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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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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

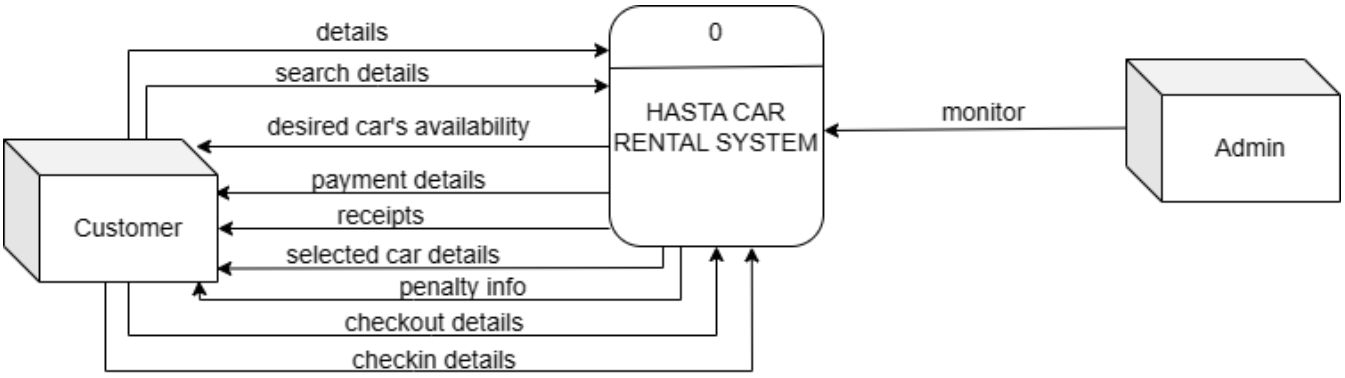

Figure 2.1: Context diagram

2.2 Diagram 0

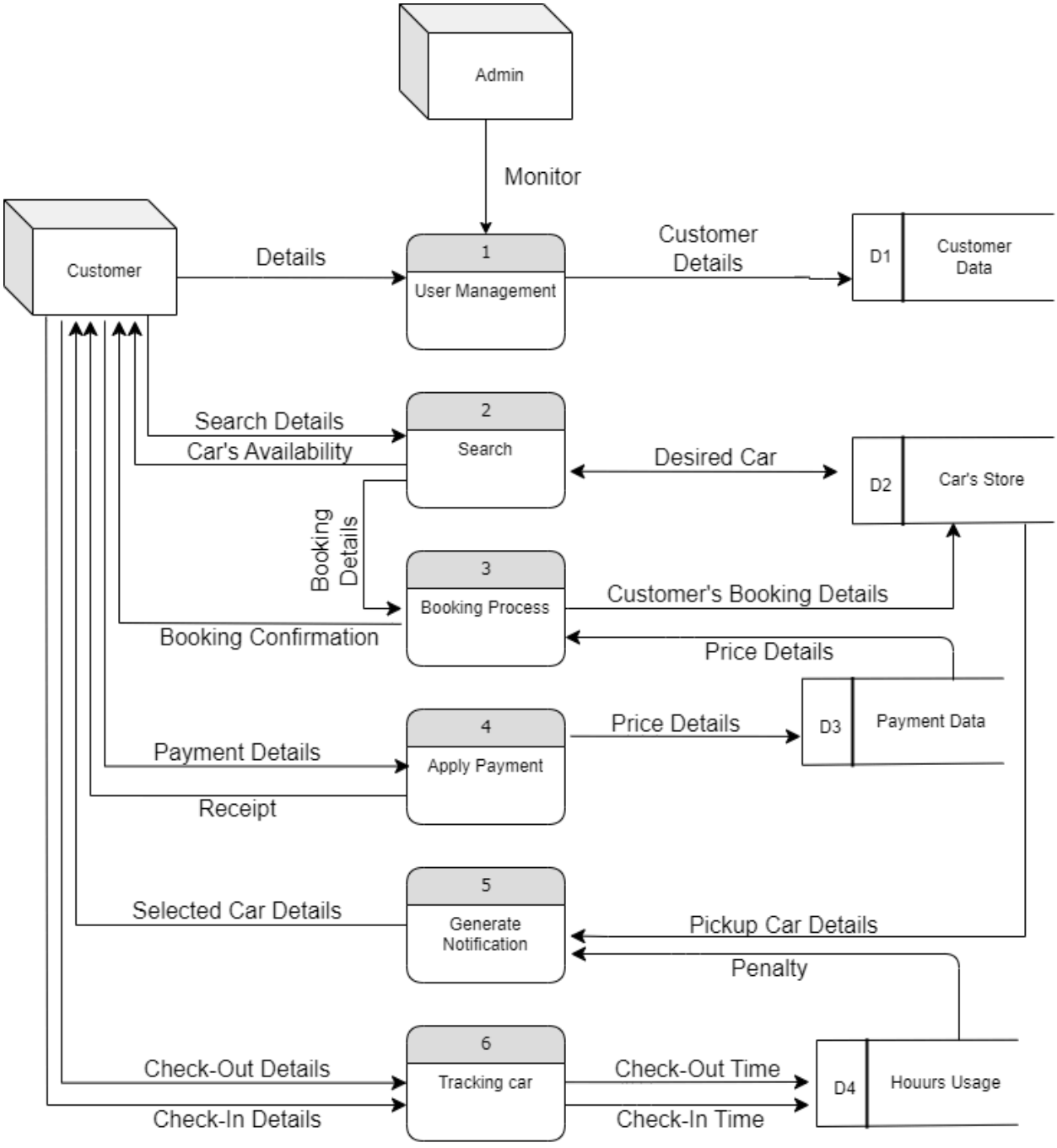

Figure 2.2: Diagram 0

2.3 Child Diagram

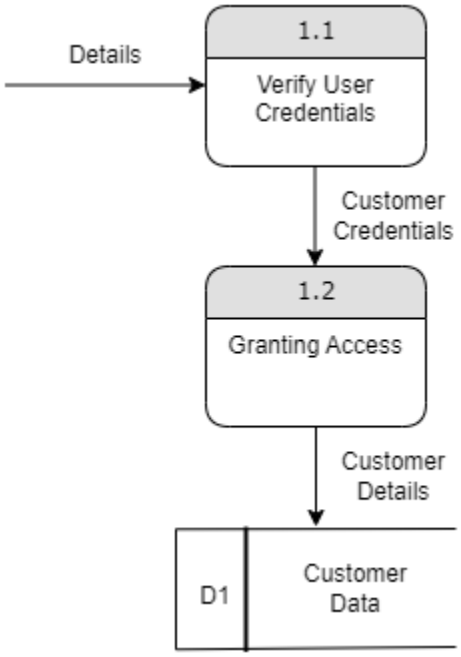

Figure 2.3.1: Child Diagram 1

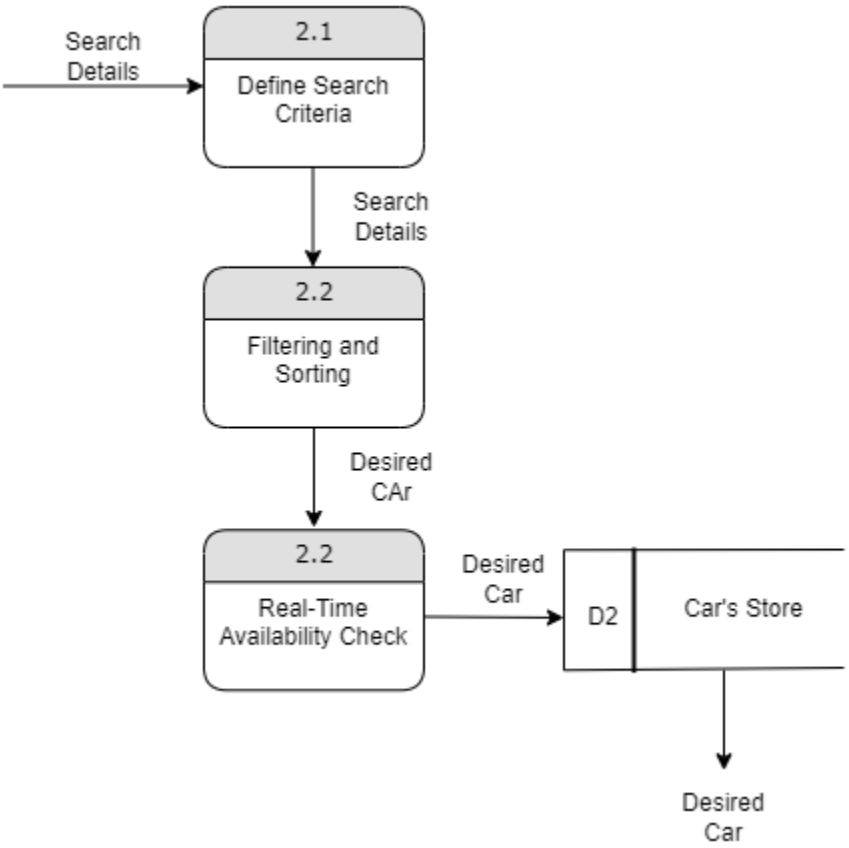

Figure 2.3.2: Child Diagram 2

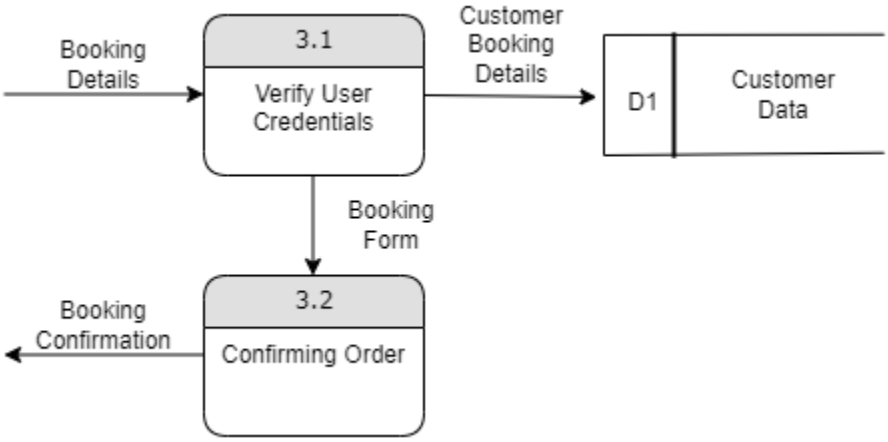

Figure 2.3.3: Child Diagram 3

3.0 Data & Transaction requirement

3.1 Proposed business rule

- Every customer and admin must register with a unique email address and each customer and admin can only register once using the same email address.
- Every registered user has to log in using a specific username and the password to access the system.
- The user of the system may be either an admin or a customer.
- A customer can define various criteria of the car he/she wants to rent.
- Each customer can place multiple rental/orders.
- Each customer can make payments for their orders/rental.
- Each payment can be referred to by an order.
- A customer can perform many pickup processes based on different orders.
- A customer can perform many returning processes based on the number of pickup processes.
- A customer may have many penalties but a specific penalty is issued to only one customer.
- Each payment can have multiple penalties but a specific penalty can be paid only once.
- An admin can perform a change to the inventory car list so car stock is always in manage.
- Each customer can receive many notifications but the notifications are specified to different categories such as Penalty status, Payment status, Pickup status and Return status notification.
- An admin can receive many notifications about car stocks.

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.

