



**UNIVERSITI TEKNOLOGI
MALAYSIA**

**System Analysis and Design
(SECP 2613)**

PROJECT

Phase 3: Analysis and Design

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1.0 Overview of the Project

The project is to develop a Car Rental Management System for Hasta Travel, a car rental service operating at Universiti Teknologi Malaysia (UTM). The goal is to replace the existing manual system which is leading to inefficiencies, errors and delays in daily operations such as booking management, tracing payments, and tracking availability of cars.

The new system will automate and simplify business via internet-based booking, real-time vehicle tracking, dynamic pricing, and payment reconciliation automation. It will enhance transparency and accountability by providing a central platform upon which customers can view the rental history, upload payment vouchers, and receive automated booking confirmations.

Through the features like dynamic pricing and confirmation notification automation, the system will improve overall service quality and operational speed. In the end, this project will render the rental experience for UTM students and staff, along with external customers, more convenient, efficient, and user-friendly.

2.0 Problem Statement

This section extracts and refines the problem statement identified in Phase 1 regarding the current vehicle rental management system as well as informs the design direction for system enhancement.

2.1 Manual Data Handling Incurs Human Error and Operational Inefficiency

The existing system relies on manual processes for data entry and report generation. This may cause data inconsistency, human error, and delays in producing essential documents such as financial reports. These delays significantly bring negative impacts on auditing processes and decision-making in management.

2.2 Absence of Real-Time System Integration

There is no real-time linkage to integrate the booking, payment, fleet, and accounting systems. This disconnect causes slow payment verification, delays in deposit updates, and inconsistencies in booking statuses. These issues may lead to poor system reliability and wasting time of staff to fix the errors.

2.3 Lack of a Centralized User Platform and Limited User Autonomy

The current system does not offer a centralized digital platform for users to manage their bookings, payments, and rental history. Users must access basic services from staff. This reduces transparency because the users are hard to access their own information easily. This also poses security risks due to uncoordinated data records. Overall, the current system leads to poor user experiences, heightened security risks, and increased operational costs.

2.4 Inflexible Pricing Structure and Model

The current system relies on a fixed pricing model that does not take into account variations in demand based on timing, such as peak and off-peak hours. This lack of dynamic pricing results in inefficient income management and may fail to encourage customers to make bookings during low-demand periods.

2.5 Weak Risk Management Due to Lack of Customer Blacklisting

The current system lacks an automated mechanism to detect and flag high-risk customers, such as those with a record of delayed payments, defaults, or frequent accidents. This absence increases the risk of financial losses, vehicle damage, and additional workload in handling such customers.

3.0 Proposed Solutions

To overcome the problems in the existing vehicle rental management system that have stated above, a centralized web-based platform will be developed as an effective solution. This platform will support real-time data synchronization and integration across all systems such as booking, payment, fleet and accounting to ensure the real-time updates. Automation features will be introduced in the improved system to reduce human errors due to the manual data handling. Besides, a dynamic pricing system will be introduced to optimize revenue of the company based on the peaks and troughs as well as timing. The following subsections discuss the solution's technical, operational, and economic feasibility in detail.

3.1 Technical Feasibility

Since there is lots of data involved, the system should ensure the security, scalability and automatic backups to minimize and reduce the risk of data loss and data breaches. Hence, cloud technologies such as AWS or Firebase will be utilized. To ensure that the platform may be accessed anytime and anywhere, the system will be designed as a web-based to allow authorized users to ensure it all time. Besides, real-time integration among booking, payment, fleet, and accounting modules will be implemented via API-driven communication to ensure all the data are synchronized and prevent data inconsistencies. These technical measures may enhance the reliability and performance of the overall system.

3.2 Operational Feasibility

The proposed system will feature an intuitive and user-friendly interface aimed to minimize the learning curve for both staff and customers. Automated systems that will be implemented in various processes such as booking confirmations, blacklist management and report generation not only reduce manual efforts and inaccuracies, but also allow staff to focus on more value added tasks. The self-service portal allows users to directly manage their bookings, payments and rental history. This increases transparency and customer satisfaction.

3.3 Economic Feasibility

In spite of the fact that initial stages of implementation involve a moderate amount of investment, it will be financially beneficial in the long term. The reason is that automation will alleviate the labor expenditures in the long-term. Not only that, a dynamic pricing system will be introduced to ensure that the company gets optimal revenue during the high demand time. Moreover, general detailed and optimization of the system, self-service portals should contribute to user experience and satisfaction. This can create customer loyalty and repeat in order to use the system. Overall, these improvements are believed to boost operational efficiency and reduce overhead costs, making the proposed system economically viable.

4.0 Current Business Process/Workflow

Workflow Steps:

1. Customer Inquiry:

After selecting the vehicle, the customer submits a booking inquiry via the Hasta Travel website or WhatsApp, asking about the availability of the vehicle. There will be some details collected, namely name, email, matric/staff ID, IC/passport no, address, selected car model and rental details.

2. Availability Check:

Staff opens the internal "Track" system. Staff manually checks vehicle availability if the requested vehicle is available for the requested time and date using spreadsheets or physical records.

3. Booking Confirmation:

If a vehicle is available, staff confirms the booking with the customer.

4. Customer Information Collection:

For new customers, staff collects personal details while for returning customers, staff retrieves existing records. Customers have to send their Identity Card (IC), matric card and also driving license for verification.

5. Payment Processing:

Two options are given to customers, which are deposit payment, deposit and full payment. Moreover, instalments are allowed for long-term rental. Customers make payment via QR, bank transfer or cash. Then, staff manually verified payment receipts and recorded the payment details. If only a deposit is made, full payment must be done before vehicle pickup. After full payment is made, staff will provide a customer rental agreement and terms and conditions.

6. Vehicle Preparation:

Staff prepares the vehicle for rental, ensuring it is clean and fueled.

7. Vehicle Handover:

Customer collects the vehicle after staff conducts a pre-rental inspection and notes any existing damages.

8. Vehicle Return:

Customer returns the vehicle. If it is over time, a penalty of RM35/hour is applicable. Next, staff conduct a post-rental inspection to identify any new damages or issues.

9. Finalization:

If the vehicle is fine, staff processes the deposit return. Staff uploads the bank statement for refund confirmation. However, if issues are found, staff calculates penalty or damage charges. Deductions are made from the deposit. Finally, the staff updates the condition report.

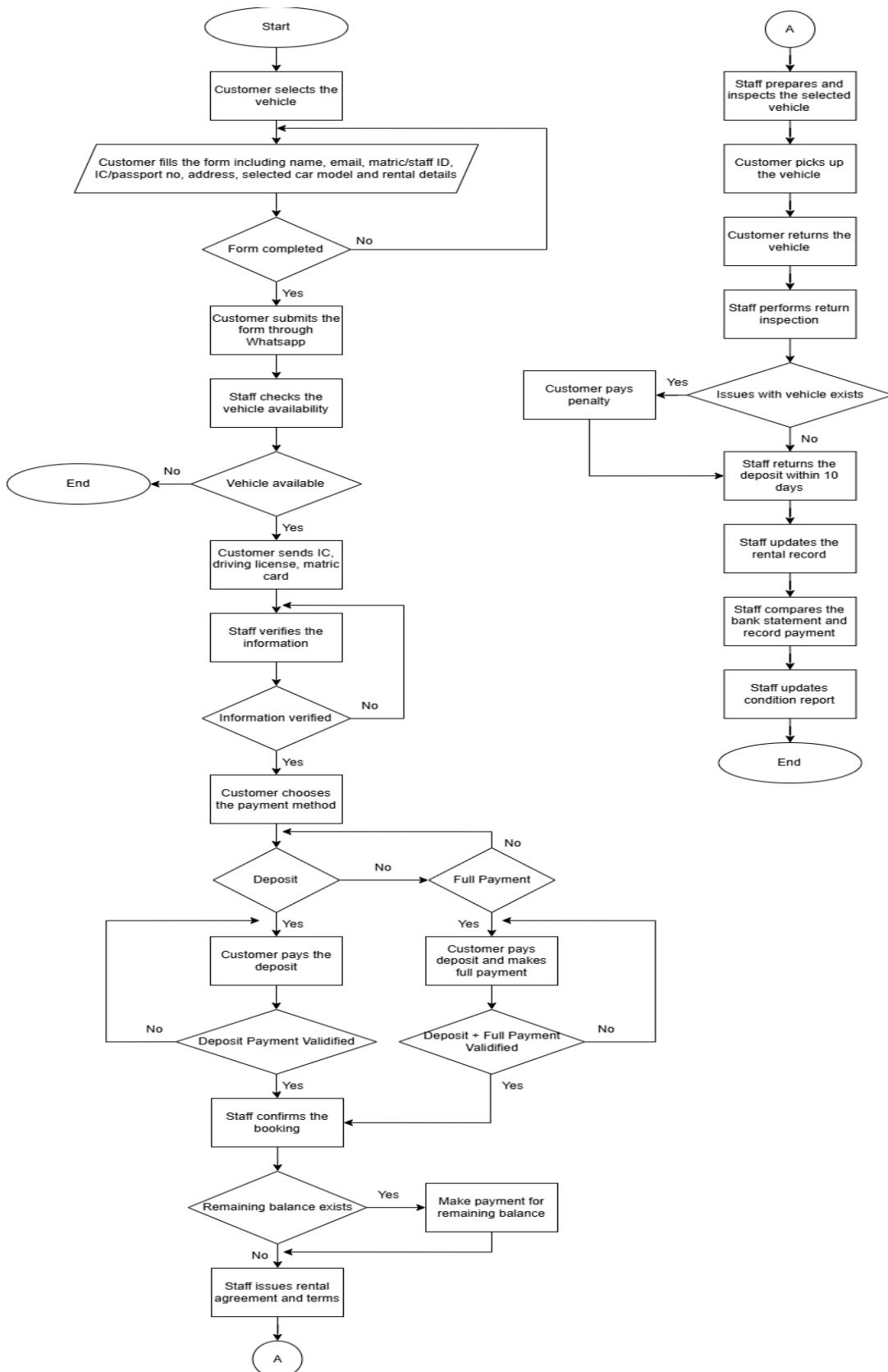


Figure 4.1 Flowchart of Current Business Process

5.0 Logical DFD (AS-IS)

5.1 Context Diagram

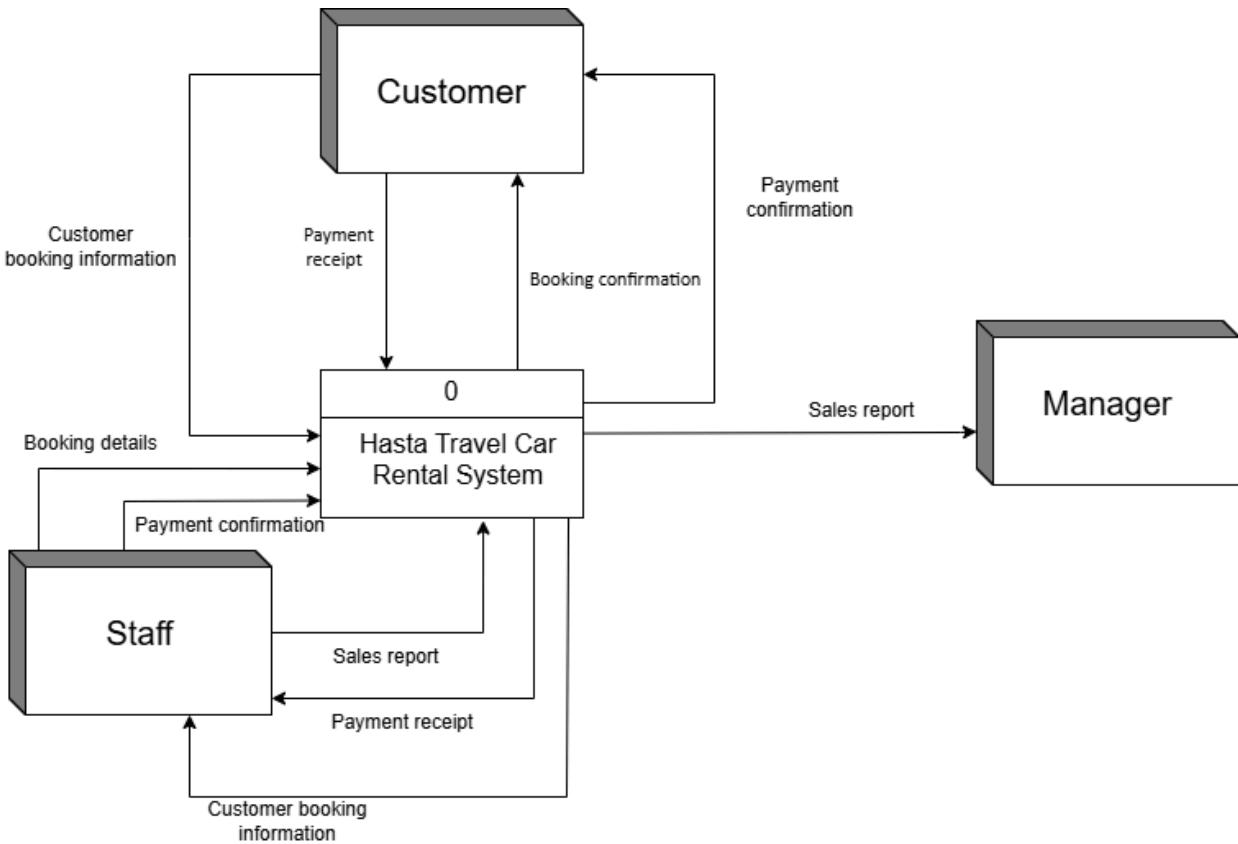


Figure 5.1.1: Context diagram for logical DFD (AS-IS)

5.2 Diagram 0

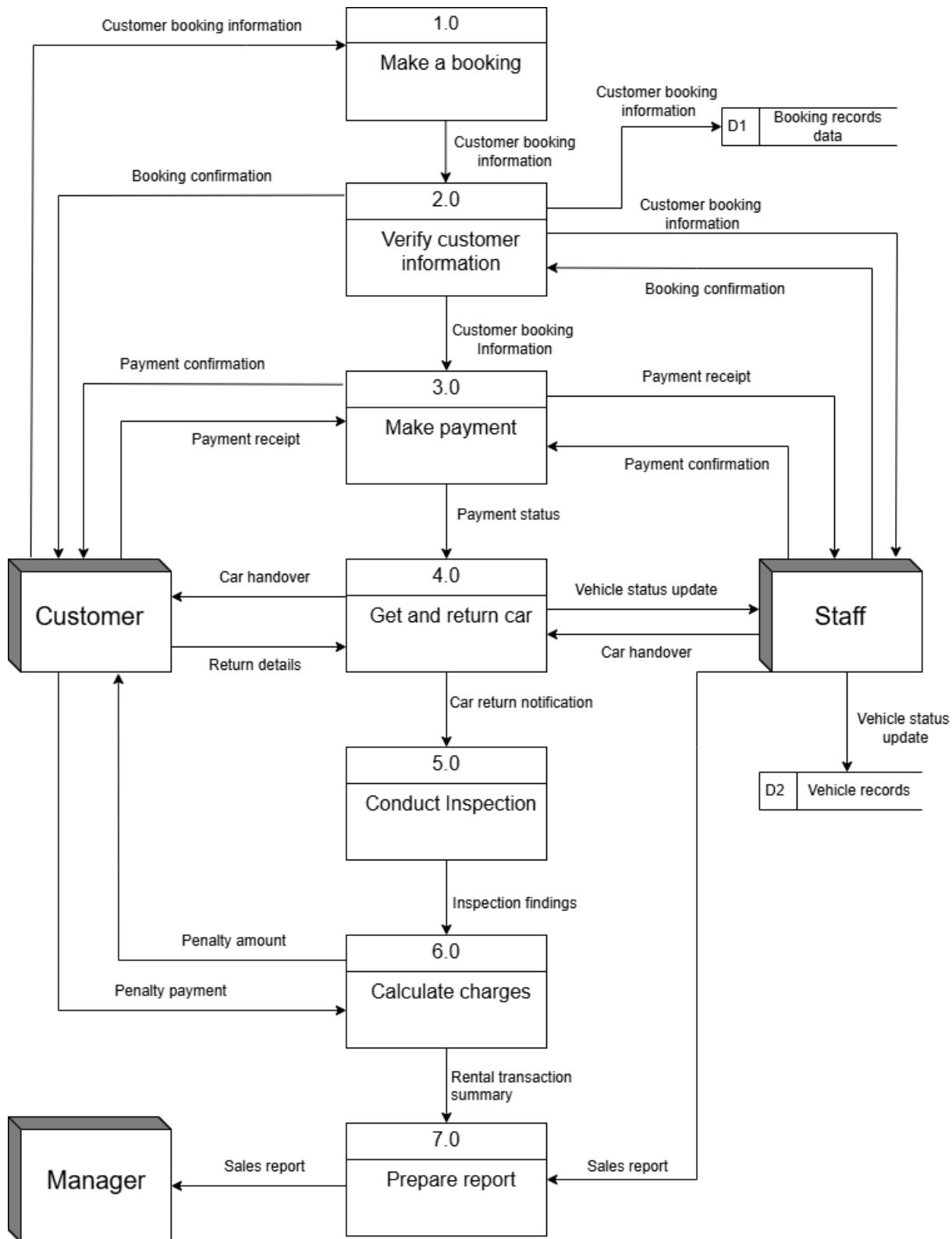


Figure 5.2.1: Diagram 0 for logical DFD (AS-IS)

