

Cheong Si Sien (Cohort Two)

JAVA DEVELOPER – SUMMATIVE CAPSTONE PROJECT

Project Title

Car Rental Management

Start Date: 29th, March 2021

End Date: 8th, July 2021

Purpose:

This project is being taken up for demonstrating skills acquired during the training. The scope of the project is decided to be as below:

Technical specifications:

The project will be developed using the following tools.

1. Tools
 - a. Windows 10 operating system
 - b. STS 4.0 for Spring Boot development platform
2. Software & technologies used
 - a. Oracle database version 12c for local implementation
 - b. Heroku Cloud platform with Postgres database for cloud implementation
 - c. Oracle SQL and Postgres SQL
 - d. Java 8
 - e. JavaScript
 - f. CSS
 - g. HTML 5.0
 - h. jQuery
 - i. Thymeleaf
 - j. Balsamiq for wireframing
 - k. Microsoft Visio for ER diagrams and other digrams.

1) SUMMARY STATEMENT

Problem of owing a car in Singapore

- 1) Steep price of owning a car due to COE (Certificate of Entitlement) and related tax and the COE allows you to drive the car for a limited time of 10 years.
- 2) High maintenance related expenses.
- 3) Pollution and congestion can be problematic if there are too many cars since Singapore is a small island country. The government implemented COE system to limit the number of cars on the road. Car sharing scheme will be a good substitute for owning a car.
- 4) Parking fee may be expensive in some part of the country. Monthly parking coupon can easily cost more than \$100 per month in most places.

Benefit of renting a car in Singapore

- 1) Is much cheaper to rent a car on an ad-hoc basis. Renting a car is not more expensive than taking taxi or Grab in Singapore. Public transport like buses and MRT are still the cheapest mode of transportation but on certain special occasions or situations where a car is needed, renting a car is a convenient and cost efficient consideration.
- 2) Renting a car provides a person the flexibility of trying out different models and makes of car and may allow him to decide on which car to buy should he/she decides to do so later.
- 3) For trips to our neighbour country like Malaysia or Thailand, taking Public transport is time consuming and tiring. Renting a car for a road trip may be tantalising to some.
- 4) One does not have to worry about vehicle insurance as usually insurance is already covered when one rents a car. Even if one needs to pay for the insurance, it is still affordable and the person will have a peace of mind driving.

2) Background

CSS (Car SpecialiSt) rental Pte Ltd is a car rental company providing car rental to both walk in customers. New walk in customers will register for membership and once verified, the handphone/telephone number will be used as reference/membership number for future rental of cars.

Opening hours is from 8.00 am to 8.00 pm. Cut off time for rental of car is 6pm and return of car is 7.00 pm. The rental rate is based on hourly rate. There will be no refund if the customer returns the car early. The car is considered rented out when the customers sign the acknowledgement form and receive the key and when the customer return the car and sign the car return form before the inspection of the car.

3) Needs statement:

The current system was designed in the 90s. The system is slow and obsolete with frequent crashes and it's only function is to serve as a simple database to store the availability of the vehicle. The owner intends to upgrade the system in order to manage the increasing demand for it's rental cars. Currently manual invoices are issued to the customers which slows down the whole car rental process and is one of the bottlenecks encountered.

There is also no system to keep track of employees access security in the company. The database of vehicle can be assessed by anyone having access to the PC and security is almost non-existent.

A computerised system is urgently needed to provide a secured environment and allow the smooth and non-disruptive operation of the company.

4) Project objectives

This project is aimed at developing a computerised system for CSS Car Rental Pte Ltd. The purpose of the system is to greatly replace the current old system and enhance the process of the car renting.

Proposed features of the new system

SCOPE DESCRIPTION FOR VERSION 1.0

In Scope (Phase 1)

This project is aimed at developing a computerised system for CSS Car Rental Pte Ltd. The purpose of the system is to greatly replace the current old system and enhance the process of the car renting. The car hiring department is the user of this system.

- Walk in current day booking of available cars
- A web application used in the company by the company employees only for the operation of car rental.
- A user management system that enabling and disabling of user accounts, updating of access level and change of role.
- Users logging in and out on the fact that the users are assumed to be the employee of the company so the employee database is already populated with all the employees' information.
- A dashboard displaying various important statistics about the cars and customers is available.
- Customers records are maintained by the staff in the car hiring department.
- A vehicle system to add, edit and delete vehicle information such as the brand/model/make, rate and license number in the database.
- Allow vehicle to be rented out to walk in customers for duration in terms of hours and by hourly rate.
- Cash transactions only
- Role management: administration/manager can update the roles of the users.
- Manage the front-end (content insertion, information update, etc.)
- Print module allows the printing of rental slips and cash invoices.
- A booking system that keep tracks of the status of the cars (free or hired), the rate and the total amount (hourly rate x hours rented) and the corresponding vehicle ID and customer ID.
- Application is based on English.

OUT OF SCOPE

Out-Scope

- Human Resource management system aka editing/addition/updating of employees' information like salary, bonuses, performance rating etc.
- Payment gateway aka payment by credit card, credit terms, funds transfer.
- Invoice system used for generating financial analysis reports.
- Cooperate booking.
- Location tracking of the hired car.
- Multilanguage support for application, Malay, Chinese and Tamil.
- Costs and Profit Analysis for business decision.
- System generated password slip for users who request a change of password or users about to change their own password on the system.
- Advanced Booking of cars

5) Roles and Responsibilities:

Business Model: Daily rental rate. Prices depend on the make and model of the cars as well as prevailing market conditions.

Client: Paying customers who pays for renting a car from the company on daily rental rate.

Administrator: Usually one of the top company management or the database administrator. The administrator has the access to all the databases and to all the functions pertaining to Car details and status, Booking status, Users access level and customer information. Only Administrator has all the rights to delete data from system.

