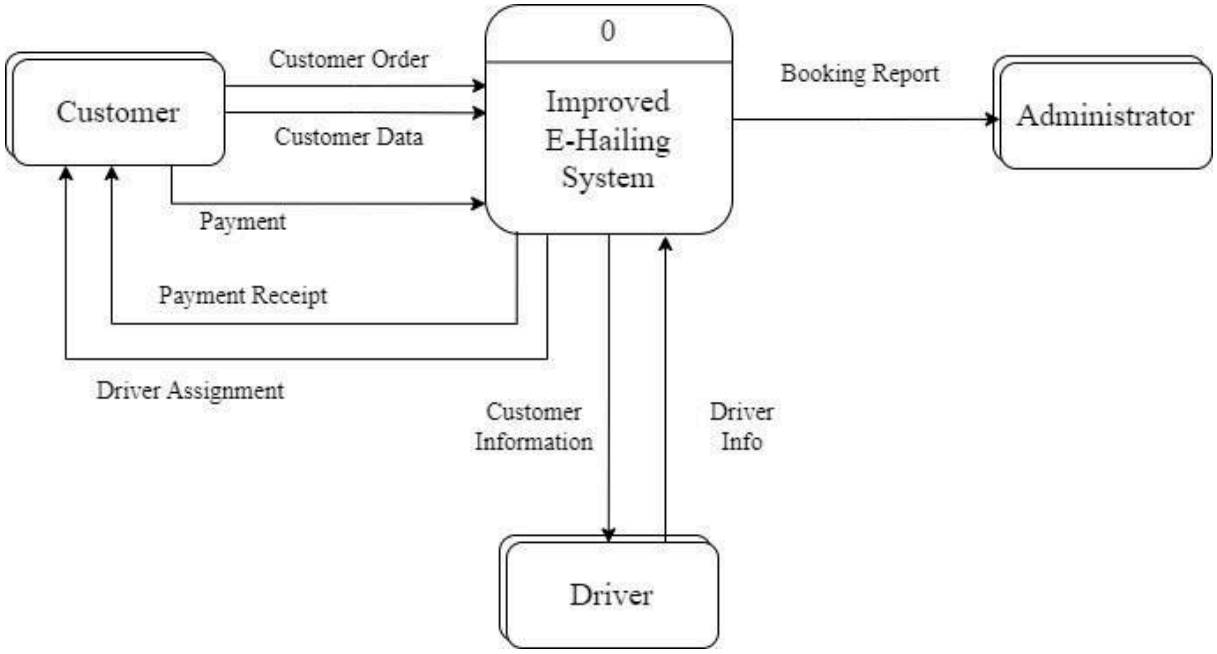
Logical Child Diagram for Process 3 (Allocating Driver) for the current e-Hailing system

6.1 System Analysis and Specification

6.1 Logical DFD TO-BE System

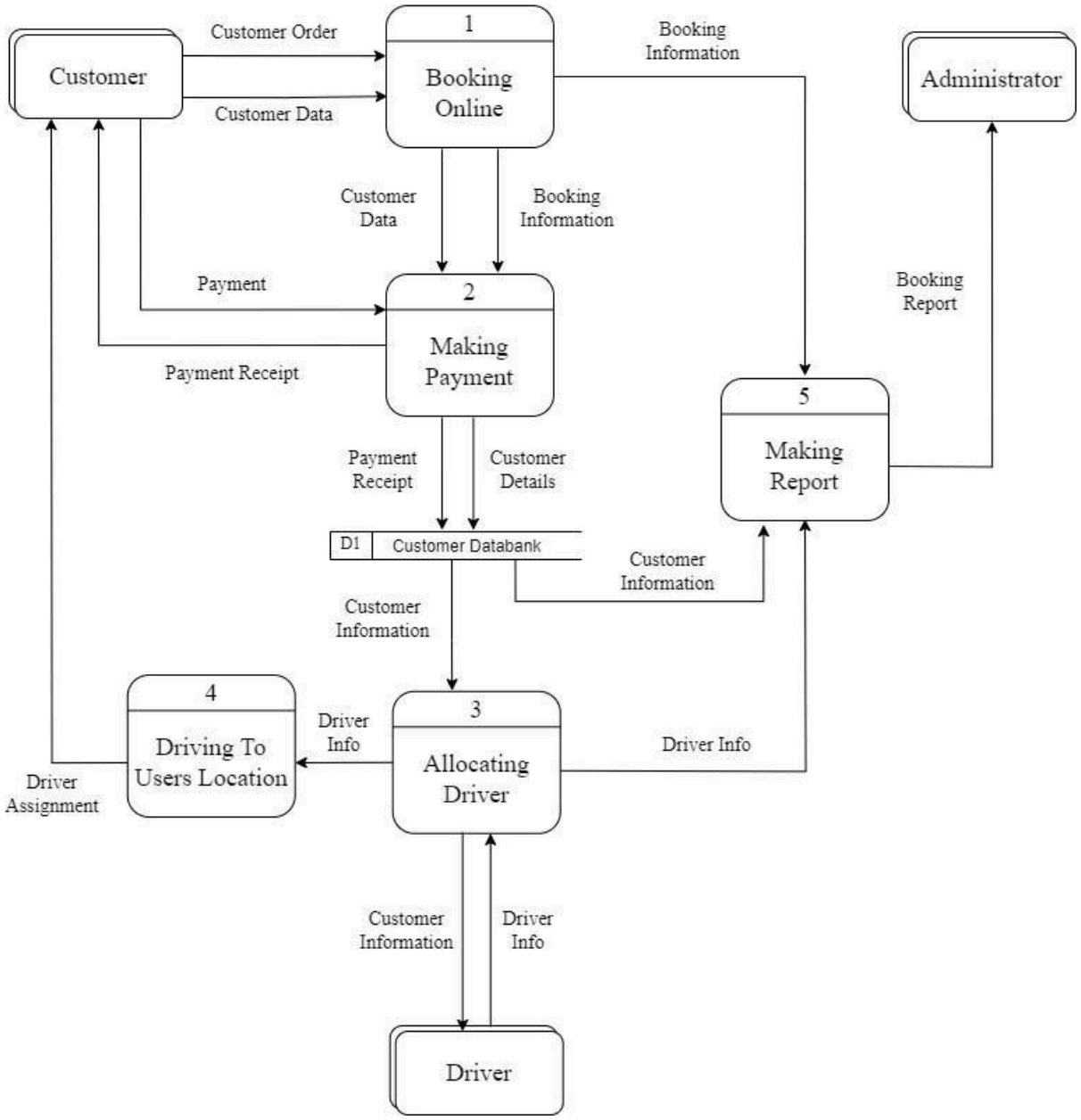
Logical Data Flow Diagram (Logical DFD) for the Proposed e-Hailing system.

6.0.1 Context Diagram



Logical Context Diagram for our proposed e-Hailing system

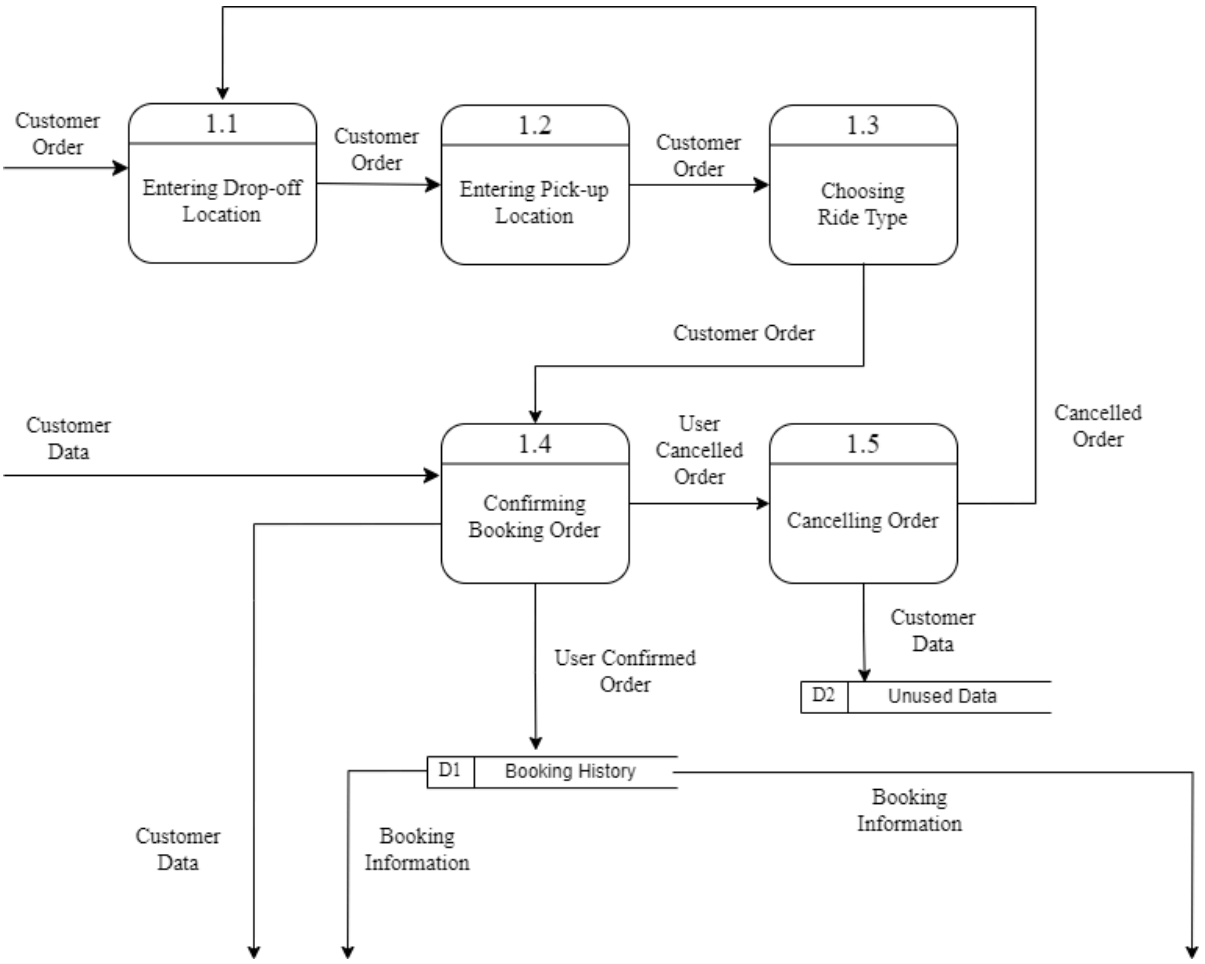
6.0.2 Diagram 0



Logical Diagram 0 for our proposed e-Hailing system

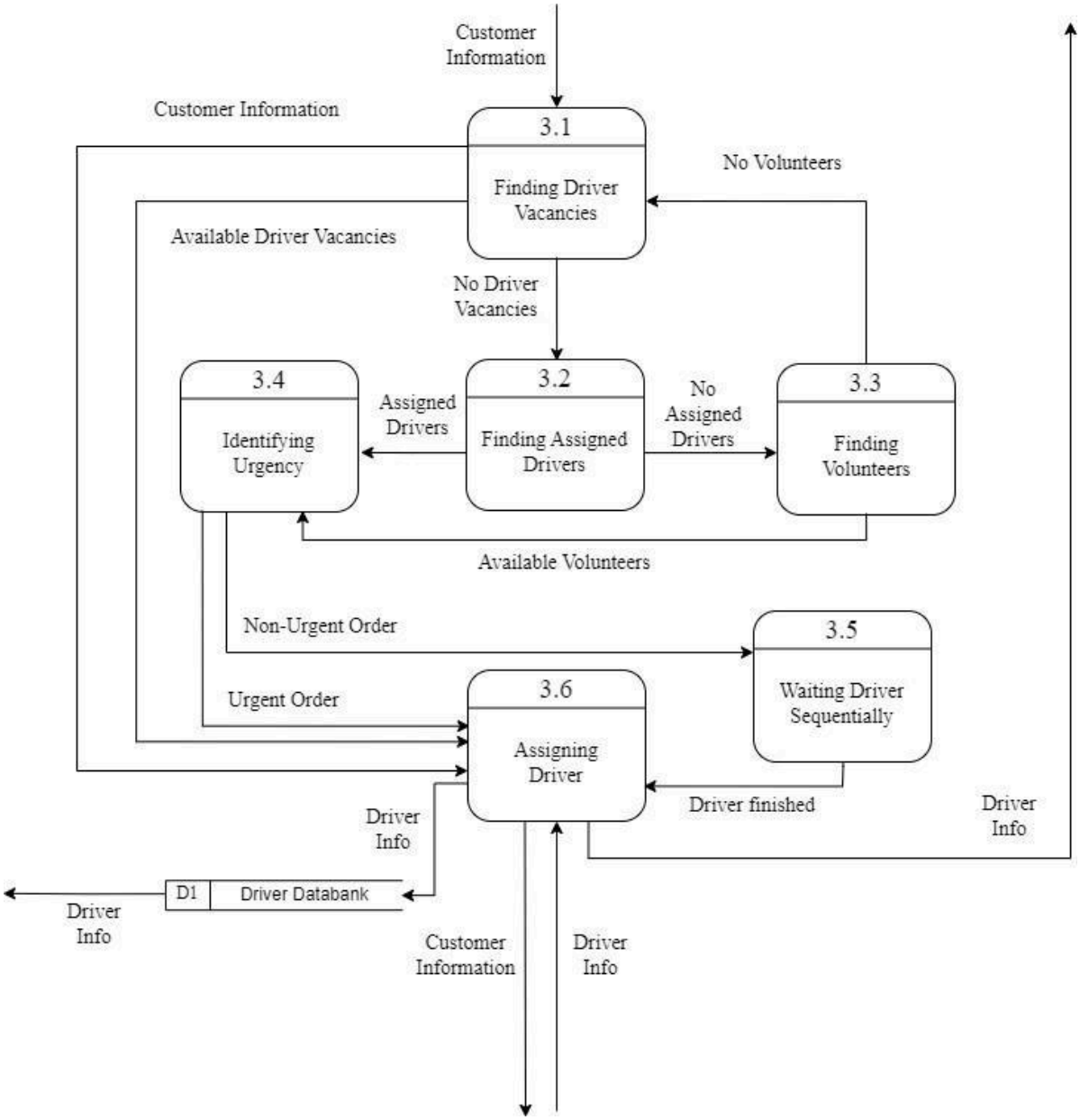
6.0.3 Child Diagrams

Process 1: Booking Online



Logical Child Diagram for Process 1 (Booking Online) for our proposed e-Hailing system

Process 3: Allocating Driver



Logical Child Diagram for Process 3 (Allocating Driver) for our proposed e-Hailing system

6.2 Process Specification

We use Structured English to model and illustrate the process of the Logical DFD TO-BE system.

1) Handle Customer Payment

IF Customer provides Payment
Details THEN Validate Payment
Details
IF Payment Details are
valid THEN Process
Payment
SEND Payment Confirmation to
Customer ELSE
SEND Payment Error Message to Customer

2) Assign Driver to Customer

IF Customer requests a Driver
THEN Retrieve Available Driver Information
SELECT an Available Driver
UPDATE Driver Assignment Details
SEND Driver Assignment Details to
Customer SEND Assignment Notification to
Driver

3) Manage Customer Information

IF Customer provides New or Updated Information
THEN Validate Customer Information
IF Customer Information is valid
THEN Update Customer Information in System
SEND Update Confirmation to Customer
ELSE
SEND Error Message to Customer

4) Manage Driver Information

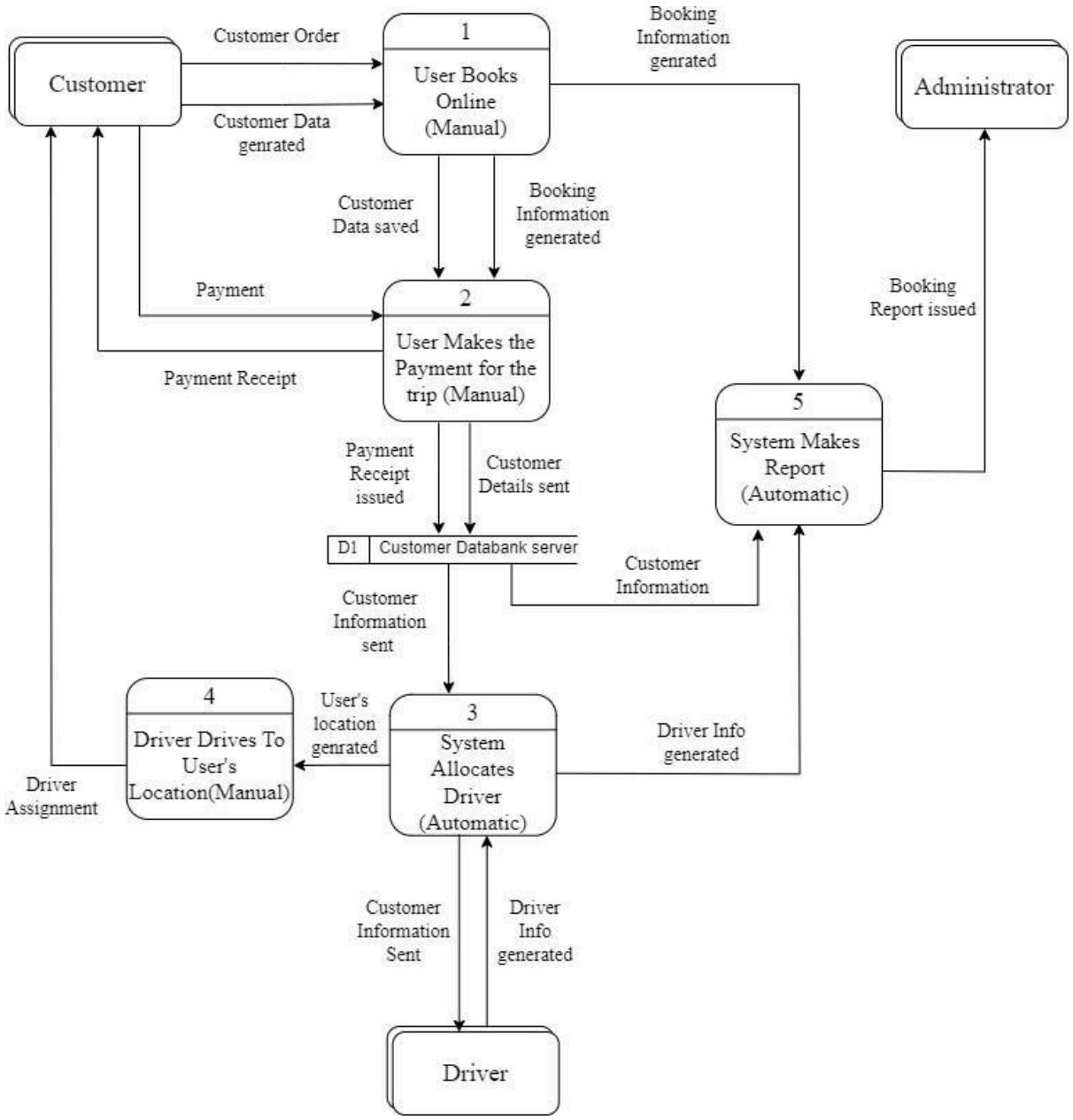
IF Driver provides New or Updated Information
THEN Validate Driver Information
IF Driver Information is valid
THEN Update Driver Information in System
SEND Update Confirmation to Driver
ELSE
SEND Error Message to Driver

7.0 Physical System Design

Physical Data Flow Diagram (Physical DFD) for our proposed system.

