UNIVERSITI TEKNOLOGI MALAYSIA

System Analysis and Design
(SECP 2613)

PROJECT

Phase 2: Information System Gathering and Requirements

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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 semi-manual system which is leading to inefficiencies, errors and delays in daily operation 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 too 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 Information Gathering Process

4.1 Methods Used

4.1.1 Interactive Methods

To understand user needs and operational challenges, an interview was conducted with key stakeholders at Hasta Travel, including the company director, Encik Mohamad Faiz Irfan and Encik Alif Firdaus. The in-depth discussions revealed the major inefficiencies in the current manual booking system. For instance, the lack of real-time vehicle availability checks which results in double bookings during peak periods. Additionally, critical information such as accident reports and traffic fines is currently tracked through informal WhatsApp messages, posing serious compliance risks.

The interview followed a funnel structure, starting with broad, open-ended questions to gather general insights, then narrowing down to specific operational issues using more focused, close-ended questions. This approach fostered an open and comfortable environment for stakeholders to share their experiences, particularly valuable when discussing topics like revenue loss and regulatory concerns.

4.1.2 Unobtrusive Methods

The observation was conducted using the STROBE (Structured Observation of the Environment) technique by simulating the complete user journey within the Hasta Travel booking system. The process from initiating a booking request to receiving confirmation, were carefully monitored to determine what worked well, where inefficiencies emerged, and which elements caused user confusion or delays.

The observation focused on actual user-system interactions to ensure an objective assessment of the booking workflow.

Figure 4.1.2.1: Rental price list for Hastal Travel

Through Figure 4.1.2.1, it was found that the current Hasta Travel application and booking system displays fixed rental rates that do not adjust based on demand. The rates remain the same during both peak and off-peak hours, with no dynamic pricing applied during high-demand periods such as semester breaks, public holidays, or university events. This lack of flexibility results in missed opportunities to take advantage of customers' higher willingness to pay, which is estimated to be 20% to 30% more during peak times.

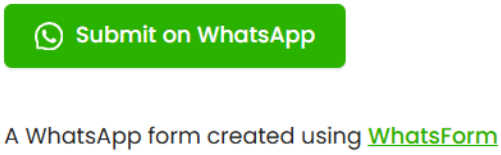

Figure 4.1.2.2: Submission for car rental booking form

The current Hasta Travel application heavily relies on manual processes, which creates noticeable pain points for users throughout the booking journey. Customers are required to go through a tedious, multi-step procedure that begins with submitting booking forms via WhatsApp. This is followed by long waiting periods as staff manually check vehicle availability and handle payment processing. Such a system not only slows down the overall experience but also reduces user satisfaction due to the lack of automation and real-time updates.

4.2 Summary of Methods Used

4.2.1 Interactive Methods

An interview was conducted with key stakeholders at Hasta Travel to discover user needs and operational challenges. The discussions reveal the critical inefficiencies in the manual booking system, including the absence of real-time vehicle availability checks which leads to double bookings, and the use of informal WhatsApp messages to manage important information such as accident reports and fines, which raises compliance concerns. The interview was structured using the funnel approach, beginning with open-ended questions and narrowing to specific issues. This method encouraged open dialogue and provided valuable insights, especially on sensitive matters like lost revenue and regulatory risks.

4.2.2 Unobtrusive Methods

The observation, conducted using the STROBE technique, provided a structured assessment of the user journey within the Hasta Travel booking system. It revealed key inefficiencies, including fixed rental rates that do not reflect demand fluctuations during peak periods such as holidays or semester breaks, resulting in missed revenue opportunities. Additionally, the system relies on manual processes, such as booking via WhatsApp and staff-dependent confirmations, creating a slow, cumbersome experience for users. These findings highlight the urgent need for automation, real-time updates, and dynamic pricing to enhance both operational efficiency and user satisfaction.

5.0 Requirements Analysis

5.1 Current Business Process

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.