Administrator will be responsible for the upkeep of the Car database, eg: addition of new arrived cars, deleting obsolete cars etc. Administrator will also be responsible for maintaining Users access level.

Manager: Supervise the counter staffs(fulfilment agents) and has full access Booking and of the Car and Users database.

Manager will be responsible supervising the daily operating of the company. So the manager has the rights to change or void any booking and also the rights to restrict the counter staffs access if there is any suspicious of malpractice.

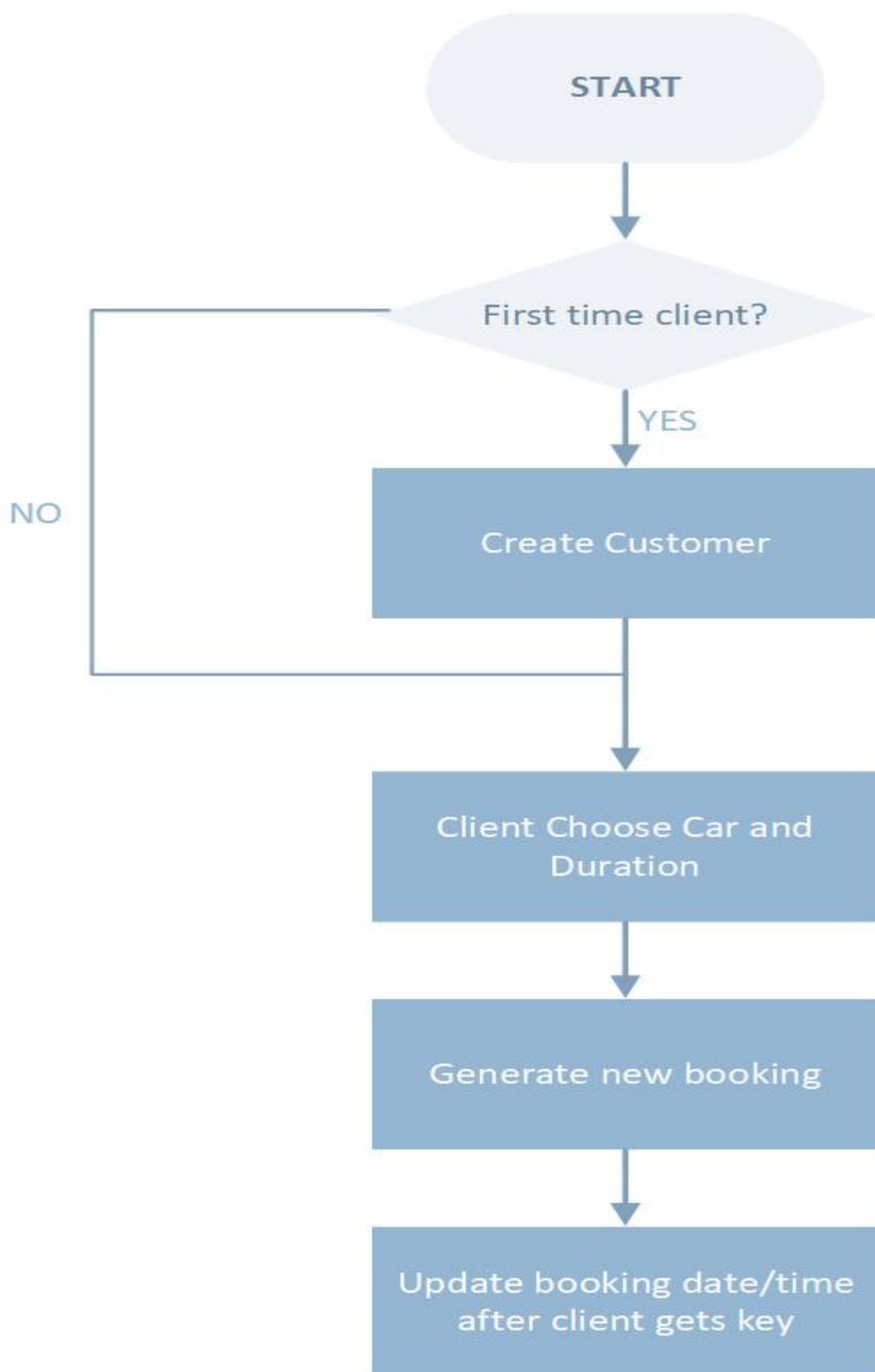
Counter Staff: Counter staff(**fulfilment agent**) has the rights to add bookings but not amending. They also have the rights to create new customer or update current customer information in the system. Any request to edit any booking or customer have to go through the manager to prevent fraud.

Counter Staff is responsible for adding a booking when customer collects the car and also update the booking when customer returns the car together with the amount of payment made. The counter staff will also have limited access to the car database eg: viewing status of cars to check whether the cars are hired or free. Any amendment to the car (damage to car) has be reported to the manager and the manager will then update the car database.