7.1 Physical DFD TO-BE System

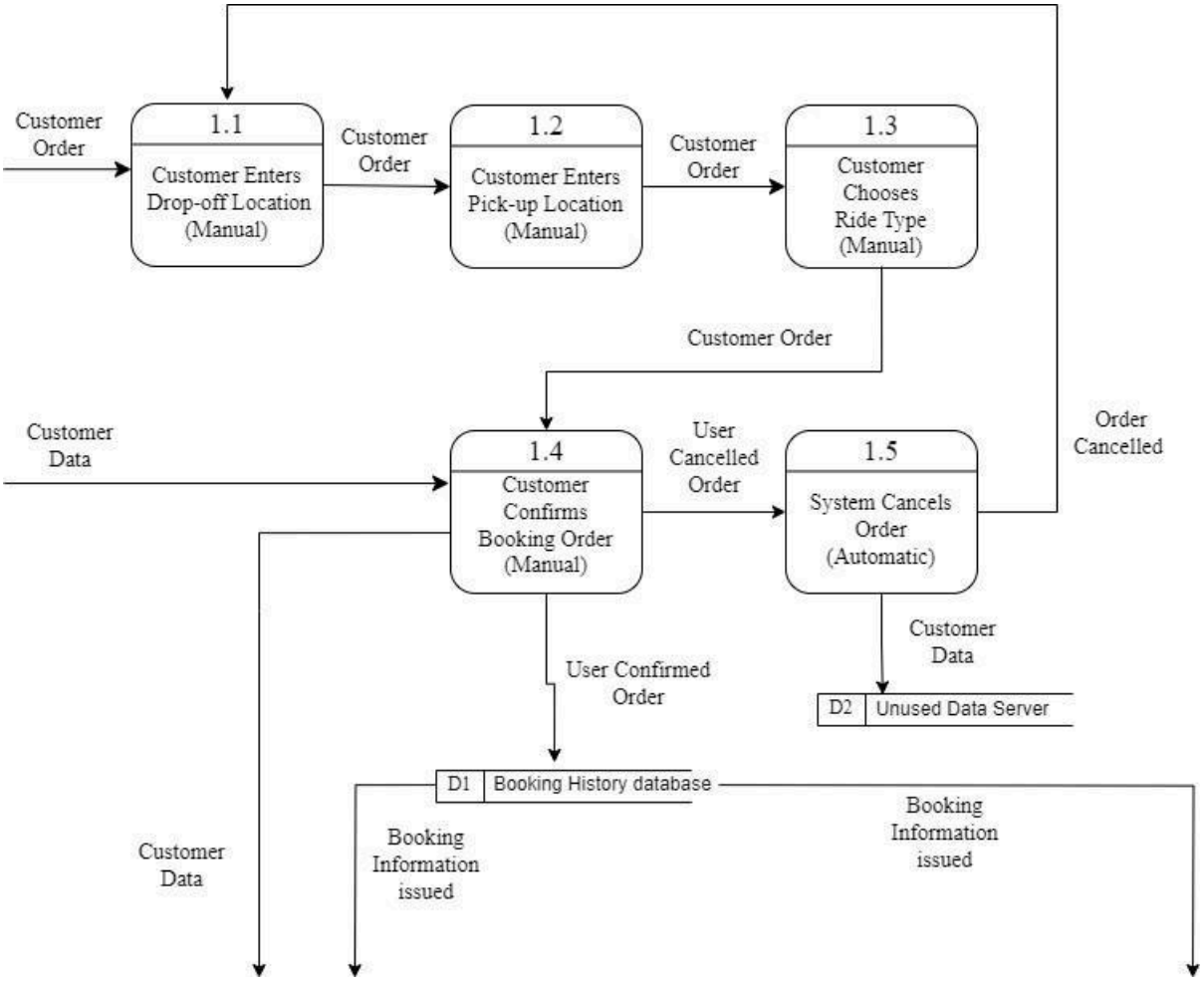
7.0.1 Diagram 0



Physical Diagram 0 of our proposed e-Hailing system

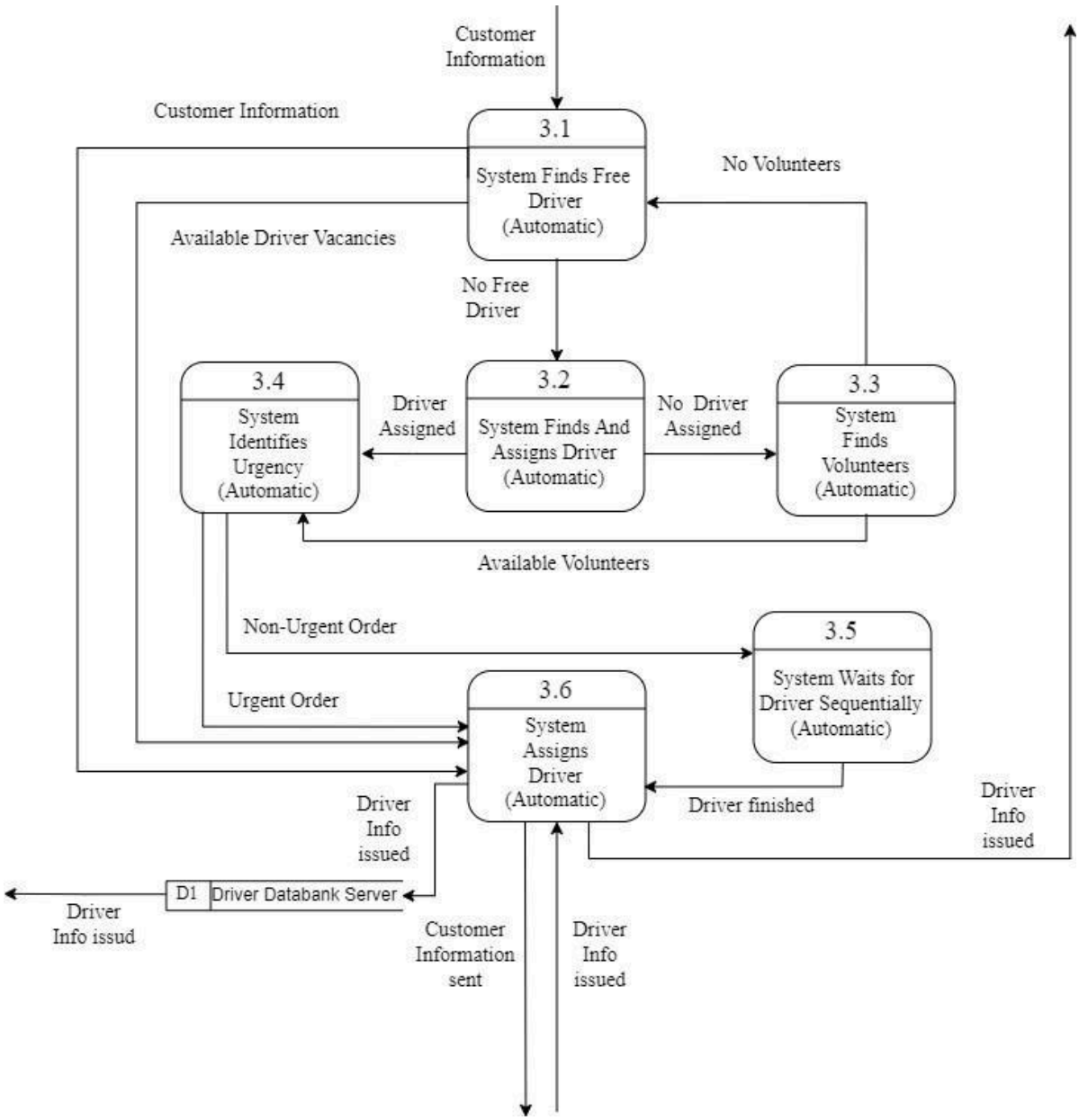
7.0.2 Child Diagrams

7.0.2.1 Process 1: Booking Online



Physical Child Diagram for Process 1 (Booking Online) of our proposed e-Hailing system

7.0.2.2 Process 3: Allocating Driver

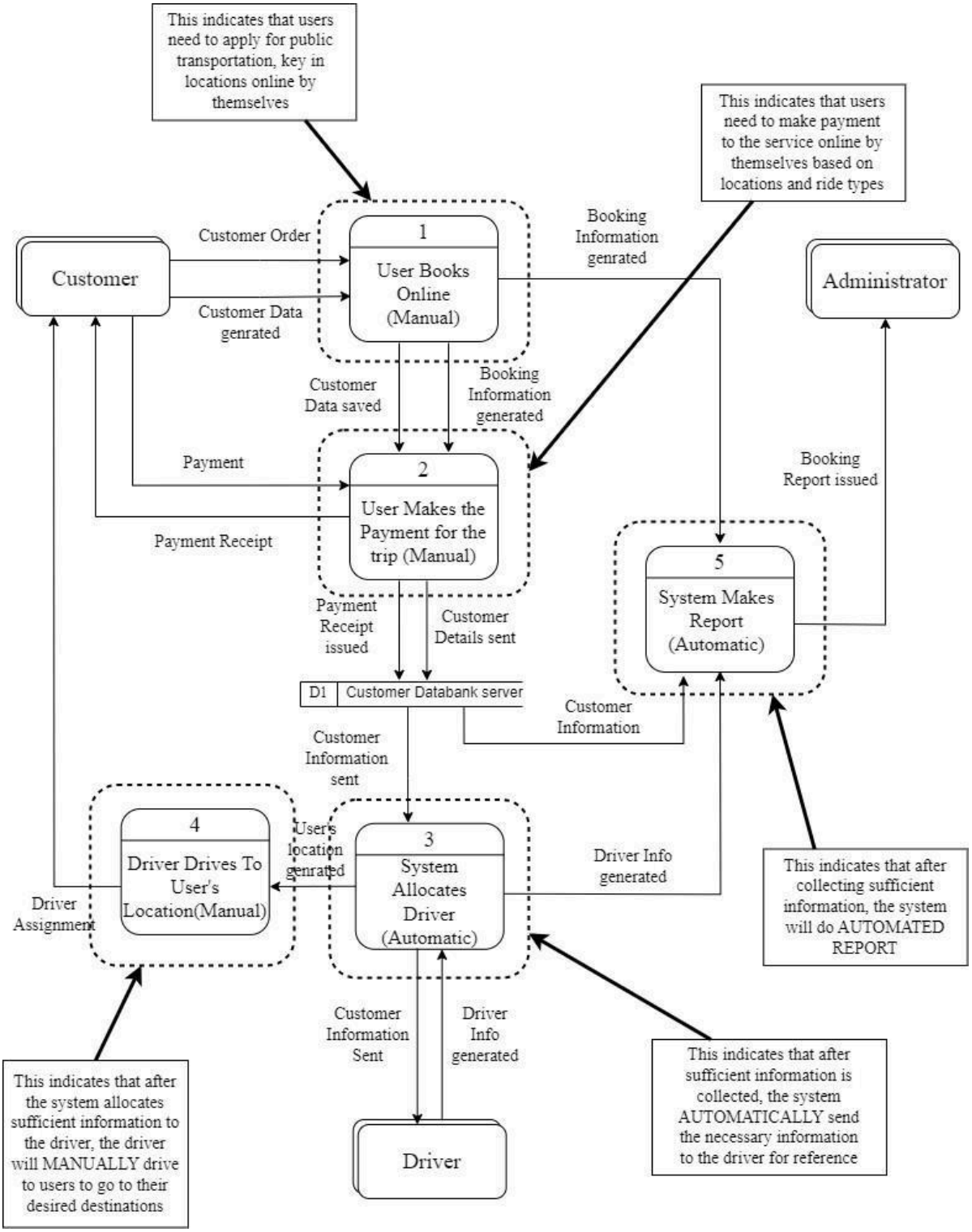


Physical Child Diagram for Process 3 (Allocating Driver) of our proposed e-Hailing system

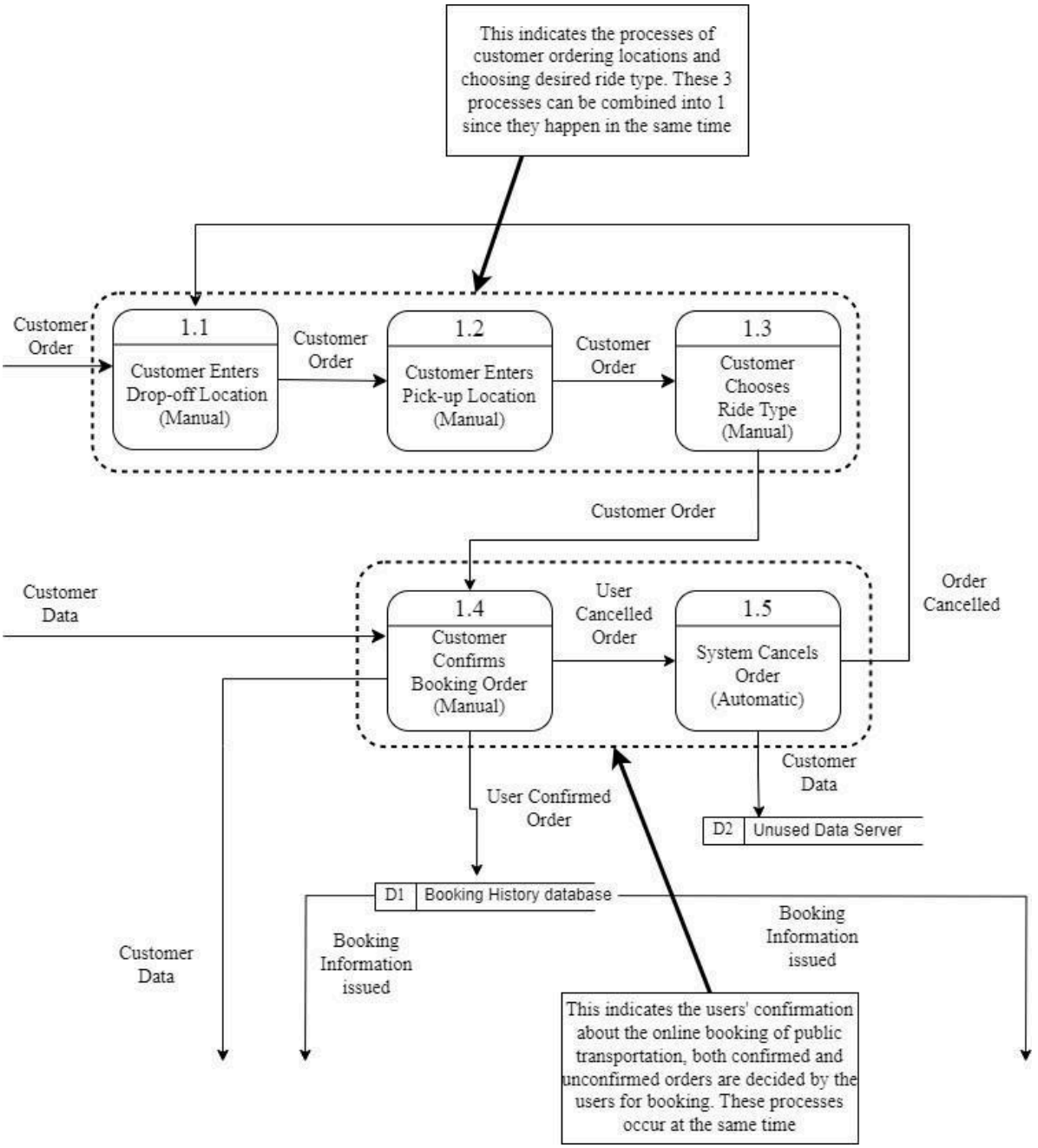
7.0.3 DFD Partitioning

Based on the physical DFD of the TO-BE system (proposed system).