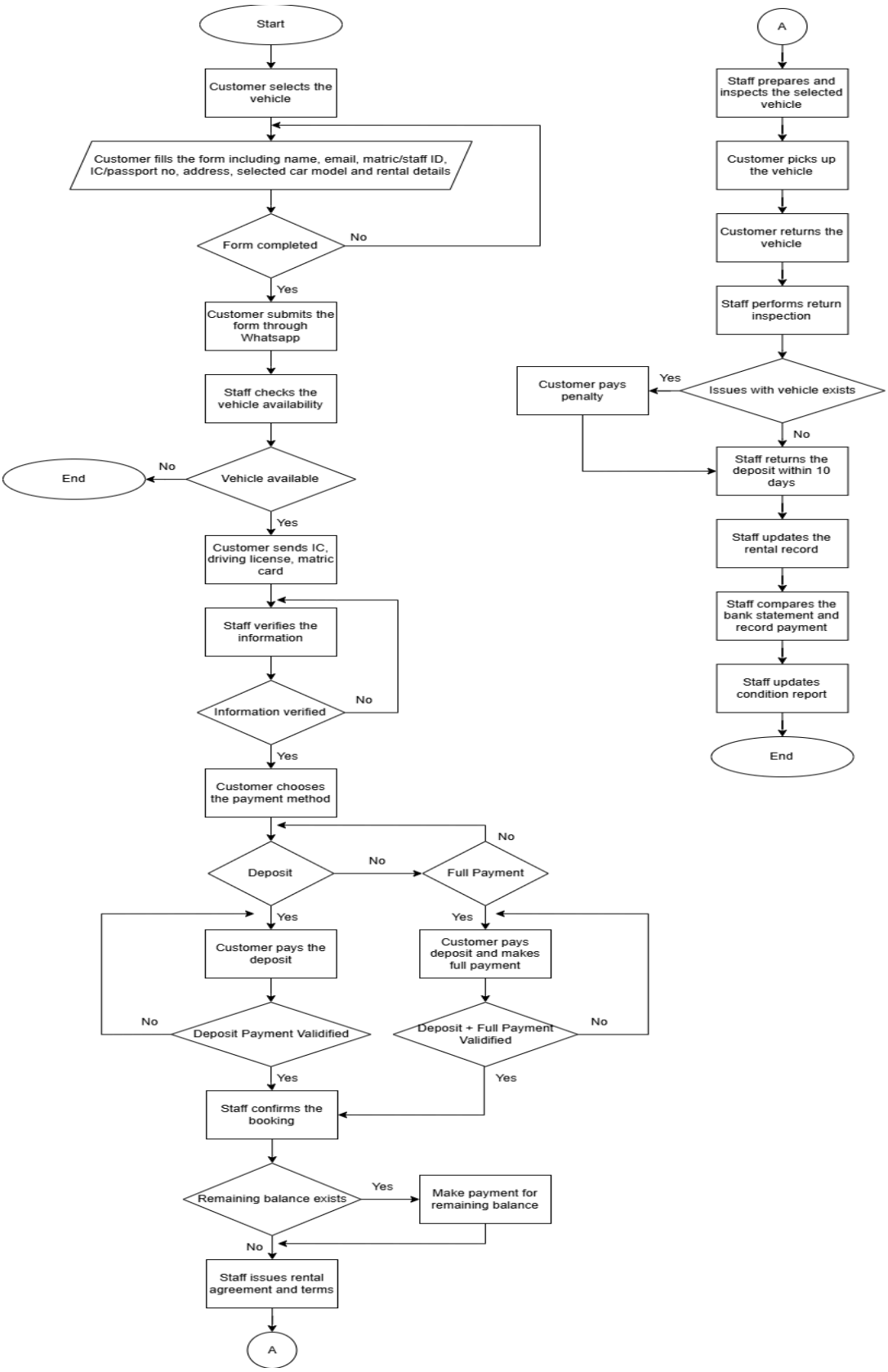

Figure 5.1.1 Flowchart of Current Business Process

5.2 Functional Requirements

5.2.1 Input

1. **Customer Inquiries**
   Customer inquiries are received via WhatsApp. Customers send requests for rental dates, vehicle types, duration (hourly/daily/monthly) and special instructions. There is no structured form for submission. For this reason, the current form is highly unstructured and varies per customer.