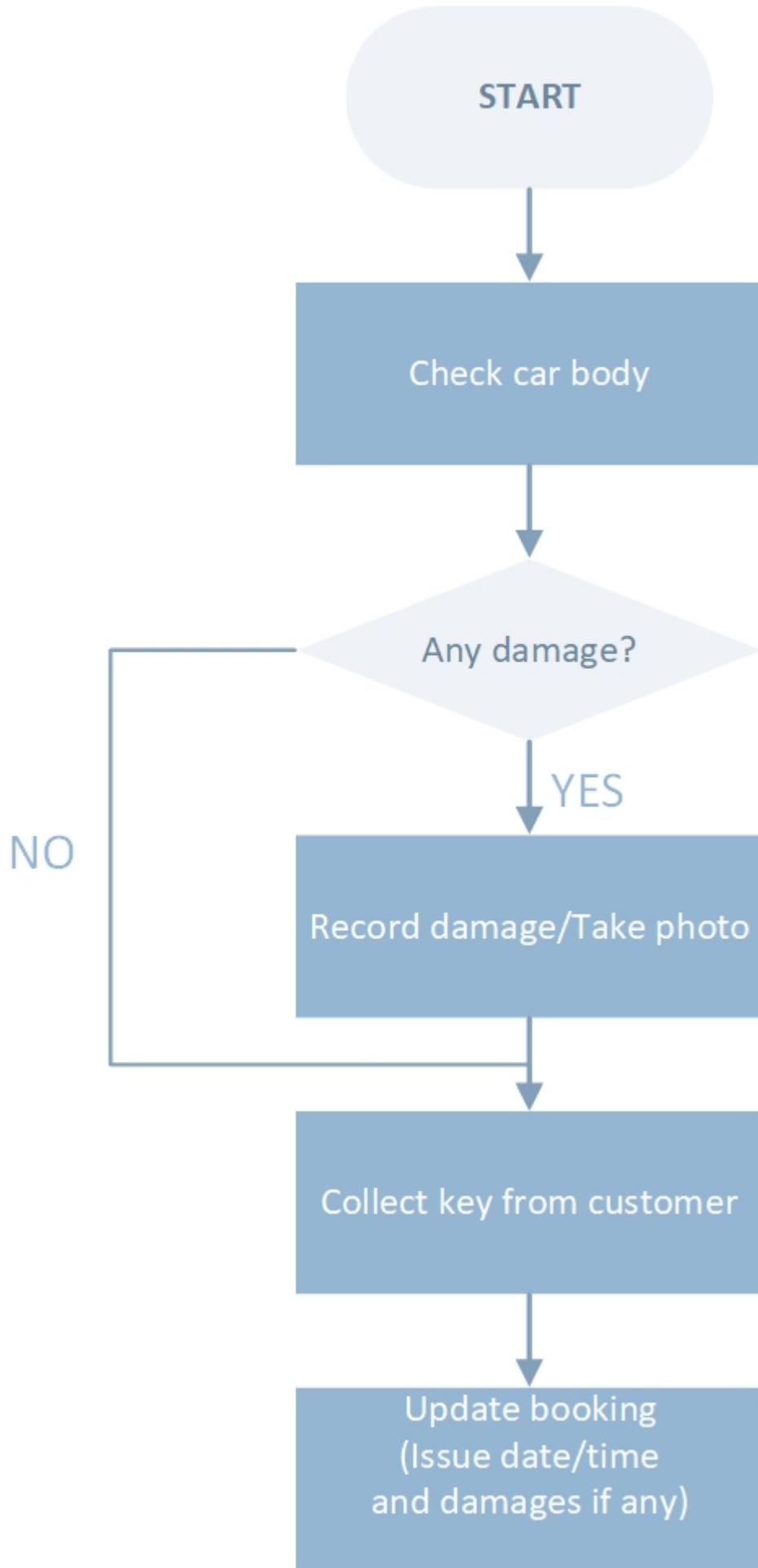
Guest: Walk-in customers can view the pricing and availability of the cars through large display monitors located in the branch.

6) Main process Flow Diagram

a) Booking and issuing of car process



b) Collection of returning car process



7) Database Design

(USERS)			
Data	Datatype	Constraint	Nullable
User_ID	INT, AUTO GENERATED BY DEFAULT	Primary Key	Not Null
User_NAME	VARCHAR2(25)		Not Null
User_EMAIL	VARCHAR2(20)		Not Null
User_PHONE	VARCHAR2(20)		Not Null
User_JOBTITLE	VARCHAR2(15)		Not Null
User_USERNAME	VARCHAR2(20)		Not Null
User_PASSWORD	Encrypted (20)		Not Null
User_IsEnabled	Boolean		

ROLE			
Data	Datatype	Constraint	Nullable
Role_ID	INT, AUTO GENERATED BY DEFAULT	Primary Key	Not Null
Role_NAME	VARCHAR2(25)		Not Null

USERROLE

Data	Datatype	Constraint	Nullable
User_ID	INT, AUTO GENERATED BY DEFAULT	Primary Key	Not Null
Role_ID	VARCHAR2(25)		Not Null

CUSTOMER

Data	Datatype	Constraint	Nullable
Customer_ID	INT, AUTO GENERATED BY DEFAULT	Primary Key	Not Null
Customer_NAME	VARCHAR2(25)		Not Null
Customer_ADDRESS	VARCHAR2(30)		Not Null
Customer_CITY	VARCHAR2(20)		Not Null
Customer_POSTCODE	VARCHAR2(15)		Not Null
Customer_DRIVINGLICENSEURL	VARCHAR2(20)		Not Null
Customer_WEBSITE	VARCHAR2 (20)		Not Null
Customer_ALTCONTACT	VARCHAR2 (20)		

