SECD2613 - 04

SYSTEM ANALYSIS AND DESIGN

SEMESTER 1 SESSION 2024/2025

GROUP PROJECT PHASE 2

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Prepare a System Requirement Document as below:

1.0 Overview of the Project

HASTA, a car rental service with an affiliation with academic institutions, currently employs a manual system for vehicle rental reservation, monitoring, and administration. This old system is plagued by numerous inefficiencies such as booking conflicts, delays in processing, and inefficient communication between staff and customers. The recommended solution is the use of a web-based Car Rental Management System (CRMS) with campus application. This system will automate reservations, consolidate vehicle data, provide real-time status, and enhance communication between users and staff.

By substituting the manual process with a computerized system, HASTA hopes to:

Enhance operational efficiency

Reduce human error.

Enhance customer satisfaction

Furthermore, it will facilitate prospective scalability, encompassing potential collaborations with payment systems and mobile applications.

2.0 Problem Statement

HASTA currently faces an array of challenges due to its reliance on manual operations in managing car rental businesses. These include:

Ongoing booking gaps are due to the lack of real-time information.

Delayed confirmations and misunderstandings with customers.

Inadequate tracking of vehicle use and accessibility.

Breakdown of centralized data that produces incongruent information.

No analytics tools for decision-making regarding fleet performance or customer behavior.

Failure to automate or scale services because of system constraints.

They hinder the organizational service quality, operational efficiency, and long-term growth potential.

3.0 Proposed Solutions

In order to surmount these difficulties, the team suggests creating and implementing a web-based Car Rental Management System with the following features:

Principal Characteristics

Online Real-time Booking Interface for staff and students.

Admin Dashboard for managing users, vehicles, and bookings.

Automated Notifications for booking reminders and confirmations.

Data Analytics Module for tracking fleet performance and utilization.

Secure Login System with role-based access control.

Feasibility Overview

Technical: Built in known web technologies (HTML, CSS, JS, PHP/Python, MySQL); able to be deployed on university or cloud servers.

Operational: Easy for employees to utilize and run; user-friendly interface minimizes training needs.

Economic: Advancement initiated by a team of students (cost-effective); enduring savings on labor-intensive procedures.

Cost-Benefit Summary Estimated Cost: RM 250 (primarily for training and minor maintenance) Expected Annual Benefit: RM 6,200 (staff time savings and fewer errors) Net Benefit: RM 5,950 and a Benefit-Cost Ratio (BCR) of 24.8

4.0 Information Gathering

4.1 Method Used

To understand the gaps in the manual car rental system used by HASTA, a predefined procedure was followed to capture information. The aim was to gather practical information from actual users, which include students and staff, and understand issues related to vehicle booking, confirmation, data tracking, and related communication. For this, we chose a hybrid approach — part observation and part digital interaction focused on the students.

The primary approach was direct observation, where each team member had to go to the HASTA rental counter and observe the process by which booking is done manually. This observation gave us a better understanding of the existing processes, constraints in the system, and potential causes of errors and inefficiencies including the use of handwritten logs, status reporting lags, and interactions among staff and users.

The second method consisted of sending an online questionnaire to a broad sample of stakeholders who had previously interacted with the HASTA service. The goal was to obtain information in both simple and complex forms value outcome metrics alongside experiences ,so the questionnaire was designed to encourage ease of completion in a brief, coherent format. We included:

- Measurable response options,
- Detailed opinion responses and suggestions,
- Nominal classifications like preferred channel for notifications,
- Interval measurements for satisfaction and importance of system features such as rating usability on a scale of 1–5.

The questionnaire was Google Form-based and shared via class groups, WhatsApp, and Telegram. This provided a self-administered approach which maintained respondent privacy and convenience. Their responses were automatically gathered in real time and structured into raw datasets for analysis.Collectively, this approach ensured there were data-backed solutions for key user requirements tailored to the users' expectations and feelings, thus creating a HASTA system that truly served the needs of users instead of defaulting to presumptions.

Survey link:
https://docs.google.com/forms/d/e/1FAIpQLScCI7xHCTcW

Closed Questions

Interval Scale:

1. On a scale of 1 to 5, how satisfied are you with the current car rental process?
2. On a scale of 1 to 5, how important is it to receive booking confirmations and reminders?
3. On a scale of 1 to 5, how easy is it to check vehicle availability before booking?