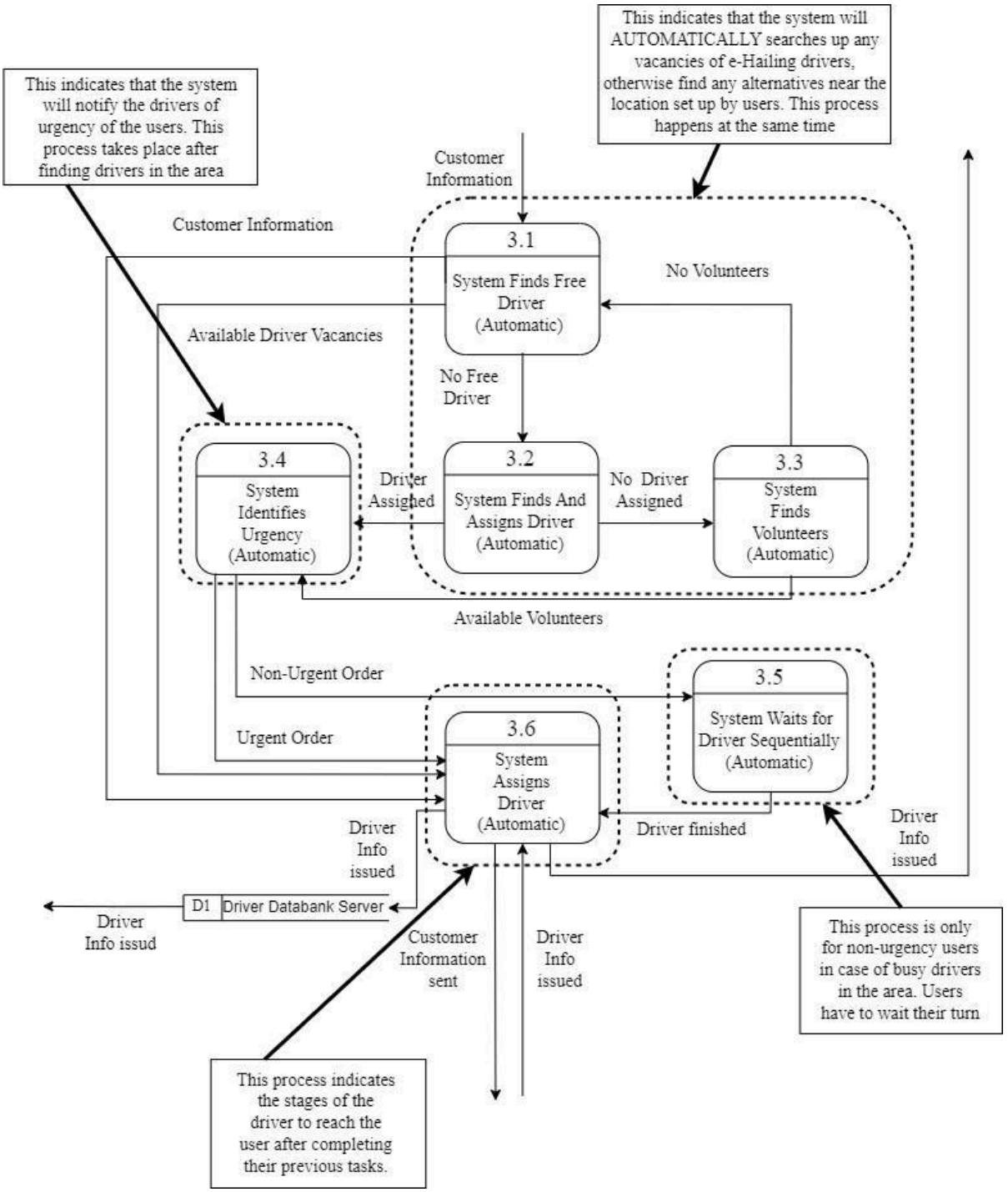
7.0.3.1 Diagram 0



7.0.3.2 Child Diagram for Process 1: Booking Online



7.0.3.3 Child Diagram for Process 3: Allocating Driver



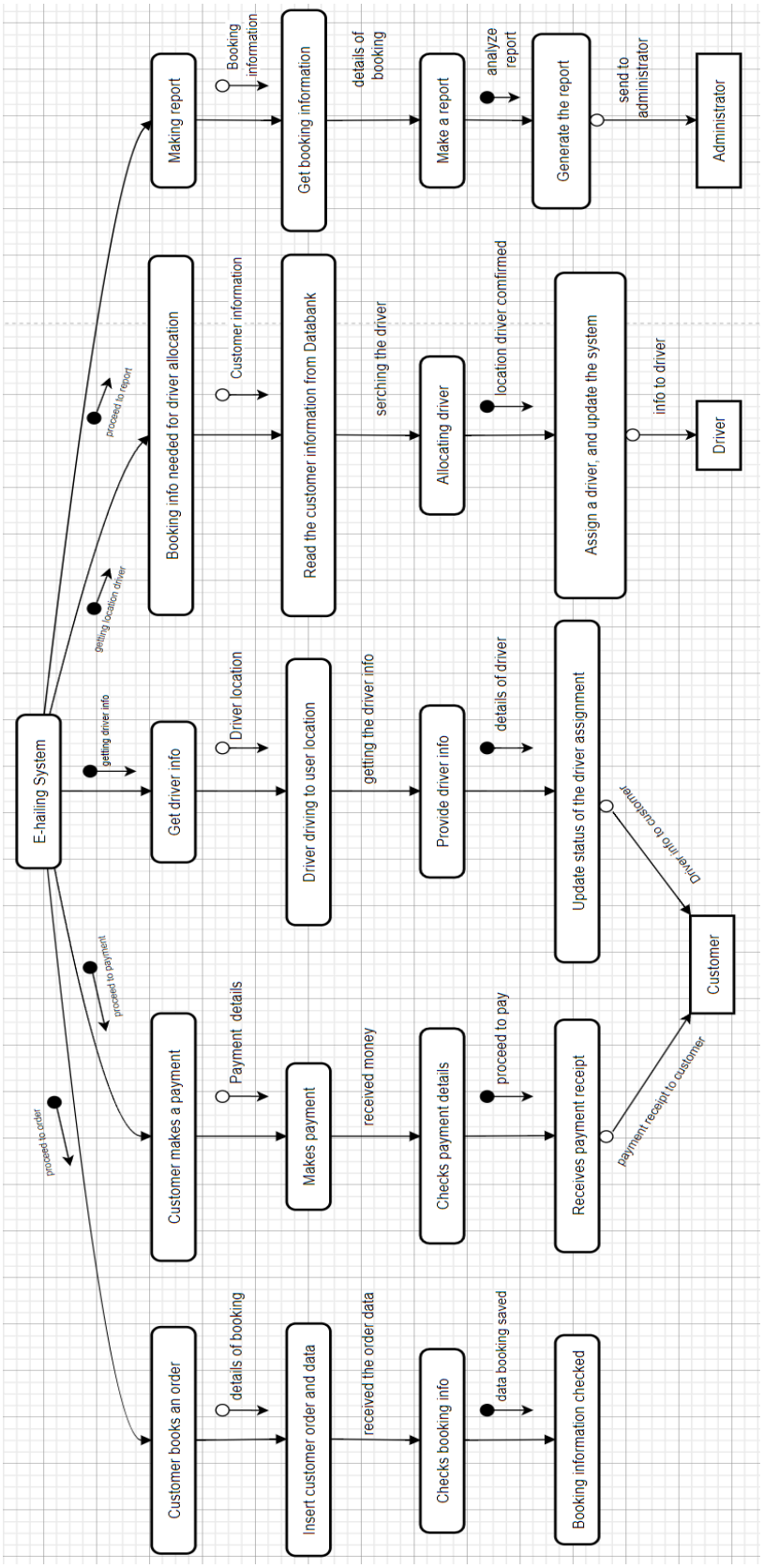
7.0.4 CRUD Matrix

Activity	Customer Databank
Booking Online	CR
Making Payment	RU
Allocating Driver	RU
Driving to User Location	R
Making Report	R

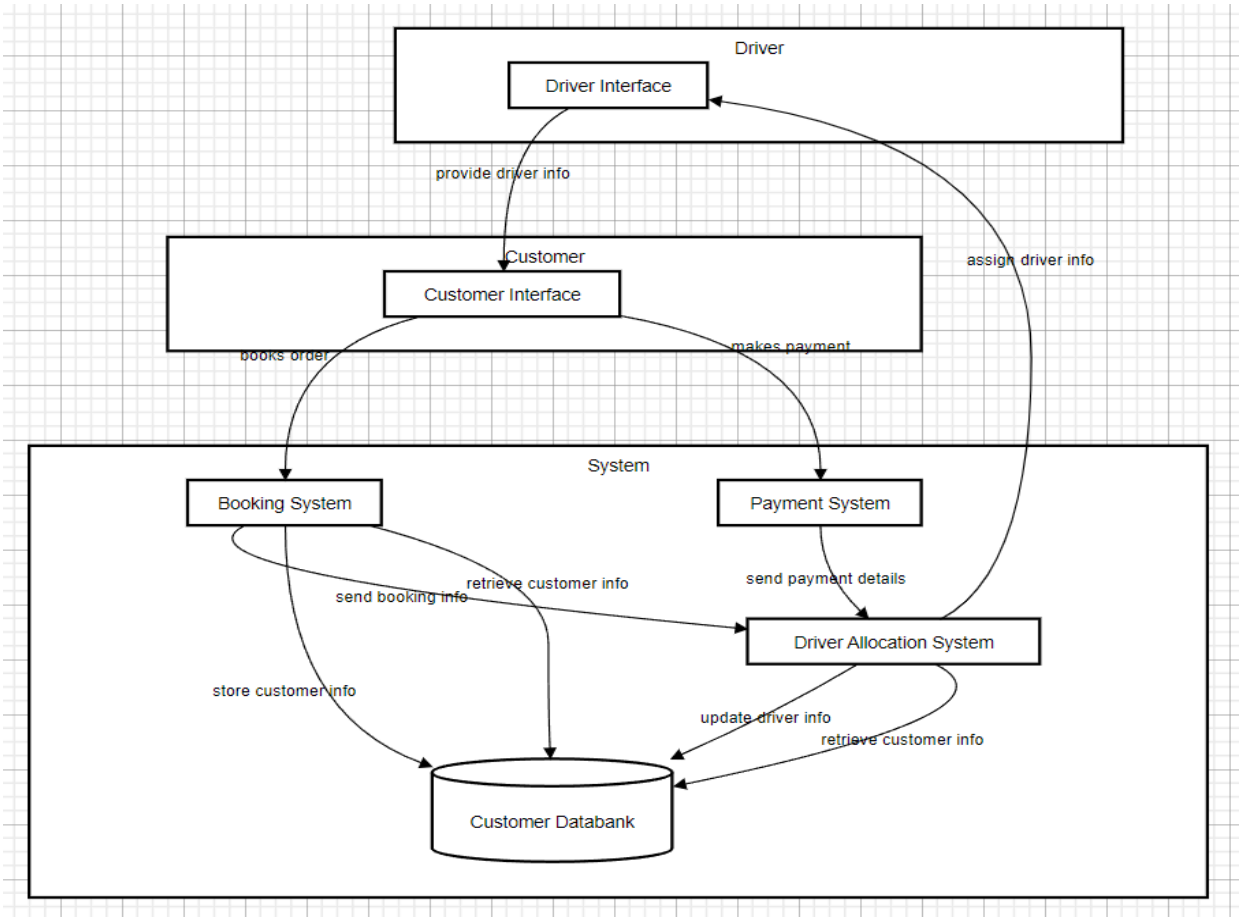
7.0.5 Event Response Table

Event	Source	Trigger	Activity	Response	Destination
Customer books in order	Customer	Insert customer order and data	Checks booking info	Booking information checked	
Customer makes a payment	Customer	Makes payment	Checks payment details	Receives payment receipt	Customer
Booking info needed for driver allocation	Driver	Read the customer information from the Customer Databank	Allocating driver	Assign a driver, and update the driver information in the system.	Driver
Driving to user location		Get driver info	Driver driving to user location	Provide driver info. Update status of the driver assignment	Customer
Making report		Get booking information	Make a report	Generate the report, send the report to the administrator	Administrator

