

AutoCare Quick Service Center Co., Ltd

# **Car Service Booking System of AUTOCARE**

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# Project Proposal

# 1 Project Proposal

## 1.1 Overview

In recent years, in our country, more and more citizens are trying to have an own car in various ways such as full cash payment, credit payment and taking out car loans. As a consequence, the more cars the people have, the more car service centers are needed as supply for the cleaning and maintenance of cars and the competition between Car Service Centers arises to offer consistent, better quality and satisfaction for customers. Therefore, in this era of increasing demands for car services and competition for customer satisfaction, AutoCare Car Service Center Co., Ltd wants to establish a new system as they discovered problems in their service processes that affects customer satisfaction, convenience and productivity of staffs. If a database-driven booking system website is developed, it will allow customers to book for all types of AutoCare's services on any devices and AutoCare admins to efficiently manage Bookings, plan schedules for workers, quality controlling and to prevent insufficient garage spaces and customers not being served, enhancing overall customer convenience, satisfaction over the business and productivity of staffs.

For these reasons, AutoCare has decided to develop a "**Database-driven booking system website**" which allows customers to book for a wide range of services offered by AutoCare, on any devices. Any customers can look around the AutoCare website to enquire various services of AutoCare. However, only account registered and logged in customers will be able to book for services. Customer have to give information about the car they want to be serviced in account registration, for cost calculation purposes. For payments, AutoCare will accept both cash payments and mobile banking payments. Promotions events will be held annually and seasonally, offering discounts for customers on service costs. Moreover, customers can give feedback rating on the services they got and can complaint if they are not satisfied with the quality of services or performance of workers.

The booking system website will also consists of administrative functions for company admins which will allows them to manage customer bookings, schedule for workers, make changes in service information, complaint resolution and generate reports on daily or monthly sales information, most visited customers and so on.

## **1.2 Background**

AutoCare Quick Service Center Co., Ltd is a Vehicle Cleaning and Maintenance service center initially founded in 2015 with 30 employees. AutoCare has been gradually expanding in branches and employment since early establishment, together with better services that meets the needs of their customers during the 8 years period.

AutoCare Service Center Co., Ltd branches now exist in 3 different Townships of Yangon. AutoCare is giving their best satisfying service with reasonable prices by using the products and equipment from Europe and US. AutoCare has been aiming to expand more new branches and create more services in major cities of Myanmar.

## **1.3 Current Business Process**

Manually, AutoCare receives customers' cars driven into their branches' workshop garages and offers services. Customers have to contact via SMS, Messenger of their Facebook page and Phone calls to make enquiries/ bookings for services, in case they are concerned about garage spaces, busy worker schedules and closed days.

AutoCare now provides a varieties of services for customers which are – Car wash, polish, waxing, Car body paint, 3D wheel alignment, Tire changing and repairing, Engine oil & filter changing, Spark plug changing, Battery switching and so on. Cars are assigned to their teams of certified trained professionals to start working on diagnosing the problems, cleaning, maintenance or repairs. Before returning, final review is done. Customers are informed to pick up through phone calls or messages once required services are finished (or) if there is any new problems encountered (or) additional delays during maintenance. They also offer seasonal or anniversary promotions that offer discount for customers with specific total repairs costs. For accepting payments, they accept cash payment and some mobile banking payment. The maintenance costs/ cleaning costs and duration of tasks can varies due to factors such as type of services and size of car.

## 1.4 Current Business Problems

Currently, there are some problems encountered in the current process of servicing car-owner customers of AutoCare, which are needed to be solved anyhow.

### **Insufficient Garage space and long queueing time**

The customers' demand for Car Washing, Car Interior Cleaning and other services is increasing around Yangon. In spite of the demands, AutoCare's branches garages are not spacious enough to handle many cars so that customers have to queue for a long time.

As a consequence, there are disappointed customers leaving from AutoCare branches without being served with their desired services and going to other service centers.

### **Dissatisfaction complaints with services received or workers**

Complaints has been received sometimes from some customers who were not fully satisfied with the quality of work (or) the performance of some workers servicing their cars.

As a result, there are customers who felt disappointed or dissatisfied with AutoCare's quality of services. As a word of mouth effect, this can be spread as a bad reputation to other car owners who are potential customers of AutoCare.

### **Paper-based system harming productivity of staffs and difficulty in scheduling, data keeping**

SMS, phone calls and messenger has been used to accept bookings and there are lots of bookings received from these three medium. With traditional paper-based system, multiple staffs from AutoCare have to be present all time to answer all these contacts, write details down and sort all the schedules in order. Often, data inaccuracies, data omission and wrong arrangement appear while recording the booking details and scheduling the bookings. Consequently, AutoCare's staffs can get Productivity issues and customers do not get immediate service as they arrive garage, due to bad scheduling. All these issues are leading to customer dissatisfactions and reputation damage.

## 1.5 Proposed System Scope

AutoCare is strongly willing to solve the above issues currently. For insufficient garage spaces and increasing car cleaning service demands, AutoCare has decided to make “Pick up/ Home Car Wash service”, in which a team of their free workers will go to customers’ home (near their branches Township) and give cleaning services. Or, the team will take the car to branches garage and offer a wider range of services.

By analyzing the problems faced by AutoCare and including their new services (such as Home services, Pick up services), it is proposed that this project will focus on creating an “**Online Booking System driven by a Database**” that allows AutoCare to efficiently manage Bookings and to prevent insufficient garage spaces and customers not being served. Some components that will help Complaint management and quality controlling will also be built in the system. It will be a web-based system so that a dynamic website will be built for customers to book for all types of AutoCare’s services on the website, on any devices. The dynamic website will mainly work with a Database system in the backend and the User Interface design will be mainly focus on web platform.

With the new system, customers will be able to access AutoCare website and book for services they need, for desired dates and time. To properly manage bookings, services and schedules, Back-end activities will also be created for admins and staffs of AutoCare such as modifying information about services, checking bookings, monitoring customers’ feedbacks and so on. The new proposed system will function as follow:

System Functions	Process
<p style="text-align: center;"><b>User Account</b></p> <ul style="list-style-type: none"><li>➤ Creating new User Account</li> <li>➤ Logging into existing User Account</li></ul>	<p>Customers can add a new user account on website. The account will include Customer’s name, email, phone no, password and main address.</p> <p>Customers must firstly log into their account with email/Username and password to start using the Booking System.</p>

<ul style="list-style-type: none"> <li>➤ Reading existing User Account</li>   <li>➤ Updating existing User Account</li>   <li>➤ Deleting existing User Account</li> </ul>	<p>Customer can also review their account profile.</p> <p>Customers can make changes to their existing User Account Information (such as passwords, address, phone numbers, emails.)</p> <p>Customers can delete their account from the website if they no longer need the account.</p>
<p><b>Vehicle Information</b></p> <ul style="list-style-type: none"> <li>➤ Creating New Vehicle Information</li>   <li>➤ Reading existing Vehicle Information</li>   <li>➤ Updating existing Vehicle Information</li>   <li>➤ Deleting existing Vehicle Information</li> </ul>	<p>Customers can register information of their cars on website. The Car Information will include Images, Name/ Model of Car, Car paint color and License Number plate data.</p> <p>This information will be checked by system and administrators, workers to offer services of different costs. Customers can review their car information profile.</p> <p>Customers can make changes to the information of their car registered.</p> <p>Customers can delete car information off their account.</p>
<p><b>Booking</b></p> <ul style="list-style-type: none"> <li>➤ Creating/ Booking a service appointment</li> </ul>	<p>Customers can start booking a service appointment on website by selecting Date, Time slot available, Selecting vehicle type, vehicle, Type of services, services and payments.</p>

<ul style="list-style-type: none"> <li>➤ Booking Date</li> <li>➤ Time slots</li> <li>➤ Type of Vehicle</li> <li>➤ Type of Services</li> <li>➤ Services</li> <li>➤ Type of Payments</li> <li>➤ Method of Payments</li> </ul>	<p>Customers can select their desired date to be served. Fully booked dates will not be available to select.</p> <p>For each day, start time slots will be given for customers to select time to be served. Fully booked/ busy time slots will not be available to select.</p> <p>Regardless of Vehicle information, Type of Vehicle (Compact /Medium /SUV /Minivan /Pickup Truck /Cargo Truck) will be required to know to calculate costs accordingly.</p> <p>Customers have to select among Pick up service method, Home service method and Garage Drive in service method.</p> <p>Customers will be given with a list of services available accordingly to selected Type of services.</p> <p>Customers can select type of payments before submitting booking. (I.e. Full payment or Partial payment). Whatever payment type is chosen, payment due date will be set for customers.</p> <p>Customers can select and declare what type of payment will be used for costs, in the booking stage (such as Cash, Mobile Banking, Credits /Debit Card.)</p>
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➤ Tracking process	Customers will be able to watch in what stage their car is in the service process.
<b>Feedback</b>  ➤ Rating stars  ➤ Comments  ➤ Replying on Comments	Customers will be able to give rating stars according to their level of satisfaction on the quality of service offered.  Customers will be able to write comments about the overall booking they got whether it is giving feedback or complaints on services.  Admin staffs of AutoCare will reply customers' comments on website and contact through customers' phone numbers if needed.
<b>Payment</b>  ➤ Type of Payments  ➤ Method of Payments	Customers can select type of payments before submitting booking. (i.e. Full payment or Partial payment). Whatever payment type is choose, payment due date will be set for customers.  Customers can select and declare what type of payment will be used for costs, in the booking stage (such as Cash, Mobile Banking, Credits /Debit Card.)
<b>Administration</b>  ➤ Reading/ Checking Bookings	Admin staffs of AutoCare are able to view all the bookings submitted by customers.

<ul style="list-style-type: none"> <li>➤ Creating Bookings</li> <li>➤ Update Bookings</li> <li>➤ Delete Bookings</li> <li>➤ Reading Customer Information</li> <li>➤ Reading Vehicle Information</li> <li>➤ Replying on Comments</li> <li>➤ Creating Services</li> <li>➤ Updating Services</li> <li>➤ Deleting Services</li> </ul>	<p>For customers who did not booked from website, admins have to create bookings for them.</p> <p>For customers who are busy for the booked day, admins can make changes in customers' booking to future date and time.</p> <p>Admins can delete a booking not submitted from website if customers requested cancellation.</p> <p>Admins and service staffs can read customer's information such as phone, addresses, etc.</p> <p>Admins and service staffs can read information related with vehicle to offer services.</p> <p>Admins can reply on comments given on website by customers for services. If necessary, Admins will make phone calls to customers to solve complaints.</p> <p>Admins can create a new service if the business has created a new service for customers.</p> <p>Admins can update information of each service (such as price, estimated duration.)</p> <p>Admins can delete a service if that service is no longer offered by AutoCare to customers.</p>
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## Car Service Booking System of AUTOCARE

➤ View service ratings	Admins can see overall service ratings and histories of services rating given by customers
<b>Garage</b>  ➤ Garage Space Availability	Admins can update available garage space slots of different branches, to display on website.

## **1.6 Aims of Project**

The main aim of this Project is to build a booking website which offers customers with ability to book for many car services they want for desired date and time. The website will helps reduces customer queueing and waiting to be served, a more convenience way to manage bookings and scheduling of tasks for AutoCare and to consistently control quality of workers' performance and services through customers' feedbacks.

## **1.7 Project Objectives**

To achieve the aims of the projects, coherent objectives must be set firstly and performed. The objectives of the projects to be accomplished are –

- To analyze the business and its goals, current situations, and identify the problems being encountered currently.
- To define a scope for system of the proposed system project, define Aims of project and coherent objectives to achieve the aims and make necessary planning for the project.
- To study and analyze about Database use for the project, evaluate Methodologies, Case Study Analysis about similar products/ services and uses of Information Systems.
- To analyze whether the project is feasible enough to implement.
- To start gathering information necessary, designing system and functions for the proposed system.
- To perform Structural, User Interface, Behavioral Designing and Database implementation phase for the proposed system.
- To review and re-evaluate the system whether it meets the needs of AutoCare and their issues.

## 1.8 Project Planning

A project plan is a collection of documents that map the scope, stages involved to deliver, costs, schedules, resources and desired results for a project. (DRMcNatty, n.d.) A proper project plan is necessary as it can help identify goals, prevent missing deadlines, problems and reduce potential risks that lead to costly project failures. A project without project planning has possibilities to miss essential details, tasks, deadlines and even deliverables. The project planning of Online Booking System for AutoCare will be done with a project management software (Microsoft Project).

### 1.8.1 Gantt chart

Gantt chart is a chart used to clearly present scheduled tasks needed to be carried accordingly to the time period. The figure below is a Gantt chart that shows all the tasks (grouped in Chapters) needed to be undertaken for the project and time expected to start and finish and estimated duration of each tasks.

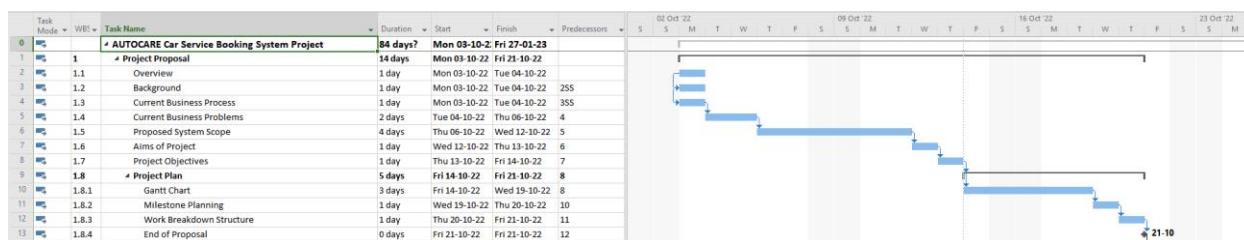


Figure 1 Planning for Project Proposal



Figure 2 Planning for Chapter 1: Introduction

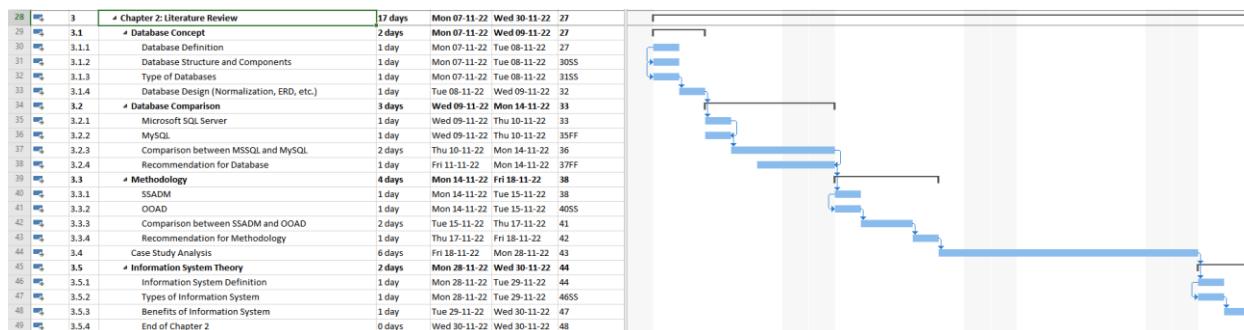


Figure 3 Planning for Chapter 2: Literature Review

## Car Service Booking System of AUTOCARE

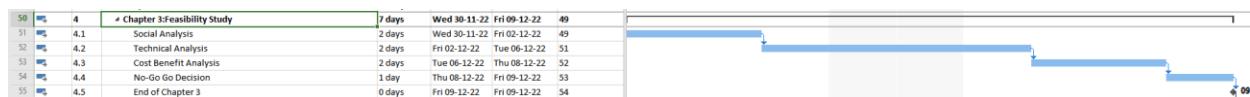


Figure 4 Planning for Chapter 3: Feasibility Analysis

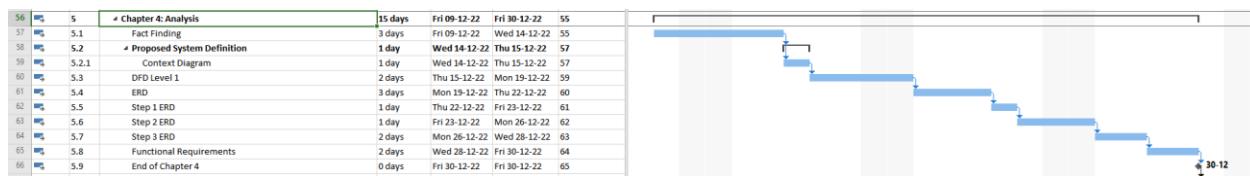


Figure 5 Planning for Chapter 4: Analysis

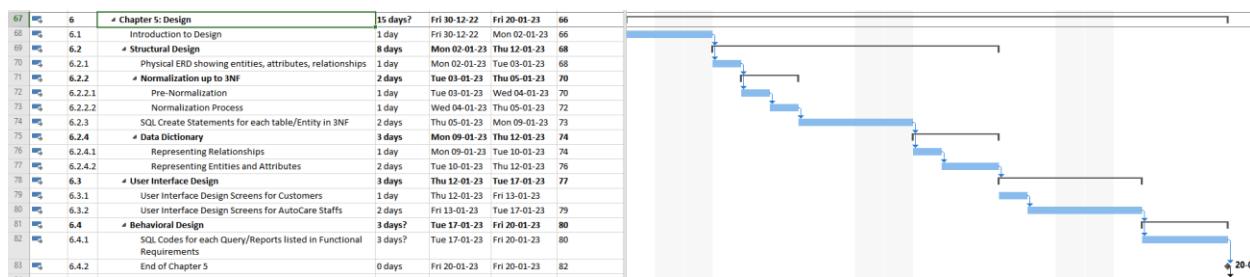


Figure 6 Planning for Chapter 5: Design

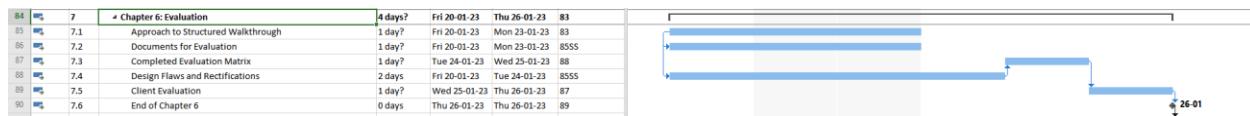


Figure 7 Planning for Chapter 6: Evaluation

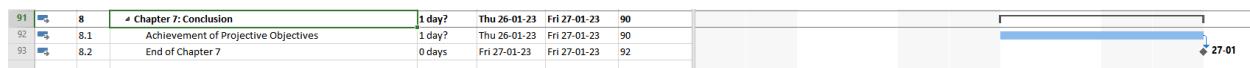


Figure 8 Planning for Chapter 7: Conclusion

### 1.8.2 Milestone Planning

Milestones are essential in a project as it provides information about time-related important events in the project. Milestone Planning makes essential events, deadlines, delays of tasks in the project easier to notice. The table below represents milestone planning for AutoCare Online Booking System.

Milestones	Deliverables	Dates
<b>Project Proposal</b>	<ul style="list-style-type: none"> <li>➤ Brief General analysis on AutoCare (Overview, Background, Current Business Process, Problems)</li> <li>➤ Recommended system to solve problems (Proposed System Scope)</li> <li>➤ Defined Aims, Objectives for proposed project</li> <li>➤ Plan for the project (Gantt chart, Milestone Planning, Work Breakdown Structure)</li> </ul>	03-10-22 to 21-10-22 (14 days)
<b>Chapter 1: Introduction</b>	<ul style="list-style-type: none"> <li>➤ General analysis on AutoCare in detail (Background, Current Business Process, Problems)</li> <li>➤ Recommended system to solve problems (Proposed System Scope)</li> <li>➤ Defined Aims, Objectives and outcome expectations for proposed project</li> <li>➤ Plan for the project (Gantt chart, Milestone Planning, Work Breakdown Structure)</li> <li>➤ Ways to manage progress of project tasks (Progress Management)</li> <li>➤ Plan for potential risks that can affect the project (Risk Management Plan)</li> </ul>	21-10-22 to 02-11-22 (11 days)

<b>Chapter 2: Literature Review</b>	<ul style="list-style-type: none"> <li>➤ Concept and literature on Database (Database definition, Structures and Components, Types, Database Design)</li> <li>➤ Chosen/ Recommended Database for proposed system (MySQL, MSSQL, Comparison, Recommendation)</li> <li>➤ Chosen/Recommended Methodology for project (SSADM, OOAD, Comparison, Recommendation)</li> <li>➤ Analysis on three similar products/ services (Case Study Analysis)</li> <li>➤ Literature on Information System Theory (Information System definition, Types, Benefits)</li> </ul>	07-11-22 to 30-11-22 (17 days)
<b>Chapter 3: Feasibility Study</b>	<ul style="list-style-type: none"> <li>➤ Analyzed result on social effects that the proposed system brings to fulfill needs of business (Social Analysis)</li> <li>➤ Analyzed result on whether the proposed system is technically feasible for business (Technical Analysis)</li> <li>➤ Analyzed result on costs compared to benefits by implementing proposed system (Cost Benefit Analysis)</li> <li>➤ Decision to do or not to do the proposed system (No-Go, Go Decision)</li> </ul>	30-11-22 to 9-12-22 (7 days)
<b>Chapter 4: Analysis</b>	<ul style="list-style-type: none"> <li>➤ Collected data, information about the systems, requirements and preferences (Fact Finding)</li> <li>➤ Proposed System Definition</li> <li>➤ Context Diagram on how users interact with system</li> </ul>	9-12-22 to 30-12-22 (15 days)

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	<ul style="list-style-type: none"> <li>➤ Data Flow Diagram on flow of information through system.</li> <li>➤ Entity Relationship Diagram</li> <li>➤ Defined functional requirement in proposed system (Functional Requirements)</li> </ul>	
<b>Chapter 5: Design</b>	<ul style="list-style-type: none"> <li>➤ Introduction to Design</li> <li>➤ Structural Design including Detail ERD with entities, attributes and relationships (Physical ERD), Normalization process up to 3NF, Physical implementation of normalized entities to tables (SQL Create Statements for each 3NF entities), Data Dictionary for tables (Representing relationships, entities and attributes)</li> <li>➤ User Interface Design Screens</li> <li>➤ Behavioral Design including SQL queries according to Functional Requirements</li> </ul>	30-12-22 to 20-01-23 (15 days)
<b>Chapter 6: Evaluation</b>	<ul style="list-style-type: none"> <li>➤ Preparing documents for evaluation</li> <li>➤ Completed Evaluation matrix</li> <li>➤ Design Flaws and Rectifications</li> <li>➤ Client Satisfaction evaluation</li> </ul>	20-01-23 to 26-01-23 (4 days)
<b>Chapter 7: Conclusion</b>	<ul style="list-style-type: none"> <li>➤ Achievement of Project Objectives</li> </ul>	26-01-23 to 27-01-23 (1 day)

## Car Service Booking System of AUTOCARE

### 1.8.3 Work Breakdown Structure

Work Breakdown Structure (WBS) is a method to complete a complex project with multiple steps in project management. WBS is needed to divide/ decompose a large project into smaller manageable components and complete them, enabling project teams to finish objectives quicker and efficiently. Levels in WBS represents new and more detailed works or sub-tasks needed to be completed in a project. The chart below represents Work Breakdown Structure (hierarchical decomposition of all tasks) for the AutoCare Online Booking System.

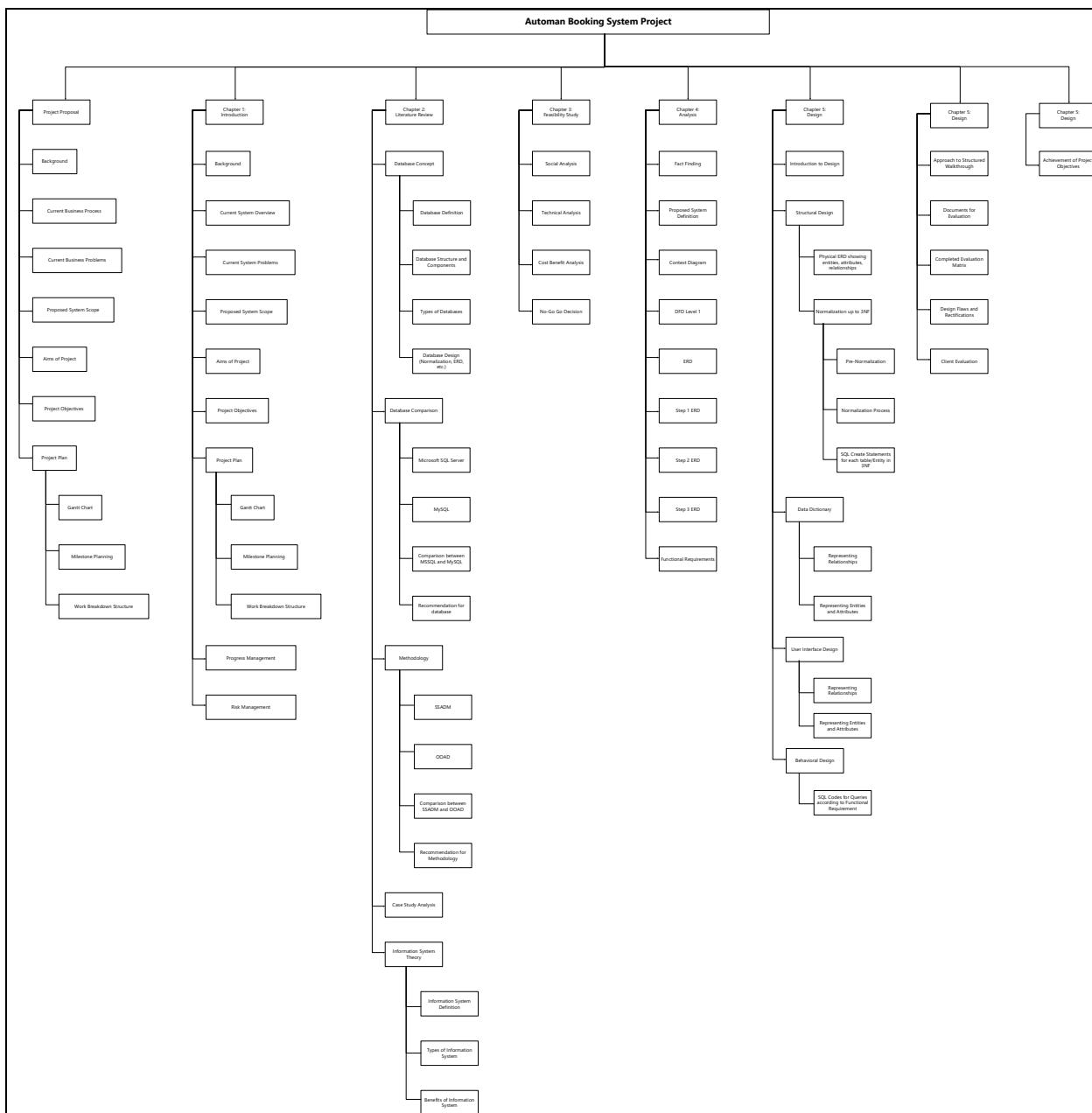


Figure 9 Work Breakdown Structure

## Car Service Booking System of AUTOCARE

# **Chapter 1:**

# **Introduction**

## **1 Chapter 1: Introduction**

In recent times, in our country, more and more people are trying to own a car in various ways. As a result, the more cars the people have, the more car service centers are needed for the cleaning and maintenance of cars and the competition between Car Services arises to offer better quality and satisfaction for customers.

### **1.1 Background of AutoCare**

AutoCare is a Car Quick Service Center Co., Ltd and it is one of the top Vehicle Cleaning and Maintenance Service based in Yangon, Myanmar. AutoCare Quick Service Center has been in business around 8 years, which had been founded in 2015 with 30 employees. AutoCare has been trying to gradually expand in branches and employment since early establishment, together with better services that meets the needs of their customers during the 8 years period.

AutoCare Service Center Co., Ltd has successfully expended up to 3 branches currently, which exist in Mingalar Taung Nyunt Township, South Okkalapa Township and North Dagon Township in Yangon, with total employees of 150 persons. AutoCare has been offering customers with satisfying services with reasonable prices by using the products and equipment imported from Europe and US. AutoCare also has an aim to establish up to 20 more new branches and more services in major cities of Myanmar.

## 1.2 Current System Overview

AutoCare currently operates their service business as traditional car service centers used to do. Customers' cars driven into their branches' workshop garages are received and offered with services. In order to make enquiries/ bookings for services, customers can contact AutoCare via SMS, Messenger of their Facebook page and Phone calls, in case they are concerned about no empty garage spaces, busy worker schedules and closed days.

Nowadays, AutoCare is providing a wide range of services necessary for various car-owner customers. Services provided at AutoCare's branches are – Car wash, polish, waxing, Car body paint, 3D wheel alignment, Tire changing and repairing, Engine oil & filter changing, Spark plug changing, Battery, Car Air-conditioning, Shock absorber repairing and Brake shoe changing and repairing, etc.

Sometimes, customers have to queue in lines for a long time to get serviced. Once the turn of customer is arrived, available teams of certified trained professionals are assigned to customers' cars to start working on diagnosing the problems, cleaning, maintenance or repairs. Before returning the car back, a final review is done by expert mechanics for assuring quality of work. They then inform the customers to pick up through phone calls or messages once required services are finished (or) if there is any new problems encountered (or) additional delays during maintenance. Annually, seasonal or anniversary promotion events that offer discount for customers with specific repairs costs are made. Currently, they accept cash payment and some mobile banking payment. According to types of services customers selected and sizes of cars, the maintenance costs/ cleaning costs and duration of tasks can varies.

### **1.3 Current System Problems**

Although AutoCare is one of the top-leading Car Quick Service Center locally, there are problems in some aspects of current processes. These are -

#### **Insufficient Garage space and long queueing time**

Most of the customers of AutoCare like their Car Washing, Car Interior Cleaning and Polishing service a lot. The demand for this type of services is increasing in townships where AutoCare's branches reside, as people who are buying and driving cars are increasing in Yangon. However, AutoCare's branches garages cannot supply enough spaces to place all the random cars queueing in front of garages and hurrying to be serviced.

As a consequence, some disappointed customers left from AutoCare branches without getting their desired services and went to other service centers.

#### **Dissatisfaction complaints with services received or workers**

There are complaints of some customers who were not fully satisfied with the quality of work (or) the performance of some workers servicing their cars. For instance, a worker forgot to clean specific interior part of the car during cleaning process (or) the maintenance/ cleaning process took significantly longer than normal.

As a result, customers may feel simply disappointed or dissatisfied with AutoCare's quality of services. As a word of mouth effect, this can be spread as a bad reputation to other car owners who are potential customers of AutoCare.

#### **Paper-based system harming productivity of staffs and difficulty in scheduling, data keeping**

AutoCare currently relies on bookings from SMS, phone calls and messenger. There are lots of bookings received from these three medium. Due to paper-based system, multiple staffs from AutoCare have to be present all time to answer all these contacts, write details down and sort all the schedules in order. At times, there can be a few inaccuracies, data omission on recording the booking details and rearranging bookings.

Consequently, Productivity of staffs can decline and customers unfortunately will not be straight-up serviced as soon as they arrive at the workshop branches, due to bad scheduling. All these issues leading to customer dissatisfactions and reputation damage.

## 1.4 Proposed System Scope

Due to the above stated issues currently occurring and imposing negative impacts, AutoCare is strongly willing to solve them.

By analyzing the information about issues encountered and new services by AutoCare, it is aimed that this project will focus mainly on designing and creating a “**Database driven online Booking System**” that boosts efficiency in managing customers’ Bookings, fairness in work assignments and preventing insufficient garage spaces and customers not being served. The new system will also have some components that will help Complaint management, Service Quality Controlling and Monitoring workers’ performance. Being a web-based system, a dynamic website will be developed for customers to book for all types of AutoCare’s services on website, on any devices. The dynamic website will mainly work with a Database system in the backend and the User Interface design will be mainly focus on web platform.

In aspect of garage space insufficiency and increasing car cleaning service demands, AutoCare has decided to create a “Pick up/ Home Car Wash service”. Customers can also book for these services. For Home Car Wash service, a team of their free workers will go to customers’ home (which are near their branches Township) and give cleaning services as scheduled in booking. For Pick up services, the team will take the car to branches garages and offer a wider range of services such as maintenance. After finishing their services, the team will bring the car back to where they picked up.

From this new system, customers will be able to visit AutoCare’s website and book for any types of services they need, after selecting a method to be served (Home, Pick up or Garage) - for desired date and start time. To properly manage bookings, services and schedules and to support the front-end website activities, Back-end activities will also be created for admins and staffs of AutoCare. The activities will include modifying services informations, checking customers’ bookings, monitoring customers’ feedback and handling complaints, scheduling tasks for worker teams and so on. The new proposed system will function as follow:-

System Functions	Process
<b>User Account</b>  ➤ Creating new User Account	Customers can add a new user account on website. The account will include Customer’s

<ul style="list-style-type: none"> <li>➤ Logging into existing User Account</li> <li>➤ Reading existing User Account</li> <li>➤ Updating existing User Account</li> <li>➤ Deleting existing User Account</li> </ul>	<p>name, email, phone no, password and main address.</p> <p>Customers must firstly log into their account with email/Username and password to start using the Booking System.</p> <p>Customer can also review their account profile.</p> <p>Customers can make changes to their existing User Account Information (such as passwords, address, phone numbers, emails.)</p> <p>Customers can delete their account from the website if they no longer need the account.</p>
<p><b>Vehicle Information</b></p> <ul style="list-style-type: none"> <li>➤ Creating New Vehicle Information</li> <li>➤ Reading existing Vehicle Information</li> <li>➤ Updating existing Vehicle Information</li> <li>➤ Deleting existing Vehicle Information</li> </ul>	<p>Customers can register information of their cars on website. The Car Information will include Images, Name/ Model of Car, Car paint color and License Number plate data.</p> <p>This information will be checked by system and administrators, workers to offer services of different costs. Customers can review their car information profile.</p> <p>Customers can make changes to the information of their car registered.</p> <p>Customers can delete car information off their account.</p>

<b>Booking</b>	
➤ Creating/ Booking a service appointment	Customers can start booking a service appointment on website by selecting Date, Time slot available, Selecting vehicle type, vehicle, Type of services, services and payments.
➤ Booking Date	Customers can select their desired date to be served. Fully booked dates will not be available to select.
➤ Time slots	For each day, start time slots will be given for customers to select time to be served. Fully booked/ busy time slots will not be available to select.
➤ Type of Vehicle	Regardless of Vehicle information, Type of Vehicle (Compact /Medium /SUV /Minivan /Pickup Truck /Cargo Truck) will be required to know to calculate costs accordingly.
➤ Type of Services	Customers have to select among Pick up service method, Home service method and Garage Drive in service method.
➤ Services	Customers will be given with a list of services available accordingly to selected Type of services.
➤ Type of Payments	Customers can select type of payments before submitting booking. (I.e. Full payment or Partial payment). Whatever payment type is

<ul style="list-style-type: none"> <li>➤ Method of Payments</li>   <li>➤ Tracking process</li> </ul>	<p>choose, payment due date will be set for customers.</p> <p>Customers can select and declare what type of payment will be used for costs, in the booking stage (such as Cash, Mobile Banking, Credits /Debit Card.)</p> <p>Customers will be able to watch in what stage their car is in the service process.</p>
<p><b>Feedback</b></p> <ul style="list-style-type: none"> <li>➤ Rating stars</li>   <li>➤ Comments</li>   <li>➤ Replying on Comments</li> </ul>	<p>Customers will be able to give rating stars according to their level of satisfaction on the quality of service offered.</p> <p>Customers will be able to write comments about the overall booking they got whether it is giving feedback or complaints on services.</p> <p>Admin staffs of AutoCare will reply customers' comments on website and contact through customers' phone numbers if needed.</p>
<p><b>Payment</b></p> <ul style="list-style-type: none"> <li>➤ Type of Payments</li>   <li>➤ Method of Payments</li> </ul>	<p>Customers can select type of payments before submitting booking. (i.e. Full payment or Partial payment). Whatever payment type is choose, payment due date will be set for customers.</p> <p>Customers can select and declare what type of payment will be used for costs, in the</p>

	booking stage (such as Cash, Mobile Banking, Credits /Debit Card.)
<b>Administration</b> <ul style="list-style-type: none"> <li>➤ Reading/ Checking Bookings</li> <li>➤ Creating Bookings</li> <li>➤ Update Bookings</li> <li>➤ Delete Bookings</li> <li>➤ Reading Customer Information</li> <li>➤ Reading Vehicle Information</li> <li>➤ Replying on Comments</li> </ul>	<p>Admin staffs of AutoCare are able to view all the bookings submitted by customers.</p> <p>For customers who did not booked from website, admins have to create bookings for them.</p> <p>For customers who are busy for the booked day, admins can make changes in customers' booking to future date and time.</p> <p>Admins can delete a booking not submitted from website if customers requested cancellation.</p> <p>Admins and service staffs can read customer's information such as phone, addresses, etc.</p> <p>Admins and service staffs can read information related with vehicle to offer services.</p> <p>Admins can reply on comments given on website by customers for services. If necessary, Admins will make phone calls to customers to solve complaints.</p>

<ul style="list-style-type: none"> <li>➤ Creating Services</li> <li>➤ Updating Services</li> <li>➤ Deleting Services</li> <li>➤ View service ratings</li> </ul>	<p>Admins can create a new service if the business has created a new service for customers.</p> <p>Admins can update information of each service (such as price, estimated duration.)</p> <p>Admins can delete a service if that service is no longer offered by AutoCare to customers.</p> <p>Admins can see overall service ratings and histories of services rating given by customers</p>
<b>Garage</b> <ul style="list-style-type: none"> <li>➤ Garage Space Availability</li> </ul>	<p>Admins can update available garage space slots of different branches, to display on website.</p>

## 1.5 Aims of Project

The essential aims of AutoCare Project is to develop a booking website which helps reduces queueing, waiting and offers customers with streamlined services, Quality Control on workers' performance and services through customers' feedbacks, more convenience way to manage bookings for AutoCare.

By building a dynamic website together with a booking system, it can assist AutoCare to become a preferred Car Quick Service Center among any other competitors by being able to fulfill services to demanded areas and townships and effective quality controlling. AutoCare aims to loosen unnecessary workloads (caused by managing bookings and scheduling of tasks on traditional paper based system) which harms staffs' productivity and to expand their services to more and more areas countrywide.

## 1.6 Project Objectives

As the core aim of AutoCare project is to produce a successful and efficient online booking system that brings convenience to all end users and the system should run with the help of a Database, coherent objectives must be set accordingly to achieve the aims. The objectives of the projects to be accomplished are –

- To analyze the business and its goals, current situations, and identify the problems being encountered currently.

### Activities

- To study the history of company, what they do and their operational processes.
- To identify the issues encountered in their current processes and their consequences.

### Deliverables

- Background, current business processes and problems of AutoCare
- To define a scope for system of the proposed system project, define Aims of project and coherent objectives to achieve the aims and make necessary planning for the project.

### Activities

- To analyze possible ways to solve problems, with the help of new system and to decide what functions will be included in the new system.
- To define Aim of the project and set objectives.
- To make appropriate project planning to plan, manage and monitor necessary tasks to accomplish in project.

### Deliverables

- Proposed system scope, Aims and Objectives of Project
- Project Planning (Gantt Chart, Milestones Planning, Work Breakdown Structure)
- To study and analyze about Database for the project, evaluate Methodologies, Case Study Analysis about similar products/ services and uses of Information Systems.

### **Activities**

- To study what a database is, structure, components and types of database, Designing stages of Databases and comparison of different DBMS.
- To perform Case Study analysis of similar car services.
- To study about Information System.

### **Deliverables**

- Database concept, Database Design (Normalization, ERD, etc)
- Methodology
- Case Study Analysis
- Information System Theory

- To analyze whether the project is feasible enough to implement.

### **Activities**

- To perform necessary analysis that considers social, technical, financial costs and benefit comparison aspects for the project and decide whether to go on or not.

### **Deliverables**

- Social Analysis, Technical Analysis, Cost Benefit Analysis
- No-go, Go Decision

- To start gathering information necessary, designing system and functions for the proposed system.

### **Activities**

- To collect necessary information to design the database of the system
- To start designing database accordingly to functional requirements.

### **Deliverables**

- Fact finding and proposed system description
- Context Diagram and Data Flow Diagram, Entity Relationship Diagram, Functional Requirements.

- To perform Structural, User Interface, Behavioral Designing and Database implementation phase for the proposed system.

### **Activities**

- To start necessary steps for designing and implementing the Database for the proposed system.

### **Deliverables**

- Introduction to Design
- Structural Designs
- User Interface Designs
- Behavioral Designs
- SQL Queries according to Functional Requirements
- Data Dictionary

- To review and re-evaluate the system whether it meets the needs of AutoCare and their issues.

### **Activities**

- Structured walkthrough approach
- Preparing documents for evaluation
- Evaluating design flaws
- Client satisfaction survey

### **Deliverables**

- Completed Evaluation Matrix
- Documentation of Design flaws and how flaws were corrected
- Completed Client Satisfaction survey
- Checking Achievement on Project's Objectives

## **1.7 Project Planning**

A project plan is a collection of documents that map the scope, stages involved to deliver, costs, schedules, resources and desired results for a project. (DRMcNatty, n.d.) A proper project plan is necessary as it can help identify goals, prevent missing deadlines, problems and reduce potential risks that lead to costly project failures. A project without project planning is most likely to miss essential details, tasks, deadlines and even deliverables. A project plan can help guiding various stakeholders, investors, teams and project manager through project phases. (Alexander, 2018) To successfully deliver the final result system, the project planning of Online Booking System for AutoCare will be done with a project management software (Microsoft Project).

## Car Service Booking System of AUTOCARE

### 1.7.1 Gantt Chart

Gantt chart is one of the project management tools used to clearly present scheduled tasks needed to be carried out and tasks completed in accordance with the planned time period. Gantt chart usually includes two parts: the left side usually outlines hierarchy of lists of tasks, the right side uses bars to present scheduled start, end dates and milestones of each tasks. The Gantt chart below shows all the tasks (grouped in Chapters) needed to be undertaken hierarchically for the project and time expected to start and finish and estimated duration of each tasks.

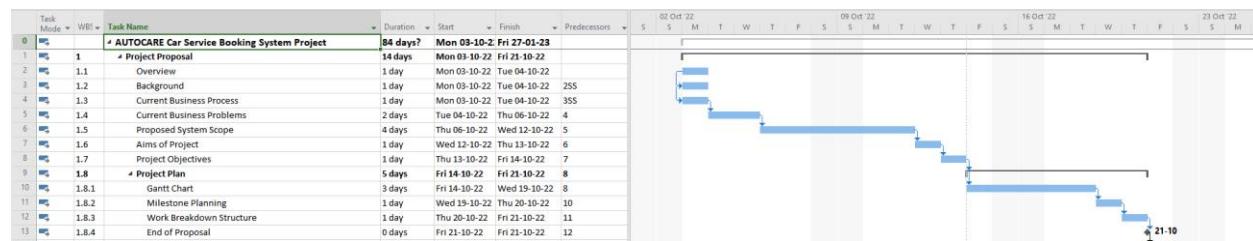


Figure 10 Planning for Project Proposal



Figure 11 Planning for Chapter 1: Introduction

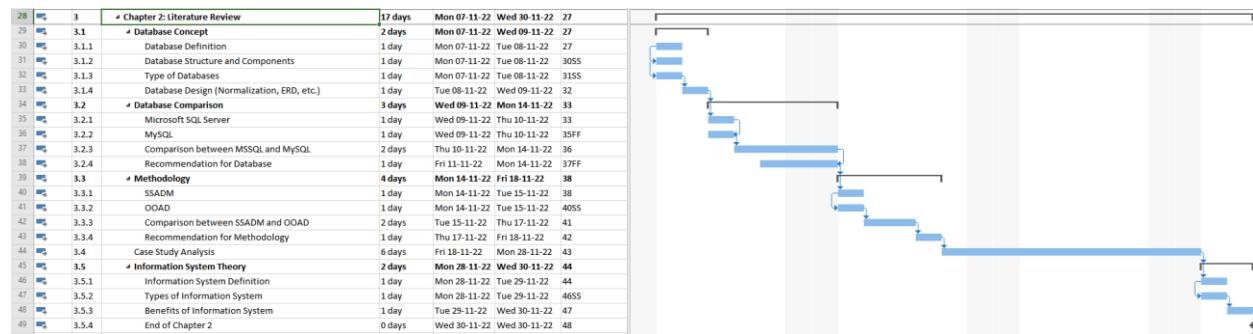


Figure 12 Planning for Chapter 2: Literature Review



Figure 13 Planning for Chapter 3: Feasibility Analysis

## Car Service Booking System of AUTOCARE

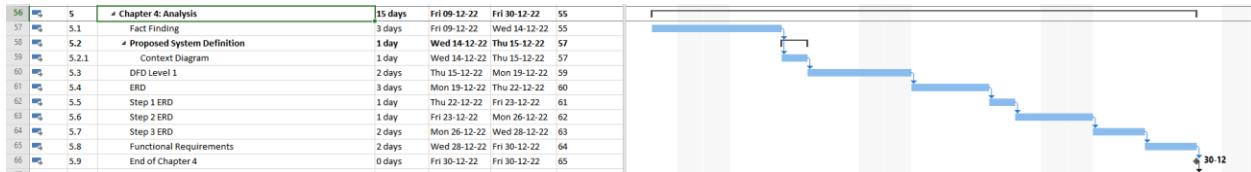


Figure 14 Planning for Chapter 4: Analysis

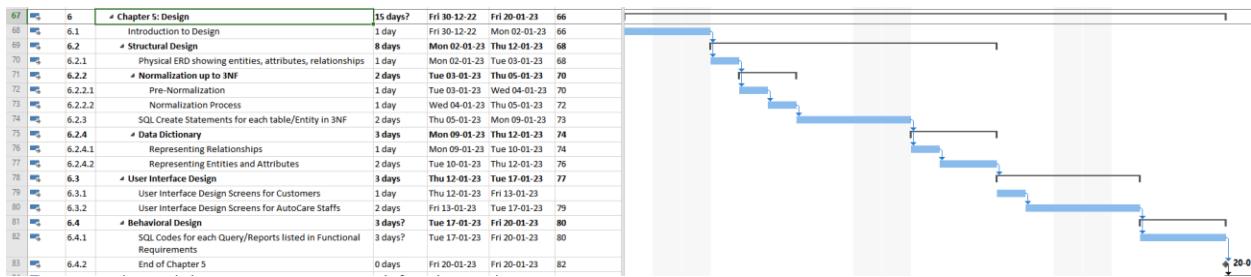


Figure 15 Planning for Chapter 5: Design



Figure 16 Planning for Chapter 6: Evaluation

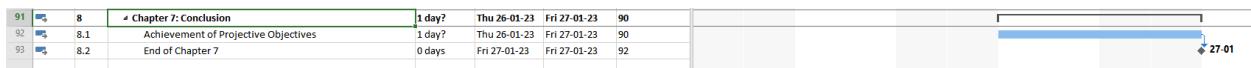


Figure 17 Planning for Chapter 7: Conclusion

### 1.7.2 Milestone Planning

Milestones are essential in a project as it provides information about time-related important events in the project. Milestones describe what the project have to achieve at planned points of dates. Milestone Plan shows logical dependencies between different milestones. (Andersen & S, 2006) Milestone Planning makes essential events, deadlines, delays of tasks in the project to be easily noticeable.