Nominal Scale:

1. How did you make your last booking with HASTA?
2. Have you ever experienced issues when booking a vehicle through HASTA?
3. Do you prefer using a web-based car rental booking system?

Open-Ended Questions

1. Which parts of the HASTA car rental service do you think need improvement?
2. Have you ever missed or had to cancel a booking due to poor communication or system delays? Please explain.
3. What features would you like to see in the new online booking system?


4.2 Summary from Method Used

To gain deeper insights into the issues users experience with the HASTA car rental service, we conducted a structured questionnaire containing both closed and open-ended questions. The responses allowed us to identify user pain points with the current manual system and uncover expectations for a future digital version.

How did you make your last booking with HASTA?
Most respondents (around 60%) reported making their bookings in person, while 25% used phone calls. Surprisingly, 15% of the respondents reported yet to have used the service, an option which suggests low awareness or accessibility under the prevailing system. That such bookings continue to depend on physical and manual processes highlights the imperative to transform to the digital era.

Q1: How did you make your last booking?
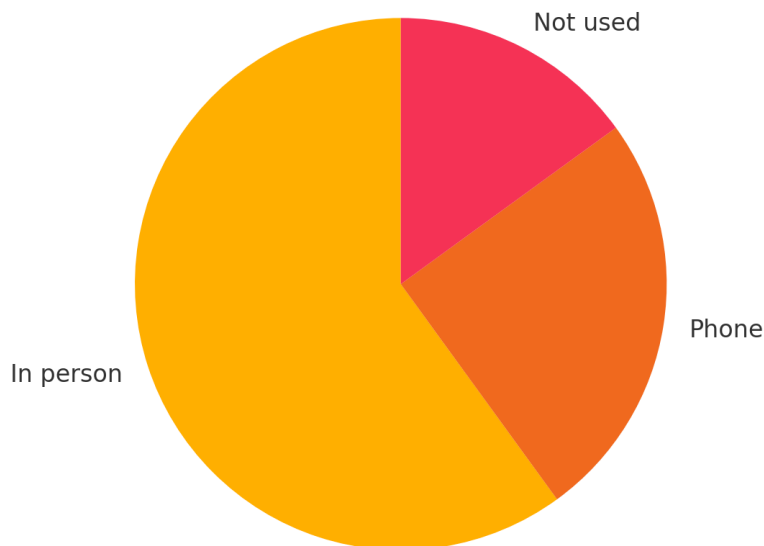
Have you ever experienced issues when booking?
Most respondents reported problems such as slow confirmations, which were experienced by 70%, double bookings or unavailability, which were experienced by 50%, and no reminders or notifications, which were experienced by 60%. User satisfaction is directly impacted by these problems and can trigger frustration, especially where access to transport is needed quickly.

Do you prefer using a web-based booking system?
The reply towards this query was surprisingly decisive: an astonishingly high 90% said they supported it, indicating a strong demand for such a system to facilitate easy and quick online bookings for cars. Only 5% were undecided or preferred to keep things as they were, indicating a strong necessity for digital change.

How satisfied are you with the current rental process?
Generally, participants reported a medium satisfaction rating, scoring 2.8 out of 5, indicating that most were not fully satisfied with the system. Their feedback revealed an underlying sense of frustration over delays in reservations, procedural complexities, and the failure to receive immediate feedback after reserving.

How important is it to receive booking confirmations and reminders?
This was the standout question, with an average importance score of 4.7 out of 5. Many respondents wrote about how timely reminders — such as reservation confirmations and return bookings reminders — would greatly eliminate cases of miscommunication and missed appointments.

Which areas of the service do you think need improvement?
Most frequently mentioned problems included the pace of bookings, excessive reliance on paper forms, unclear booking guidelines, and irregular communication. Users noted that although the system operates, it is not convenient and intuitive for students used to online services.

Have you ever had to miss or cancel a reservation due to the system?
Around 45% of the questioned reported positively. They cited double bookings, inadequate confirmations, and last-minute messages to be the regular causes of confusion or cancellation.

What would you like to see in the new system?
Respondents provided the following suggestions: car availability being seen in real-time, automatic notifications, mobile-friendliness, live chat support with HASTA staff, and receipts and booking history being easily accessible.

5.0 REQUIREMENT ANALYSIS (based on AS-IS analysis)

The requirement analysis process is a critical foundation for the development of any information system. For this project, the objective of the requirement analysis is to identify, understand, and document the current challenges within the existing manual HASTA car rental system (referred to as the AS-IS system) and to define the necessary features and functionalities for the new proposed system (TO-BE system). This process ensures that the final system is tailored to meet user expectations, operational goals, and organizational needs.

