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UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING
UTM Johor Bahru

SECD2523
SECTION 10

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PROJECT TITLE:
HASTA CAR RENTAL
(PHASE 2)

GROUP: MEOW

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Phase 2

1.0 Introduction

We are enrolled as undergraduate students at the University of Technology Malaysia, currently in our second year, first semester, pursuing a Bachelor's Degree in Computer Science with Honors, specializing in Graphic and Multimedia Software. The development of this project proposal aligns with the academic requirements of our SECD2523 Database course, specifically Section 10, under the guidance of our esteemed lecturer, Dr. Rozilawati Binti Dollah @ Md Zain. The focus of our project revolves around addressing a crucial challenge faced by an e-commerce entity, HASTA car service rental. As they do not have a digital system yet, we want to conceptualize and construct an integrated digital system and ensure details tailored to enhance efficiency and align seamlessly with the objectives and purposes of HASTA's operations.

2.0 DFD (to-be)

2.1 Context Diagram

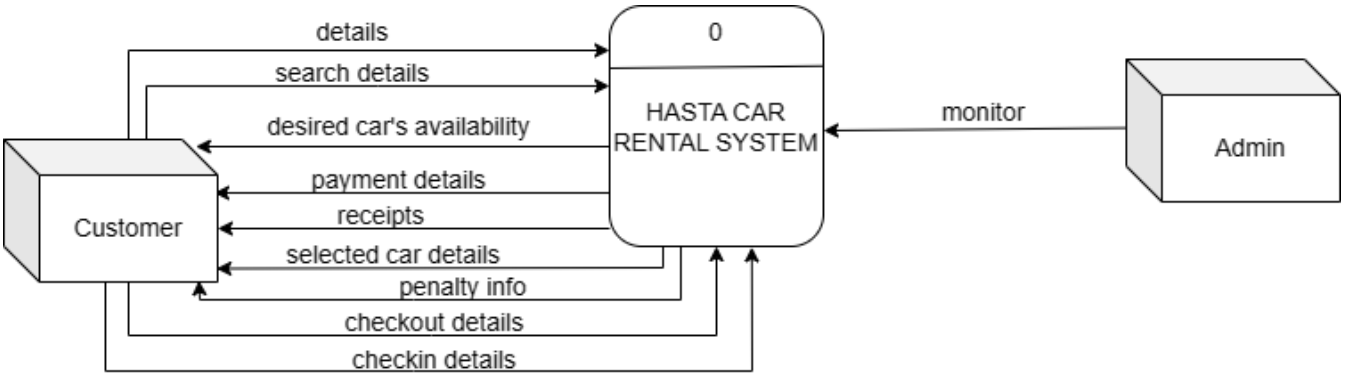

Figure 2.1: Context diagram

2.2 Diagram 0

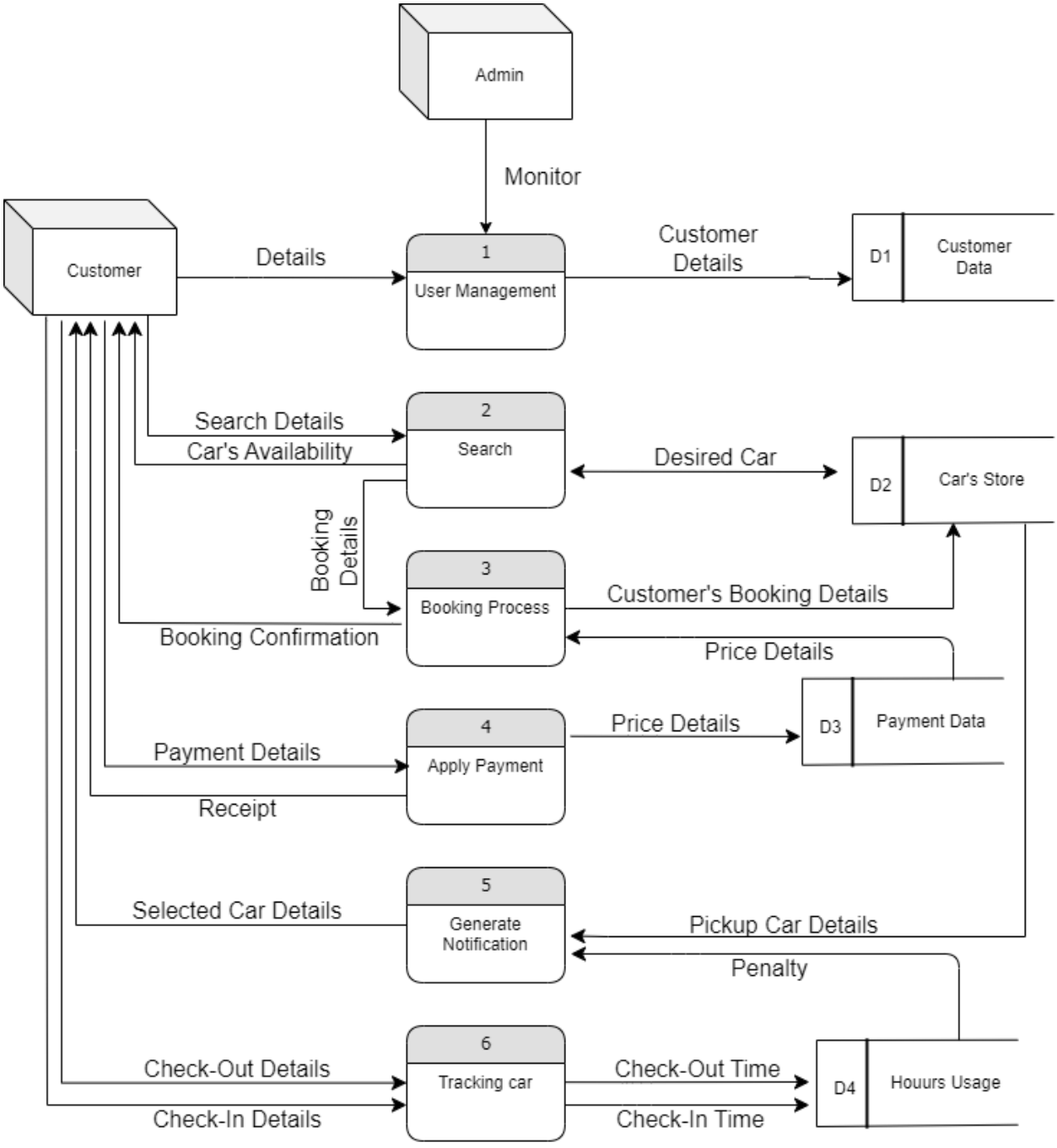

Figure 2.2: Diagram 0

2.3 Child Diagram

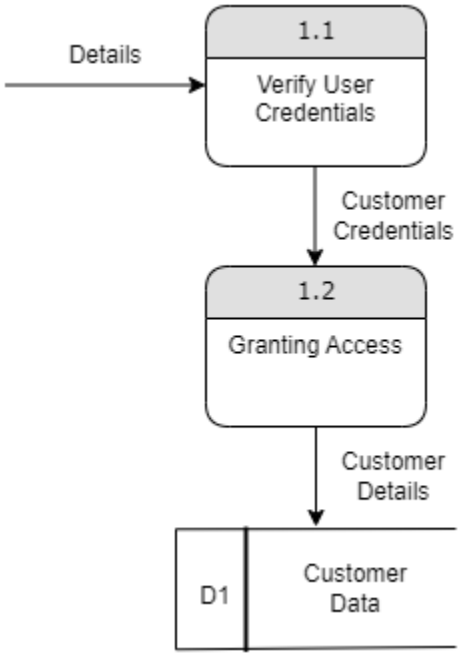

Figure 2.3.1: Child Diagram 1

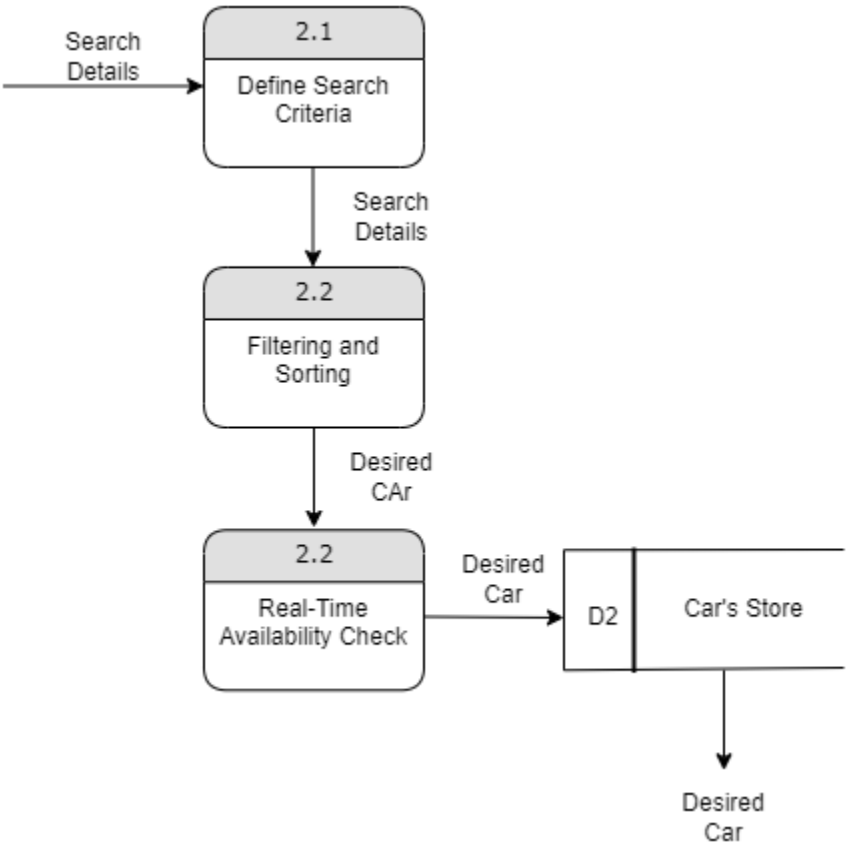

Figure 2.3.2: Child Diagram 2

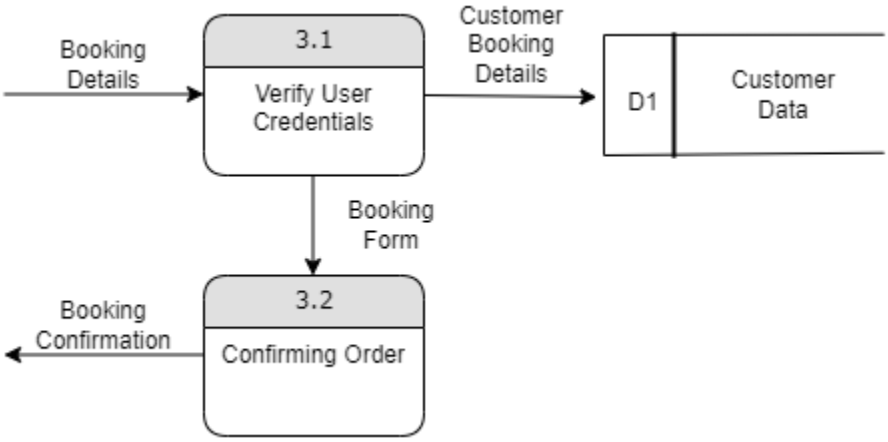

Figure 2.3.3: Child Diagram 3

3.0 Data & Transaction requirement

3.1 Proposed business rule

- Every customer and admin must register with a unique email address and phone number for system access.
- Every customer and admin need to log in using their unique username and password before accessing the application.
- Each customer can make multiple orders.
- Each customer can make payments for their orders.
- Each customer can define search criteria and choose their preferred cars based on those criteria.
- Each customer and admin can receive multiple notifications.
- Only the admin has the authority to monitor the notifications.
- Customers can schedule pickups for their orders.
- Customers can schedule returns for the cars they rented.
- Admin can monitor inventory updates, including changes in availability status.
- Admin can monitor pickup information, including order details and date/time.
- Admin can monitor return information, including order details, date/time, and hours of usage.
- Every customer can define search criteria, such as category, price range, model, and brand.
- Each order records payments, including transaction details, total amount, and payment status.