The table below represents milestone planning for AutoCare Online Booking System.

Milestones	Deliverables	Dates
<b>Project Proposal</b>	<ul style="list-style-type: none"> <li>➤ Brief General analysis on AutoCare (Overview, Background, Current Business Process, Problems)</li> <li>➤ Recommended system to solve problems (Proposed System Scope)</li> <li>➤ Defined Aims, Objectives for proposed project</li> <li>➤ Plan for the project (Gantt chart, Milestone Planning, Work Breakdown Structure)</li> </ul>	03-10-22 to 21-10-22 (14 days)
<b>Chapter 1: Introduction</b>	<ul style="list-style-type: none"> <li>➤ General analysis on AutoCare in detail (Background, Current Business Process, Problems)</li> <li>➤ Recommended system to solve problems (Proposed System Scope)</li> <li>➤ Defined Aims, Objectives and outcome expectations for proposed project</li> <li>➤ Plan for the project (Gantt chart, Milestone Planning, Work Breakdown Structure)</li> <li>➤ Ways to manage progress of project tasks (Progress Management)</li> <li>➤ Plan for potential risks that can affect the project (Risk Management Plan)</li> </ul>	21-10-22 to 02-11-22 (11 days)

<b>Chapter 2: Literature Review</b>	<ul style="list-style-type: none"> <li>➤ Concept and literature on Database (Database definition, Structures and Components, Types, Database Design)</li> <li>➤ Chosen/ Recommended Database for proposed system (MySQL, MSSQL, Comparison, Recommendation)</li> <li>➤ Chosen/Recommended Methodology for project (SSADM, OOAD, Comparison, Recommendation)</li> <li>➤ Analysis on three similar products/services (Case Study Analysis)</li> <li>➤ Literature on Information System Theory (Information System definition, Types, Benefits)</li> </ul>	07-11-22 to 30-11-22 (17 days)
<b>Chapter 3: Feasibility Study</b>	<ul style="list-style-type: none"> <li>➤ Analyzed result on social effects that the proposed system brings to fulfill needs of business (Social Analysis)</li> <li>➤ Analyzed result on whether the proposed system is technically feasible for business (Technical Analysis)</li> <li>➤ Analyzed result on costs compared to benefits by implementing proposed system (Cost Benefit Analysis)</li> <li>➤ Decision to do or not to do the proposed system (No-Go, Go Decision)</li> </ul>	30-11-22 to 9-12-22 (7 days)
<b>Chapter 4: Analysis</b>	<ul style="list-style-type: none"> <li>➤ Collected data, information about the systems, requirements and preferences (Fact Finding)</li> <li>➤ Proposed System Definition</li> </ul>	9-12-22 to 30-12-22 (15 days)

## Car Service Booking System of AUTOCARE

	<ul style="list-style-type: none"> <li>➤ Context Diagram on how users interact with system</li> <li>➤ Data Flow Diagram on flow of information through system.</li> <li>➤ Entity Relationship Diagram</li> <li>➤ Defined functional requirement in proposed system (Functional Requirements)</li> </ul>	
<b>Chapter 5: Design</b>	<ul style="list-style-type: none"> <li>➤ Introduction to Design</li> <li>➤ Structural Design including Detail ERD with entities, attributes and relationships (Physical ERD), Normalization process up to 3NF, Physical implementation of normalized entities to tables (SQL Create Statements for each 3NF entities), Data Dictionary for tables (Representing relationships, entities and attributes)</li> <li>➤ User Interface Design Screens</li> <li>➤ Behavioral Design including SQL queries according to Functional Requirements</li> </ul>	30-12-22 to 20-01-23 (15 days)
<b>Chapter 6: Evaluation</b>	<ul style="list-style-type: none"> <li>➤ Preparing documents for evaluation</li> <li>➤ Completed Evaluation matrix</li> <li>➤ Design Flaws and Rectifications</li> <li>➤ Client Satisfaction evaluation</li> </ul>	20-01-23 to 26-01-23 (4 days)
<b>Chapter 7: Conclusion</b>	<ul style="list-style-type: none"> <li>➤ Achievement of Project Objectives</li> </ul>	26-01-23 to 27-01-23 (1 day)

### 1.7.3 Work Breakdown Structure

Work Breakdown Structure (WBS) hierarchically decomposes the work needed to be carried out by the project teams. It enables project teams to achieve objectives quicker and efficiently. (Wrike, n.d.) Descending levels in WBS represents new and more detailed works or sub-tasks needed to be completed in a project. The chart below shows Work Breakdown Structure (hierarchical decomposition of all tasks) for the AutoCare Online Booking System.

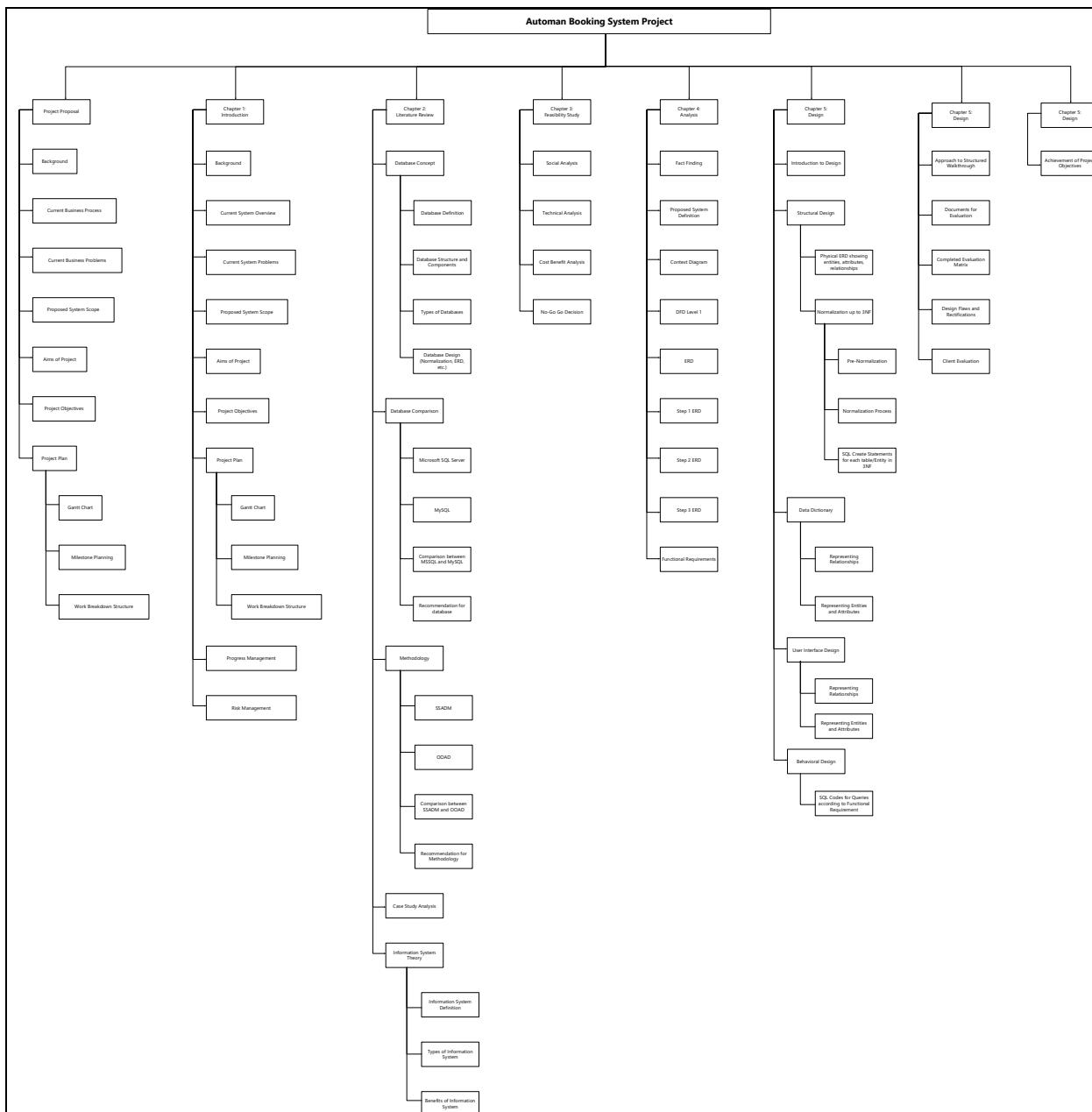


Figure 18 Work Breakdown Structure

## 1.8 Progress Management

Progress management is one of the most important role for a successful project because it helps in ensuring whether the team is accomplishing tasks successfully and achieving all important and desired deliverables or not. (Indeed, 2021) Good, regular progress management/ monitoring help keep the project on track, allows communication within team and gain information about progress of on-going tasks, compared to project plan. (WellExtreme, n.d.)

Several Project Management Tools are utilized for effective and efficient tracking and monitoring of tasks in a project. These includes -

- Checking Gantt chart and Milestones plans regularly to track and evaluate deliverables of each tasks completed and whether on-going tasks are able to finish within planned timeframe.
- Using Work Breakdown Structure to decompose overwhelming large tasks into smaller sub-tasks and monitor whether the tasks are carried out correctly in hierarchy.
- Holding Progress Meeting with supervisors regularly after a set period of time to report progress and completion of tasks. If there is any delay in tasks, reviewing schedules will be done.

## 1.9 Risk Management

In projects, Risk is defined as future uncertainty about deviation of a project from expected outcome. Risk management is a process of predicting, identifying, analyzing, evaluating, preventing / overcoming any kinds of risks (predictable/unpredictable, external/internal, even positive risks) that can occur during a project in order to keep the project in the direction of desired outcomes and goals and to prevent catastrophic failure. (Ray, 2021) (Asana Team, 2022) Both positive and negative risks can be managed by – (Lavanya, N. & Malarvizhi, T., 2008)

- 1. Identifying risk – making a list of potential risks that can occur and affect the project and knowing what they are.
- 2. Analyzing risk impact – exploring the probability of each risk to happen and potential impact each risk imposes on project.
- 3. Assigning priority – by using probability and impact factors of risks, risk levels are determined such as High, medium, low.
- 4. Mitigating/ preventing risk – making risk response plans to reduce each risk in possible ways and to eliminate risks if unavoidable.

(Lavanya, N. & Malarvizhi, T., 2008)

## Car Service Booking System of AUTOCARE

A risk management plan is done below for implementing AutoCare Booking Project as there is possible risks that might cause project delays, expanding costs, losing assets for projects or progress of the project.

Risks and its synopsis	Type of Risk	Probability to happen	Impacts	Rank	Risk Prevention Plan
➤ <b>Project Schedule Risk (Time Crunch):</b> A task not finishing accordingly to scheduled deadlines or longer delay period than expected.	Personality, Environmental, Technical	HIGH	HIGH  Delays in a task can cause the project to take longer to finish, resulting in increasing budgets, project crunches, low performance, and unprofessional impression.	HIGH	<ul style="list-style-type: none"> <li>• Using PM tools           <ul style="list-style-type: none"> <li>➤ Gantt Chart</li> <li>➤ Work Breakdown Structure</li> <li>➤ Milestone Planning</li> </ul> </li> <li>• Monitoring task progress periodically</li> <li>• Overestimating the time to complete tasks in planning.</li> <li>• If encountered with this risk, find how to reduce remaining tasks' duration without reducing quality.</li> </ul>
➤ <b>Scope Creep</b> Project objectives were not well-set/defined together with clients,	Personality	MEDIUM	HIGH  Client/ Stakeholders changing/ increasing requirements during mid-	MEDIUM	<ul style="list-style-type: none"> <li>• Clear, determined project objectives from the initial stages, clarifying that changes cannot be made to requirements once set.</li> </ul>

stakeholders because of ineffective communication.			project, leading to chaos in project planning and failure.		<ul style="list-style-type: none"> <li>Effective communication with clients</li> <li>Monitoring progress often to ensure the project stays within original scope.</li> </ul>
<b>➤ Technical Loss Risks</b> Documentation s for the project are written by using multiple software and are stored on digital devices (i.e. computer, laptops). These devices have risks of not only being stolen/ robbed but also crashing/ getting malware attacks from online and files getting corrupted.	Technic al	MEDIUM	HIGH  Documents crucial for project can be lost/ corrupted, causing delay in project and previously completed task have to be accomplished again.	LOW	<ul style="list-style-type: none"> <li>Documentations should be backed up regularly in places which are easy to recover, such as <ul style="list-style-type: none"> <li>➤ Cloud storages like Google drive, Mega, One drive.</li> <li>➤ External USB with no viruses</li> <li>➤ Another storage drive of the device.</li> </ul> </li> </ul> <p>If unavoidable and encountered with this risk, loss should be honestly reported to supervisors and</p>

					organization to restart processes.
<p>➤ <b>Natural Disasters</b> Natural disasters like Earthquake can cause documentation' s devices to be destroyed.</p>	Environmental	LOW	HIGH  Documents crucial for project can be hard to retrieve from device or destroyed, having to restart the entire project.	LOW	<ul style="list-style-type: none"> <li>• Documentations should be backed up regularly in places which are easy to recover, such as           <ul style="list-style-type: none"> <li>➤ Cloud storages like Google drive, Mega, One drive.</li> <li>➤ External USB with no viruses.</li> </ul> </li> </ul> <p>If unavoidable and encountered with this risk, loss should be honestly reported to supervisors and organization to restart processes.</p>
<p>➤ <b>Accidental deletion</b> Someone can accidentally delete the project documentation by mistake.</p>	Personal	LOW	HIGH  Documents crucial for project can be destroyed, if not recovered with tools in time.	LOW	<ul style="list-style-type: none"> <li>• Documentations should be backed up regularly in places which are easy to recover, such as           <ul style="list-style-type: none"> <li>➤ Cloud storages like Google</li> </ul> </li> </ul>

## Car Service Booking System of AUTOCARE

				<ul style="list-style-type: none"> <li>➤ External USB with no viruses</li> <li>• Another storage drive of the device.</li> <li>• Using proper naming convention to recognize the file well.</li> <li>• Having a file recovery tool in advance.</li> </ul> <p>If unavoidable and encountered with this risk, loss should be honestly reported to supervisors and organization to restart processes.</p>	drive, Mega, One drive.



HIGH = Bad/ Most likely to happen



MEDIUM = Moderate/ Likely to happen



LOW = Ok/ Rare to happen

According to the risk management plan table, although all risks impacts are significantly high, most are only moderately likely to happen. Project Schedule Risk is ranked HIGH in both 'Probability to happen' and 'impact' aspects, prioritizing it as the main risk for the AutoCare Car Service Booking Project.

# **Chapter 2:**

# **Literature Review**

## 2 Chapter 2: Literature Review

In above chapter, an introduction about the AutoCare Company and proposed system to solve their business problems has been made. In this chapter, in order to design and implement the proposed system to its best, necessary literature studies about main components (i.e. database and information systems) within the system, types of ways (or) methodologies to implement the project, choice of most-suitable DBMS for the system and Case study on similar business like AutoCare will be made.

### 2.1 Database Concept

#### 2.1.1 Database Definition

A database stores organized groups of data which contains logically related information. In computing, database and data are stored electronically in a computer system so that data can be easily created, stored, retrieved, updated and managed. (Oracle, n.d.) Database can facilitate the drawbacks of a spreadsheet as it can provide nearly unlimited, program-independent data, relationships between data, less redundant/ consistent data, accessibility by multiple users at the same time and better decision making support. (Keene, 2021)

#### 2.1.2 Database Structure and Components

Structure of a database mainly comprises of 4 components. (Tutorial Cup, n.d.) These 4 components are –

- Users – Users are the people who uses the database for specific purposes. Users can be not only end-users but also administrators and developers.
- Database Application – It is a program which helps users to perform functions with the database through Query Languages.
- DBMS – Database Management System is a software that can create and manage databases and allows users to create, read, updated and delete data within the databases.
- Database – Database is where enormous amount of data are stored in rows and columns in tables for efficient data querying and processing. It is the essential core data source with which other components interact. (Oracle, n.d.)

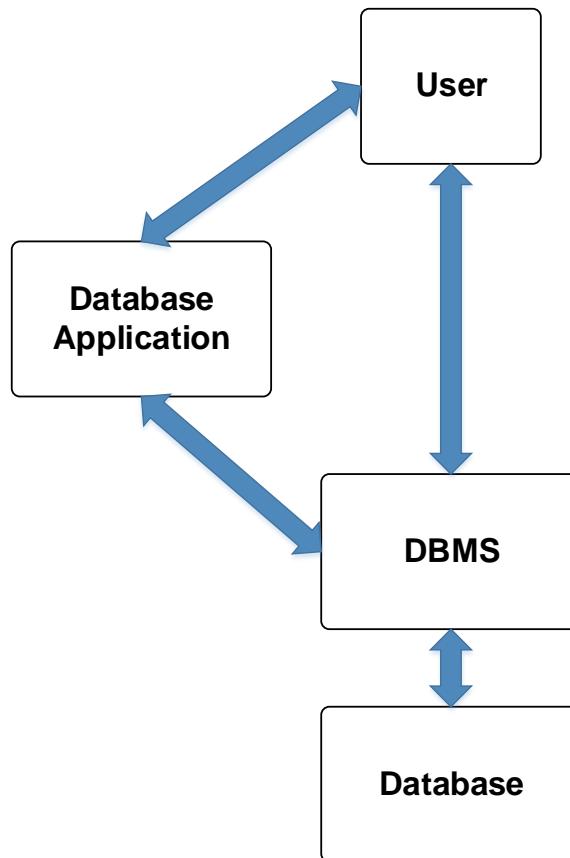


Figure 19 Components of a Database Structure

### 2.1.3 Types of Database

Although there are various kinds of databases, the way an organization wants to use the data is essential in choosing database. (Oracle, n.d.)

Type of Database	Description
➤ <b>Centralized Database</b>	<p>It is a database that operates only within one central location and is used by large organizations (for instance, Corporate Businesses, Universities). A single computer operates/ maintains the database and users from different locations can access the data.</p> <p>(Indeed, 2020)</p>

➤ <b>Commercial Database</b>	It is a database designed uniquely and subjectively for users by commercial businesses. (Sam, 2020) Users have to pay to use commercial databases. (Indeed, 2020)
➤ <b>End User Database</b>	It is a database designed for end users such as managers, used primarily by only one person. For example, spreadsheets, documents, presentations. (Indeed, 2020)
➤ <b>Distributed Database</b>	It is a database that is distributed within multiple devices at different physical locations or within the same location, unlike Centralized Database. (Indeed, 2020)
➤ <b>Operational Database</b>	It is a database which keeps data related to operations (such as marketing, employee relations, customer management service) of an enterprise (Sam, 2020) and are important for business analysts. (Indeed, 2020) It allows users to make real-time CRUD data modifications.
➤ <b>Open-source Database</b>	It is a database designed and free for public, without requiring to pay a fee, unlike Commercial Database. Although users can make customized changes to the database, it may lack some more advanced features of commercial ones.
➤ <b>Personal Database</b>	It is a database simply designed and installed for one user to keep and manage information on their personal computers/devices. (Indeed, 2020) For instance, famous note-taking app like Notion uses Personal Database.
➤ <b>Cloud Database</b>	It is a database that runs over Internet protected by encryption. Data might be stored on a local drive/ server but the full information is stored online. Users can access the information from anywhere with an internet connection. (Indeed, 2020)

#### **2.1.4 Database Design (Normalization, ERD, etc.)**

Three types of data model are necessary to successfully design and implement a database for a system.

- Conceptual Data Model: This model describes '**What**' will be included within the proposed system of an organization. (Taylor, 2022) Conceptual Data Model can present the big picture view of system by the objects involved (for instance, customer, product and supplier, etc.) It establishes necessary entities for the system, their attributes and relationships between entities. (Visual Paradigm, n.d.)
- Logical Data Model: This model shows '**How**' the database should be implemented with any DBMS (Taylor, 2022) and is a more-detailed version of Conceptual model ERD, by converting entities as tables and attributes as columns of table, setting relationships between them and by introducing operational/ transactional entities necessary for the system. (Visual Paradigm, n.d.)

The converted tables must also be well-structured which means having anomalies eliminated, having data integrity and good performance with lowest data redundancy. Normalization process (which restructures the database through a series of normal forms like UNF, 1NF, 2NF, 3NF) (Singh, 2015) should be done in tables to have well-structured tables.

- Physical Data Model: This model specifically presents '**How**' the database will be actually implemented according to the selected DBMS. (Taylor, 2022) Types of data, length, nullability, keys and constraints are assigned to table columns and all necessary relationships and cardinalities are included. (Visual Paradigm, n.d.)

## 2.2 Database Comparison

Database is one of the essential component within the system that will help this project to be successful. Database is vital for the system to store all types of data from the back-end administration processes and front-end input processes. Therefore, an effective and a right-fitting database must be thought and chosen for the proposed system to perform best. Among database management systems in the world market, Microsoft SQL Server and MySQL server will be initially selected to be discussed, compared and the best-fit DBMS for the system will be chosen.

### 2.2.1 MySQL

MySQL is not only one of the widely used Relational Database Management System but also free and open-source database. It is developed and technically supported by Oracle Corporation. MySQL is mostly used with PHP language in back-end to develop websites and well known for their ease of use, reliability and performance factors. (MySQL, n.d.) (Pedamkar, n.d.)

#### Advantages and Disadvantages of MySQL

<u>Advantages</u>	<u>Disadvantages</u>
Reduced costs since MySQL is open-source.	MySQL cannot support/ handle a very large size of Database efficiently; struggling in large amount of reading and writing operations.
Has reliable Data Security as all the data are protected by a password stored in complex encrypted algorithms, which cannot be easily broken.	MySQL does not have better debugging tools than paid RDBMS.
Good platform support as it is compatible with most Operation Systems.	Does not have proper scalability for growth of application in size.
Being open source, the source codes are available to be edited as desired.	

(Roor, 2022)

### 2.2.2 MSSQL

MSSQL is also one of the widely used RDBMS developed by Microsoft. MSSQL is mainly used on Windows operating system and well-known for its performance and scalability, making it a convenient choice for large to enterprise level of applications. (Pedamkar, n.d.)

#### Advantages and Disadvantages of MySQL

<u>Advantages</u>	<u>Disadvantages</u>
Data Recovery support is available to prevent data corruption due to power issues or server shutdowns.	There is a free version of MSSQL but more complex apps and features may require investing on latest version of MSSQL.
Ease of use and set up as users don't need third party toolkits to install, updates are automatically available to update MSSQL and software modification components can be installed easily.	Only compatible with windows platform so that using other OS platforms will cost more to invest.
Greater level of Data security compared to open source RDBMS.	

(Pedamkar, n.d.)

### 2.2.3 Comparison of MySQL and MSSQL

By comparing the two Relational Database Management System, we can find out good, useful reasons and bad reasons to choose the best-fitted RDBMS for our proposed system. The following table is comparison of MySQL and MSSQL with Criteria important for proposed system. (Pedamkar, n.d.)

<u>Criteria</u>	<u>MySQL</u>	<u>MSSQL</u>
<b>Costs</b>	Open Source – Free to use	proprietary product – Requires costs for licenses
<b>Compatibility</b>	Compatible with most of Operating systems, used mostly with Linux, LAMP stack	Compatible with both Windows and Linux, but originally developed for Windows Platform
<b>Performance</b>	Similar in Performance and Speed, but known to struggle in handling very large amount of read/ write operations.	Similar in Performance and Speed
<b>Scalability in long term</b>	Flexible to handle transactions as data size grows	Scalable enough for increased transactions
<b>Security</b>	MySQL allows access and others to manipulate database during runtime.	MSSQL does not allow unauthorized access and making manipulation to files under its control, offering better security than MySQL.
<b>Query Functionality</b>	MySQL does not allow user interruption till a query is successfully executed.	MSSQL allows to control query execution and able to stop execution midway.

(Pedamkar, n.d.)

#### **2.2.4 Recommendation for proposed system**

After making analysis and comparison between two RDBMS, MSSQL is chosen as most suitable for our Database driven online booking system due to the following reasons –

- The proposed system has potential to grow in size as users and customers grow and as AutoCare expands in branches.
- Familiarity with MSSQL is better as I have done previous e-commerce database project in MSSQL.
- Both developers and AutoCare itself is using Windows Operating system.
- Expansion in AutoCare's branches and users, customers need scalable database and hence, MSSQL is a better choice.

## **2.3 Methodology**

Merriam-Webster Dictionary describe methodology as “a body of methods, rules, and postulates employed by a discipline: a particular procedure or set of procedures”. (Merriam-Webster Dictionary, n.d.) Fundamentally, a methodology is a group of methods, defined principles and processes, techniques and procedures for the processes. A methodology may be thought of as a skeleton, a backbone of a project. It is significantly important for the success of a project because a suitable, a right-fitting methodology for a project can offer path and guidelines to make a project manageable, smooth and effective to be succeed. (Thompson, n.d.) Among many methodologies, for system design and development with database, SSADM (Structured system analysis and design methodology) and OOAD (Object-Oriented analysis and design methodology) will be studied in detail below, make comparisons and the most suitable methodology will be chosen for the proposed system.

### **2.3.1 SSADM (Structured system analysis and design methodology)**

SSADM is a methodology initially used as a requirement to develop British Government computing and database projects, developed by Learmonth Burchett Management Systems (LBMS) and Central Computer Telecommunications Agency (CCTA), in 1980. It is a methodology with a base on the top-down waterfall model and used by many businesses and developers. (Techopedia, 2011)

SSADM gives a framework to manage projects suitably by breaking down projects into modules, stages, steps and tasks. Objectives of SSADM are to improve project management and controlling, to develop systems of better quality and to offer good communications among project team members and users. (Lutkevich, 2022) As SSADM is based on Waterfall model, reviews must be done to ensure accomplishment of each stages before the next stage can start and making changes on previous stages is not allowed. Therefore, SSADM can be most favorable to be used by projects with requirements and objectives that have less possibility to change. Three data modeling techniques (Logical Data Modeling, Data flow modeling, Entity behavior modeling) are used in SSADM. The following are the advantages and disadvantages of SSADM methodology. (Schumacher, 2001) (Tutorialspoint, n.d.)

### **Advantages and Disadvantages of SSADM**

<b><u>Advantages</u></b>	<b><u>Disadvantages</u></b>
<ul style="list-style-type: none"> <li>➤ The use of Logical Data modelling, Data flow modelling, Entity behavior modelling techniques make sure the information system is viable and well-understood.</li> </ul>	<ul style="list-style-type: none"> <li>➤ One stage or phase of the project should be completed and reviewed before continuing to next stage and no iteration/ changes is allowed for previous completed phases. The whole process has to be restarted when errors occur in previous phases, when business must make changes in requirements or objectives during development.</li> </ul>
<ul style="list-style-type: none"> <li>➤ As SSADM emphasize on analyzing the business needs and objectives since documentation, SSADM ensures the project planning meets the actual requirement of the business.</li> </ul>	<ul style="list-style-type: none"> <li>➤ The larger the system, the more details will be drawn in technical diagrams such as Data flow diagrams so that outlines can become hard to understand, with inclusion of all related data flows.</li> </ul>
<ul style="list-style-type: none"> <li>➤ As SSADM offers ability to plan, manage and control projects suitably, it encourages on-time delivery of final product, effective use of resources and productivity.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Potential of shift to over-analyzing exists in SSADM, which can be time and cost-expensive in large systems.</li> </ul>

### **2.3.2 OOAD (Object-oriented analysis and design methodology)**

Unlike SSADM, OOAD is more focused and based on objects rather than processes. OOAD decompose the project system into smaller modular components (i.e. objects) which can independently exist and can be changed without imposing effects to the others around them. This makes OOAD to easy to add more functions to system and to be a favorable to choose for complex projects with possibility to change in requirements and objectives. (Techopedia, n.d.) Three techniques (Object modelling, Dynamic modelling, Functional modelling) are used in OOAD. (Tutorialspoint, n.d.) The following are the advantages and disadvantages of OOAD methodology.

**Advantages and Disadvantages of OOAD**

<b><u>Advantages</u></b>	<b><u>Disadvantages</u></b>
➤ It is easier to upgrade/ upscale the system from small to larger ones and easier to make revisions for previous stages in OOAD rather than SSADM.	➤ Object-Oriented models cannot easily show how objects communicates within a system.
➤ Modularity of objects helps in managing complexities of system effectively.	➤ Nature of OOAD methods may be not well suited for procedural languages/ systems.
➤ As OOAD encourages encapsulation, all small systems and objects produced during development can be mixed matched as desired into a self-contained entity.	➤ Not an ideal approach for simpler projects where procedural languages are best-suited. (Depend on judgement of developers.)

### 2.3.3 Comparison of SSADM and OOAD

By comparing the two methodologies, we can find out good, useful reasons and bad reasons to choose the best-fitted one for our proposed system. The following table is comparison of SSADM and OOAD with Criteria important for proposed system.

<b>Criteria</b>	<b>SSADM</b>	<b>OOAD</b>
<b>Ability to handle changing requirements during development</b>	Best-fitted for fixed/ well-defined project with stable user requirements.	Best-fitted for larger and complex project with changing user requirements.
<b>Main focus</b>	Focuses on the processes and procedures of system	Focuses on real-world objects which are crucial for system.
<b>Types of models/ Diagrams to be used</b>	Includes Data Flow Diagram (DFDs), Entity Relationship Diagram (ERD), Data Dictionary, Decision Tables/Trees, Context Diagram	Includes Classes Diagram, Use Case model, Sequence Diagram, State chart Diagram
<b>Working with phases/ steps</b>	One phase/ step must be completely and correctly finished before moving to next one.	Phases/ steps can be carried out at the same time.
<b>Suitability for types of systems/ projects</b>	Suitable for Real-time systems, embedded systems and projects.	Suitable for most business apps, Game development projects, projects and systems that need many customizations/ changes.
<b>Ability to Manage</b>	Easier to manage projects due to clearly defined phases in advance.	Difficult to manage projects due to uncertain flow between phases.

### **2.3.4 Recommendation for proposed system**

After making analysis and comparison between two methodologies, SSADM is chosen as most suitable and most beneficial methodology for our Database driven online booking system due to the following reasons –

- The proposed system that is going to be developed is a Real-time system, which is best-suited to use SSADM.
- To know and understand better about AutoCare and to solve their issues, a thorough focus on analysis of their business processes is preferred as problems are occurring within their specific processes.
- Feasibility Analysis of SSADM can help ensure whether the proposed system is useful, attainable and necessary for AutoCare business from different views.
- The use of SSADM DFD diagrams, ER diagrams, and Context diagrams can offer graphically better understanding on the current system/ processes and proposed system.

## 2.4 Case Study Analysis

When most Car Service Center businesses were started, they mostly used a manual, paper-based system (or) Spreadsheets at best and ordinary telephone calls, SMS messaging to receive bookings, record customer details and schedule service appointments manually, in order to save costs as the business was small in size with a few manageable customer visits. However, as the business grows, customer base significantly increased and business processes need to be more streamlined, the old ways of managing bookings become impractical and inefficient. The following case studies about 3 similar businesses will be made to know how they transformed issues and inefficiencies with their old manual system to a more modern, automated system.

### APEX Auto Service Co., LTD

Apex Auto Service Co., LTD, located in Thingangyun Township, Yangon, Myanmar was founded in 18<sup>th</sup> June, 2016 with total 35 employees. They started out with Body repairs, Car Wash and Detailing services and gradually offers a wide variety of services like Car Painting, 3D Wheel Alignment, Engine repair, suspension repairs, Diagnosis and Wiring services and Crane services, by the workforce of 150, after 6 years. Moreover, APEX expended the new workshop branch with space capacity of over 50, in Dagon Industrial Zone, mainly for mega maintenances, auto body painting and repairs. (APEX Auto Service, 2021)

Similar to other car service businesses, APEX initially relied on paper based system for scheduling, data recording and Telephone bookings, SMS bookings for appointments. They had to handle both customer enquiries and bookings through 4 telephones in each branches and had to manually schedule on paper. As their business growth in late 2020, their current ways of managing booking are not efficient enough to handle increasing customer base and started encountering lots of challenges, and also they wanted their business to be more well-known within the market and available online. Some issues are –

- **Lack of online presence:** As they previously did not have social media pages and websites before, they had to depend on word-of-mouth effect, brochures to advertise target customers and customers have to go to their workshops or contact through phone to enquire services.
- **Handling bookings:** When a booking phone call is received, staffs have to write down details as customers talk through phone and there can be possibilities for data omission, hearing issues, miss-hearing customers leading to wrong detail record.

- **Technician availability and wrong booking scheduling:** The scheduler also have to consider worker availability for customer's desired appointment time when accepting booking on the call. Without real-time information, mistakes in scheduling often happens. This causes customers to wait until some technician are available when they arrive garage.
- **Customer frustration:** Customers become frustrated and dissatisfied by waiting and the company's inability to offer services in-time.
- **Employee frustration:** Employees become frustrated with their uncertain, overwhelming job schedules and unhappy working on a lot of orders daily.

To solve these issues, the senior management of APEX decided to change from paper-based system and to own a branded online website together with a booking system for customers. The decision led to make changes in both software and hardware.

Hardware	System's features
Computers: Desktops (or) Laptops  Wi-Fi router for active internet connection  Generators/ UPS	<b>Display feature:</b> All information about APEX and their services are displayed on website.  <b>Viewing &amp; choosing services:</b> Before bookings, customers can view and choose their desired services.  <b>Booking appointment:</b> Customers can book for appointment to get desired services on desired date and time period.  <b>Viewing &amp; managing bookings:</b> Technicians, workers and admin staffs can view detail information and accept or cancel bookings in real-time.  <b>Scheduling bookings:</b> The database system will automatically rearrange and schedule bookings accordingly to date and time slots.

	<b>Newspaper subscription:</b> Customers can subscribe online APEX email newspaper to be informed with new services and promotions.
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APEX Auto Service Co., Ltd was able to solve their problems encountered due to the benefits of the new system changes as following:

- Owning a website can help their business to show up in google search results so that potential customers notice their business and visit to their centers for services.
- Increased convenience for customers to enquire services and submit bookings.
- Handling and managing bookings becomes easier for staffs due to abilities offered by new system and technician staffs and workers can now focus more on their core activities and not stressed by overwhelming schedules.
- Less admin staffs is needed for handling bookings therefore, reducing in payroll expenses.
- Email newspaper keep customers updated with promotions and tips so that customers stay keep in touch with APEX.

### **RepairSmith mobile auto repair service**

RepairSmith was founded in 2018 and is now significantly well-known as ‘mobile mechanics on wheels’ in Los Angeles. Although Joel Milne, an angel investor/ entrepreneur and Felix-Matthias Walter, previously a Manufacturing executive and 25 years experienced Auto Technician of Mercedes-Benz wanted to establish a car repair service, Felix came up with an idea to switch their conventional car repair business to an innovative startup, upgrading car repair truly convenient for customers. They wanted to solve the issue of being non-digital to digitalized service where customers can make bookings conveniently from home, get serviced at their driveway without having to drive to the workshop and a taxi back home. (CISION, 2021)

According to their new startup idea, they implemented a website with Online booking appointment system and completely changed their way of operating and servicing to be fully mobile. Their startup is backed by funds from Ti Capital, Mercedes-Benz and Porsche. (CISION, 2021) Rather than residing in a workshop location, they invested in a smaller company location and vans for their mechanics. If a customer books for an appointment/ get a quote by providing their vehicle information and repair service needed, they will reply with an instant quote as soon as possible. If customers’ requirements are special, they can discuss with service advisors and will receive a quote within 24 hours after request. They can also call diagnosis team if customer does not know

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the exact issue. After quote is accepted, a team of mechanics in a van with required equipment will be sent to customers' car location and start repairing.

In order to implement their plan, top-management of RepairSmith acquired many new hardware devices and software for their Online booking service, admin staffs and mechanics.

Hardware	Software
Computers: Desktops (or) Laptops  Internet Service Provider plan or Wi-Fi router  Portable Printers  Batteries/ Portable generators	<b>Display feature:</b> All information about RepairSmith and their services are displayed on website together with helpful blogs and FAQs.  <b>Get a Quote/ Booking appointment feature:</b> Customers can get a Quote for price according to their vehicle and required service. Customers can also make special Quote requests for customized repairs with service advisors.  <b>Viewing &amp; choosing services:</b> Before bookings, customers can view and choose their desired services.  <b>Viewing &amp; managing bookings:</b> Technicians teams and admin staffs can view detail information of booking and accept or cancel bookings in real-time.  <b>Viewing vehicle history:</b> Customers and Technician teams can view repair history of their previous customers for better diagnosis.  <b>Newspaper subscription:</b> Customers can subscribe online APEX email newspaper to

	be informed with new services and promotions.
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RepairSmith was able to establish their desired unique auto repair service due to the benefits of the Online Booking System website as following:

- The website with Online Booking System was the heart of their startup business. Owning a website helped their unique business to be discovered in google search results of people in United States so that potential customers notice their business and apply bookings to get their services.
- Significantly increased convenience for customers as bookings and enquires can be done entirely at home through website and not necessary to drive to a workshop location as RepairSmith teams come and perform services at customer's car location.
- The online booking system is able to provide mobile technician teams with precise information related with booked customers according to their zip codes so that any nearby RepairSmith teams within that zip code location can come and serve customers.
- Unlike conventional auto services, expenses on buying land or rent are greatly saved.
- Email newspaper keep customers updated with promotions, service updates, reminders and car care tips so that customers stay keep in touch with RepairSmith.

### **Star Car Wash**

Star Car Wash is a family-owned hand car washing, cleaning and detailing service provider in business for 19 years. Their business way started in 2003, at Mascot, NSW. They aims to be Australia's highest quality professional hand wash service provider. They set their small service sites at different locations around Australia and some near shopping center car parks. (Star Car Wash, n.d.) Similar to other car service businesses, Star initially relied on paper based system for scheduling, data recording and Telephone bookings, SMS bookings for appointments for many years. They had to handle both customer enquiries and bookings through a telephone in each branches and scheduling is done manually on paper. As their business growth in late 2012 together with a lot of smaller branches in many towns in Australia, their current ways of managing booking are not efficient enough to handle increasing customer base and started encountering lots of challenges in managing bookings. Some issues are –

- **Lack of convenient booking for customers:** Each of their small branches have only a phone number, booking for services was not convenient due to call busy.
- **Handling bookings:** Similar to Apex, when a booking phone call is received, a staff have to write down details as customers talk through phone and there can be possibilities for data omission, hearing issues, miss-hearing customers leading to wrong detail record.
- **Employee availability and wrong booking scheduling:** The scheduler also have to consider worker availability for customer's desired appointment time when accepting booking on the call. Without real-time information, mistakes in scheduling often happens. This causes customers to wait until some service employees are available when they arrive sites.
- **Customer frustration:** Customers become frustrated and dissatisfied by waiting and the company's inability to offer services in-time.
- **Employee frustration:** Employees become frustrated with their uncertain, overwhelming job schedules and unhappy working on a lot of orders daily.

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To solve these issues, the owners of Star decided to change from paper-based system and to own have a booking system integrated in their own branded online website together for customers. The decision led to make changes in both software and hardware.

Hardware	System's features
<p>Computers: A Desktop (or) Laptop or At least a well-performing mobile with touch screen for each site</p> <p>Wi-Fi router/ Mobile data for active internet connection</p> <p>Generators/ UPS</p>	<p><b>Display feature:</b> All information about Star and their services are displayed on website.</p> <p><b>Viewing &amp; choosing services and booking:</b> Before bookings, customers can view and choose one of their nearest site, desired services (Both Normal and Platinum level services) according to customer cars, pick date, time slot and Book for service.</p> <p><b>Viewing &amp; managing bookings:</b> Technicians, workers and admin staffs can view detail information and accept or cancel bookings in real-time.</p> <p><b>Scheduling bookings:</b> The database system will automatically rearrange and schedule bookings accordingly to date and time slots.</p> <p><b>Newspaper subscription:</b> Customers can subscribe online Star Car Wash email newspaper to be informed with Car Care tips, new services, new site launches and promotions.</p>

Star Car Wash was able to solve their problems encountered due to the benefits of the new system integration as following:

- Owning a website with booking system can help their business to show up in google search results so that potential customers notice their business, different site locations, services with prices showing transparently and visit to their sites for services.
- Increased convenience and transparency for customers to enquire services with prices and submit Platinum bookings.
- Handling and managing bookings becomes easier for Star staffs in each site due to capabilities offered by booking system and workers can now focus more on their core service activities and not stressed by overwhelming schedules.
- Email newspaper subscription keep customers updated with new site launches, promotions and Care tips on car cleaning so that customers stay keep in touch and familiar with Star Car Wash.

## 2.5 Information System Theory

### 2.5.1 Information System Definition

Information system can be defined as a composition of many IT components such as computer software, hardware, database, Internet, etc... together with processes and functions of a business. (Boell & Cecez-Kecmanovic, 2015) Businesses nowadays uses Information systems for managing operations and planning/ making efficient strategic decisions to keep ahead within competitions.

### 2.5.2 Types of Information System

Although there are many and various information systems, a business must choose mostly suitable type of information system to be used in a business, depending on its objectives and purposes. There are mainly six types of information systems in accordance with the 3 levels of organization.

- Executive Support/Information Systems: ESS/EIS supports senior-level management in planning and making strategic business decisions by providing them with gathered, analyzed and summarized internal (e.g. sales and manufacturing) and external information reports. (e.g. competitor's strategies, future trends) (Emeritus, 2022)
- Management Information Systems: MIS supports middle-level management by providing automation of previously manual processes such as performance tracking, budgeting, market researching. (Emeritus, 2022)
- Decision Support Systems: DSS supports middle-level management in making decisions or problem solving by gathering desired information, analyzing and predicting possible outcomes. (Emeritus, 2022)
- Knowledge Management Systems: KMS supports both middle-level-management and operational-level by using documentations, visuals, and graphics to help the flow of new and updated knowledge sharing in the business processes. (Emeritus, 2022)
- Transaction Processing Systems: TPS supports operational-level employees with smooth, consistent daily business operations by providing automation of collecting, storing and processing daily transactions. (Emeritus, 2022)
- Office Automation Systems: OAS supports operational-level employees with productivity by providing automation in admin processes such as documentation, data recording, office transactions, teleworking, and communication. (Emeritus, 2022)

### **2.5.3 Benefits of Information System**

By using information systems, both tangible and intangible benefits can be achieved for the business (Lipaj & Davidavičienė, 2013), such as –

- Improving decision making process,
- Enhanced team-working and communication,
- Taking advantages of future market trends,
- Gaining competitive advantage,
- Improving productivity of workers,
- Standardized and speed up operational processes,
- Reduced unnecessary administrative costs,
- Reduced paperwork and unnecessary time,
- Improved customer services and satisfaction,
- Improved information transparency and
- Reduced operational expenses.

(Lipaj & Davidavičienė, 2013)

# **Chapter 3:**

# **Feasibility Study**

### 3 Chapter 3: Feasibility Study

#### 3.1 Social Analysis

Before actual preparations and implementation for new proposed system to be made, it is crucial to analyze the social impact of both the older system and proposed system imposes on the people related with AutoCare (according to their organizational roles, job roles, educational levels, technical knowledge levels) and whether the new proposed system will be able to solve the old issues in the processes of previous system and provide benefits. Only then it will be more clear and effective to decide whether new proposed system is socially feasible to be implemented.

The (6) types of employees in AutoCare have various levels of education backgrounds, knowledge, skills and all of them help operate AutoCare with different job roles. Therefore, impacts of the systems may imposed on them in different ways. The following table presents each AutoCare employees' education level, computer knowledge, current job roles and impacts of the system on their jobs.