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

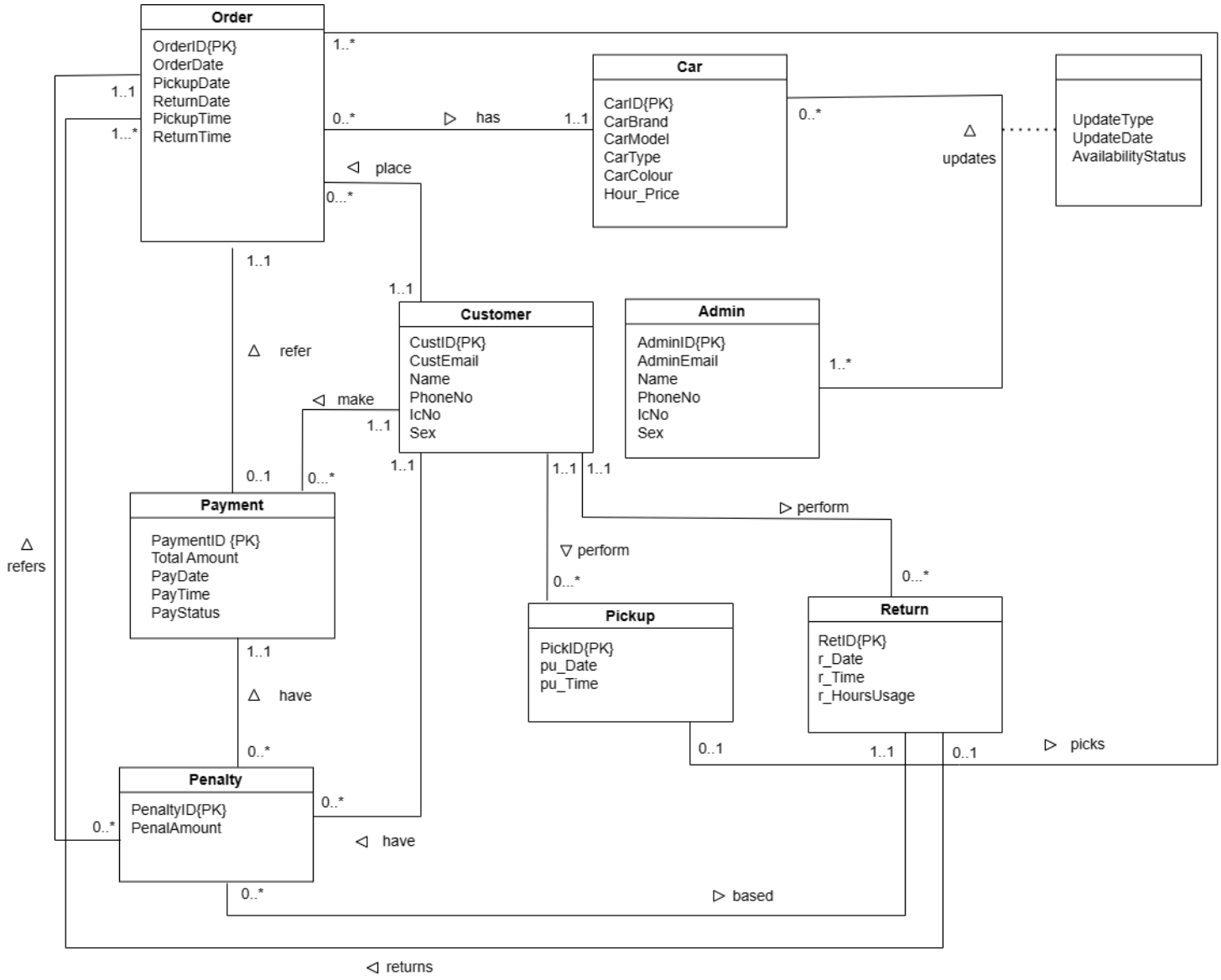

Figure 4.1: Conceptual ERD

4.2 Enhanced ERD (EERD)

Figure 4.2 below is an enhanced ERD based on the to-be system of HASTA.