5.3 Child Diagram

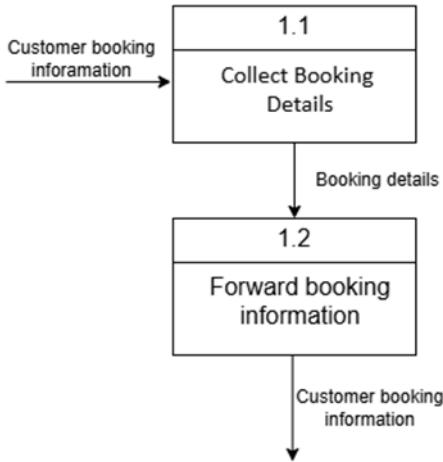


Figure 5.3.1: Child diagram for process 1.0
(Make a booking)

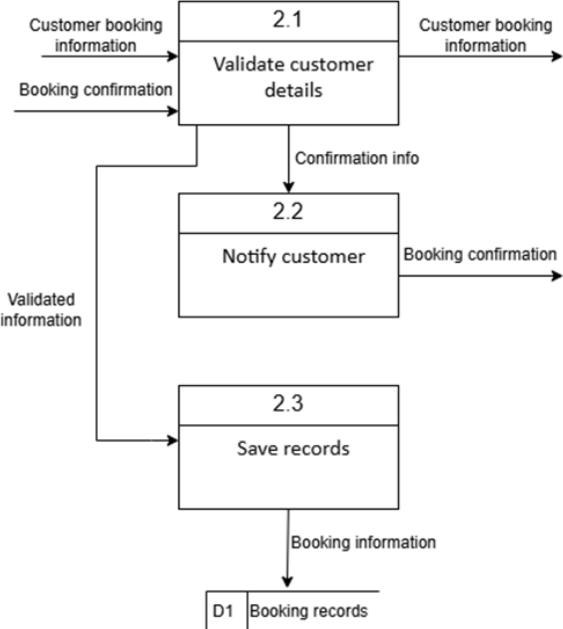


Figure 5.3.2: Child diagram for process 2.0 (Verify customer information)

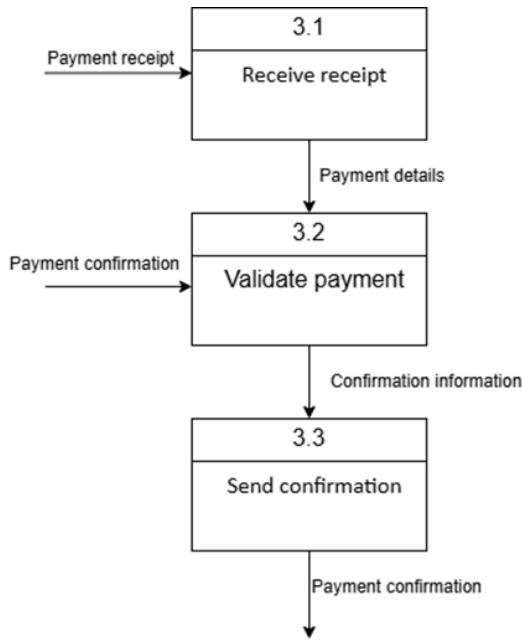


Figure 5.3.3: Child diagram for process 3.0 (Make payment)

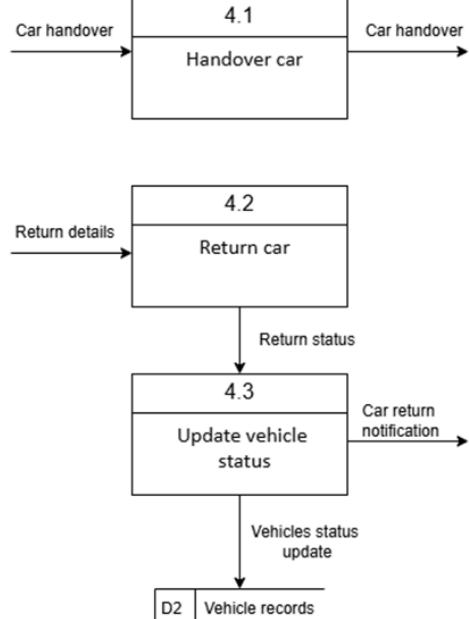


Figure 5.3.4: Child diagram for process 4.0 (Get and return car)

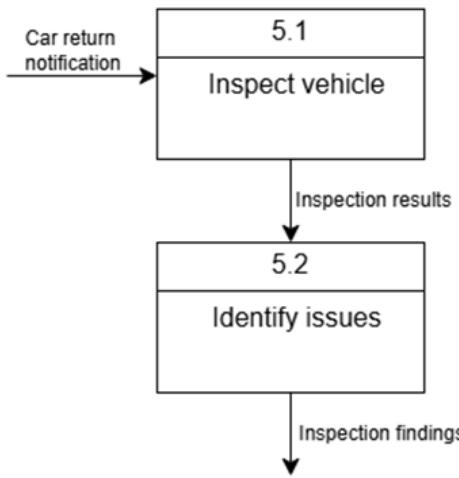


Figure 5.3.5: Child diagram for process 5.0
(Conduct inspection)

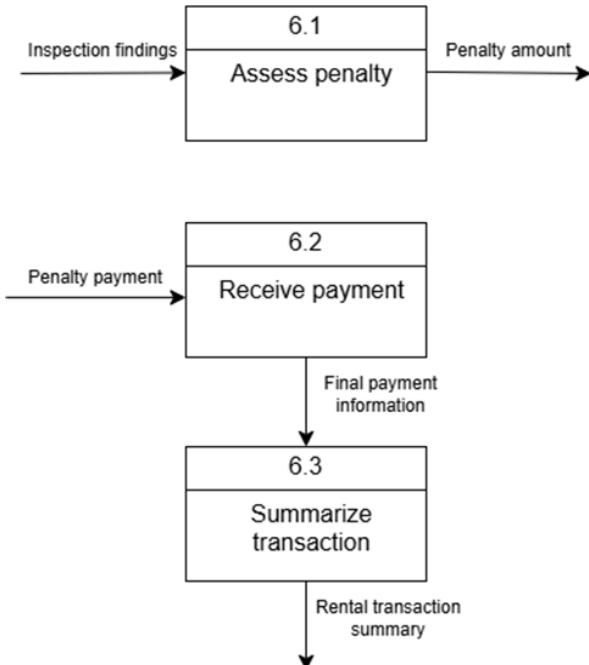


Figure 5.3.6: Child diagram for process 6.0 (Calculate charges)

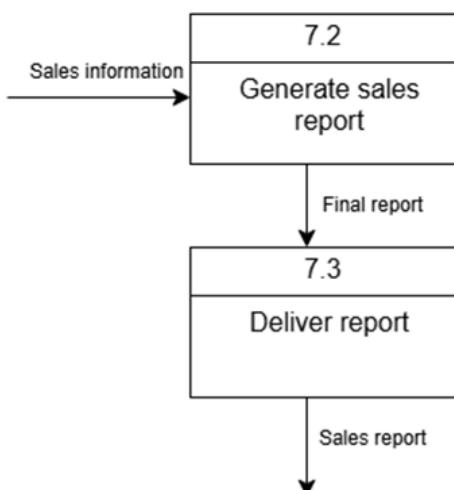
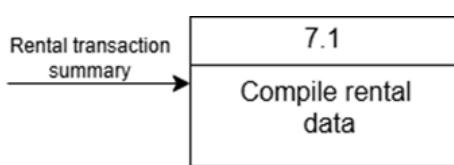


Figure 5.3.7: Child diagram for process 7.0
(Prepare report)