3.2 Proposed data & transactional

Entity	Data	Data Entry	Data Update	Data Delete	Data Queries
Customer	• CustID • Name • PhoneNo • Email • ICNo • Sex	Details entered by customers	Customer information updated in the system.	System delete customer information.	Query on customer's data.
Admin	• AdminID • Username • Password	Details entered by admin	Admin information updated in the system.	Admin information can be deleted from the system based on AdminID.	Query on admin's data.
Order	• OrderID • CarID • CarPlates • CarBrand • CarModel • CarType • CarColour • PickupTime • ReturnTime	Customers can make orders with the following details.	Order information can be updated based on OrderID.	Orders can be deleted based on OrderID.	Order information can be queried based on OrderID, CarID and UserID.
Payment	• PaymentID • OrderID • TransactionID • TotalAmount • Payment Date and Time • Payment Status	Payment details can be entered with the following information.	Payment information can be updated based on PaymentID or OrderID.	Payments can be deleted based on PaymentID or OrderID.	Payment information can be queried based on PaymentID, OrderID and UserID.
Penalty	• PenaltyID • UserID • ReturnDate	Penalties can be recorded with the following details.	Penalty information can be updated based on PenaltyID or UserID.	Penalties can be deleted based on PenaltyID or UserID.	Penalty information can be queried based on PenaltyID and UserID.
Return	• OrderID	Return details	Return	Returns can be	Return

	• UserID • ReturnDate • ReturnTime • HoursUsage	can be recorded with the following information.	information can be updated based on OrderID or UserID.	deleted based on OrderID or UserID.	information can be queried based on OrderID, UserID and ReturnDate.
Pickup	• OrderID UserID • PickupDate • PickupTime	Pickup details can be recorded with the following information.	Pickup information can be updated based on OrderID or UserID.	Pickups can be deleted based on OrderID or UserID.	Pickup information can be queried based on OrderID, UserID and PickupDate.
Inventory Update	• UpdateID • CarID • UpdateType • UpdateDate • Avalability Status	Admin manage InventoryUpdate	Inventory update information can be updated based on UpdateID or CarID.	Inventory updates can be deleted based on UpdateID or CarID.	Inventory update information can be queried based on UpdateID, CarID and UpdateType.
NotificationLog	• NotifID • UserID • NotiType • TimeStamp • Message	Notification logs can be recorded with the following details.	Notification log information can be updated based on NotifID or UserID.	Notification logs can be deleted based on NotifID or UserID.	Notification log information can be queried based on NotifID, UserID and NotiType.
Registration	• UserID • PhoneNo • Email • ICNo • Sex	Customers enter required details to register.	User information can be updated based on UserID.	User registrations can be deleted based on UserID.	User information can be queried based on UserID, PhoneNo, Email and ICNo.
SearchCriteria	• CriteriaID • UserID • Category • Price Range • Model • Brand	Customers search for their preferred car.	Search criteria information can be updated based on CriteriaID or UserID.	Search criteria can be deleted based on CriteriaID or UserID.	Search criteria information can be queried based on CriteriaID, UserID, Category, Price Range, Model and Brand.
Transaction	• TransID • TransDate • TransTime • TransStatus	Transaction details recorded from TransID in payment.	Transaction information can be updated based on TransID.	Transaction information can be deleted based on TransID.	Query on TransID.

4.0 Database conceptual design

4.1 Conceptual ERD

Figure 4.1 below is a conceptual ERD based on the to-be system of HASTA. The ERD has all entities involved for each module for the new system.

Module1: User Management

Entities: Registration

They will be responsible for verifying user identity during login using credentials and capturing user details for account creation, facilitating secure access and personalized features in the system.