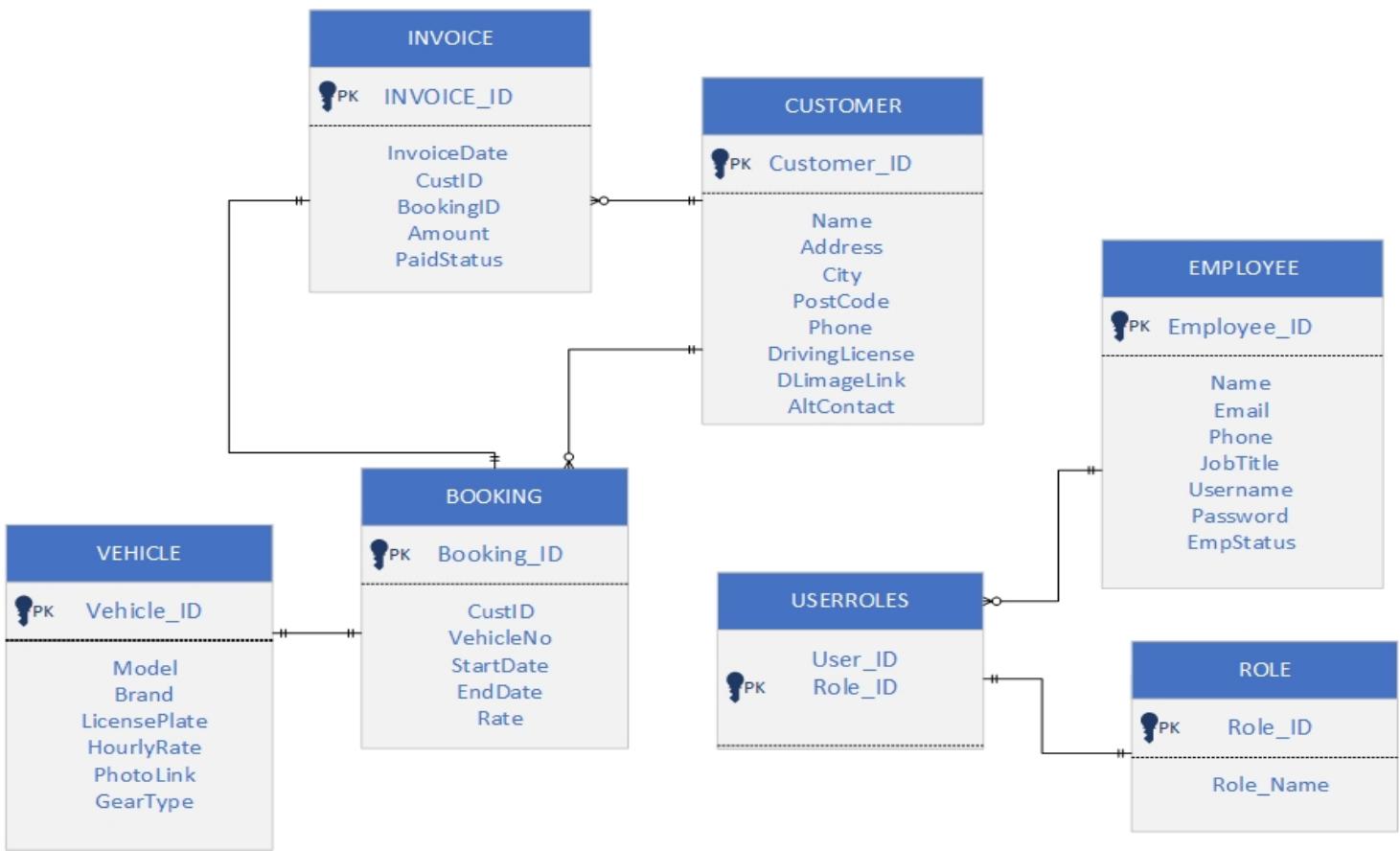
VEHICLE

Data	Datatype	Constraint	Nullable
Vehicle_ID	INT, GENERATED BY DEFAULT ON NULL AS IDENTITY	Primary Key	Not Null
Vehicle_MODEL	VARCHAR2(50)		Not Null
Vehicle_BRAND	VARCHAR2(50)		Not Null
Vehicle_Transmission	VARCHAR2(15)		Not Null
Vehicle_RATE	Double		Not Null
Vehicle_LICPLATEURL	VARCHAR2(20)		

BOOKING

Data	Datatype	Constraint	Nullable
Booking_ID	INT, GENERATED BY DEFAULT ON NULL AS IDENTITY	Primary Key	Not Null
Booking_CUSTINFO	VARCHAR(30)		Not Null
Booking_VEHICLEID	INT		Not Null
Booking_EFFDATE	DATE		Not Null
Booking_NOOFDAYS	INT		Not Null
Booking_PAIDDATE	DATE		Not Null
Booking_AMOUNT	Double		Not Null
Booking_FULFILAGENT	VARCHAR(20)		Not Null
Booking_RATE	Double		Not Null

8) ER DIAGRAM



9) User Interface Design (Balsamiq wireframing)

a) Login page

LOGIN PAGE

USERNAME:

PASSWORD:

b) Main page (Dashboard style) with side menus.

INDEX (MAIN) PAGE - DASHBOARD

File Edit View Help

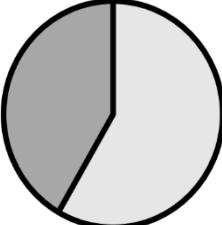
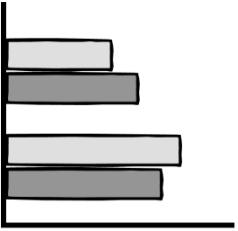
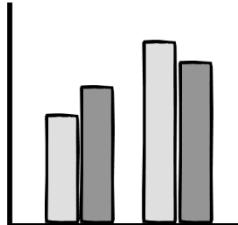
USERS(Employee) MANAGEMENT

CUSTOMER MANAGEMENT

BOOKING MANAGEMENT

INVOICE MANAGEMENT

STATISTICS



3 ▲

c) Listing of users' roles and access levels (employees)

LIST OF USERS (EMPLOYEES)							Update Role Activate /Deactivate
Name	Employee ID	Email	JobTitle	Phone #	Role	Access	
XXXX	123	xx@yyy.zzz	Manager	8888888888	counter	1	
XXXX	123	xx@yyy.zzz	Manager	8888888888		0	
XXXX	123	xx@yyy.zzz	Manager	8888888888	Admin	1	
XXXX	123	xx@yyy.zzz	Manager	8888888888	manager	1	

Page 1 ... next page

d) Updating of access level

USERS ACCESS LEVEL MANAGEMENT

USER ACCESS UPDATE

Name	Employee ID	Email	JobTitle	Phone #	Role	Access
XXXX	123	xx@yyy.zzz	Manager	8888888888	counter	1