6.0 System Analysis and Specification

6.1 Logical DFD TO-BE System

6.1.1 Context Diagram

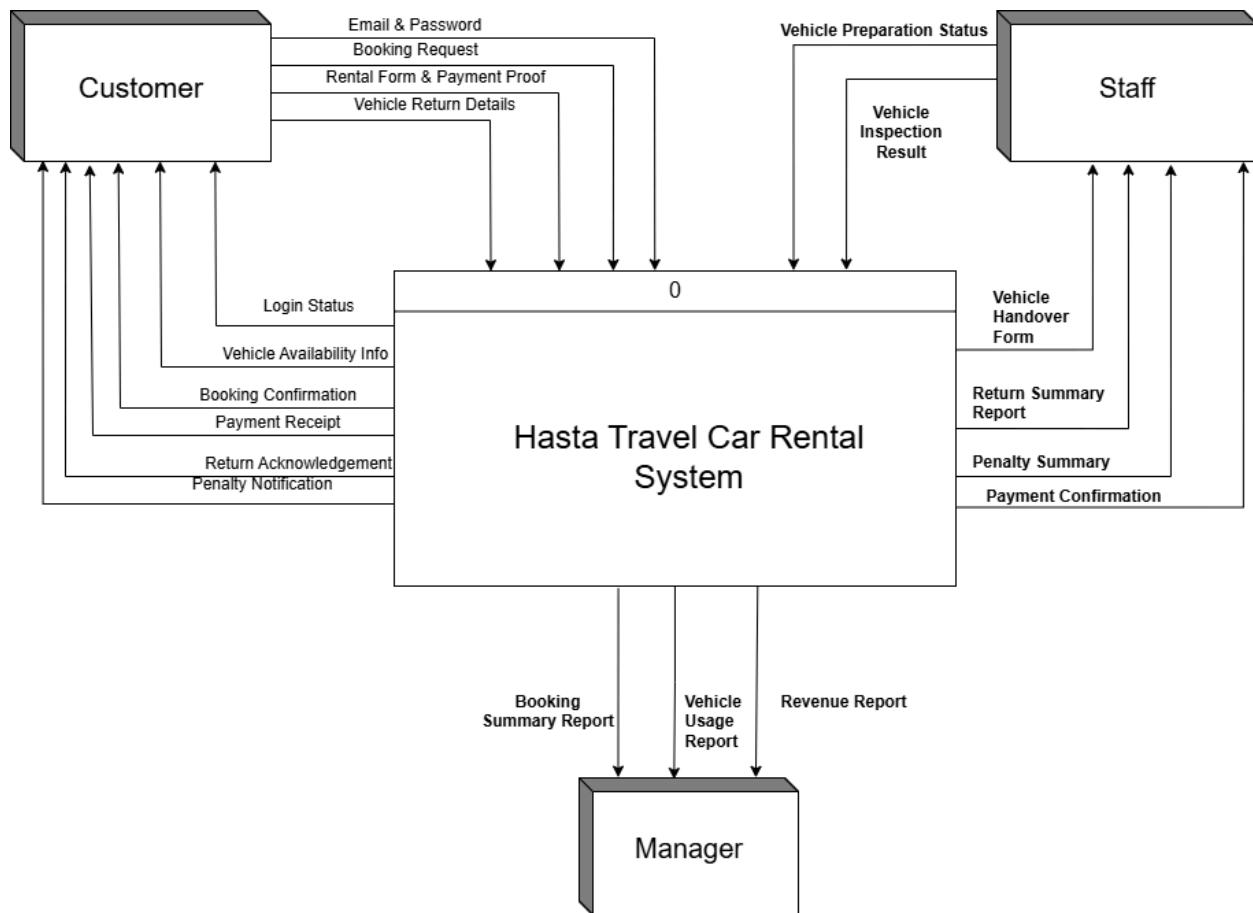


Figure 6.1.1.1: Context diagram for logical DFD TO-BE system

6.1.2 Diagram 0

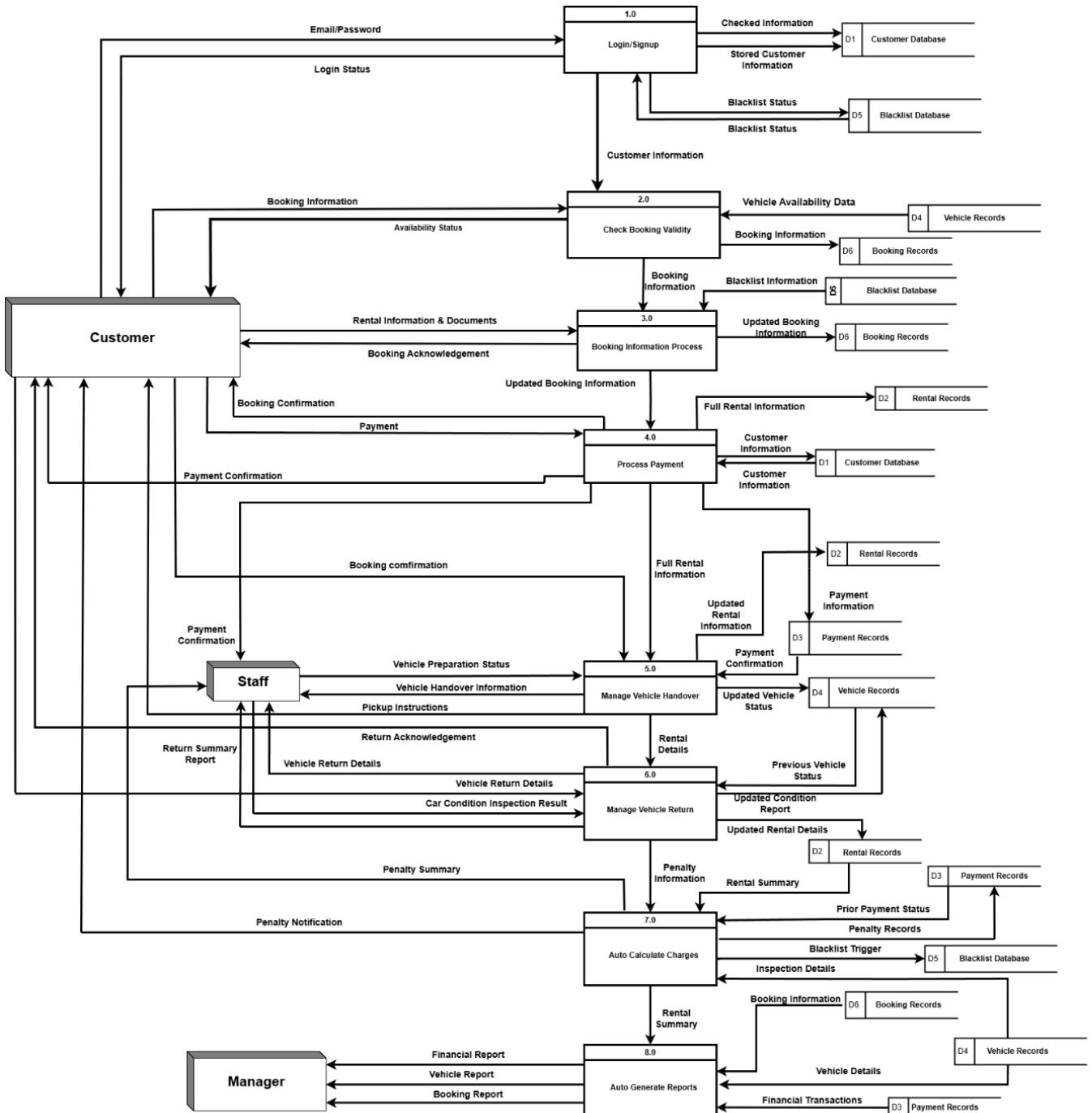
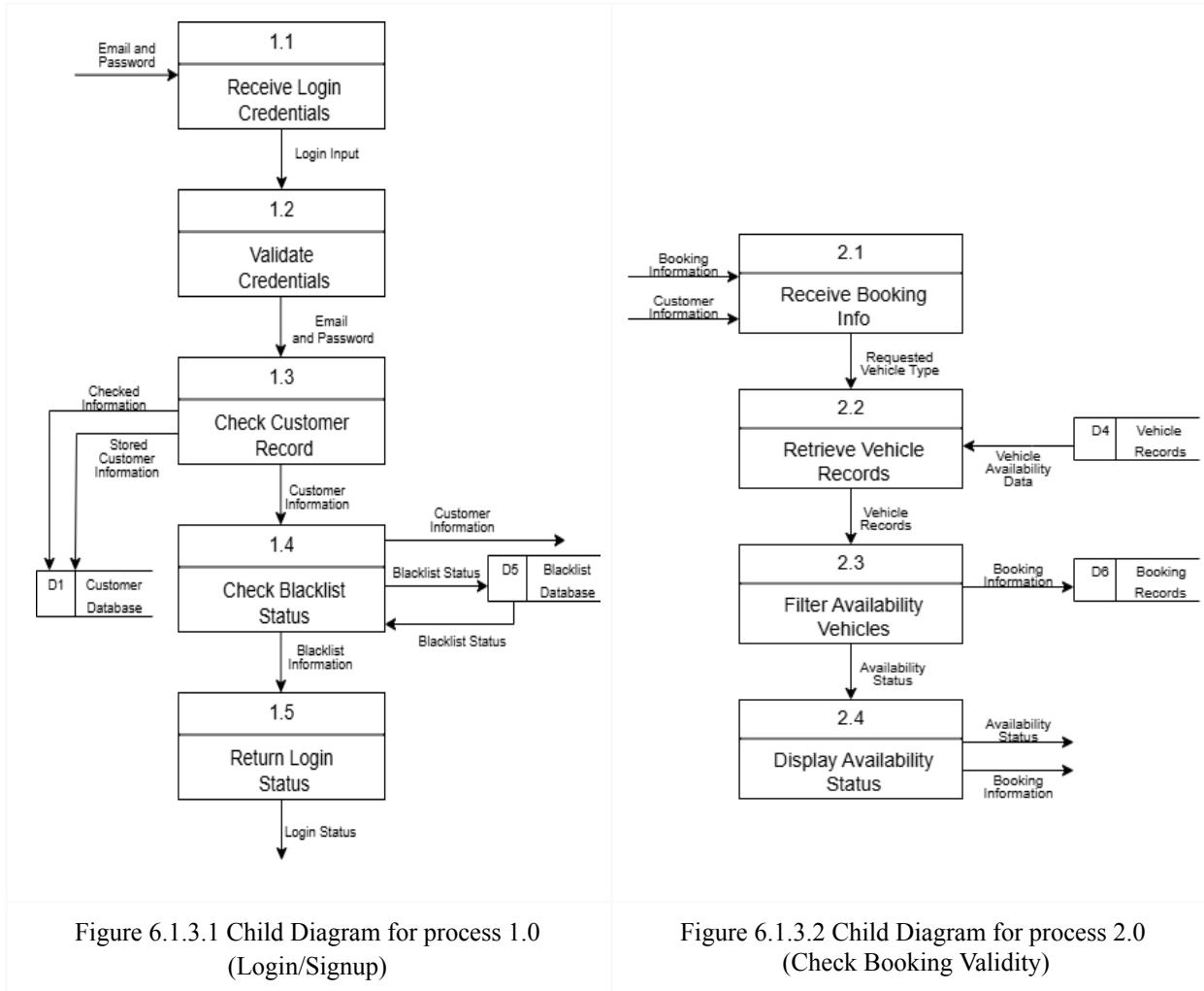


Figure 6.1.2.1: Diagram 0 for logical DFD TO-BE system

6.1.3 Child Diagram



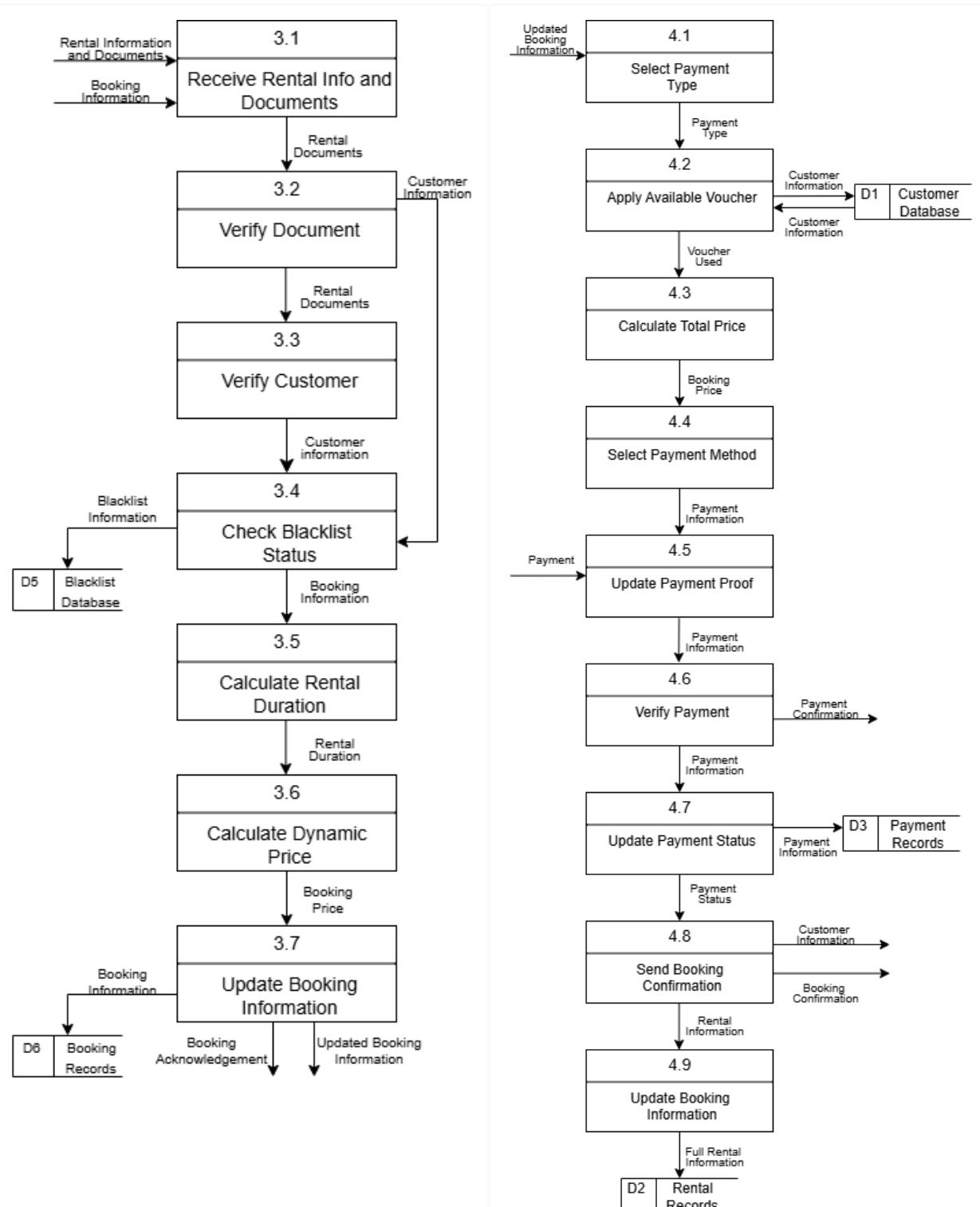
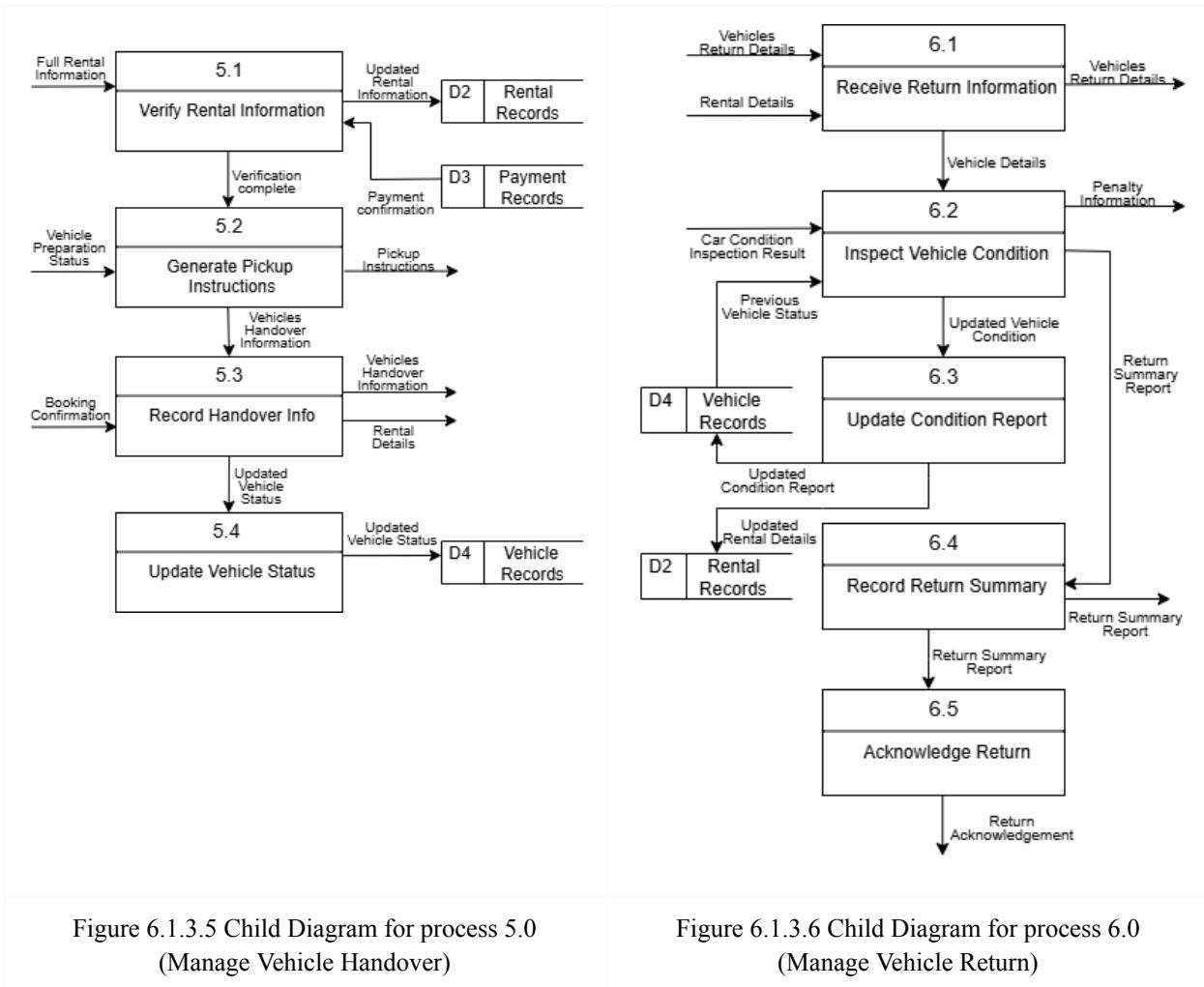


Figure 6.1.3.3 Child Diagram for process 3.0
(Booking Information Process)

Figure 6.1.3.4 Child Diagram for process 4.0
(Process Payment)



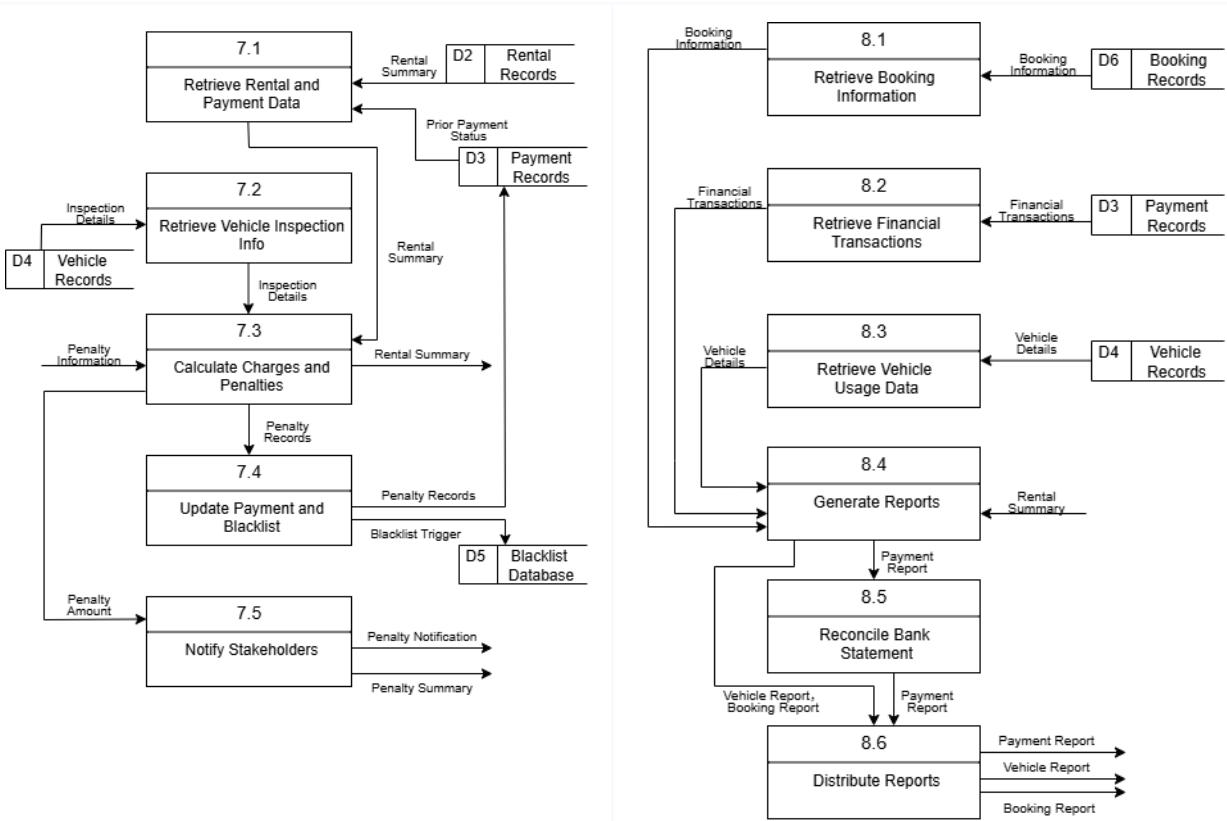


Figure 6.1.3.7 Child Diagram for process 7.0
(Auto Calculate Charges)

Figure 6.1.3.8 Child Diagram for process 8.0
(Auto Generate Reports)

6.2 Process Specification

6.2.1 Process 1.0

```
READ customer login credentials (email and password) submission
VALIDATE credentials
BEGIN IF
IF credentials are valid
    RETRIEVE customer information from Customer Database
    RETRIEVE blacklist information from Blacklist Database
    CHECK if customer is blacklisted
    IF not blacklisted
        VERIFY customer login
    ELSE
        DISPLAY "Access denied. You are blacklisted"
    ENDIF
ELSE
    DISPLAY "Invalid Login"
    OFFER option to sign up
    PROCEED to login
ENDIF
```

6.2.2 Process 2.0

```
READ customer information and booking information (selected car, start date, end date, time) from
customer
RETRIEVE vehicle availability data from the Vehicle Records Database
CHECK the vehicle availability
BEGIN IF
IF car is available
    ADD booking information in Booking Records Database
ELSE
    DISPLAY "Selected car is not available"
    OFFER other available vehicle options to customer
ENDIF
```

6.2.3 Process 3.0

Figure 6.2.3.1 is a decision tree that shows how customer go through process 3.0 to complete a booking process. The customer will first be determined whether he is verified. The customer would have to go through the verification process if he has not been verified yet. On the same time, if the customer is verified and not blacklisted, the dynamic price would be calculated besides the booking information would be updated and stored in Booking Records Database. However, the customer would not be allowed to book the vehicle if he is blacklisted.