Module 2: Inventory Management

Entities: InventoryUpdate,NotificationLog

The "InventoryUpdate" entity is designed to track changes in the inventory status of individual cars.This information aids in maintaining a comprehensive history of changes to the inventory, ensuring transparency and accountability in the System and can alert customers through notificationLog about the update.

Module 3: Search and Filtering Management

Entity: SearchCriteriaCaptures customer preferences for car searches.It handles customer-defined preferences, enabling personalized and automated searches in the system.

Module 4:Checkout and Payment

Entities: Order,Payment and Transaction,NotificationLog.

The important entity is Payment because its Payment ensures secure, encrypted transactions, validates payment data, and facilitates seamless communication with external payment systems during Payment and Transaction process.

We also include additional entities in order to complete the whole system.

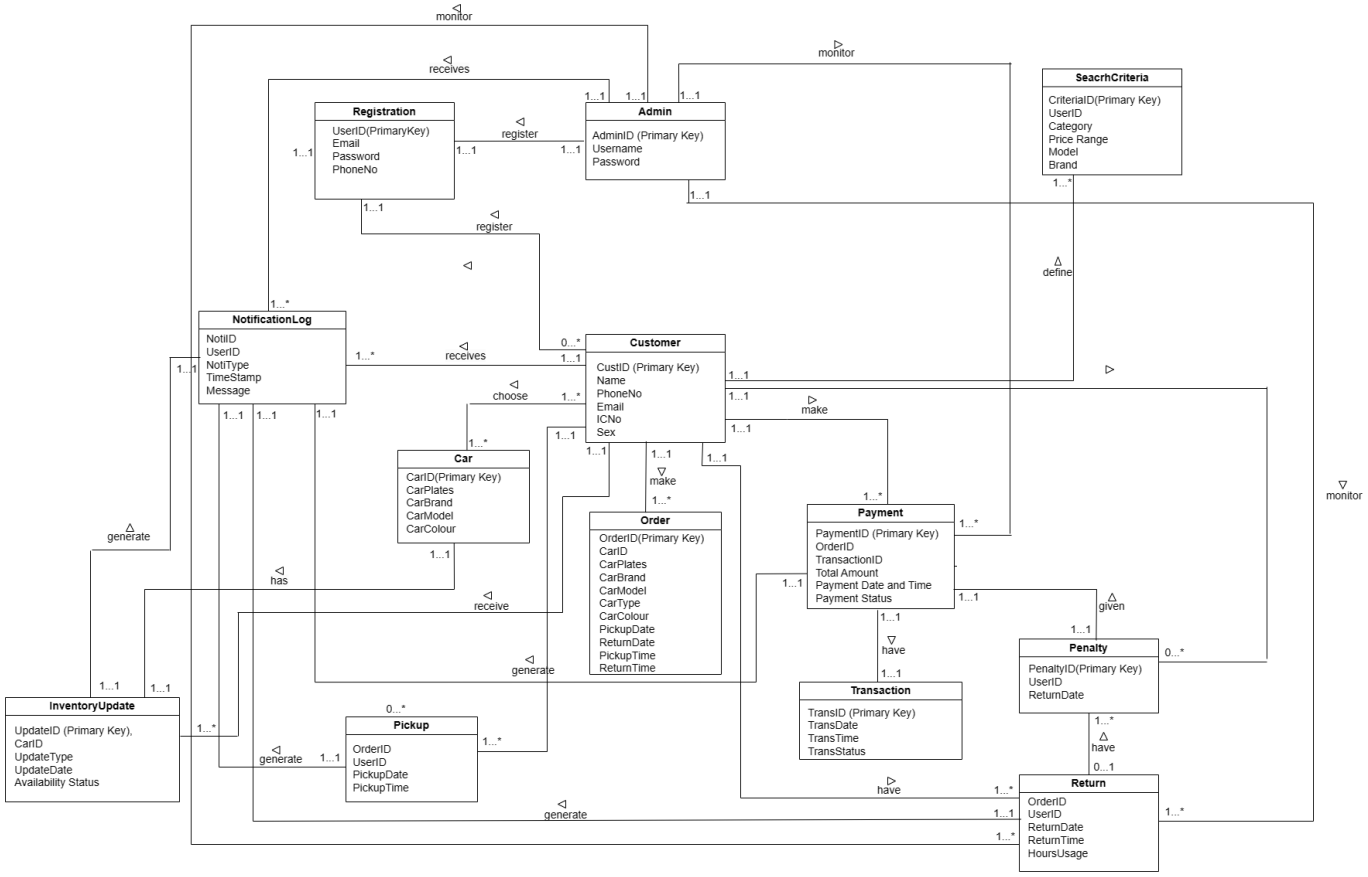

Figure 4.1: Conceptual ERD

4.2 Enhanced ERD (EERD)

Figure 4.2 below is an enhanced ERD based on the to-be system of HASTA. The EERD has two superclasses and four subclasses.

EERD 1: User Management

- Superclass: User
    - Attributes: UserID {PK}, Username, Password
- Subclass: Admin
    - Attributes: AdminID {PK}
- Subclass: Customer