User employee	Education	Computer knowledge	Current Job role	Impacts of the system on their jobs
<b>Manager/ Owner</b>	<ul style="list-style-type: none"> <li>-Bachelor degree level (preferred: auto mechanics or related field)</li> <li>-High school diploma/ GED</li> <li>- certification in auto mechanic repairing</li> </ul>	<ul style="list-style-type: none"> <li>basic / can be extremely limited</li> </ul>	<ul style="list-style-type: none"> <li>-customer management</li> <li>-operation management</li> <li>-employee hiring, training, supervising</li> <li>-equipment /inventory management</li> <li>-financial management</li> </ul>	<p>The system will have some negative but mostly positive impact on this employee.</p> <p><b>Negative</b></p> <p>With limited knowledge in computer or technology, training must be provided for this employee to use the system at its best.</p> <p>With unfamiliarity of new system, both workload and pressure on this employee may increase initially.</p>

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			<ul style="list-style-type: none"> <li>-work safety management</li>   <li>-tasks and scheduling management</li> </ul>	<p><b><u>Positive</u></b></p> <p>The new system will help owner in</p> <ul style="list-style-type: none"> <li>- recording details and scheduling for bookings,</li>   <li>- tasks assignment on workers,</li>   <li>- keeping records of customers and repair costs for their cars,</li>   <li>- monitoring employee performance</li>   <li>- managing customer complaints/suggestions</li> </ul>
<b>Repair Technician/ Mechanic</b>	<ul style="list-style-type: none"> <li>- High school diploma/ GED</li>   <li>-on-job-training on auto repairs</li>   <li>- certification in auto mechanic repairing</li> </ul>	<ul style="list-style-type: none"> <li>- limited</li> </ul>	<ul style="list-style-type: none"> <li>- fixing car exteriors (frames, dents, windows, suspensions, wheel alignments)</li>   <li>-interacting directly with customers, estimators and estimate approx. cost, required repairs</li> </ul>	<p>The system might not have direct benefit on job roles of mechanics. However, they will be benefited positively with</p> <p><b><u>Positive</u></b></p> <ul style="list-style-type: none"> <li>-fairly assigned tasks and work schedules,</li>   <li>-get training and supervised according to customers' booking feedback on performance.</li> </ul>

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			- performing effective vehicle repairs where necessary	-function to keep customer updated with service progress.
<b>Detailer Technician</b>	<ul style="list-style-type: none"> <li>- High School Diploma/ GED</li> <li>-on-job-training on auto servicing</li> <li>- certification in auto mechanic repairing</li> </ul>	<ul style="list-style-type: none"> <li>- extremely limited</li> </ul>	<ul style="list-style-type: none"> <li>- detailing service with various cleaning techniques and products</li> <li>- responsible to offer superior cleanliness for cars</li> <li>- cashing in to owner</li> </ul>	<p>With the system, detailer technicians will be benefited with</p> <p><b><u>Positive</u></b></p> <ul style="list-style-type: none"> <li>-fairly assigned tasks and work schedules,</li> <li>-gaining precise information about booked customers to go and perform Home service/ Pick up service methods,</li> <li>-get training and supervised according to customers' booking feedback on performance,</li> <li>-function to keep customer updated with service progress.</li> </ul>
<b>Customer Service Representative/ Estimator</b>	<ul style="list-style-type: none"> <li>- High School Diploma/ GED</li> <li>- Bachelor degree (preferred)</li> </ul>	<ul style="list-style-type: none"> <li>- basic</li> </ul>	<ul style="list-style-type: none"> <li>- communicating with customers directly</li> <li>- dealing with claims people</li> </ul>	<p>The system may not have much influence on this estimator employee's job roles.</p> <p><b><u>Positive</u></b></p>

## Car Service Booking System of AUTOCARE

	<ul style="list-style-type: none"> <li>- on-job-training on auto servicing</li> <li>- certification in business management</li> </ul>		<ul style="list-style-type: none"> <li>- performing damage/repair assessment for optimal repair and reduced liability</li> <li>-estimating costs necessary for overall repairs</li> </ul>	<p>Only customers' feedback on estimator will help manager in monitoring performance and integrity of estimator.</p>
<b>Service Manager</b>	<ul style="list-style-type: none"> <li>- Bachelor degree in auto mechanics (preferred)</li> <li>- High school diploma/GED</li> <li>- certification in auto mechanic repairing and operation management</li> </ul>	<ul style="list-style-type: none"> <li>- basic</li> </ul>	<ul style="list-style-type: none"> <li>- supervise technicians and detail technicians</li> <li>- oversee all repairs and services performed in workshop being completed with quality and timely outcomes</li> <li>- maintaining safe and clean work environment</li> <li>- resolving complaints of customers on services quality and workers performance</li> </ul>	<p>The system will have some positive impacts on this service manager employee.</p> <p><b><u>Positive</u></b></p> <ul style="list-style-type: none"> <li>- In addition to their supervision, customer's feedback on services and performance of workers can be received</li> <li>- ability to improve overall services to be better and maintain quality to full customer satisfaction</li> <li>- offering necessary trainings for low-performing, low-rated technicians</li> </ul>

			<ul style="list-style-type: none"> <li>- cashing in to owner</li> </ul>	<ul style="list-style-type: none"> <li>- ability to gain feedback on Home services technicians' performance</li> </ul> <p><b><u>Negative</u></b></p> <ul style="list-style-type: none"> <li>- Training on how to use the new system for their best potential must be provided</li> <li>- Service managers' productivity will be greatly reduced by handling all sorts of customer complaints if most fellow technicians performed badly.</li> </ul>
<b>Receptionist/ Admin staff</b>	<ul style="list-style-type: none"> <li>- Bachelor degree (preferred)</li> <li>- High school diploma/ GED</li> <li>- vocational certificate in customer management/ sales/ front-office management</li> </ul>	<ul style="list-style-type: none"> <li>- fairly good</li> </ul>	<ul style="list-style-type: none"> <li>- Greeting, welcoming, directing customers</li> <li>- Responding to visitor inquiries</li> <li>- giving directory</li> <li>- Accepting and answering booking/ enquiry calls, messages</li> </ul>	<p>The system will have mostly positive impacts on this Receptionist/ Admin staff.</p> <p><b><u>Positive</u></b></p> <ul style="list-style-type: none"> <li>- As the new system will record history, preferences and information of customers, Admin staffs perform customer relationship management activities easier.</li> </ul>

## Car Service Booking System of AUTOCARE

			<ul style="list-style-type: none"><li>- performing office-related duties if requested</li><li>- re-contacting/ reminding customers after months they received services</li><li>- cashing in to owner</li></ul>	<ul style="list-style-type: none"><li>- Also they can perform after-sales services easily.</li><li>- By the help of booking system, reduced workload to answer all the contacts will allow them to focus on communicating with customers at workshop and office works.</li></ul>
--	--	--	--	--

### 3.2 Technical Analysis

To implement the proposed online database-driven booking system, AutoCare company will need to improve their technological infrastructure to operate the system. In this Technical analysis, inspection and analysis will be made on what kind of hardware and software are currently used and how adding the new hardware and software will make impacts on the job roles of employees and organization.

The only hardware devices exist in AutoCare Branches are 2 wired telephone to accept phone calls, 2 mobiles to accept SMS/ messenger bookings, large generators for power, 1 computer for financial accounting purposes, a printer and computerized devices for wheel alignment in each branch. The shop owners also have their own outdated laptop with low specifications. Yet the amount of hardware devices and software currently owned by AutoCare will not be sufficient to operate the proposed system. Therefore, new hardware devices and software will be necessary for each individual branches which are –

Hardware	Software	Other/ Misc
<ul style="list-style-type: none"> <li>➤ 2 Core i3 CPU, 4GB ram, 650W PSU, 500GB HDD office PC Rigs (with PC, Mouse, Keyboard)</li> <li>➤ Ethernet Cables</li> <li>➤ 1 printer</li> <li>➤ Budget android phones for Home service/ Pick up service team who don't own mobile with touch screen</li> </ul>	<ul style="list-style-type: none"> <li>➤ Windows 10 Pro</li> <li>➤ A browser app</li> <li>➤ Subscriptions for website hosting</li> <li>➤ Domain</li> </ul>	<ul style="list-style-type: none"> <li>➤ Internet Service Provider plan and router</li> <li>➤ Backup inverter/ Power station for electrical outages</li> </ul>

## Car Service Booking System of AUTOCARE

All 3 branches of AutoCare will be equipped with the new software and hardware devices together with internet access for the proposed system. The new printers will be placed near admin staffs and manager to conveniently print out financial documents and invoices related with repairs and customer information. Managing bookings will be done easily on browsers on PC rigs. Android phones will be shared to Home service/ Pick up service teams who don't have one, to perform booked services and show stages of service process for customers.

### 3.3 Cost Benefit Analysis

It is also essential to take consideration on how and how much the new proposed system will make profits for the business compared to the overall costs invested in hardware, software and miscellaneous to develop it (i.e. Economic feasibility).

Benefits can be both tangible and intangible. As for this analysis, costs will be categorized into 'Development Cost', which is a one-time cost and 'Operational Cost', which need to be paid on yearly basis. As for benefits, both tangible benefits and intangible benefits will be taken into consideration. –

COST			
Development Cost			
<u>Item</u>	<u>Quantity</u>	<u>Costs in dollar</u>	<u>Total in dollar</u>
Core i3 CPU, 4GB ram, 650W PSU, 500GB HDD office PC Rigs (with PC, Mouse, Keyboard)	6	\$ 420	\$ 2,520
Internet Service Provider installation	3	\$ 30	\$ 90
Canon MF743Cdw All-in-One Printer	3	\$ 600	\$ 1,800
Android Mobile phones for Home service/ Pick up service teams (optional*)	15	\$ 200	\$ 3,000
Backup power station for router	3	\$ 200	\$ 600
System Development Fees	1	\$ 1500	\$ 1,500
Booking System Training Fees	3	\$ 300	\$ 900
Windows 10 Pro	6	\$ 200	\$ 1200
<b>Total Development Cost</b>			\$ 8,610 to \$ 11,610

<b>Operational Costs (for 1 year)</b>		
<u>Item</u>	<u>Costs per month in dollar</u>	<u>Total in dollar</u>
Internet Service Provider Subscription	\$ 150	\$ 1,800
Web hosting Subscription + Domain	\$ 100	\$ 1,200
<b>Total Operational Cost (for 1 year)</b>		\$ 3,000

<b>Benefits</b>	
<b>Tangible Benefits (for 1 year)</b>	
Decrease expenses (reduced administrative and transactional fees)	\$ 3,500
Increase in sales and profits, Reduced garage space unavailability due to booking management system for both Garage services and Home/ Pickup services) (estimated.)	\$ 25,630
<b>Intangible Benefits</b>	
Streamlined and convenient services	
Un-overwhelming/ Fairly scheduled work tasks	
Improved Productivity	
Easier to offer after-sales services/ keeping in touch with customers	
Improved customer retention/ loyalty	
Work Efficiency in accepting bookings, managing bookings and scheduling for workers	
Transparency of processes and services between business and customers	
Well-managed Garage Space in branches	
<b>Total Benefits</b>	\$ 29,130

One additional thing to consider for AutoCare is that to offer streamlined services with no waiting time, they may require to increase in workforce if required. Therefore, payroll expense can increase.

On the other hands, increased workforce will be able to handle more quantity of bookings so that profits margin will increase if AutoCare receives high visitors/ booking amounts per day. Idle workers are also allowed to join Home services/ Pick up services teams. Since the payroll is not entirely related with system development/ operational costs, calculations will not be shown.

<b><u>Net Benefits</u></b>
----------------------------

= Benefits (for 1 year) – Development cost (for 1 year)  
= \$ 29,130 - \$ 11,610  
= \$ 17,520

<b><u>Return of Investment %</u></b>
--------------------------------------

= [Net Benefits / Development cost (for 1 year)] x 100  
= (\$ 17,520 / \$ 11,610) x 100  
= 151%

<b><u>Payback Period</u></b>
------------------------------

= Development Cost (for 1 year) / Net Benefits  
= \$ 11,610 / \$ 17,520  
= 0.66 (approximately over 7 months)

### 3.4 No-Go, Go Decision

After performing Social analysis, Technical analysis and Cost Benefit Analysis, it can be assumed that a decision can be made on whether the new proposed should be continued to implementation or not. According to the good results (referred from feasibility analysis) on following criteria, a 'GO' decision is made to implement the new proposed system.

<b>No-Go, Go Decision Checklist</b>			
<b>Criteria</b>	<b>Description</b>	<b>Yes</b>	<b>No</b>
<b>Acceptance by users</b>	According to Social Analysis, the new proposed system will have mostly positive impacts on the employees. Although lack of computer knowledge and requirement of training can be stressful for some employees, with the training plans on how to use the new system, employees will be most likely to accept the new system change. The customers are also most likely to accept the change, as the proposed system can bring convenience in making appointments, eliminate waiting time mostly and transparency in viewing services, stages of on-services and possible fees.	✓	
<b>Compatibility for business expansion</b>	AutoCare originally has a vision/ goal to expand their business in more branches and more services in the future. The new proposed system can easily support newly added branches or new services without the need of another new system or changes for booking and schedule management. It will also be able to support increase in number of workers.	✓	
<b>Impact in Operation efficiency, Productivity and Quality Controlling</b>	Newly proposed system will make majority of job roles to be more efficient and convenient to perform with consistent productivity, especially in booking management, customer management and task scheduling (with a few clicks on digital devices, rather than rushing for writing down details from	✓	

## Car Service Booking System of AUTOCARE

	<p>calls and working manually on paper). Rating and feedback comment section of individual booking will also help the managers and supervisors to control quality, worker performance consistently and to be better.</p>		
<b>More Benefits compared to Costs</b>	<p>Although AutoCare may have to hire more employees for Home services, Pick up services team and increase payroll costs if demands for these services increase, booking system website will help along with the expansion of business and help acquiring more potential customers to actually apply for services due to its existence on the internet with all required information.</p> <p>As stated in Cost benefit analysis, for a year, tangible benefits to be gained from developing the new system is noticeably surpassing the costs (By \$ 17,520). More importantly, intangible benefits from the proposed system can help solve the current business problems significantly.</p>	<input checked="" type="checkbox"/>	
<b>Return of Investment &gt; 70% per year</b>	<p>It is essential to invest wisely to be a profitable investment, for the betterment of organization. Calculation from cost benefit analysis indicates that the profit return by implementing the booking system website will double up the amount invested (150% ROI).</p>	<input checked="" type="checkbox"/>	
<b>Payback Period &lt; 2 years</b>	<p>Calculation from cost benefit analysis estimates that it will take the business over 7 months to fully recover their financial investment for the system. (0.66).</p>	<input checked="" type="checkbox"/>	

# **Chapter 4:**

# **Analysis**

## 4 Chapter 4: Analysis

### 4.1 Fact Finding

Fact-finding is a process done to discover and collect information about an organization, government, etc. based on information gathering methods such as surveys, questionnaires, interviews, focus groups, observations and so on. Fact-finding techniques are utilized to design and build not only new systems but also to upgrade existing systems. (BCIS Notes, 2020) AutoCare is a quick Vehicle Cleaning and Maintenance service company, operating on a manual system for handling bookings and encountering issues. Here, Fact-finding to gather necessary information about AutoCare's current manual operations will be done, in order to design and implement newly proposed system properly.

The following is the fact-finding plan, together with dates and combinations of information gathering techniques that will be used according to availability of responsible persons from AutoCare.

- On 1<sup>st</sup> October, 2022, according to availability and time limitation of Manager from AutoCare, an interview appointment was made and questionnaires related with the background history, aims, current services and operations, employees and their roles etc. were interviewed. The following questions will be asked in the meeting:
  - May I know about the background, history of AutoCare company?
  - Aims or Goals for the AutoCare company in the future?
  - What kind of services are offered in AutoCare?
  - How many employees are in AutoCare company? Their roles and how they are positioned for operations?
- On 3<sup>rd</sup> October, 2022, interview appointment with AutoCare Manager was made and questionnaires about the current issues they are experiencing, their future plans and discussion together on solving current problems. The following questions will be asked in the meeting:
  - Is there any issues that AutoCare company experiencing? What are they?
  - Previous attempts, Ideas that stakeholders had to resolve the issues
  - More detailed questions according to answer on issues
  - More detailed questions according to their desired system and functions to resolve issues

- On 5<sup>th</sup> October, 2022, observation will be done at a garage branch of AutoCare, in order to observe and learn about their daily flow of processes and operational activities. The following actions will be asked in the observation:
  - Follow and observe activities starting from customer driving into AutoCare garage to servicing, making payments and After sales services.

## 4.2 Proposed System Description

### 4.2.1 Context Diagram

For AutoCare's Database-driven online booking system, AutoCare employees, especially the admin staffs and Customers of AutoCare are the external entities, who will be mainly interacting with the proposed system. The following figure shows how the external entities will be interacting with the System and the flow-ins and outs of data.

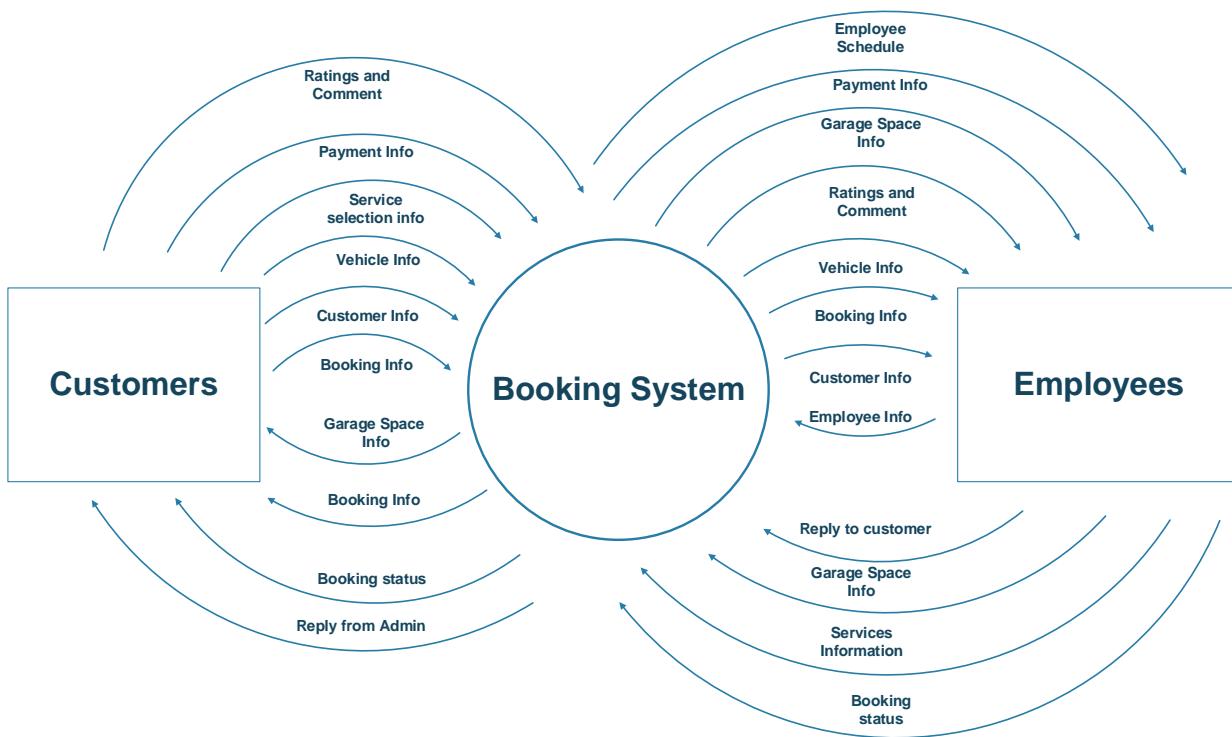


Figure 20 Context Diagram of AutoCare Car service booking system

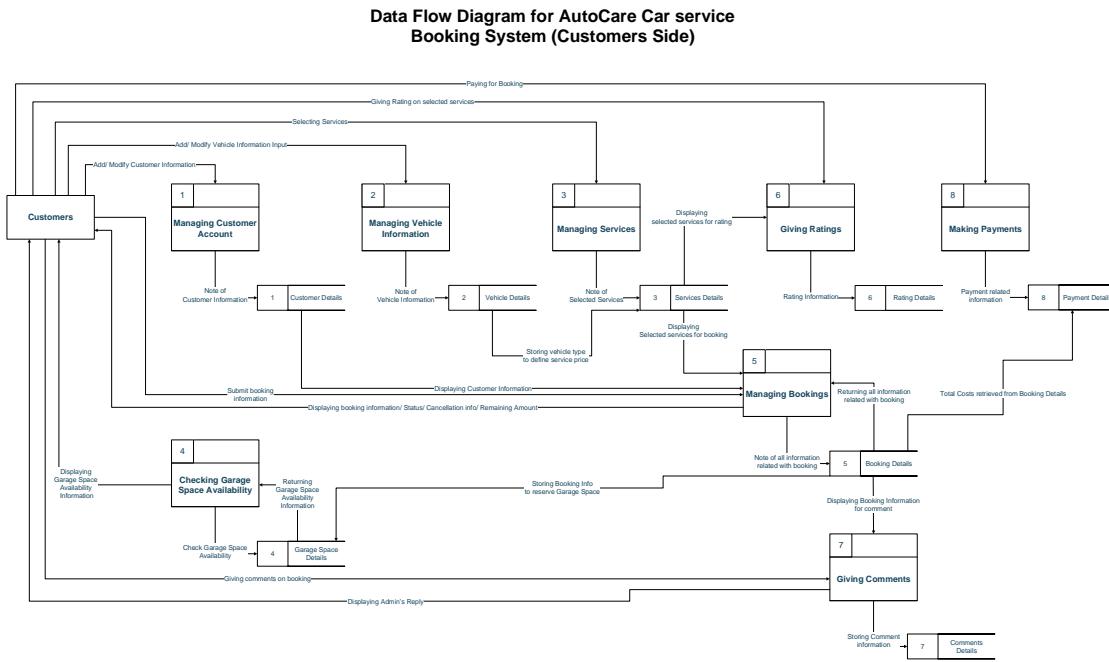
Customers will be interacting with the system in Signing up/ logging in their accounts, adding information about their vehicles, viewing and selecting types of services and services according to their type of vehicle, viewing garage space information, submitting booking info, viewing progress status of their booking, making payments for bookings and giving rate and comments of services and bookings.

On the other hands, employees, especially admins and Home service workers will be viewing bookings info, vehicle info, payment info, rating and comment info of customers and making modifications in services, bookings, garage space availability info and replying to customer's comments.

## Car Service Booking System of AUTOCARE

### 4.3 DFD

The following Data Flow Diagram will be showing how information flows between the customer, the system and the employees, in performing their main activities, in more detailed manner.



*Figure 21 Data Flow Diagram (Customer Side)*

The data flow-ins and out and processes and storage will happen when customers are managing their account, vehicle information, creating bookings, giving ratings and comments, making payments and checking garage space availability.

## Car Service Booking System of AUTOCARE

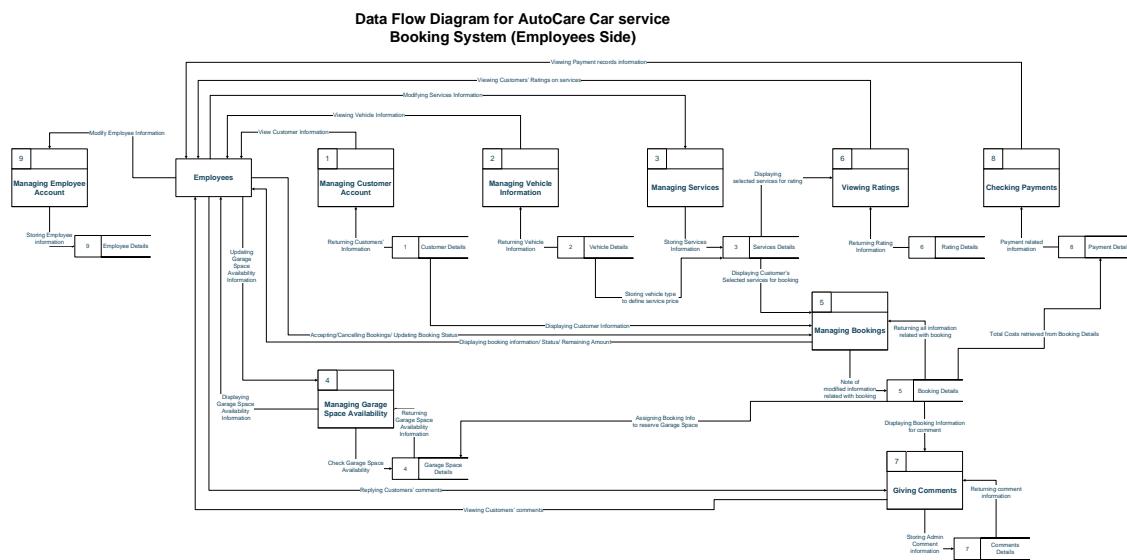


Figure 22 Data Flow Diagram (Employee Side)

The data flow-ins and out and processes and storage will happen when employees especially admins are managing employees' account, service assignments, viewing vehicle information, managing Services, managing bookings, viewing ratings and replying customers' comments, checking payments information and managing garage space availability.

## 4.4 ERD

An ERD is drawn to know operations and relationships of entities (such as people, things) within an organization. By drawing ERD in advance, it can help in designing logical database structure. (SmartDraw, n.d.)

## 4.5 Step 1 ERD

In Step 1 of ERD, major entities will be laid out as following for our proposed system.

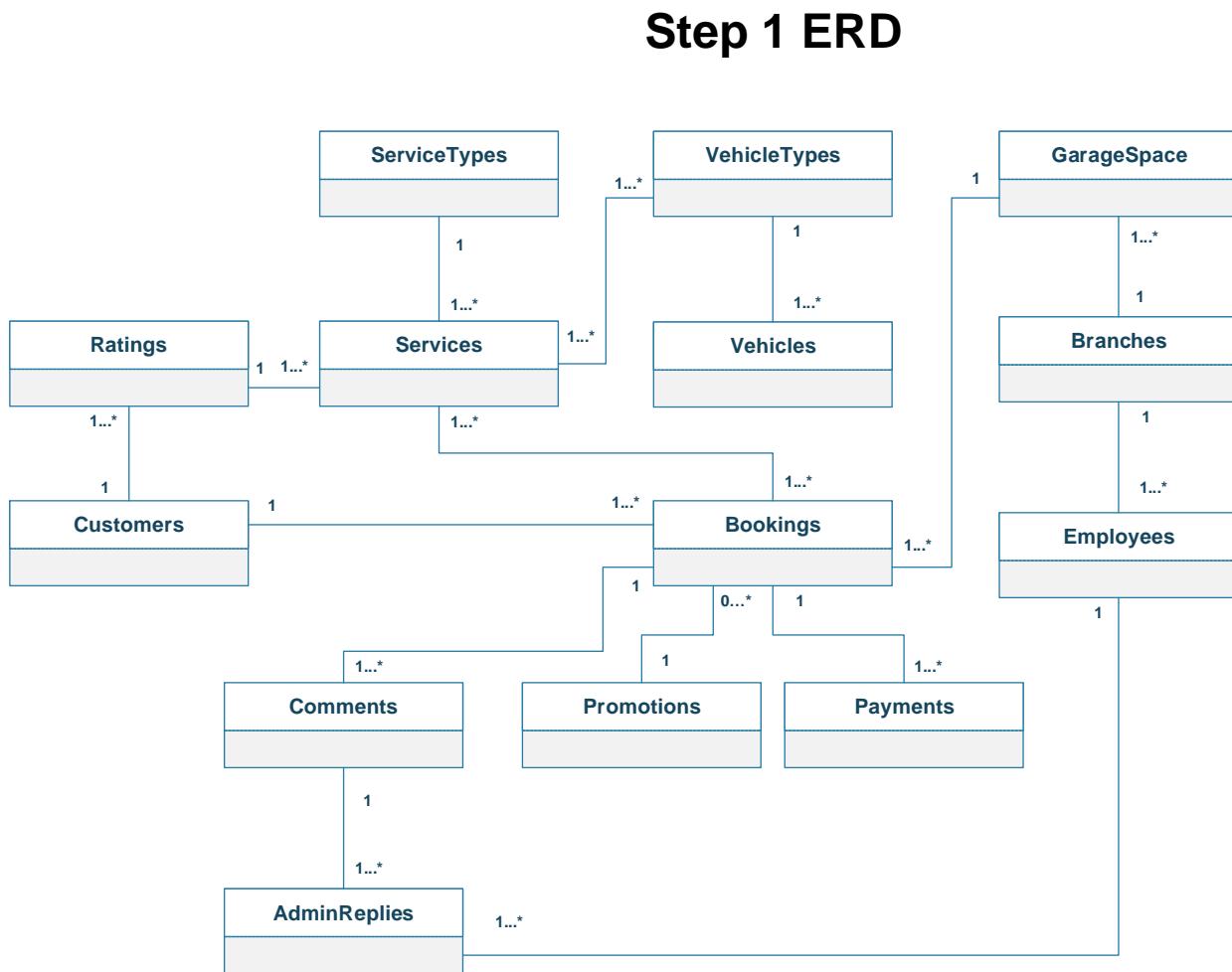


Figure 23 Step 1 ERD of AutoCare Booking System

## 4.6 Step 2 ERD

In Step 2, transactional entities will be thought and added to our step 1 ERD and relationships between entities are thought and attached and necessary dummy tables will be added according to the processes of AutoCare as following:

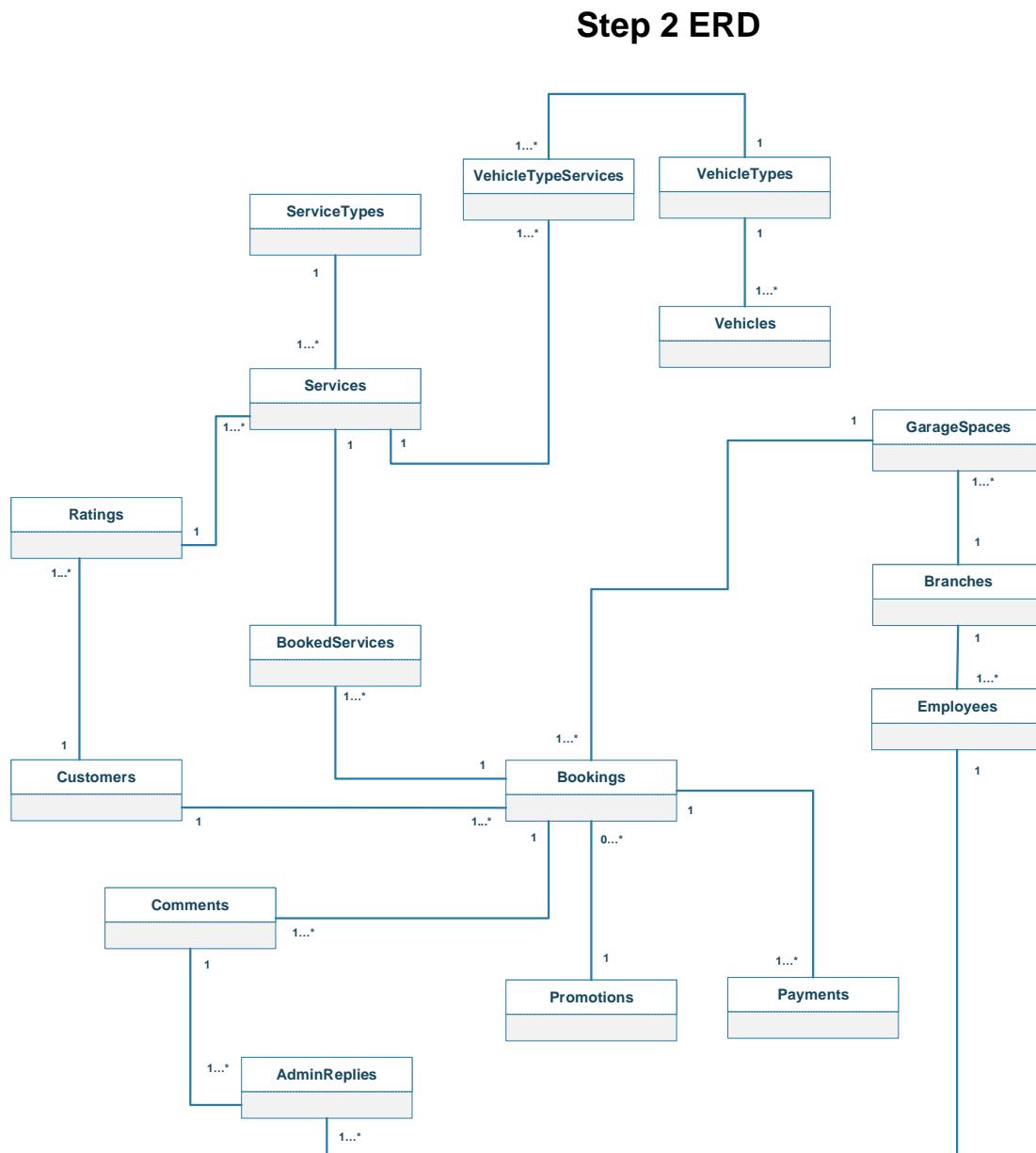


Figure 24 Step 2 ERD of AutoCare Booking System

## 4.7 Step 3 ERD

In Step 3 ERD, all related entities will be fully shown, relationships are fully established and attributes of each entities will be thought and added according to AutoCare's business operation processes and documents as following:

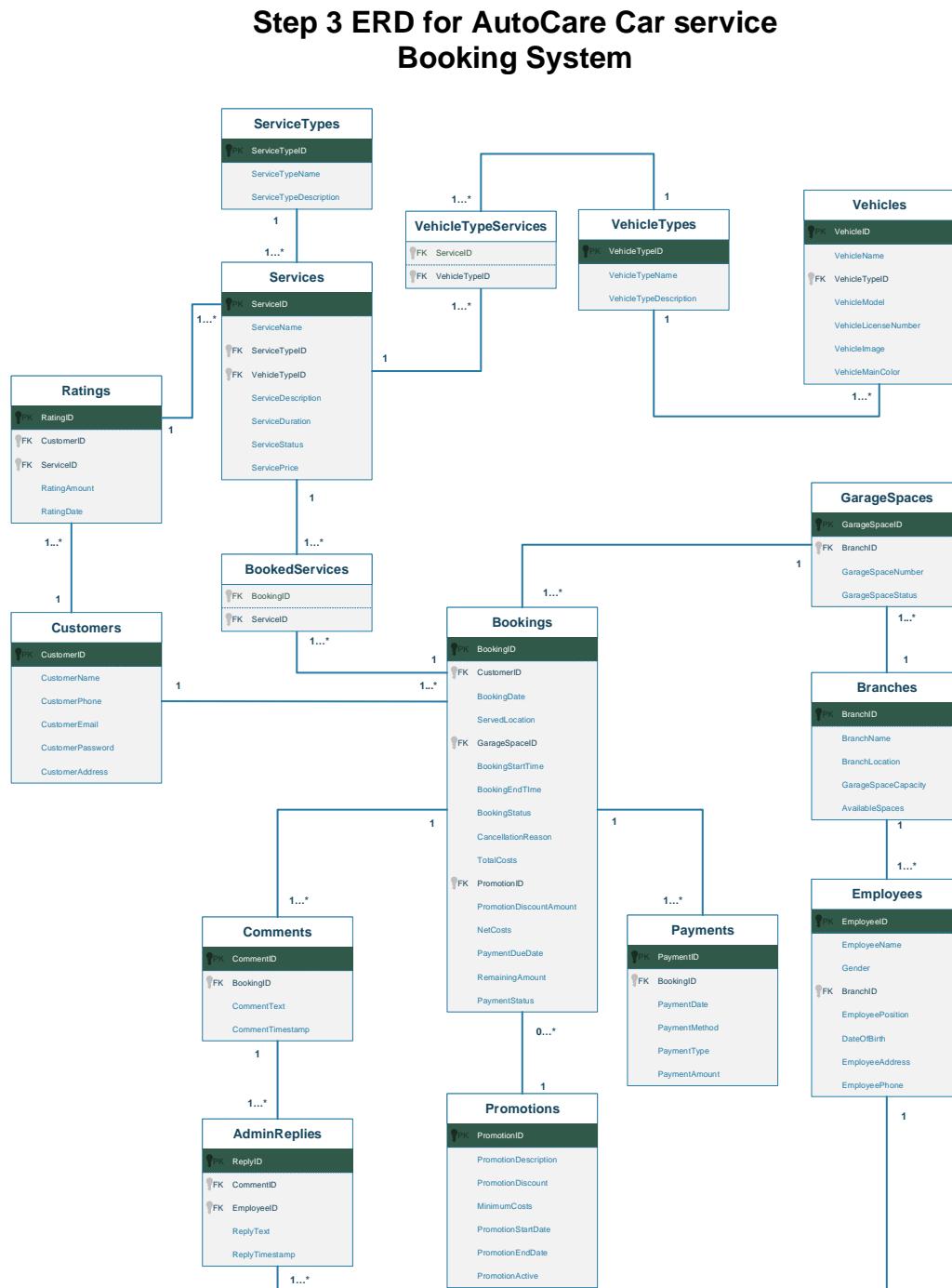


Figure 25 Step 3 ERD of AutoCare Booking System

## 4.8 Functional Requirements

As proposed online booking system being Database base driven, CRUD functions working with Database in both back-end and front-end activities will be defined in CRUD matrix table below.

CRUD matrix for AutoCare Online Booking System Functions																
Functions	Entities															
	Customers	VehicleTypes	Vehicles	VehicleTypeServices	ServiceTypes	Services	BookedServices	Bookings	Promotions	Payments	Employees	Branches	GarageSpaces	Ratings	Comments	AdminReplies
<b>1 Customers</b>																
Create Customer Account	C															
View Customer Information without passwords	R															
Update specific Customer Information	U															
Generate report on most frequently visited customers within 2 months	R							R								
Generate report on top spending customer of month	R							R								
<b>2 VehicleTypes</b>																
Add new Vehicle Type		C														

## Car Service Booking System of AUTOCARE

View Vehicle Type Information		R													
Generate report on Most booked vehicle type according to booked services		R					R	R							
<b>3 Vehicles</b>															
Add new Vehicle			C												
View Vehicle Information + Vehicle Type Name		R	R												
Update Vehicle Information			U												
<b>4 ServiceTypes</b>															
Create New Service Type					C										
View Service Type information					R										
<b>5 Services</b>															
Create New Service					C										
View Service information according to Vehicle Type and Service Type		R			R	R									
Update Service information					U										

## Car Service Booking System of AUTOCARE

Top 3 Most Booked Services of the month															
<b>6 Bookings</b>															
Create New Booking								C							
View specific customer's Booking history	R				R	R		R	R						
	Customers	VehicleTypes	Vehicles	VehicleServices	ServiceTypes	Services	BookedServices	U	Bookings	Promotions	Payments	Employees	Branches	GarageSpaces	Ratings
Update Booking Information for Cancel								U							
Update Booking For Fully paid customer								U							
Update Booking Status					R	R	U	R							
Generate report on Bookings lists for specific date, start time, end time, at specific Branch							R				R	R			
Generate report on most booked months							R								
<b>7 Promotions</b>															
Create new Promotion								C							

## Car Service Booking System of AUTOCARE

View Promotion information									R						
<b>8 Payments</b>															
Make/ Record new Payment									C						
	Customers	VehicleTypes	Vehicles	VehicleServices	ServiceTypes	Services	BookedServices	Bookings	Promotions	Payments	Employees	Branches	GarageSpaces	Ratings	Comments
Generate report on Customers who have remaining 2 <sup>nd</sup> payment	R						R		R						AdminReplies
Make/ Record second payment							R		C R						
Generate report on Total revenue of month from bookings							R								
<b>9 Employees</b>															
Create New Employee Account										C					
View Employee Information in specific branch										R					
Updating Employee Information										U					

# Car Service Booking System of AUTOCARE

	Customers	VehicleTypes	Vehicles	VehicleServices	ServiceTypes	Services	BookedServices	Bookings	Promotions	Payments	Employees	Branches	GarageSpaces	Ratings	Comments	AdminReplies
<b>10 Branches</b>																
Create Branch												C				
Updating Total Available Spaces												R U				
<b>11 GarageSpaces</b>																
Create Garage Space												C				
View Garage Space according to Branch												R R				
Update Garage Space												U				
<b>12 Ratings</b>																
Customer Rate on services						R						C				
Generate report on Overall ratings of services						R						R				
<b>13 Comments</b>																
Customer comment on booking												C				
<b>14 AdminReplies</b>																
Admins' Reply to Comments												C				

## Car Service Booking System of AUTOCARE

View all related customer comment & admin replies for a specific booking										R				R	R
--	--	--	--	--	--	--	--	--	--	---	--	--	--	---	---

# **Chapter 5:**

# **Design**

## 5 Chapter 5: Design

### 5.1 Introduction to Design

As this proposed Car Service Booking System of AutoCare is driven by Database, it is necessary to design the database and User Interface for both Front-End activities (where the system will be interacted with customers) and Back-End activities (where the system itself and AutoCare employees will interact with the system). The database will be designed in stages of Conceptual, Logical to Physical, for Back-end. For Front-end, the User interface where all users will interact with the system will be mainly focused to design.

## **5.2 Structural Design**

Database design structure is essential for the back-end part of the proposed system, designed to make sure the proposed system database is efficient for its operations.

### 5.2.1 Physical ERD showing entities, attributes, relationships

#### Step 3 ERD for AutoCare Car service Booking System

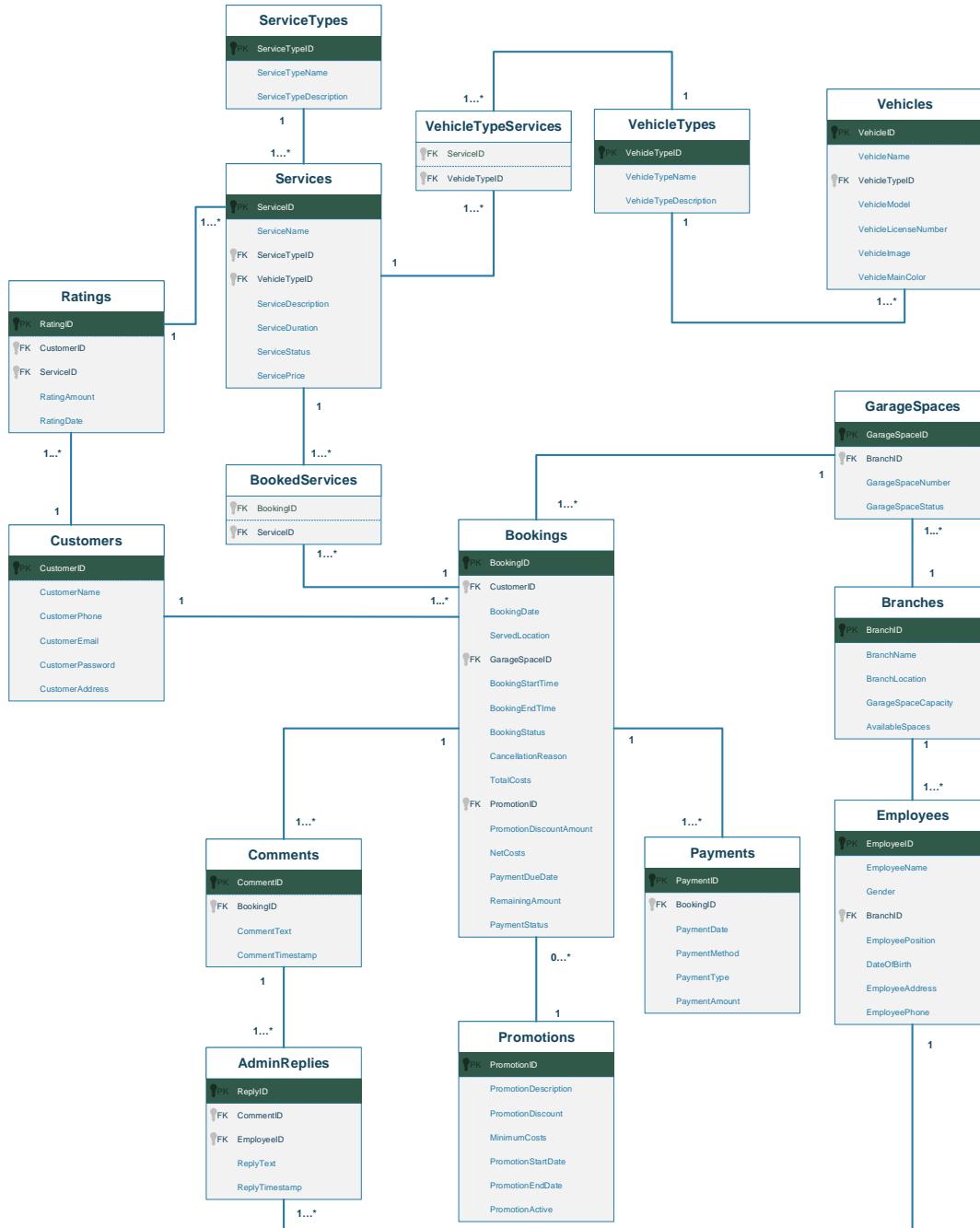


Figure 26 Physical ERD of AutoCare Car Service Booking system

## 5.2.2 Normalization up to 3NF

### 5.2.2.1 Pre-Normalization

The following are two necessary steps to be carried out before performing normalization. These are –

- **Identifying Repeating Groups**

The following are the possible repeating groups exists in the tables of our proposed system database.

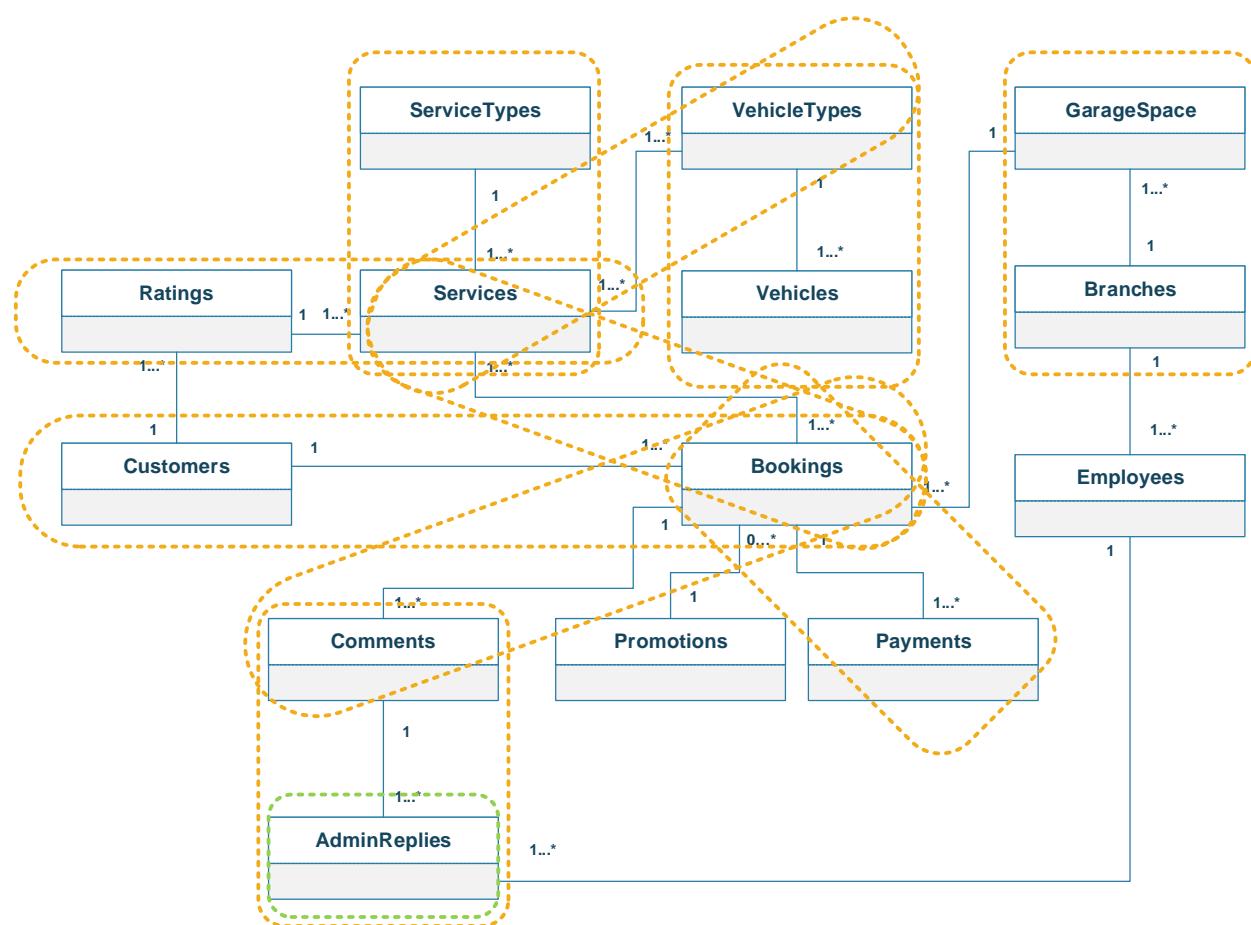


Figure 27 ERD with indication of possible repeating groups

- **Selecting Entity that best represent the system**

Bookings entity and Service entity (especially, Service entity) can best represent the overall system.

### 5.2.2.2 Normalization Process

Normalization for our proposed Car Service online booking system will be split into mainly 3 parts.