2. **Customer Personal Information**
   The customer's personal information can only be manually collected during communication. This includes name, phone number, faculty, college, matric number (for UTM students) and staff ID (for UTM Staff). The information is stored either in spreadsheets, chat history or written notes.

3. **Payment Details**
   Customers send proof of bank transfer (screenshots) or confirm cash payments. Then, staff receives and verifies manually via WhatsApp. Most importantly, there is no centralized logging system which means the verification is recorded only in "remarks" or internal notes.

4. **Vehicle Condition Reports**
   Inspection is conducted before and after rental to identify any new damages or issues. The inspections include damage like scratches or dents, cleanliness and fuel level. Findings are filled manually into a paper form or a basic digital log (Track system).

5.2.2 Process

1. **Availability Check**
   Staff uses the Track system or spreadsheets to verify if a vehicle is free on selected dates. This step is done manually by checking records, which takes time and is prone to errors.

2. **Customer Information Logging**
   Information is typed manually into spreadsheets or internal systems, Track. There is no automatic verification or validation so errors can occur. For example, phone number is typed wrongly or a duplicate entry might occur.

3. **Payment Processing**
   Staff waits for WhatsApp proof of transfer or physical cash. Payment status like deposit, full payment and installment, is updated manually. For long-term rentals like 3 months, installment payments are allowed but noted only in "remarks".

4. **Vehicle Preparation**
   Staff ensures the vehicle is cleaned, fueled and checked before handing over. However, there is no digital checklist so it will be reliant on employee memory or informal routines.

5. **Pre- and Post-Rental Inspections**
   Inspections are done by staff using a standard inspection form. Results are entered manually into the Track system. Then, findings like damage or fuel shortages lead to manual penalty calculations.

6. **Penalty & Charges Calculation**
   Extra time is billed at RM35 per hour. The penalty is calculated manually and communicated to the customer via WhatsApp or verbally. Payment for penalties is also made manually and proof is shared by the customer.

5.2.3 Output

1. **Booking Confirmation**
   Booking confirmation is sent via WhatsApp after payment is received. Nevertheless, no standardized invoice or digital confirmation document is given to customers.

2. **Customer Records**
   Customer Information is stored in a spreadsheet or the Track system. The record contains personal data, booking history, remarks on payment and conduct.

3. **Vehicle Inspection Records**
   Vehicle Inspection Records are logged manually before and after rental in PDF, spreadsheet or Track, depending on staff.

4. **Receipts or Invoices**
   Receipts or invoices are issued manually if needed. They are usually shared via WhatsApp or printed. There is no automated system for generating structured receipts or invoices.

5.3 Non-functional Requirements

5.3.1 Performance

1. **Slow Response Times**
   Due to manual availability checking and communication, customers often wait hours or longer for booking confirmation.

2. **Limited Operational Efficiency**
   Staff handles all bookings manually. Thus, workload and risk of overlooking customer messages or bookings increase.

3. **Lack of Real-time Data**
   The system does not have a feature that allows customers to see availability or get instant booking status. Most importantly, even staff need time to open systems, verify and cross-check before replying.

4. **Scalability Limitations**
   Current system does not support high booking volume efficiently. For instance, adding more vehicles, customers or staff leads to chaos without a centralized and automated tool.

5.3.2 Control

1. **Human Error**
   Manual data entry leads to typographical error, miscommunication, double-bookings and also incorrect penalty calculation. As a result, data accuracy is susceptible to human error.

2. **Data Inconsistency**
   Customer data is spread across chats, spreadsheets and internal tools, so data is not validated or does not have a consistent format.

3. **Lack of Audit Trail**
   The current system is difficult to track who the person that handled a booking is, changes in booking or payment records and also history of vehicle issues.

4. **Minimal Data Protection**
   Customer info is stored in WhatsApp chats or Excel files, which may not be encrypted. Besides, the current system does not have role-based access, which any staff member may access sensitive data. Consequently, data security measures for protecting customer and financial information are limited.

5. **Limited Compliance & Reporting**
   No system can auto-generate financial reports, LHDN-compliant invoices or monthly summaries. Hence, it is hard for management to review performance or financial health efficiently.