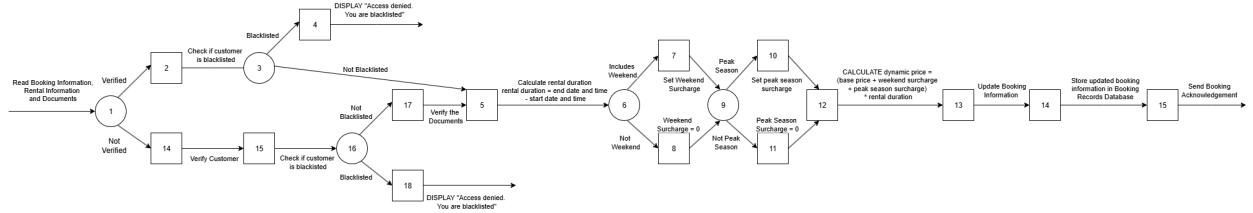


Figure 6.2.3.1 Decision Tree of Process 3.0

6.2.4 Process 4.0

Figure 6.2.3.1 shows a decision tree that represents how customer go through the process 4.0, payment process. The customer will select the payment types which are deposit payment and full payment. Then, he can choose whether he wants to apply the voucher for discount. If customer wishes to pay by QR, he has to upload payment proof. The system will automatically compare the recipient number with the bank receipt then update the payment status. Thus, when the payment status turns successful, a booking number will be generated and at the same time, a booking confirmation will be sent to customer.

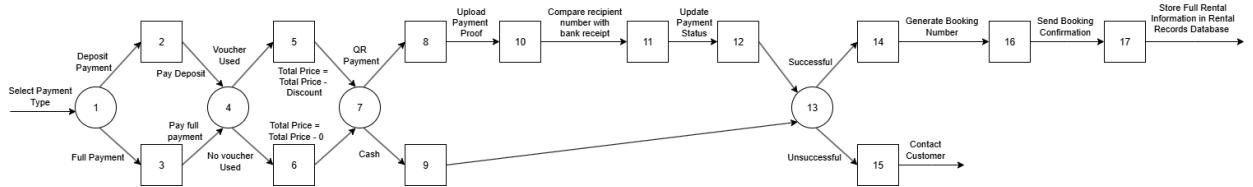


Figure 6.2.4.1 Decision Tree of Process 4.0

6.2.5 Process 5.0

```

READ booking number
CHECK rental information
GET payment details from Payment Records Database
CHECK remaining payment
BEGINIF
IF remaining payment exists
    THEN pay remaining payment
    UPDATE payment details
ELSE
    SEND payment confirmation to customer
ENDIF
READ payment confirmation status
READ vehicle preparation status
GENERATE pick up instructions
RECORD handover information
UPDATE rental information in Rental Records Database
UPDATE vehicle details in Vehicle Records Database

```

6.2.6 Process 6.0

```

READ rental information
BEGINIF
IF reached rental endtime
    SEND return notification to customer
IF car is not returned on time
    CHARGE penalty
ENDIF
READ vehicle return info
CHECK vehicle condition
RECORD vehicle inspection details
UPDATE vehicle condition report in Vehicle Records Database
BEGINIF
IF car condition is bad
    THEN charge penalty
ENDIF
UPDATE rental information in Rental Records Database
CREATE return summary report
SEND return acknowledgement to customer

```

6.2.7 Process 7.0

Table 6.2.7.1 Decision Table of Process 7.0

Condition	Rule 1	Rule 2	Rule 3	Rule 4
Customer has penalty	N	Y	Y	Y
Penalty paid	-	Y	N	N
Penalty overdue > 1 month	-	-	N	Y
Action				
Send penalty payment request		X	X	X
Update payment information into Payment Database		X		
Return deposit to customer	X	X		
Blacklist customer				X
Update blacklist information in Blacklist Database				X
Give royal points to customer	X	X		

Update rental information in Rental Records Database	X	X	X	X
Create rental summary	X	X	X	X

6.2.8 Process 8.0

READ rental summary
 GET vehicle details from Vehicle Records Database
 GENERATE vehicle report
 GET booking information from Booking Records Database
 GENERATE booking report
 GET payment details from Payment Records Database
 CALCULATE daily, monthly and yearly payment
 GENERATE financial report
 DO
 COMPARE bank statement with financial report
 IF Not Tally
 RECHECK Payment Database
 ENDIF
 WHILE (bank statement is not equal to financial report)
 SUBMIT all reports to manager
 END

7.0 Physical System Design

7.1 Physical DFD TO-BE system

7.1.1 Diagram 0

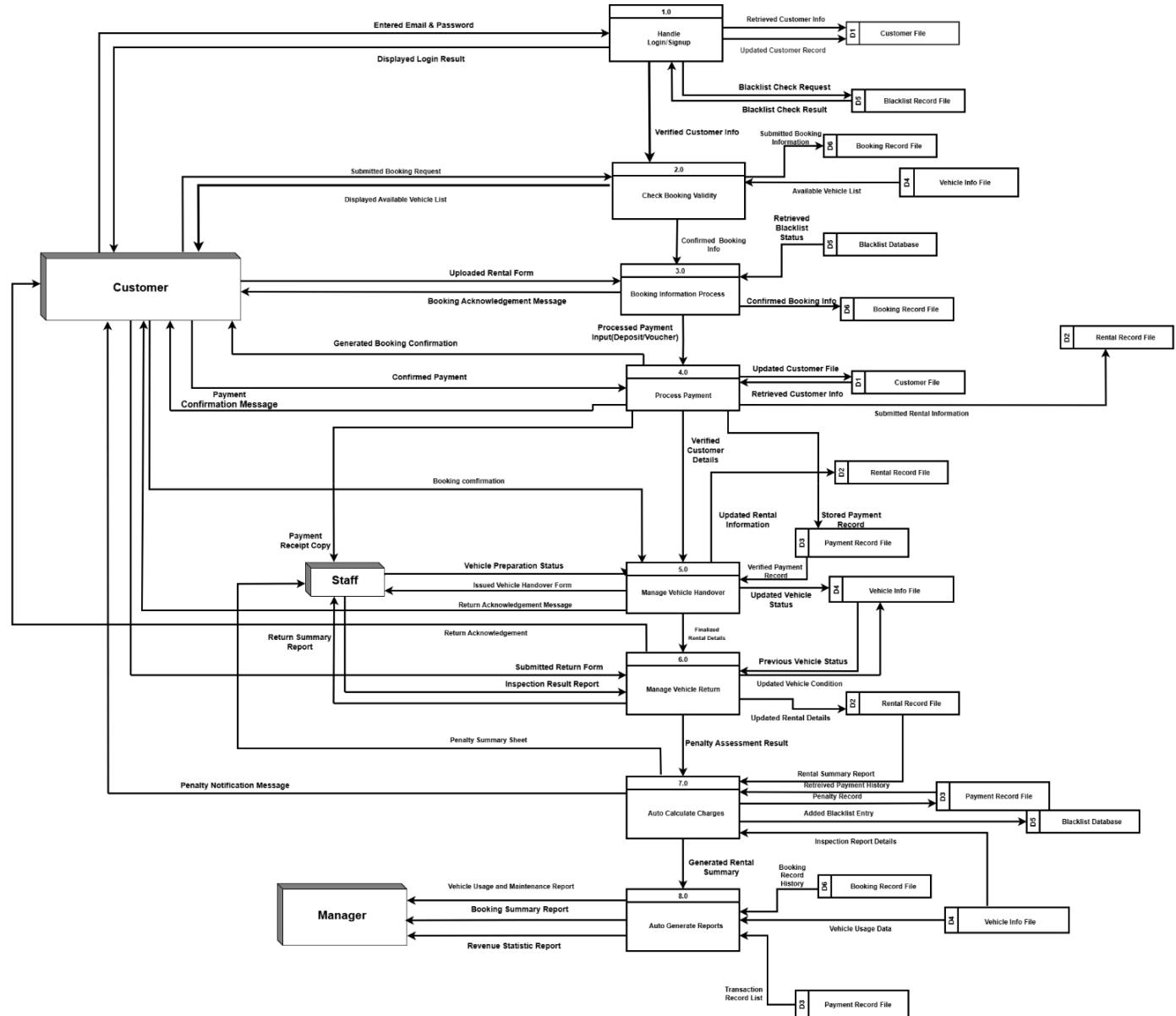


Figure 7.1.1.1: Diagram 0 for physical DFD TO-BE system

7.1.2 Child Diagram

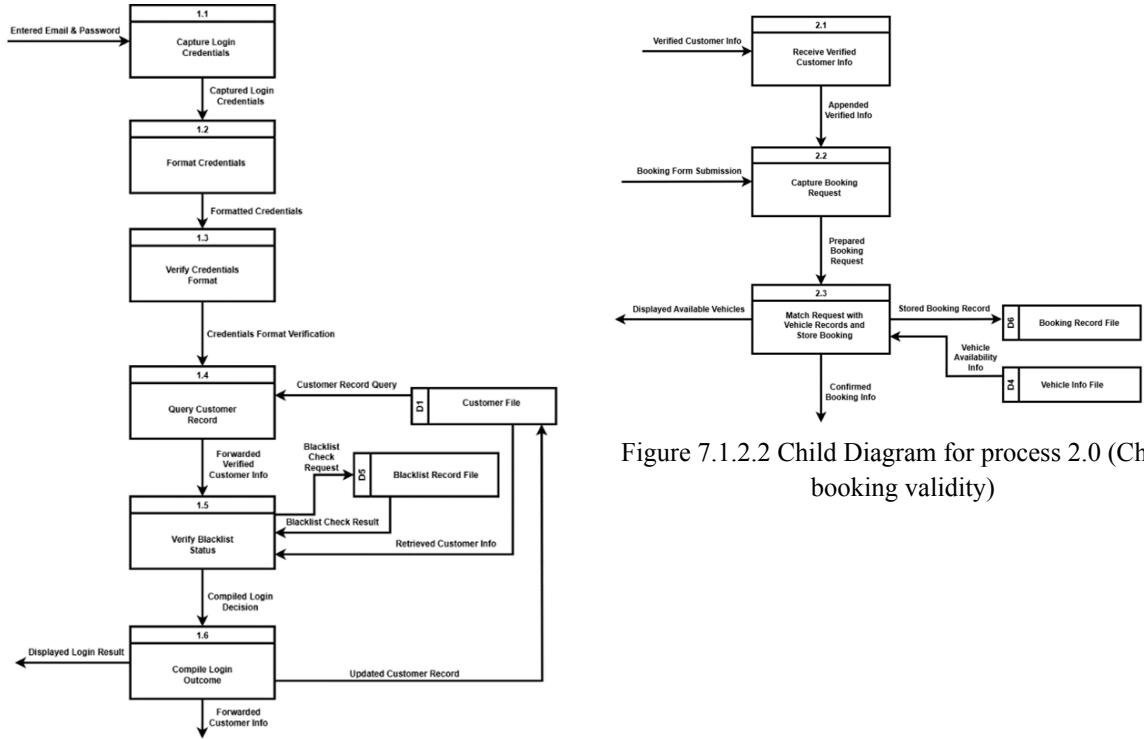


Figure 7.1.2.2 Child Diagram for process 2.0 (Check booking validity)

Figure 7.1.2.1 Child Diagram for process 1.0 (Handle Login / Signup)

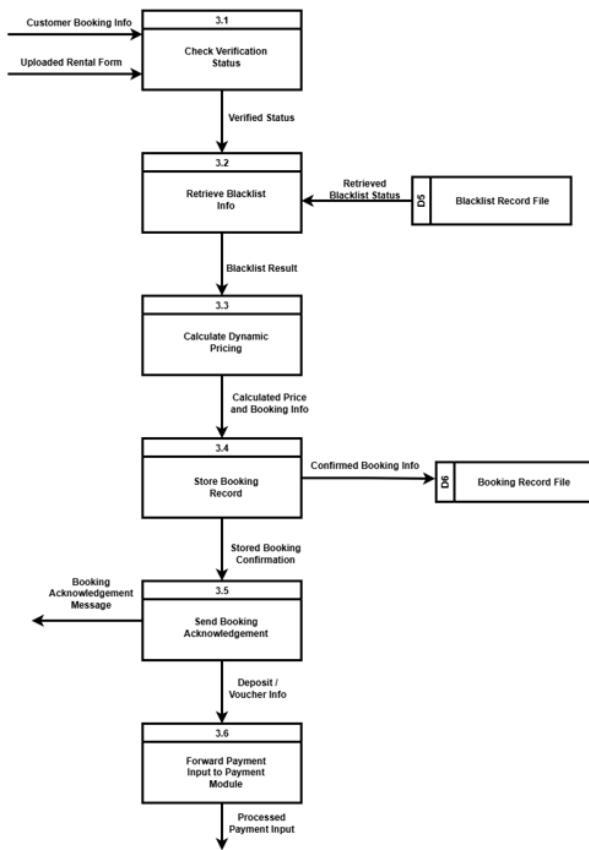


Figure 7.1.2.3 Child Diagram for process 3.0 (Booking information process)



Figure 7.1.2.4 Child Diagram for process 4.0 (Process payment)