Confirm

e) Listing of customers with delete and edit

CUSTOMERS MANAGEMENT

LIST OF CUSTOMERS [Create new Customer record](#)

CustID	Name	Address	City	Post	Phone	Email	AlternateContact	License no + Photo	Edit	Delete
0002	XXX	Blk 2, Ang Mo ...	Singapore 555555	98733333	xx@yyy.zzz	8782222	SBC5555Y	+ Photo		
0006	XXX	Blk 6, Thomson ..	Singapore 666655	92322233	tt@yhh.zz	8181111	SJJ88Y	+ Photo		

Page 1 ... [next page](#)

f) Add/Edit of customers

CUSTOMER ADDITION/EDITING

Name:

Address:

City:

Phone number:

Email:

Alternate contact:

Driving Licence number:

Photo of licence attached:

Confirm

g) Booking addition/editing

BOOKING ADDITION/EDITING

VEHICLE ID:

Customer ID:

Start Date:

End Date:

License plate
Car photo
Rate
Status

Customer name
Customer contact

Confirm

h) Booking - Returning car

BOOKING RETURN

VEHICLE ID:

Customer ID:

Start Date:

End Date:

License plate
Car photo
Rate

Customer name
Customer contact

RETURNING CONFIRMED?

i) Invoice Printing

INVOICE SYSTEM

Invoice number: <input type="text"/>	Customer ID: <input type="text"/>	Vehicle ID: <input type="text"/>
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Invoice no	Start date	End Date	Rate	Customer ID	Vehicle ID	Total amt\$	Status	Print
0001	1/2/2021	3/2/2021	\$50	XXX	SBC1111X	100	closed	<input type="button" value="Print"/>
0088	1/3/2021	4/3/2021	\$60	XXX	STY2222J	180	closed	<input type="button" value="Print"/>
0003	26/3/2021	28/3/2021	\$50	XXX	SRR3333R	100	open	<input type="button" value="Print"/>

Page 1 ... next page

j) REPORT - Car hiring history

VEHICLE MANAGEMENT

VEHICLE HIRE HISTORY

VEHICLE ID:	<input type="text" value="0001"/>	LICENSE PLATE:	<input type="text" value="SBX 1111D"/>
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HireID	StartDate	EndDate	Rate	AgentID
0001	1/2/2021	3/2/2021	\$50	0004:XXX
0002	1/3/2021	20/3/2021	\$50	0002:YYY
0003	26/3/2021		\$50	0010:ZZZ

Page 1 ... next page

10) Hardware and Software requirements:

The completed application requires the following:

Hardware:

- 1) A PC running Windows OS or a Mac running on Mac Operating system.
- 2) Internet connection
- 3) At least 8Gb ram for smooth execution of the program.

Software:

Based locally:

- 1) Oracle database version 12c (or any similar)
- 2) Java JRE 8 or higher
- 3) An internet browser preferable Chrome or Edge.

Based on cloud:

- 1) An internet browser preferable Chrome or Edge.

12) Screen Capture

a) Login



b) Main Page

i) Index page

IT Support: 63332222 English Welcome david [Administrator]

Dashboard Booking data | Customer data | Vehicle Data Rent a car | Print invoice | Add Customer

Today's date: 30/05/2021 Branches operating hours: 9.30am to 9.30pm daily Display Board

Total no. of cars	Cars available now	Unavailable now
6	5	1
0	Unavailable now	CAR HIRED

No. of customers	No. of employees
6	3
CUSTOMERS	EMPLOYEE

AVAILABLE CAR LISTING (lowest --> highest rental rate)