7.0.6 *Structure Chart*

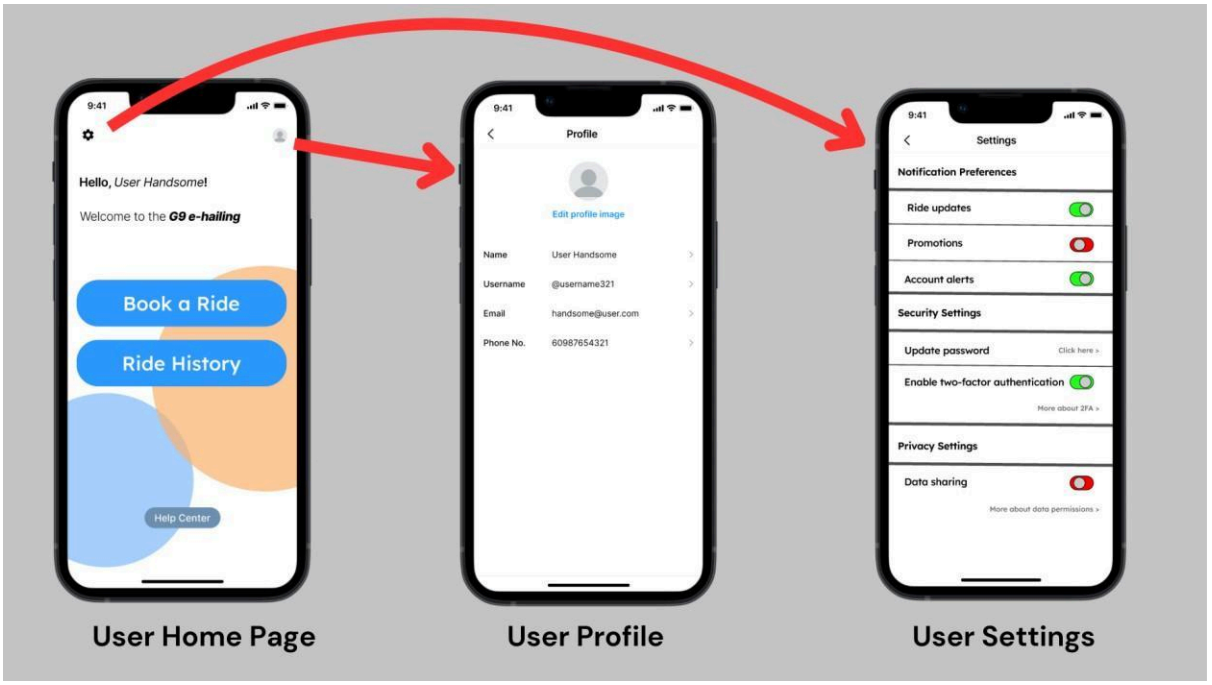


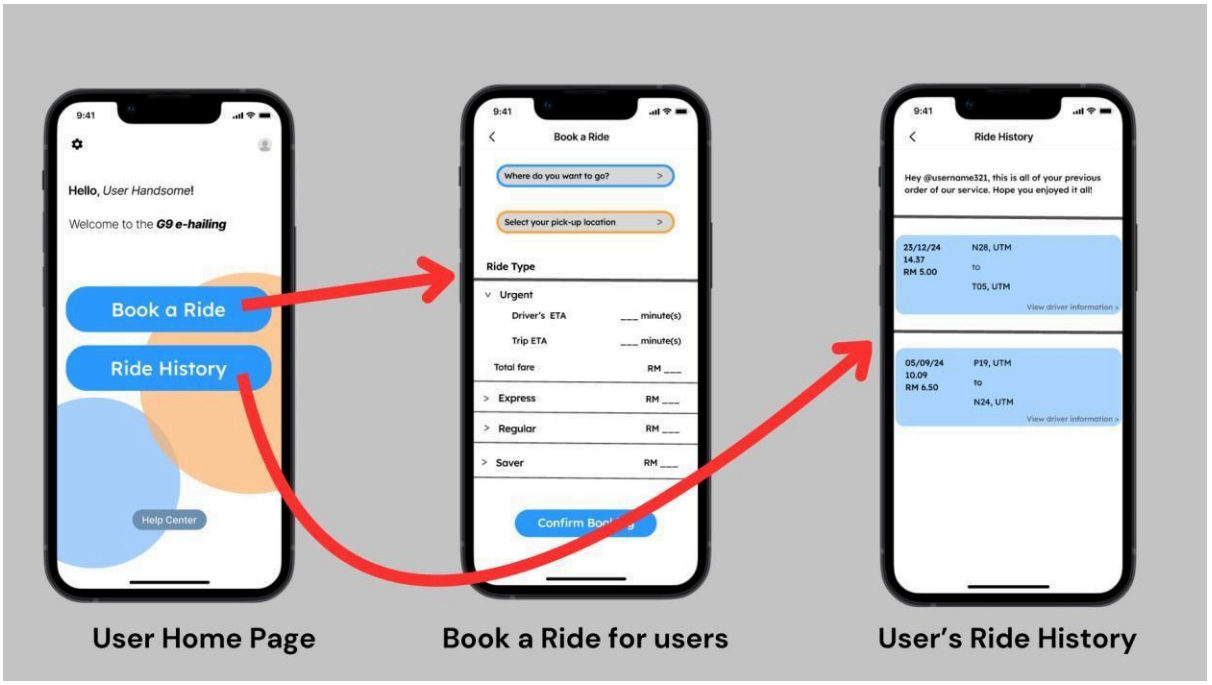
7.0.7 System Architecture



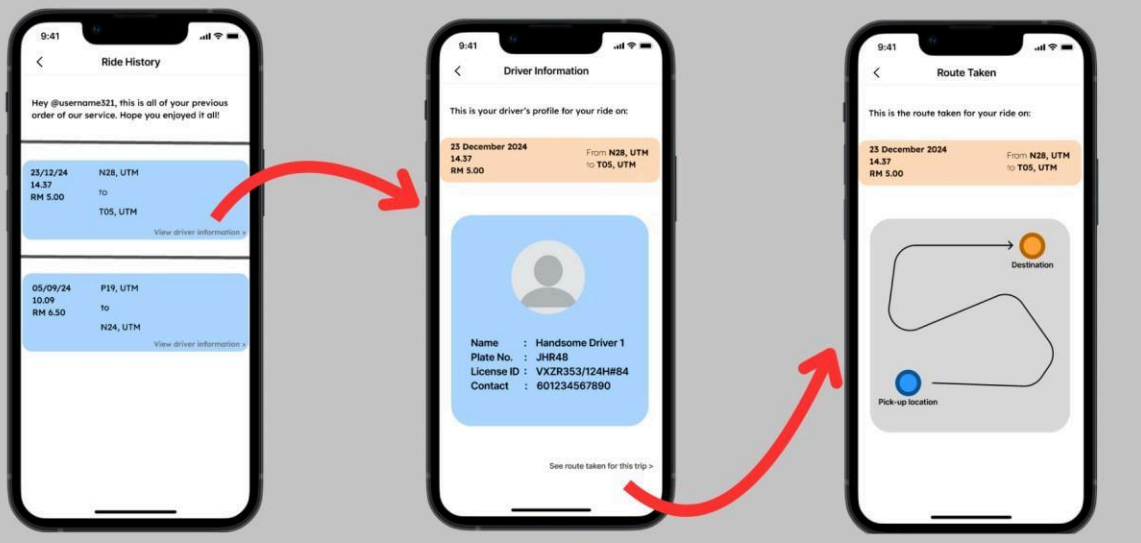
8.0 System Wireframe

8.0 For user



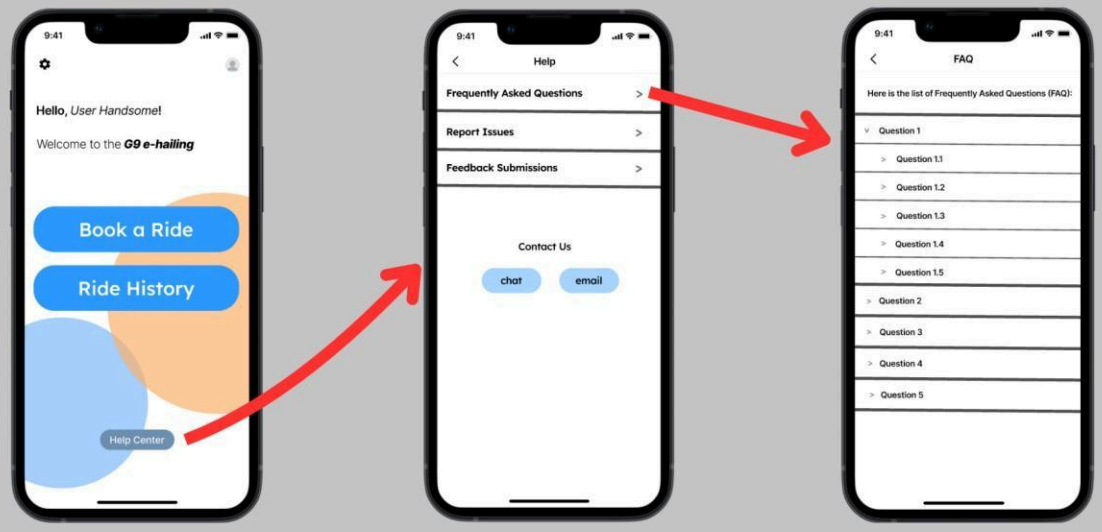


Ride History Menu

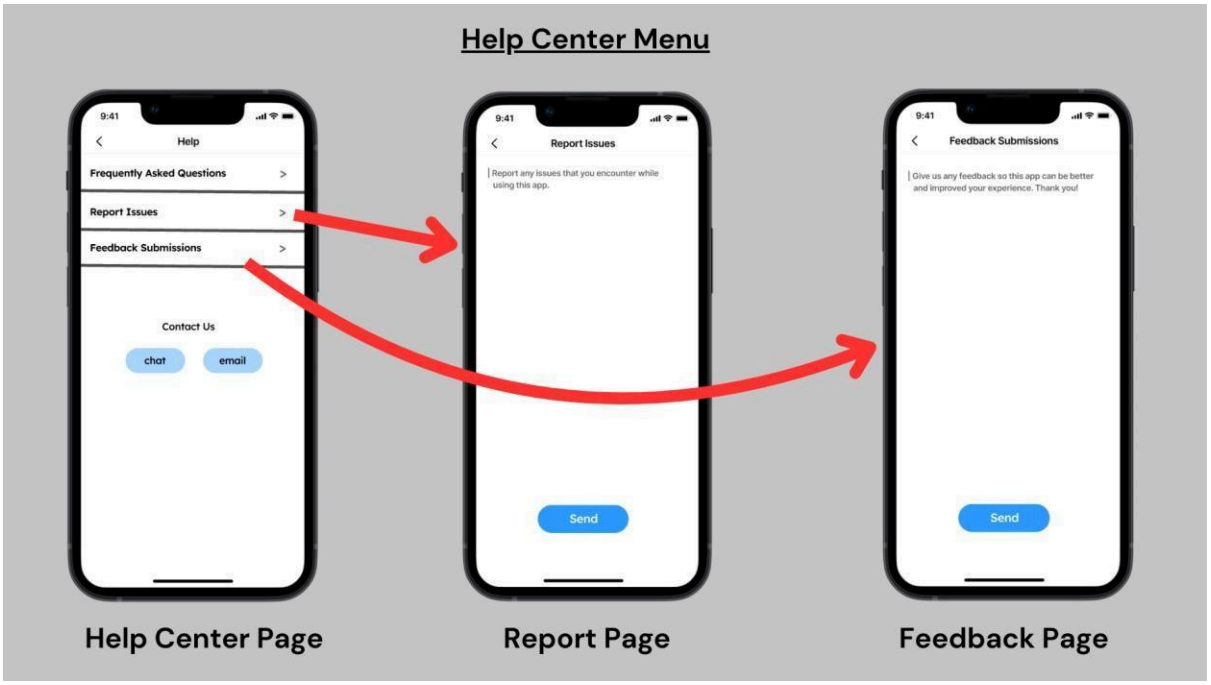


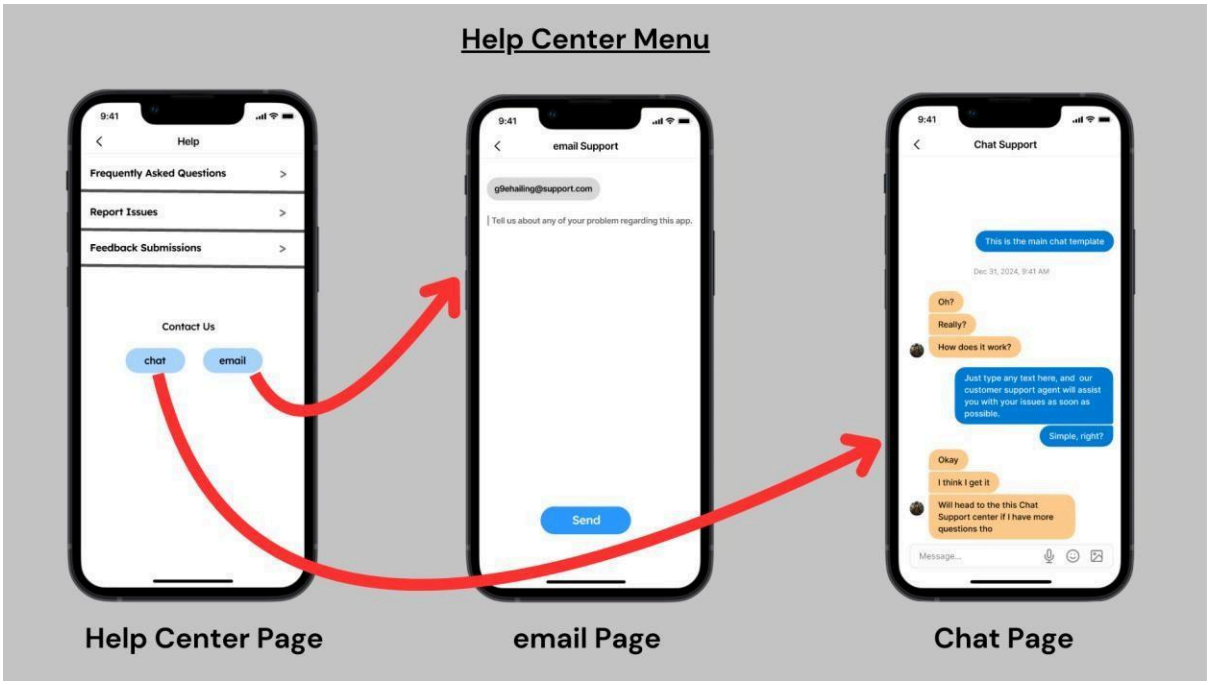
Ride History | Driver Info for the ride | Route taken for the ride

Help Center Menu

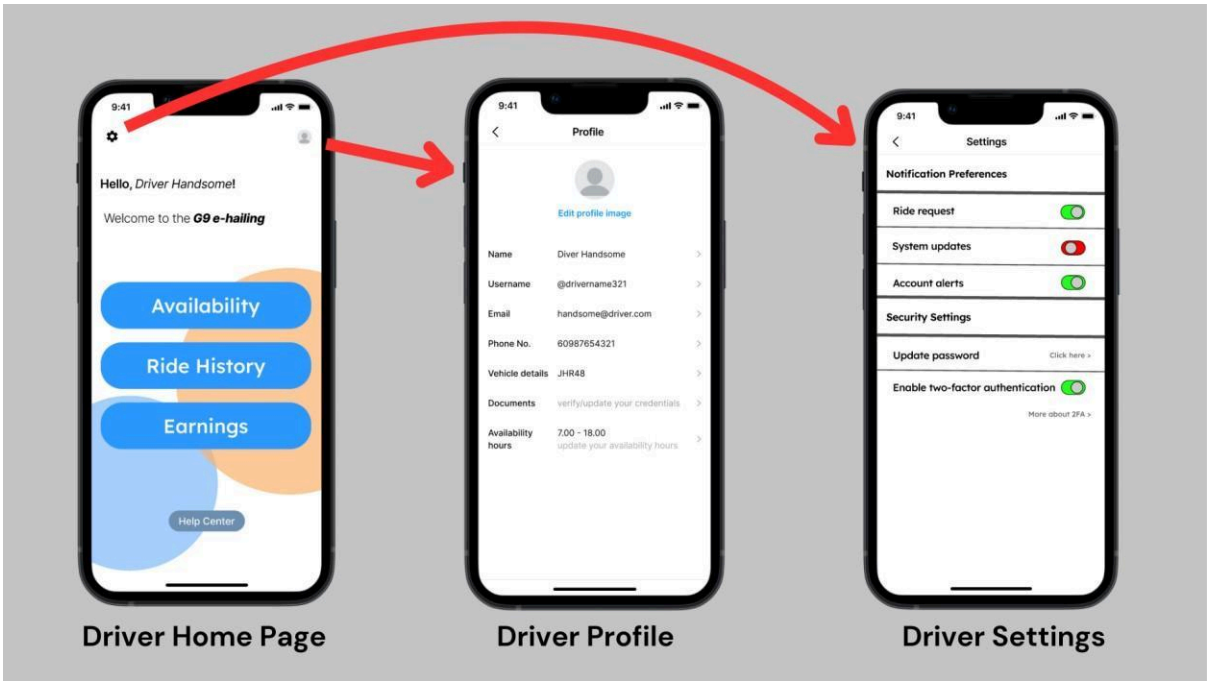


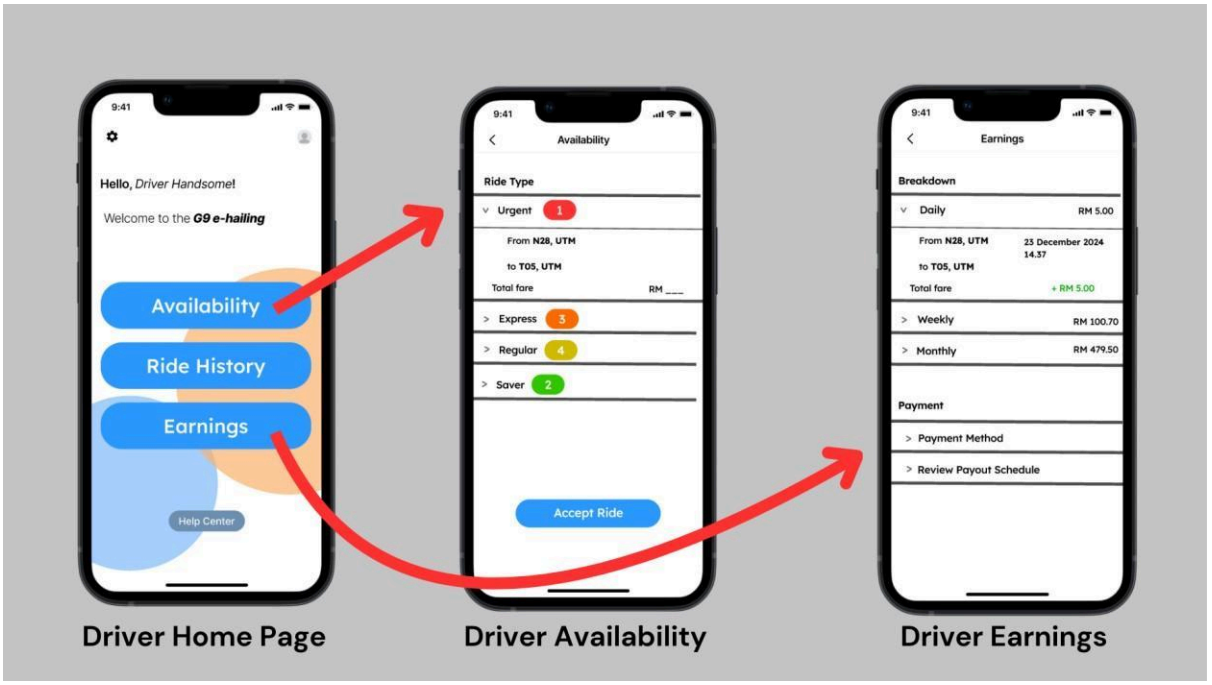
User Home Page | Help Center Page | FAQ Page



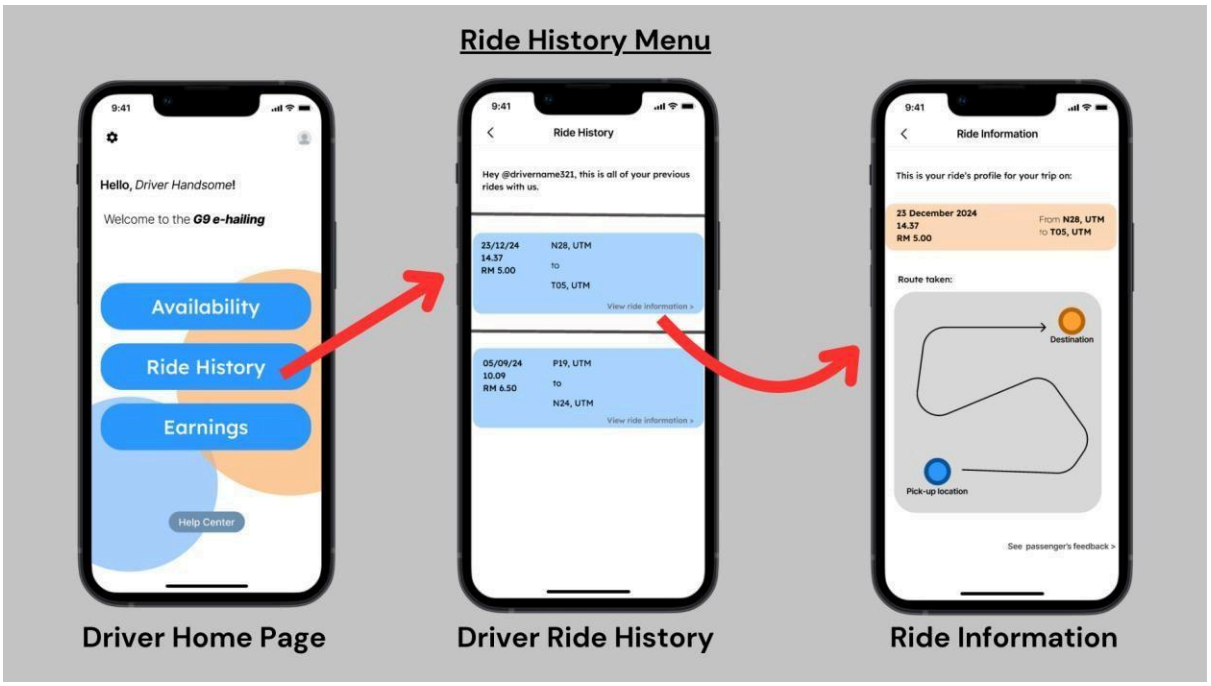


8.1 For driver

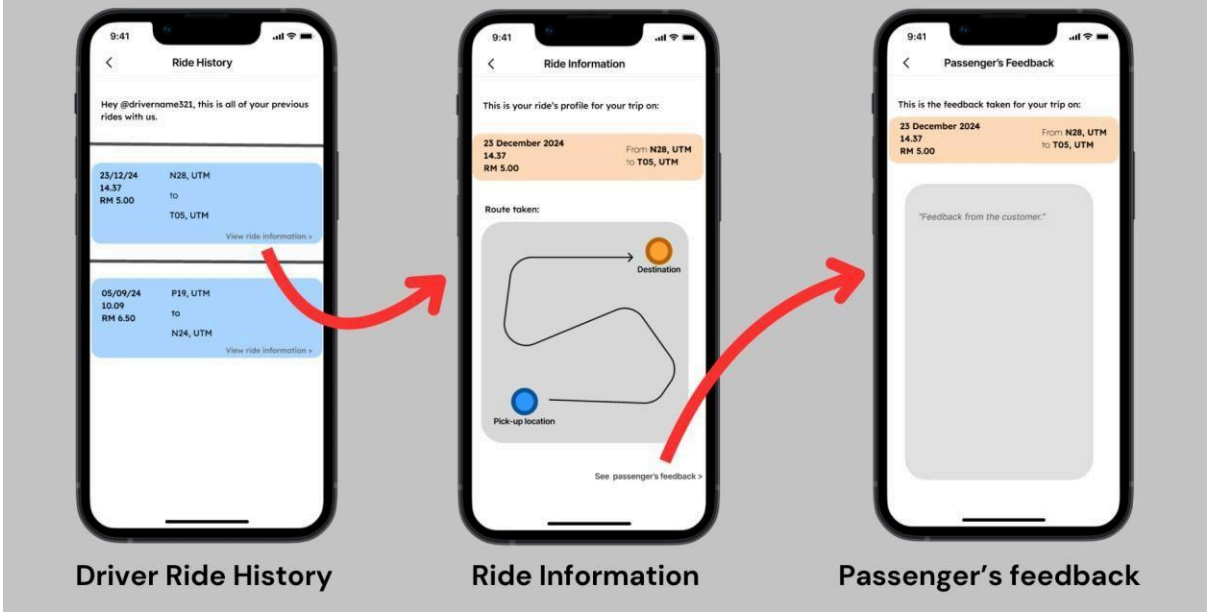

9:41
Hello, Driver Handsome!
Welcome to the G9 e-hailing
Availability
Ride History
Earnings
Help Center
Driver Home Page
9:41
Profile
Edit profile image
Name
Diver Handsome
Username
@drivername321
Email
handsome@driver.com
Phone No.
60987654321
Vehicle details
JHR48
Documents
verify/update your credentials
Availability hours
7.00 - 18.00
update your availability hours
Driver Profile
9:41
Settings
Notification Preferences
Ride request
System updates
Account alerts
Security Settings
Update password
Click here >
Enable two-factor authentication
More about 2FA >
Driver Settings

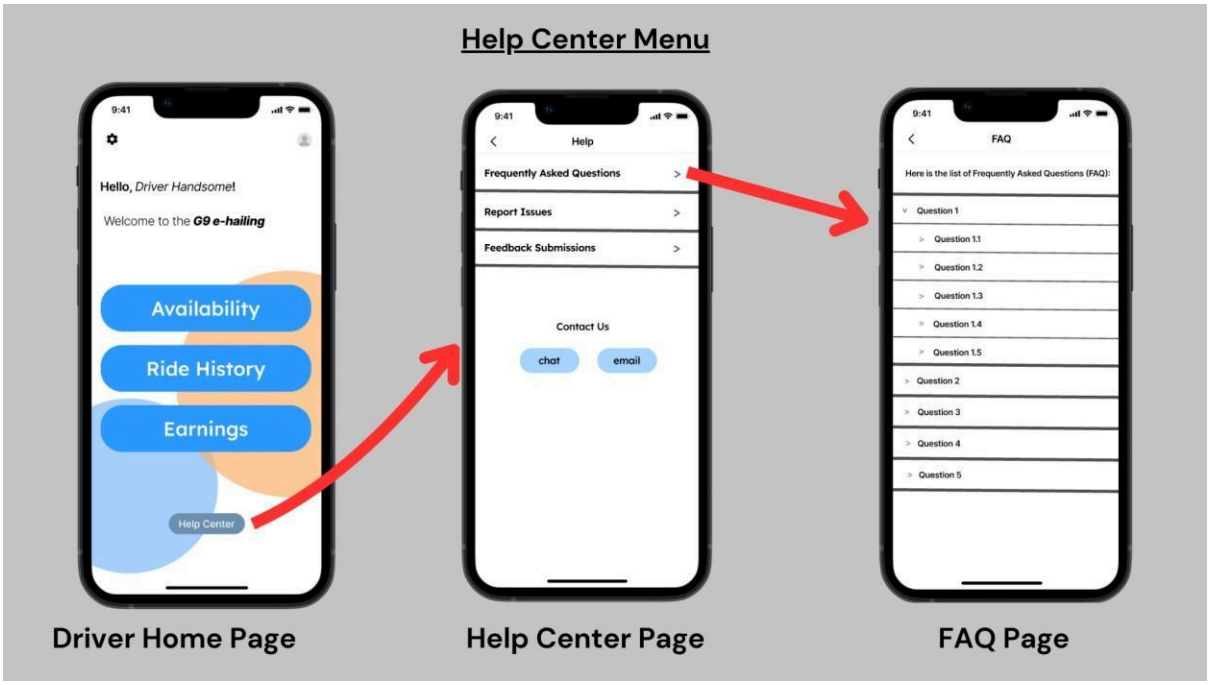

9:41
Hello, Driver Handsome!
Welcome to the G9 e-hailing
Availability
Ride History
Earnings
Help Center
Driver Home Page
9:41
Availability
Ride Type
Urgent 1
From N28, UTM
to T05, UTM
Total fare
RM ___
Express 3
Regular 4
Saver 2
Accept Ride
Driver Availability
9:41
Earnings
Breakdown
Daily
RM 5.00
From N28, UTM
to T05, UTM
25 December 2024
14.37
Total fare
+ RM 5.00
Weekly
RM 100.70
Monthly
RM 479.50
Payment
Payment Method
Review Payout Schedule
Driver Earnings