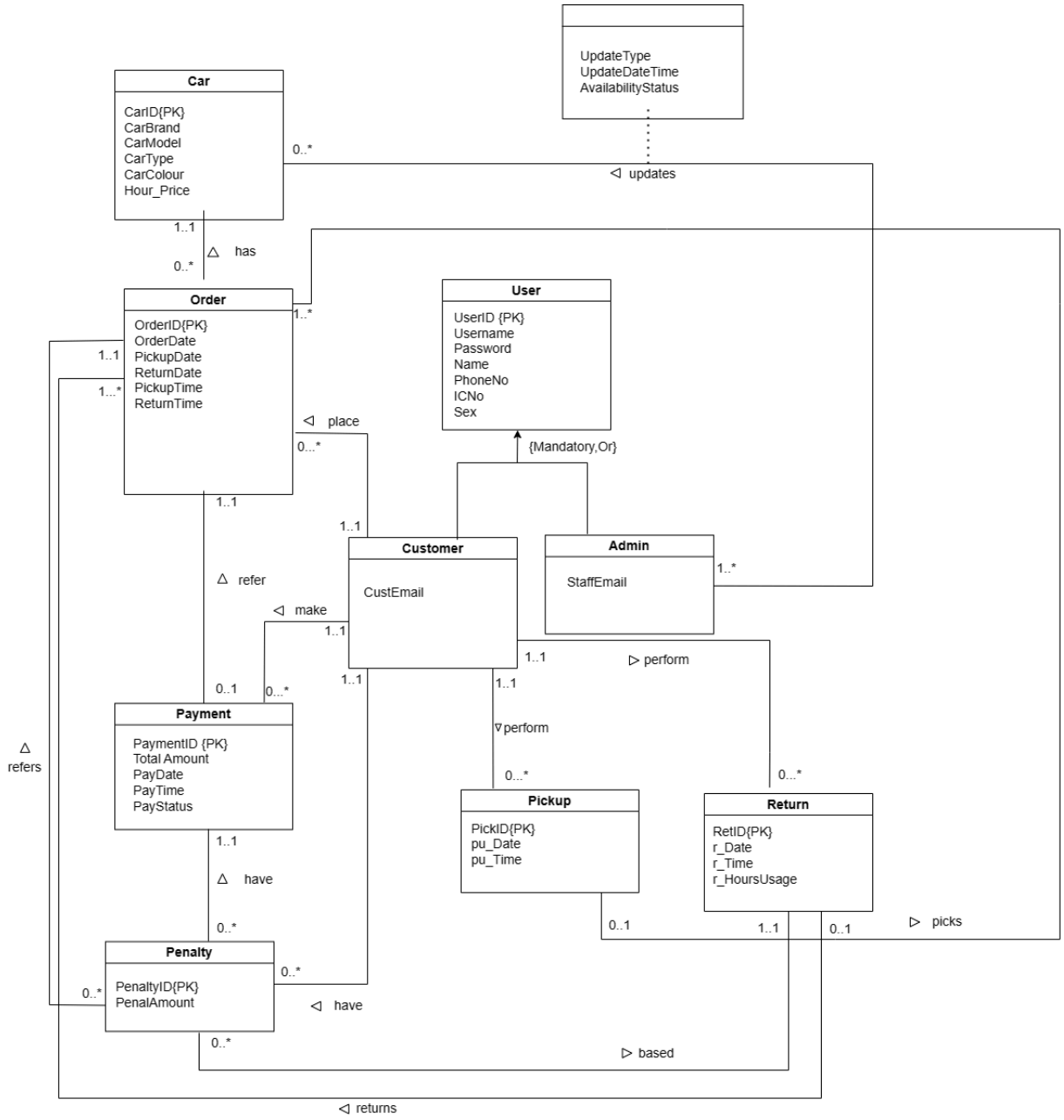

Figure 4.2: Enhanced EERD

5.0 Data dictionary

5.1 Description of Entity

Entity Name	Description	Occurrences
Customer	Buyers who buy rent the cars	-Each customer can place many order -Each customer can make many payment -Each customer have zero or many penalty -Each customer can perform zero or many pickups. -Each customer can perform zero or many returns.
Admin	Staff that manage the system.	-An admin can update zero or many cars
Order	Order details for specific rental.	-An order can have only one car involved. -An order referred to by only one payment. -An order can be referred to by penalties but not necessarily. -An order of a car can be returned by zero or one return process. -An order of a car can be picked by zero or one pickup process. -An order can be linked to only one specific customer.
Payment	Payment amount for specific rental	-A payment refers to one specific order. -A payment is made by one specific customer. -A payment can include zero to many penalties.
Penalty	Penalty amount for specific rental.	-A penalty refers to specific order. -A specific penalty can be linked to a specific customer. -A penalty is based on the actual return time of the rent car. -A penalty can have only one payment.
Pickup	Pickup process for and order rental	-A pickup can be performed by only one customer. -A pickup process can pick up one to many orders of rent car.
Return	Return process for and order rental	-A return can be performed by only one customer. -A return process can return many orders. -A return is being referenced to zero or many penalties.
Car	Unique identifier for car	-A car can take many updates. -A car can be in many orders after each return.

5.2 Description of Attribute

Entity Name	Attributes	Description	Data Type & Length	Nulls	Multivalued
Customer	CustEmail	Customer email address	30 variable characters	NO	NO
Admin	StaffEmail	Admin email address	30 variable characters	NO	NO
Penalty	PenaltyID	Unique identifier for penalties.	10 variable characters	NO	NO
	PenaltyAmount	Price for penalty	NUMBER(5,2)	YES	NO
Order	OrderID	Unique identifier for the order.	10 variable characters	NO	NO