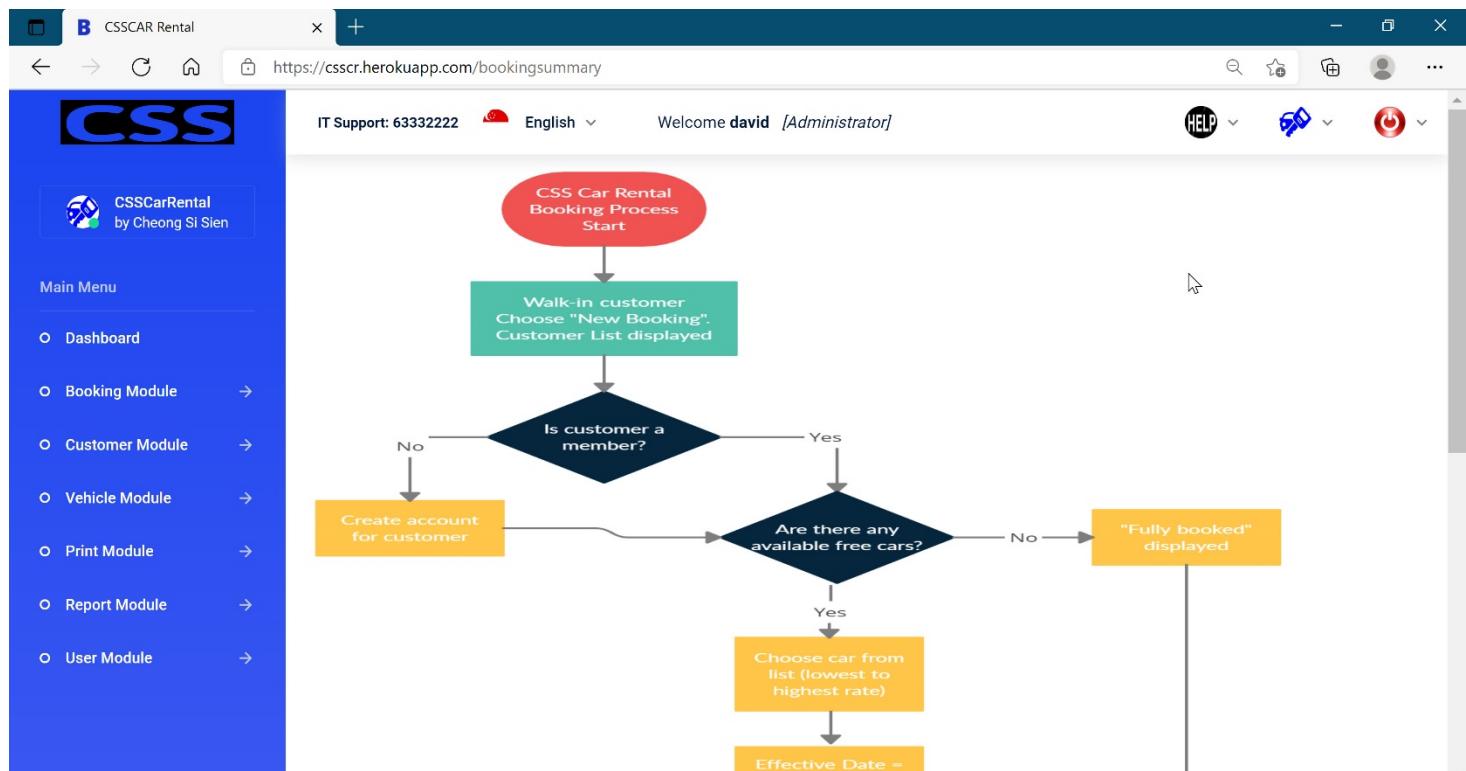
Toyota Vios
\$60/day
Automatic
SGT2883S

ii) Help Module

The screenshot shows the 'CSS Car Rental Access Updating' page. On the right, a 'HELP' icon is open, displaying a list of topics:

- 1) Introduction
- 2) Booking Process Summary
- 3) The Main Menu
- 4) Information on Dashboard
- 5) How to create new bookings

iii) Help – Main Process



iv) Contact

The screenshot shows the CSS Rental by Cheong Si Sien web application. At the top, there is a header with the CSS logo, IT Support contact information (63332222), language selection (English), and user authentication (Welcome david [Administrator]). On the left, a sidebar titled 'Main Menu' lists various modules: Dashboard, Booking Module, Customer Module, Vehicle Module, Print Module, Report Module, and User Module. The main content area displays a dashboard summary with statistics: Total no. of cars (6), Cars available now (5), No. of customers (6), and No. of employees (3). It also shows 'Unavailable now' status (0) with a car and wrench icon. Below this, a section titled 'AVAILABLE CAR LISTING (lowest --> highest rental rate)' shows a white Mazda 3 with the text 'Mazda 3 \$65/day Automatic'. A navigation bar at the bottom includes links for 'Customer', 'Logout', and 'Help'.

v) Display board

The screenshot shows the CSS Car Rental web application. The layout is similar to the previous dashboard, featuring a sidebar with 'BRANCHES' (Bukit Timah Branch, Empty, Empty) and a main content area with a summary of car availability (Total no. of cars: 6, Cars available now: 5). Below this, a section titled 'AVAILABLE CAR LISTING (lowest --> highest rental rate)' shows a red Nissan Pulsar with the text 'Nissan Pulsar \$70/day Automatic'. Navigation arrows are present on both sides of the car image.

c) Booking Module

i) New Booking

The screenshot shows a web browser window for 'CSSCar Rental' at the URL <https://csscr.herokuapp.com/bookings>. The page title is 'Booking Module - Choose a customer to start booking'. The left sidebar has a 'Main Menu' with 'Booking Module' expanded, showing 'New Booking' and 'Bookings Listing'. The main content area displays a table of customers:

Customer ID	Name	Tel Number	Email	ACTION
6	Lee Seok Chu	92732332	leesc@hotmail.com	
5	Wee You Ming	82321644	Wee@gmail.com	
4	Ahmad Sunni	87423212	sunni@outlook.com	
3	Simon	98888888	simon@gmail.com	
2	Susan Johnson	92323211	henryj@gmail.com	

Total Items: 6 - Page 1 of 2 - First Previous 1 2 Next Last

Cheong Si Sien Summative Project (Cohort 2)

ii) Booking Listing

The screenshot shows a web browser window for 'CSSCar Rental' at the URL <https://csscr.herokuapp.com/listbookings>. The page title is 'BOOKINGS LISTING'. The left sidebar has a 'Main Menu' with 'Booking Module' expanded, showing 'New Booking' and 'Bookings Listing'. The main content area displays a table of bookings:

Booking ID	Cust Name	Car ID	Effective Date	Daily Rate \$	Total Amt \$	Car Returned	ACTION
2	Lee Seok Chu	5	2021-05-30T17:20	60.0	60.0	false	
1	Susan Johnson	4	2021-05-29T15:59	60.0	120.0	true	

Total Items: 2 - Page 1 of 1 - First Previous 1 Next Last

Cheong Si Sien Summative Project (Cohort 2)

d) Customer Module

i) Add customer

The screenshot shows the 'Add Customer' form. On the left is a blue sidebar menu with options like Dashboard, Booking Module, Customer Module (selected), Vehicle Module, Print Module, Report Module, and User Module. The main area has sections for 'Customer's Contact Details' (Name, Phone Number, Alt Contact, Personal Email, Website), 'Customer's Address Details' (Address, City/Country, Postal Code), and 'Customer's License Details' (LICENSE URL). There are 'Submit' and 'Cancel' buttons at the bottom.

IT Support: 63332222 English Welcome david [Administrator]

Add Customer

Customer's Contact Details

Name Phone Number

*Alt Contact Personal Email

*Website

Customer's Address Details

Address City/Country

Postal Code

Customer's License Details

LICENSE URL

Submit Cancel

ii) Customer Listing

The screenshot shows the 'Customer Listing' page. It features a search bar at the top right and a table below it titled 'CUSTOMERS INFORMATION'. The table has columns for Customer ID, Name, Tel Number, Email, More details..., and ACTION. Each row contains a set of icons for edit, view, and delete. At the bottom of the table, there are links for 'Total Items: 6 - Page 1 of 2 - First Previous 1 2 Next Last' and a footer note 'Cheong Si Sien Summative Project (Cohort 2)'.