- Process of customer selecting multiple services, submitting booking and paying for a booking/ mainly referred to booking service invoices
- Process of customer giving rating
- Process of customer giving comments on a booking and admins replying on comments

#### Normalization on Process of customer making, submitting and paying for a booking

UNF	Lvl	1NF	2NF	3NF
(Customer Name)	1	<b>(Booking No) (PK)</b>	<b>(Booking No) (PK)</b>	<b>(Customer ID) (PK)</b>
(Customer Phone)	1	(Customer Name)	(Customer Name)	(Customer Name)
(Customer Email)	1	(Customer Phone)	(Customer Phone)	(Customer Phone)
(Customer Address)	1	(Customer Email)	(Customer Email)	(Customer Email)
(Customer Address)	1	(Customer Address)	(Customer Address)	(Customer Address)
(Vehicle Name)	1	(Vehicle Name)	(Customer Address)	
(Vheicle Type)	1	(Vehicle Type)	(Vehicle Name)	<b>(Vehicle Type ID) (PK)</b>
(Vehicle Type Desc)	1	(Vehicle Type Desc)	(Vehicle Type)	(Vehicle Type)
(Vehicle Model)	1	(Vehicle Model)	(Vehicle Type Desc)	(Vehicle Type Desc)
(License No)	1	(License No)	(Vehicle Model)	
(Vehicle Image)	1	(Vehicle Image)	(License No)	
(Primary Color)	1	(Primary Color)	(Vehicle Image)	<b>(Vehicle ID) (PK)</b>
(Service Type Name)	1	(Service Type Name)	(Primary Color)	<b>(Vehicle Type ID) (FK)</b>
(Service Type Desc)	1	(Service Type Desc)	(Service Type Name)	(Vehicle Name)
(Service No)	2	(Booking Date)	(Service Type Name)	(Vehicle Model)
(Service Name)	2	(Served Location)	(Service Type Desc)	(License No)
(Service Desc)	2	(Booking Start Time)	(Booking Date)	(Vehicle Image)
(Service Duration)	2	(Booking End Time)	(Served Location)	(Primary Color)
(Service Status)	2	(Total Costs)	(Booking Start Time)	
(Service Price)	2	(Promotion Code)	(Booking End Time)	<b>(Booking No) (PK)</b>
<b>(Booking No) (PK)</b>	1	(Promotion Discount Amount)	(Total Costs)	<b>(Customer ID) (FK)</b>
(Booking Date)	1	(Net Costs)	(Promotion Code)	<b>(Promotion ID) (FK)</b>
(Served Location)	1	(Remaining Amount)	(Promotion)	<b>(Garage Space ID) (FK)</b>
(Booking Start Time)	1	(Payment Method)	(Discount Amount)	(Booking Date)
(Booking End Time)	1	(Payment Date)	(Net Costs)	(Served Location)
(Total Costs)	1	(Payment Amount)	(Remaining Amount)	(Booking Start Time)
(Promotion Code)	1	(Branch No)	(Promotion Code)	(Booking End Time)
(Promotion Discount Amount)	1	(Branch Location)	(Promotion Discount Amount)	(Total Costs)
		(Garage Space No)	(Payment Method)	(Promotion Code)
		<b>(Booking No) (FK)</b>	(Payment Date)	(Promotion Discount Amount)
		(Service No)		

Car Service Booking System of AUTOCARE

(Net Costs) (Remaining Amount) (Payment Method) (Payment Date) (Payment Amount) (Branch No) (Branch Location) (Garage Space No)	1 1 1 1 1 1 1 1	(Service Name) (Service Desc) (Service Duration) (Service Status) (Service Price)	(Payment Amount) (Branch No) (Branch Location) (Garage Space No)	(Net Costs) (Remaining Amount)  <b>(Promotion ID) (PK)</b> (Promotion Code)
			<b>(Booking No) (PK,FK)</b> <b>(Service No) (PK,FK)</b>	<b>(Payment ID) (PK)</b> <b>(Booking ID) (FK)</b> (Payment Method) (Payment Date) (Payment Amount)
			<b>(Service No) (PK)</b> (Service Name) (Service Desc) (Service Duration) (Service Status) (Service Price)	<b>(Branch ID) (PK)</b> (Branch No) (Branch Location)
				<b>(Garage Space ID) (PK)</b> <b>(Branch ID) (FK)</b> (Garage Space No)
				<b>(Booking No) (PK,FK)</b> <b>(Service No) (PK,FK)</b>
				<b>(Service No) (PK,FK)</b> <b>(Vehicle Type ID) (PK,FK)</b>
				<b>(Service No) (PK)</b> <b>(Service Type ID) (FK)</b> <b>(Vehicle Type ID) (FK)</b> (Service Name) (Service Desc) (Service Duration) (Service Status) (Service Price)
				<b>(Service Type ID) (PK)</b> (Service Type Name) (Service Type Desc)

### Entities retrieved from normalization

Customers,

VehicleTypes,

Vehicles,

Bookings,

Promotions,

Payments,

Branches,

GarageSpaces,

BookedServices,

VehicleTypeServices,

Services,

ServiceTypes

### Normalization on Process of customer giving rating

UNF	Lvl	1NF	2NF	3NF
(Customer ID) (PK)	1	(Customer ID) (PK)	(Customer ID) (PK)	(Customer ID) (PK)
(Customer Name)	1	(Customer Name)	(Customer Name)	(Customer Name)
(Customer Phone)	1	(Customer Phone)	(Customer Phone)	(Customer Phone)
(Customer Email)	1	(Customer Email)	(Customer Email)	(Customer Email)
(Customer Address)	1	(Customer Address)	(Customer Address)	(Customer Address)
(Service No)	2	(Customer ID) (FK)	(Rating ID) (PK)	(Rating ID) (PK)
(Service Name)	2	(Service No)	(Customer ID) (FK)	(Customer ID) (FK)
(Service Desc)	2	(Service Name)	(Service No)	(Service No) (FK)
(Service Duration)	2	(Service Desc)	(Service Name)	(Rating Amount)
(Service Status)	2	(Service Duration)	(Service Desc)	(Rating Date)
(Service Price)	2	(Service Status)	(Service Duration)	
(Rating ID)	2	(Service Price)	(Service Status)	
(Rating Amount)	2	(Rating Amount)	(Service Price)	
(Rating Date)	2	(Rating Date)	(Rating Amount)	
			(Rating Date)	

**Entities retrieved from normalization**

Customers, Ratings, Services

**Normalization on Process of giving comment on booking and admin replying on comment**

UNF	Lvl	1NF	2NF	3NF
(Booking ID) (PK)	1	(Booking ID) (PK)	(Booking ID) (PK)	(Booking ID) (PK)
(Comment Text)	2			
(Comment	2			
Timestamp)				
(Employee ID)	2	(Booking ID) (FK)	(Comment ID) (PK)	(Comment ID) (PK)
(Employee Name)	2	(Comment Text)	(Booking ID) (FK)	(Booking ID) (FK)
(Reply Text)	2	(Comment	(Comment Text)	(Comment Text)
(Reply Timestamp)	2	Timestamp)	(Comment	(Comment
		(Employee ID)	Timestamp)	Timestamp)
		(Employee Name)		
		(Reply Text)		
		(Reply Timestamp)		
			(Reply ID) (PK)	(Reply ID) (PK)
			(Comment ID) (FK)	(Comment ID) (FK)
			(Employee ID) (FK)	(Employee ID) (FK)
			(Reply Text)	(Reply Text)
			(Reply Timestamp)	(Reply Timestamp)
				(Employee ID) (PK)
				(Employee Name)

**Entities retrieved from normalization**

Bookings, Comments, AdminReplies, Employees

### 5.2.3 SQL Create Statements for each table/Entity in 3NF

#### 5.2.3.1 Customers

```
/*Creating Tables from Strongest ones*/
/*--- 1. Customers ---*/
CREATE TABLE Customers
(
    CustomerID VARCHAR(15) NOT NULL UNIQUE,
    CustomerName VARCHAR(100) NOT NULL,
    CustomerEmail VARCHAR(100),
    CustomerPassword VARCHAR(50) NOT NULL,
    CustomerPhone VARCHAR(20),
    CustomerAddress VARCHAR(150),
    PRIMARY KEY (CustomerID),
    CHECK (CustomerID LIKE ('Cus-%') AND
    CustomerEmail LIKE ('%gmail.com'))
);
100 % <
Messages
Commands completed successfully.

Completion time: 2023-01-28T00:15:23.0307266+06:30
```

Figure 28 Create Query for Customers

### 5.2.3.2 Branches

```
/*--- 2. Branches ---*/
CREATE TABLE Branches
(
    BranchID VARCHAR(15) NOT NULL UNIQUE,
    BranchName VARCHAR(50),
    BranchLocation VARCHAR(150),
    GarageSpaceCapacity TINYINT,
    AvailableSpaces TINYINT,
    PRIMARY KEY (BranchID),
    CHECK (BranchID LIKE ('Br-%'))
);
00 % < Messages
Commands completed successfully.

Completion time: 2023-01-28T00:18:10.6825557+06:30
```

Figure 29 Create Query for Branches

### 5.2.3.3 Promotions

```
/*--- 3. Promotions ---*/
CREATE TABLE Promotions
(
    PromotionID VARCHAR(15) NOT NULL UNIQUE,
    PromotionCode VARCHAR(15) NOT NULL,
    MinimumCosts DECIMAL(10,2),
    PromotionDiscount DECIMAL(5,2),
    PromotionStartDate DATE,
    PromotionEndDate DATE,
    PromotionDescription VARCHAR(200),
    PromotionActive VARCHAR(10),
    PRIMARY KEY (PromotionID),
    CHECK (PromotionID LIKE ('Promo-%') AND
    PromotionActive IN ('Active','Expired'))
);
00 % < Messages
Commands completed successfully.

Completion time: 2023-01-28T00:20:28.4019715+06:30
```

Figure 30 Create Query for Promotions

#### 5.2.3.4 ServiceTypes

```
/*--- 4. ServiceTypes ---*/
CREATE TABLE ServiceTypes
(
    ServiceTypeID VARCHAR(15) NOT NULL UNIQUE,
    ServiceTypeName VARCHAR(30),
    ServiceTypeDescription VARCHAR(200),
    PRIMARY KEY (ServiceTypeID),
    CHECK (ServiceTypeID LIKE ('St-%'))
);

00 % < Messages
Commands completed successfully.

Completion time: 2023-01-28T00:21:49.0438831+06:30
```

Figure 31 Create Query for ServiceTypes

#### 5.2.3.5 VehicleTypes

The screenshot shows a database interface with a code editor and a message log. The code editor contains the following SQL script:

```
/*--- 5. VehicleTypes ---*/
CREATE TABLE VehicleTypes
(
    VehicleTypeID VARCHAR(15) NOT NULL UNIQUE,
    VehicleTypeName VARCHAR(50),
    VehicleTypeDescription VARCHAR(200),
    PRIMARY KEY (VehicleTypeID),
    CHECK (VehicleTypeID LIKE ('Vt-%'))
);
```

The message log below the code editor shows the following output:

- Commands completed successfully.
- Completion time: 2023-01-28T00:23:10.7167786+06:30

Figure 32 Create Query for VehicleTypes

#### 5.2.3.6 Employees

The screenshot shows a MySQL Workbench interface with a code editor and a messages panel. The code editor contains the SQL query for creating the 'Employees' table. The messages panel shows the command was completed successfully.

```
/*--- 6. Employees ---*/
CREATE TABLE Employees
(
    EmployeeID VARCHAR(15) NOT NULL UNIQUE,
    EmployeeName VARCHAR(100),
    Gender VARCHAR(20),
    BranchID VARCHAR(15) NOT NULL,
    EmployeePosition VARCHAR(30),
    DateOfBirth DATE,
    EmployeeAddress VARCHAR(150),
    EmployeePhone VARCHAR(20),
    PRIMARY KEY (EmployeeID),
    FOREIGN KEY (BranchID) REFERENCES Branches (BranchID) ON UPDATE CASCADE,
    CHECK (EmployeeID LIKE ('Emp-%') AND
    BranchID LIKE ('Br-%') AND
    Gender IN ('Male' , 'Female' , 'LGBTIQ'))
);
```

100 %

Messages

Commands completed successfully.

Completion time: 2023-01-28T00:24:52.0991852+06:30

Figure 33 Create Query for Employees

#### 5.2.3.7 Vehicles

The screenshot shows a database interface with a SQL query window and a messages window.

```
/*--- 7. Vehicles ---*/
CREATE TABLE Vehicles
(
    VehicleID VARCHAR(15) NOT NULL UNIQUE,
    VehicleName VARCHAR(100),
    VehicleTypeID VARCHAR(15),
    VehicleModel VARCHAR(30),
    VehicleLicenseNumber VARCHAR(8),
    VehicleImage VARBINARY(MAX),
    VehicleMainColor VARCHAR(20),
    PRIMARY KEY (VehicleID),
    FOREIGN KEY (VehicleTypeID) REFERENCES VehicleTypes (VehicleTypeID) ON UPDATE CASCADE,
    CHECK (VehicleID LIKE ('V-%') AND
    VehicleTypeID LIKE ('Vt-%'))
);
```

Messages window:

Commands completed successfully.

Completion time: 2023-01-28T00:25:55.5403476+06:30

Figure 34 Create Query for Vehicles

#### 5.2.3.8 Services

The screenshot shows a database interface with a SQL query window and a message window.

```
/*--- 8. Services ---*/
CREATE TABLE Services
(
    ServiceID VARCHAR(15) NOT NULL UNIQUE,
    ServiceName VARCHAR(50),
    ServiceTypeID VARCHAR(15) NOT NULL,
    VehicleTypeID VARCHAR(15),
    ServiceDescription VARCHAR(200),
    ServiceDuration TIME,
    ServiceStatus VARCHAR(20),
    ServicePrice DECIMAL(10,2),
    PRIMARY KEY (ServiceID),
    FOREIGN KEY (ServiceTypeID) REFERENCES ServiceTypes (ServiceTypeID) ON UPDATE CASCADE,
    FOREIGN KEY (VehicleTypeID) REFERENCES VehicleTypes (VehicleTypeID) ON UPDATE CASCADE,
    CHECK (ServiceID LIKE ('S-%')) AND
    ServiceTypeID LIKE ('St-%') AND
    VehicleTypeID LIKE ('Vt-%') AND
    ServiceStatus IN ('Active', 'Temporarily paused', 'Terminated'))
);
```

Messages

Commands completed successfully.

Completion time: 2023-01-28T00:27:03.3140391+06:30

Figure 35 Create Query for Services

### 5.2.3.9 VehicleTypeServices

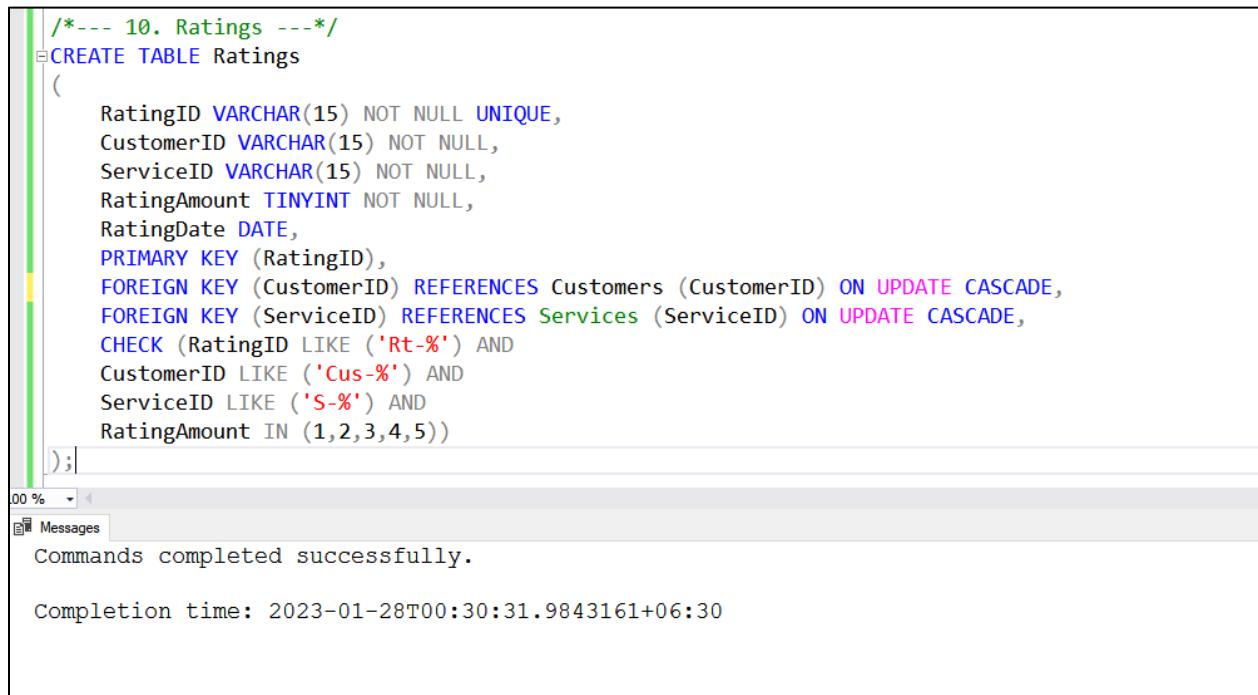
```
/*--- 9. VehicleTypeServices ---*/
CREATE TABLE VehicleTypeServices
(
    ServiceID VARCHAR(15),
    VehicleTypeID VARCHAR(15),
    Primary Key (ServiceID, VehicleTypeID),
    FOREIGN KEY (ServiceID) REFERENCES Services (ServiceID) ON UPDATE CASCADE,
    FOREIGN KEY (VehicleTypeID) REFERENCES VehicleTypes (VehicleTypeID),
    CHECK (ServiceID LIKE ('S-%')) AND
    VehicleTypeID LIKE ('Vt-%'))
);

100 % < Messages
Commands completed successfully.

Completion time: 2023-01-28T00:28:07.7654119+06:30
```

Figure 36 Create Query for VehicleTypeServices

#### 5.2.3.10 Ratings



The screenshot shows a MySQL Workbench interface with a SQL editor window. The SQL code creates a table named 'Ratings' with columns: RatingID (VARCHAR(15) NOT NULL UNIQUE), CustomerID (VARCHAR(15) NOT NULL), ServiceID (VARCHAR(15) NOT NULL), RatingAmount (TINYINT NOT NULL), and RatingDate (DATE). It includes a PRIMARY KEY on RatingID, FOREIGN KEY constraints linking to 'Customers' and 'Services' tables, and a CHECK constraint ensuring RatingID starts with 'Rt-', CustomerID with 'Cus-', ServiceID with 'S-', and RatingAmount is between 1 and 5. The message pane below shows the command was completed successfully.

```
/*--- 10. Ratings ---*/
CREATE TABLE Ratings
(
    RatingID VARCHAR(15) NOT NULL UNIQUE,
    CustomerID VARCHAR(15) NOT NULL,
    ServiceID VARCHAR(15) NOT NULL,
    RatingAmount TINYINT NOT NULL,
    RatingDate DATE,
    PRIMARY KEY (RatingID),
    FOREIGN KEY (CustomerID) REFERENCES Customers (CustomerID) ON UPDATE CASCADE,
    FOREIGN KEY (ServiceID) REFERENCES Services (ServiceID) ON UPDATE CASCADE,
    CHECK (RatingID LIKE ('Rt-%') AND
    CustomerID LIKE ('Cus-%') AND
    ServiceID LIKE ('S-%') AND
    RatingAmount IN (1,2,3,4,5))
);
```

00 %

Messages

Commands completed successfully.

Completion time: 2023-01-28T00:30:31.9843161+06:30

Figure 37 Create Query for Ratings

### 5.2.3.11 GarageSpaces

The screenshot shows a SQL query being executed in a database management system. The query creates a table named 'GarageSpaces' with the following structure:

```
/*--- 11. GarageSpaces ---*/
CREATE TABLE GarageSpaces
(
    GarageSpaceID VARCHAR(15) NOT NULL UNIQUE,
    BranchID VARCHAR(15) NOT NULL,
    GarageSpaceNumber VARCHAR(10), /*change to varchar*/
    GarageSpaceStatus VARCHAR(15),
    PRIMARY KEY (GarageSpaceID),
    FOREIGN KEY (BranchID) REFERENCES Branches (BranchID) ON UPDATE CASCADE,
    CHECK (GarageSpaceID LIKE ('Gs-%') AND
    BranchID LIKE ('Br-%') AND
    GarageSpaceStatus IN ('Free', 'Taken', 'Disabled'))
);
```

After executing the query, the system displays a message indicating that the commands completed successfully. The completion time is also shown.

100 % ↺

Messages

Commands completed successfully.

Completion time: 2023-01-28T00:31:32.9864426+06:30

Figure 38 Create Query for GarageSpaces

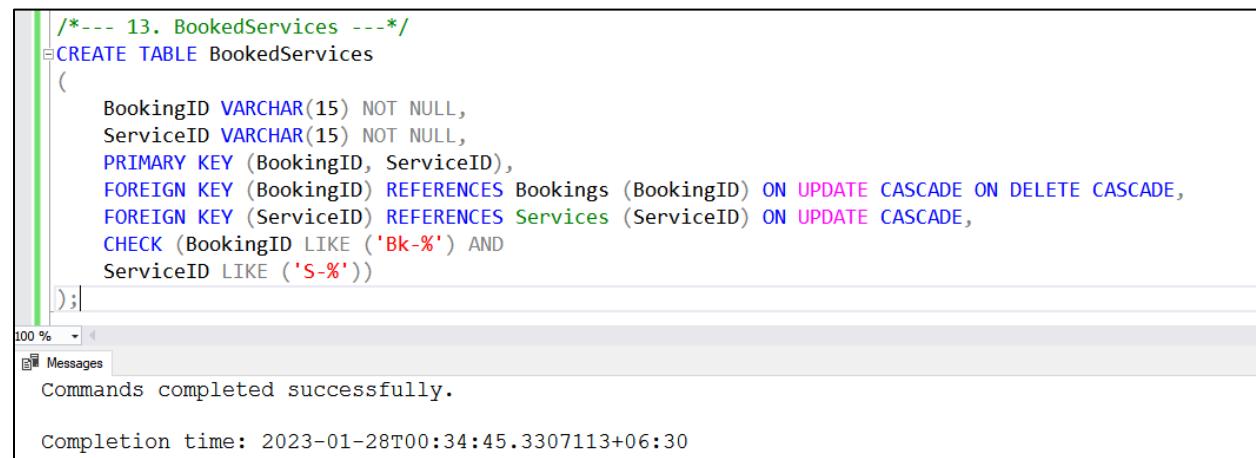
### 5.2.3.12 Bookings

The screenshot shows the MySQL Workbench interface with a code editor window. The code is a CREATE TABLE statement for a 'Bookings' table. The table includes columns for BookingID, CustomerID, BookingDate, ServedLocation, GarageSpaceID, BookingStartTime, BookingEndTime, BookingStatus, CancellationReason, TotalCosts, PromotionID, PromotionDiscountAmount, NetCosts, PaymentDueDate, RemainingAmount, and PaymentStatus. It features primary key constraints on BookingID and foreign key constraints linking to 'Customers', 'GarageSpaces', and 'Promotions' tables. A CHECK constraint ensures specific booking status values. The code is preceded by a multi-line comment /\*--- 12. Bookings ---\*/ and followed by a closing brace }). Below the code, a message window displays 'Commands completed successfully.' and a completion time of 2022-01-28 00:22:19.

```
/*--- 12. Bookings ---*/
CREATE TABLE Bookings
(
    BookingID VARCHAR(15) NOT NULL UNIQUE,
    CustomerID VARCHAR(15) NOT NULL,
    BookingDate DATE,
    ServedLocation VARCHAR(15),
    GarageSpaceID VARCHAR(15),
    BookingStartTime TIME, /*Domain*/
    BookingEndTime TIME,
    BookingStatus VARCHAR(20),
    CancellationReason VARCHAR(150),
    TotalCosts DECIMAL(10,2),
    PromotionID VARCHAR(15),
    PromotionDiscountAmount DECIMAL(10,2),
    NetCosts DECIMAL(10,2),
    PaymentDueDate DATE,
    RemainingAmount DECIMAL(10,2),
    PaymentStatus VARCHAR(20),
    PRIMARY KEY (BookingID),
    FOREIGN KEY (CustomerID) REFERENCES Customers (CustomerID) ON UPDATE CASCADE,
    FOREIGN KEY (GarageSpaceID) REFERENCES GarageSpaces (GarageSpaceID) ON UPDATE CASCADE,
    FOREIGN KEY (PromotionID) REFERENCES Promotions (PromotionID) ON UPDATE CASCADE,
    CHECK (BookingID LIKE ('Bk-%') AND
    CustomerID LIKE ('Cus-%') AND
    GarageSpaceID LIKE ('Gs-%') AND
    PromotionID LIKE ('Promo-%') AND
    ServedLocation IN ('Home', 'Garage') AND
    BookingStatus IN ('Pending', 'Accepted', 'Cancelled', 'On The Way', 'Work In Progress', 'Final Checked', 'All Finished') AND
    PaymentStatus IN ('Fully Paid', 'Partially Paid', 'No Payment Made', 'Refunded'))
);
100 % < Messages
Commands completed successfully.
Completion time: 2022-01-28 00:22:19 711ms
```

Figure 39 Create Query for Bookings

#### 5.2.3.13 BookedServices



The screenshot shows a database interface with a SQL query window and a message pane. The SQL query is:

```
/*--- 13. BookedServices ---*/
CREATE TABLE BookedServices
(
    BookingID VARCHAR(15) NOT NULL,
    ServiceID VARCHAR(15) NOT NULL,
    PRIMARY KEY (BookingID, ServiceID),
    FOREIGN KEY (BookingID) REFERENCES Bookings (BookingID) ON UPDATE CASCADE ON DELETE CASCADE,
    FOREIGN KEY (ServiceID) REFERENCES Services (ServiceID) ON UPDATE CASCADE,
    CHECK (BookingID LIKE ('Bk-%') AND
    ServiceID LIKE ('S-%'))
);
```

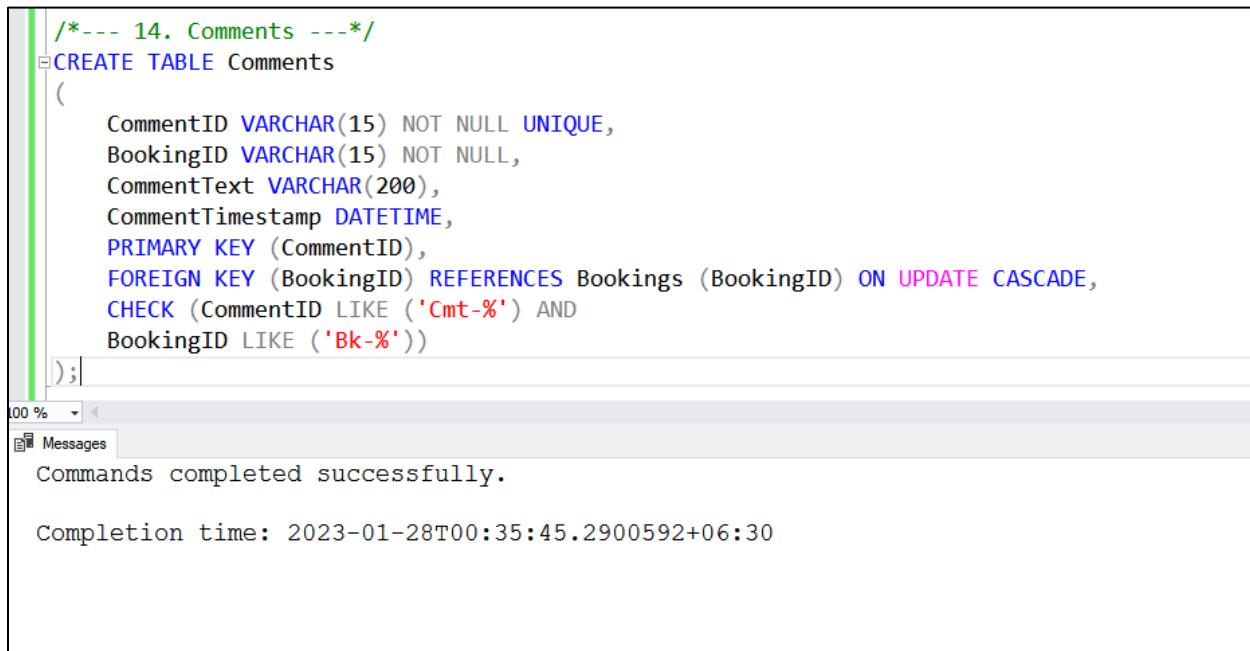
The message pane indicates:

- 100 %
- Messages
- Commands completed successfully.

Completion time: 2023-01-28T00:34:45.3307113+06:30

Figure 40 Create Query for BookedServices

#### 5.2.3.14 Comments



The screenshot shows a database interface with a code editor and a message log. The code editor contains the following SQL query:

```
/*--- 14. Comments ---*/
CREATE TABLE Comments
(
    CommentID VARCHAR(15) NOT NULL UNIQUE,
    BookingID VARCHAR(15) NOT NULL,
    CommentText VARCHAR(200),
    CommentTimestamp DATETIME,
    PRIMARY KEY (CommentID),
    FOREIGN KEY (BookingID) REFERENCES Bookings (BookingID) ON UPDATE CASCADE,
    CHECK (CommentID LIKE ('Cmt-%') AND
    BookingID LIKE ('Bk-%'))
);
```

The message log below the code editor shows the following output:

- Commands completed successfully.
- Completion time: 2023-01-28T00:35:45.2900592+06:30

Figure 41 Create Query for Comments

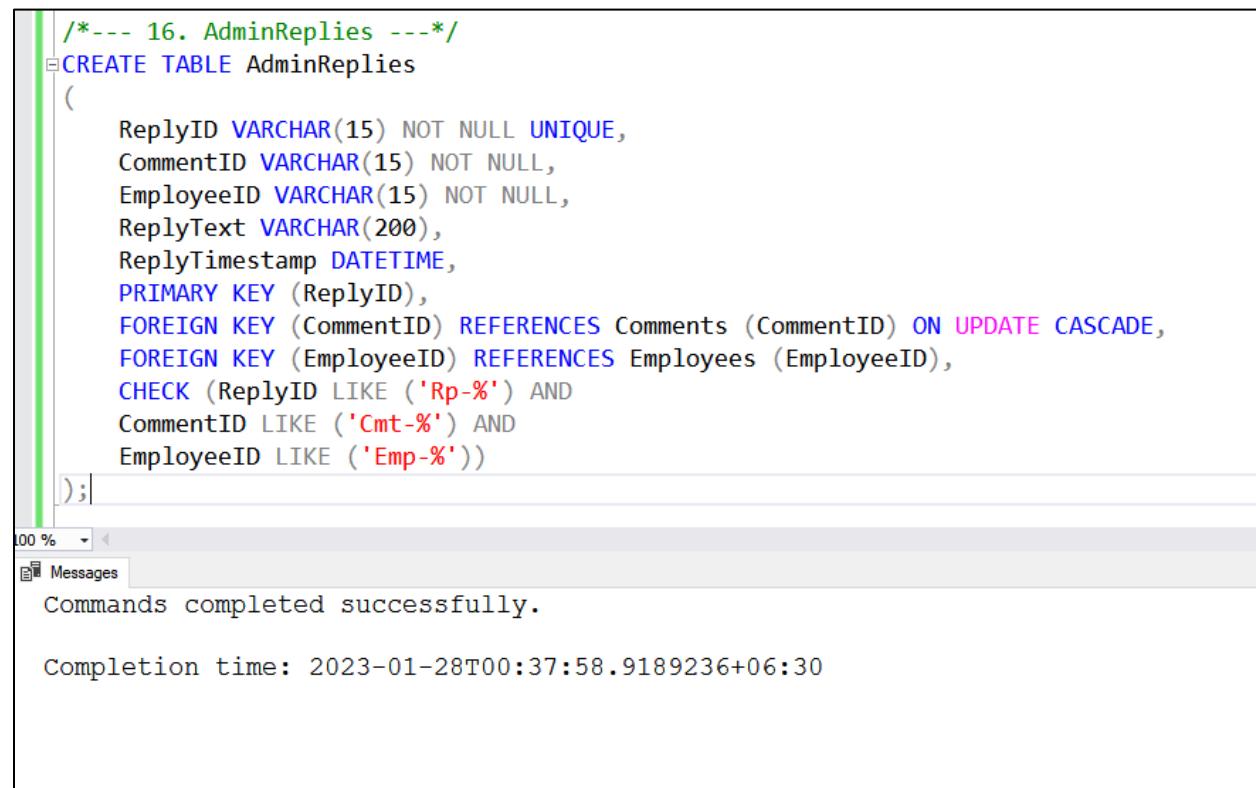
### 5.2.3.15 Payments

```
/*--- 15. Payments ---*/
CREATE TABLE Payments
(
    PaymentID VARCHAR(15) NOT NULL UNIQUE,
    BookingID VARCHAR(15) NOT NULL,
    PaymentDate DATE,
    PaymentType VARCHAR(10),
    PaymentMethod VARCHAR(15),
    PaymentAmount DECIMAL(10,2),
    PRIMARY KEY (PaymentID),
    FOREIGN KEY (BookingID) REFERENCES Bookings (BookingID) ON UPDATE CASCADE,
    CHECK (PaymentID LIKE ('Pay-%') AND
    BookingID LIKE ('Bk-%') AND
    PaymentType IN ('Full', 'Partial') AND
    PaymentMethod IN ('Cash', 'CB Pay', 'KBZ Pay', 'Wave Pay', 'JCB MPU'))
);
00 % < Messages
Commands completed successfully.

Completion time: 2023-01-28T00:36:56.0236455+06:30
```

Figure 42 Create Query for Payments

#### 5.2.3.16 AdminReplies



The screenshot shows a database management interface with a code editor and a message log.

```
/*--- 16. AdminReplies ---*/
CREATE TABLE AdminReplies
(
    ReplyID VARCHAR(15) NOT NULL UNIQUE,
    CommentID VARCHAR(15) NOT NULL,
    EmployeeID VARCHAR(15) NOT NULL,
    ReplyText VARCHAR(200),
    ReplyTimestamp DATETIME,
    PRIMARY KEY (ReplyID),
    FOREIGN KEY (CommentID) REFERENCES Comments (CommentID) ON UPDATE CASCADE,
    FOREIGN KEY (EmployeeID) REFERENCES Employees (EmployeeID),
    CHECK (ReplyID LIKE ('Rp-%')) AND
    CommentID LIKE ('Cmt-%') AND
    EmployeeID LIKE ('Emp-%'))
);
```

Messages

Commands completed successfully.

Completion time: 2023-01-28T00:37:58.9189236+06:30

Figure 43 Create Query for AdminReplies

## 5.2.4 Data Dictionary

Creating and Documenting Data Dictionary involves 2 parts. They are –

### 5.2.4.1 Representing Relationships

The following diagram with arrows and texts represents how an entity has relationship with another entity.

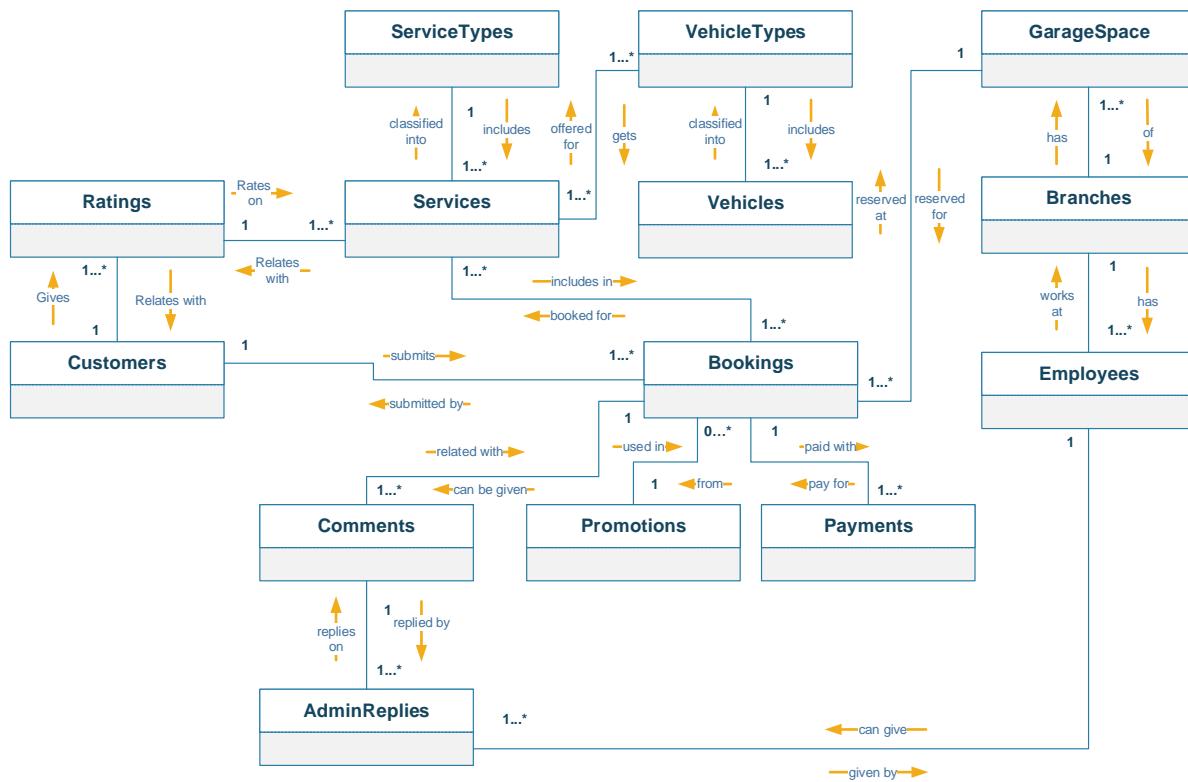


Figure 44 ERD with labels and arrows representing entity relationships

### **Relationships between Entities, Descriptions, Cardinality, Optionality**

#### **Relationship 1**

<b>A Customer can book for one to many Bookings.</b>						
<b>A Booking must be related with only one customer.</b>						
Entity	Cardinality	Optionality		Optionality	Cardinality	Entity
Customers	One	Mandatory		Optional	Many	Bookings

#### **Relationship 2**

<b>A Customer can give one to many Ratings.</b>						
<b>A Rating must be related with only one Customer.</b>						
Entity	Cardinality	Optionality		Optionality	Cardinality	Entity
Customers	One	Mandatory		Optional	Many	Ratings

#### **Relationship 3**

<b>A Rating can be given on one Service.</b>						
<b>A Service can be related with one to many Ratings.</b>						
Entity	Cardinality	Optionality		Optionality	Cardinality	Entity
Ratings	One	Optional		Mandatory	Many	Services

#### **Relationship 4**

<b>A Service Type can include one to many Services.</b>						
<b>A Service can be classified into only one Service Type.</b>						
Entity	Cardinality	Optionality		Optionality	Cardinality	Entity
ServiceTypes	One	Mandatory		Mandatory	Many	Services

### Relationship 5

A Vehicle Type can get one to many Services.						
A Service is offered for one to many Vehicle Types.						
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity	
VehicleTypes	Many	Mandatory		Mandatory	Many	Services

### Relationship 6

A Vehicle Type includes one to many Vehicles.						
A Vehicle can be classified into only one Vehicle Type.						
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity	
VehicleTypes	One	Mandatory		Mandatory	Many	Vehicles

### Relationship 7

A Booking can include one to many Services.						
A Service can be booking in one to many Bookings.						
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity	
Bookings	Many	Mandatory		Mandatory	Many	Services

### Relationship 8

A Booking can be related with one to many Comments.						
A Comment can be only given for one Booking.						
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity	
Bookings	One	Mandatory		Optional	Many	Comments

### Relationship 9

A Comment can get replied by one to many Admin Replies.						
An Admin Reply can be done on only one Comment.						
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity	
Comments	One	Mandatory		Mandatory	Many	AdminReplies

### Relationship 10

<b>An Employee can give one to many Admin Replies.</b>					
<b>An Admin Reply can be done by/ tracked to only one Employee.</b>					
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity
Employees	One	Mandatory	Mandatory	Many	AdminReplies

### Relationship 11

<b>A Branch can have one to many Employees.</b>					
<b>An Employee must work at only one Branch.</b>					
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity
Branches	One	Mandatory	Mandatory	Many	Employees

### Relationship 12

<b>A Branch has one to many Garage Spaces.</b>					
<b>A Garage Space must be of only one Branch.</b>					
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity
Branches	One	Mandatory	Mandatory	Many	GarageSpaces

### Relationship 13

<b>A Promotion can be used in one to many Bookings.</b>					
<b>A Booking can be benefited from only one Promotion.</b>					
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity
Promotions	One	Mandatory	Optional	Many	Bookings

### Relationship 14

<b>A Booking be paid with one to many parts of Payments.</b>					
<b>A Payment can be done for only one Booking.</b>					
Entity	Cardinality	Optionality	Optionality	Cardinality	Entity
Bookings	One	Mandatory	Mandatory	Many	Payments

**Relationship 15**

<b>A Garage Space will be reserved for one to many Bookings.</b>					
<b>A Booking will be reserved at only one Garage Space or not at all.</b>					
Entity	Cardinality	Optionality		Optionality	Cardinality
GarageSpaces	One	Optional		Mandatory	Many
					Bookings

#### 5.2.4.2 Representing Entities and Attributes

##### 5.2.4.2.1 Customers

Table Name : <b>Customers</b>				
Primary Key : CustomerID				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
CustomerID	Varchar (15)	First Character will be 'Cus-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Customers with alphanumeric numbers
CustomerName	Varchar (100)		Not Null	To record the name of customers
CustomerEmail	Varchar (100)	Emails must end with '@gmail.com'		To record email of customers
CustomerPassword	Varchar (50)		Not Null	To record password of customers
CustomerPhone	Varchar (20)			To record the phone number of customers
CustomerAddress	Varchar (150)			To record the address of customers

#### 5.2.4.2.2 Branches

Table Name : <b>Branches</b>				
Primary Key : BranchID				
Foreign Key : None				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
BranchID	Varchar (15)	First Character will be 'Br-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Branches with alphanumeric numbers
BranchName	Varchar (50)			To record the name of Branch
BranchLocation	Varchar (150)			To record address of Branch
GarageSpaceCapacity	TinyINT			To record total space capacity of Branch
AvaialableSpaces	TinyINT			To record available spaces of Branch

#### 5.2.4.2.3 Promotions

Table Name : <b>Promotions</b>				
Primary Key : PromotionID				
Foreign Key : None				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
PromotionID	Varchar (15)	First Character will be 'Promo-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Promotions with alphanumeric numbers
PromotionCode	Varchar (15)		Not Null	To record promotion codes
MinimumCosts	Decimal (10,2)			To record minimal costs to start using promotion
PromotionDiscount	Decimal (5,2)			To record discount of promotion
PromotionStartDate	Date			To record the start date of promotion
PromotionEndDate	Date			To record the end date of promotion
PromotionDescription	Varchar (200)			To record the description of promotion
PromotionActive	Varchar (10)	Domain constraint for 'Active', 'Expired'		To record whether promotion is active or expired

#### **5.2.4.2.4 ServiceTypes**

<b>Table Name : ServiceTypes</b>				
<b>Primary Key : ServiceTypeID</b>				
<b>Foreign Key : None</b>				
<b>Attribute Name</b>	<b>Data Type</b>	<b>Domain Constraint</b>	<b>Integrity Constraint</b>	<b>Description</b>
ServiceTypeID	Varchar (15)	First Character will be 'St-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Service Types with alphanumeric numbers
ServiceTypeName	Varchar (30)			To record the name of Service Type
ServiceTypeDescription	Varchar (200)			To record the Description of Service Types

#### 5.2.4.2.5 VehicleTypes

Table Name : <b>VehicleTypes</b>				
Primary Key : VehicleTypeID				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
VehicleTypeID	Varchar (15)	First Character will be 'Vt-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Vehicle Types with alphanumeric numbers
VehicleTypeName	Varchar (50)			To record the name of Vehicle Type
VehicleTypeDescription	Varchar (200)			To record the Description of Vehicle Type

#### **5.2.4.2.6 Employees**

<b>Table Name : Employees</b>				
<b>Attribute Name</b>	<b>Data Type</b>	<b>Domain Constraint</b>	<b>Integrity Constraint</b>	<b>Description</b>
EmployeeID	Varchar (15)	First Character will be 'Emp-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Employees with alphanumeric numbers
EmployeeName	Varchar (100)			To record the name of Employee
Gender	Varchar (20)	Domain constraint for 'Male', 'Female', 'LGBTIQ'.		To record the gender of employees
BranchID	Varchar (15)	First Character will be 'Br-' followed by a sequential number	Foreign Key Not Null	To record branch where employee works
EmployeePosition	Varchar (30)			To record the position of employees
DateOfBirth	Date			To record DOB of employees
EmployeeAddress	Varchar (150)			To record addresses of employees
EmployeePhone	Varchar (20)			To record phone numbers of employees

#### **Propagation Constraint**

**Add propagation constraints on Employees table of BranchID**

Foreign Key (BranchID) References Branches (BranchID)

ON UPDATE CASCADE

#### 5.2.4.2.7 Vehicles

Table Name : <b>Vehicles</b>				
Primary Key : VehicleID				
Foreign Key : VehicleTypeID				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
VehicleID	Varchar (15)	First Character will be 'V-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Vehicles with alphanumeric numbers
VehicleName	Varchar (100)			To record the name of Vehicles
VehicleTypeID	Varchar (15)	First Character will be 'Vt-' followed by a sequential number	Foreign Key	To uniquely record Vehicle Types with alphanumeric numbers
VehicleModel	Varchar (30)			To record Models of Vehicles
VehicleLicense Number	Varchar (8)			To record the License number of vehicles
VehicleImage	Varbinary (max)			To record an image of Vehicle
VehicleMainColor	Varchar (20)			To record primary color of Vehicle

#### Propagation Constraint

Add propagation constraints on Vehicles table of VehicleTypeID

Foreign Key (VehicleTypeID) References VehicleTypes (VehicleTypeID)

ON UPDATE CASCADE

#### 5.2.4.2.8 Services

Table Name : <b>Services</b>				
Primary Key : ServiceID				
Foreign Key : ServiceTypeID, VehicleTypeID				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
ServiceID	Varchar (15)	First Character will be 'S-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record services with alphanumeric numbers
ServiceName	Varchar (50)			To record the name of Service
ServiceTypeID	Varchar (15)	First Character will be 'St-' followed by a sequential number	Foreign Key Not Null	To uniquely record service types with alphanumeric numbers
VehicleTypeID	Varchar (15)	First Character will be 'Vt-' followed by a sequential number	Foreign Key	To uniquely record Vehicle types with alphanumeric numbers
ServiceDescription	Varchar (200)			To record the description of Services
ServiceDuration	Time			To record duration taken for services
ServiceStatus	Varchar (20)	Domain constraint for 'Active', 'Temporarily paused', 'Terminated'		To record service status
ServicePrice	Decimal (10,2)			To record price amount of services