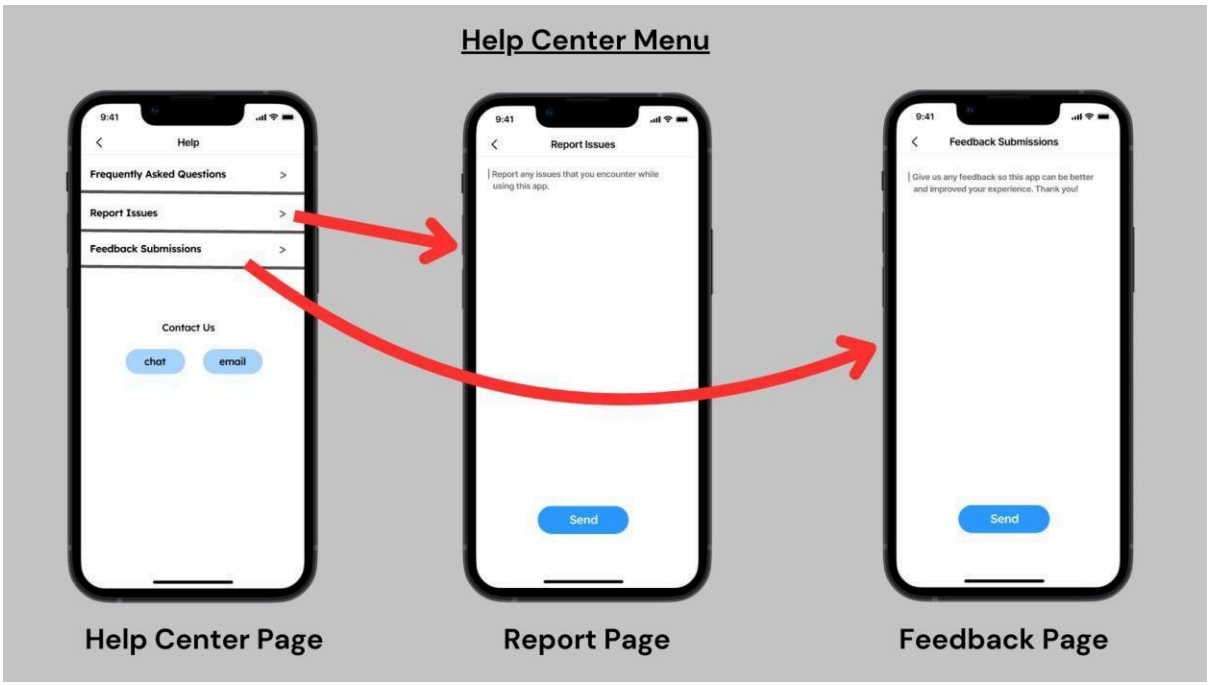
Ride History Menu

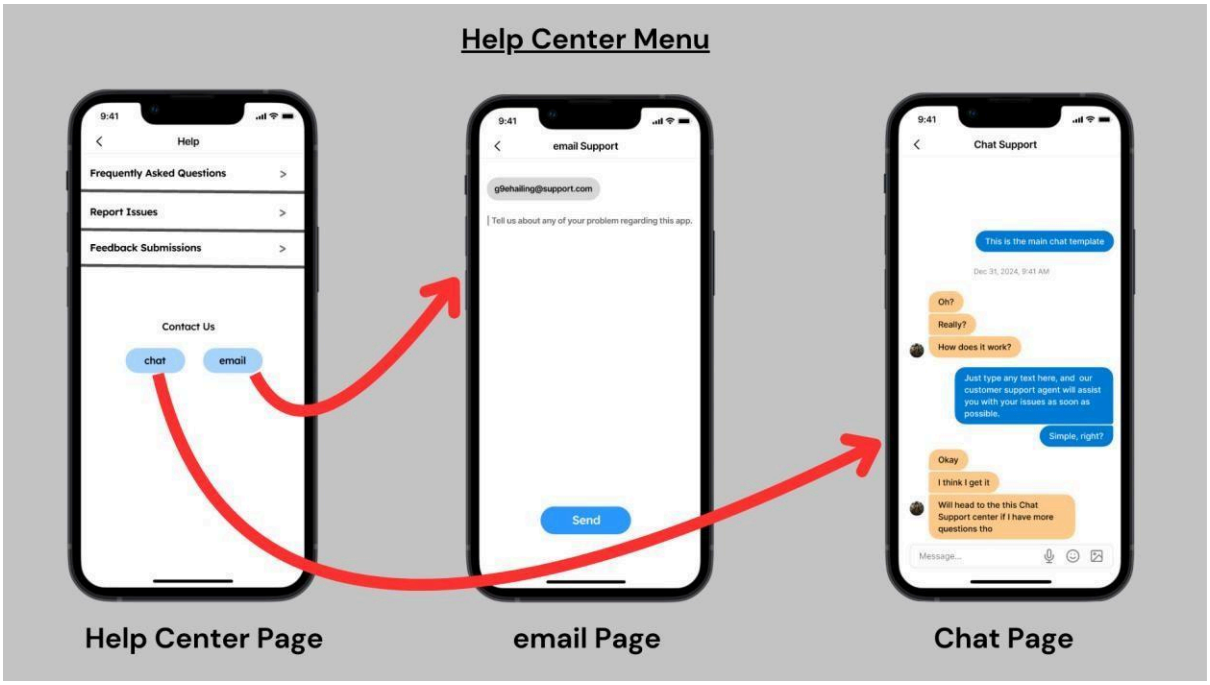


Ride History Menu




Help Center Menu
9:41
Hello, Driver Handsome!
Welcome to the G9 e-hailing
Availability
Ride History
Earnings
Help Center
Driver Home Page
9:41
Help
Frequently Asked Questions
Report Issues
Feedback Submissions
Contact Us
chat
email
Help Center Page
9:41
FAQ
Here is the list of Frequently Asked Questions (FAQ):
Question 1
Question 1.1
Question 1.2
Question 1.3
Question 1.4
Question 1.5
Question 2
Question 3
Question 4
Question 5
FAQ Page


Help Center Menu
9:41
Help
Frequently Asked Questions
Report Issues
Feedback Submissions
Contact Us
chat
email
Help Center Page
9:41
Report Issues
Report any issues that you encounter while using this app.
Send
Report Page
9:41
Feedback Submissions
Give us any feedback so this app can be better and improved your experience. Thank you!
Send
Feedback Page


Help Center Menu
9:41
Help
Frequently Asked Questions
Report Issues
Feedback Submissions
Contact Us
chat
email
9:41
email Support
g9ehailing@support.com
Tell us about any of your problem regarding this app.
Send
9:41
Chat Support
This is the main chat template
Dec 31, 2024, 9:41 AM
Oh?
Really?
How does it work?
Just type any text here, and our customer support agent will assist you with your issues as soon as possible.
Simple, right?
Okay
I think I get it
Will head to the this Chat Support center if I have more questions tho
Message...
Help Center Page
email Page
Chat Page

9.0 Summary of Proposed System

In conclusion, we have come up with the solution of developing an improved e-Hailing system, specifically Grab e-Hailing system, for our proposed system. In this report, we briefly state our problem statement, project objectives, the current business workflow, the logical DFDs for the current system, the functional and non-functional requirements, the logical DFDs for the proposed system, the physical DFDs for the proposed system and providing system wireframe to visualize the system's output to the users.

Our proposed system ensures that the users are able to meet their urgent needs whenever in need in order to allow them to obtain rides immediately from the available drivers from their desired location. To ensure smoothness of the system's flow, several ordering channels are made to reduce the delays for the waiting time for drivers to reach to users. Aside from regular e-Hailing drivers, volunteers are also hired to make sure whenever there is high traffic in the ordering system, these volunteers are able to help users to reach their destination, ensuring an efficient service.

Overall, our proposed e-Hailing system aims to improve the capabilities of the current e-Hailing system. By enhancing the current system, we are able to optimize the system's efficiency. We try to make sure the users' complaints on the e-Hailing system are reduced to a minimum. Besides, making a user-friendly interface for the system is crucial to ensure everyone regardless of age is able to use the system correctly.

10.0 GitHub Link for Project Phase 3

https://github.com/Mathan0702/SYSTEM-ANALYSIS-AND-DESIGN

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UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

SECD2613-03

SYSTEM ANALYSIS AND DESIGN

PROJECT PHASE 2 – INFORMATION SYSTEM GATHERING AND REQUIREMENT

Lecturer Name:

DR. ROZILAWATI BINTI DOLLAH @ MD. ZAIN

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1.0 Overview of the Project

In this project, we aim to enhance the current e-Hailing system to address its existing issues and improve user experience. E-hailing services allow users to book transportation via electronic applications, facilitating easy travel for students, workers, and the general public. Despite the convenience, the current systems have problems related to complexity, data security, and efficiency. Our goal is to enhance the current e-Hailing system to a user-friendly, secure, and efficient e-Hailing system that caters to a broad range of users, including older generations and to those who are less familiar with the current modernized technology.

While identifying the problem statement and feasibility studies along with the project objectives and scopes, we need to identify the users' feedbacks on the current issues of e-Hailing system in order for us to develop a more smoother and more user-friendly of the e-Hailing system, to ensure the system is applicable to everyone involved in booking public transportation online. Then, we need to arrive at a conclusion on the users' feedback and proceed with the project objectives.

2.0 Problem Statement

Based on our analysis of the current e-hailing systems, we have identified three main problems:

- Price and affordability:

  During peak hours or high-demand situations, e-hailing services often give high and unpredictable prices, making it not affordable at all to most users. This condition will also affect the accessibility and reliability of the e-hailing services

- Safety concerns:

  Whether driver or customer, e-hailing services face significant challenges regarding the safety aspect. Incidents of harassment, assault, and theft have been reported, causing an untrusted environment among people in the e-hailing community

- Inefficiency in Handling High User Traffic:

  The systems struggle with delays and inefficiencies, particularly during peak times. This leads to frustration among users who need timely transportation.

3.0 Proposed Solutions

To tackle these identified problems, we proposed the following solutions based on three aspects:

Price and affordability:

1. Implement a Cap on Surge Pricing

Introduce a maximum limit on how high surge prices can go during peak times. This cap can prevent exorbitant fare increases while still allowing for some flexibility to incentivize drivers.

2-Driver Incentives During Peak Times

Offer additional incentives to drivers during peak hours without passing the extra cost directly to passengers. Ex: give bonus for completing a certain number of rides during high-demand periods

Safety concerns:

1- Anonymous Reporting System

Create an anonymous reporting system within the app that allows users to report safety concerns without revealing their identity, encouraging more users to report issues without fear of repercussions.

2- In-App Emergency Button

Integrate an emergency button within the app that allows passengers and drivers to immediately notify local authorities or e-hailing service security teams in case of an emergency.

Inefficiency in Handling High User Traffic:

1- Real-Time Data Processing

Use real-time data processing technologies to ensure that user requests and driver availability are updated instantly, reducing delays.

2- Cloud-Based Infrastructure

Implement a cloud-based system to handle high volumes of data and user requests efficiently.

3- AI and Machine Learning

Utilize AI for demand forecasting and optimal driver allocation to improve response times and service reliability.

By addressing these key issues, the e-Hailing system will offer a more accessible, secure, and efficient service, enhancing overall user satisfaction.

4.0 Information Gathering Process

4.1 Method used

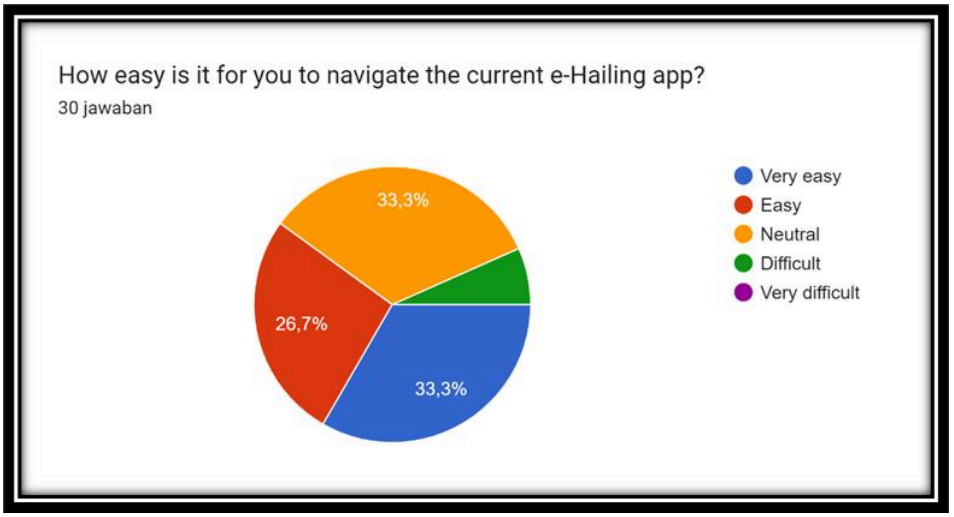
For this project, we decided to use the interactive method to collect the data. We collected the information needed by making a questionnaire related to the problems that we identified in the e-hailing systems, and in this case, we specifically mean Grab. Then, we distributed the survey across several groups online.

We chose an interactive method, specifically an online questionnaire, for gathering information because in this project, we unfortunately do not have the resources to proceed with other methods like preparing an interview with the users involved in the e-hailing system, we certainly cannot do the Joint Application Design (JAD) method and it is not possible for us to do the unobtrusive method as well. Because, again, the lack of resources and time, we cannot use the sampling, investigation, or the observation method. Thus, we decided to proceed with the online questionnaire distribution to deal with our case study.

Here is the link of the questionnaire:
https://docs.google.com/forms/d/e/1FAIpQLScOkxA711i6Gr4fXFDJcq-eTi8r5yqZEEewW9FEIX1jdHppJA/viewform?usp=sf_link

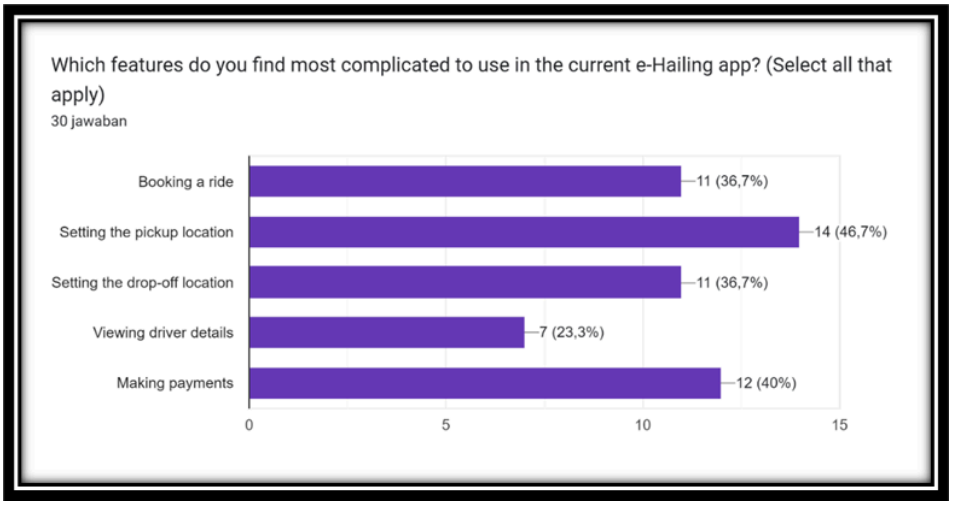
After distributing the questionnaire across several UTM students' groups online, we successfully gathered 30 responses. Here is the information obtained from each of the questions.

Question 1: How easy is it for you to navigate the current e-Hailing app?



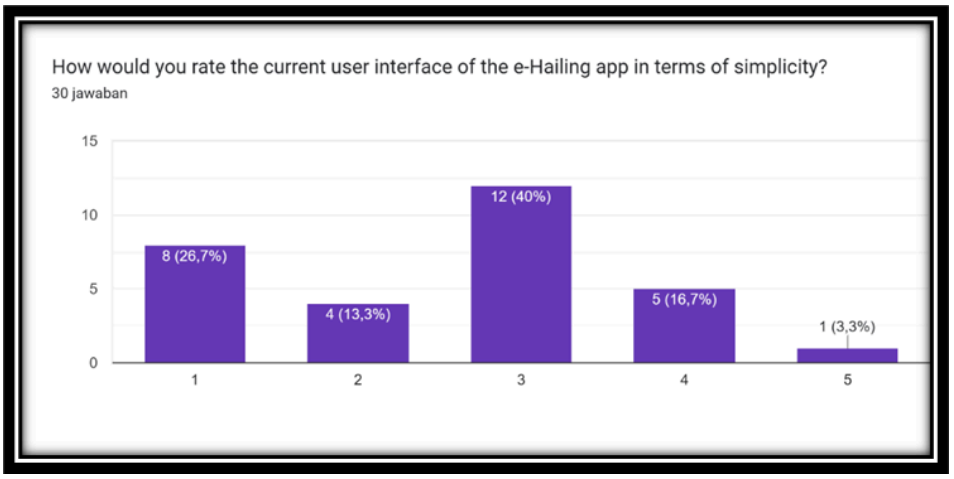
There are about 10 people who think the current e-hailing apps are very easy to use. While the e-Hailing system is easy to use, there are several individuals who experienced issues with the current system.

Question 2: Which features do you find most complicated to use in the current e-Hailing app? (Select all that apply)



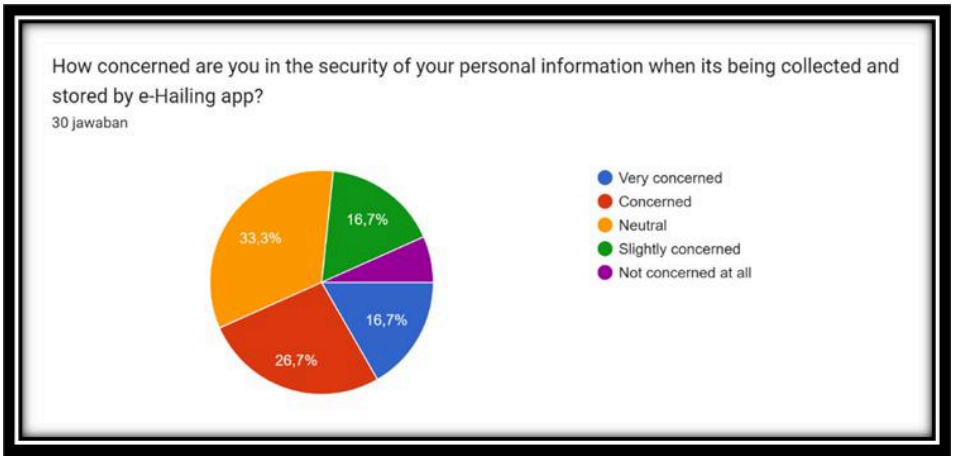
Almost half of the respondents agree that the most complex use in the e-Hailing app is setting the pickup location, followed by making payments.

Question 3: How would you rate the current user interface of the e-Hailing app in terms of simplicity?