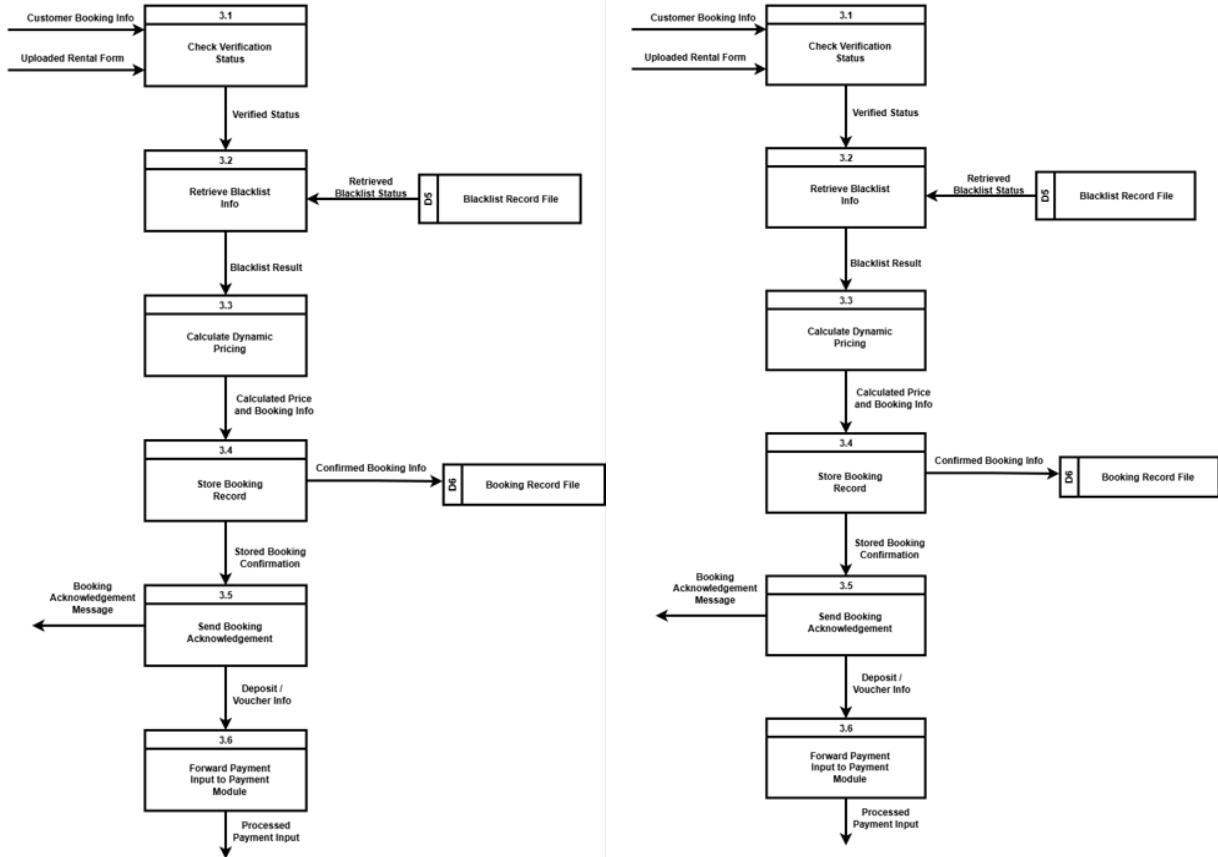


Figure 7.1.2.5 Child Diagram for process 5.0 (Manage vehicle handover)

Figure 7.1.2.6 Child Diagram for process 6.0 (Manage vehicle return)

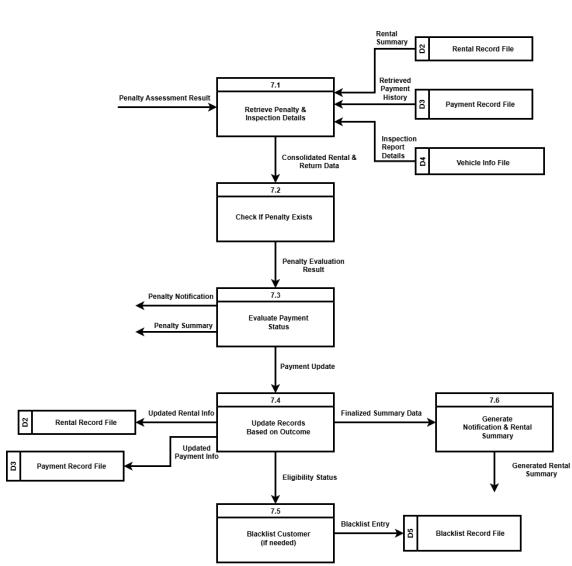


Figure 7.1.2.7 Child Diagram for process 7.0 (Auto calculate charges)

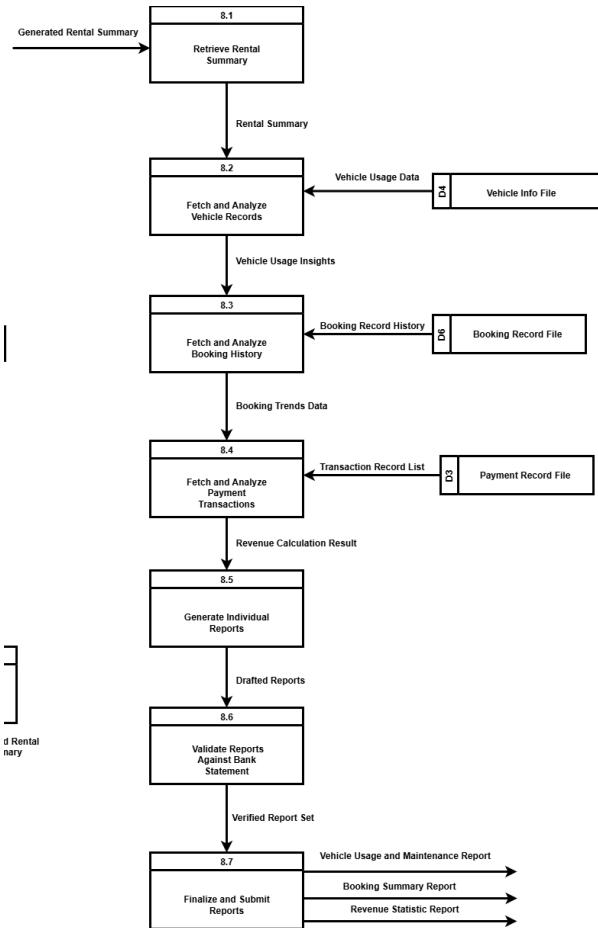


Figure 7.1.2.8 Child Diagram for process 8.0 (Auto generate report)

7.1.3 Partitioning

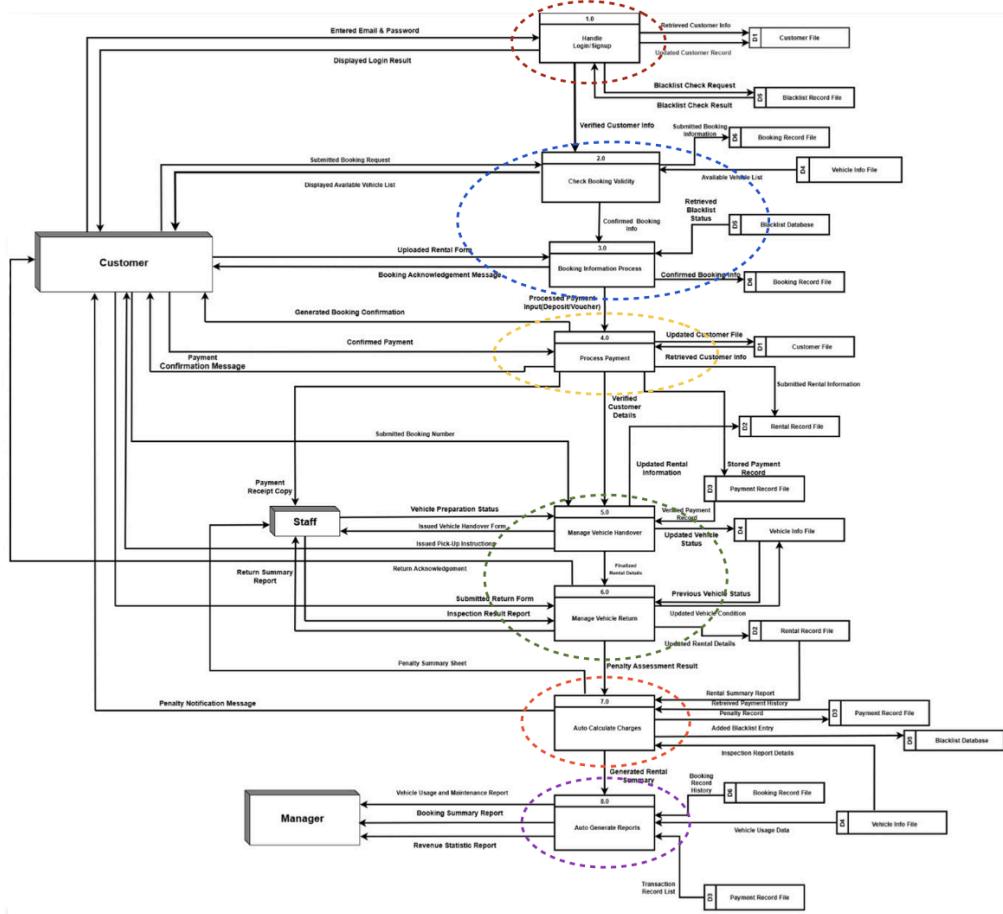


Figure 7.1.3.1: Partitioning for Physical DFD AS-IS system

The system is divided into several functional modules based on their roles in the overall process. The Authentication Module corresponds to Process 1.0, which handles user login and signup by verifying credentials against the customer and blacklist databases. The Booking Management Module encompasses Processes 2.0 and 3.0, managing vehicle availability checks and rental detail submissions, thereby supporting the customer booking journey. The Payment Handling Module, represented by Process 4.0, deals with processing payments, including deposits, full payments, and vouchers, and interacts directly with the payment records database. The Vehicle Operations Module includes Processes 5.0 and 6.0, focusing on vehicle handover and return, which require physical coordination and updates to vehicle status. The Penalty & Inspection Module is addressed by Process 7.0, which automatically calculates penalties based on vehicle condition reports and inspection details. Finally, the Reporting & Monitoring Module, represented by Process 8.0, generates comprehensive reports such as booking summaries and usage data for managerial review, drawing from all relevant databases to provide oversight and analytics.

7.2 CRUD Matrix

Table 7.2.1: CRUD Matrix

Process\Data Store	D1: Customer File	D2: Rental Record File	D3: Payment Record File	D4: Vehicle Info File	D5: Blacklist Record File	D6: Booking Record File
1.0 Login/ Signup	C, R,U				R	
2.0 Check Vehicle Availability				R		C
3.0 Submit Rental Details				R	R	C
4.0 Process Payment	R, U	C	C, U			
5.0 Manage Vehicle Handover		U	R	U		R
6.0 Manage Vehicle Return		U		U		
7.0 Auto Calculate Charges		R,U	R,C	R	C	
8.0 Auto-Generate Reports		R	R	R		R

8.0 System Wireframe

The system wireframe is a visual mockup that illustrates the interface design and layout of the proposed Car Rental System. It helps to conceptualize how users will navigate and interact with the system by showing the arrangement of key features and components on each screen. The following outlines the wireframes created for each core process in the system.

8.1 Customer Page

i. Process 1.0 (Login and Sign Up Page)

Figure 8.1.1 shows the login page interface for users to access the car rental system. If users already have an account, they can login to this system by entering their email address and password. If users don't have an account, they can click the Sign Up button and navigate to the sign-up page in figure 8.1.2. In the Sign Up page, they need to put their personal information such as full name, email address and create a password. After clicking the login button or creating an account , they will navigate to the main page in figure 8.1.3.



Figure 8.1.1: Login Page



Figure 8.1.2: Sign Up Page

ii. Process 2.0 (Dashboard)

Figure 8.1.3 shows the main dashboard displaying available cars along with navigation options. When the user hovers over the Rent button, the unavailable times for that car model will appear above the button, as illustrated in Figure 8.1.4. This feature informs customers about the car's availability, also allowing them to adjust their plans accordingly.

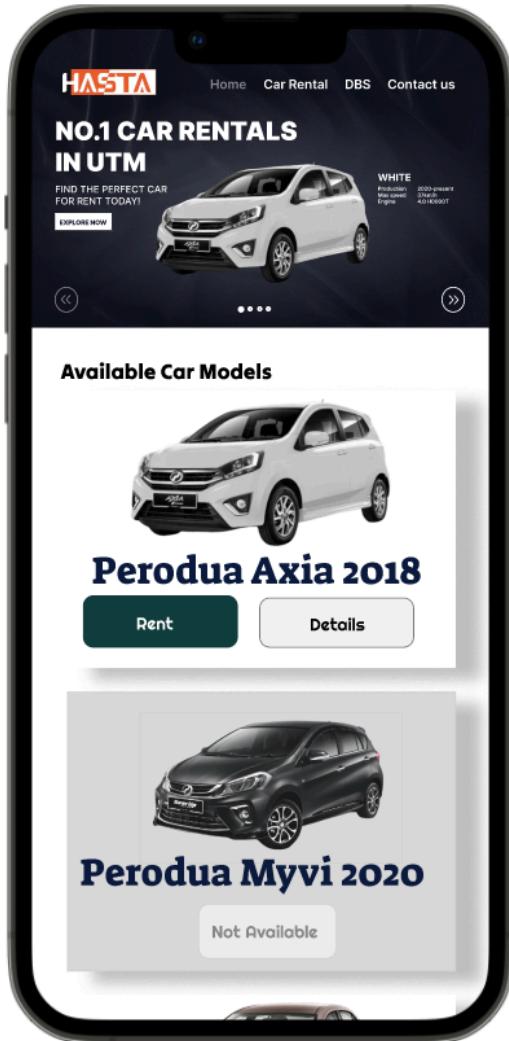


Figure 8.1.3: Main Page

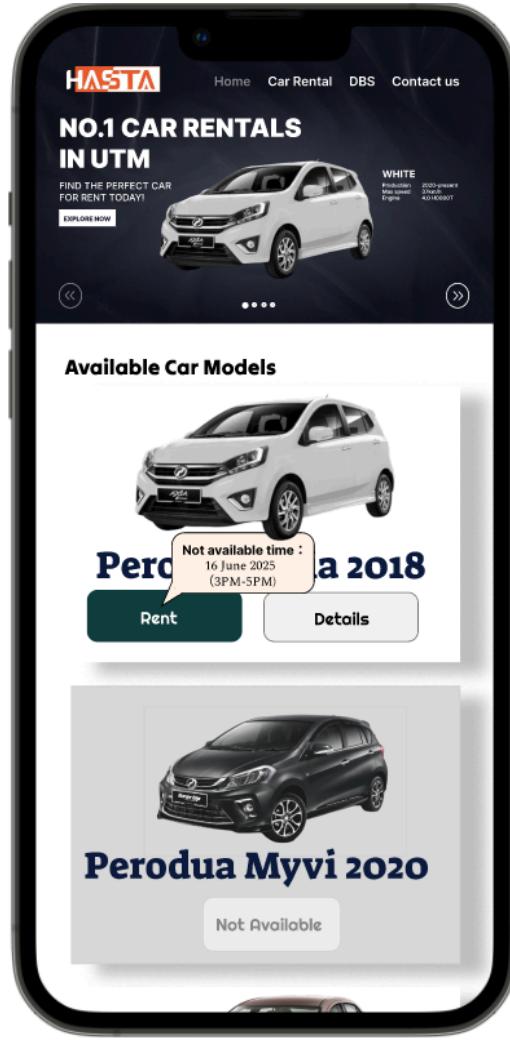


Figure 8.1.4: The “Not available time” for a specific car model

When clicking the DBS(Destination-Based Booking) button, Figure 8.1.5 will be shown. When users enter their travel destination, pickup date, return date and preferred car type, the travel analysis and recommended vehicles will be shown in Figure 8.1.6 and Figure 8.1.7.