**Propagation Constraint**

**Add propagation constraints on Services table of ServiceTypeID**

Foreign Key (ServiceTypeID) References ServiceTypes (ServiceTypeID)

ON UPDATE CASCADE

**Add propagation constraints on Services table of VehicleTypeID**

Foreign Key (VehicleTypeID) References VehicleTypes (VehicleTypeID)

ON UPDATE CASCADE

#### 5.2.4.2.9 VehicleTypeServices

Table Name : <b>VehicleTypeServices</b>				
Composite Primary Key : ServiceID, VehicleTypeID				
Foreign Key : ServiceID, VehicleTypeID				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
ServiceID	Varchar (15)	First Character will be 'S-' followed by a sequential number	Foreign Key Not Null	To uniquely record Services with alphanumeric numbers
VehicleTypeID	Varchar (15)	First Character will be 'Vt-' followed by a sequential number	Foreign Key Not Null	To uniquely record Vehicle Types with alphanumeric numbers

#### Propagation Constraint

Add propagation constraints on VehicleTypeServices table of ServiceID

Foreign Key (ServiceID) References Services (ServiceID)

ON UPDATE CASCADE

#### 5.2.4.2.10 Ratings

Table Name : <b>Ratings</b>				
Primary Key : RatingID				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
RatingID	Varchar (15)	First Character will be 'Rt-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Service Ratings with alphanumeric numbers
CustomerID	Varchar (15)	First Character will be 'Cus-' followed by a sequential number	Foreign Key Not Null	To uniquely record Customers with alphanumeric numbers
ServiceID	Varchar (15)	First Character will be 'S-' followed by a sequential number	Foreign Key Not Null	To uniquely record Services with alphanumeric numbers
RatingAmount	TinyInt	Domain constraint for 1,2,3,4,5.	Not Null	To record rating amount given for service
RatingDate	Date			To record date of rating

#### Propagation Constraint

##### Add propagation constraints on Ratings table of CustomerID

Foreign Key (CustomerID) References Customers (CustomerID)

ON UPDATE CASCADE

##### Add propagation constraints on Ratings table of ServiceID

Foreign Key (ServiceID) References Services (ServiceID)

ON UPDATE CASCADE

#### **5.2.4.2.11 GarageSpaces**

<b>Table Name : GarageSpaces</b>				
<b>Primary Key : GarageSpaceID</b>				
<b>Foreign Key : BranchID</b>				
<b>Attribute Name</b>	<b>Data Type</b>	<b>Domain Constraint</b>	<b>Integrity Constraint</b>	<b>Description</b>
GarageSpaceID	Varchar (15)	First Character will be 'Gs-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Service Ratings with alphanumeric numbers
BranchID	Varchar (15)	First Character will be 'Br-' followed by a sequential number	Foreign Key Not Null	To uniquely record Branches with alphanumeric numbers
GarageSpace Number	Varchar (10)			To record Space number
GarageSpace Status	Varchar (15)	Domain constraint for 'Taken', 'Free', 'Disabled'.		To record Status of garage space

#### **Propagation Constraint**

**Add propagation constraints on GarageSpaces table of BranchID**

Foreign Key (BranchID) References Branches (BranchID)

ON UPDATE CASCADE

### 5.2.4.2.12 Bookings

Table Name : <b>Bookings</b>				
Primary Key : BookingID				
Foreign Key : CustomerID, GarageSpaceID, PromotionID,				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
BookingID	Varchar (15)	First Character will be 'Bk-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record customer's Bookings with alphanumeric numbers
CustomerID	Varchar (15)	First Character will be 'Cus-' followed by a sequential number	Foreign Key Not Null	To uniquely record customers with alphanumeric numbers
BookingDate	Date			To record desired date of booking
ServedLocation	Varchar (15)	Domain constraint for 'Home, 'Garage'.		To record Location where services will be done
GarageSpaceID	Varchar (15)	First Character will be 'Gs-' followed by a sequential number	Foreign Key	To record Garage Space reserved/ assigned for booking
BookingStartTime	Time			To record start time of Bookings
BookingEndTime	Time			To record end time of Bookings
BookingStatus	Varchar (20)	Domain constraint for 'Pending', 'Accepted', 'Cancelled', 'On The Way', 'Work in		To record the status of booking and servicing processes

## Car Service Booking System of AUTOCARE

		‘Progress’, ‘Final checked’, ‘All Finished’, ‘Returned’.		
Cancellation Reason	Varchar (150)			To record the reason why a booking is cancelled
TotalCosts	Decimal (10,2)			To record the Total costs of services
PromotionID	Varchar (15)	First Character will be ‘Promo-’ followed by a sequential number	Foreign Key	To uniquely record Promotions with alphanumeric numbers
PromotionDiscount Amount	Decimal (10,2)			To record Promotion Discount Amount according to costs
NetCosts	Decimal (10,2)			To record the net amount of costs after subtracting Promotion Discount amount
PaymentDueDate	Date			To record the due date of all payments
RemainingAmount	Decimal (10,2)			To record the remaining amount to pay
PaymentStatus	Varchar (20)	Domain constraint for ‘Fully Paid’, ‘Partially Paid’, ‘No Payment Made’, ‘Refunded’.		To record the status related with payment

### Propagation Constraint

Add propagation constraints on Bookings table of CustomerID

Car Service Booking System of AUTOCARE

Foreign Key (CustomerID) References Customers (CustomerID)

ON UPDATE CASCADE

**Add propagation constraints on Bookings table of GarageSpaceID**

Foreign Key (GarageSpaceID) References GarageSpaces (GarageSpaceID)

ON UPDATE CASCADE

**Add propagation constraints on Bookings table of PromotionID**

Foreign Key (PromotionID) References Promotions (PromotionID)

ON UPDATE CASCADE

#### **5.2.4.2.13 BookedServices**

<b>Table Name : BookedServices</b>				
Composite Primary Key : BookingID, ServiceID				
Foreign Key : BookingID, ServiceID				
<b>Attribute Name</b>	<b>Data Type</b>	<b>Domain Constraint</b>	<b>Integrity Constraint</b>	<b>Description</b>
BookingID	Varchar (15)	First Character will be 'Bk-' followed by a sequential number	Foreign Key Not Null	To uniquely record Booking with alphanumeric numbers
ServiceID	Varchar (15)	First Character will be 'S-' followed by a sequential number	Foreign Key Not Null	To uniquely record Services with alphanumeric numbers

#### **Propagation Constraint**

##### **Add propagation constraints on BookedServices table of BookingID**

Foreign Key (BookingID) References Bookings (BookingID)

ON UPDATE CASCADE

ON DELETE CASCADE

##### **Add propagation constraints on BookedServices table of ServiceID**

Foreign Key (ServiceID) References Services (ServiceID)

ON UPDATE CASCADE

#### 5.2.4.2.14 Comments

Table Name : <b>Comments</b>				
Primary Key : CommentID				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
CommentID	Varchar (15)	First Character will be 'Cmt-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Comments with alphanumeric numbers
BookingID	Varchar (15)	First Character will be 'Bk-' followed by a sequential number	Foreign Key Not Null	To uniquely record Booking with alphanumeric numbers
CommentText	Varchar (200)			To record full comment text of customer
CommentTime Stamp	DateTime			To record date and time when customer commented

#### Propagation Constraint

Add propagation constraints on Comments table of BookingID

Foreign Key (BookingID) References Bookings (BookingID)

ON UPDATE CASCADE

#### 5.2.4.2.15 Payments

Table Name : <b>Payments</b>				
Primary Key : PaymentID				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
PaymentID	Varchar (15)	First Character will be 'Pay-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record Payments with alphanumeric numbers
BookingID	Varchar (15)	First Character will be 'Bk-' followed by a sequential number	Foreign Key Not Null	To uniquely record Booking with alphanumeric numbers
PaymentDate	Date			To record date of payment done
PaymentType	Varchar (10)	Domain constraint for 'Full', 'Partial'.		To record the type of payment for booking
PaymentMethod	Varchar (15)	Domain constraint for 'Cash', 'CBPay', 'KBZPay', 'WavePay', 'JCB MPU'		To record the payment method used
PaymentAmount	Decimal (10,2)			To record the amount of money paid

#### Propagation Constraint

Add propagation constraints on Payments table of BookingID

Foreign Key (BookingID) References Bookings (BookingID)

ON UPDATE CASCADE

#### 5.2.4.2.16 AdminReplies

Table Name : <b>AdminReplies</b>				
Primary Key : ReplyID				
Foreign Key : CommentID, EmployeeID				
Attribute Name	Data Type	Domain Constraint	Integrity Constraint	Description
ReplyID	Varchar (15)	First Character will be 'Rp-' followed by a sequential number	Primary Key Not Null Unique	To uniquely record admins' replies with alphanumeric numbers
CommentID	Varchar (15)	First Character will be 'Cmt-' followed by a sequential number	Foreign Key Not Null	To uniquely record Comments with alphanumeric numbers
EmployeeID	Varchar (15)	First Character will be 'Emp-' followed by a sequential number	Foreign Key Not Null	To uniquely record Employees with alphanumeric numbers
ReplyText	Varchar (200)			To record the replies of admins made on comments
ReplyTime stamp	DateTime			To record the time when a reply is made

#### Propagation Constraint

**Add propagation constraints on AdminReplies table of CommentID**

Foreign Key (CommentID) References Comments (CommentID)

ON UPDATE CASCADE

## 5.3 User Interface Design

In this section, User Interface design prototypes were made according to the needs from Function Requirements. The following designs are separated into two parts: Design screens which will be mostly interacted with customers to submit bookings and other features and design screens which will only be used by AutoCare employees. All the prototypes are designed with Figma tool. The design focus to be simple, consistent and easy to use by users together with nice aesthetics and bumblebee color scheme.

Here is link to the Figma design prototype:

<https://www.figma.com/proto/TsohuXLidbsSzOn4WyFmfA/AUTOCARE-Booking-System-Prototype-Test?node-id=1%3A2&scaling=min-zoom&page-id=0%3A1&starting-point-node-id=1%3A2&showproto-sidebar=1>

### 5.3.1 User Interface Design Screens for Customers

#### 5.3.1.1 Home Page

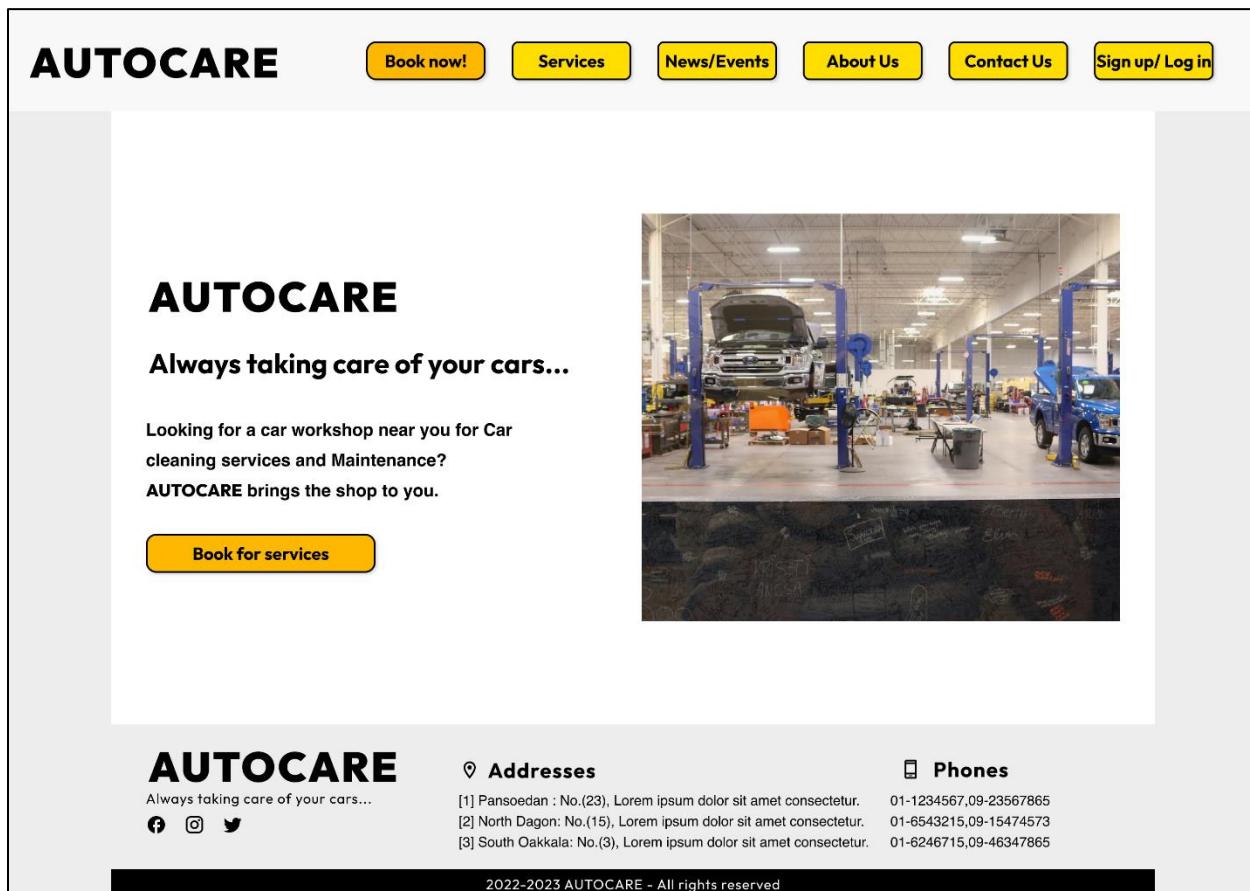


Figure 45 Home Page

### 5.3.1.2 ServiceTypes Selection Page

**AUTOCARE**

[Book now!](#) [Services](#) [News/Events](#) [About Us](#) [Contact Us](#)  Welcome! CiCi289

Home > Service Types

**Please select your preferred Type of service...**



[Home](#) [Pick up](#) [In Garage](#)

For home services, we will send workers to your home to serve you with a range of cleaning services.

- Car Wash
- Car Polish
- Interior Cleaning
- Waxing

By visiting our branches garage, we will be able to offer a broader range of services such as Car Maintenance and Repairing.

- 3D Wheel Alignment Service
- Tyre Changing and Repairing
- Engine Oil & Filters Changing
- Battery Changing
- Car Air-conditioning
- Shock Absorber Repairing
- Brake Shoe Changing and Repairing
- Car Wash
- Car Polish
- Interior Cleaning
- Waxing

**AUTOCARE**

Always taking care of your cars...

**Addresses**

[1] Pansoedan : No.(23), Lorem ipsum dolor sit amet consectetur.  
[2] North Dagon: No.(15), Lorem ipsum dolor sit amet consectetur.  
[3] South Oakkala: No.(3), Lorem ipsum dolor sit amet consectetur.

**Phones**

01-1234567,09-23567865  
01-6543215,09-15474573  
01-6246715,09-46347865

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Figure 46 ServiceTypes Selection Page

### 5.3.1.3 Cars and Services selection Page

**AUTOCARE**

[Book now!](#) [Services](#) [News/Events](#) [About Us](#) [Contact Us](#)

Welcome! CiCi289

Home > Service Types > Cars & Services

**Please select your car...**



Name: Nissan GT-R  
 Vehicle Type: Regular  
 Model: R-35  
 License: BP 7777  
 Primary Color: Crimson Red

**Please select desired In-Garage services for your car...**

<input checked="" type="radio"/> Car Wash	<input type="radio"/> Tyre Changing and Repairing
<input checked="" type="radio"/> Car Polish	<input type="radio"/> Engine Oil and Filters Changing
<input checked="" type="radio"/> Interior Cleaning	<input type="radio"/> Battery Changing
<input type="radio"/> Waxing	<input type="radio"/> Car Air-Conditioning
<input type="radio"/> 3D Wheel Alignment	<input type="radio"/> Shock Absorber Repairing
<input type="radio"/> Brake shoes Changing and Reparing	

Est Total Cost: MMK 50,000

[<< Back to Service Types](#) [Proceed to Choose Date, Time & Branch >>](#)

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 [2] North Dagon: No.(15), Lorem ipsum dolor sit amet consectetur.  
 [3] South Oakkala: No.(3), Lorem ipsum dolor sit amet consectetur.

**Phones**  
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 01-6543215, 09-15474573  
 01-6246715, 09-46347865

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Figure 47 Cars and (In-Garage) services selection Page

### 5.3.1.4 Date, Time and Branch selection Page

**AUTOCARE**
[Book now!](#)
[Services](#)
[News/Events](#)
[About Us](#)
[Contact Us](#)
Welcome!  
CiCi289

Home > Service Types > Cars & Services > Date Time & Branch

**Please select your convenient date for services...**

Jan 2023							Feb 2023						
SUN	MON	TUE	WED	THU	FRI	SAT	SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7	29	30	31	1	2	3	4
8	9	10	11	12	13	14	5	6	7	8	9	10	11
15	16	17	18	19	20	21	12	13	14	15	16	17	18
22	23	24	25	26	27	28	19	20	21	22	23	24	25
29	30	31	1	2	3	4	26	27	28	1	2	3	4

**Please select your desired Start Time...**

[7:00 AM](#)

[11:00 AM](#)

[3:00 PM](#)

[8:00 AM](#)

[12:00 AM](#)

[4:00 PM](#)

[9:00 AM](#)

[1:00 PM](#)

[5:00 PM](#)

[10:00 AM](#)

[2:00 PM](#)

[6:00 PM](#)

**Please select convenient Branch for services...**

**Branch 1**  
 No.(23), Lorem ipsum dolor sit amet consectetur  
**Available spaces: 10/30**

**Branch 2**  
 No.(15), Lorem ipsum dolor sit amet consectetur  
**Available spaces: 15/30**

[<< Back to Cars & Services](#)

[Proceed to Choose Payment Method >>](#)

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Addresses
 Phones

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[2] North Dagon: No.(15), Lorem ipsum dolor sit amet consectetur.  
[3] South Oakkala: No.(3), Lorem ipsum dolor sit amet consectetur.

01-1234567,09-23567865  
01-6543215,09-15474573  
01-6246715,09-46347865

Figure 48 Date, Time and Branch selection Page

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### 5.3.1.5 Payment Types, Payment Methods selection and booking submit Page

**AUTOCARE**
[Book now!](#)
[Services](#)
[News/Events](#)
[About Us](#)
[Contact Us](#)
Welcome!  
CiCi289

Home > Service Types > Cars & Services > Date Time & Branch > Payments

**Please select your preferred payment method...**

**Cash Only**

**CB PAY**

**KBZ PAY**

**WAVE PAY**

**Please select payment type...**

**Full Payment**

**Partial Payment**

**Booking Summary**

**Branch 1**  
No.(23), Lorem ipsum dolor sit amet consectetur.

---

**31st January 2023**  
11:00 AM

<b>Car Wash</b>	<b>MMK 5,000</b>
<b>Car Polish</b>	<b>MMK 25,000</b>
<b>Interior Cleaning</b>	<b>MMK 20,000</b>
<b>SubTotal</b>	<b>MMK 50,000</b>
<b>Discount</b>	<b>(-MMK 5,000)</b>
<b>Net Costs</b>	<b>MMK 45,000</b>

Add Promo Code:

[<< Back to Date Time & Branch](#)
[Submit Booking ✓](#)

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**Addresses**

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[2] North Dagon: No.(15), Lorem ipsum dolor sit amet consectetur.  
[3] South Oakkala: No.(3), Lorem ipsum dolor sit amet consectetur.

**Phones**

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01-6543215,09-15474573  
01-6246715,09-46347865

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Figure 49 Payment Types, Payment methods selection and Booking submit Page

154 | Page

### 5.3.1.6 Customer Sign up Page

The screenshot shows the 'Account Sign Up' page. At the top, there is a navigation bar with the 'AUTOCARE' logo and links for 'Book now!', 'Services', 'News/Events', 'About Us', 'Contact Us', and 'Sign up/ Log in'. The main title 'Account Sign Up' is centered above a form. The form consists of several input fields: 'Name' (text), 'Email' (text), 'Password' (text), 'Phone' (text), 'Address' (text), and 'Address (Township)' (text). Below the 'Address' field, there is a note: 'By checking this button, you Agree to [Privacy Policy](#) and [Terms of Use](#)'. At the bottom right of the form is a yellow 'Sign up new account' button. At the bottom of the page, there is a footer section with the 'AUTOCARE' logo, social media icons (Facebook, Instagram, Twitter), and links for 'Addresses' and 'Phones'. The 'Addresses' section lists three locations with their addresses and phone numbers. The 'Phones' section lists three phone numbers. A black footer bar at the very bottom contains the text '2022-2023 AUTOCARE - All rights reserved'.

**AUTOCARE**

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**Addresses**

[1] Pansoedan : No.(23), Lorem ipsum dolor sit amet consectetur.  
[2] North Dagon: No.(15), Lorem ipsum dolor sit amet consectetur.  
[3] South Oakkala: No.(3), Lorem ipsum dolor sit amet consectetur.

**Phones**

01-1234567,09-23567865  
01-6543215,09-15474573  
01-6246715,09-46347865

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Figure 50 Customer Sign up Page

### 5.3.1.7 Customer Log in Page

The screenshot shows the 'Account Log In' page of the AUTOCARE website. At the top, there is a navigation bar with the 'AUTOCARE' logo and links for 'Book now!', 'Services', 'News/Events', 'About Us', 'Contact Us', and 'Sign up/ Log in'. The main section is titled 'Account Log In' and contains instructions: 'Log in to your AUTOCARE account to start booking for services!' and 'Don't have an account? [Sign Up Here.](#)'. There are two input fields: one for 'Email' and one for 'Password'. Below the password field is a link 'Forgot Password???' and a yellow 'Log into account' button. At the bottom of the page, there is a footer with the 'AUTOCARE' logo and the tagline 'Always taking care of your cars...', social media icons for Facebook, Instagram, and Twitter, and two tables: 'Addresses' and 'Phones'. The 'Addresses' table lists three locations: Pansoedan, North Dagon, and South Oakkala, each with a placeholder address. The 'Phones' table lists three phone numbers: 01-1234567, 01-6543215, and 01-6246715. A black footer bar at the bottom contains the text '2022-2023 AUTOCARE - All rights reserved'.

**AUTOCARE**

Always taking care of your cars...

[Book now!](#) [Services](#) [News/Events](#) [About Us](#) [Contact Us](#) [Sign up/ Log in](#)

**Account Log In**

Log in to your AUTOCARE account to start booking for services!

Don't have an account? [Sign Up Here.](#)

**Email**

**Password**

[Forgot Password???](#)

**Log into account**

**AUTOCARE**

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**Addresses**

[1] Pansoedan : No.(23), Lorem ipsum dolor sit amet consectetur.  
[2] North Dagon: No.(15), Lorem ipsum dolor sit amet consectetur.  
[3] South Oakkala: No.(3), Lorem ipsum dolor sit amet consectetur.

**Phones**

01-1234567,09-23567865  
01-6543215,09-15474573  
01-6246715,09-46347865

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Figure 51 Customer Log in Page

### 5.3.1.8 Account Information Page

The screenshot shows the 'Account Profile Information' section of the AUTOCARE website. At the top, there are three yellow buttons: 'Account Information' (with a user icon), 'Vehicle Information' (with a car icon), and 'Booking & History' (with a calendar icon). Below this, the user's profile information is displayed:

Name:	CiCi289
Phone:	09756970487
Email:	cihtinaung289.cha@gmail.com
Address:	Building. 15/ 201, Lorum Ipsum Street, Lacidame township, Coriem.

A yellow 'Log out of account' button is located at the bottom left of this section. At the very bottom of the page, there is a footer with social media links (Facebook, Instagram, Twitter), addresses, phones, and a copyright notice.

**AUTOCARE**  
Always taking care of your cars...  
Facebook Instagram Twitter

**Addresses**  
[1] Pansoedan : No.(23), Lorem ipsum dolor sit amet consectetur.  
[2] North Dagon: No.(15), Lorem ipsum dolor sit amet consectetur.  
[3] South Oakkala: No.(3), Lorem ipsum dolor sit amet consectetur.

**Phones**  
01-1234567,09-23567865  
01-6543215,09-15474573  
01-6246715,09-46347865

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Figure 52 Account Information Page

### 5.3.1.9 Vehicle Information Page

The screenshot shows the 'Vehicle Information' page of the AUTOCARE website. At the top, there is a navigation bar with links for 'Book now!', 'Services', 'News/Events', 'About Us', 'Contact Us', and a user profile icon with the text 'Welcome! CiCi289'. Below the navigation bar are three yellow buttons: 'Account Information' (with a user icon), 'Vehicle Information' (with a car icon), and 'Booking & History' (with a calendar icon). The main content area is titled 'Vehicle Information' and features a red Nissan GT-R in the background. To the right of the image, vehicle details are listed: Name: Nissan GT-R, Vehicle Type: Regular, Model: R-35, License: BP 7777, and Primary Color: Crimson Red. There are also 'Edit' and 'Delete' buttons. Below this section is a form titled 'Add new Vehicle' with fields for Vehicle Name, Model, Primary Color, Vehicle Type, License Number, and Vehicle Image (with a 'Browse...' button). At the bottom of the page, there is a footer with the AUTOCARE logo, social media links (Facebook, Instagram, Twitter), addresses, phones, and a copyright notice: '2022-2023 AUTOCARE - All rights reserved'.

**AUTOCARE**

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[Facebook](#) [Instagram](#) [Twitter](#)

**Addresses**

[1] Pansoedan : No.(23), Lorem ipsum dolor sit amet consectetur.  
[2] North Dagon: No.(15), Lorem ipsum dolor sit amet consectetur.  
[3] South Oakkala: No.(3), Lorem ipsum dolor sit amet consectetur.

**Phones**

01-1234567, 09-23567865  
01-6543215, 09-15474573  
01-6246715, 09-46347865

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Figure 53 Vehicle Information Page

### 5.3.1.10 Booking & History Page

**AUTOCARE**
[Book now!](#)
[Services](#)
[News/Events](#)
[About Us](#)
[Contact Us](#)
Welcome!  
CiCi289

 Account Information
 Vehicle Information
 Booking & History

#### On-Going Bookings

No.	Booking ID	Date & Time	Vehicle	Service Type	Services	Net Costs	Booking Status
1	Bk-003	2-2-2023 (10:00 AM)	Nissan GT-R	In-Garage	Car Wash Interior Cleaning	10,000	Work in Progress >

#### Booking History

No.	Booking ID	Date & Time	Vehicle	Service Type	Services	Net Costs	Payment Status
1	Bk-002	31-1-2023 (11:00 AM)	Nissan GT-R	In Garage	Car Wash Car Polish Interior Cleaning	45,000	Fully Paid ▾
1	Bk-001	15-1-2023 (9:00 AM)	Nissan GT-R	In Garage	Car Wash	7,000	Fully Paid ▾

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 Always taking care of your cars...
   
  

**Addresses**  
 [1] Pansoedan : No.(23), Lorem ipsum dolor sit amet consectetur.  
 [2] North Dagon: No.(15), Lorem ipsum dolor sit amet consectetur.  
 [3] South Oakkala: No.(3), Lorem ipsum dolor sit amet consectetur.

**Phones**  
 01-1234567,09-23567865  
 01-6543215,09-15474573  
 01-6246715,09-46347865

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Figure 54 Booking & History Page

159 | Page

### 5.3.2 User Interface Design Screens for AutoCare Staffs

#### 5.3.2.1 Customers Panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

[Customers >](#) [Bookings >](#) [Garage & Spaces >](#) [Services & Types >](#) [Vehicles & Types >](#) [Ratings >](#) [Comments >](#) [Promotions >](#) [Payments >](#) [Employees >](#)

List of Customers [Date & Time ...](#) [Filter by ...](#) [Sort by ...](#) [Search...](#) [Export/Print](#)

CustomerID	Name	Phone	Email	Address	Update	Delete
Cus-001	CiCi289	09756970487	chitinaung289.cha@gmail.com	Building. 15/ 201, Lorum Ipsum...	<a href="#">Edit</a>	<a href="#">Delete</a>
Cus-002	U Kaung Myat	09894060654	KaungMyat654@gmail.com	Building. 35/ 101,Kant Kaw Street,...	<a href="#">Edit</a>	<a href="#">Delete</a>
Cus-003	Kyaw Htay	09894135074	KyawH074.kh@gmail.com	Building. 21/ 201, Sapal Street,...	<a href="#">Edit</a>	<a href="#">Delete</a>
Cus-004	U Mya Thaung	09752465865	MThaung123.mt@gmail.com	Building. 35/ 101, ZiZaWah Street,...	<a href="#">Edit</a>	<a href="#">Delete</a>
Cus-005	U Kyaw Thinn	09765352475	KoKyawThinn.154@gmail.com	Building. 25/ 101, 140th Street,...	<a href="#">Edit</a>	<a href="#">Delete</a>

Add new Customer

Name	Email
<input type="text"/>	<input type="text"/>
Phone	Password
<input type="text"/>	<input type="text"/>
Address	Address (Township)
<input type="text"/>	<input type="text"/>

[Cancel](#) [Add](#)

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Figure 55 Customers Panel Page

### 5.3.2.2 Top Spending Customers filtered panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

[Customers >](#) [Bookings >](#) [Garage & Spaces >](#) [Services & Types >](#) [Vehicles & Types >](#) [Ratings >](#) [Comments >](#) [Promotions >](#) [Payments >](#) [Employees >](#)

List of Customers For: January 2023 Filter by: Spending Sort by: Largest to Smallest Search... [Export/Print](#)

CustomerID	Name	Phone	Email	Address	Spending (MMK)
Cus-001	CiCi289	09756970487	chitinaung289.cha@gmail.com	Building. 15/ 201, Lorum Ipsum...	50,000
Cus-003	Kyaw Htay	09894135074	KyawH074.kh@gmail.com	Building. 21/ 201, Sapal Street,...	30,000
Cus-004	U Mya Thaung	09752465865	MThaung123.mt@gmail.com	Building. 35/ 101, ZiZaWah Street,...	20,000
Cus-002	U Kaung Myat	09894060654	KaungMyat654@gmail.com	Building. 35/ 101, Kant Kaw Street,...	15,000
Cus-005	U Kyaw Thinn	09765352475	KoKyawThinn.154@gmail.com	Building. 25/ 101, 140th Street,...	10,000

Add new Customer

Name

Email

Phone

Password

Address

Address (Township)

[Cancel](#) [Add](#)

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Figure 56 Top Spending Customers filtered panel Page

### 5.3.2.3 Bookings Panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

**Customers >**

**Bookings >**

**Garage & Spaces >**

**Services & Types >**

**Vehicles & Types >**

**Ratings >**

**Comments >**

**Promotions >**

**Payments >**

**Employees >**

**List of Submitted Bookings** [Date & Time ...](#) [Filter by ...](#) [Sort by ...](#)  [Search...](#)

BookingID	Customer Name	Date	Time	Type	Branch Services	Net Cost	Accept	Cancel	Manage	
Bk-004	Kyaw Htay	3-2-2023	10:00 AM	In-Garage	Br-1	Car Wash	5,000	✓	X	<a href="#">Details</a>
Cancellation reason (if): <input type="text"/>										Booking Status: <a href="#">-</a>
Manual Assign to Garage Space No: <a href="#">1</a>										
Bk-005	U Kaung Myat	1-1-2023	5:00 PM	In-Garage	Br-2	Car Wash Oil Change	15,000	✓	X	<a href="#">Details</a>
Bk-006	U Mya Thaung	5-1-2023	11:00 AM	Home	-	Car Wash Interior Cleaning	10,000	✓	X	<a href="#">Details</a>

[Export/Print](#)

[Create New Booking](#)

**List of On-Going Bookings** [Date & Time ...](#) [Filter by ...](#) [Sort by: recent](#)  [Search...](#)

BookingID	Customer Name	Date	Time	Type	Branch Services	Net Cost	Manage	Status	
Bk-003	CIC1289	2-2-2023	10:00 AM	In-Garage	Br-1	Car Wash Interior Cleaning	10,000	<a href="#">Details</a>	<a href="#">Work in Progress</a>

Estimated End Time:

[Export/Print](#)

**List of Previous Bookings** [Date & Time ...](#) [Filter by ...](#) [Sort by: recent](#)  [Search...](#)

BookingID	Customer Name	Date	Time	Type	Branch Services	Net Cost	Manage	Status
-----------	---------------	------	------	------	-----------------	----------	--------	--------

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Figure 57 Bookings Panel Page

### 5.3.2.4 Branch, Garage and Spaces Panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

[Customers >](#) [Bookings >](#) [Garage & Spaces >](#) [Services & Types >](#) [Vehicles & Types >](#) [Ratings >](#) [Comments >](#) [Promotions >](#) [Payments >](#) [Employees >](#)

Garage Spaces and Status

Branch-1 2-2-2023 10:00 AM Search... [Add New Branch](#)

Branch : 1  
Name : PaZunTaung Branch  
Location : No.(23), Lorem ipsum dolor sit amet consectetur.

**Available Spaces: 14/15**

**Garage Spaces** [Add new Garage Spaces](#)

1	2	3	4	5
Bk-003 10:00 AM-12:30 PM Set as Free ✓	- Set as Taken X			
6	7	8	9	10
- Set as Taken X	- Set as Taken X	- Set as Taken X	- Set as Taken X	- Set as Taken X
11	12	13	14	15
- Set as Taken X	- Set as Taken X	- Set as Taken X	- Set as Taken X	- Set as Taken X

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Figure 58 Branch, Garage and Spaces Panel Page

### 5.3.2.5 Service Types and Services Panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

[Customers >](#) [Bookings >](#) [Garage & Spaces >](#) [Services & Types >](#) [Vehicles & Types >](#) [Ratings >](#) [Comments >](#) [Promotions >](#) [Payments >](#) [Employees >](#)

**Service Types & Services** [Filter by ...](#) [Sort by ...](#) [Search...](#)

ServiceID	Service Name	Type	Vehicle Type	Duration	Description	Price	Status	Manage
S-001	Car Wash	In-Garage	compact	00:30	This is car wash for regular car types, done in Garage.	5,000	Active	<a href="#">Edit info</a>
S-002	Car Wash	Home	compact	00:30	This is car wash for compact car types, done at your home.	7,000	Active	<a href="#">Edit info</a>
S-003	Interior Cleaning	In-Garage	compact	00:40	This is interior cleaning for compact car types.	20,000	Active	<a href="#">Edit info</a>

[Service Status: Active](#)

[Export/Print](#)

**Service Types**

Service Type ID:

Service Type Name:

Service Type Description:

[Add new Service Type](#)

**Services**

Service ID:

Service Name:

Service Type:

Vehicle Type:

Service Description:

Service Duration:  Service Status:

[Add new Service](#)

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Figure 59 Service Types and Services Panel Page

### 5.3.2.6 Vehicles and Types Panel Page

The screenshot shows the AUTOCARE Vehicles and Types Panel Page. The top right corner displays a welcome message for 'Admin1' and a 'Sign Out >' button. On the left, a vertical sidebar lists navigation links: Customers, Bookings, Garage & Spaces, Services & Types, Vehicles & Types (highlighted in yellow), Ratings, Comments, Promotions, Payments, and Employees.

The main content area is divided into two sections: 'Vehicle Types & Vehicles' and 'Vehicle Types' and 'Vehicles'.

**Vehicle Types & Vehicles:**

- Header: Vehicle TypeID, Name, Description, Manage.
- Buttons: Filter by ..., Sort by ..., Search... with a magnifying glass icon.
- Data table rows:
  - Vt-001: Compact, Criteria: Smallest overall dimensions, Smaller engine capacity, HP. Edit info button.
  - Vt-002: Medium, Criteria: Larger overall dimensions than compact, Similar or Larger engine capacity, HP. Edit info button.
  - Vt-003: Van, Criteria: Larger overall dimensions than medium, Larger engine capacity, HP. Edit info button.
  - Vt-004: Compact Trucks, Criteria: Larger overall dimensions than mediums, Larger engine capacity, HP, with back storage. Edit info button.
- Buttons: Export/Print.

**Vehicle Types and Vehicles:**

**Vehicle Types:**

- Form fields: Vehicle Type ID, Vehicle Type Name, Vehicle Type Description.
- Buttons: Add new Vehicle Type.

**Vehicles:**

- Form fields: Vehicle ID, Vehicle Name, Vehicle Type, Model, Image (with a Browse... button), License No., Primary Color.
- Buttons: Add new Vehicle.

At the bottom, a footer bar displays the text '2022-2023 AUTOCARE - All rights reserved'.

Figure 60 Vehicle Types and Vehicles Panel Page

### 5.3.2.7 Ratings panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

**Summarized Rating**

Service ID	Name	Service Type	Vehicle Type	Ratings	Manage
S-001	Car Wash	In-Garage	Compact	★★★★★	<a href="#">Edit</a>
S-002	Car Wash	Home	Compact	★★★★☆	<a href="#">Edit</a>
S-003	Interior Cleaning	In-Garage	Compact	★★★★☆	<a href="#">Edit</a>

[Export/Print](#)

---

**Rating History**

Rating ID	Customer ID	Service ID	Ratings	Time Stamp	Manage
Rt-001	Cus-001	S-001	★★★★★	20/1/2023-01:23:40 PM	<a href="#">Details</a>
Rt-002	Cus-001	S-003	★★★★☆	20/1/2023-01:24:20 PM	<a href="#">Details</a>
Rt-003	Cus-002	S-001	★★★★☆	18/1/2023-10:15:40 AM	<a href="#">Details</a>
Rt-004	Cus-003	S-001	★★★★★	18/1/2023-05:10:40 PM	<a href="#">Details</a>

[Export/Print](#)

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Figure 61 Ratings panel Page

### 5.3.2.8 Comments Panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

[Customers >](#) [Bookings >](#) [Garage & Spaces >](#) [Services & Types >](#) [Vehicles & Types >](#) [Ratings >](#) [Comments >](#) [Promotions >](#) [Payments >](#) [Employees >](#)

**Lists of Comments** [Filter by ...](#) [Sort by ...](#) [January 2023](#)

**Comments History**

Comment ID	Booking ID	Ratings	Time Stamp	Manage
Rt-001	B-001	Overall, the services were satisfying.	20/1/2023-01:23:40 PM	<a href="#">Reply</a>
Admin's reply: <input style="border: 1px solid black; width: 200px; height: 20px; margin-right: 10px;" type="text" value="We are so glad to hear your comment! :)"/> <a href="#">Edit</a> 20/1/2023-01:23:40 PM				
Rt-002	B-001	Overall, the services were satisfying.	20/1/2023-01:24:20 PM	<a href="#">Reply</a>
Reply on Comment: <input style="width: 200px; height: 20px; margin-right: 10px;" type="text"/> <a href="#">Send &gt;</a>				
Rt-003	B-002	Overall, the services were satisfying.	18/1/2023-10:15:40 AM	<a href="#">Reply</a>
Rt-004	B-002	Overall, the services were satisfying.	18/1/2023-05:10:40 PM	<a href="#">Reply</a>

[Export/Print](#)

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Figure 62 Comments panel page

### 5.3.2.9 Promotions Panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

[Customers >](#) [Bookings >](#) [Garage & Spaces >](#) [Services & Types >](#) [Vehicles & Types >](#) [Ratings >](#) [Comments >](#) **Promotions >** [Payments >](#) [Employees >](#)

**Lists of Promotions** [Filter by ...](#) [Sort by ...](#) [Date...](#)  [Search...](#) [Create New Promotion](#)

PromotionID	Promo Code	Discount%	Min. Cost	Description	Start date	End date	Status	Manage
Promo-003	ACValentine	14%	60,000	Promotion event for valentines. Customers with Total spendi...	1/2/2023	28/2/2023	Active	<a href="#">Edit</a>
Promo-002	NYAC	10%	20,000	Promotion event for New Year. Customers with Total Spend...	26/12/2022	2/1/2022	Ended	<a href="#">Edit</a>
Promo-003	XmasAC	25%	100,000	Promotion event for Christmas. Customers with Total spendi...	25/12/2022	25/12/2022	Ended	<a href="#">Edit</a>

[Export/Print](#)

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Figure 63 Promotions Panel Page

### 5.3.2.10 Payments Panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

[Customers >](#) [Bookings >](#) [Garage & Spaces >](#) [Services & Types >](#) [Vehicles & Types >](#) [Ratings >](#) [Comments >](#) [Promotions >](#) [Payments >](#) [Employees >](#)

**Lists of Payments** [Filter by ...](#) [Sort by ...](#) [Date ...](#)  [Search](#)

[Add a payment record](#)

PaymentID	BookingID	Method	Payment Amount	Type	Date	Status	Due Date	Manage
Pay-001	B-006	CB PAY	50,000	Partial	10/1/2023	Partial Payment Required	20/1/2023	<a href="#">Edit/ Notify!</a>
Pay-002	B-001	Cash Only	5,000	Full	15/1/2023	Fully Paid	-	<a href="#">Edit</a>
Pay-003	B-002	Cash Only	50,000	Full	31/1/2023	Fully Paid	-	<a href="#">Edit</a>

[Export/Print](#)

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Figure 64 Payments Panel Page

### 5.3.2.11 Employees Panel Page

**AUTOCARE**

Welcome! Admin1 [Sign Out >](#)

[Customers >](#) [Bookings >](#) [Garage & Spaces >](#) [Services & Types >](#) [Vehicles & Types >](#) [Ratings >](#) [Comments >](#) [Promotions >](#) [Payments >](#) [Employees >](#)

**Lists of Employees** [Filter by ...](#) [Sort by ...](#) [Date ...](#)

[Add new employee](#)

**Employee Records**

EmployeeID	Name	Gender	Address	Position	BranchID	DOB	Phone	Manage
Emp-001	Aung Thin	Male	No. 23, Kant Kaw Street..Manager	Br-1	12/10/1976	09125367646	<a href="#">Edit</a>	
Emp-002	Ko Kyaw Khin	Male	No. 213, Wit Kyaung...	Technician	Br-1	12/10/1990	09125367646	<a href="#">Edit</a>
Emp-003	Aung Din	Male	No. 23, Kant Kaw Street..Admin	Br-1	12/10/1990	09125367646	<a href="#">Edit</a>	
Emp-004	Aung Kaung Khant	Male	No. 63/A, Zi Za Wah...	Admin	Br-2	12/10/1990	09125367646	<a href="#">Edit</a>

[Export/Print](#)

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Figure 65 Employees Panel Page

## 5.4 Behavioral Design

### 5.4.1 SQL Codes for each Query/Reports listed in functional requirements

In this section, SQL Query codes related with Functional Requirements will be shown. (Create/Add query functions are already shown in Structural Design section above.)