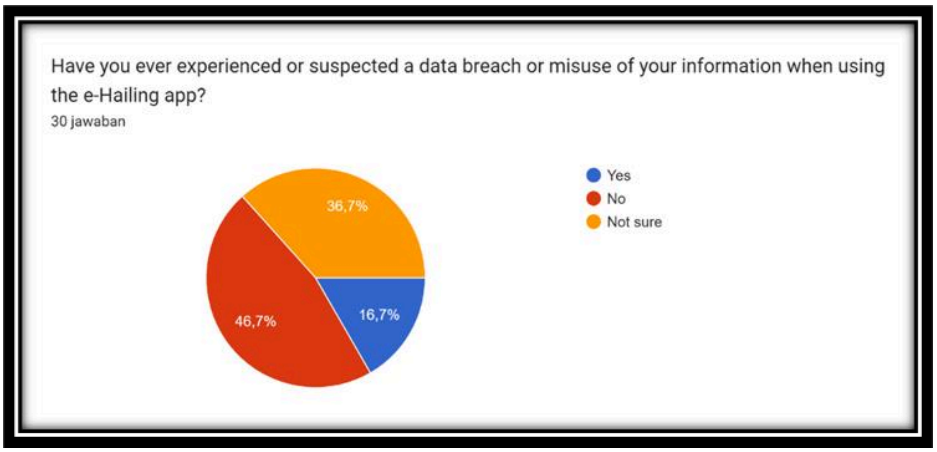
Most respondents rate the current UI of the e-hailing app as average. However, some of the respondents responded that they faced difficulties with the e-Hailing system design interface.

Question 4: How concerned are you in the security of your personal information when its being collected and stored by e-Hailing app?



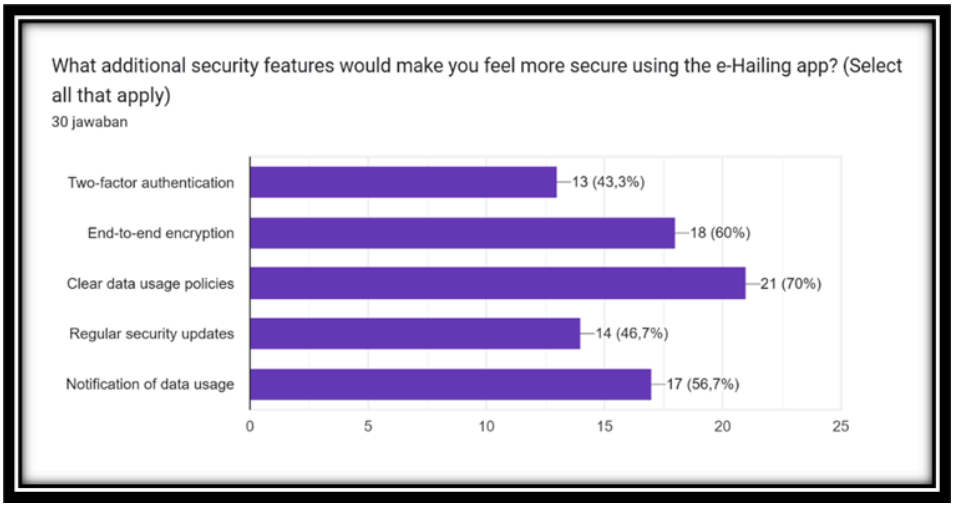
About 10 out of 30 people feel normal regarding the security of personal data in the e-hailing app, yet there are also some respondents who feel concerned about their data privacy online.

Question 5: Have you ever experienced or suspected a data breach or misuse of your information when using the e-Hailing app?



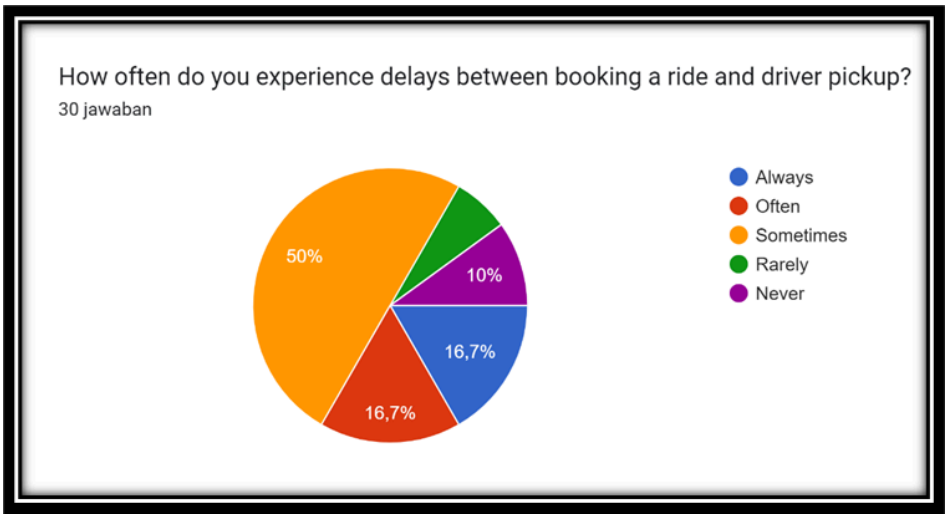
14 respondents never experienced data misused in e-hailing apps, but 5 of them had. This indicates that there have been cases of users' data being misused.

Question 6: What additional security features would make you feel more secure using the e-Hailing app? (Select all that apply)



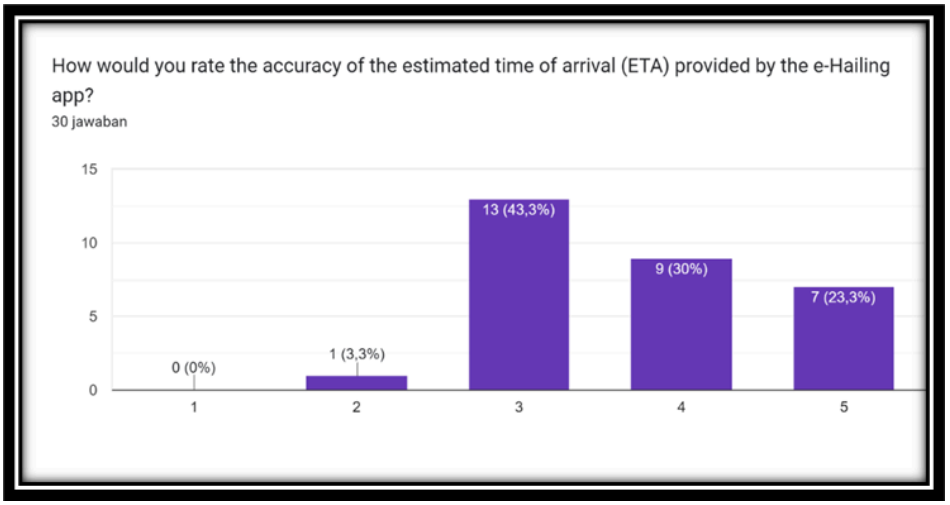
Data usage policies is the most demanded feature by more than half of the respondents, followed by end-to-end encryption and data usage notification feature.

Question 7: How often do you experience delays between booking a ride and driver pickup?



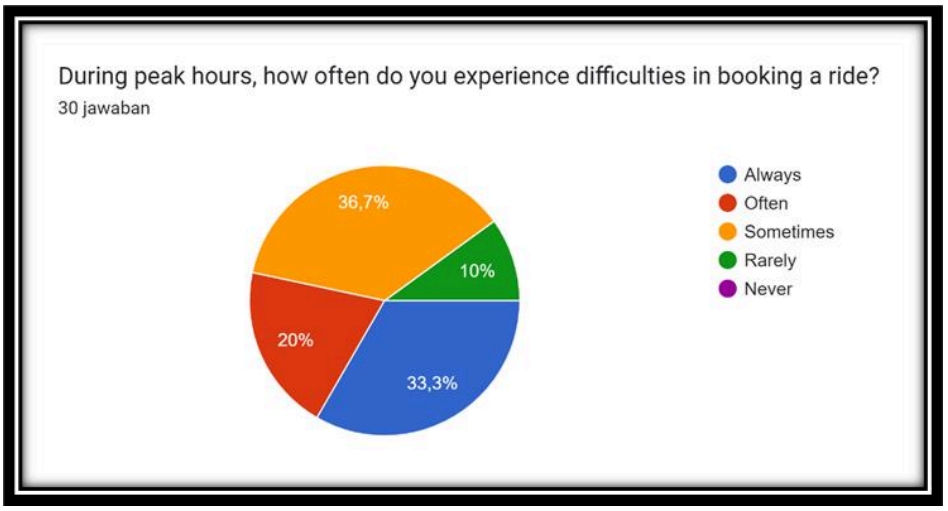
Occasionally, 15 out of 30 users got some time delays between ride booking and driver pickup. This is confirming us that there are users who experience delays in public transportation booking and pickup.

Question 8: How would you rate the accuracy of the estimated time of arrival (ETA) provided by the e-Hailing app?



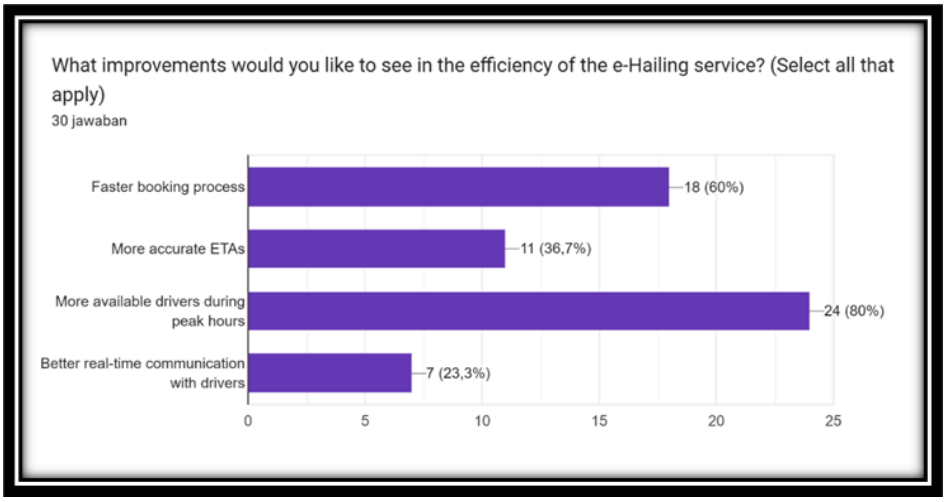
Almost every respondent feels that the ETA provided by the e-hailing app is accurate enough. Nevertheless, there is a respondent who responded less accurately.

Question 9: During peak hours, how often do you experience difficulties in booking a ride?



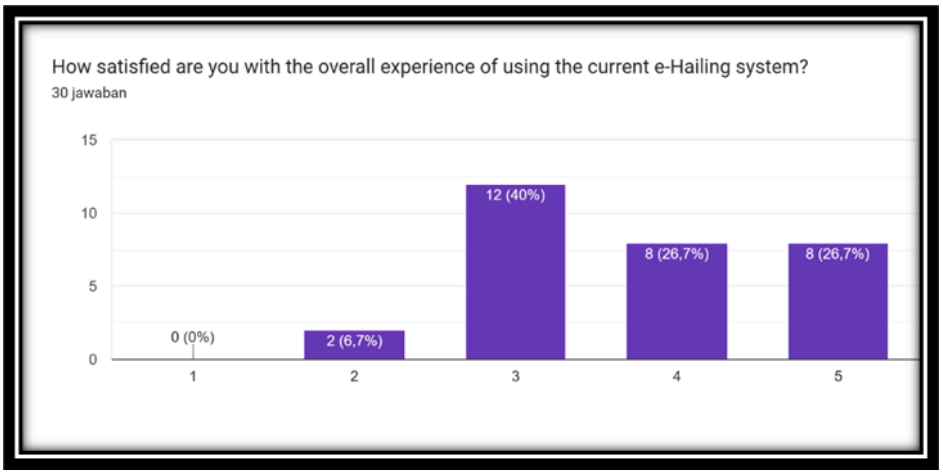
All respondents had experienced difficulties in booking a ride during peak hours of e-hailing. This tells us that during urgency periods, delays are more likely to occur.

Question 10: What improvements would you like to see in the efficiency of the e-Hailing service? (Select all that apply)



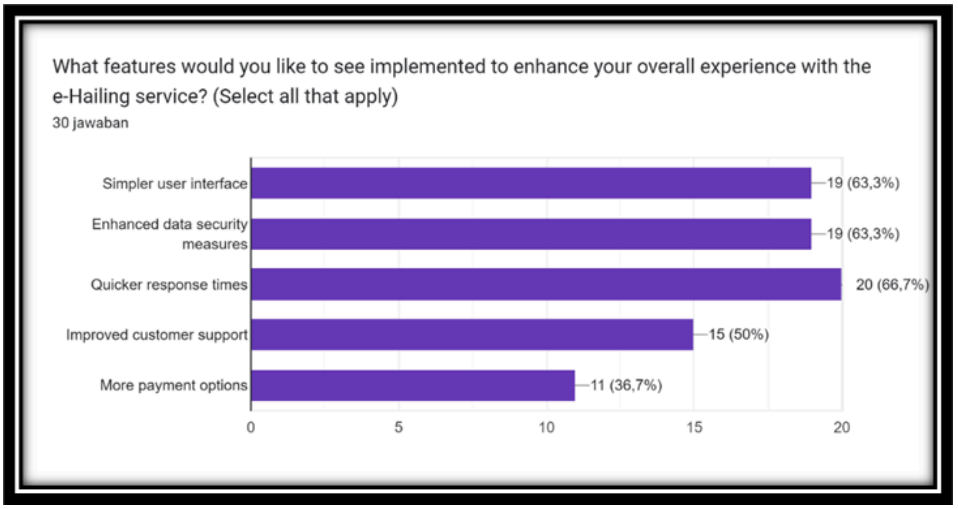
The most wanted improvement in the e-hailing system asked by users are related to drivers' availability in peak-hours period and the booking process time.

Question 11: How satisfied are you with the overall experience of using the current e-Hailing system?



More than 90% users are satisfied with the overall current e-hailing system, which is a high confidence level. Although it is quite high, we try to increase the confidence level even more to ensure a broader number of users will face minimal issues with the e-Hailing system.

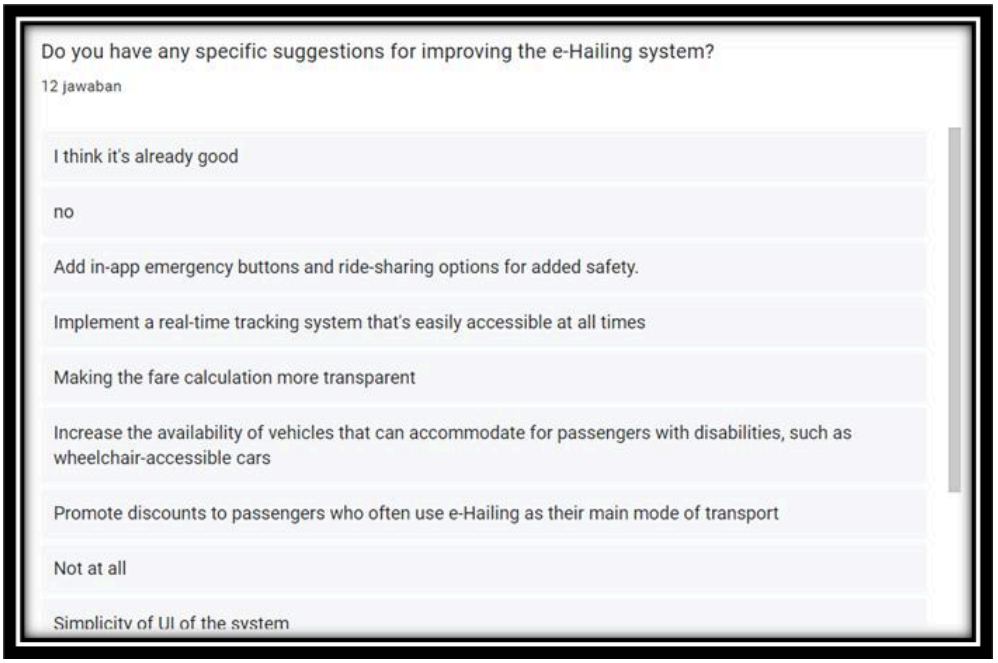
Question 12: What features would you like to see implemented to enhance your overall experience with the e-Hailing service? (Select all that apply)



Faster response times, data security enhancements, and a simpler UI are the features that users want to improve their overall experience with the e-hailing systems.

Question 13: Do you have any specific suggestions for improving the e-Hailing system?

Here are some other specific suggestions from the respondents.



(This question is not compulsory to fill, so not all respondents answered it.)

4.2 Summary from Method Used

By collecting the data through the survey, we can see some of the issues that currently still exist within the Grab application's system. Based on the users' input, we can focus on determining which aspects need to be improved first, like the peak-hours issue. This, hopefully, is what can help us to be able to create a better system than before, which can help solve the problems that are still bothering application users today and improve their experience when using it.

5.0 Requirement Analysis

5.1 Current Business Process

Here are the scenarios and workflow of the current system process for the **users**.

1) Login to the System
2) Main Menu Options
   The main menu displays options "Book a Ride", "Ride History", "Profile", "Settings", and "Help."

3) Book a Ride
   a) Enter Pickup and Drop-off Locations
      Users will decide their locations for pickup and drop-off.
   b) Select Ride Type
      Users choose the preferred ride type based on fare and vehicle availability that are able to tackle their urgent needs.
   c) Confirm Booking
      Users confirm the booking, and the system searches for available drivers. Estimated time of arrival (ETA) for the driver is displayed.
   d) Track Ride
      Users can track the driver's location in real-time on a map.

4) Ride History
   a) View Past Rides
      Users can view details of their past rides like date, time, fare, driver information, and route taken.

5) Settings
   a) Notification Preferences
      Manage notification settings for ride updates, promotions, and account alerts.
   b) Security Settings
      Update password and enable two-factor authentication.
   c) Privacy Settings
      Review and manage data sharing preferences and permissions.

6) Help
   a) FAQs and Support
      Access FAQs, contact support via chat or email, and report issues or provide feedback.

Here are the scenarios and workflow of the current system process for the **driver**.

1) Login to the System
   Drivers open the e-Hailing app.

2) Main Menu Options
   The main menu displays options such as "Availability", "Ride History", "Profile", "Earnings", "Settings", and "Help."

3) Availability
   a) View Ride Requests
      Drivers will see available ride requests such as pickup and drop-off locations.
   b) Accept Ride
      Drivers accept a ride request, and the system provides navigation to the pickup location.
   c) Start Ride
      Upon reaching the pickup location, drivers start the ride after confirming the passenger's identity.
   d) Complete Ride
      Drivers navigate to the drop-off location and complete the ride.

4) Ride History
   a) View Past Rides
      Drivers can view details of past rides, including date, time, fare, and passenger feedback.

5) Profile
   a) View and Edit Profile
      Drivers can view and edit personal information, vehicle details, and documents.
   b) Availability Hours
      Drivers can set up their preferred availability hours to the users or their journey of pickup and drop-off.