Figure 8.1.5: Destination-Based Booking



Figure 8.1.6 Trip Analysis



Figure 8.1.7 Recommended Vehicles

When users go back to the Home page and click the Details button for one of the car models, detailed specifications and features of a selected car will be shown in Figure 8.1.6. When hovering to the Price button, Figure 8.1.9 will show dynamic pricing adjustments based on demand or rental duration for user's reference. When users decide to rent the car, they can click the Rent button and navigate to Figure 8.1.10 which will enter the process 3.0 car booking form.



Figure 8.1.8: Car Details



Figure 8.1.9: Dynamic pricing for car rental

ii. Process 3.0 (Car Booking Form)

When the Rent button is clicked, the system will navigate the user to Figure 8.1.10 which is a car booking form for rental details including name, email, phone number, ID number, pick up place, and the car rental date. After entering the booking details, the final total price will be shown in Figure 8.1.11, which is calculated automatically based on the dynamic pricing rules.

HASTA

Car Booking Form

Name

Email

Phone No
 +60

ID No

Pick up

Start Date

End Date

Confirm

Figure 8.1.10: Car Booking Form

HASTA

Car Booking Form

Name
John Adam

Email
johnadam@gmail.com

Phone No
+60 12 345 678

ID No
A24C3322

Pick up
UTM PRZS

Start Date
27.7.2025 9.20 P.M.

End Date
27.7.2025 10.20 P.M.

Total RM 15.12

Confirm

Figure 8.1.11: Exact price for booking details

iv. Process 4.0 (Verify the account)

When clicking the Confirm button, users will be navigated to verify their account by taking a real-time photo using their device camera (Figure 8.1.12), upload a photo of their face along with their ID card (Figure 8.1.13) and upload their driving license (Figure 8.1.14) to identity authenticity and enhances security during the booking process.

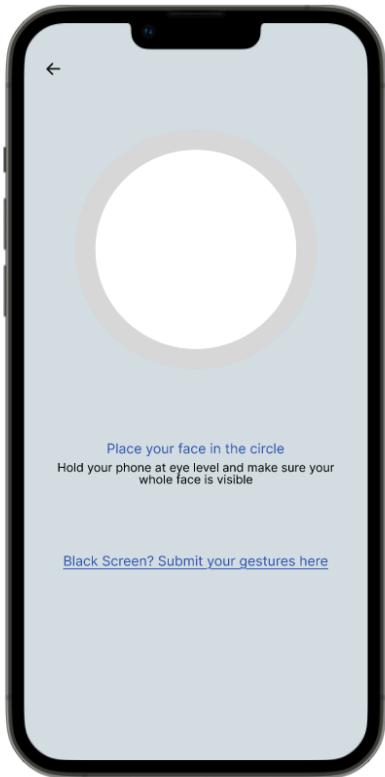


Figure 8.1.12: Facial recognition verification

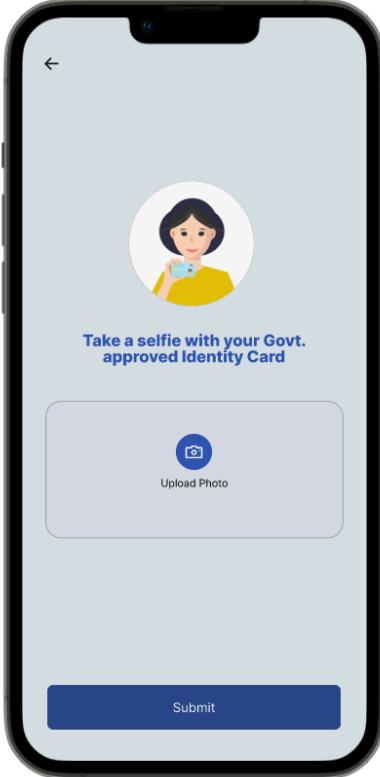


Figure 8.1.13: IC verification



Figure 8.1.14: Driver's license

v. Process 5.0 (Confirmation of booking)

After that, the Booking Confirmation page, as shown in Figure 8.1.15, will appear. It includes a summary of the booking and available payment options before finalization. When the user selects the QR Payment option, a QR code will be displayed, and after the user uploads their payment receipt, the confirmation message will be sent to indicate the successful payment and booking (Figure 8.1.16).

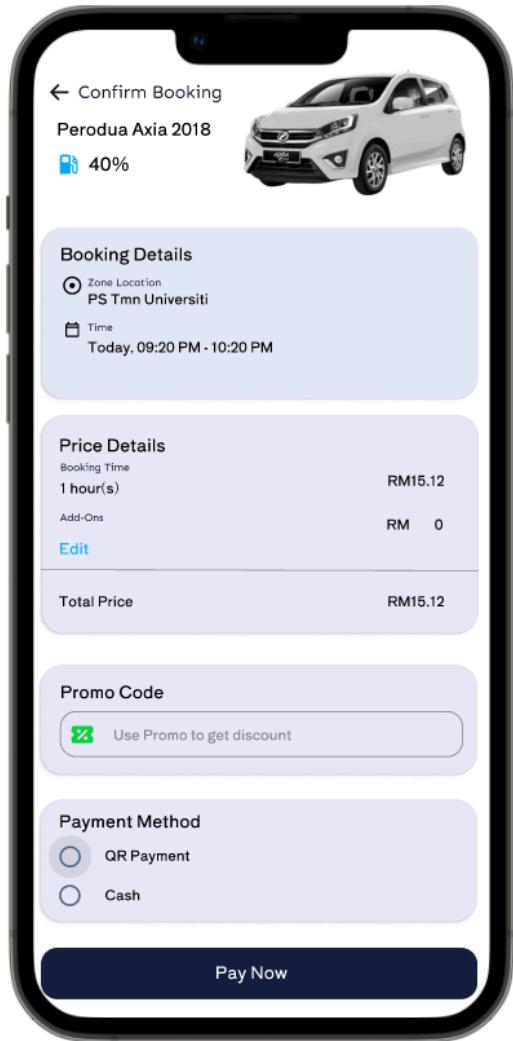


Figure 8.1.15: The confirmation of booking

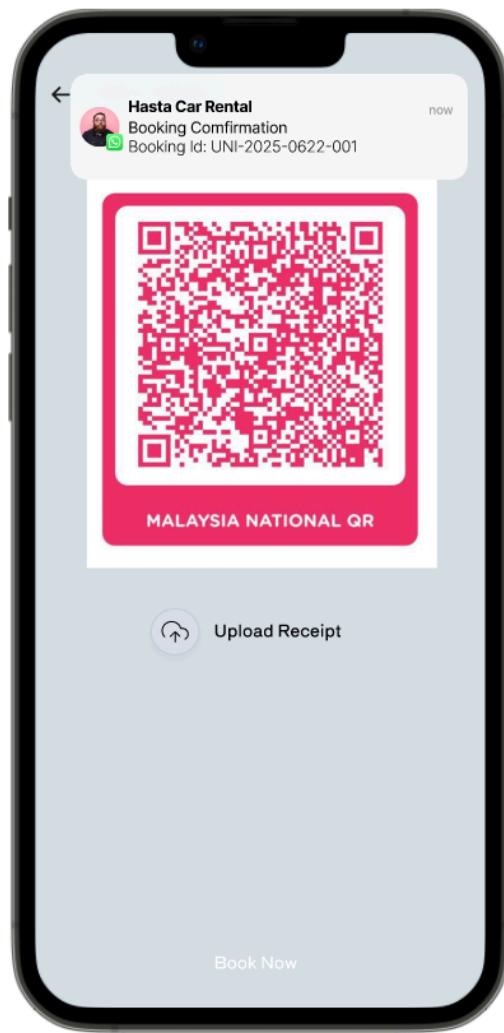


Figure 8.1.16: Give booking ID after booking success

vi. Process 6.0 (Picking the car)

After users confirm their booking, Figure 8.1.17 will display the car pick-up instructions, including guidance, assistant contact details, car information, and the location for collection. If users arrive at the designated location and cannot find the assistant, they have the option to call or message them. Once they locate the assistant and successfully collect the car key, they can tap the Assistant Found button in Figure 8.1.18.

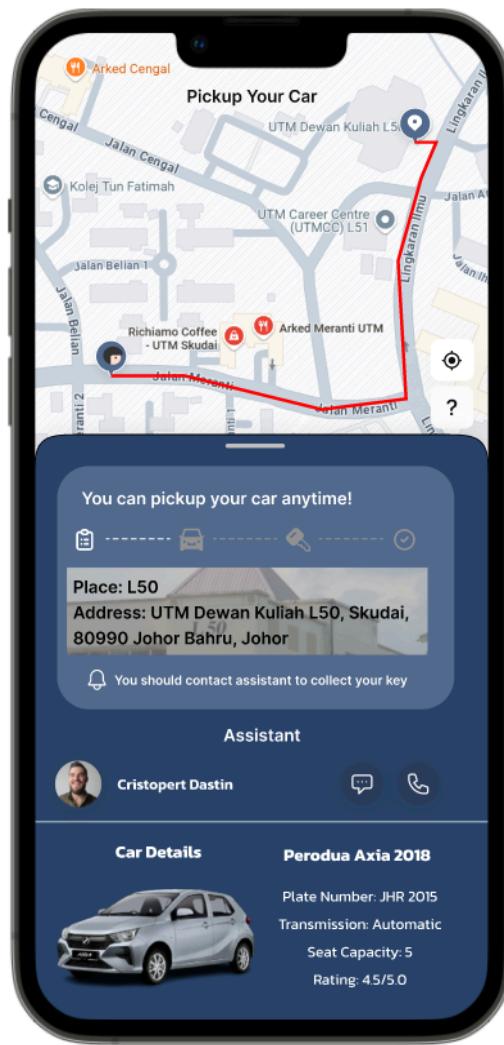


Figure 8.1.17: Instructions for picking the car

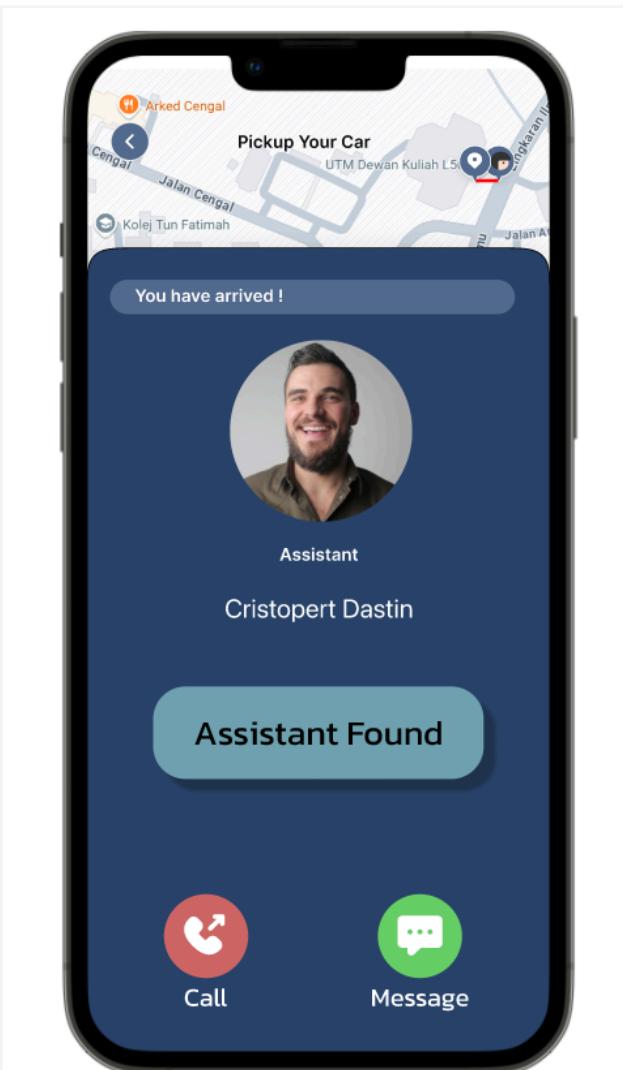


Figure 8.1.18: Ways to find the assistant

vii. Process 7.0 (Return the car)

Figure 8.1.19 displays the details of the return time for the user's reference.

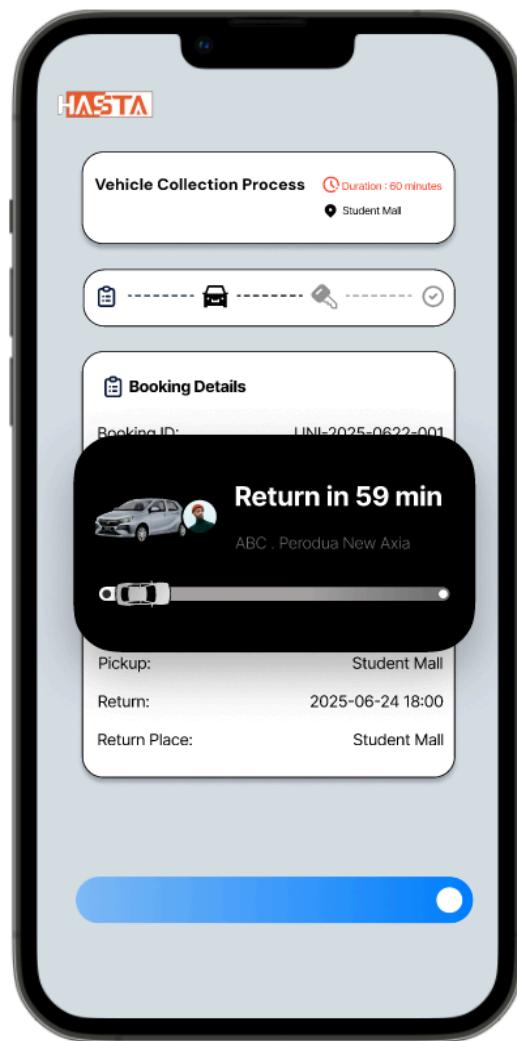


Figure 8.1.19: Time to return the car

After the user returns the car, Figure 8.1.20 will appear, allowing them to report any issues related to their rental experience and rate the car to support future improvements.

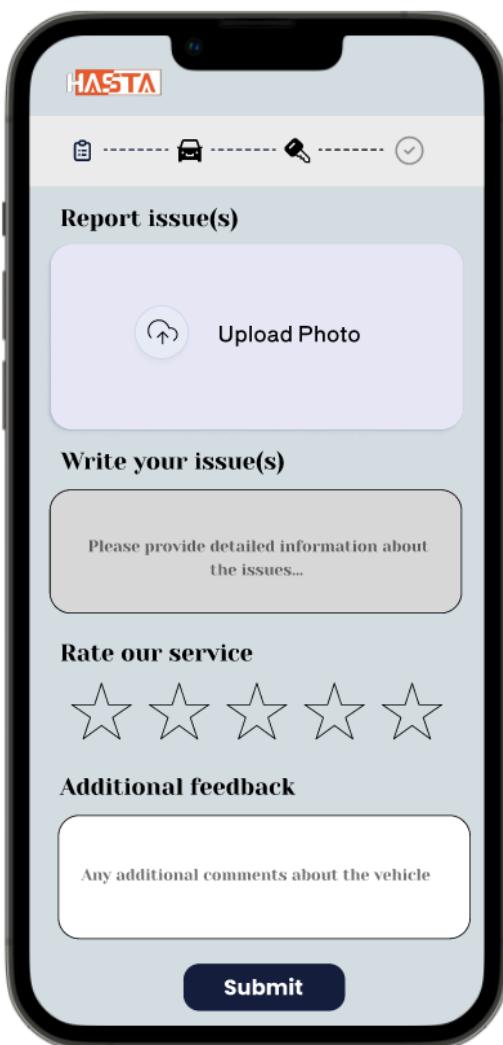


Figure 8.1.20: Feedback form

After submitting the report and feedback, a confirmation message will be shown in Figure 8.1.21. The reward points earned from the current car rental experience will be shown as in Figure 8.1.22.