IT Support: 63332222 English Welcome david [Administrator]

CUSTOMERS INFORMATION

Customer ID	Name	Tel Number	Email	More details...	ACTION
6	Lee Seok Chu	92732332	leesc@hotmail.com		
5	Wee You Ming	82321644	Wee@gmail.com		
4	Ahmad Sunni	87423212	sunni@outlook.com		
3	Simon	98888888	simon@gmail.com		
2	Susan Johnson	92323211	henryj@gmail.com		

Total Items: 6 - Page 1 of 2 - First Previous 1 2 Next Last

Cheong Si Sien Summative Project (Cohort 2)

e) Vehicle Module

i) Add Vehicle

The screenshot shows the 'ADD Vehicle' form. On the left is a blue sidebar menu with sections like Dashboard, Booking Module, Customer Module, Vehicle Module (selected), and Print Module. The main area has a title 'ADD Vehicle' and a section 'Vehicle's Details' with fields for Brand, Model, License Plate, Daily Rate, Transmission (set to 'automatic'), and Status (set to 'free'). Below that is a 'Car Photo' section with a 'Photo URL' input field. At the bottom are 'Submit' and 'Cancel' buttons.

ii) Vehicle Listing

The screenshot shows a listing of vehicles. The sidebar menu includes sections like Dashboard, Booking Module, Customer Module, Vehicle Module (selected), Print Module, and Report Module. The main area has a search bar and a table titled 'VEHICLES INFORMATION'. The table columns are Car ID, Brand, Model, Transmission, Daily Rate \$, Status, License Plate, Photo of Car, and ACTION. There are five rows of data:

Car ID	Brand	Model	Transmission	Daily Rate \$	Status	License Plate	Photo of Car	ACTION
1	Honda	City	automatic	65.0	free	SMV5065K		
2	Mazda	Mazda 3	automatic	65.0	free	SMA3111J		
3	Nissan	Pulsar	automatic	70.0	free	SLJ547U		
4	Toyota	Auris	automatic	60.0	free	SKS4535S		
5	Toyota	Vios	manual	60.0	hired	SLV1387U		

Total Items: 6 - Page 1 of 2 - First Previous 1 **2** Next Last

Cheong Si Sien Summative Project (Cohort 2)

f) Print Module

i) Rental Slip Printing

The screenshot shows the 'RENTAL SLIP PRINTING' section of the application. On the left, a sidebar menu lists various modules: Dashboard, Booking Module, Customer Module, Vehicle Module, Print Module (selected), Report Module, and User Module. Under the Print Module, 'Rental Slips' is listed. The main content area displays a table with one row of data:

Booking ID	Customer	Vehicle ID	Effective Date	Daily Rate \$	Total Amt \$	Car Returned	ACTION
2	Lee Seok Chu	5	2021-05-30T17:20	60.0	60.0	false	

Below the table, a message says 'Total Items: 1 - Page 1 of 1 - First Previous 1 Next Last'. A footer note reads 'Cheong Si Sien Summative Project (Cohort 2)'. A modal window titled 'Generate Rental Slip (PDF format)' contains the message 'Generating Rental Slip in PDF format, click PROCEED to continue and click BACK once you receive the PDF.' with a progress bar below it. Buttons for 'BACK' and 'PROCEED' are at the bottom.

ii) Cash Invoice Printing

The screenshot shows the 'INVOICE PRINTING' section of the application. The sidebar menu is identical to the previous screenshot. The main content area displays a table with one row of data:

Invoice ID	Customer	Vehicle ID	Effective Date	Daily Rate \$	Total Amt \$	Car Returned	ACTION
1	Susan Johnson	4	2021-05-29T15:59	60.0	120.0	true	

Below the table, a message says 'Total Items: 1 - Page 1 of 1 - First Previous 1 Next Last'. A footer note reads 'Cheong Si Sien Summative Project (Cohort 2)'. A modal window titled 'Generate Invoice (PDF format)' contains the message 'Generating CASH INVOICE in PDF format, click PROCEED to continue and click BACK once you receive the PDF.' with a progress bar below it. Buttons for 'BACK' and 'PROCEED' are at the bottom.

iii) Rental Slip and Cash Invoice Samples (PDF)

CSS CAR RENTAL 888 NTUC ROAD Singapore S(8888) RENTAL SLIP <hr/> <p>CUSTOMER Lee Seok Chu</p> <p>Daily Rate \$: 60.0 Effective Date: 2021-05-30T17:20 Days rented: 1 Total Amt \$: 60.0 Fulfillment Agent: david</p> <p>Note: Avoid penalty fee by returning car on time.</p>	CSS CAR RENTAL 888 NTUC ROAD Singapore S(8888) CASH INVOICE <hr/> <p>Bill to: CUSTOMER Susan Johnson, rented car with Veh ID: 4 => SKS4535S</p> <p>Daily Rate \$: 60.0 Effective Date: 2021-05-29T15:59 Days rented: 2 Total Amt \$: 120.0 Payment Made: true ==> paid on 2021-05-29T15:59 Fulfillment Agent: david</p> <p>THANKYOU FOR YOUR BUSINESS</p>
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g) Report Module

i) Report Listing

The screenshot shows the 'Customer Past Bookings Information' page. The left sidebar has a 'Report Module' section with 'Customer Past bookings' selected. The main content area displays a table with columns: Customer ID, Name, Tel Number, Email, and Bookings History... (with a red circular icon). The table contains six rows of data. At the bottom, there are navigation links for 'Total Items: 6 - Page 1 of 2 - First Previous 1 2 Next Last'.