5.4 Logical DFD AS-IS system

5.4.1 Context Diagram

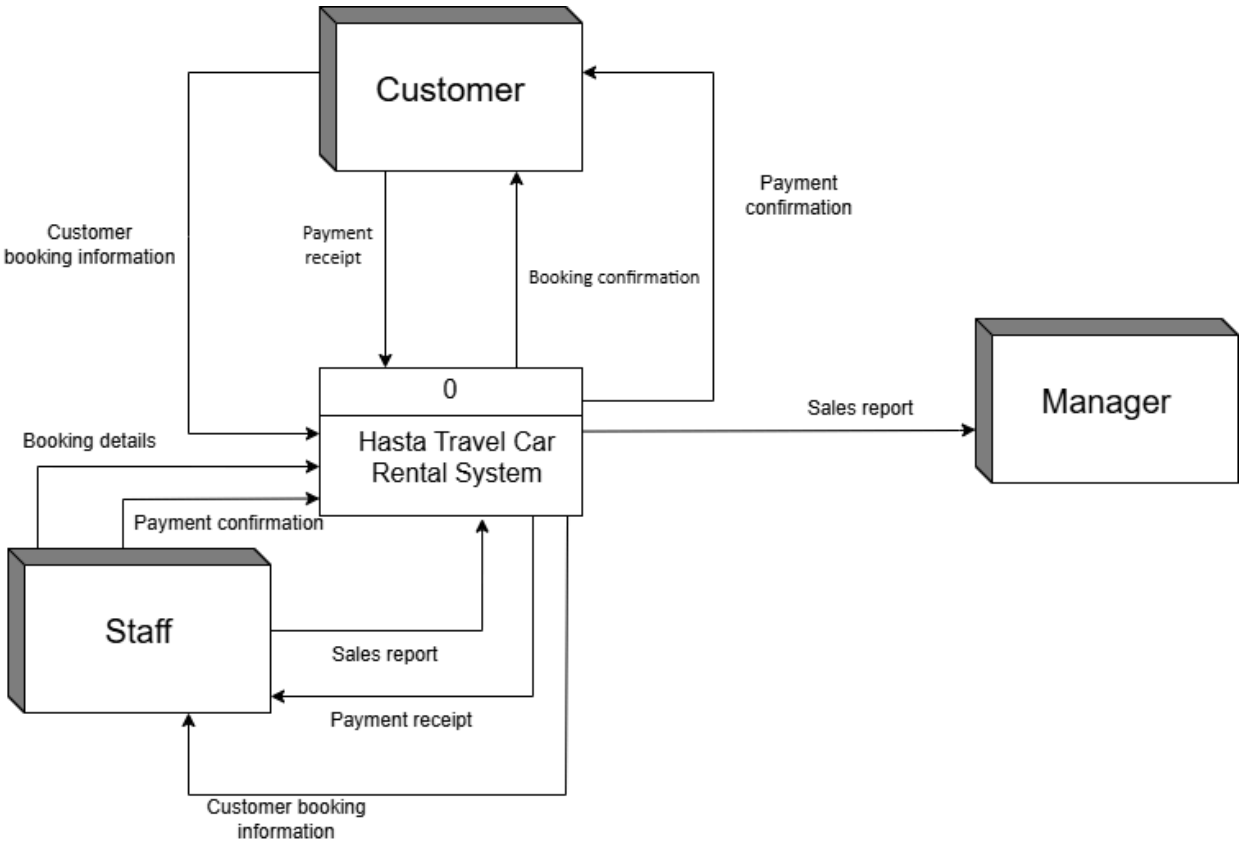

Figure 5.4.1.1: Context diagram for logical DFD AS-IS system

5.4.2 Diagram 0

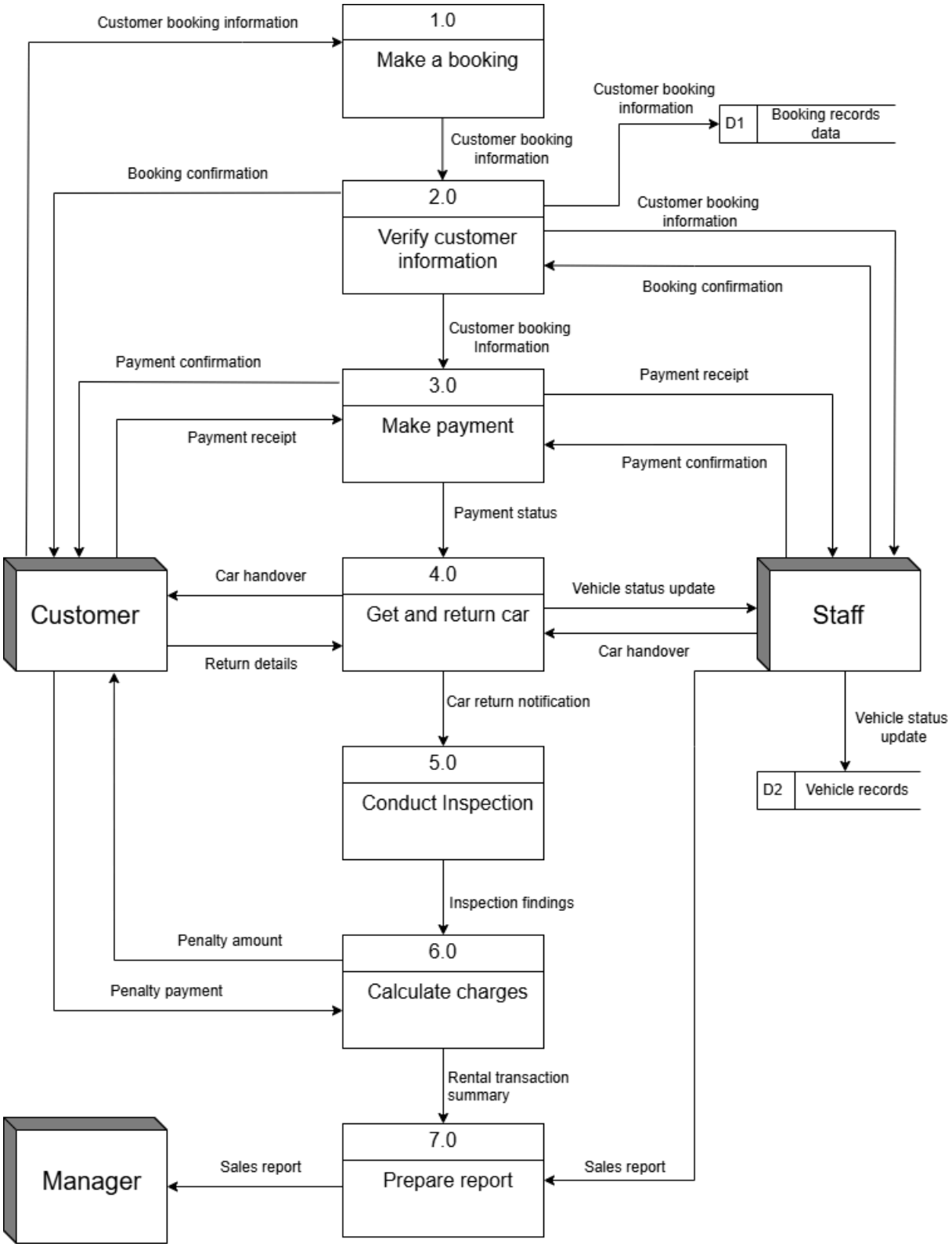

Figure 5.4.2.1:Diagram 0 for logical DFD AS-IS system

5.4.3 Child Diagram

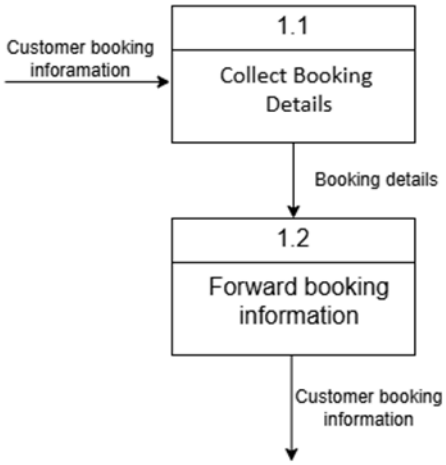

Figure 5.4.3.1: Child diagram for process 1.0 (Make a booking)