Figure 8.1.21: Confirmation of report submission

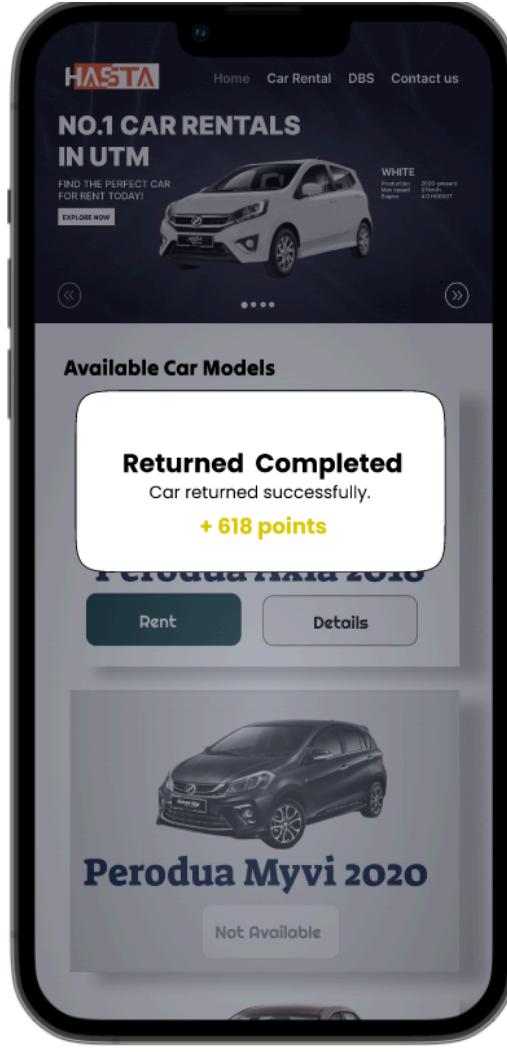


Figure 8.1.22: Royal points earned

8.2 Admin Page

Figure 8.2.1 shows the Login Page for staff. They can login to this system by entering their staff ID and password. After clicking the Login button, staff will be navigated to the Dashboard page which is shown in Figure 8.2.2.

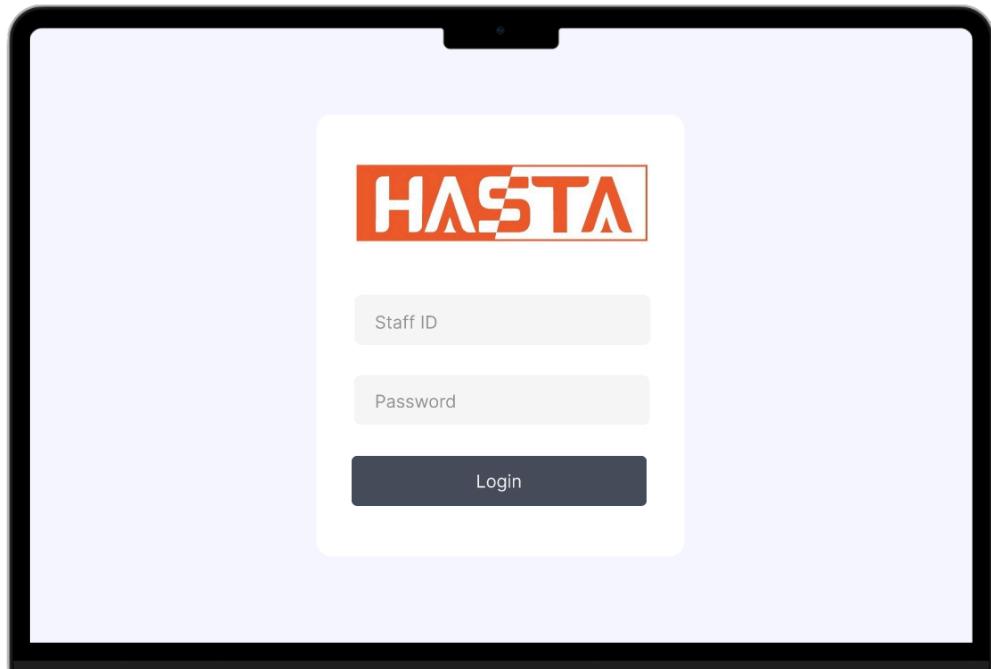


Figure 8.2.1: Login Page

Figure 8.2.2 shows the dashboard page for staff. Several information such as total revenue, new bookings, rented car and available car compared to last week. Also, the earning summary which provides a detailed breakdown of income for financial analysis, car availability and upcoming booking will be shown in the Dashboard page.

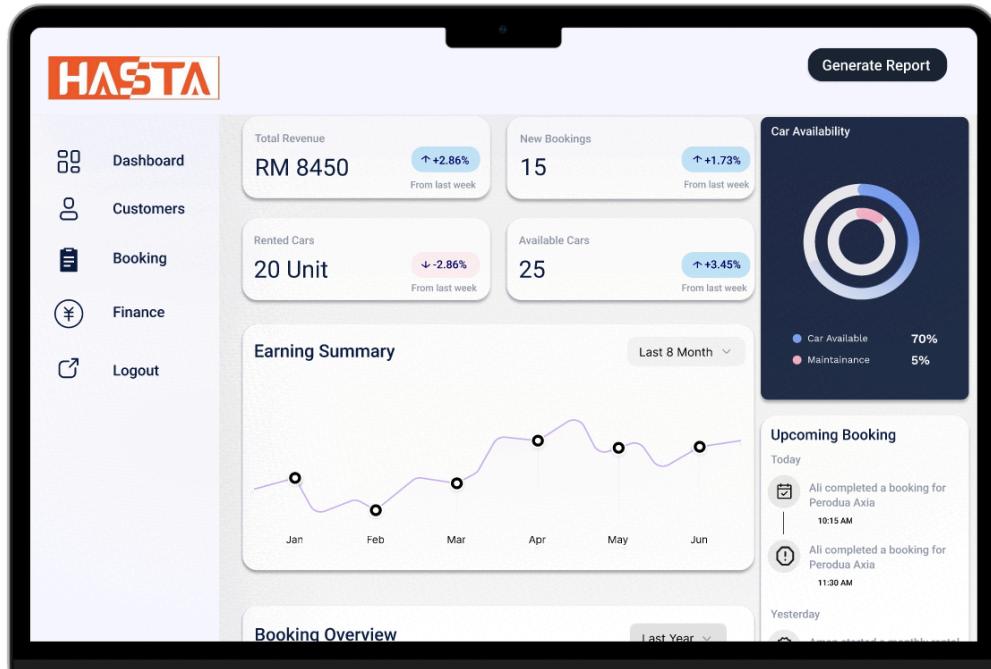


Figure 8.2.2: Dashboard

When clicking the Generate Report button, staff will be navigated to Figure 8.2.3 and the AI report generation about the booking summary, revenue statistics report and vehicle usage and maintenance report will appear.

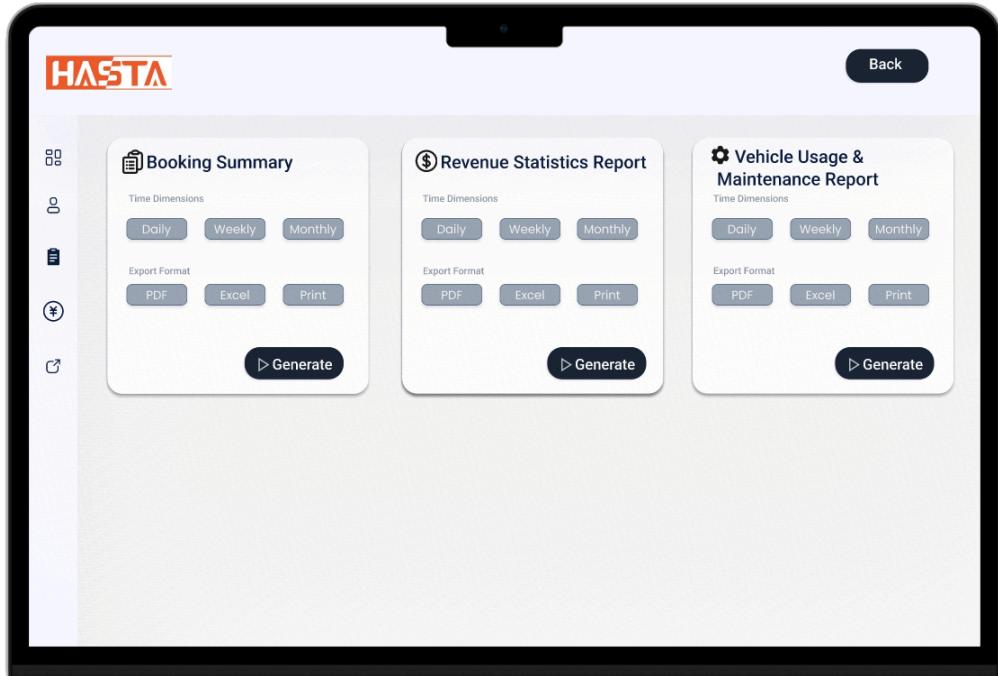


Figure 8.2.3: AI report generation

Figure 8.2.4 displays the customer section, where staff can view customer profiles, including their status, submitted documents, and contact email. This allows staff to easily access customer information and communicate with them when needed.

Customer Profile					
Name		Document	Status		
	John Adam	johnadam@gmail.com	IC	● BLACKLISTED	<button>Edit</button> <button>Delete</button>
	Emily Brown	emilybrown@gmail.com	IC	1,233 points	<button>Edit</button> <button>Delete</button>
	Michael Clark	michaelclark@gmail.com	IC	1,178 points	<button>Edit</button> <button>Delete</button>
	Sarah Davis	sarahdavis@gmail.com	IC	896 points	<button>Edit</button> <button>Delete</button>
	James Evan	jamesevan@gmail.com	IC	1,458 points	<button>Edit</button> <button>Delete</button>
	Laura Fisher	laurafisher@gmail.com	IC	589 points	<button>Edit</button> <button>Delete</button>
	Daniel Jackson	daniel@gmail.com	IC	● BLACKLISTED	<button>Edit</button> <button>Delete</button>

Figure 8.2.4: Customer Profile

Figure 8.2.5 shows the Booking section which displays the car availability with car information such as car capacity and transmission.

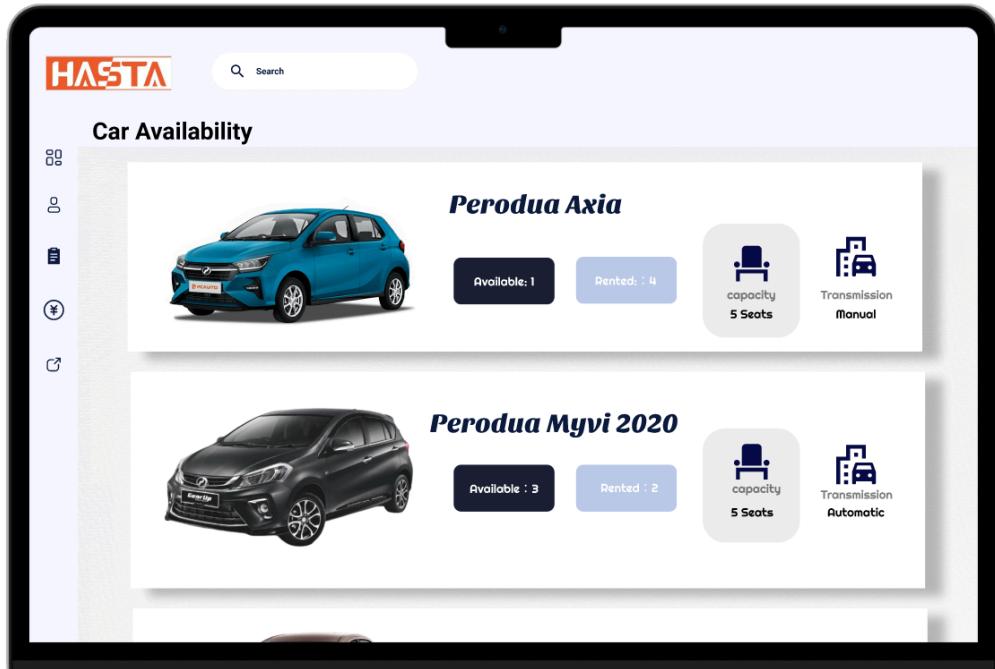


Figure 8.2.5: Car availability

When clicking the Available button, the details for available cars, including the level of cleanliness, petrol, plate number, transmission, seat capacity, rating and available date will be shown (Figure 8.2.6) for staff to track the condition of the car.

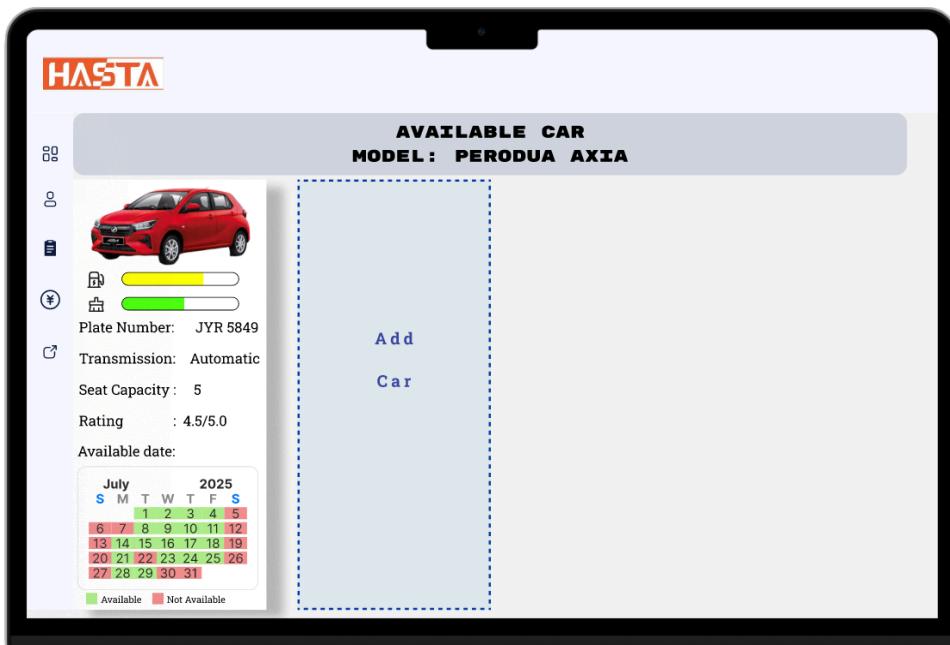


Figure 8.2.6: Details for available car

When the Rented button in Dashboard page (Figure 8.2.5) is clicked, detailed information about specific rented cars will be displayed. This includes the fuel level, plate number, transmission type, customer details, and real-time car location (Figure 8.2.7). These functions allow staff to monitor vehicle status, verify customer information, and track the car's conditions for better rental management.