    - Attributes: CustomerID {PK}, Name, PhoneNo, Email, ICNo, Sex
- Constraint: {Mandatory, Or}
    - Participation: “Mandatory” implies that every entity in the superclass must participate in at least one of the subclasses. In other words, it's mandatory for every user to have a role as either an admin or a customer. This is denoted by a double line connecting the superclass to each subclass.
    - Disjoint: “Or” specifies that an entity in the superclass can belong to one and only one subclass at a time. In this case, the "or" implies that a user can be either an admin or a customer, but not both simultaneously. This is also known as a non-overlapping or disjoint constraint.

EERD 2: Transaction Management

- Superclass: TransactionInfo
    - Attributes: TransactionID {PK}, TransDate, TransTime, TransStatus.
- Subclass: Payment
    - Attributes: PaymentID {PK}, OrderID, TotalAmount, PaymentStatus, PaymentDateandTime
- Subclass: Transaction
    - Attributes: TransactionID {PK}, TransDate, TransTime, TransStatus.

- Constraint: {Mandatory, And}
    - Participation: "Mandatory" implies that every entity in the superclass must participate in both subclasses. Every TransactionInfo must be both a Payment and a Transaction.
    - Disjoint: "And" specifies that an entity in the superclass can belong to both subclasses simultaneously. In this case, a TransactionInfo can be both a Payment and a Transaction.