#### 5.4.1.1 Insert into Customers/ Create new customer accounts

The screenshot shows two panes of an Oracle SQL Developer interface. The left pane displays an SQL script for inserting five new customer records into the 'Customers' table. The right pane shows the results of executing this query, including the inserted data and a select statement confirming the data.

```

/*
/*Insert into/ Create new rows into Tables*/
/* 1. Customers */
INSERT INTO Customers
    (CustomerID,
     CustomerName,
     CustomerEmail,
     CustomerPassword,
     CustomerPhone,
     CustomerAddress)

VALUES ('Cus-001',
        'CiCi289',
        'cihtinaung289.cha@gmail.com',
        'cici289',
        '09798457867',
        'No.15/201, ATP street, MGTN Township, Yangon.'),

       ('Cus-002',
        'U Aung Aung',
        'AungAung183@gmail.com',
        'aungaung183',
        '09572426746',
        'No.34/G, 124th street, MGTN Township, Yangon.'),

       ('Cus-003',
        'Kyaw Thet',
        'KyawT.KT123@gmail.com',
        'KyawThet123',
        '09798356246',
        'No.20/ 201, Sapal street, AL Township, Yangon.'),

       ('Cus-004',
        'U Aung Min Thein',
        'AungMT.235@gmail.com',
        'AungMT235',
        '095188325',
        'No.124/ 301, 51st street, BTH Township, Yangon.'),

       ('Cus-005',
        'Ko Kan Kaung',
        'KKKLucky.123@gmail.com',
        'KKKLucky1',
        '09756835626',
        'No.9/ 501, 140th street, TM Township, Yangon.');

SELECT * FROM Customers;

```

Messages pane (Left):

- (5 rows affected)
- Completion time: 2023-01-28T01:09:07.3023889+06:30

Messages pane (Right):

- (5 rows affected)
- Completion time: 2023-01-28T01:09:07.3023889+06:30

Figure 66 Insert Query into Customers

#### 5.4.1.2 Insert into Branches

```
/* 2. Branches */
INSERT INTO Branches
    (BranchID,
     BranchName,
     BranchLocation,
     GarageSpaceCapacity,
     AvailableSpaces)

VALUES  ('Br-001',
         'Pansoedan Branch',
         'No.77, Upper Pansoedan Road, MGTN Township, Yangon.',
         15,
         14),

        ('Br-002',
         'North Dagon Branch',
         'No.269, Pyi Htaung Su Road, ND Township, Yangon.',
         15,
         14),

        ('Br-003',
         'South Oakkalapa Branch',
         'No.333, Thit Sar Road, SOK Township, Yangon.',
         15,
         14);

SELECT * FROM Branches;
```

70 % ▾

Messages

(3 rows affected)

Completion time: 2023-01-28T01:12:44.1822098+06:30

Figure 67 Insert Query into Branches

#### 5.4.1.3 Insert into Promotions



```
/* 3. Promotions */
INSERT INTO Promotions
(PromotionID,
PromotionCode,
MinimumCosts,
PromotionDiscount,
PromotionStartDate,
PromotionEndDate,
PromotionDescription,
PromotionActive)

VALUES ('Promo-001',
'XmasAC',
30000,
0.1,
'2022-12-25',
'2022-12-26',
'Promotion event of AutoCare for Christmas. Customers with spending of 30000 and above will gain 10 percent discount within promo days.',
'Expired'),

('Promo-002',
'NYAC2023',
50000,
0.1,
'2022-12-31',
'2023-1-5',
'Promotion event of AutoCare for New Year 2023. Customers with spending of 50000 and above will gain 10 percent discount within promo days.',
'Expired'),

('Promo-003',
'CNYAC2023',
30000,
0.1,
'2023-1-22',
'2023-1-31',
'Promotion event of AutoCare for Chinese New Year. Customers with spending of 30000 and above will gain 10 percent discount within promo days.',
'Active');
```

70 % ↴

Messages

(3 rows affected)

Completion time: 2023-01-28T01:14:18.6312512+06:30

Figure 68 Insert into Promotions

#### 5.4.1.4 Insert into ServiceTypes

```
/* 4. ServiceTypes */
INSERT INTO ServiceTypes
    (ServiceTypeID,
     ServiceTypeName,
     ServiceTypeDescription)

VALUES ('St-001',
        'In-Garage',
        'A wide range of services will be offered at our branches garage, if customers chooses this In-Garage Service. Prices may vary.),

        ('St-002',
         'Home',
         'A limited range of services will be offered in this type. We will send fleets to your home or driveway of car location and offer services.
         Duration may be longer and Prices may vary.),

        ('St-003',
         'Pick Up',
         'A wide range of services will be offered. We will send fleets to your location to pick up your car.);

(3 rows affected)
Completion time: 2023-01-28T01:16:16.3977231+06:30
```

Figure 69 Insert Query into ServiceTypes

#### 5.4.1.5 Insert into VehicleTypes

```
/* 5. VehicleTypes */
INSERT INTO VehicleTypes
(VehicleTypeID,
VehicleTypeName,
VehicleTypeDescription)

VALUES ('Vt-001',
'Compact',
'Smallest overall dimension, Smallest engine capacity, HP'),

('Vt-002',
'Medium',
'Larger overall dimension, Similar/Larger engine capacity, HP'),

('Vt-003',
'Van/SUV',
'Larger overall dimension, Larger engine capacity, HP'),

('Vt-004',
'Compact Truck',
'Largest overall dimension, Larger engine capacity, HP with a storage container.');

(4 rows affected)

Completion time: 2023-01-28T01:17:32.2537324+06:30
```

Figure 70 Insert Query into VehicleTypes

#### 5.4.1.6 Insert Into Employees

```
/* 6. Employees */
INSERT INTO Employees
(EmployeeID,
EmployeeName,
Gender,
BranchID,
EmployeePosition,
DateOfBirth,
EmployeeAddress,
EmployeePhone)

VALUES ('Emp-001',
'U Aung Thin',
'Male',
'Br-001',
'Manager',
'1976-10-12',
'No.23/ 201, Kant Kaw Street, YG Township, Yangon.',
'09751748673'),

('Emp-002',
'Ko Kyaw Khin',
'Male',
'Br-001',
'Technician',
'1990-9-18',
'No.213, Wutt Kyaung Street, YK Township, Yangon.',
'0951756846'),

('Emp-003',
'Ko Aung Kyaw',
'Male',
'Br-001',
'Admin',
'1995-4-25',
'No.24/ 201, 124th Street, MGTN Township, Yangon.',
'0951446643'),
```

70 %

Messages

```
(9 rows affected)
```

```
Completion time: 2023-01-28T01:18:58.8501198+06:30
```

Figure 71 Insert Query into Employees (1)

```
( 'Emp-004',
  'U Aung Hein',
  'Male',
  'Br-002',
  'Admin',
  '1980-5-28',
  'No.102/ A, 30th Street, BTH Township, Yangon.',
  '09894538673'),  
  
( 'Emp-005',
  'Ko Myat Tun',
  'Male',
  'Br-002',
  'Detail Technician',
  '1985-10-1',
  'No.23/ 201, 150th Street, MGTN Township, Yangon.',
  '09798465713'),  
  
( 'Emp-006',
  'Ko Tun Tun',
  'Male',
  'Br-002',
  'Manager',
  '1990-12-1',
  'No.123/ 201, 132nd Street, MGTN Township, Yangon.',
  '095155836'),  
  
( 'Emp-007',
  'Ko Jone Lwin',
  'Male',
  'Br-003',
  'Technician',
  '1995-01-15',
  'No.123/ 201, 132nd Street, MGTN Township, Yangon.',
  '095155836')  
  
70 % < >  
Messages  
  
(9 rows affected)  
  
Completion time: 2023-01-28T01:18:58.8501198+06:30
```

Figure 72 Insert Query into Employees (2)

```
( 'Emp-007',
  'Ko Jone Lwin',
  'Male',
  'Br-003',
  'Admin',
  '1995-8-16',
  'No.24/ B, 31st Street, YK Township, Yangon.',
  '098945862867'),  
  
( 'Emp-008',
  'Ma Saw Sandar',
  'Female',
  'Br-003',
  'Manager',
  '1980-12-2',
  'No.50, 160th Street, TM Township, Yangon.',
  '0951684867'),  
  
( 'Emp-009',
  'Ko Aung Thaw',
  'Male',
  'Br-003',
  'Technician',
  '1986-6-6',
  'No.27/201, 90th Street, MGTN Township, Yangon.',
  '09894585385');  
70 % < Messages  
(9 rows affected)  
Completion time: 2023-01-28T01:18:58.8501198+06:30
```

Figure 73 Insert Query into Employees (3)

#### 5.4.1.7 Insert into Vehicles

The screenshot shows a SQL query being run in a database environment. The query inserts five rows of vehicle data into the 'Vehicles' table. The columns inserted are VehicleID, VehicleName, VehicleTypeID, VehicleModel, VehicleLicenseNumber, VehicleImage, and VehicleMainColor. The data for each row includes a unique VehicleID, a vehicle name, a vehicle type ID, a model year, a license number, a placeholder for vehicle image, and a color. The execution message at the bottom indicates 5 rows affected.

```
/* 7. Vehicles */
INSERT INTO Vehicles
    (VehicleID,
     VehicleName,
     VehicleTypeID,
     VehicleModel,
     VehicleLicenseNumber,
     VehicleImage,
     VehicleMainColor)

VALUES ('V-001',
        'Volkswagen Beetle',
        'Vt-001',
        '2020',
        '9Q-6969',
        NULL,
        'Cyan'),

       ('V-002',
        'Honda Civic',
        'Vt-001',
        '2019',
        '5H-1122',
        NULL,
        'Black'),

       ('V-003',
        'Chevrolet Silverado',
        'Vt-002',
        '2019',
        '4M-5678',
        NULL)
```

80 %

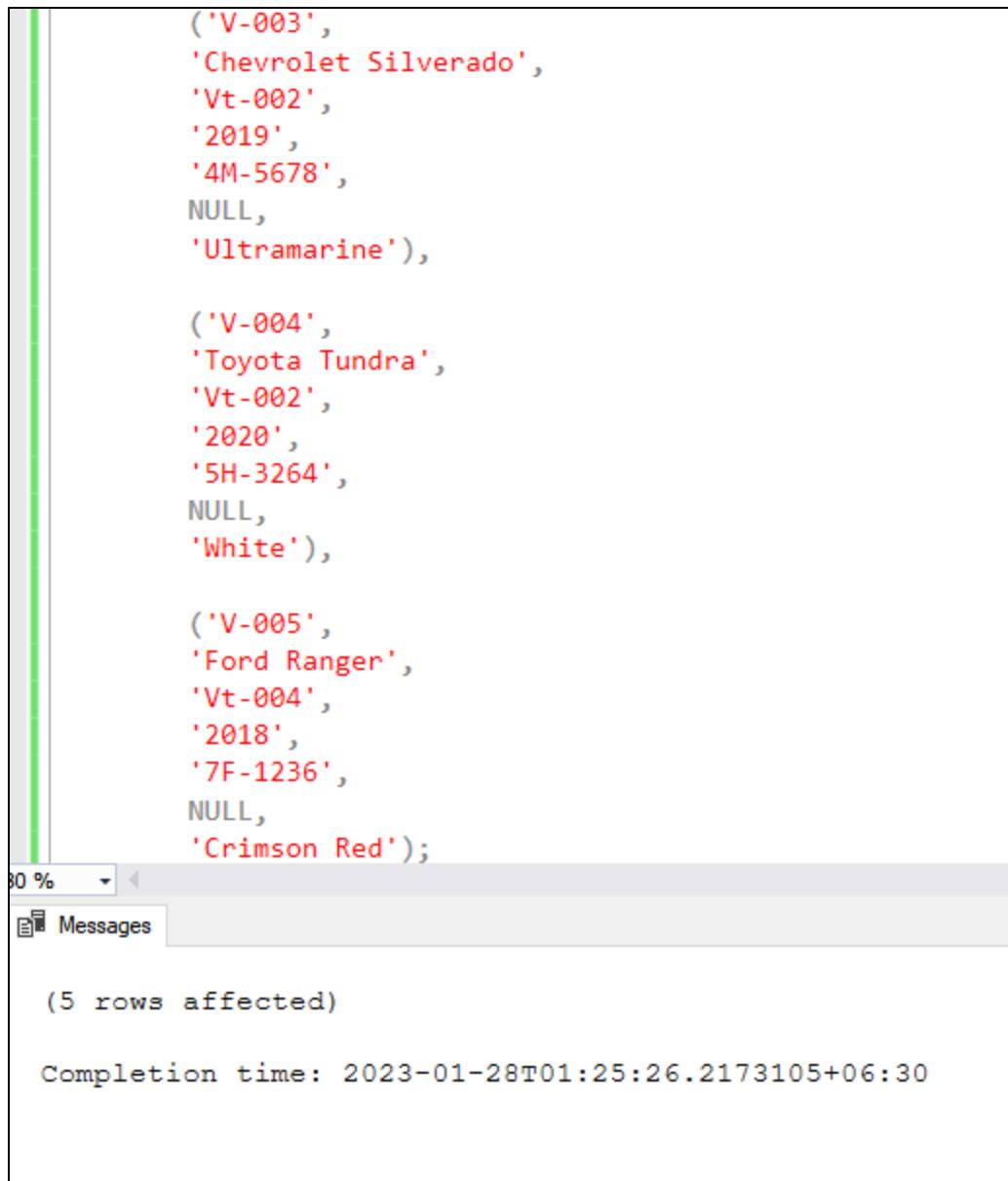
Messages

(5 rows affected)

Completion time: 2023-01-28T01:25:26.2173105+06:30

Figure 74 Insert Query into Vehicles (1)

## Car Service Booking System of AUTOCARE



The screenshot shows a SQL query being executed in a database interface. The query inserts five rows of vehicle data into a table named 'Vehicles'. The columns are represented by question marks in the insert statement. The data includes vehicle IDs (V-003, V-004, V-005), make and model names ('Chevrolet Silverado', 'Toyota Tundra', 'Ford Ranger'), license plate numbers ('4M-5678', '5H-3264', '7F-1236'), and colors ('Ultramarine', 'White', 'Crimson Red'). The query concludes with a semicolon.

```
( 'V-003' ,  
    'Chevrolet Silverado' ,  
    'Vt-002' ,  
    '2019' ,  
    '4M-5678' ,  
    NULL ,  
    'Ultramarine' ),  
  
( 'V-004' ,  
    'Toyota Tundra' ,  
    'Vt-002' ,  
    '2020' ,  
    '5H-3264' ,  
    NULL ,  
    'White' ),  
  
( 'V-005' ,  
    'Ford Ranger' ,  
    'Vt-004' ,  
    '2018' ,  
    '7F-1236' ,  
    NULL ,  
    'Crimson Red' );
```

Messages

(5 rows affected)

Completion time: 2023-01-28T01:25:26.2173105+06:30

Figure 75 Insert Query into Vehicles (2)

#### 5.4.1.8 Insert into Services

```
/* 8. Services */
INSERT INTO Services
    (ServiceID,
     ServiceName,
     ServiceTypeID,
     VehicleTypeID,
     ServiceDescription,
     ServiceDuration,
     ServiceStatus,
     ServicePrice)

VALUES ('S-001',
        'Car Wash for Compacts(Garage)',
        'St-001',
        'Vt-001',
        'Car wash service for Compact cars, Done at our branches garages.',
        '00:30:00',
        'Active',
        5000),

       ('S-002',
        'Car Wash for Mediums(Garage)',
        'St-001',
        'Vt-002',
        'Car wash service for Medium cars, Done at our branches garages.',
        '00:35:00',
        'Active',
        6000),

       ('S-003',
        'Car Wash for Van/SUVs(Garage)',
        'St-001',
        'Vt-003',
        'Car wash service for Van/SUVs, Done at our branches garages.',
        '00:40:00',
        'Active',
        7000);

(18 rows affected)

Completion time: 2023-01-28T01:29:39.4720432+06:30
```

Figure 76 Insert Query into Services (1)

## Car Service Booking System of AUTOCARE

```
\n    ('S-003',\n     'Car Wash for Van/SUVs(Garage)',\n     'St-001',\n     'Vt-003',\n     'Car wash service for Van/SUVs cars, Done at our branches garages.',\n     '00:45:00',\n     'Active',\n     7000),\n\n    ('S-004',\n     'Car Wash for Compact Trucks(Garage)',\n     'St-001',\n     'Vt-004',\n     'Car wash service for Compact Trucks, Done at our branches garages.',\n     '00:45:00',\n     'Active',\n     9000),\n\n    ('S-005',\n     'Car Wash for Compacts(Home)',\n     'St-002',\n     'Vt-001',\n     'Car wash service for Compact cars, Done at your location. Transportation fees added.',\n     '00:45:00',\n     'Active',\n     7000),\n\n    ('S-006',\n     'Car Wash for Mediums(Home)',\n     'St-002',\n     'Vt-002',\n     'Car wash service for Medium cars, Done at your location. Transportation fees added.',\n     '00:50:00',\n     'Active',\n     8000),\n\n(18 rows affected)\nCompletion time: 2023-01-28T01:29:39.4720432+06:30
```

Figure 77 Insert Query into Services (2)

## Car Service Booking System of AUTOCARE

```
('S-007',
'Car Wash for Van/Suvs(Home)',
'St-002',
'Vt-003',
'Car wash service for Van/SUVs cars, Done at your location. Transportation fees added.',
'1:00:00',
'Active',
9000),  
  
('S-008',
'Car Wash for Compact Trucks(Home)',
'St-002',
'Vt-004',
'Car wash service for Compact Trucks, Done at your location. Transportation fees added.',
'1:10:00',
'Temporarily paused',
11000),  
  
('S-009',
'Car Polish for Compact(Garage)',
'St-001',
'Vt-001',
'Car polish service for Compact cars, Done at our branches garages.',
'1:30:00',
'Active',
13000),  
  
('S-010',
'Car Polish for Medium(Garage)',
'St-001',
'Vt-002',
'Car polish service for Medium cars, Done at our branches garages.',
'1:35:00',
'Active',
14000),  
  
('S-011',
'Car Polish for Van/SUVs(Garage)',
'St-001',
'Vt-003',
'Car polish service for Vans/SUVs cars, Done at our branches garages.',
'2:00:00',
'Active',
16000),
```

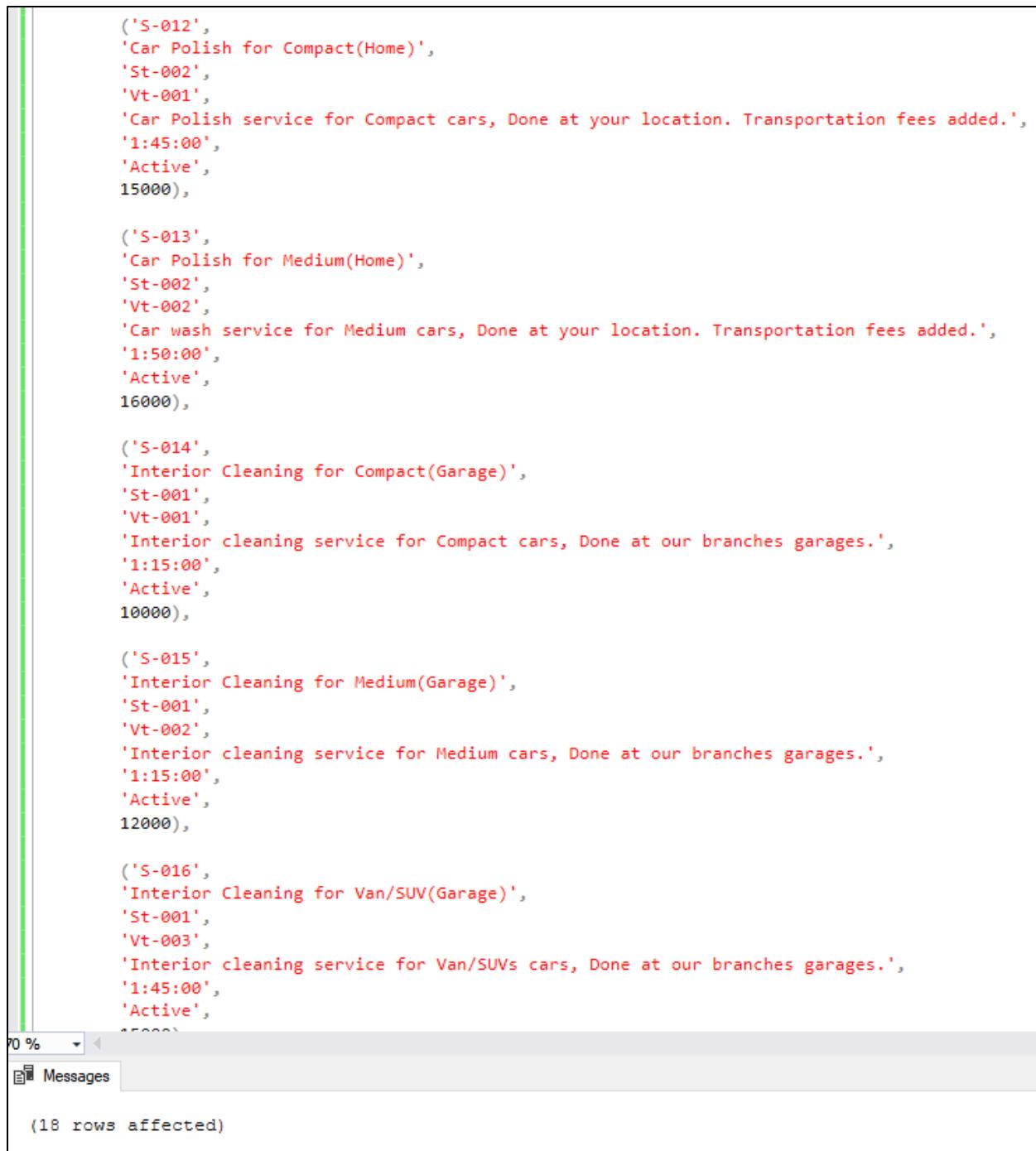
70 %

Messages

(18 rows affected)

Figure 78 Insert Query into Services (3)

## Car Service Booking System of AUTOCARE



The screenshot shows a SQL query being executed in a database environment. The query inserts six service records into a table. Each record includes a service ID (S-012 to S-017), a description, two service types (St-001 or St-002, Vt-001 or Vt-002), a detailed description, a duration, an active status, and a price.

```
('S-012',
'Car Polish for Compact(Home)',
'St-002',
'Vt-001',
'Car Polish service for Compact cars, Done at your location. Transportation fees added.',
'1:45:00',
'Active',
15000),

('S-013',
'Car Polish for Medium(Home)',
'St-002',
'Vt-002',
'Car wash service for Medium cars, Done at your location. Transportation fees added.',
'1:50:00',
'Active',
16000),

('S-014',
'Interior Cleaning for Compact(Garage)',
'St-001',
'Vt-001',
'Interior cleaning service for Compact cars, Done at our branches garages.',
'1:15:00',
'Active',
10000),

('S-015',
'Interior Cleaning for Medium(Garage)',
'St-001',
'Vt-002',
'Interior cleaning service for Medium cars, Done at our branches garages.',
'1:15:00',
'Active',
12000),

('S-016',
'Interior Cleaning for Van/SUV(Garage)',
'St-001',
'Vt-003',
'Interior cleaning service for Van/SUVs cars, Done at our branches garages.',
'1:45:00',
'Active',
15000)
```

Messages: (18 rows affected)

Figure 79 Insert Query into Services (4)

## Car Service Booking System of AUTOCARE

The screenshot shows a SQL query execution window with the following content:

```
( 'S-016',
  'Interior Cleaning for Van/SUV(Garage)' ,
  'St-001' ,
  'Vt-003' ,
  'Interior cleaning service for Van/SUVs cars, Done at our branches garages.' ,
  '1:45:00' ,
  'Active' ,
  15000) ,  
  
( 'S-017',
  '3D wheel alignment for Compact(Garage)' ,
  'St-001' ,
  'Vt-001' ,
  '3D wheel alignment service for Compact cars, Done at our branches garages.' ,
  '1:00:00' ,
  'Active' ,
  20000) ,  
  
( 'S-018',
  '3D wheel alignment for Medium(Garage)' ,
  'St-001' ,
  'Vt-001' ,
  '3D wheel alignment service for Medium cars, Done at our branches garages.' ,
  '1:00:00' ,
  'Active' ,
  20000);
```

Messages

(18 rows affected)

Completion time: 2023-01-28T01:29:39.4720432+06:30

Figure 80 Insert Query into Services (5)

#### 5.4.1.9 Insert into VehicleTypeServices

```
/* 9. VehicleTypeServices */
=INSERT INTO VehicleTypeServices
    (ServiceID,
     VehicleTypeID)

VALUES ('S-001',
        'Vt-001'),

       ('S-002',
        'Vt-002'),

       ('S-003',
        'Vt-003'),

       ('S-004',
        'Vt-004'),

       ('S-005',
        'Vt-001'),

       ('S-006',
        'Vt-002'),

       ('S-007',
        'Vt-003'),

       ('S-008',
        'Vt-004'),

       ('S-009',
        'Vt-001'),

       ('S-010',
        'Vt-002'),

       ('S-011',
        'Vt-003'),

       ('S-012',
```

70 % ▾

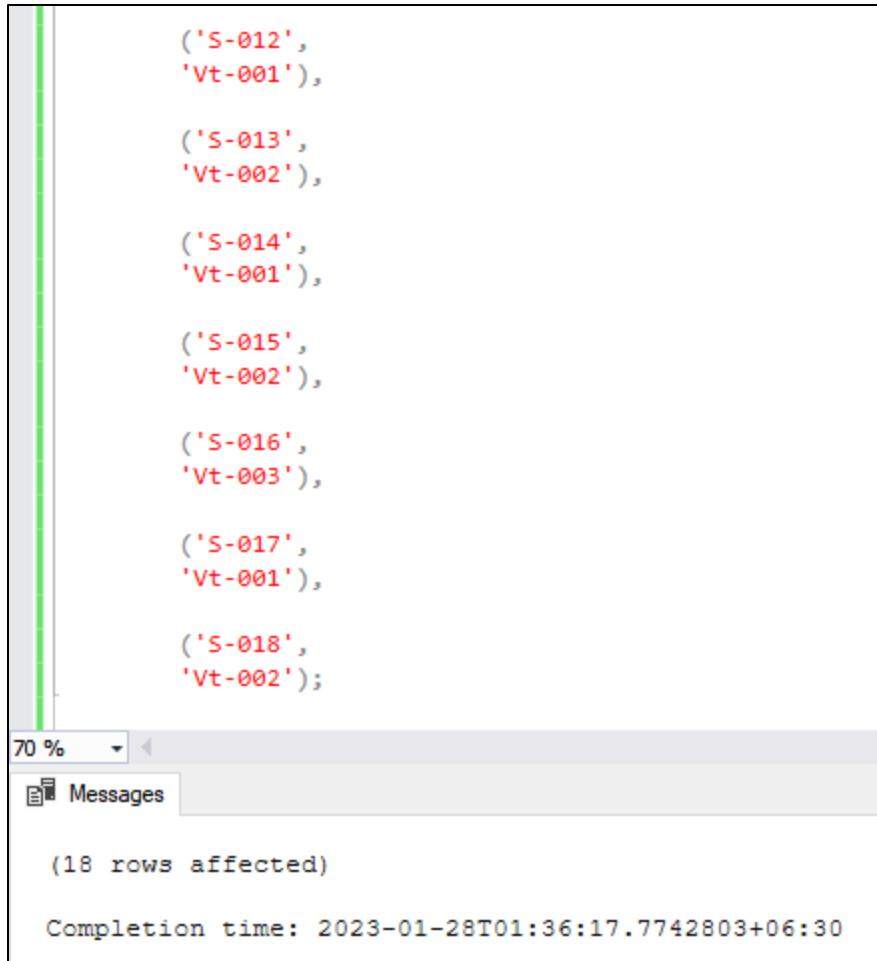
Messages

(18 rows affected)

Completion time: 2023-01-28T01:36:17.7742803+06:30

Figure 81 Insert Query into VehicleTypeServices (1)

## Car Service Booking System of AUTOCARE



The screenshot shows a database query execution window. The main area contains an SQL insert query:

```
( 'S-012' ,  
  'Vt-001' ),  
  
 ( 'S-013' ,  
  'Vt-002' ),  
  
 ( 'S-014' ,  
  'Vt-001' ),  
  
 ( 'S-015' ,  
  'Vt-002' ),  
  
 ( 'S-016' ,  
  'Vt-003' ),  
  
 ( 'S-017' ,  
  'Vt-001' ),  
  
 ( 'S-018' ,  
  'Vt-002' );
```

Below the query, the message pane shows:

70 % ▶ Messages  
(18 rows affected)  
Completion time: 2023-01-28T01:36:17.7742803+06:30

Figure 82 Insert Query into VehicleTypeServices (2)

#### 5.4.1.10 Insert into GarageSpaces

The image shows two side-by-side Oracle SQL Developer windows. Both windows have a green vertical bar on the left and a progress bar at the bottom labeled '50 %'.

**Left Window:**

```

/* 10. GarageSpaces */
INSERT INTO GarageSpaces
    (GarageSpaceID,
     BranchID,
     GarageSpaceNumber,
     GarageSpaceStatus)
VALUES ('Gs-001',
       'Br-001',
       '1',
       'Taken'),
       ('Gs-002',
       'Br-001',
       '2',
       'Free'),
       ('Gs-003',
       'Br-001',
       '3',
       'Free'),
       ('Gs-004',
       'Br-001',
       '4',
       'Free'),
       ('Gs-005',
       'Br-001',
       '5',
       'Free'),
       ('Gs-006',
       'Br-001',
       '6',
       'Free'),
       ('Gs-007',
       'Br-001',
       '7',
       'Free'),
       ('Gs-008',
       'Br-001',
       '8',
       'Free'),
       ('Gs-009',
       'Br-001',
       '9',
       'Free'),
       ('Gs-010',
       'Br-001',
       '10',
       'Free'),
       ('Gs-011',
       'Br-001',
       '11',
       'Free'),
       ('Gs-012',
       'Br-001',
       '12',
       'Free'),
       ('Gs-013',
       'Br-001',
       '13',
       'Free'),
       ('Gs-014',
       'Br-001',
       '14',
       'Free'),
       ('Gs-015',
       'Br-001',
       '15',
       'Free'),
       ('Gs-016',
       'Br-002',
       '1',
       'Taken'),
       ('Gs-017',
       'Br-002',
       '2',
       'Free'),
       ('Gs-018',
       'Br-002',
       '3',
       'Free'),
       ('Gs-019',
       'Br-002',
       '4',
       'Free'),
       ('Gs-020',
       'Br-002',
       '5',
       'Free'),
       ('Gs-021',
       'Br-002',
       '6',
       'Free'),
       ('Gs-022',
       'Br-002',
       '7',
       'Free'),
       ('Gs-023',
       'Br-002',
       '8',
       'Free')
  
```

**Right Window:**

```

/* 10. GarageSpaces */
INSERT INTO GarageSpaces
    (GarageSpaceID,
     BranchID,
     GarageSpaceNumber,
     GarageSpaceStatus)
VALUES ('Gs-001',
       'Br-001',
       '1',
       'Taken'),
       ('Gs-002',
       'Br-001',
       '2',
       'Free'),
       ('Gs-003',
       'Br-001',
       '3',
       'Free'),
       ('Gs-004',
       'Br-001',
       '4',
       'Free'),
       ('Gs-005',
       'Br-001',
       '5',
       'Free'),
       ('Gs-006',
       'Br-001',
       '6',
       'Free'),
       ('Gs-007',
       'Br-001',
       '7',
       'Free'),
       ('Gs-008',
       'Br-001',
       '8',
       'Free'),
       ('Gs-009',
       'Br-001',
       '9',
       'Free'),
       ('Gs-010',
       'Br-001',
       '10',
       'Free'),
       ('Gs-011',
       'Br-001',
       '11',
       'Free'),
       ('Gs-012',
       'Br-001',
       '12',
       'Free'),
       ('Gs-013',
       'Br-001',
       '13',
       'Free'),
       ('Gs-014',
       'Br-001',
       '14',
       'Free'),
       ('Gs-015',
       'Br-001',
       '15',
       'Free'),
       ('Gs-016',
       'Br-002',
       '1',
       'Taken'),
       ('Gs-017',
       'Br-002',
       '2',
       'Free'),
       ('Gs-018',
       'Br-002',
       '3',
       'Free'),
       ('Gs-019',
       'Br-002',
       '4',
       'Free'),
       ('Gs-020',
       'Br-002',
       '5',
       'Free'),
       ('Gs-021',
       'Br-002',
       '6',
       'Free'),
       ('Gs-022',
       'Br-002',
       '7',
       'Free'),
       ('Gs-023',
       'Br-002',
       '8',
       'Free')
  
```

Both windows show the same execution results:

- Messages: (45 rows affected)
- Completion time: 2023-01-28T01:39:01.2863076+06:30

Figure 83 Insert Query into GarageSpaces (1)

## Car Service Booking System of AUTOCARE

```

'Br-002',
'8',
'Free'),

('Gs-024',
'Br-002',
'9',
'Free'),

('Gs-025',
'Br-002',
'10',
'Free'),

('Gs-026',
'Br-002',
'11',
'Free'),

('Gs-027',
'Br-002',
'12',
'Free'),

('Gs-028',
'Br-002',
'13',
'Free'),

('Gs-029',
'Br-002',
'14',
'Free'),

('Gs-030',
'Br-002',
'15',
'Free'),

('Gs-031',
'Br-003',
'1',
'Free'),

('Gs-032',
'Br-003',
'2',
'Free'),

('Gs-033',
'Br-003',
'3',
'Free'),

('Gs-034',
'Br-003',
'4',
'Free'),

('Gs-035',
'Br-003',
'5',
'Free'),

('Gs-036',
'Br-003',
'6',
'Free'),

('Gs-037',
'Br-003',
'7',
'Free'),

('Gs-038',
'Br-003',
'8',
'Free'),

('Gs-039',
'Br-003',
'9',
'Free'),

('Gs-040',
'Br-003',
'10',
'Free'),

('Gs-041',
'Br-003',
'11',
'Free'),

('Gs-042',
'Br-003',
'12',
'Free'),

('Gs-043',
'Br-003',
'13',
'Free'),

('Gs-044',
'Br-003',
'14',
'Free'),

('Gs-045',
'Br-003',
'15',
'Free');

SELECT * FROM GarageSpaces;

```

50 % ▾ Messages (45 rows affected) Completion time: 2023-01-28T01:39:01.2863076+06:30

50 % ▾ Messages (45 rows affected) Completion time: 2023-01-28T01:39:01.2863076+06:30

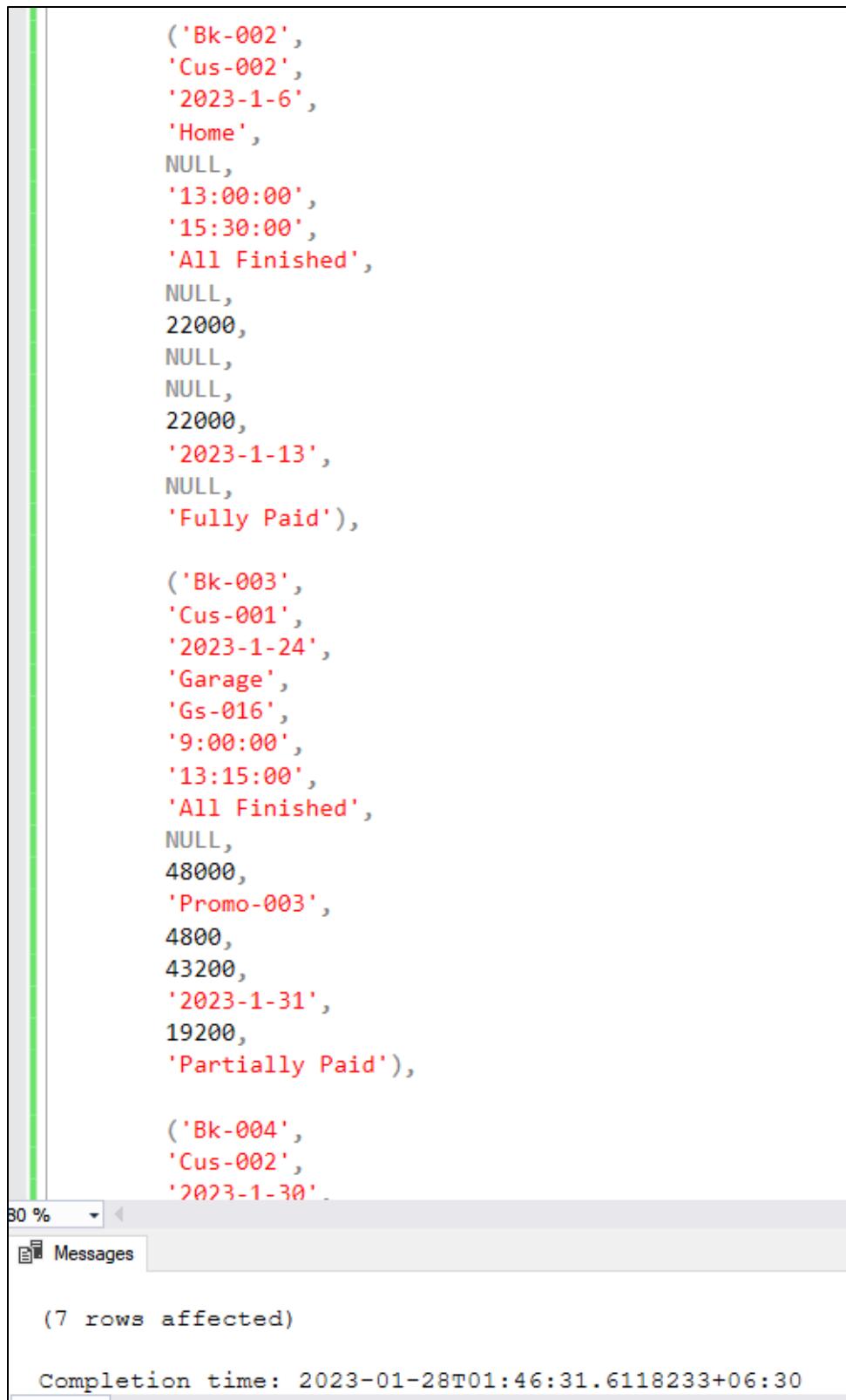
Figure 84 Insert Query into GarageSpaces (2)

#### 5.4.1.11 Insert into Bookings

```
/* 11. Bookings */
INSERT INTO Bookings
(BookingID,
CustomerID,
BookingDate,
ServedLocation,
GarageSpaceID,
BookingStartTime,
BookingEndTime,
BookingStatus,
CancellationReason,
TotalCosts,
PromotionID,
PromotionDiscountAmount,
NetCosts,
PaymentDueDate,
RemainingAmount,
PaymentStatus)

VALUES ('Bk-001',
'Cus-001',
'2022-12-25',
'Garage',
'Gs-001',
'10:00:00',
'13:00:00',
'All Finished',
NULL,
38000,
'Promo-001',
3800,
34200,
'2023-2-1',
NULL,
'Fully Paid'),  
('Bk-002')  
  
(7 rows affected)  
  
Completion time: 2023-01-28T01:46:31.6118233+06:30
```

Figure 85 Insert Query into Bookings (1)



The screenshot shows a SQL query being executed in a database environment. The query consists of three separate INSERT statements for the 'Bookings' table. Each statement includes columns for booking ID, customer ID, service date, location, start time, end time, status, duration, discount code, discount amount, total amount, and payment status.

```
( 'Bk-002',
  'Cus-002',
  '2023-1-6',
  'Home',
  NULL,
  '13:00:00',
  '15:30:00',
  'All Finished',
  NULL,
  22000,
  NULL,
  NULL,
  22000,
  '2023-1-13',
  NULL,
  'Fully Paid'),  
  
( 'Bk-003',
  'Cus-001',
  '2023-1-24',
  'Garage',
  'Gs-016',
  '9:00:00',
  '13:15:00',
  'All Finished',
  NULL,
  48000,
  'Promo-003',
  4800,
  43200,
  '2023-1-31',
  19200,
  'Partially Paid'),  
  
( 'Bk-004',
  'Cus-002',
  '2023-1-30' )
```

(7 rows affected)

Completion time: 2023-01-28T01:46:31.6118233+06:30

Figure 86 Insert Query into Bookings (2)

## Car Service Booking System of AUTOCARE

```
'Cus-002',
'2023-1-30',
'Garage',
NULL,
'13:00:00',
'16:45:00',
'Pending',
NULL,
31000,
'Promo-003',
3100,
27900,
'2023-2-6',
27900,
'No Payment Made'),  
  
('Bk-005',
'Cus-001',
'2023-1-31',
'Home',
NULL,
'10:00:00',
'11:00:00',
'Accepted',
NULL,
9000,
NULL,
NULL,
9000,
'2023-2-7',
NULL,
'Fully Paid'),  
  
('Bk-006',
'Cus-003',
'2023-1-27',
'Garage',
'Gs-002').  
Completion time: 2023-01-28T01:46:31.6118233+06:30
```

Figure 87 Insert Query into Bookings (3)

## Car Service Booking System of AUTOCARE

```
( 'Bk-006',
'Cus-003',
'2023-1-27',
'Garage',
'Gs-002',
'9:00:00',
'11:10:00',
'Work In Progress',
NULL,
20000,
NULL,
NULL,
20000,
'2023-2-3',
NULL,
'Fully Paid'),  
  
( 'Bk-007',
'Cus-005',
'2023-1-15',
'Garage',
'Gs-003',
'10:00:00',
'12:00:00',
'All Finished',
NULL,
20000,
NULL,
NULL,
20000,
'2023-1-22',
NULL,
'Fully Paid');  
  
0 % < >  
Messages  
  
(7 rows affected)  
  
Completion time: 2023-01-28T01:46:31.6118233+06:30
```

Figure 88 Insert Query into Bookings (4)

#### 5.4.1.12 Insert into BookedServices

```
/* 12. BookedServices */
INSERT INTO BookedServices
    (BookingID,
     ServiceID)

VALUES ('Bk-001',
       'S-001'),

       ('Bk-001',
       'S-009'),

       ('Bk-001',
       'S-017'),

       ('Bk-002',
       'S-005'),

       ('Bk-002',
       'S-012'),

       ('Bk-003',
       'S-001'),

       ('Bk-003',
       'S-009'),

       ('Bk-003',
       'S-014'),

       ('Bk-003',
       'S-017'),

       ('Bk-004',
       'S-011'),

       ('Bk-004',
       'S-016')

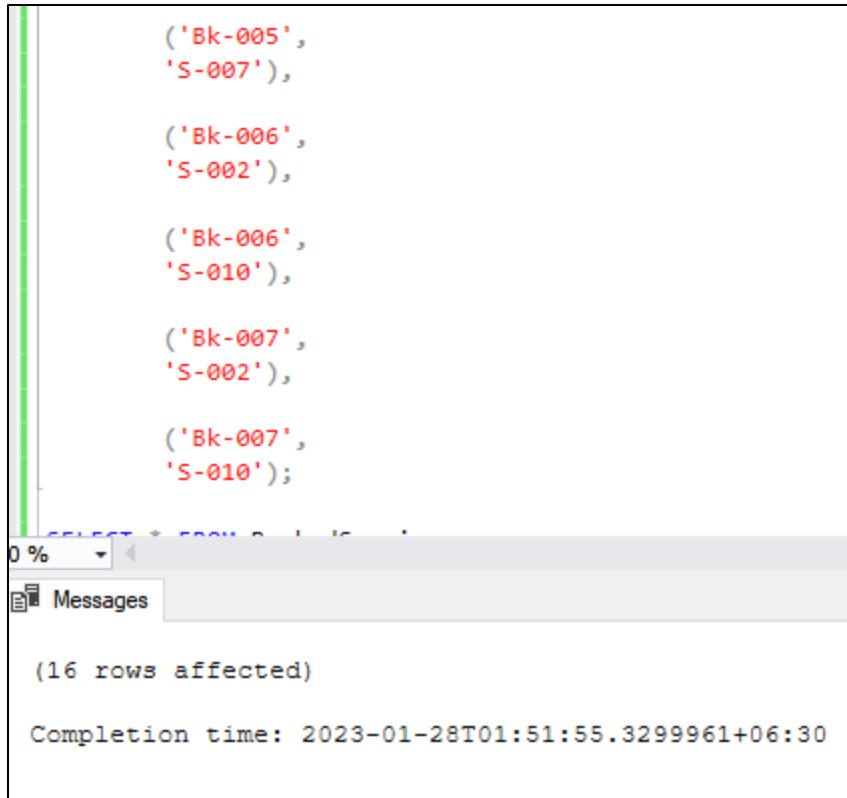
70 % < Messages

(16 rows affected)

Completion time: 2023-01-28T01:51:55.3299961+06:30
```

Figure 89 Insert Query into BookedServices (1)

## Car Service Booking System of AUTOCARE



The screenshot shows a database interface with a query window containing the following SQL code:

```
( 'Bk-005' ,  
  'S-007' ),  
  
( 'Bk-006' ,  
  'S-002' ),  
  
( 'Bk-006' ,  
  'S-010' ),  
  
( 'Bk-007' ,  
  'S-002' ),  
  
( 'Bk-007' ,  
  'S-010' );
```

Below the query window, the status bar displays:

0 % Messages (16 rows affected)  
Completion time: 2023-01-28T01:51:55.3299961+06:30

Figure 90 Insert Query into BookedServices (2)

#### 5.4.1.13 Insert into Payments

```
/* 13. Payments */
INSERT INTO Payments
    (PaymentID,
     BookingID,
     PaymentDate,
     PaymentType,
     PaymentMethod,
     PaymentAmount)

VALUES  ('Pay-001',
        'Bk-001',
        '2022-12-25',
        'Full',
        'CB Pay',
        34200),

        ('Pay-002',
        'Bk-002',
        '2023-1-6',
        'Full',
        'Cash',
        22000),

        ('Pay-003',
        'Bk-003',
        '2023-1-25',
        'Partial',
        'CB Pay',
        24000),

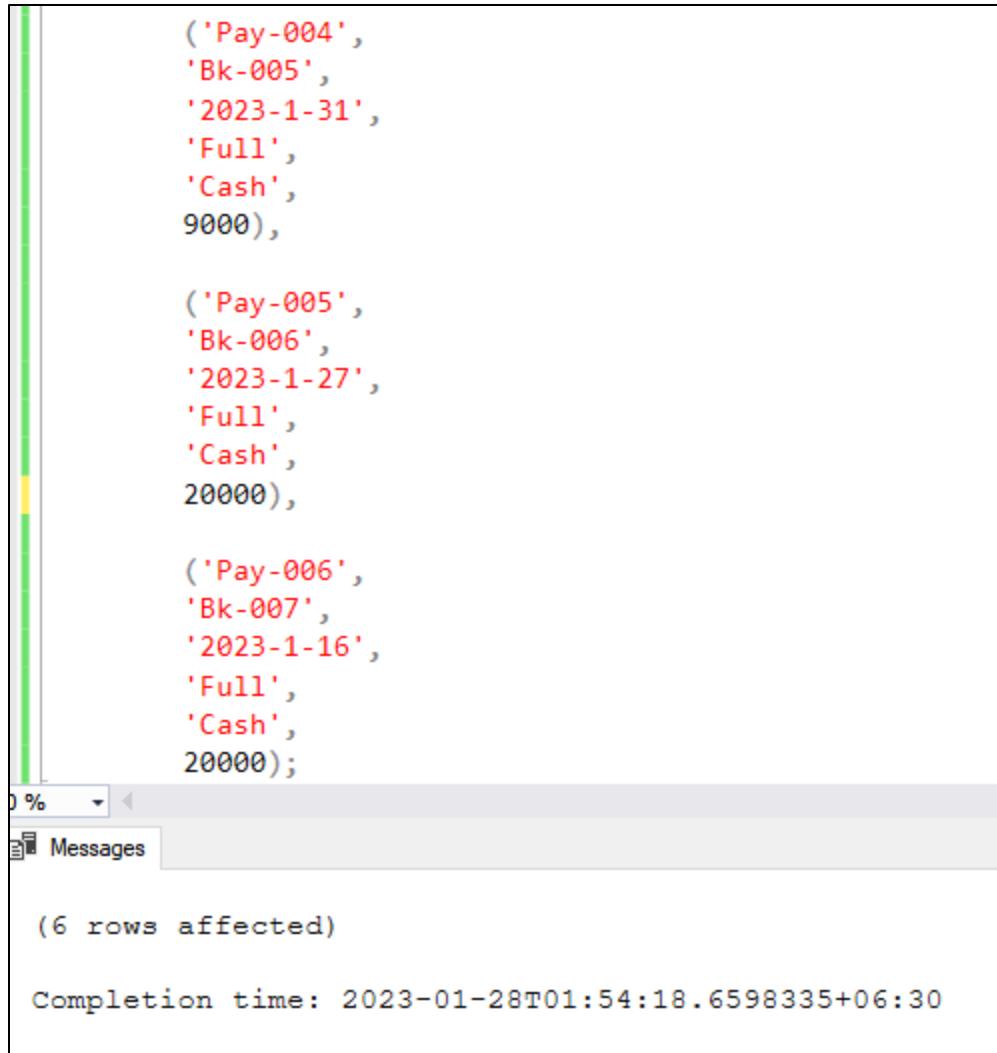
        ('Pay-004',
        'Bk-005',
        '2023-1-31',
        'Full',
        null,
        null)

(6 rows affected)

Completion time: 2023-01-28T01:54:18.6598335+06:30
```

Figure 91 Insert Query into Payments (1)

## Car Service Booking System of AUTOCARE



The screenshot shows a MySQL command-line interface window. The query being run is:

```
( 'Pay-004' ,  
  'Bk-005' ,  
  '2023-1-31' ,  
  'Full' ,  
  'Cash' ,  
  9000) ,  
  
( 'Pay-005' ,  
  'Bk-006' ,  
  '2023-1-27' ,  
  'Full' ,  
  'Cash' ,  
  20000) ,  
  
( 'Pay-006' ,  
  'Bk-007' ,  
  '2023-1-16' ,  
  'Full' ,  
  'Cash' ,  
  20000);
```

Below the query, the output shows:

0 % < Messages  
( 6 rows affected)  
Completion time: 2023-01-28T01:54:18.6598335+06:30

Figure 92 Insert Query into Payments (2)