Customer ID	Name	Tel Number	Email	Bookings History...
6	Lee Seok Chu	92732332	leesc@hotmail.com	
5	Wee You Ming	82321644	Wee@gmail.com	
4	Ahmad Sunni	87423212	sunni@outlook.com	
3	Simon	98888888	simon@gmail.com	
2	Susan Johnson	92323211	henryj@gmail.com	

Total Items: 6 - Page 1 of 2 - First Previous 1 2 Next Last

Cheong Si Sien Summative Project (Cohort 2)

ii) Customer Past Booking

The screenshot shows the 'Customer's Past Bookings List' page. The left sidebar has a 'Report Module' section with 'Customer Past bookings' selected. The main content area shows customer details (Customer ID: 6, Name: Lee Seok Chu, Phone Number: 92732332) and a table of past bookings. The table has columns: Date, Booking Id, Veh Id, Veh LicensePlate, Rate \$, No.of.Days, Total \$, Paid & Returned, and Fulfillment Agent. One row of data is shown: 2021-05-30T17:20, 2, 5, SLV1387U, 60.0, 1, 60.0, false, david. A 'Back' button is at the bottom left.

Date	Booking Id	Veh Id	Veh LicensePlate	Rate \$	No.of.Days	Total \$	Paid & Returned	Fulfillment Agent
2021-05-30T17:20	2	5	SLV1387U	60.0	1	60.0	false	david

Information ==> Customer ID: 6

Customer's Contact Details

Name Lee Seok Chu Phone Number 92732332

Customer's Past Bookings List

2021-05-30T17:20 2 5 SLV1387U 60.0 1 60.0 false david

Back

Cheong Si Sien Summative Project (Cohort 2)

h) USER MODULE

i) User Listing

The screenshot shows a web browser window for 'CSSCar Rental' at the URL <https://csscr.herokuapp.com/users>. The page title is 'IT Support: 63332222' and the language is set to English. The user 'david [Administrator]' is logged in. On the left, there is a blue sidebar menu titled 'Main Menu' with options like Dashboard, Booking Module, Customer Module, Vehicle Module, Print Module, Report Module, and User Module (with a dropdown for 'Update Users Access and Roles'). The main content area is titled 'USERS INFORMATION And ACCESS LEVEL' and displays a table of users:

EMPID	Name	Email	Phone	JobTitle	Enabled	Username	Pwd	Role	ACTION
1	David Tan	david@gmail.com	98566766	CEO	true	david	***	***	
3	John Lee	John@outlook.com	89233211	CounterStaff	true	john	***	***	
2	Mary Ho	mary@outlook.com	99723232	Manager	true	mary	***	***	

Below the table, it says 'Total Items: 3 - Page 1 of 1 - First Previous 1 Next Last'. At the bottom, there is a footer note: 'Cheong Si Sien Summative Project (Cohort 2)'.

ii) User Access Edit

The screenshot shows a web browser window for 'CSSCar Rental' at the URL <https://csscr.herokuapp.com/users/edit/1>. The page title is 'IT Support: 63332222' and the language is set to English. The user 'david [Administrator]' is logged in. The left sidebar is identical to the previous screenshot. The main content area is titled 'CSS Car Rental Access Updating' and shows the details for Employee ID 1:

Employee's Personal Details

Employee's ID	1
Name	David Tan
Email	david@gmail.com
Phone	98566766

Employee's Company Credentials

Job Title	CEO	Username	david
Role	Administrator	Enabled	true

At the bottom, there are 'Submit' and 'Cancel' buttons.

12) Application Details

Heroku Implementation: CSS Car Rental Apps

a) Links/URL : <http://csscr.herokuapp.com>

b) Application name: **CSSCR (Cheong Si Sien Car Rental)**

c) Database used: **Postgres**

d) Credentials

User	Password	Role
david	pass	<i>Admin</i>
mary	pass	<i>Manager</i>
john	pass	<i>User</i> (Sales agent)

Note:

1. The complete user data is only visible to the Administrator (Admin role).
2. Only Administrator has the rights to remove data from the system.
3. Users (User role) can only add records for customer and hire data and see the list of customers and hires.
4. Managers (Manager role) are given the rights to edit /delete the data across all the modules barring the User information.

13) CSS Car Rental Test Cases

Functional	Result
All the mandatory fields should be validated.	Passed
Test the numeric fields should not accept the alphabets and proper error message should display.	Passed
Test to see negative numbers, if allowed for numeric fields.	Passed
Test the max length of every field to ensure the data is not truncated.	Passed
Test that a confirmation message should display delete operations.	Passed
Test the Java script is properly working in different browsers (IE, Firefox, Chrome, safari and Opera).	Passed
Usability	
Web page content should be correct without any spelling or grammatical errors	Passed
Check for broken links and images.	Passed
Home link should be there on every single page.	Passed
Check for broken links and images.	Passed

14) Future improvement and upgrading of application

The design of the application should take into account potential future expansion of the car rental business and also the revolution of the technology.

- a) The system should be flexible enough to allow future implementation of a complete costs and profit analysis in order to help the company maximise profit.
- b) The owner of the company may decide to open up more branches and the application should be able to handle increased volume and remote connectivity between the various servers located at different branches
- c) The rental business may venture into different type of vehicles like renting of bicycle, motorcycles etc.. So the application should allow the different category of vehicles to be implemented.
- d) Currently the rate is fixed at monthly rate. Hourly rate or even blocked-date discounted rate may be implemented in the future so the application will have to be flexible enough to cater for the different modes of rate.
- e) The company may decide to venture into co-operate leasing of vehicles where one person is able to rent a few cars at the same time on behalf of a company.
- f) The trend is for self booking only by the customers so the software development language used to develop the application should be flexible to handle mobile applications.