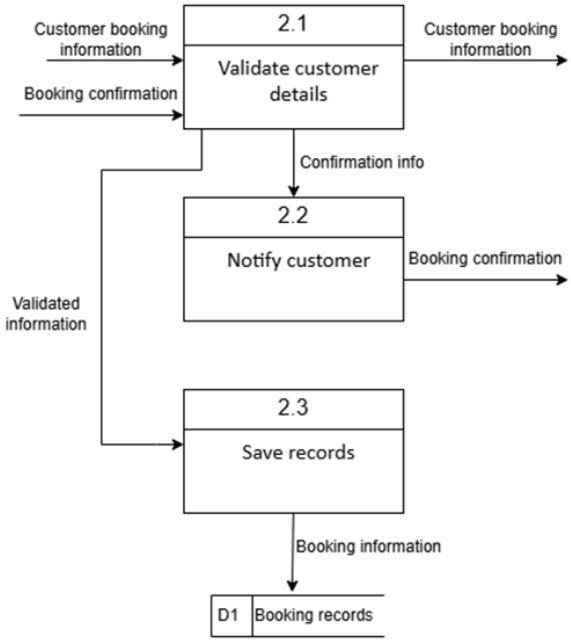

Figure 5.4.3.2: Child diagram for process 2.0 (Verify customer information)

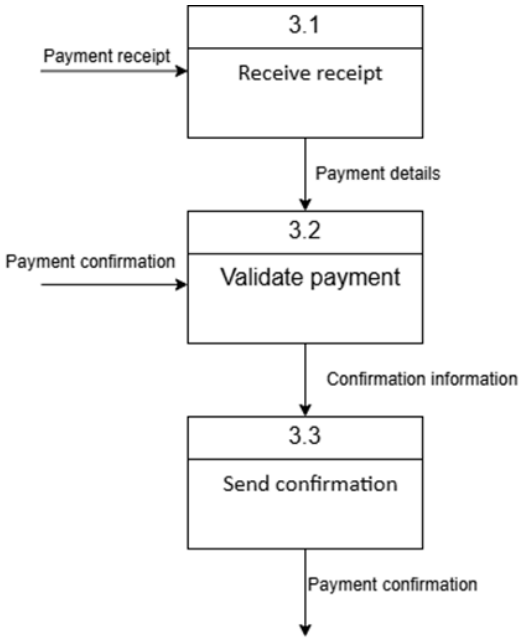

Figure 5.4.3.3: Child diagram for process 3.0 (Make payment)

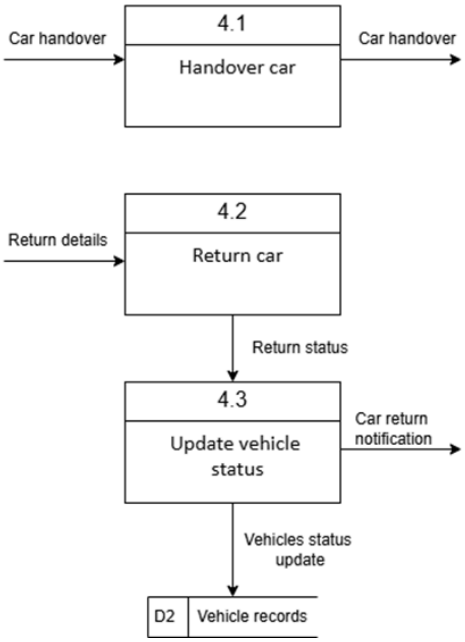

Figure 5.4.3.4: Child diagram for process 4.0 (Get and return car)