#### 5.4.1.14 Insert into Ratings

```
/* 14. Ratings */
INSERT INTO Ratings
    (RatingID,
     CustomerID,
     ServiceID,
     RatingAmount,
     RatingDate)

VALUES ('Rt-001',
        'Cus-001',
        'S-001',
        5,
        '2022-12-26'),

       ('Rt-002',
        'Cus-001',
        'S-009',
        4,
        '2022-12-26'),

       ('Rt-003',
        'Cus-001',
        'S-017',
        4,
        '2022-12-26'),

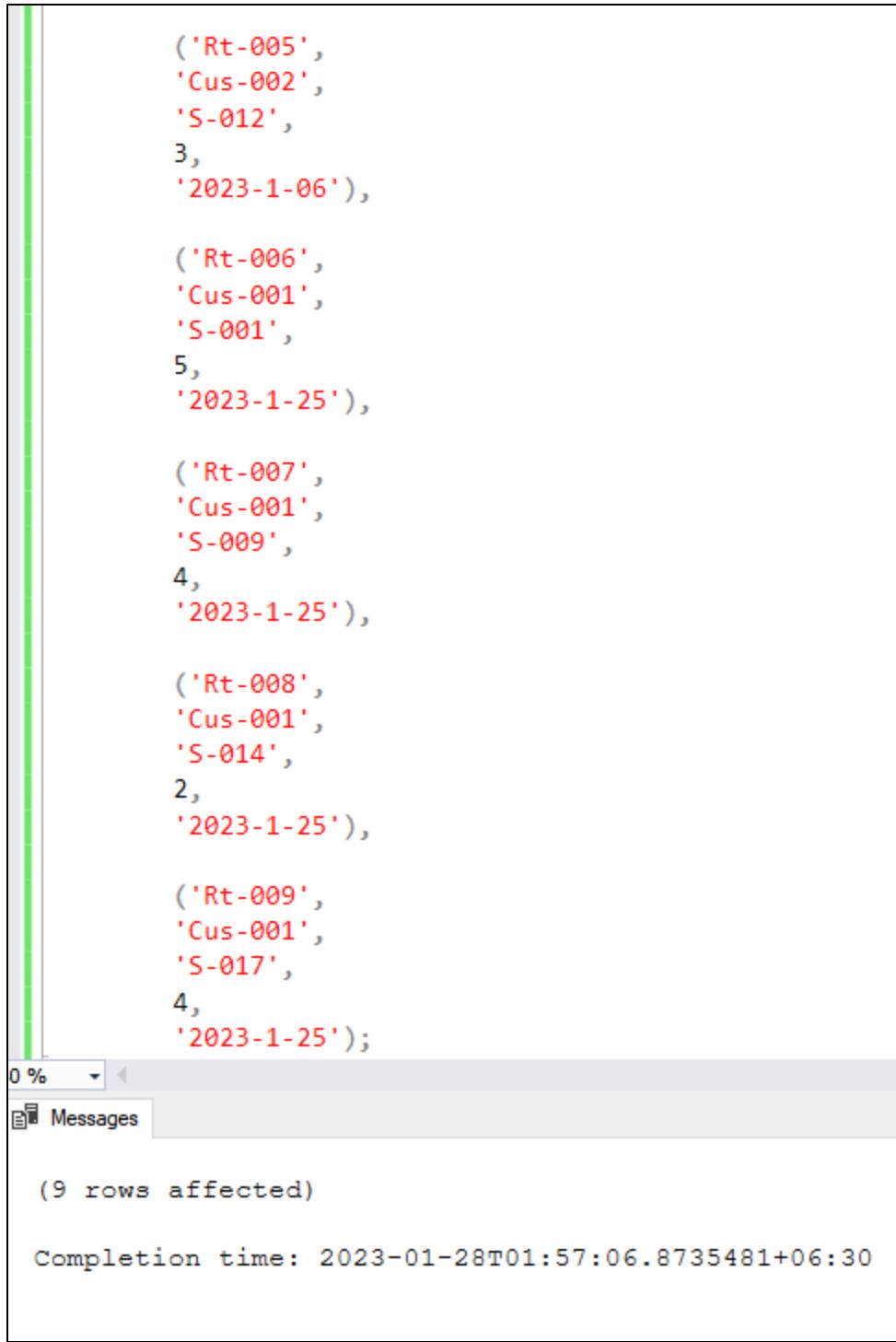
       ('Rt-004',
        'Cus-002',
        'S-005',
        5,
        '2023-1-06'),


(9 rows affected)

Completion time: 2023-01-28T01:57:06.8735481+06:30
```

Figure 93 Insert Query into Ratings (1)

## Car Service Booking System of AUTOCARE



The screenshot shows a database terminal window with a green vertical scrollbar on the left. The main area contains an SQL insert statement for a 'Ratings' table. The statement consists of six separate insert tuples, each with five fields: service ID ('Rt-005' through 'Rt-009'), customer ID ('Cus-002' through 'Cus-001'), vehicle ID ('S-012' through 'S-017'), rating value (3, 5, 4, 2, 4), and a timestamp ('2023-1-06', '2023-1-25', '2023-1-25', '2023-1-25', '2023-1-25'). The statement concludes with a semicolon. Below the SQL statement, the terminal displays '(9 rows affected)' and the completion time 'Completion time: 2023-01-28T01:57:06.8735481+06:30'. At the bottom left, there is a progress bar at 0% and a 'Messages' tab.

```
( 'Rt-005',
  'Cus-002',
  'S-012',
  3,
  '2023-1-06'),

( 'Rt-006',
  'Cus-001',
  'S-001',
  5,
  '2023-1-25'),

( 'Rt-007',
  'Cus-001',
  'S-009',
  4,
  '2023-1-25'),

( 'Rt-008',
  'Cus-001',
  'S-014',
  2,
  '2023-1-25'),

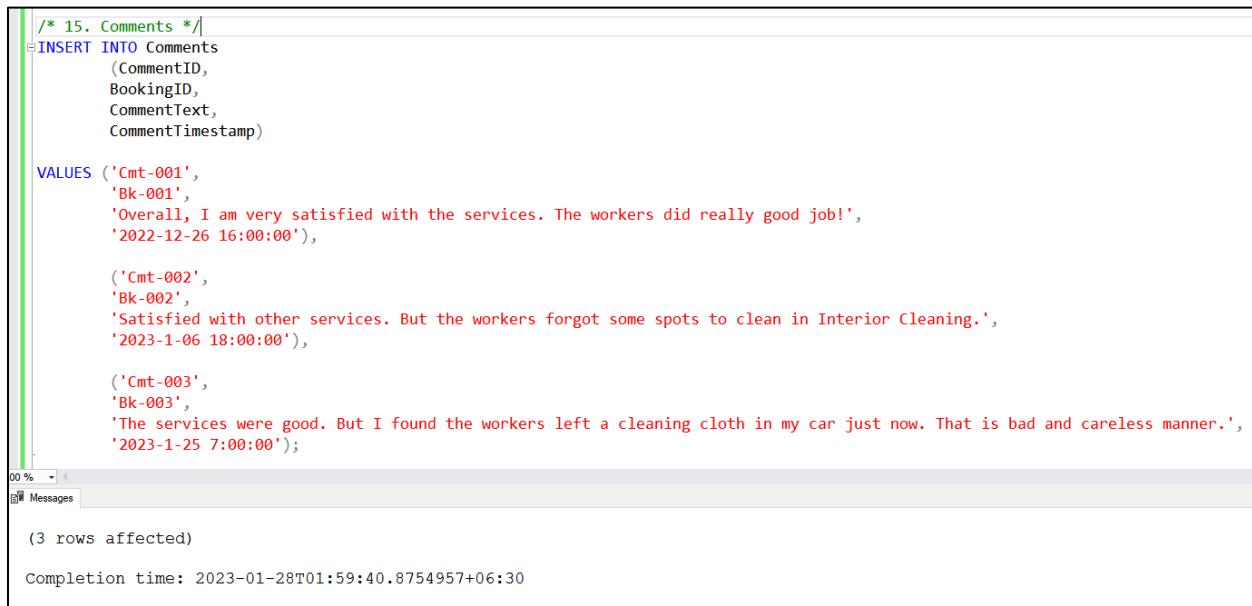
( 'Rt-009',
  'Cus-001',
  'S-017',
  4,
  '2023-1-25);

(9 rows affected)

Completion time: 2023-01-28T01:57:06.8735481+06:30
```

Figure 94 Insert into Ratings (2)

#### 5.4.1.15 Insert into Comments



```
/* 15. Comments */
INSERT INTO Comments
(CommentID,
BookingID,
CommentText,
CommentTimestamp)

VALUES ('Cmt-001',
'Bk-001',
'Overall, I am very satisfied with the services. The workers did really good job!',
'2022-12-26 16:00:00'),

('Cmt-002',
'Bk-002',
'Satisfied with other services. But the workers forgot some spots to clean in Interior Cleaning.',
'2023-1-06 18:00:00'),

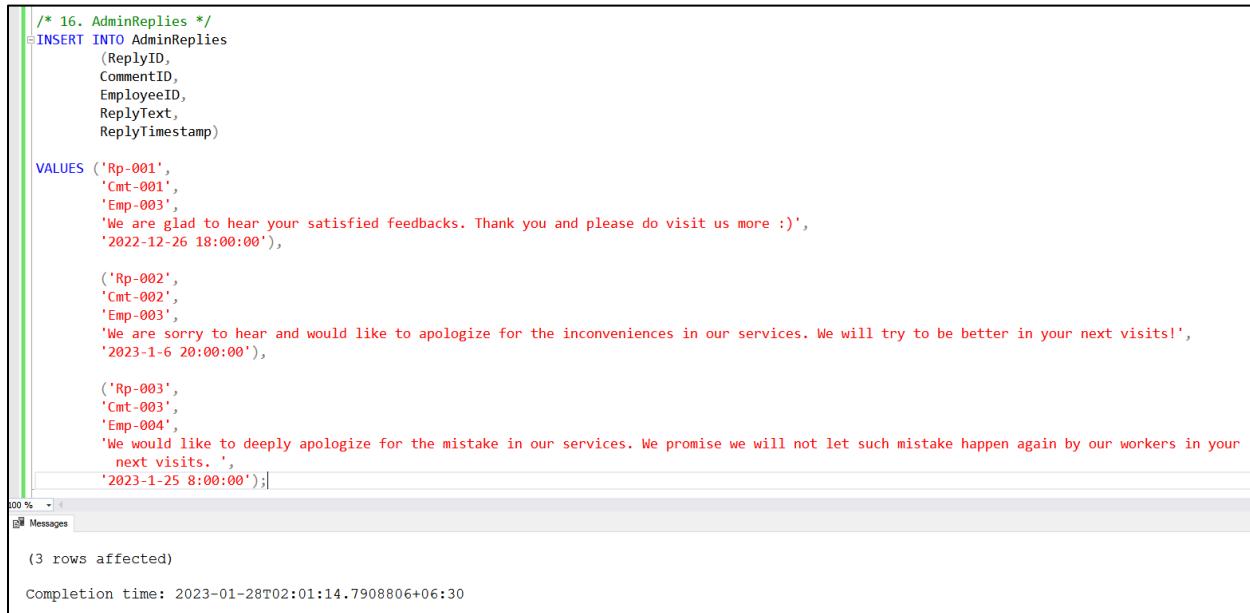
('Cmt-003',
'Bk-003',
'The services were good. But I found the workers left a cleaning cloth in my car just now. That is bad and careless manner.',
'2023-1-25 7:00:00');

(3 rows affected)
```

Completion time: 2023-01-28T01:59:40.8754957+06:30

Figure 95 Insert Query into Comments

#### 5.4.1.16 Insert into AdminReplies



```
/* 16. AdminReplies */
INSERT INTO AdminReplies
(ReplyID,
CommentID,
EmployeeID,
ReplyText,
ReplyTimestamp)

VALUES ('Rp-001',
'Cmt-001',
'Emp-003',
'We are glad to hear your satisfied feedbacks. Thank you and please do visit us more :)',
'2022-12-26 18:00:00'),

('Rp-002',
'Cmt-002',
'Emp-003',
'We are sorry to hear and would like to apologize for the inconveniences in our services. We will try to be better in your next visits!',
'2023-1-6 20:00:00'),

('Rp-003',
'Cmt-003',
'Emp-004',
'We would like to deeply apologize for the mistake in our services. We promise we will not let such mistake happen again by our workers in your next visits. ',
'2023-1-25 8:00:00');
```

100 % ↴ ↵ Messages

(3 rows affected)

Completion time: 2023-01-28T02:01:14.7908806+06:30

Figure 96 Insert Query into AdminReplies

#### 5.4.1.17 View customer lists without passwords

The screenshot shows a SQL query window in SSMS. The query is:

```
/*Customers*/
/* View customer lists w/o passwords */
SELECT CustomerID, CustomerName, CustomerEmail, CustomerPhone, CustomerAddress
FROM Customers;
```

The results pane displays a table with 5 rows of customer data:

	CustomerID	CustomerName	CustomerEmail	CustomerPhone	CustomerAddress
1	Cus-001	CiCi289	Cihtinaung289.cha@gmail.com	09798457867	No.15/201, ATP street, MGTN Township, Yangon.
2	Cus-002	U Aung Aung	AungAung183@gmail.com	09572426746	No.34/G, 124th street, MGTN Township, Yangon.
3	Cus-003	Kyaw Thet	KyawT.KT123@gmail.com	09798356246	No.20/ 201, Sapal street, AL Township, Yangon.
4	Cus-004	U Aung Min Thein	AungMT.235@gmail.com	095188325	No.124/ 301, 51st street, BTH Township, Yangon.
5	Cus-005	Ko Kan Kaung	KKKLucky.123@gmail.com	09756835626	No.9/ 501, 140th street, TM Township, Yangon.

Figure 97 Query to view customer lists without passwords

#### 5.4.1.18 Update specific customer's information

The screenshot shows a SQL query window in SSMS. The query is:

```
/* Update specific customer information */
UPDATE Customers
SET CustomerPhone = '09756970487'
WHERE CustomerID = 'Cus-001';
```

The results pane shows the output of the update query:

(1 row affected)

Completion time: 2023-01-28T02:08:34.6394689+06:30

Figure 98 Query to Update specific customer's information

#### 5.4.1.19 Generate report on most frequently visited customers within 2 months

```

/*
Generate report on most frequently visited customers within 2 months
*/
SELECT C.CustomerName, COUNT(B.CustomerID) as 'Frequency of Visit'
FROM Bookings as B
JOIN Customers as C ON B.CustomerID = C.CustomerID
WHERE B.BookingDate BETWEEN '2022-12-1' AND '2023-1-31'
GROUP BY C.CustomerName
ORDER BY COUNT(B.CustomerID) DESC;

```

The screenshot shows an SQL query in the top pane and its results in the bottom pane. The results table has two columns: CustomerName and Frequency of Visit. The data is as follows:

	CustomerName	Frequency of Visit
1	CiCi289	3
2	U Aung Aung	2
3	Ko Kan Kaung	1
4	Kyaw Thet	1

Figure 99 Query to Generate report on most frequently visited customers within 2 months

#### 5.4.1.20 Generate report on Top 3 spending customers of the month

```

/*
Generate report on Top 3 most spending customer of the month
*/
SELECT TOP 3 C.CustomerName, SUM(B.NetCosts) as 'Total Spendings'
FROM Bookings as B
JOIN Customers as C ON B.CustomerID = C.CustomerID
WHERE B.BookingDate BETWEEN '2023-1-1' AND '2023-1-31'
GROUP BY C.CustomerName
ORDER BY SUM(B.NetCosts) DESC;

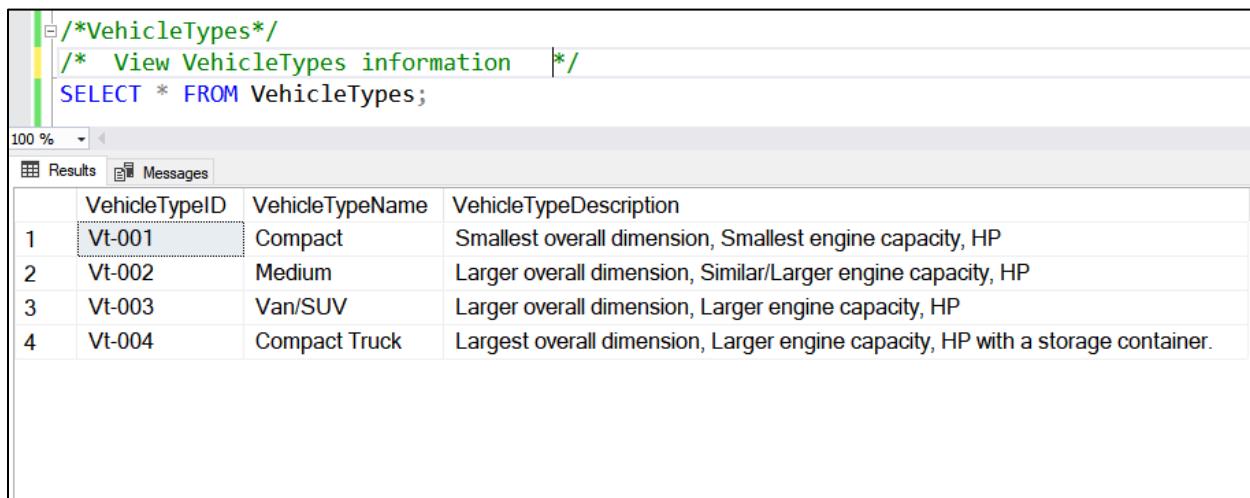
```

The screenshot shows an SQL query in the top pane and its results in the bottom pane. The results table has two columns: CustomerName and Total Spendings. The data is as follows:

	CustomerName	Total Spendings
1	CiCi289	52200.00
2	U Aung Aung	49900.00
3	Kyaw Thet	20000.00

Figure 100 Query to Generate report on Top 3 spending customers of the month

#### 5.4.1.21 View VehicleTypes information

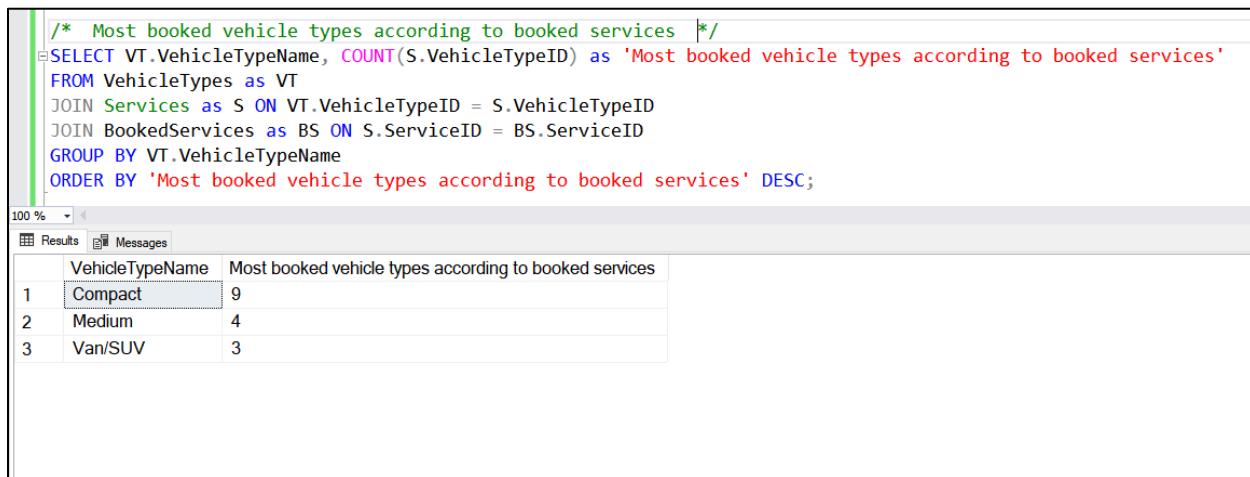


```
/*VehicleTypes*/
/* View VehicleTypes information */
SELECT * FROM VehicleTypes;
```

	VehicleTypeID	VehicleTypeName	VehicleTypeDescription
1	Vt-001	Compact	Smallest overall dimension, Smallest engine capacity, HP
2	Vt-002	Medium	Larger overall dimension, Similar/Larger engine capacity, HP
3	Vt-003	Van/SUV	Larger overall dimension, Larger engine capacity, HP
4	Vt-004	Compact Truck	Largest overall dimension, Larger engine capacity, HP with a storage container.

Figure 101 Query to View VehicleTypes information

#### 5.4.1.22 Most booked vehicle types according to Booked services



```
/* Most booked vehicle types according to booked services */
SELECT VT.VehicleTypeName, COUNT(S.VehicleTypeID) as 'Most booked vehicle types according to booked services'
FROM VehicleTypes as VT
JOIN Services as S ON VT.VehicleTypeID = S.VehicleTypeID
JOIN BookedServices as BS ON S.ServiceID = BS.ServiceID
GROUP BY VT.VehicleTypeName
ORDER BY 'Most booked vehicle types according to booked services' DESC;
```

	VehicleTypeName	Most booked vehicle types according to booked services
1	Compact	9
2	Medium	4
3	Van/SUV	3

Figure 102 Query to Generate report on Most booked vehicle types according to booked services

#### 5.4.1.23 View vehicle information Together with vehicle type names

The screenshot shows a SQL query results window. The query retrieves vehicle information including vehicle type names. The results are displayed in a table with columns: VehicleID, VehicleName, VehicleTypeID, VehicleModel, VehicleLicenseNumber, VehicleImage, VehicleMainColor, and VehicleTypeName. The data shows five vehicles: V-001 (Volkswagen Beetle), V-002 (Honda Civic), V-003 (Chevrolet Silverado), V-004 (Toyota Tundra), and V-005 (Ford Ranger). The VehicleImage column contains NULL values.

	VehicleID	VehicleName	VehicleTypeID	VehicleModel	VehicleLicenseNumber	VehicleImage	VehicleMainColor	VehicleTypeName
1	V-001	Volkswagen Beetle	Vt-001	2020	9Q-6969	NULL	Cyan	Compact
2	V-002	Honda Civic	Vt-001	2019	5H-1122	NULL	Black	Compact
3	V-003	Chevrolet Silverado	Vt-002	2019	4M-5678	NULL	Ultramarine	Medium
4	V-004	Toyota Tundra	Vt-002	2020	5H-3264	NULL	White	Medium
5	V-005	Ford Ranger	Vt-004	2018	7F-1236	NULL	Crimson Red	Compact Truck

Figure 103 Query to View vehicle information Together with vehicle type names

#### 5.4.1.24 Update vehicle information

The screenshot shows a SQL query results window. The query updates the VehicleName of vehicle V-002 to 'Honda Fit'. The output indicates that 1 row was affected. The completion time is shown as 2023-01-28T02:23:29.3118341+06:30.

(1 row affected)

Completion time: 2023-01-28T02:23:29.3118341+06:30

Figure 104 Query to Update vehicle information

#### 5.4.1.25 View ServiceTypes information

The screenshot shows a SQL query results window. The query is:

```
/*ServiceTypes*/
/*1 View ServiceTypes Information*/
SELECT * FROM ServiceTypes;
```

The results table has four columns: ServiceTypeID, ServiceTypeName, and ServiceTypeDescription. There are three rows of data:

	ServiceTypeID	ServiceTypeName	ServiceTypeDescription
1	St-001	In-Garage	A wide range of services will be offered at our ...
2	St-002	Home	A limited range of services will be offered in thi...
3	St-003	Pick Up	A wide range of services will be offered. We wi...

Figure 105 Query to View ServiceTpes information

#### 5.4.1.26 Update Service Information

The screenshot shows a SQL query results window. The query is:

```
/* Update Service Information*/
UPDATE Services
SET VehicleTypeID = 'Vt-002'
WHERE ServiceID = 'S-018';
```

The results show the message: (1 row affected). The completion time is: 2023-01-28T02:28:42.4700216+06:30.

Figure 106 Query to Update Service Information

#### 5.4.1.27 View Service information according to Vehicle Type and Service Type

```
/* View Service Information according to Vehicle Type and Service Type */
SELECT S.*
FROM Services as S
JOIN ServiceTypes as ST ON S.ServiceTypeID = ST.ServiceTypeID
JOIN VehicleTypes as VT ON S.VehicleTypeID = VT.VehicleTypeID
WHERE ST.ServiceTypeName = 'In-Garage' AND VT.VehicleTypeName = 'Compact';
```

The screenshot shows a SQL query results window. The query retrieves service information for compact cars. The results table has columns: ServiceID, ServiceName, ServiceTypeID, VehicleTypeID, ServiceDescription, ServiceDuration, ServiceStatus, and ServicePrice. The data shows four services: Car Wash for Compacts(Garage), Car Polish for Compact(Garage), Interior Clearing for Compact(Garage), and 3D wheel alignment for Compact(Garage). All services are listed as active and have a duration of 00:30:00.

ServiceID	ServiceName	ServiceTypeID	VehicleTypeID	ServiceDescription	ServiceDuration	ServiceStatus	ServicePrice
1 S-001	Car Wash for Compacts(Garage)	St-001	Vt-001	Car wash service for Compact cars, Done at our b...	00:30:00.0000000	Active	5000.00
2 S-009	Car Polish for Compact(Garage)	St-001	Vt-001	Car polish service for Compact cars, Done at our b...	01:30:00.0000000	Active	13000.00
3 S-014	Interior Clearing for Compact(Garage)	St-001	Vt-001	Interior cleaning service for Compact cars, Done a...	01:15:00.0000000	Active	10000.00
4 S-017	3D wheel alignment for Compact(Garage)	St-001	Vt-001	3D wheel alignment service for Compact cars, Do...	01:00:00.0000000	Active	20000.00

Figure 107 Query to view service information according to Vehicle type and Service type

#### 5.4.1.28 Top 3 most booked services of the month

```
/* Top 3 most booked services of the month */
SELECT TOP 3 S.ServiceID, S.ServiceName as 'Top 3 most booked services of the month', COUNT (BS.ServiceID) as 'Frequency'
FROM Services as S
JOIN BookedServices as BS ON S.ServiceID = BS.ServiceID
JOIN Bookings as B ON BS.BookingID = B.BookingID
WHERE B.BookingDate BETWEEN '2023-1-1' AND '2023-1-31'
GROUP BY S.ServiceID, S.ServiceName
ORDER BY 'Frequency' DESC;
```

The screenshot shows a SQL query results window. The query retrieves the top 3 most booked services for January. The results table has columns: ServiceID, Top 3 most booked services of the month, and Frequency. The data shows three services: Car Wash for Mediums(Garage), Car Polish for Medium(Garage), and Car Wash for Van/Suvs(Home), all with a frequency of 2.

ServiceID	Top 3 most booked services of the month	Frequency
1 S-002	Car Wash for Mediums(Garage)	2
2 S-010	Car Polish for Medium(Garage)	2
3 S-007	Car Wash for Van/Suvs(Home)	1

Figure 108 Query to generate report on Top 3 most booked services of the month

## Car Service Booking System of AUTOCARE

### 5.4.1.29 View specific customer's booking history

The screenshot shows a SQL query being run in SQL Server Management Studio. The query retrieves booking history for customer 'cici289'. The results are displayed in a table with columns: CustomerName, BookingID, BookingDate, Start Time (AM/PM), End Time (AM/PM), BookedServices, ServedLocation, GarageSpaceID, BookingStatus, NetCosts, and PaymentStatus.

CustomerName	BookingID	BookingDate	Start Time (AM/PM)	End Time (AM/PM)	BookedServices	ServedLocation	GarageSpaceID	BookingStatus	NetCosts	PaymentStatus
Cici289	Bk-001	2022-12-25	10:00 AM	13:00 PM	Car Wash for Compacts(Garage), Car Polish for Co...	Garage	Gs-001	All Finished	34200.00	Fully Paid
Cici289	Bk-003	2023-01-24	09:00 AM	13:15 PM	Car Wash for Compacts(Garage), Car Polish for Co...	Garage	Gs-016	All Finished	43200.00	Partially Paid
Cici289	BK-005	2023-01-31	10:00 AM	11:00 AM	Car Wash for Van/Suvs(Home)	Home	NULL	Accepted	9000.00	Fully Paid

Figure 109 Query to View specific customer's booking history

### 5.4.1.30 Update Booking information for cancellation

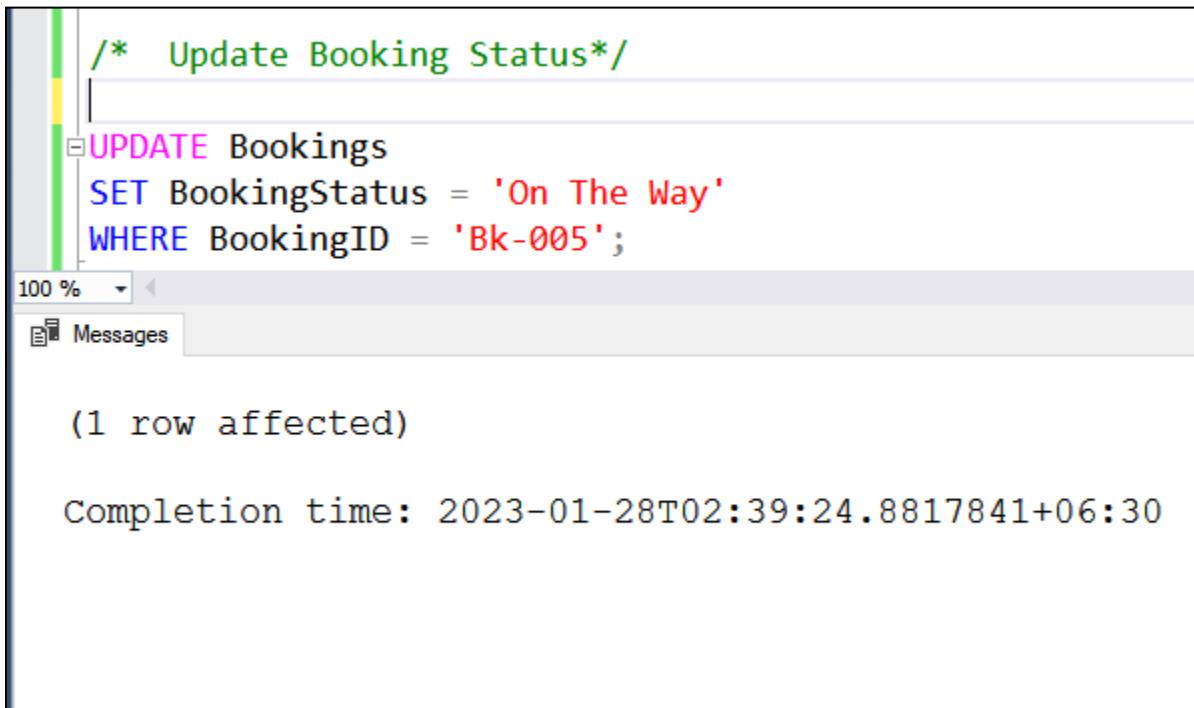
The screenshot shows a query to update booking information for cancellation. The booking with ID 'Bk-004' is set to status 'Cancelled' with reason 'We are sorry to cancel your booking as we failed to announce as closed day for our garage maintenances.' and remaining amount set to NULL.

(1 row affected)

Completion time: 2023-01-28T02:37:33.9812234+06:30

Figure 110 Query to update booking information for cancellation

#### 5.4.1.31 Update Booking Status



The screenshot shows a database query window with the following content:

```
/* Update Booking Status*/
UPDATE Bookings
SET BookingStatus = 'On The Way'
WHERE BookingID = 'Bk-005';

100 %
Messages

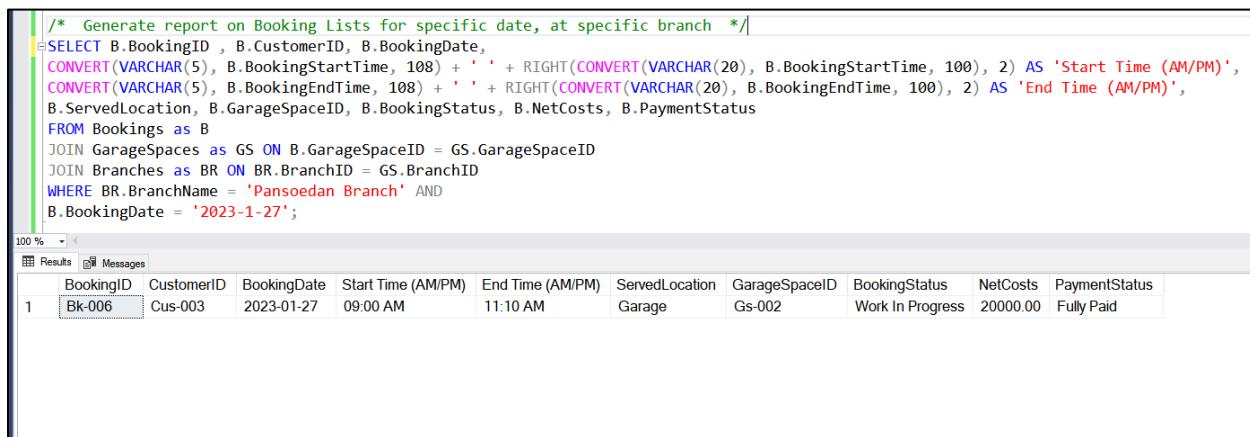
(1 row affected)

Completion time: 2023-01-28T02:39:24.8817841+06:30
```

The window includes a sidebar with a green progress bar at 100%, a 'Messages' tab, and a completion time stamp.

Figure 111 Query to Update Booking Status

#### 5.4.1.32 Generate report on Booking lists at specific date, at specific branch



```

/*
Generate report on Booking Lists for specific date, at specific branch */
SELECT B.BookingID , B.CustomerID, B.BookingDate,
CONVERT(VARCHAR(5), B.BookingStartTime, 108) + ' ' + RIGHT(CONVERT(VARCHAR(20), B.BookingStartTime, 100), 2) AS 'Start Time (AM/PM)',
CONVERT(VARCHAR(5), B.BookingEndTime, 108) + ' ' + RIGHT(CONVERT(VARCHAR(20), B.BookingEndTime, 100), 2) AS 'End Time (AM/PM)',
B.ServedLocation, B.GarageSpaceID, B.BookingStatus, B.NetCosts, B.PaymentStatus
FROM Bookings as B
JOIN GarageSpaces as GS ON B.GarageSpaceID = GS.GarageSpaceID
JOIN Branches as BR ON BR.BranchID = GS.BranchID
WHERE BR.BranchName = 'Pansoedan Branch' AND
B.BookingDate = '2023-1-27';

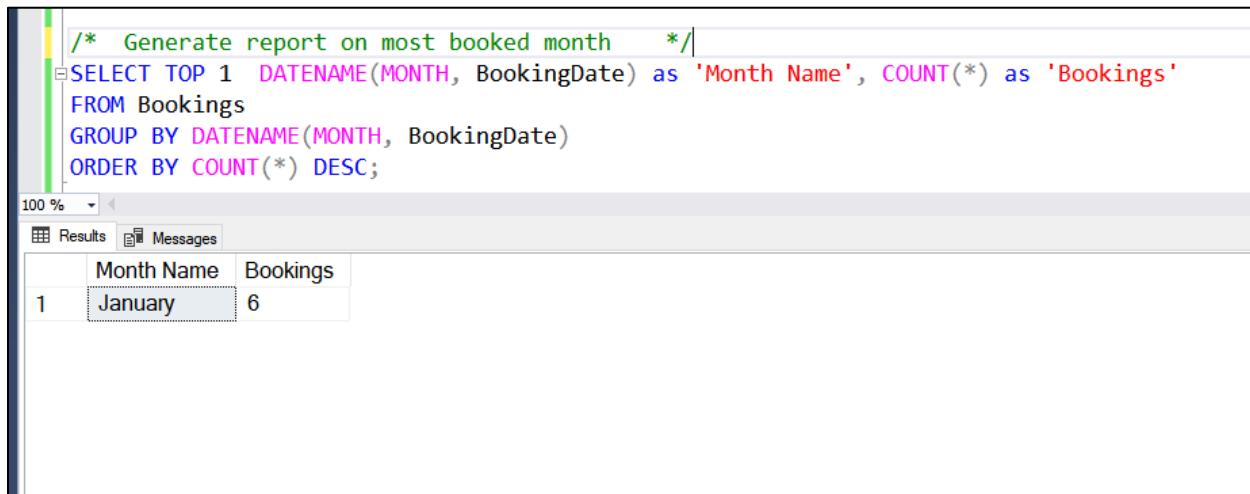
```

The screenshot shows the SQL query above and its execution results. The results table has columns: BookingID, CustomerID, BookingDate, Start Time (AM/PM), End Time (AM/PM), ServedLocation, GarageSpaceID, BookingStatus, NetCosts, and PaymentStatus. One row is displayed:

	BookingID	CustomerID	BookingDate	Start Time (AM/PM)	End Time (AM/PM)	ServedLocation	GarageSpaceID	BookingStatus	NetCosts	PaymentStatus
1	Bk-006	Cus-003	2023-01-27	09:00 AM	11:10 AM	Garage	Gs-002	Work In Progress	20000.00	Fully Paid

Figure 112 Query to Generate report on Booking Lists at specific date, at specific branch

#### 5.4.1.33 Generate report on most booked month



```

/*
Generate report on most booked month */
SELECT TOP 1 DATENAME(MONTH, BookingDate) as 'Month Name', COUNT(*) as 'Bookings'
FROM Bookings
GROUP BY DATENAME(MONTH, BookingDate)
ORDER BY COUNT(*) DESC;

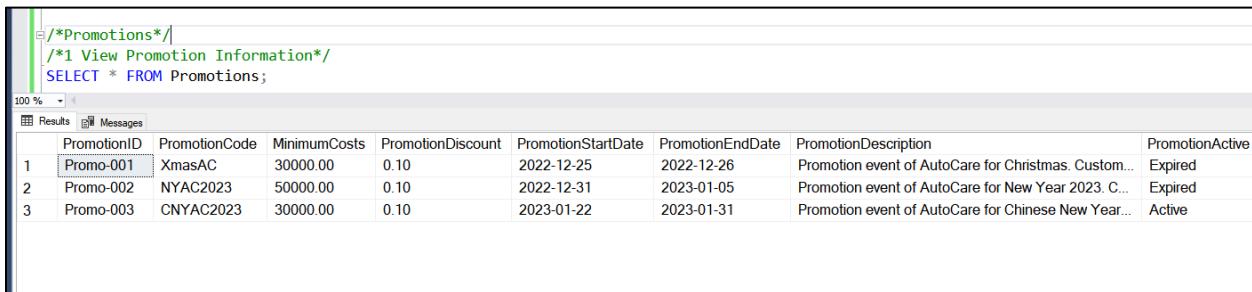
```

The screenshot shows the SQL query above and its execution results. The results table has columns: Month Name and Bookings. One row is displayed:

	Month Name	Bookings
1	January	6

Figure 113 Query to generate report on most booked month

#### 5.4.1.34 View Promotions information

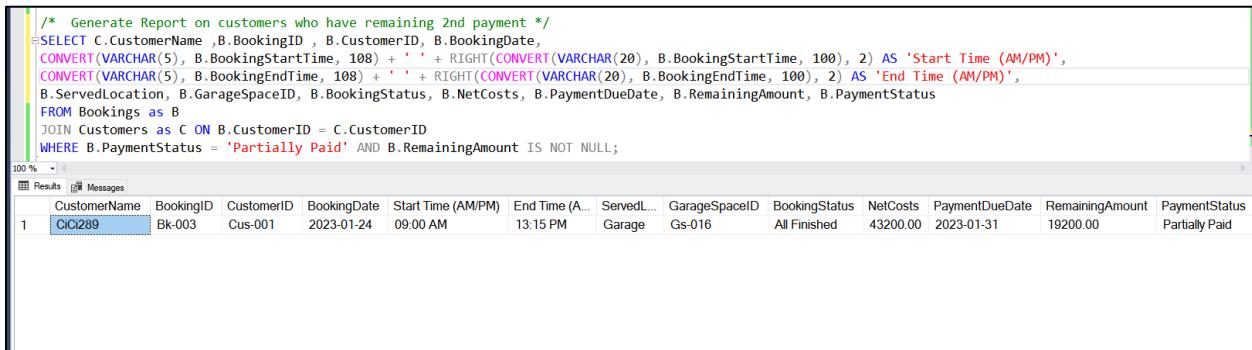


```
/*Promotions*/
/*1 View Promotion Information*/
SELECT * FROM Promotions;
```

PromotionID	PromotionCode	MinimumCosts	PromotionDiscount	PromotionStartDate	PromotionEndDate	PromotionDescription	PromotionActive	
1	Promo-001	XmasAC	30000.00	0.10	2022-12-25	2022-12-26	Promotion event of AutoCare for Christmas. Custom...	Expired
2	Promo-002	NYAC2023	50000.00	0.10	2022-12-31	2023-01-05	Promotion event of AutoCare for New Year 2023. C...	Expired
3	Promo-003	CNYAC2023	30000.00	0.10	2023-01-22	2023-01-31	Promotion event of AutoCare for Chinese New Year...	Active

Figure 114 Query to view promotions information

#### 5.4.1.35 Generate report on customers who have remaining 2<sup>nd</sup> payment

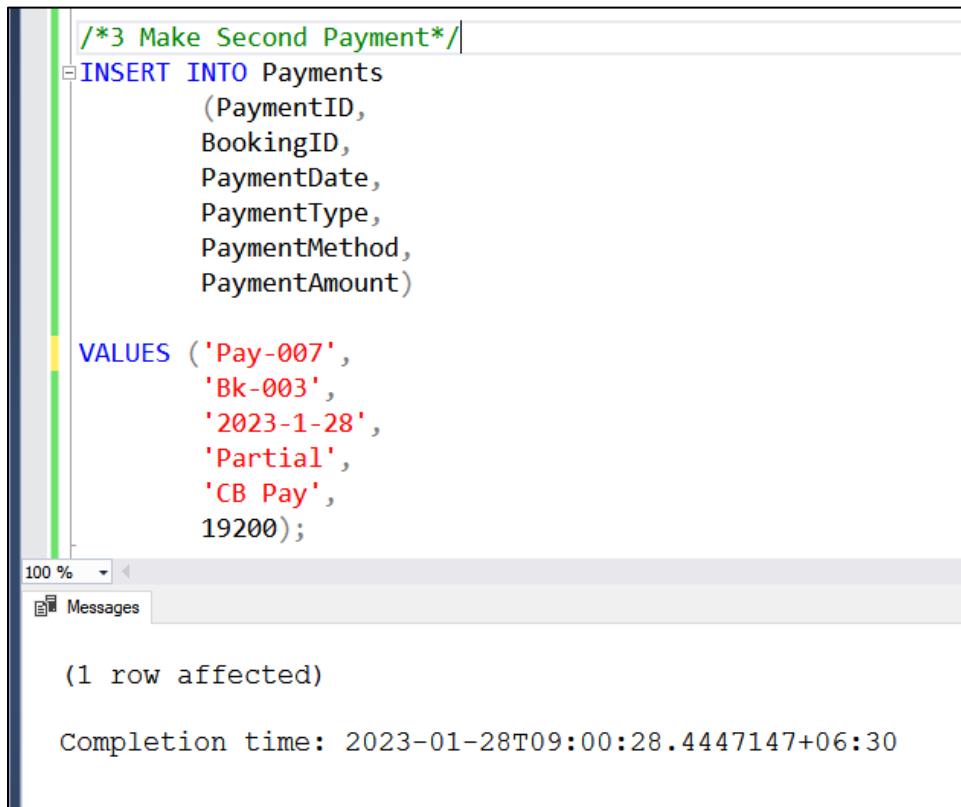


```
/* Generate Report on customers who have remaining 2nd payment */
SELECT C.CustomerName ,B.BookingID , B.CustomerID, B.BookingDate,
CONVERT(VARCHAR(5), B.BookingStartTime, 108) + ' ' + RIGHT(CONVERT(VARCHAR(20), B.BookingStartTime, 100), 2) AS 'Start Time (AM/PM)',
CONVERT(VARCHAR(5), B.BookingEndTime, 108) + ' ' + RIGHT(CONVERT(VARCHAR(20), B.BookingEndTime, 100), 2) AS 'End Time (AM/PM)',
B.ServedLocation, B.GarageSpaceID, B.BookingStatus, B.NetCosts, B.PaymentDueDate, B.RemainingAmount, B.PaymentStatus
FROM Bookings as B
JOIN Customers as C ON B.CustomerID = C.CustomerID
WHERE B.PaymentStatus = 'Partially Paid' AND B.RemainingAmount IS NOT NULL;
```

CustomerName	BookingID	CustomerID	BookingDate	Start Time (AM/PM)	End Time (A...	ServedL...	GarageSpaceID	BookingStatus	NetCosts	PaymentDueDate	RemainingAmount	PaymentStatus
CiCi289	Bk-003	Cus-001	2023-01-24	09:00 AM	13:15 PM	Garage	Gs-016	All Finished	43200.00	2023-01-31	19200.00	Partially Paid

Figure 115 Query to Generate report on customers who have remaining 2nd payment

#### 5.4.1.36 Making 2<sup>nd</sup> payment



```
/*3 Make Second Payment*/
INSERT INTO Payments
(PaymentID,
BookingID,
PaymentDate,
PaymentType,
PaymentMethod,
PaymentAmount)

VALUES ('Pay-007',
'Bk-003',
'2023-1-28',
'Partial',
'CB Pay',
19200);

(1 row affected)

Completion time: 2023-01-28T09:00:28.4447147+06:30
```

Figure 116 Query to make 2nd payment

#### 5.4.1.37 Update booking information for fully paid customer

The screenshot shows a SQL query window in SSMS. The query updates a booking record where the BookingID is 'Bk-003'. It sets the PaymentStatus to 'Fully Paid' and the RemainingAmount to NULL. The query is preceded by a comment /\* Update Booking for Fully paid customer \*/. The execution results show one row affected. The completion time is listed at the bottom.

```
/* Update Booking for Fully paid customer */
UPDATE Bookings
SET PaymentStatus = 'Fully Paid',
    RemainingAmount = NULL
WHERE BookingID = 'Bk-003';

(1 row affected)

Completion time: 2023-01-28T09:01:43.2593899+06:30
```

Figure 117 Query to update booking information for fully paid customer

#### 5.4.1.38 Generate report on Total Revenues of each month from Bookings

The screenshot shows a SQL query window in SSMS. The query generates a report of total revenues for each month. It selects the month name from the BookingDate column, groups the results by month, and filters out cancelled bookings. The results are displayed in a table showing two rows: December with a total revenue of 34200.00 and January with a total revenue of 114200.00.

```
/* Generate report on Total Revenue of month from Bookings */
SELECT DATENAME(MONTH, BookingDate) as 'Month Name', SUM(Netcosts) as 'Total Revenues'
FROM Bookings
WHERE BookingStatus != 'Cancelled'
GROUP BY DATENAME(MONTH, BookingDate);
```

	Month Name	Total Revenues
1	December	34200.00
2	January	114200.00

Figure 118 Query to Generate report on Total Revenues of each month from Bookings