To begin the requirement analysis, the project team first examined the current operational methods used by HASTA. This involved investigating how car rental bookings were made, how vehicle availability was monitored, and how confirmations were communicated to users. The AS-IS system heavily relies on manual processes such as handwritten logs, physical booking forms, and verbal or phone-based communication. As a result, numerous inefficiencies were identified, including delays in confirmation, overlapping bookings, lack of proper data tracking, and limited visibility into vehicle availability.

To validate these issues and gather user-specific requirements, the team conducted a structured data collection process involving two main methods: direct observation and an online questionnaire. Each team member visited the HASTA car rental counter to observe the booking and rental process in real-time. These observations revealed system constraints such as the absence of real-time data updates, reliance on paper-based logs, and difficulties in maintaining accurate transaction records.

In parallel, a digital questionnaire was distributed among students and staff who had previously interacted with the HASTA rental service. This allowed the team to gather both quantitative and qualitative data from a broader set of users. The questionnaire results highlighted key pain points experienced by users, including slow confirmations (reported by 70% of respondents), double bookings (50%), and the lack of automated reminders or notifications (60%). Additionally, when asked about their preference for a digital system, 90% of users expressed support for a web-based booking platform, clearly indicating a strong demand for digital transformation.

Using this feedback, the team evaluated the gap between the current system and what users expected. Functional gaps such as real-time availability checking, digital confirmation, payment integration, and improved communication features were noted as high-priority requirements. Moreover, expectations around system speed, reliability, and ease of use informed the non-functional aspects of the new system's design.

The requirement analysis concluded by documenting both the functional and non-functional requirements based on the AS-IS analysis. These requirements include system login, rental booking with validation, payment processing, and automatic notification mechanisms. In addition, performance targets such as response time, system availability, security features, and scalability have been defined to ensure the system performs efficiently and securely under various conditions.

Through this structured and evidence-based approach, the requirement analysis serves as a roadmap for the development of the HASTA Car Rental Management System. It ensures that the system design is driven by real user needs, grounded in operational reality, and focused on solving actual problems in the existing manual process. Ultimately, this phase strengthens the foundation for the system's success, supporting both the short-term goals of improved service and the long-term vision of scalable, digital transformation.

5.1 CURRENT BUSINESS WORKFLOW:

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                             ▼
                   ┌──────────────────┐
                   │ STUDENT LANDING  │
                   │ TO THE MAIN PAGE │
                   └──────────────────┘
                             │
                             ▼
                   ┌──────────────────┐
                   │ STUDENT GO TO    │
                   │ BOOK CAR OPTION  │
                   └──────────────────┘
                             │
                             ▼
┌─────────────────┐  YES    ◇ STUDENT ◇   NO   ┌──────────────────┐
│ STUDENT FILL IN │◄────────│ SELECT CAR TO │─────►│ STUDENT GO BACK  │
│ THE FORM TO     │         │     BOOK      │      │ TO MAIN PAGE     │
│ RENT CAR        │         ◇               ◇      └──────────────────┘
└─────────────────┘
         │
         ▼
      ◇ STUDENT ◇     NO    ┌──────────────────┐
      │ SUBMIT THE │────────►│ STUDENT GO BACK  │
      │ FORM ON    │         │ TO MAIN PAGE     │
      │ WHATAPP    │         └──────────────────┘
      ◇           ◇
         │
        YES
         │
         ▼
┌─────────────────┐       ◇ STAFF CHECK CAR ◇   NO   ┌──────────────────┐
│ STAFF PROCESSING│──────►│ AVAILABLE OR NOT │───────►│ CANCEL OR        │
│ THE FORM        │       ◇                  ◇        │ CHANGE DATE      │
└─────────────────┘                                   └──────────────────┘
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                                 YES
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                       ┌──────────────────┐
                       │ STAFF PROVIDE QR │
                       │ OR ACCOUNT NO    │
                       │ FOR PAYMENT      │
                       └──────────────────┘
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                                  ▼
                       ┌──────────────────┐
                       │ STUDENT MAKE THE │
                       │ PAYMENT          │
                       └──────────────────┘
                                  │
                                  ▼
                       ┌──────────────────┐
                       │ STUDENT RECEIVE  │
                       │ PAYMENT INVOICE  │
                       │ AND RENTAL DETAIL│
                       └──────────────────┘
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                             (  END  )
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Logical DFD (AS-IS) system (based on current business process/workflow)