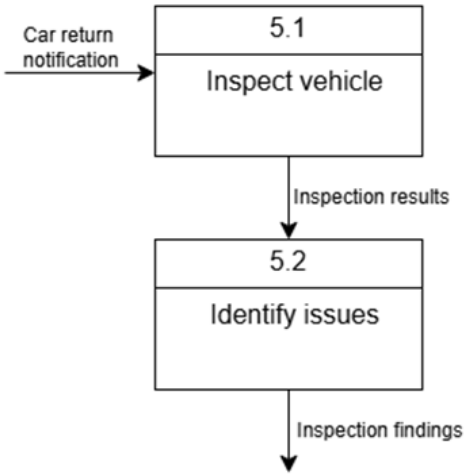

Figure 5.4.3.5: Child diagram for process 5.0 (Conduct inspection)

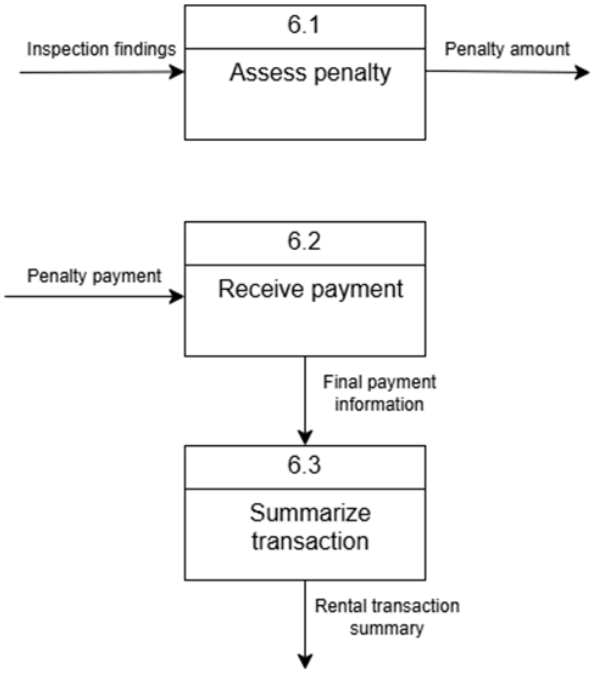

Figure 5.4.3.6: Child diagram for process 6.0 (Calculate charges)

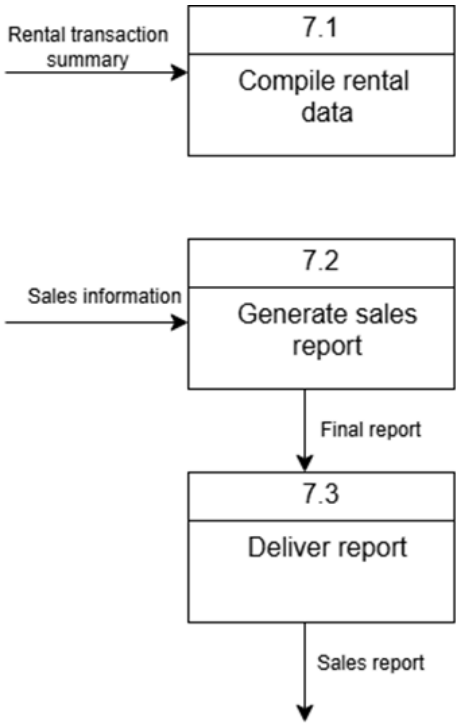

Figure 5.4.3.7: Child diagram for process 7.0 (Prepare report)

6.0 Summary of Requirement Analysis Process

The requirement analysis process began with the identification of some of the key issues in the current semi-manual car rental system of Hasta Travel, such as human error caused by manual data handling, lack of real-time integration, no centralized system, static pricing, and lack of automatic customer risk rating. To address these problems, it was proposed to have a centralized web-based system that would offer real-time updates, automation, and dynamic pricing.

Information was gathered by interviews through interactive methods with stakeholders to understand inefficiencies. Other than that, an unobtrusive method which is observation by using the STROBE method used to assess the whole booking experience. This revealed problems like double booking, inflexible pricing, and slow confirmation due to manual processes.

Functional and non-functional requirements were also defined including the inputs about user details and payment confirmation; the processes about availability checking and inspections, also outputs about booking confirmation and receipts. Non-functional requirements are concerned with performance, data accuracy, and the scalability of the system. Existing workflows and system diagrams were lastly recorded to pave the way for future improvements.