	OrderDate	Date order made	Date	YES	NO
	PickupDate	Date for car pickup.	Date	YES	NO
	ReturnDate	Date for car return.	Date	YES	NO
	PickupTime	Time for car pickup.	Time	YES	NO
	ReturnTime	Time for car return.	Time	YES	NO
Return	RetID	Unique identifier for Return.	10 variable characters	NO	NO
	r_Date	Date to return rented car.	Date	YES	NO
	r_Time	Time to return rented car.	Time	YES	NO
	r_HoursUsage	Hours of car used.	4 variable numbers	YES	NO
Pickup	PickID	Unique identifier for pickup.	10 variable characters	NO	NO
	pu_Date	Date to pick up rented car.	Date	YES	NO

	pu_Time	Time to pick up rented car	Time	YES	NO
Payment	PaymentID	Unique identifier for the payment.	20 variable characters	NO	NO
	TotalAmount	Amount paid for the order.	NUMBER(5,2)	YES	NO
	PayDate	Date of payment.	30 variable characters	YES	NO
	PayTime	Time paid.	Time	YES	NO
	PayStatus	Success status of the payment.	10 variable characters	YES	NO
Car	CarID	Unique identifier for car	10 variablecharacters	NO	NO
	CarModel	Model of car	30 variable characters	NO	NO
	CarType	Type/class of car	30 variable characters	NO	NO
	CarBrand	Company brand of car	30 variable characters	NO	NO
	CarColour	Color of car body	20 variable characters	NO	NO
	Hour_price	Rent price per hour of car	NUMBER(5,2)	NO	NO
User	UserID	Uniquely identified the users	20 variable characters	NO	NO
	Name	Name of the customer	40 variable characters	NO	NO
	PhoneNo	Customer phone number	11 variable numbers	NO	YES
	ICNo	Customer IC number	12 variable numbers	NO	NO
	Sex	Customer gender	10 variable characters	NO	NO
	Username	Customer’s login identifier.	50 variable characters	NO	NO
	Password	Customer’s access key.	50 variable characters	NO	NO

5.3 Description of Relationship

Entity Name	**Multiplicity**	**Relationship**	**Entity Name**	**Multiplicity**
Penalty	0..*	refers	Order	1..1
	0..*	based	Return	1..1
	1..*	have	Payment	1..1
Payment	0..1	refer	Order	1..1
Order	0..*	has	Car	1..1
Pickup	0..1	picks	Order	1..*
Return	0..1	returns	Order	1..*
Customer	1..1	place	Order	0..*
	1..1	make	Payment	0..*
	1..1	have	Penalty	0..*
	1..1	perform	Pickup	0..*
	1..1	perform	Return	0..*
Admin	1..*	update	Car	0..*

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.