6) Earnings
   a) Earnings Breakdown
      Detailed breakdown of earnings, including daily, weekly, and monthly summaries.
   b) Payment Settings
      Manage payment methods and review payout schedules.

7) Settings
    a) Notification Preferences
       Manage notification settings for ride requests, system updates, and account alerts.
    b) Security Settings
       Update password and enable two-factor authentication.

8) Help
    a) FAQs and Support
       Access FAQs, contact support via chat or email, and report issues or provide feedback.

5.2 Functional Requirement (Input, Process, and Output)

5.2.1 Context Diagram

PROCESS	INPUT	OUTPUT
Current E-Hailing System	• Customer Order • Customer Data • Payment • Driver Info	• Booking Report • Customer Information • Payment Receipt • Driver Assignment

5.2.2 Diagram 0

PROCESS	INPUT	OUTPUT
Booking Online	• Customer Order • Customer Data	• Booking Information • Customer Data
Making Payment	• Payment • Customer Data • Booking Information	• Payment Receipt • Customer Details
Allocating Driver	• Customer Information • Driver Info	• Driver Info • Customer Information
Driving	• Driver Info	• Driver Assignment
Making Report	• Booking Information • Customer Information • Driver Info	• Booking Report

5.2.3 Child Diagrams

5.2.3.1 Child Diagram for Process 1: Booking Online

PROCESS	INPUT	OUTPUT
Entering Drop-off Location	• Customer Order • Canceled Order	• Customer Order
Entering Pick-up Location	• Customer Order	• Customer Order
Confirming Booking Order	• Customer Order • Customer Data	• Unconfirmed Order • Confirmed Order • Customer Data
Canceling Order	• Unconfirmed Order	• Canceled Order

5.2.3.2 Child Diagram for Process 3: Allocating Driver

PROCESS	INPUT	OUTPUT
Finding Driver Vacancies	• Customer Information • No Assigned Drivers	• Customer Information • Available Driver Vacancies • No Driver Vacancies
Finding Assigned Drivers	• No Driver Vacancies	• Available Assigned Drivers • No Assigned Drivers
Waiting Driver Sequentially	• Available Assigned Drivers	• Driver finished
Assigning Driver	• Customer Information • Available Driver Vacancies • Driver finished • Driver Info	• Driver Info • Customer Information

5.3 Non-functional requirement

5.3.1 Security

- The E-hailing system should employ multi-factor authentication (MFA) for user accounts, especially for administrators and drivers.
- Regular security audits and vulnerability assessments must be conducted every month to ensure data integrity online.

5.3.2 Performance

- The E-hailing system should be able to handle thousands of ride requests per second to ensure smooth operation during peak hours.
- Average response time for user requests should be less than 2 seconds. This will minimize the delays during peak hours whenever users are in urgency.

5.3.3 Scalability

- The E-hailing system must be able to scale horizontally to accommodate increased load without significant degradation in performance.
- The system should support scaling up to 100 000 simultaneous users to ensure everyone can apply for public transportation online easier.

5.3.4 Accessibility

- The E-hailing system must comply with accessibility standards such as WCAG 2.1 to ensure it is usable by people with disabilities.
- Features such as voice commands, screen readers, and adjustable text sizes should be supported as well.

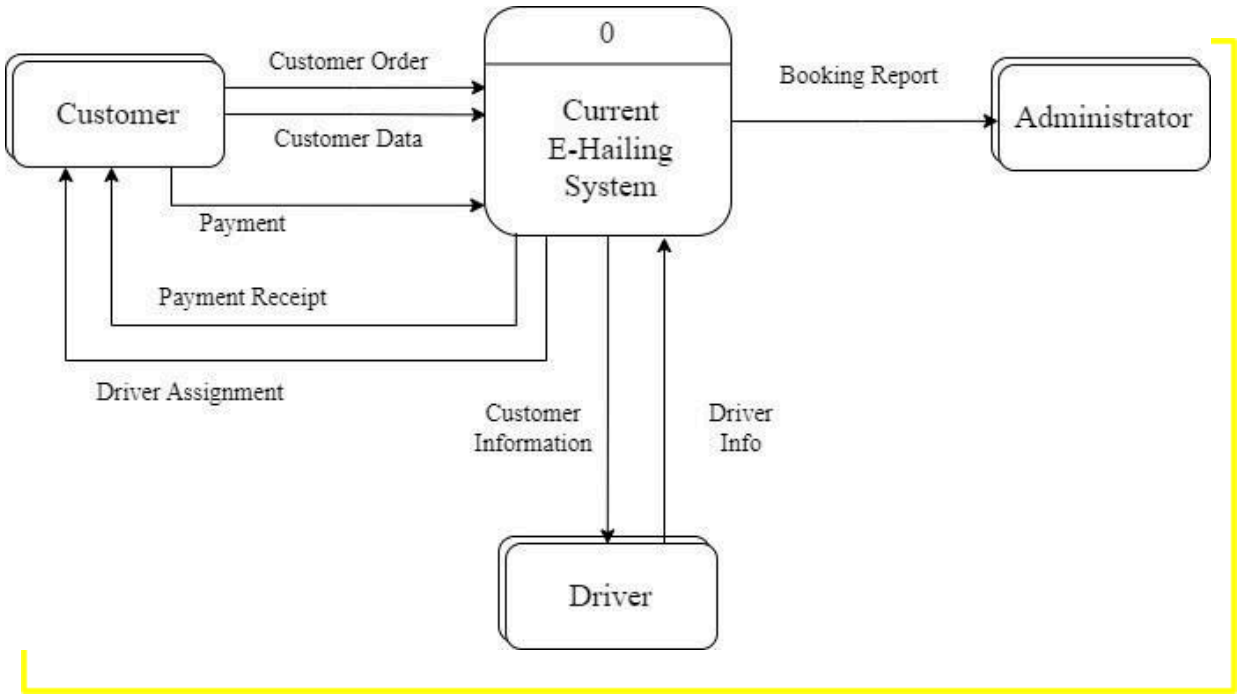
5.3.5 Resilience

- The E-hailing system must be able to recover from failures periodically.
- Disaster recovery plans should be in place, with data recovery tests conducted periodically.

5.4 Logical DFD AS-IS System

Logical Data Flow Diagram (DFD) for the current e-Hailing system.

5.3.6 Context Diagram



Context Diagram for the current E-Hailing system

5.3.7 Diagram 0

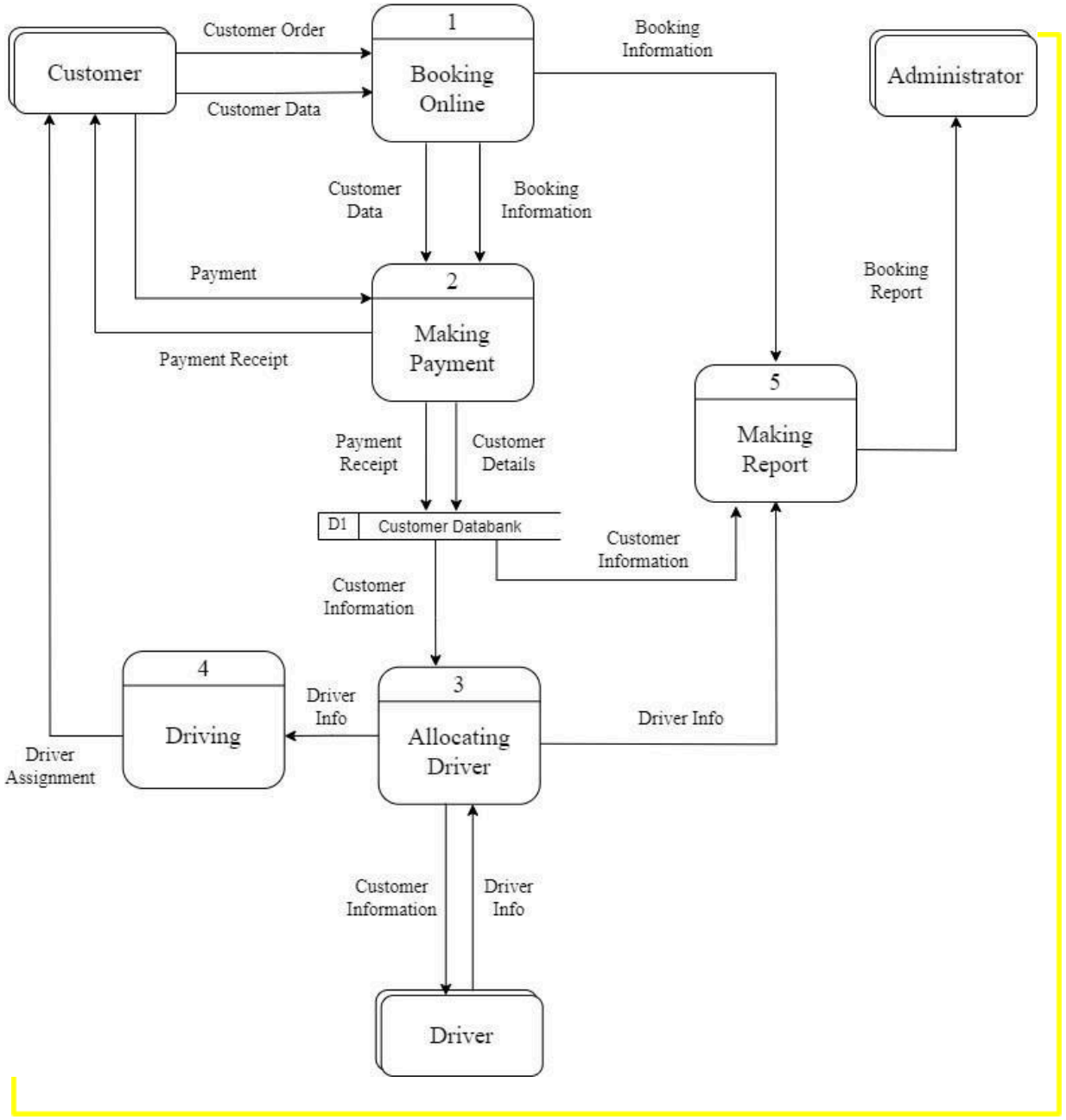
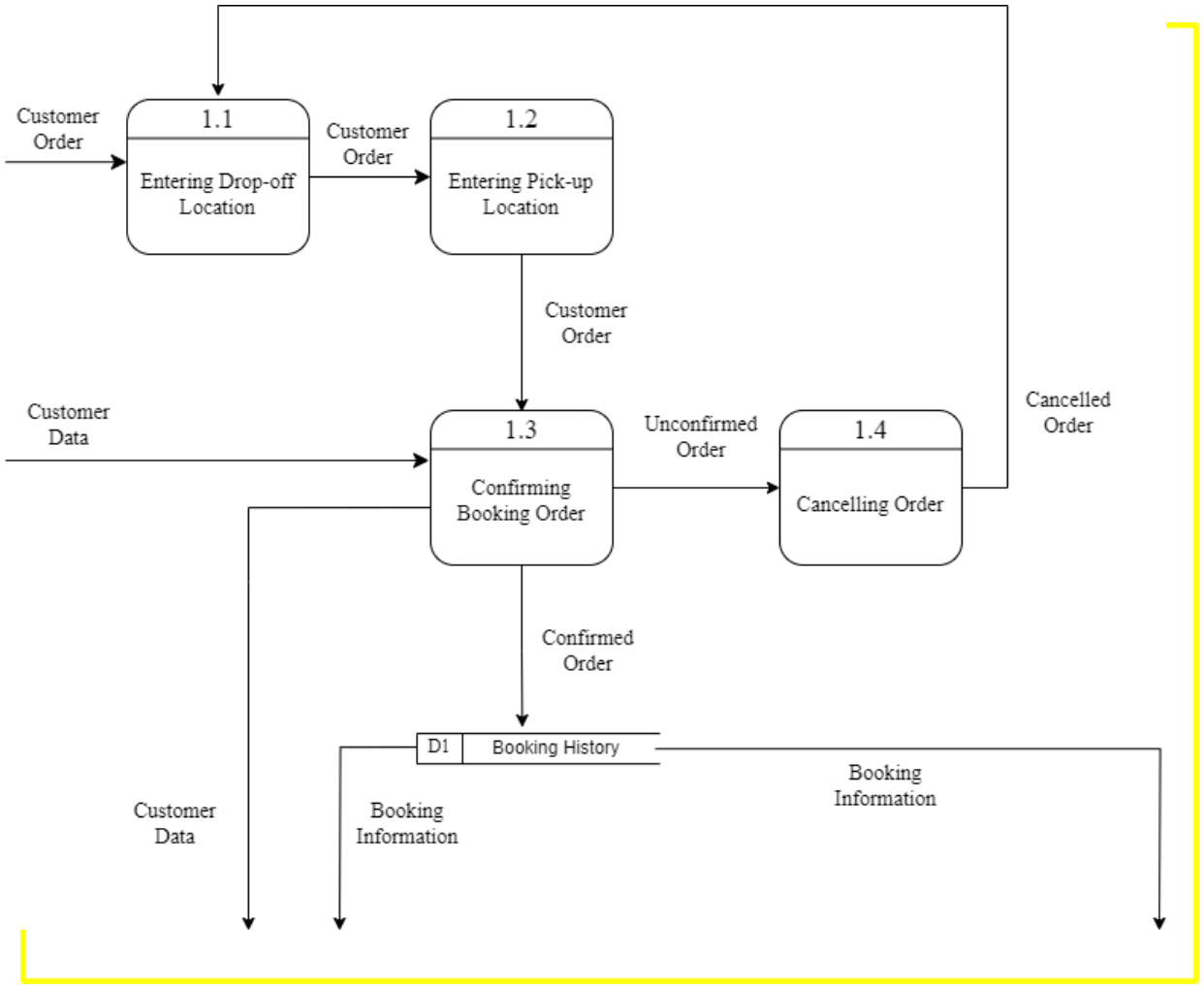


Diagram 0 for the current e-Hailing system

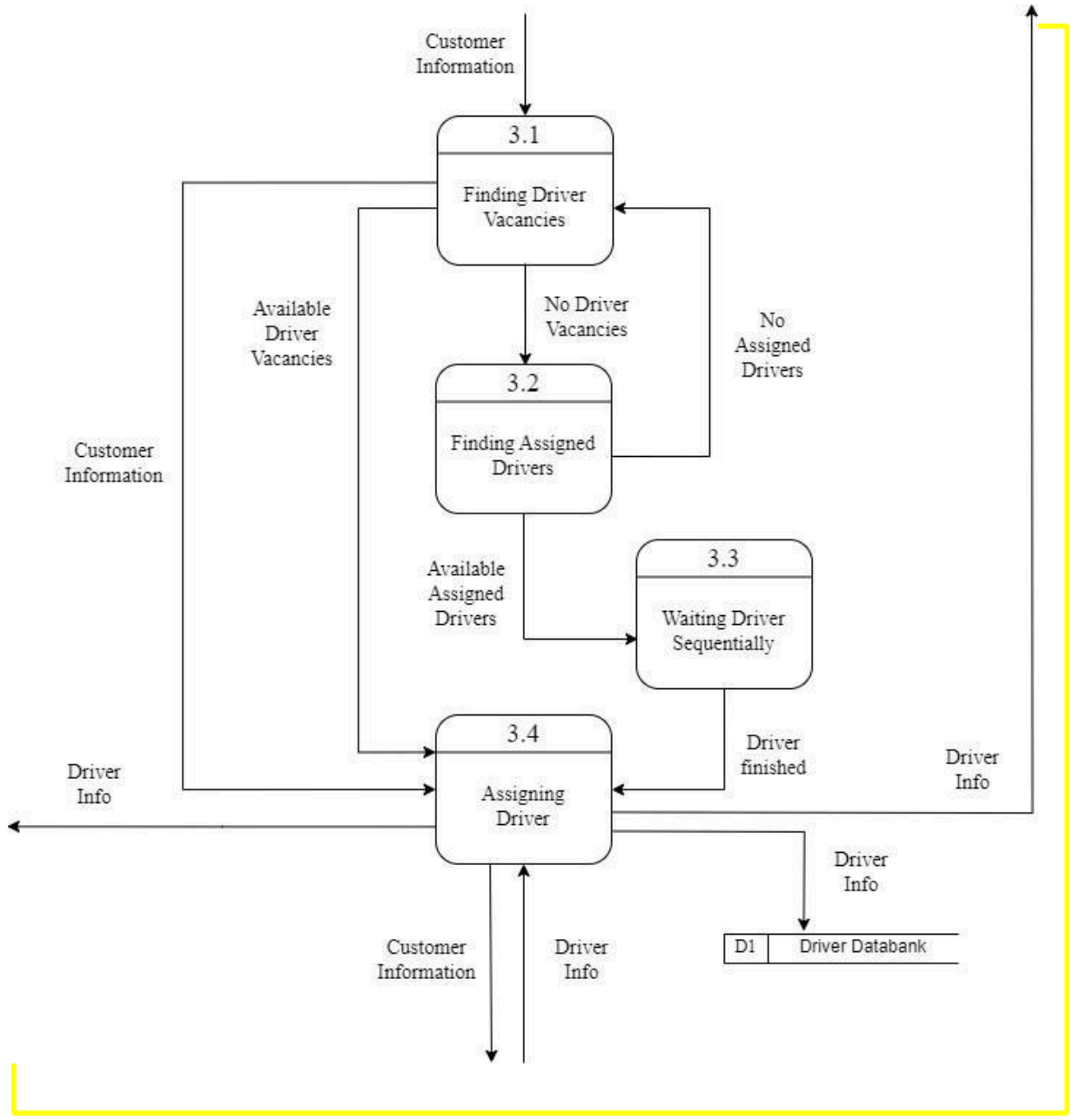
5.3.8 Child Diagram(s)

Process 1: Booking Online



Child Diagram for Process 1 (Booking Online) for the current e-Hailing system

Process 3: Allocating Driver



Child Diagram for Process 3 (Allocating Driver) for the current e-Hailing system

6.0 Summary of Requirement Analysis Process

In the requirement analysis process for our e-Hailing system project, we conducted a thorough examination to understand the needs and challenges faced by users and drivers. Here's a summary of what we did and what we found:

1. Information Gathering

We collected data using an online questionnaire. This method was chosen because it was efficient and feasible given our time and resource constraints. The questionnaire was distributed to various groups online, and we received 30 responses. The questions covered ease of use, complexity of features, data security concerns, booking delays, and overall user satisfaction.

2. Analysis of Responses

The data collected from the questionnaire revealed several key insights:

Ease of Use: Most users found the current e-hailing apps easy to use, but some had issues with setting pickup locations and making payments.
User Interface (UI): The majority rated the current UI as average, with a few facing difficulties. Data Security: There were mixed feelings about data security, with some users expressing concerns over their data privacy.
Booking Delays: Many users experienced delays between booking a ride and the driver's arrival, especially during peak hours.
Peak Hour Difficulties: All respondents had trouble booking rides during peak hours, indicating inefficiency in handling high traffic.
Desired Improvements: Users wanted better driver availability during peak hours, faster booking processes, enhanced data security, and a simpler UI.