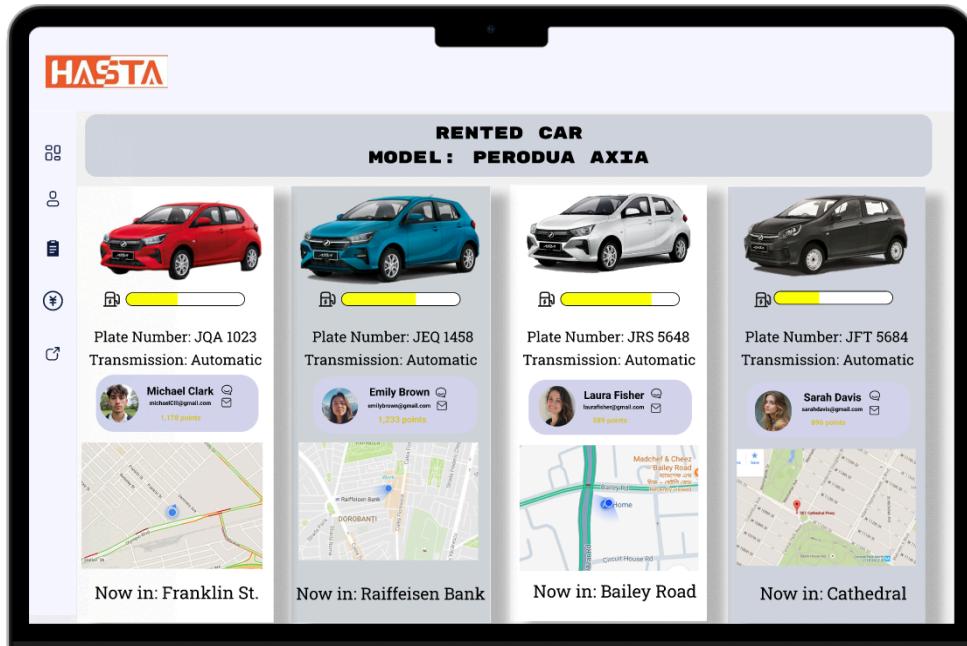


Figure 8.2.7: Details for rented car

When the Finance button in Dashboard page (Figure 8.2.5) is clicked, the financial related matters will be shown from Figure 8.2.8 to 8.2.11.

Figure 8.2.8 shows the time-based pricing rules, which allow staff to track rental rates based on specific time periods.

The screenshot shows the HASTA Time-Based Pricing Rules dashboard. At the top, there are navigation links: Payment Tracking, Penalty Management, Payment Reconciliation, Time-Based Pricing Rules (which is the active tab), Cashback Rules Dashboard, and Demand Prediction Dashboard. On the left is a sidebar with icons for location, user, calendar, and yen symbol. The main area has a title 'Time-Based Pricing Rules' and two dropdown menus: 'Select a month' and 'Select a year'. Below is a table with columns: #, MODEL, YEAR, CATEGORY, BASE RATE (MYR), PEAK RATE (MYR), and KEY STRATEGIES. The table data is as follows:

#	MODEL	YEAR	CATEGORY	BASE RATE (MYR)	PEAK RATE (MYR)	KEY STRATEGIES
1	Perodua Axia	2018	Budget Economy	RM120/day	RM145/day	Fuel-efficient upsell
2	Perodua Axia	2024	Budget Economy	RM130/day	RM155/day	Highlight "2024 Model" for premium feel
3	Perodua Myvi	2015	Compact Hatchback	RM120/day	RM145/day	Target students/long-term rentals
4	Perodua Myvi	2020	Compact Hatchback	RM150/day	RM175/day	Push as "best-selling local car"
5	Perodua Bezza	2015	Budget Sedan	RM140/day	RM165/day	Highlight fuel efficiency
6	Perodua Bezza	2024	Budget Sedan	RM140/day	RM165/day	Market as "latest safety features"

Figure 8.2.8: Time-Based Pricing Rules

Figure 8.2.9 shows the payment tracking for all customers including their payment method, deposit and payment status.

The screenshot shows the HASTA Payment Tracking dashboard. At the top, there are navigation links: Payment Tracking (active), Penalty Management, Payment Reconciliation, Time-Based Pricing Rules, Cashback Rules Dashboard, and Demand Prediction Dashboard. On the left is a sidebar with icons for location, user, calendar, and yen symbol. The main area has a title 'Payment Tracking' and a table with columns: Customer Name, Booking ID, Payment method, Total Amount, Paid Amount, Deposit, and Status. The table data is as follows:

Customer Name	Booking ID	Payment method	Total Amount	Paid Amount	Deposit	Status
Sarah Davis Sarahdavis@gmail.com	#3021	QR payment	RM600	RM300 (50%)	RM150 [150]	Pending
Shabrina shabrina@gmail.com	#2048	Cash	RM750	RM750 (100%)	RM200 [200]	Paid
John Adam johnadam@gmail.com	#2189	Cash	RM900	RM450 (50%)	RM200 [200]	Overdue
Charlie Bruce charliebruce@gmail.com	#3148	QR payment	RM1500	RM500 (33%)	RM400 [400]	Pending
Daniel Jackson daniel.jackson@gmail.com	#1948	Cash	RM800	RM0 (0%)	RM300 [300]	Overdue
Jackson Wong jacksonwong@gmail.com	#2098	Cash	RM240	RM120 (50%)	RM50 [50]	Pending

Figure 8.2.9: Payment Tracking

Figure 8.2.10 shows the payment reconciliation for all customers including their bank statement, system records and attached receipt.

The screenshot displays the HASTA software interface, specifically the 'Payment Reconciliation' section. At the top, there is a navigation bar with links to 'Payment Tracking', 'Penalty Management', 'Time-Based Pricing Rules', 'Cashback Rules Dashboard', 'Payment Reconciliation', and 'Demand Prediction Dashboard'. Below the navigation bar, the title 'Payment Reconciliation' is centered above a table. The table has columns for 'Customer Name', 'Booking ID', 'Bank Statement', 'System Records', and 'Receipt'. Each row contains a set of data for a specific customer, with a '[details]' link in the 'Receipt' column. To the left of the table, there is a vertical sidebar with several icons: two overlapping circles, a document, a gear, a dollar sign, and a double arrow.

Customer Name	Booking ID	Bank Statement	System Records	Receipt
Sarah Davis	#3021	15/06/2025 - RM300	RM300 (#3021)	[details]
John David	#2578	15/06/2025 - RM150	RM150 (#2578)	[details]
Sarah Ain	#2345	16/06/2025 - RM100	RM90 (#2345)	[details]
Kathleen Soo	#1590	17/06/2025 - RM200	RM200 (#1590)	[details]
John Adam	#3120	18/06/2025 - RM350	RM350 (#3120)	[details]
Julie See	#2764	19/06/2025 - RM250	RM250 (#2764)	[details]
Wildan Wong	#1970	20/06/2025 - RM100	RM100 (#1970)	[details]

Figure 8.2.10: Payment Reconciliation

Figure 8.2.11 shows the penalty management for all customers and a penalty calculator that can calculate penalty when entering the due date/time and actual return date/time.

The screenshot displays the HASTA software interface, specifically the 'Penalty Management' section. At the top, there is a navigation bar with links to 'Payment Tracking', 'Penalty Management', 'Time-Based Pricing Rules', 'Cashback Rules Dashboard', 'Payment Reconciliation', and 'Demand Prediction Dashboard'. On the left side, there is a vertical sidebar with icons for 'Customer List', 'Booking ID', 'Due Date & Time', 'Actual Return Date & Time', 'Hour Late', 'Total Penalty', and a currency symbol.

The main area is titled 'Penalty Management' and contains a table listing four customer bookings:

Customer Name	Booking ID	Due Date & Time	Actual Return Date & Time	Hour Late	Total Penalty
John Adam johnadam@gmail.com	#2189	20/06/2025 18:00	21/06/2025 09:00	15 hours	RM225
Daniel Jackson danieljackson@gmail.com	#1948	22/06/2025 10:00	22/06/2025 14:30	4.5 hours	RM67.50
Sarah Ain sarahain@gmail.com	#2567	23/06/2025 12:00	24/06/2025 09:15	21.25 hours	RM318.75
John David johndavid@gmail.com	#2488	25/06/2025 15:00	25/06/2025 18:45	3.75 hours	RM56.25

Below the table, there is a section titled 'Penalty Calculator' with input fields for 'Due Date & Time', 'Actual Return Date & Time', 'Penalty Rate', 'Late Duration', and 'Total Penalty'. The 'Penalty Rate' field is set to 'RM15/hour', 'Late Duration' is listed as 'XXXXXX', and 'Total Penalty' is also listed as 'XXXXXX'.

Figure 8.2.11: Penalty Management

Figure 8.2.12 shows the cashback rules dashboard which shows discounts that can be redeemed by using points.

The screenshot displays the HASTA platform's Cashback Rules Dashboard. At the top, there is a navigation bar with links to Payment Tracking, Penalty Management, and Payment Reconciliation, along with Time-Based Pricing Rules, Cashback Rules Dashboard, and Demand Prediction Dashboard. On the left, a sidebar features icons for Home, User, Data, and Help. The main content area is titled "Cashback Rules Dashboard". It contains a table with the following data:

Discount	Description	Points	Valid (month)
15% Cashback	15% returned as credit after booking	1,000	3 months
RM3 Flat	RM3 off your total rental.	3,000	5 months
10% + Free GPS	10% off + free GPS device.	1,000	8 months
RM70/day (5+ days)	RM70/day for rentals 5 days or more.	3,000	5 months
8% Cashback	8% returned as credit.	800	4 months
RM30 Flat	RM30 off instantly.	10,000	9 months
20% Cashback	20% returned as credit.	1,500	12 months
5% (Hybrid/EV)	5% off Hybrid or EV rentals.	500	7 months

Figure 8.2.12: Cashback Rules Dashboard

Figure 8.2.13 shows a demand prediction dashboard that predict the demand of customer in future and the comparison between predicted booking trend and actual booking trend. Also, the recommended pricing calculated automatically according to demand level.

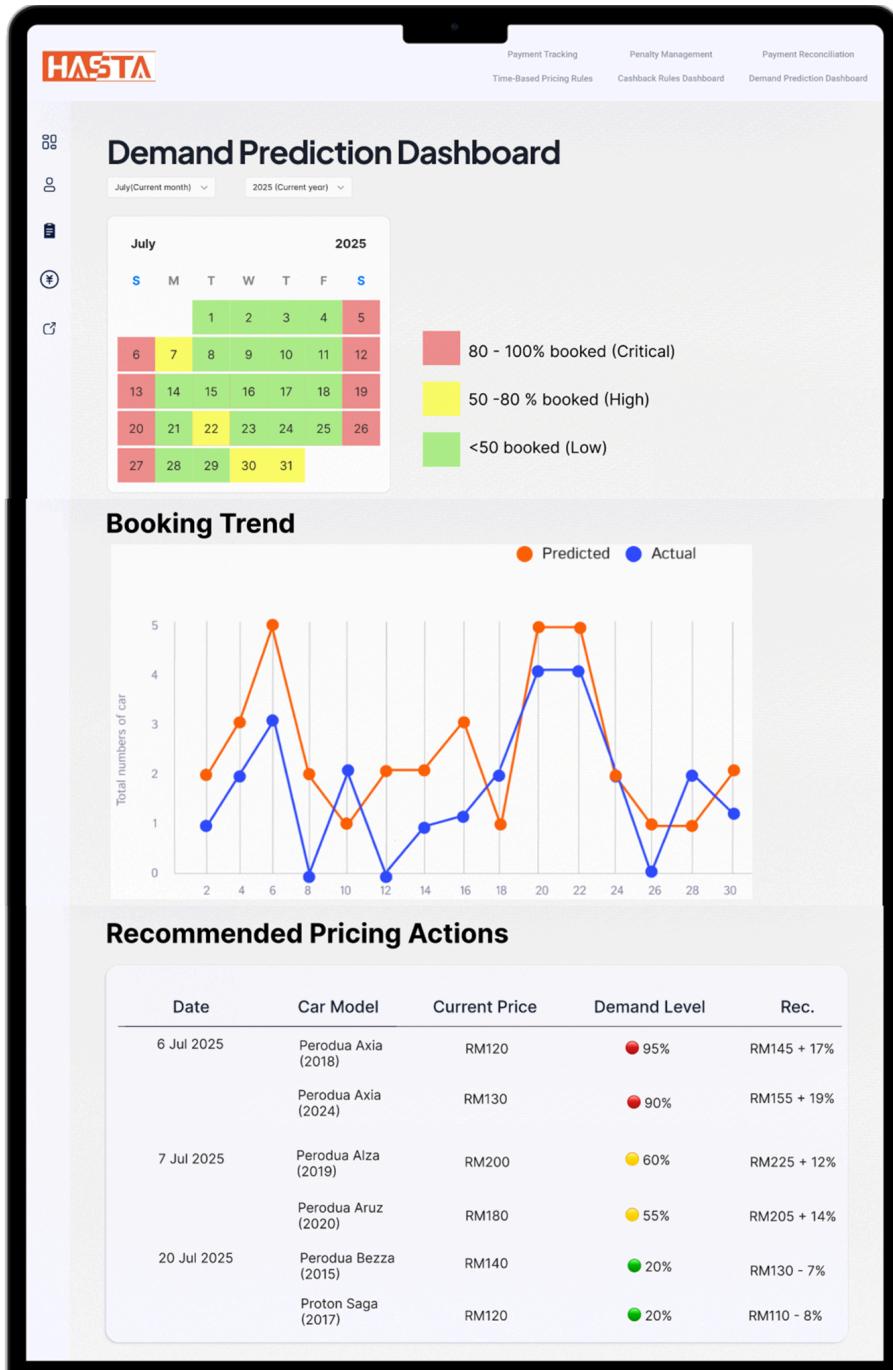


Figure 8.2.13: Demand Prediction Dashboard

8.3 Figma Link

Admin:

<https://www.figma.com/proto/JcGwzrEeJ3Lu4Bt1Z3UzC1/SAD-TECH5GO?node-id=141-3168&m=dev&scaling=scale-down&content-scaling=fixed&page-id=18%3A2&starting-point-node-id=141%3A3168&showproto-sidebar=1&t=KCpoFmN6twUYFmAW-1>

User:

<https://www.figma.com/proto/JcGwzrEeJ3Lu4Bt1Z3UzC1/SAD-TECH5GO?node-id=98-390&m=dev&scaling=scale-down&content-scaling=fixed&page-id=0%3A1&starting-point-node-id=68%3A382&showproto-sidebar=1&t=QPTCrwMdmf78Mqfd-1>

9.0 Summary of the proposed system

The Car Rental Management System for Hasta Travel aims to modernize and automate the current vehicle rental process. However, the existing system may lead to human errors, data inconsistencies, and operational delays due to manual record-keeping and limited digital integration. To address these issues, a centralized web-based platform will be implemented to simplify workflows, minimize manual processes, and enhance the overall service experience for both customers and staff.

One of the major improvements includes real-time data synchronization across several key modules such as booking, payment, fleet management, and accounting. This integration will reduce the risk of conflicting information and delays through instant updates. Features like dynamic pricing and automated confirmation notifications further optimize operational efficiency and improve income management, particularly during peak rental periods.

Additionally, the system introduces a user-friendly self-service portal that encourages customers to manage their own bookings, upload payment proof, view rental history, and receive real-time updates which will improve user autonomy and satisfaction. From the staff's perspective, automation in processes like booking verification, blacklist management, and report generation reduces workload and allows more focus on customer service and decision-making.

Technically, the system will leverage cloud technologies such as AWS or Firebase to support scalability, data backup, and system security. Economically, although initial development requires moderate investment, the long-term benefits—such as reduced labor costs and optimized pricing—make the system cost-effective. Operationally, the intuitive interface minimizes the learning curve, ensuring smooth adoption by both staff and users.

In conclusion, the proposed system is a robust and future-ready solution that addresses the core limitations of Hasta Travel's current process. It enhances efficiency, data accuracy, user experience, and revenue potential, positioning Hasta Travel as a more competitive and reliable car rental service at Universiti Teknologi Malaysia (UTM).