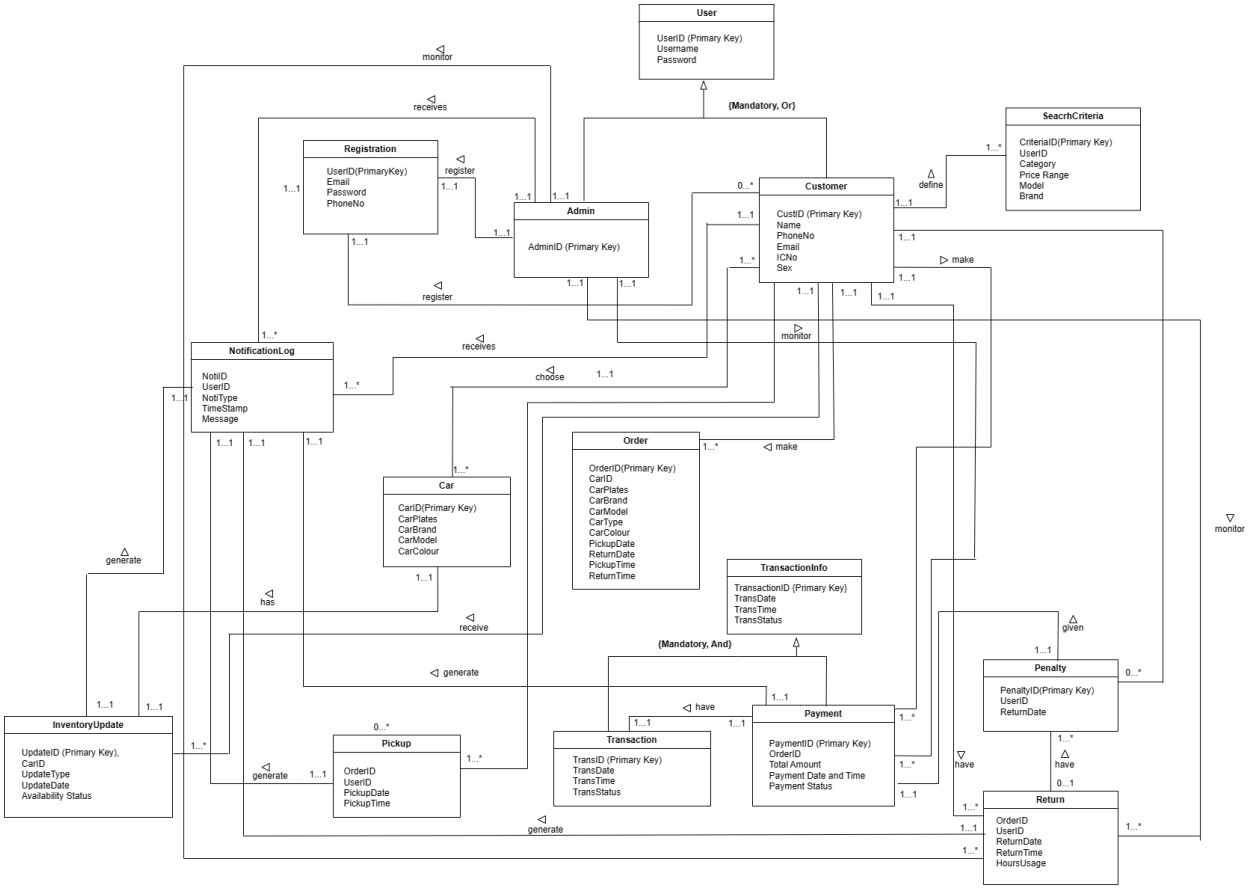

Figure 4.2: Enhanced EERD

5.0 Data dictionary

Entity Name	Attributes	Description	Data Type & Length	Nulls	Multivalued
Customer	CustID	Uniquely identified the customer	20 variable characters	NO	NO
	Name	Name of the customer	40 variable characters	NO	NO
	PhoneNo	Customer phone number	11 variable numbers	NO	YES
	Email	Customer email address	30 variable characters	NO	NO
	ICNo	Customer IC number	12 variable numbers	NO	NO
	Sex	Customer gender	10 variable characters	NO	NO
Admin	AdminID	Uniquely identified admin	20 variable characters	NO	NO
	Username	Username of admin	30 variable characters	NO	NO
	Password	Password of admin	20 variable characters	NO	NO
Car	CarID	Uniquely identified car	10 variable characters	NO	NO
	CarPlates	Number plates of car	10 variable characters	NO	NO
	CarBrand	Brand of car	20 variable characters	NO	NO
	CarModel	Model of a Car	20 variable characters	NO	NO

	CarColour	Uniquely identified the customer	20 variable characters	NO	NO
Registration	UserID	Uniquely identified user .	20 variable characters	NO	NO
	Email	Customer email address	30 variable characters	NO	NO
	Password	Password of user	20 variable characters	NO	NO
	PhoneNo	User phone number	11 variable numbers	NO	NO
Admin	AdminID	Uniquely identified admin	20 variable characters	NO	NO
	Username	Username of admin	30 variable characters	NO	NO
	Password	Password of admin	20 variable characters	NO	NO
SearchCriteria	CriteriaID	Uniquely identified criteria	40 variable characters	NO	NO
	UserID	Uniquely identified user	20 variable characters	NO	NO
	Category	Search item category	40 variable characters	NO	NO
Order	OrderID	Uniquely identified order	40 variable characters	NO	NO
	CarID	Uniquely identified car	10 variable characters	NO	NO
	CarPlates	Number plates of car	10 variable characters	NO	NO
	CarBrand	Brand of car	20 variable characters	NO	NO
	CarModel	Model of a Car	20 variable characters	NO	NO
	CarType	Type of a car	20 variable	NO	NO