3. Identified Requirements

Based on the responses, we identified several functional and non-functional requirements:

Functional Requirements:

- Simplified user interface for easier navigation.
- Real-time data processing to reduce booking delays.
- Cloud-based infrastructure to handle high data volumes.
- AI and machine learning for better demand forecasting and driver allocation.
- Anonymous reporting system and in-app emergency button for safety.

Non-Functional Requirements:

- Enhanced data security measures, including end-to-end encryption.
- Reliable and scalable system performance to handle peak-hour traffic efficiently.
- Affordable pricing model with a cap on surge pricing.

4. Conclusion

The requirement analysis process provided us with a clear understanding of the current system’s weaknesses and the users' needs. By addressing these issues with our proposed solutions, we aim to enhance the current e-Hailing system to a more user-friendly, secure, and efficient e-Hailing system that improves overall satisfaction for both users and drivers.

7.0 GitHub Link for Project Phase 2

https://github.com/Mathan0702/SYSTEM-ANALYSIS-AND-DESIGN

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SYSTEM ANALYSIS AND DESIGN

PROJECT PHASE 1 – PROJECT PROPOSAL

Lecturer Name:

DR ROZILAWATI BINTI DOLLAH @ MD. ZAIN

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Table of Contents

1.0 Introduction

E-Hailing is a service provided to book public transport services through electronic applications – a type of electronic system that allows users such as workers and students to travel around easily. An e-Hailing vehicle is a private vehicle used to provide public transport services to passengers who book through electronic applications. As simple as clicking a button, everything is possible from their houses and their desired destinations even miles away. With platforms such as *Grab*, *KumPool*, and *MyCar*, users now have easier and convenient ways to book their rides using their smartphone devices.

The common widespread uses of e-Hailing services throughout an area may include the increasing demand for public transportation. Users such as students can use these services to attend lectures and tutorial classes for their studies. Besides, factory workers who rely on public transportation can also benefit from e-Hailing services. In the modern era, smartphones are viable belongings in which everyone must have to do their work a lot easily. While doing their work, they also need to move around more efficiently. Thus, E-Hailing is a perfect solution for the users' travelling issues.

Several administrators and the workers of the e-Hailing service companies made a digital system design for e-Hailing services. This is to make sure users can access public transportation with just simple clicks on their devices. However, several issues related to the current system implementation with the end users sparked undeniable problems. In this project, we try to determine the problems of the current e-Hailing system, solutions to the problems, and to derive possibly a new and improvised system for the e-Hailing to ensure flexibilities and easier management among users.

2.0 Background Study

Firstly, we need to identify the users who encountered numerous issues with the current e-Hailing system. Several users complained about the complexities of the current e-Hailing system, especially for the older generations. Designers often include all possible features in e-Hailing systems, making them difficult for users unfamiliar with online services to navigate. As a result, these kind of users may find booking public transportation more of a hassle than necessary.

Secondly, due to a significant increase in technology usage in the modern era, e-Hailing has become a vital method of booking public transportation. Thus, many users will be keying in their personal information through the digital world. Many users are concerned about data privacy during the ordering process. Questions such as, “Is my information safe?”, “Is there a possibility where my information will leak online through irresponsible behavior of other people?” and “Are there any suspicious people who track down others using their submitted information online?” reflect widespread apprehensions about privacy and security, which can undermine trust in e-Hailing services among users.

Then, we are eager to know the efficacy of the e-Hailing system itself, whether the system is flexible enough to handle a large number of users across an entire place or even an entire country. Users have reported delays between ordering and driver pickup, particularly in urgent situations like being late for class or work. These delays often result from inefficiencies in the system’s coordination with the management, causing dissatisfaction among users who need immediate transportation.

3.0 Problem Statement

Based on the background studies, we identified **three** problems with the current e-Hailing system, which include...

- The current e-Hailing system design may be too complex for users (less user-friendly), especially for inexperienced users and older generations to book public transportation online.
- The current e-Hailing system design may lack data protection and security issues since the users will provide their personal information to the e-Hailing service drivers. This may lead to illegal ethical privacy issues among irresponsible people.
- The current e-Hailing system design may face high user traffic due to high ongoing demands since people nowadays especially younger generations prefer to apply for easier and convenient public transportations. This could cause major delays between users and the system with the services if not handled carefully.

By identifying these problems, we are able to proceed to the feasibility studies and to identify the needs of an improvised e-Hailing system design.

4.0 Proposed Solutions

4.1 Technical Feasibility

Technical feasibility assesses whether the technology required to develop the new e-Hailing system is available and capable of meeting the project's requirements.

System Architecture:

- **Application System Design**
    - Developing intuitive and user-friendly e-Hailing system is essential. The interfaces designed with simplicity in mind, especially for older users. For example, features like larger icons, voice commands, and simplified navigation.
- **Security Measures**
    - Implementing enhanced security measures, such as data encryption and securing authentication protocols. This will address user concerns about data privacy and protection.
- **Real-Time Data Processing**
    - Utilizing real-time data processing technologies like *Apache Kafka*, can ensure that user requests and driver availability are updated instantly, reducing delays and improving system efficiency.
- **Cloud-Based Infrastructure**
    - Implementing a cloud-based system can provide scalability, flexibility, and reliability. This can handle large volumes of data and user requests a lot efficiently.

Integration with Existing Systems:

- **GPS and Mapping Services**
    - Integrating with reliable GPS and mapping services like *Google Maps* can enhance route optimization and provide accurate estimated time arrival (ETA).
- **Payment Gateways**
    - Secured payment gateways needed to offer multiple payment options to ensure user convenience and data security.

Technological Innovations:

- **AI and Machine Learning**
    - Using AI for predictive analytics can improve demand forecasting, optimizing e-Hailing driver allocation, and personalize user experiences.
- **Internet of Things (IoT) and Telematics**
    - Incorporating Internet of Things devices and telematics can provide real-time vehicle diagnostics, improve safety, and to enhance overall system efficiency in general.

5.0 Economic Feasibility

Economic feasibility examines the cost-effectiveness of the proposed e-Hailing system and its potential for financial viability.

Cost Analysis:

- **Development Costs**

  This includes expenses for hardware tools, software development, and integration of third-party services like GPS system.

- **Operational Costs**

  These include server maintenance, customer support, marketing, and regular system updates.

- **Security Investments**

  Allocating budget for advanced security features and compliance with data protection regulations is crucial to protect user information and maintain trust.

Revenue Analysis:

- **Commission from Rides**

  Charging a commission fee on each ride is a primary revenue source of e-Hailing services.

- **Subscription Models**

  Offering premium features through a subscription model can generate additional revenue.

- **Advertisement**

  Integrating advertisements within the app can provide another revenue stream, provided it does not interfere with user experience.

Predictions made using *Cost-Benefit Analysis* (CBA):

Estimated Costs:

Training for drivers and support staff: RM 20 000

Mobile Apps: RM 10 000

Customer Support: RM 5 000

Vehicle Maintenance: RM 30 000

Expected Benefits:

Increased accessibility for users: RM 2 000 per month

Reduction in traditional taxi service competition: RM 25 000

Revenue generation through ride commissions: RM 10 000

Assumptions:

Discount rate: 15%

Sensitivity factor (cost): 0.50

Sensitivity factor (benefit): 0.90

Annual increment (costs): 5%

Annual increment (benefit): 15%

Cost-Benefit Analysis (CBA) table is on page 10 (next page).

Cost-Benefit Analysis (CBA) for our team's E-Hailing Project Proposal

CRITERIA (RM)	YEAR

1. COSTS	YEAR 0	YEAR 1	YEAR 2	YEAR 3
A. Development				
Mobile Apps	5 000			
Training for drivers and support staff	10 000			
Total Development Cost	15 000			
B. Operational				
Customer Support		2 500	2 625	2 756
Vehicle Maintenance		15 000	15 750	16 538
Total Operational Cost (Annual)		17 500	18 375	19 294
Present Value (PV)		15 217	13 894	12 686
Accumulated Cost		30 217	44 112	56 797
2. BENEFITS				
Increased accessibility for users		21 600	24 840	28 566
Reduction in traditional taxi service competition		22 500	25 875	29 756
Revenue generation through ride commissions		9 000	10 350	11 903
Total Benefit (Annual)		53 100	61 065	70 225
Present Value (PV)		46 174	46 174	46 174
Accumulated Benefit		46 174	92 348	138 522
Gain/Loss		15 957	48 236	81 725
Profitability Index	5.448			

The estimated profitability index (PI) value for our e-Hailing project proposal is **5.448**.

Based on our prediction of data, we obtained a PI value higher than 1.00. Thus, we estimated this as a good investment.

6.0 Operational Feasibility

User Training and Support:

- **Training Programs**
    - Offering training sessions and convenient tutorials to users, especially older generations to be familiar with the improvised user-friendly e-Hailing system.
- **Customer Services**
    - Provide users with customer feedback and reviews on the improvised e-Hailing system to enhance system reliability.

Scalability:

- **Pilot Implementation**
    - Testing the improvised e-Hailing system among smaller community to gain feedback before launching it officially to the public.

Operational Workflow:

- **Driver Management**
    - Implementing a streamlined driver management system to handle onboarding, scheduling, and performance tracking.
- **Incident Management**
    - Setting up a comprehensive incident management process to address and resolve issues swiftly, ensuring minimal disruption to services.

Regulatory Compliance:

- **Safety and Regulations**
    - Making sure the improvised e-Hailing system secured from illegal data and information incidents through multiple stages of indirect digital communication between users and the administration.

7.0 Objectives

Based on our achievable feasibility studies and the problem statements derived, we can determine three achievable project objectives to look for a newly improvised e-Hailing system based on our three proposed problems, which include…

- Develop and design a generalized user-friendly design from the current e-Hailing system, to ensure everyone including younger and older generations to utilize e-Hailing services efficiently by reducing the system complexities.
- Implementing a high data and privacy security for the current e-Hailing service systems, to ensure data ethical and safety among users whenever entering their personal information online and among administrations collecting users' data for future uses.
- Develop and design multiple ordering channels under a single e-Hailing service system, to ensure multiple users can access e-Hailing services quickly, hiring more e-Hailing drivers to allocate users' time efficiently and to reduce traffic delays compared to lesser order channels.

By referring to our objectives, we are able to identify the hotspots for improving the current e-Hailing system to ensure flexibility, reliability, and reusability.

8.0 Scope of the Project

Our scopes of the project may include…

- User-friendly design of the e-Hailing system.
- Enhanced security authorization and data protection when entering data via online booking of public transportations, or in other words netiquette.
- Providing multiple ordering channels and e-Hailing driver slots to ensure a quicker user experience.

We aim to reduce…

- System complexities to ensure all users regardless of their age range will be easier to book for e-Hailing transportation on digital world.
- Users concern about data privacy and security issues online.
- Delay issues within the e-Hailing system and the users – to minimal time latency issues among users who are in need of urgency.

9.0 Project Planning

The important phase is the project planning, where we planned and discuss the possible ways to achieve our goals. There are four parts in our project planning, which are Human Resource, Work Breakdown Structure (WBS), PERT chart and Gantt chart.

10.0 Work Breakdown Structure (WBS)

For every journey towards the final touching of our project, we have defined detailed steps in identifying project studies, backgrounds, problems, objectives, scopes, thorough analysis, estimations, developing and designing the system and implement the system to the targeted users. A periodical maintenance is crucial to ensure the e-Hailing system's efficacy and up-to-date.

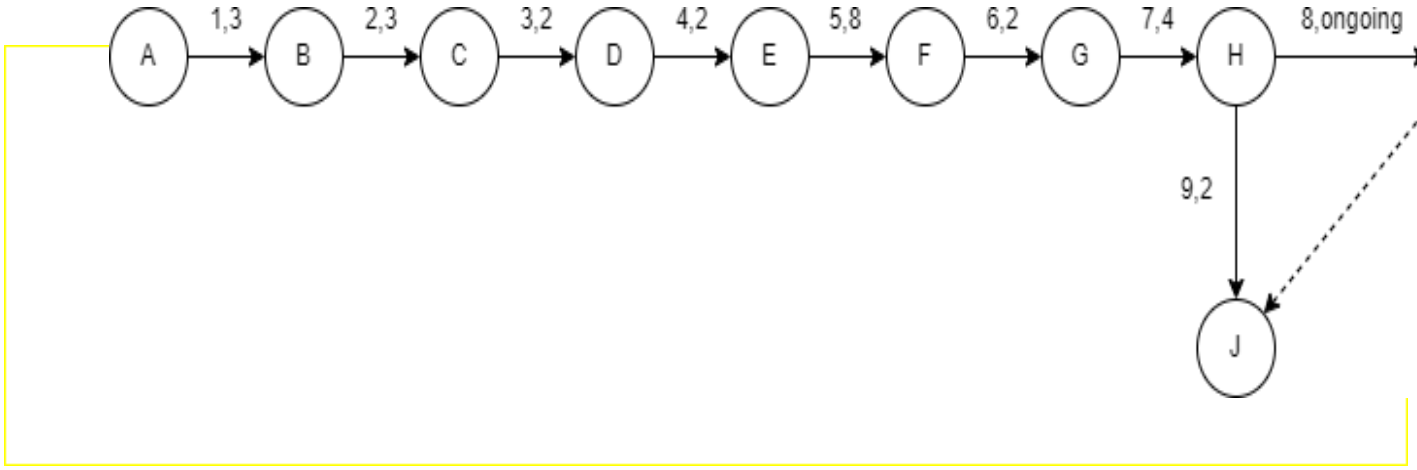
No.	Tasks	Duration (weeks)	Predecessor
1	Identifying Backgrounds, Problems, Opportunities, Objectives, and Project Scopes	3	
2	Conduct surveys and interviews with users for the current e-Hailing system	3	1
3	Analyzing Feedback of Current e-Hailing System	2	2
4	Estimating project budget, time, and resource requirements	2	3
5	Developing and Designing a new e-Hailing system	8	4
6	Testing and Documentation	2	5
7	Phased Implementation	4	6
8	Improvised e-Hailing System Maintenance	Ongoing	7
9	Post-Implementation Reports	2	7,8
		⩾ 26 weeks	

Work Breakdown Structure (WBS) for our proposed improvised e-Hailing system

We predicted a minimal total of 26 weeks required to complete our proposed improvised e- Hailing system. The rest weeks are only for maintenance of the new system.

11.0 PERT Chart

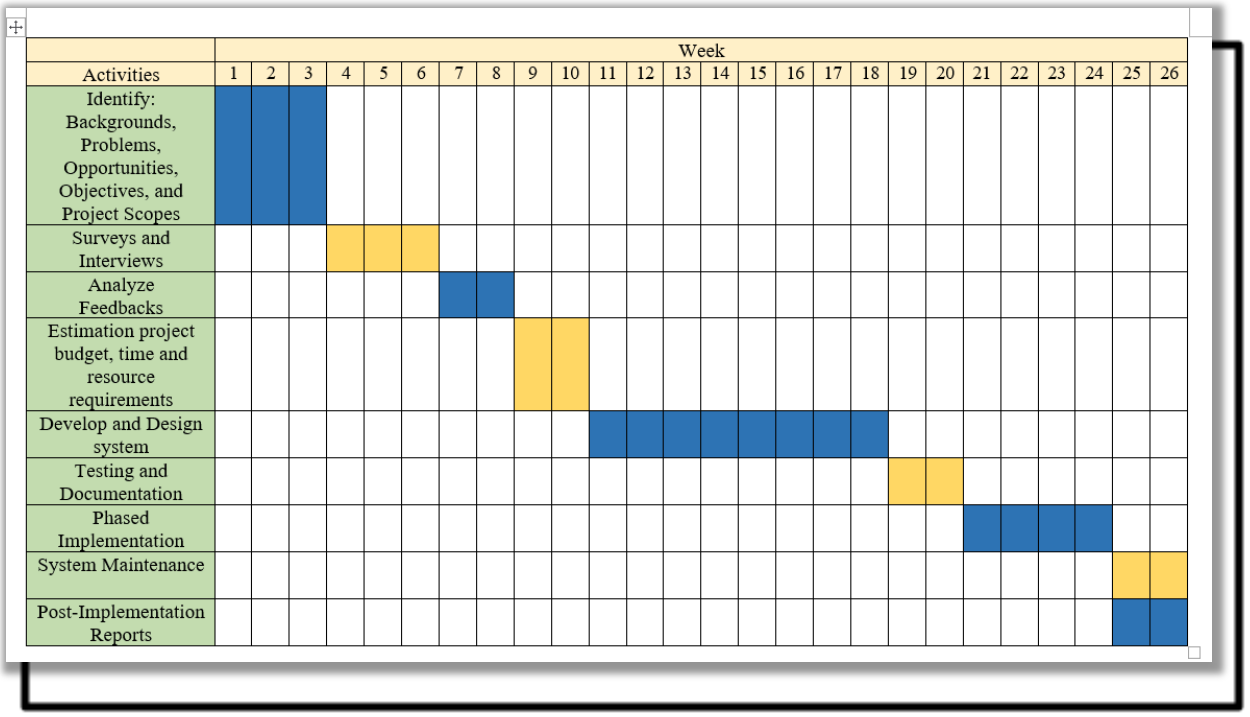
Our PERT diagram is a conversion of our Work Breakdown Structure (WBS) to identify a detailed flow of our project processes more collectively. This is to help us keeping the project at the right track within a certain period easily.



PERT Diagram for our proposed improvised e-Hailing system

12.0 Gantt Chart

A modified version of our PERT diagram. Gantt chart allows us to see any overlapping activities and/or activities with completed predecessors to make sure we can achieve an optimal time spent on the project.



Gantt chart for our proposed improvised e-Hailing system activities

13.0 Benefit and Overall Summary of Proposed System

In conclusion, we aim to achieve optimal performance by developing and designing an improved e-Hailing system that enhances user expectations and satisfaction. Our proposed project objectives ensure users benefit from a simplified user interface for easier e-Hailing management across all ages. Additionally, users will enjoy enhanced data protection and security through secure digital transactions when booking public transportation online. Furthermore, users will benefit from quicker e- Hailing transport arrival, reducing delays and improving their overall experience.

We propose an improved e-Hailing system that aims to revolutionize the transportation experience for users of all ages. By addressing the complexities of the current system, enhancing data privacy and security measures, and optimizing transportation service efficiency, our goal is to provide a user-friendly system design, enhanced data protection, and quick response to user needs.

By prioritizing these objectives, we believe our proposed e-Hailing system will help users easily book public transportation online, regardless of age. Additionally, their personal information will remain safe and secure, and they will benefit from quick estimated times of arrival to ensure user satisfaction.

Hence, our proposed e-Hailing system represents a step forward in the ongoing journey towards creating smarter, more efficient, and user-centric transportation solutions. With the support of stakeholders and the dedication of our team, we are confident that this system will positively influence users across the entire country.

14.0 References

Ministry of Transport Malaysia, (2024). *e-Hailing Services*. Retrieved from https://www.mot.gov.my/en/land/infrastructure/e-hailing-services

Kendall, K.E. & Kendall, J.E., 2024. *System Analysis and Design*. 11th Ed. Essex: Pearson.

15.0 GitHub Link for Project Phase 1

https://github.com/Mathan0702/SYSTEM-ANALYSIS-AND-DESIGN