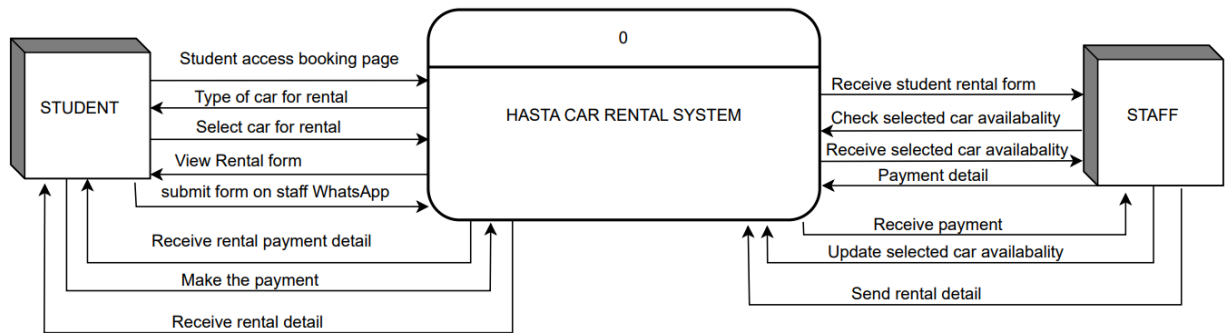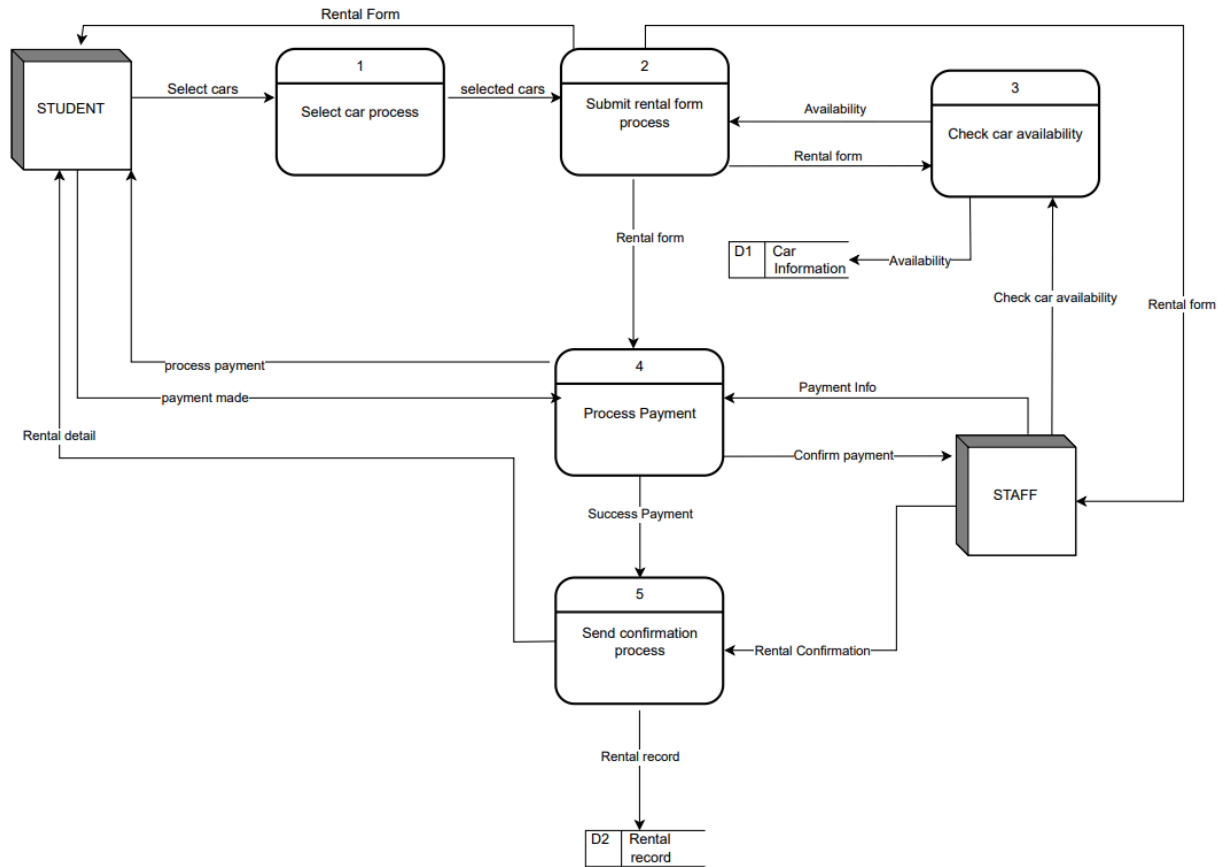## Context Diagram:

Diagram 0:

Functional requirements

Add login process:

- Input:
    - Student ID and password
- Process:
    - Validate student credential
- Output:
    - View page

Improve Rental System:

- Input:
    - Select car type (sedan, MPV, SUV, e.g)
    - Student input rental details (start and end dates, contact number, purpose of rental, Destination)
- Process:
    - System check selected car availability during selected dates
    - Sends availability status to the student
- Output:
    - Availability confirmation
    - Message to student("Car is available", " Car not available")

Enhance Payment Process:

- Input:
    - Validated form and car availability confirmation
    - Payment through fpx, debit card, credit card, etg.
- Process:
    - System calculates totals rental cost (rate * number of days rented).
    - Display summary of payments to students.
    - Sends payment details to Staff for confirmation.
- Output:
    - Payment status (success or failure)
    - Payment record.

Automatic Send Rental Confirmation Detail:

- Input:
    - Success payment
    - Rental details and payment Receipt
- Process:
    - Generates digital rental receipt
    - Send confirmation to students and notifies staff.
    - Store rental transactions in Rental records.
    - Update car availibilty on the selected date.
- Output:
    - Digital Rental and payment detail message to student via email.
    - Staff notified of completed Rental.
    - Selected status changed to Unavailable on the selected dates.

By establishing these functional criteria with explicit inputs, procedures, and outputs, the HASTA car rental may be upgraded to better suit the demands of its users, boosting overall functionality and user satisfaction.

5.4 Non-functional requirements:

Non-functional requirements refer to the system's operating characteristics and restrictions, rather than particular behaviours or functionalities. They ensure the system satisfies user expectations in performance, usability, dependability, and security.

Performance requirements:

- Response Time: The system responds to 95% of queries within 2 seconds.

- Scalability: Allow up to 1,000 concurrent users.

- Throughput: Manage 100 car rentals per minute.

- Availability: 99.9%.

- Capacity: Support data for 100,000 students and 1TB of car information and car rental information.

Control requirements:

- Security: Includes SSL/TLS encryption, hashed passwords, and role-based access control.

- Backup and Recovery: Daily backups, off-site storage, and four-hour recovery.

- Audit Logging: Detailed records of user activity are retained for 2 years.

- Data integrity: Includes transaction management and data validation procedures.

- Compliance: Adherence to data privacy standards and frequent security audits.

Including non-functional criteria in the HASTA Car rental system ensures efficient performance, security, and compliance with applicable standards.

6.0 Summary of Requirement Analysis process

Together, we discovered that a crucial component of the AS-IS system is the Requirement Analysis Process, which is based on AS-IS analysis. It assists our team members in guaranteeing the success of the process of developing our new system as a solution.

Understanding user and stakeholder scheduling requirements and preferences is the aim of the requirement analysis process. We will be able to establish a clear vision for the system's evolution and define its scope.

Obtaining information about the present system was the first thing our team performed. In order to get system insights, we used the interactive approach, which involves questionnaires, to administer an online survey to users of the existing systems. We can also determine the system's weak points and areas for development thanks to the survey.

Then we examine the data that was collected from the users. We determine the present system's circumstances and process. This makes it simpler for us to research the issues and user-submitted improvement ideas. Next, we'll look at each issue to see which has the most effects on the system and is most effective. We then go ahead and start recording the criteria.

Based on the existing system AS-IS analysis, we provide the current business process workflow in this system requirement. Additionally, we demonstrated the Context Diagram and Diagram 0 that make up the logical DFD AS-IS system. Next, we outlined the functional and non-functional requirements for the TO-BE system.

In order to effectively design the AS-IS system and make sure that the solutions provided can satisfy the demands of users and stakeholders, we firmly believe that a requirement analysis should be effective. We think that by acting appropriately, our team can improve cooperation and lower risks.