			characters		
	CarColour	Colour of a car	10 variable characters	NO	NO
	PickupDate	Date to pick up car	Date	NO	NO
	ReturnDate	Date to return car	Date	NO	NO
	PickupTime	Time to pick up car	Timestamp	NO	NO
	ReturnTime	Time to return car	Timestamp	NO	NO
Payment	PaymentID	Uniquely identified payment ID	20 variable characters	NO	NO
	OrderID	Uniquely identified payment	40 variable characters	NO	NO
	TransactionID	Uniquely identified transaction ID	40 variable characters	NO	NO
	Total_Amount	Amount that need to be pay	20 variable numbers	NO	NO
	Payment_Date_ And_Time	Date and time for payment	30 variable characters	NO	NO
	Payment_Status	Status of payment	40 variable characters	NO	NO
Transaction	TransID	Uniquely identified transaction ID	40 variable characters	NO	NO
	TransDate	Date of transaction	Date	NO	NO
	TransTime	Time of transaction	Time	NO	NO
	TransStatus	Status of transaction	40 variable characters	NO	NO
Notification log	NotiID	Uniquely identified notification ID	50 variable characters	NO	NO

	UserID	Uniquely identified user ID	20 variable characters	NO	NO
	NotiType	Type of notification	40 variable characters	NO	NO
	TimeStamp	Time for notification being sent	Timestamp	NO	NO
	Message	Notification message	255 variable characters	NO	NO
Penalty	PenaltyID	Uniquely identified penalty ID	40 variable characters	NO	NO
	UserID	Uniquely identified user ID	20 variable characters	NO	NO
	ReturnDate	Date to return car	Date	NO	NO
Pickup	OrderID	Uniquely identified order	40 variable characters	NO	NO
	UserID	Uniquely identified user ID	20 variable characters	NO	NO
	PickupDate	Date to pick up car	Date	NO	NO
	PickupTime	Time to pick up car	Timestamp	NO	NO
InventoryUpdate	UpdateID	Uniquely identified update ID	40 variable characters	NO	NO
	CarID	Uniquely identified car	10 variable characters	NO	NO
	UpdateType	Type of update	20 variable characters	NO	NO
	UpdateDate	Date of update	Date	NO	NO
	Availability_Status	Status of availability	20 variable characters	NO	NO

6.0 Summary

In the proposed Hasta car rental system, a series of strategically designed modules acts as a collective solution of the previous system, elevating the user experience, enhancing operational efficiency, and ensuring transparency throughout the entire process. Module 1, User Management, serves as the gateway to the system, prioritizing secure access and personalization features. By implementing a thorough registration process, this module not only verifies user identity during login but also captures essential details, laying the foundation for a secure and user-centric environment.

Module 2, Inventory Management, introduces entities such as InventoryUpdate and NotificationLog, revolutionizing how the system handles changes in the inventory status of individual cars. InventoryUpdate meticulously tracks alterations, creating a comprehensive history that ensures transparency and accountability. Concurrently, the NotificationLog feature promptly communicates updates to customers, fostering engagement and keeping them informed about any changes in the available inventory.

Complementing these modules is Module 3, Search and Filtering Management, featuring the entity SearchCriteria. This module empowers users to capture and define their preferences for car searches, introducing a personalized touch to the system. By facilitating automated searches based on customer-defined criteria, it ensures a tailored experience, further enhancing user satisfaction and system efficiency.

The latest addition, Module 4: Checkout and Payment, introduces entities such as Order, Payment, Transaction, and NotificationLog. At the core of this module is the Payment entity, which plays a pivotal role in ensuring secure, encrypted transactions. Validating payment data and facilitating seamless communication with external payment systems, Payment guarantees a smooth and secure payment and transaction process. The incorporation of NotificationLog enriches customer communication, providing timely updates on payment status and contributing to a transparent and customer-centric car rental journey.

Collectively, these modules create a holistic and integrated car rental system, seamlessly guiding users from registration and inventory exploration to personalized searches and secure payment transactions. With a focus on transparency, accountability, and user satisfaction, the enhanced system not only streamlines operations but also redefines the car rental experience for both staff and students at the University Technology Malaysia.