#### 5.4.1.39 View employees' information in specific branch

The screenshot shows a SQL query in the query editor and its results in the results grid.

```
/*Employees*/
/*1 View Employees information in specific Branch*/
SELECT BR.BranchName , E.*
FROM Employees as E
JOIN Branches as BR ON E.BranchID = BR.BranchID
WHERE BR.BranchName = 'Pansoedan Branch';
```

The results grid displays the following data:

	BranchName	EmployeeID	EmployeeName	Gender	BranchID	EmployeePosition	DateOfBirth	EmployeeAddress	EmployeePhone
1	Pansoedan Branch	Emp-001	U Aung Thin	Male	Br-001	Manager	1976-10-12	No.23/ 201, Kant Kaw Street, YG Township, Yangon.	09751748673
2	Pansoedan Branch	Emp-002	Ko Kyaw Khin	Male	Br-001	Technician	1990-09-18	No.213, Wutt Kyang Street, YK Township, Yangon.	0951756846
3	Pansoedan Branch	Emp-003	Ko Aung Kyaw	Male	Br-001	Admin	1995-04-25	No.24/ 201, 124th Street, MGTN Township, Yangon.	0951446643

Figure 119 Query to view employees' information in specific branch

#### 5.4.1.40 Update an employee's information

The screenshot shows a query to update an employee's phone number.

```
/* Updating Employee Information */
UPDATE Employees
SET EmployeePhone = '09798523634'
WHERE EmployeeID = 'Emp-003';
```

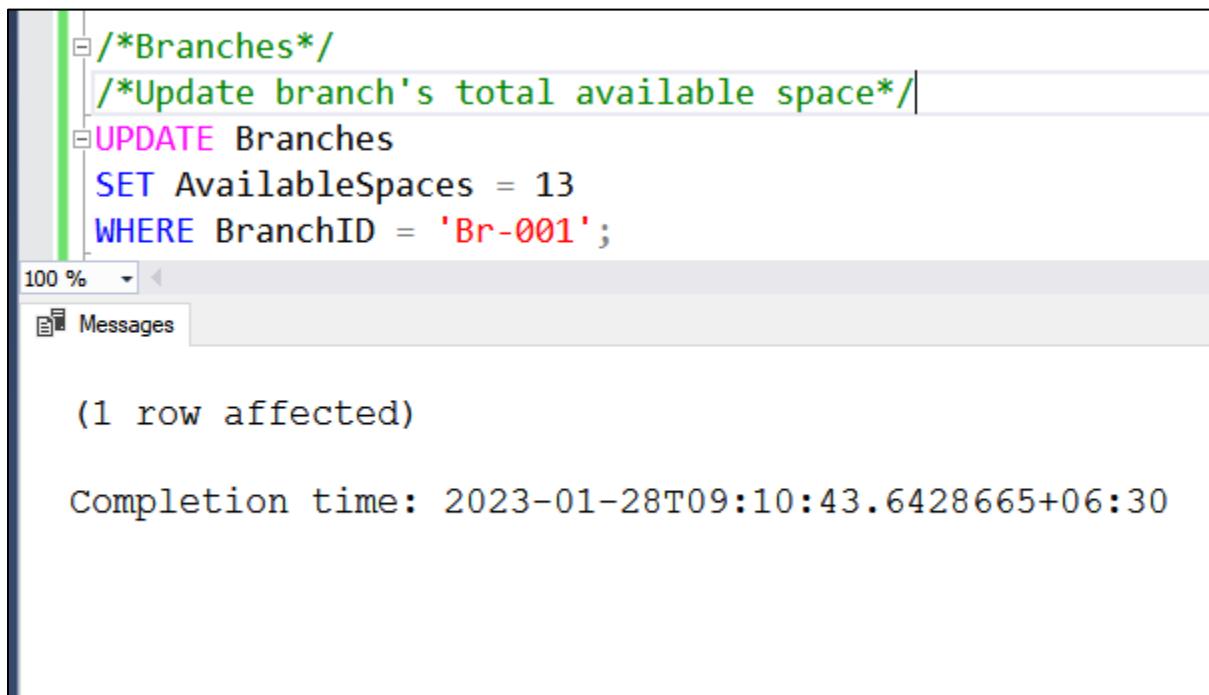
The output shows the result of the update:

(1 row affected)

Completion time: 2023-01-28T09:07:57.9103834+06:30

Figure 120 Query to update an employee's information

#### 5.4.1.41 Update Branch's Total Available space



The screenshot shows a database query editor window. The query is:

```
/*Branches*/  
/*Update branch's total available space*/  
UPDATE Branches  
SET AvailableSpaces = 13  
WHERE BranchID = 'Br-001';
```

The output shows:

(1 row affected)

Completion time: 2023-01-28T09:10:43.6428665+06:30

Figure 121 Query to update Branch's Total Available space

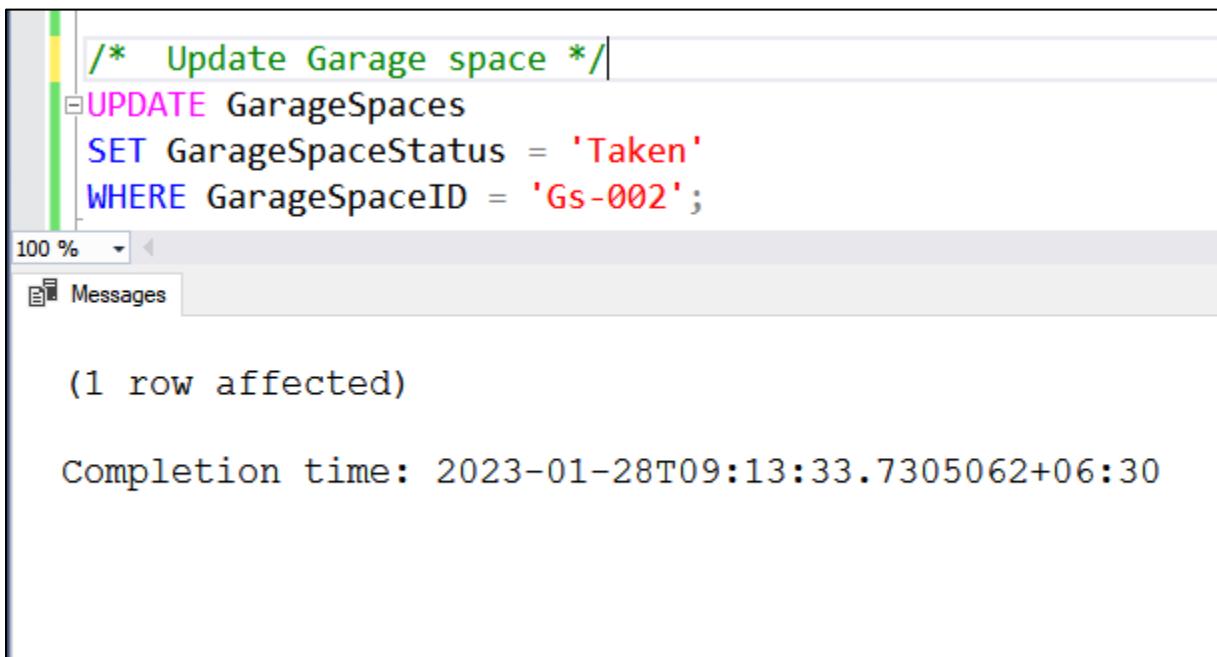
#### 5.4.1.42 View Garage space information according to Branch

The screenshot shows a SQL query results window. The query retrieves garage space information from the 'GarageSpaces' table, joining it with the 'Branches' table to filter by the 'North Dagon Branch'. The results are displayed in a table with columns: GarageSpaceID, BranchID, GarageSpaceNumber, GarageSpaceStatus, and BranchName. The data shows 15 rows of garage spaces, all belonging to BranchID Br-002 and BranchName North Dagon Branch. The first row has GarageSpaceID Gs-016 and GarageSpaceNumber 1, with status Taken.

	GarageSpaceID	BranchID	GarageSpaceNumber	GarageSpaceStatus	BranchName
1	Gs-016	Br-002	1	Taken	North Dagon Branch
2	Gs-017	Br-002	2	Free	North Dagon Branch
3	Gs-018	Br-002	3	Free	North Dagon Branch
4	Gs-019	Br-002	4	Free	North Dagon Branch
5	Gs-020	Br-002	5	Free	North Dagon Branch
6	Gs-021	Br-002	6	Free	North Dagon Branch
7	Gs-022	Br-002	7	Free	North Dagon Branch
8	Gs-023	Br-002	8	Free	North Dagon Branch
9	Gs-024	Br-002	9	Free	North Dagon Branch
10	Gs-025	Br-002	10	Free	North Dagon Branch
11	Gs-026	Br-002	11	Free	North Dagon Branch
12	Gs-027	Br-002	12	Free	North Dagon Branch
13	Gs-028	Br-002	13	Free	North Dagon Branch
14	Gs-029	Br-002	14	Free	North Dagon Branch
15	Gs-030	Br-002	15	Free	North Dagon Branch

Figure 122 Query to view garage space information according to Branch

#### 5.4.1.43 Update Garage Space information



The screenshot shows a database query window with the following content:

```
/* Update Garage space */
UPDATE GarageSpaces
SET GarageSpaceStatus = 'Taken'
WHERE GarageSpaceID = 'Gs-002';
```

Below the query results:

100 %

Messages

(1 row affected)

Completion time: 2023-01-28T09:13:33.7305062+06:30

Figure 123 Query to update Garage Space information

#### 5.4.1.44 Generate report on Overall ratings of AutoCare services

```

/*
Ratings*
* Generate report on Overall Ratings of Services *
SELECT S.ServiceName, AVG(R.RatingAmount) as 'Average Rating'
FROM Services as S
JOIN Ratings as R ON S.ServiceID = R.ServiceID
GROUP BY S.ServiceName
ORDER BY AVG(R.RatingAmount) DESC;

```

The screenshot shows a SQL query window with the results tab selected. The results are displayed in a table:

	ServiceName	Average Rating
1	Car Wash for Compacts(Garage)	5
2	Car Wash for Compacts(Home)	5
3	3D wheel alignment for Compact(Garage)	4
4	Car Polish for Compact(Garage)	4
5	Car Polish for Compact(Home)	3
6	Interior Cleaning for Compact(Garage)	2

Figure 124 Query to Generate report on Overall ratings of AutoCare services

#### 5.4.1.45 View all related customer comments and Admin replies on a specific booking

```

/*
Comments and AdminReplies*
* View all related customer comments & admin replies for a specific booking *
SELECT BK.BookingID, CMT.CommentID, CMT.CommentText,
CONVERT(VARCHAR, CMT.CommentTimestamp, 108) + ' ' + CONVERT(VARCHAR, CMT.CommentTimestamp, 108) AS 'Comment Date and Time (AM/PM)',
AR.ReplyID, AR.EmployeeID, AR.ReplyText,
CONVERT(VARCHAR, AR.ReplyTimestamp, 108) + ' ' + CONVERT(VARCHAR, AR.ReplyTimestamp, 108) AS 'Admin Reply Date and Time (AM/PM)'
FROM Comments as CMT
JOIN Bookings as BK ON CMT.BookingID = BK.BookingID
JOIN AdminReplies as AR ON CMT.CommentID = AR.CommentID
WHERE BK.BookingID = 'BK-003';

```

The screenshot shows a SQL query window with the results tab selected. The results are displayed in a table:

	BookingID	CommentID	CommentText	Comment Date and Time (AM/PM)	ReplyID	EmployeeID	ReplyText	Admin Reply Date and Time (AM/PM)
1	BK-003	Cmt-003	The services were good. But I found t...	Jan 25 2023 7:00AM 07:00:00	Rp-003	Emp-004	We would like to deeply apologize for the mista...	Jan 25 2023 8:00AM 08:00:00

Figure 125 Query to View all related customer comments and Admin replies on a specific booking

# **Chapter 6: Evaluation**

## 6 Evaluation

### 6.1 Approach to Structured walkthrough

Structured walkthroughs are carried out between peers/ stakeholders to review and evaluate the technological aspects in development process of the proposed system. It is recommended as a must-do process as its sole objective is to identify errors, weaknesses, pain points to further improve the quality of the system rather than error correction. Error correction must be done by the concerned person (author/developer) only after walkthrough with stakeholders is completed. (Michigan Department of Technology, Management and Budget, 2014) In previous chapters, Conceptual, logical, physical database designs, Data Dictionary and Interface UI designs are done and revision and evaluation will be done in the following.

## 6.2 Documents for evaluation

The following table matrix will be used in structured walkthrough process on the proposed system. This matrix includes all the essential function and parts that the system should have and should be implemented.

The first columns represents lists of function requirements of the system. The second field will represent User Interface design features to represent how each functions will be displayed and complement the functions. The third column is degree of how far the designs are fulfilled for the functional needs of proposed system. The criteria is if design represented 100% satisfied functional requirements 100%, then it is 'Fully Met'. If above 50% is satisfied, it is 'Partially Met'. If not satisfied to any extent, then it is fulfillment not met. The comment field will be used if comment on design is necessary.

No.	Functional Requirements	Design Feature	Degree of Fulfillment			Comments
			Fully Met	Partially Met	Not Met	
1	<b>Customers</b>					
	Create Customer Accounts	Form Ui Design SQL Query				
	View Customer Information without passwords	List Ui Design SQL Query				
	Update specific Customer Information	List Ui Design SQL Query				
	Generate report on most frequently visited customers within 2 months	SQL Query				
	Generate report on top spending customer of month	List Ui Design SQL Query				
2	<b>VehicleTypes</b>					
	Add new Vehicle Types	Form Ui Design				

## Car Service Booking System of AUTOCARE

		SQL Query				
	View Vehicle Type Information	List Ui Design SQL Query				
	Generate report on Most booked vehicle type according to booked services	SQL Query				
<b>3</b>	<b>Vehicles</b>					
	Add new Vehicles	Form Ui Design SQL Query				
	View Vehicle Information + Vehicle Type Name	List Ui Design SQL Query				
	Update Vehicle Information	List Ui Design SQL Query				
<b>4</b>	<b>ServiceTypes</b>					
	Create New Service Types	Form Ui Design SQL Query				
	View Service Type information	List Ui Design SQL Query				
<b>5</b>	<b>Services</b>					
	Create New Services	Form Ui Design SQL Query				
	View Service information according to Vehicle Type and Service Type	SQL Query				
	Update Service information	List Ui Design SQL Query				
	Top 3 Most Booked Services of the month	SQL Query				
<b>6</b>	<b>Bookings</b>					
	Create New Bookings	Form Ui Design				

## Car Service Booking System of AUTOCARE

		SQL Query				
	View specific customer's Booking Information	List Ui Design SQL Query				
	Update Booking Information for Cancel	List Ui Design SQL Query				
	Update Booking Status	List Ui Design SQL Query				
	Generate report on Bookings lists for specific date, start time,end time, at specific Branch	SQL Query				
	Generate report on most booked months	SQL Query				
<b>7</b>	<b>Promotions</b>					
	Create new Promotion	SQL Query				
	View Promotion information	List Ui Design SQL Query				
<b>8</b>	<b>Payments</b>					
	Make/ Record new Payment	Form Ui Design SQL Query				
	Generate report on Customers who have remaining 2 <sup>nd</sup> payment	SQL Query				
	Make/ Record second payment	SQL Query				
	Generate report on Total revenue of month from bookings	SQL Query				
<b>9</b>	<b>Employees</b>					
	Create New Employee Accounts	List Ui Design SQL Query				

## Car Service Booking System of AUTOCARE

	View Employee Information in specific branch	List Ui Design SQL Query				
	Updating Employee Information	SQL Query				
<b>10</b>	<b>Branches</b>					
	Create Branches	List Ui Design SQL Query				
	Updating Total Available Spaces	Form Ui Design SQL Query				
<b>11</b>	<b>GarageSpaces</b>					
	Create Garage Space	List Ui Design SQL Query				
	View Garage Space according to Branch	List Ui Design SQL Query				
	Update Garage Space	List Ui Design SQL Query				
<b>12</b>	<b>Ratings</b>					
	Customer Rate on services	List Ui Design SQL Query				
	Generate report on Overall ratings of services	List Ui Design SQL Query				
<b>13</b>	<b>Comments</b>					
	Customer comment on booking	List Ui Design SQL Query				
<b>14</b>	<b>AdminReplies</b>					
	Admins' Reply to Comments	List Ui Design SQL Query				
	View all related customer comment & admin replies for a specific booking	SQL Query				

### 6.3 Completed Evaluation Matrix

No.	Functional Requirements	Design Feature	Degree of Fulfillment			Comments
			Fully Met	Partially Met	Not Met	
1	<b>Customers</b>					
	Create Customer Accounts	Form Ui Design SQL Query	✓			
	View Customer Information without passwords	List Ui Design SQL Query	✓			
	Update specific Customer Information	List Ui Design SQL Query	✓			
	Generate report on most frequently visited customers within 2 months	SQL Query	✓			
	Generate report on top spending customer of month	List Ui Design SQL Query	✓			
2	<b>VehicleTypes</b>					
	Add new Vehicle Types	Form Ui Design SQL Query	✓			
	View Vehicle Type Information	List Ui Design SQL Query	✓			
	Generate report on Most booked vehicle type according to booked services	SQL Query	✓			
3	<b>Vehicles</b>					
	Add new Vehicles	Form Ui Design SQL Query				

## Car Service Booking System of AUTOCARE

	View Vehicle Information + Vehicle Type Name	List Ui Design SQL Query		✓			
	Update Vehicle Information	List Ui Design SQL Query					
<b>4</b>	<b>ServiceTypes</b>						
	Create New Service Types	Form Ui Design SQL Query		✓			
	View Service Type information	List Ui Design SQL Query					
<b>5</b>	<b>Services</b>						
	Create New Services	Form Ui Design SQL Query					
	View Service information according to Vehicle Type and Service Type	SQL Query		✓			
	Update Service information	List Ui Design SQL Query					
	Top 3 Most Booked Services of the month	SQL Query					
<b>6</b>	<b>Bookings</b>						
	Create New Bookings	Form Ui Design SQL Query		✓			
	View specific customer's Booking Information	List Ui Design SQL Query					
	Update Booking Information for Cancel	List Ui Design SQL Query					
	Update Booking Status	List Ui Design SQL Query					

## Car Service Booking System of AUTOCARE

	Generate report on Bookings lists for specific date, start time, end time, at specific Branch	SQL Query					
	Generate report on most booked months	SQL Query					
<b>7</b>	<b>Promotions</b>						
	Create new Promotion	SQL Query	✓				
	View Promotion information	List Ui Design SQL Query					
<b>8</b>	<b>Payments</b>						
	Make/ Record new Payment	Form Ui Design SQL Query	✓				
	Generate report on Customers who have remaining 2 <sup>nd</sup> payment	SQL Query					
	Make/ Record second payment	SQL Query					
	Generate report on Total revenue of month from bookings	SQL Query					
<b>9</b>	<b>Employees</b>						
	Create New Employee Accounts	List Ui Design SQL Query	✓				
	View Employee Information in specific branch	List Ui Design SQL Query					
	Updating Employee Information	SQL Query					
<b>10</b>	<b>Branches</b>						
	Create Branches	List Ui Design SQL Query					



	Updating Total Available Spaces	Form Ui Design SQL Query				
<b>11</b>	<b>GarageSpaces</b>					
	Create Garage Space	List Ui Design SQL Query				
	View Garage Space according to Branch	List Ui Design SQL Query	✓			
	Update Garage Space	List Ui Design SQL Query				
<b>12</b>	<b>Ratings</b>					
	Customer Rate on services	List Ui Design SQL Query				
	Generate report on Overall ratings of services	List Ui Design SQL Query	✓			
<b>13</b>	<b>Comments</b>					
	Customer comment on booking	List Ui Design SQL Query	✓			
<b>14</b>	<b>AdminReplies</b>					
	Admins' Reply to Comments	List Ui Design SQL Query		✓		
	View all related customer comment & admin replies for a specific booking	SQL Query				

## 6.4 Design Flaws and Rectification

This part will present about difficulties and flaws during Physical Database designing and User Interface designing processes and how the flaws and gaps were filled and fixed as best as possible throughout the process.

Module	Design Flaws/ Faults	How these were corrected
Customers Module	<p>There was no form for creating customer accounts, and no option for updating customer information in both employee and customer side.</p> <p>No SQL Query – to update accounts, viewing them w/o passwords and generate reports according to Function requirements</p>	<p>A sign up form was created to create customer accounts. Added option/button in design to edit customer information.</p> <p>SQL Queries required were provided.</p>
VehicleTypes Module	<p>There was no form for adding new Vehicles, and viewing all vehicle types' information. No option/button given for editing vehicle information.</p> <p>No SQL Query – to view vehicle types information and to see report on most booked vehicle types.</p>	<p>A list style admin dashboard was created together with form to add more vehicle types.</p> <p>SQL Queries required were provided.</p>
Vehicles Module	<p>There was no form for adding new vehicles and viewing all vehicles information.</p> <p>No SQL Query – to view and update vehicle related information.</p>	<p>A form section was provided in both customer pages and admin dashboard to add more vehicles.</p> <p>SQL Queries required were provided.</p>
ServiceTypes Module	There was no form to add new or update service types information.	A form section was provided in admin dashboard to add

## Car Service Booking System of AUTOCARE

	No SQL Query – to view, update and generate reports according to functional requirements.	more service types. Service types selection page was added for customers to view and select services types.  SQL Queries required were provided.
Services Module	There was no form to add new or update service information.  No SQL Query – to view, update and generate reports according to functional requirements.	A form section was provided in admin dashboard to add more service types. Service selection page was added for customers to view and select services.  SQL Queries required were provided.
Bookings Module	There was no form and list design to create and submit booking and to view and update booking information.  No SQL Query – to view, update and generate reports according to functional requirements.	Necessary design components are added in customers' pages and list sections are provided in admin dashboard to manage bookings.  SQL Queries required were provided.
Promotions Module	There was no list designs to view promotion related information.  No SQL Query – to create and view promotion information.	A list section was provided in admin dashboard. Create new promotion button was added.  SQL Queries required were provided.

## Car Service Booking System of AUTOCARE

Payments	<p>There was no from to select payments types and methods for making payment.</p> <p>No SQL Query – to record payment made and generate records according to functional requirement.</p>	<p>A list section was provided in admin dashboard to view and manage payment records.</p> <p>SQL Queries required were provided.</p>
Employees	<p>There was no list design to view employee information.</p> <p>No SQL Query – to record, view and update employees' information.</p>	<p>A list section was provided in admin dashboard to manage employees' information.</p> <p>SQL Queries required were provided.</p>
Branches	<p>There was no component design to view and select branches in making booking. No option to add more branches in admin dashboard.</p> <p>No SQL Query – to record and manage branches information.</p>	<p>Component to select branches is provided in customer pages. Component to update total available space in admin dashboard.</p> <p>SQL Queries required were provided.</p>
GarageSpaces	<p>There was no component design to view and manage garage spaces in branches.</p> <p>No SQL Query – to add spaces and manage the spaces.</p>	<p>Garage space slots were added in admin dashboard to manage spaces.</p> <p>SQL Queries required were provided.</p>
Ratings	<p>There was no list design to view ratings on services.</p> <p>No SQL Query – to give ratings and generate reports on overall ratings.</p>	<p>A list design was provided in admin dashboard to view summarized ratings and rating history.</p>

## Car Service Booking System of AUTOCARE

		SQL Queries required were provided.
Comments	<p>There was no list design to view and manage customer comments.</p> <p>No SQL Query – to give comment and view comments.</p>	<p>A list design was added to admin dashboard to view comments.</p> <p>SQL Queries required were provided.</p>
AdminReplies	<p>There was no list design and component to view and give admin replies.</p> <p>No SQL Query – to give replies of customer's comments on bookings.</p>	<p>A list design and component were added to admin dashboard to write replies to each customer's comments.</p> <p>SQL Queries required were provided.</p>

## 6.5 Client Evaluation

### Customer Satisfaction Rating

Disclaimer: Only the Project Manager of this Project may complete the following questionnaire and rating checkboxes, according to the satisfaction of the client. Every categories should be filled out and not be omitted.

According to the categories and questionnaires provided below and within a range of 1 to 5, please tick and rate the following:

Project Category	Significantly Below Expectations	Below Expectations	Meets Expectations	Above Expectations	Significantly Above Expectations
	1	2	3	4	5
<b>Scope:</b> How well the expectation are achieved according to scope			✓		
<b>Schedule:</b> achievement according to scheduled timeline			✓		
<b>Interface Design:</b> how well the prototype designed satisfied functional requirement and client users				✓	

## Car Service Booking System of AUTOCARE

<b>Quality:</b> how well the deliverables meets expectations in functions/ problem solving			✓		
<b>Budgets:</b> how well the project is aligned with budget				✓	
<b>Overall Satisfaction</b>				✓	

Satisfaction Rating Completed by: \_\_\_\_\_

Date: DD: MM: YY: 29<sup>th</sup> Jan, 2023

# **Chapter 7: Conclusion**

## 7 Conclusion

### 7.1 Achievement of Project Objectives

Projective Objectives	Achieved	Not Achieved
To analyze the business and its goals, current situations, and identify the problems being encountered currently.	✓	
To define a scope for system of the proposed system project, define Aims of project and coherent objectives to achieve the aims and make necessary planning for the project.	✓	
To study and analyze about Database use for the project, evaluate Methodologies, Case Study Analysis about similar products/services and uses of Information Systems.	✓	
To analyze whether the project is feasible enough to implement.	✓	
To start gathering information necessary, designing system and functions for the proposed system.	✓	
To perform Structural, User Interface, Behavioral Designing and Database implementation phase for the proposed system.	✓	
To review and re-evaluate the system whether it meets the needs of AutoCare and their issues.	✓	

With this proposed **AUTOCARE database-driven online booking system**, we believe it will help AUTOCARE in their revolutionizing business journey, increasing efficiency in business processes, increasing incomparable customer convenience and most importantly, customer satisfactions.

## Presentation Slides

# Car Service Booking System of AUTOCARE

BUSINESS PROJECT

PRESENTED BY: CI HTIN AUNG

PP00197147

## Business Background (AUTOCARE)

- Founded: in 2015
- Offering a wide range of Car Quick services  
(from Car washing, polishing to Changing services)
- Launched 3 branches
- Aiming to offer more, unique services soon!  
(Home service, Pick up service)



## Current System Overview

- Operating as Traditional Car services centers
- Manual data recording and booking scheduling
- Accepts bookings, Make contacts via Phone calls, SMS, Facebook messenger
- Accepts Drive-in customers (requires queueing if there are not enough spaces available)

## Current Business Problems

- Insufficient Garage Space & Long queueing time
- Dissatisfaction/ Complaints on service quality/ workers
- Manual, paper based system harming employees' Productivity
- Inaccuracies/ Omissions in recording booking details, booking miss-scheduling
- Customer dissatisfaction & Reputation Damage



## Proposed Database-driven online Booking system (Aims)

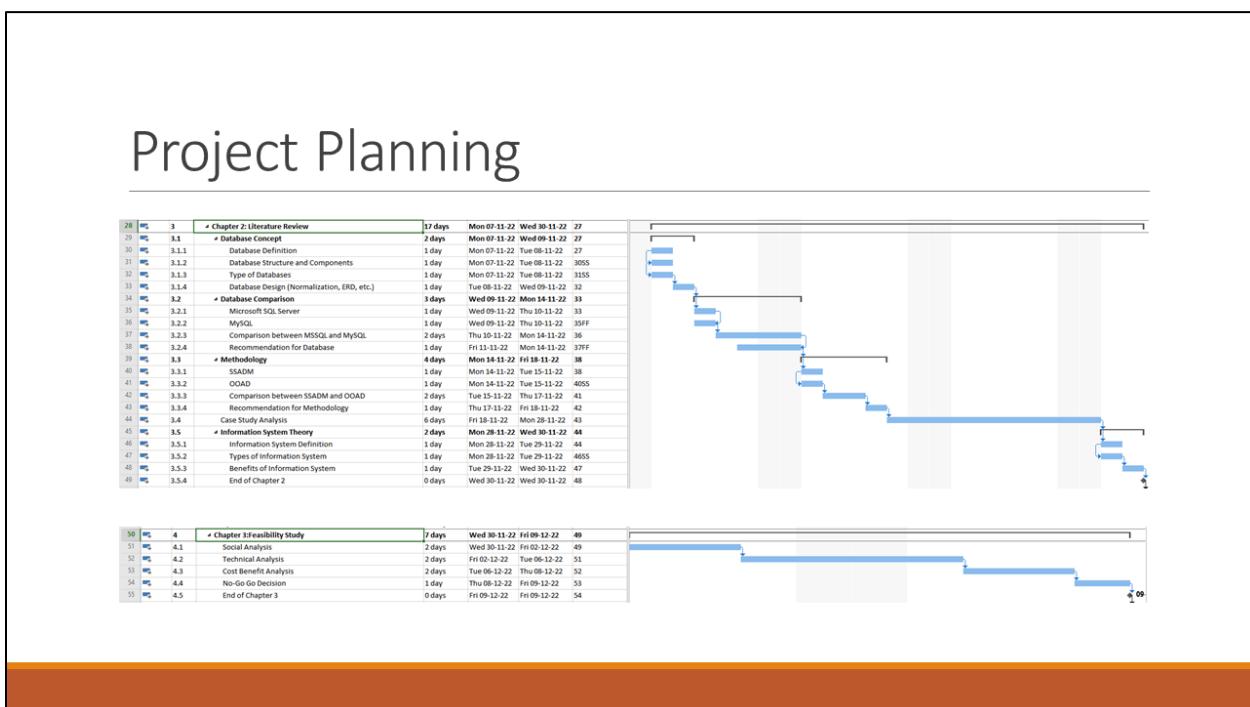
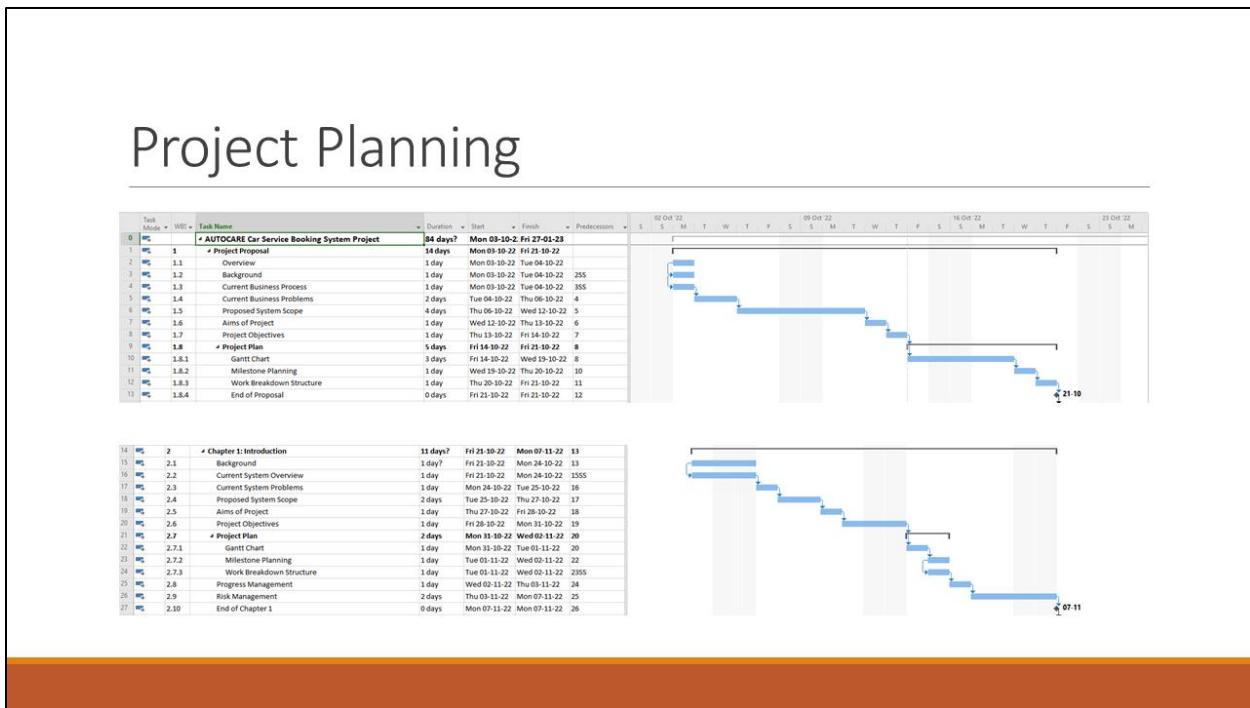
- To reduce customer queueing/ waiting
- Streamlined servicing
- Improved Quality Control over services and workers
- More convenience in managing Bookings, improved productivity



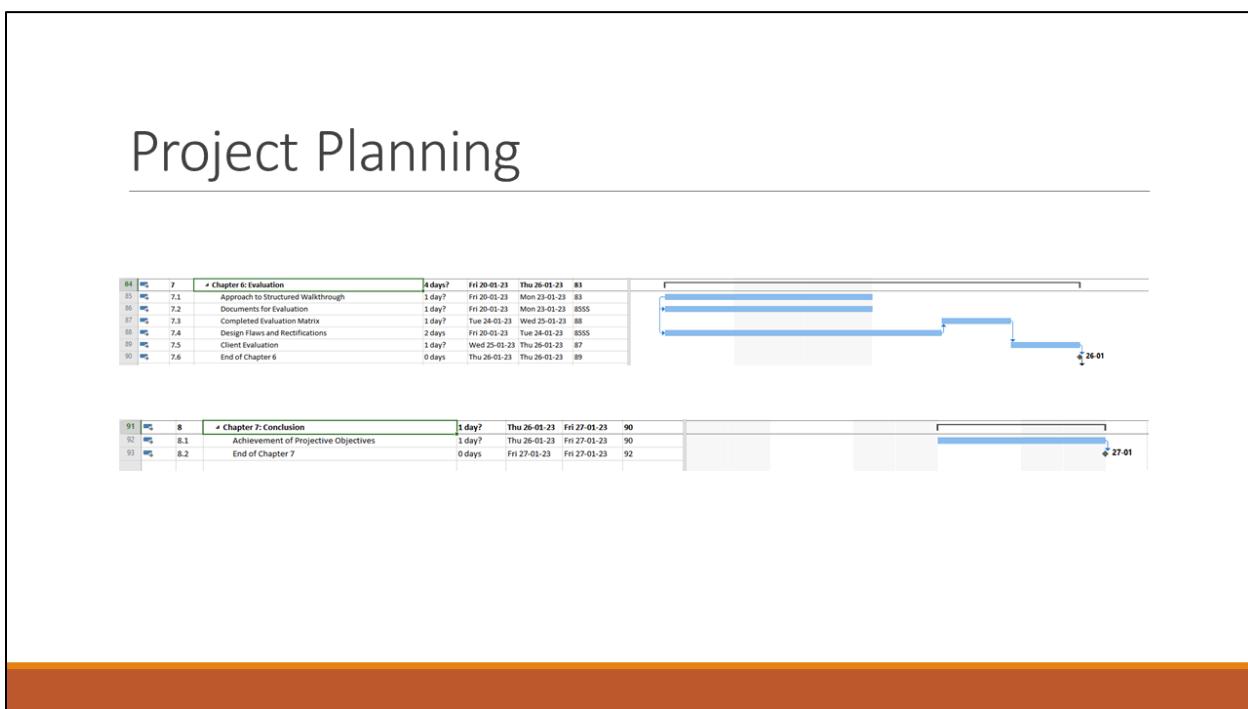
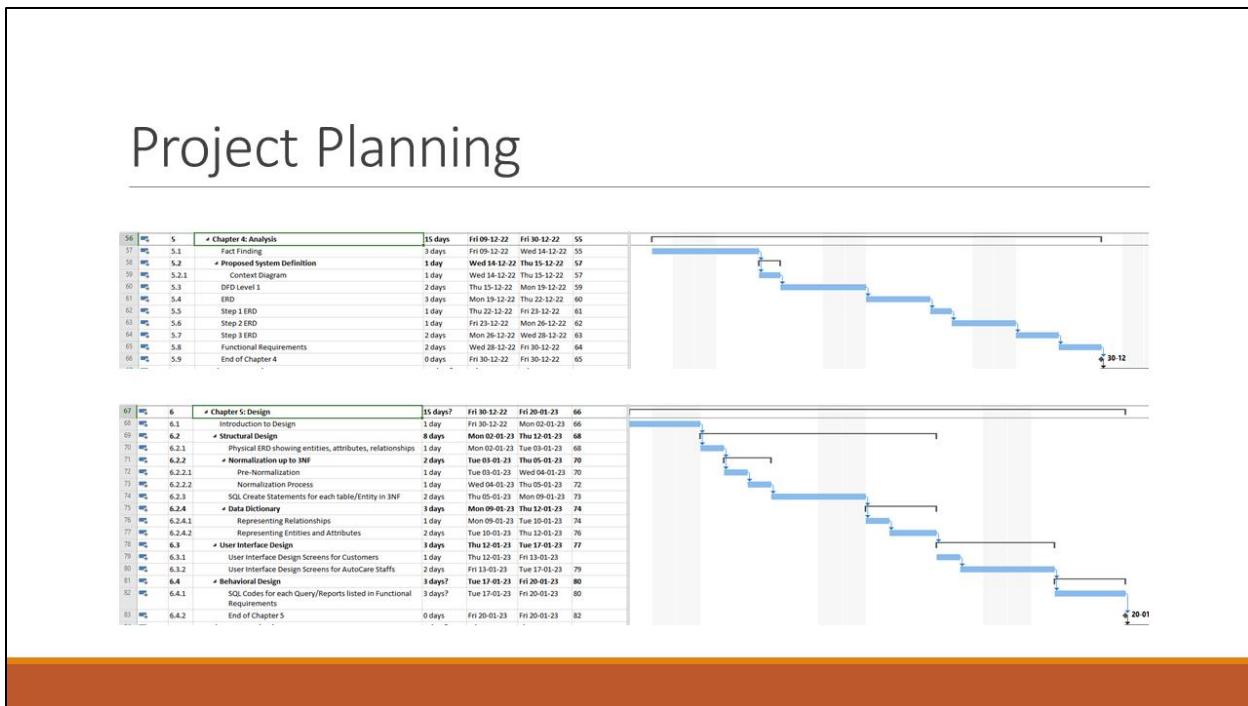
## Proposed Database-driven online Booking system (Objectives)

- Analyze AUTOCARE's processes and problems
- Define solution, scopes, aims and objectives
- Literature study on DBMSs, Methodologies, Similar Businesses & information systems
- Feasibility Analysis on proposed system
- Requirement gathering and designing how the proposed system would work
- Structural Design, User Interface Design, Behavioral Design and Database implementation
- System Evaluation according to the needs of AUTOCARE and its issues

## Car Service Booking System of AUTOCARE



## Car Service Booking System of AUTOCARE



## Milestones Planning

Milestones	Deliverables	Dates
<b>Project Proposal</b>	<ul style="list-style-type: none"> <li>➤ Overview, Background, Current Business Process, Problems</li> <li>➤ Proposed System Scope</li> <li>➤ Defined Aims, Objectives for proposed project</li> <li>➤ Plan for the project (Gantt chart, Milestone Planning, Work Breakdown Structure)</li> </ul>	<b>03-10-22 to 21-10-22</b> <b>(14 days)</b>
<b>Chapter 1: Introduction</b>	<ul style="list-style-type: none"> <li>➤ Background, Current Business Process, Problems</li> <li>➤ Proposed System Scope</li> <li>➤ Defined Aims, Objectives and outcome expectations for proposed project</li> <li>➤ Plan for the project (Gantt chart, Milestone Planning, Work Breakdown Structure)</li> <li>➤ Progress Management</li> <li>➤ Risk Management Plan</li> </ul>	<b>21-10-22 to 02-11-22</b> <b>(11 days)</b>

## Milestones Planning

Milestones	Deliverables	Dates
<b>Chapter 2: Literature Review</b>	<ul style="list-style-type: none"> <li>➤ Database definition, Structures and Components, Types, Database Design</li> <li>➤ MySQL, MSSQL, Comparison, Recommendation</li> <li>➤ SSADM, OOAD, Comparison, Recommendation</li> <li>➤ Case Study Analysis</li> <li>➤ Information System definition, Types, Benefits</li> </ul>	<b>07-11-22 to 30-11-22</b> <b>(17 days)</b>
<b>Chapter 3: Feasibility Study</b>	<ul style="list-style-type: none"> <li>➤ Social Analysis</li> <li>➤ Technical Analysis</li> <li>➤ Cost Benefit Analysis</li> <li>➤ No-Go, Go Decision</li> </ul>	<b>30-11-22 to 9-12-22</b> <b>(7 days)</b>

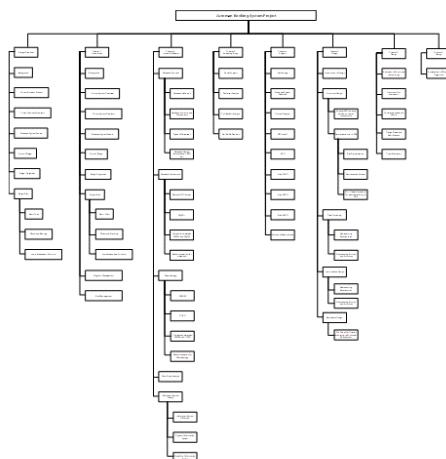
## Milestones Planning

Milestones	Deliverables	Dates
<b>Chapter 4: Analysis</b>	<ul style="list-style-type: none"> <li>➤ Fact Finding</li> <li>➤ Proposed System Definition</li> <li>➤ Context Diagram on how users interact with system</li> <li>➤ Data Flow Diagram</li> <li>➤ Entity Relationship Diagram</li> <li>➤ Functional Requirements</li> </ul>	<b>9-12-22 to 30-12-22 (15 days)</b>
<b>Chapter 5: Design</b>	<ul style="list-style-type: none"> <li>➤ Introduction to Design</li> <li>➤ Structural Design including Physical ERD, Normalization process up to 3NF, Physical implementation of normalized entities to tables (SQL Create Statements), Data Dictionary for tables</li> <li>➤ User Interface Design Screens</li> <li>➤ Behavioral Design including SQL queries according to Functional Requirements</li> </ul>	<b>30-12-22 to 20-01-23 (15 days)</b>

## Milestones Planning

Milestones	Deliverables	Dates
<b>Chapter 6: Evaluation</b>	<ul style="list-style-type: none"> <li>➤ Preparing documents for evaluation</li> <li>➤ Completed Evaluation matrix</li> <li>➤ Design Flaws and Rectifications</li> <li>➤ Client Satisfaction evaluation</li> </ul>	<b>20-01-23 to 26-01-23 (4 days)</b>
<b>Chapter 7: Conclusion</b>	<ul style="list-style-type: none"> <li>➤ Achievement of Project Objectives</li> </ul>	<b>26-01-23 to 27-01-23 (1 day)</b>

## Work Breakdown Structure



## Progress Management

- Tracking tasks with Gantt Chart & Milestones
- Break down large tasks into small ones with Work Breakdown Structure
- Holding progress meeting with supervisors regularly  
(re-evaluate plan schedule if delay exists in tasks)

## Risk Management

Risks and its synopsis	Type of Risk	Probability to happen	Impacts	Rank	Risk Prevention Plan
<b>➤ Project Schedule Risk (Time Crunch):</b> A task not finishing accordingly to scheduled deadlines or longer delay period than expected.	Personal, Environmental, Technical	HIGH	<b>HIGH</b> Delays take longer to finish, increasing budgets, project crunches, low performance, and unprofessional impression.	HIGH	<ul style="list-style-type: none"> <li>Using PM tools               <ul style="list-style-type: none"> <li>➤ Gantt Chart</li> <li>➤ Work Breakdown Structure</li> <li>➤ Milestone Planning</li> </ul> </li> <li>Progress Monitoring</li> <li>Overestimating the time to complete tasks in planning.</li> <li>If encountered, find how to reduce remaining tasks' duration without reducing quality.</li> </ul>

## Risk Management

Risks and Synopsis	Type of Risk	Probability to happen	Impacts	Rank	Risk Prevention Plan
<b>➤ Scope Creep</b> Project objectives were not well-set/ defined together with clients, stakeholders because of ineffective communication.	Personal	MEDIUM	<b>HIGH</b> Client/ Stakeholders changing/ increasing requirements during mid-project, leading to chaos in project planning and failure.	MEDIUM	<ul style="list-style-type: none"> <li>Clear, determined project objectives from the initial stages, no changes.</li> <li>Effective communication with clients</li> <li>Progress Monitoring</li> </ul>

## Risk Management

Risks and its Synopsis	Type of Risk	Probability to happen	Impacts	Rank	Risk Prevention plan
<b>➤ Technical Loss Risks</b> Devices used for documentation have risks of not only being stolen/ robbed but also crashing/ getting malware attacks from online and files getting corrupted.	Technical	MEDIUM	HIGH Documents crucial for project can be lost/ corrupted, causing delay in project and previously completed task have to be accomplished again.	LOW	<ul style="list-style-type: none"> <li>Back up with <ul style="list-style-type: none"> <li>Cloud storages like Google drive, Mega, One drive.</li> <li>External USB with no viruses</li> <li>Another storage drive of the device.</li> </ul> </li> </ul> If encountered, loss should be honestly reported to supervisors and organization to restart processes.

## Risk Management

Risks and its Synopsis	Type of Risk	Probability to happen	Impacts	Rank	Risk Prevention plan
<b>➤ Natural Disasters</b> Natural disasters like Earthquake can cause documentation's devices to be destroyed.	Environmental	LOW	HIGH Documents crucial for project can be hard to retrieve from device or destroyed, having to restart the entire project.	LOW	<ul style="list-style-type: none"> <li>Back up with <ul style="list-style-type: none"> <li>Cloud storages like Google drive, Mega, One drive.</li> <li>External USB with no viruses</li> </ul> </li> </ul> If encountered, loss should be honestly reported to supervisors and organization to restart processes.

## Risk Management

Risks and its Synopsis	Type of Risk	Probability to happen	Impacts	Rank	Risk Prevention plan
<b>➤ Accidental deletion</b> Someone can accidentally delete the project documentation by mistake.	Personal	LOW	HIGH  Documents crucial for project can be destroyed, if not recovered with tools in time.	LOW	<ul style="list-style-type: none"> <li>• Back up with               <ul style="list-style-type: none"> <li>➤ Cloud storages like Google drive, Mega, One drive.</li> <li>➤ External USB with no viruses</li> </ul> </li> <li>• Another storage drive of the device.</li> <li>• Using proper naming convention</li> <li>• Having a file recovery tool in advance.</li> </ul> If encountered, loss should be honestly reported to supervisors and organization to restart processes.

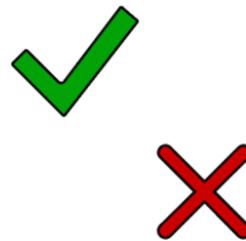
## Literature Review

- Database Concepts
- Database Management Systems
- Case Study Analysis on similar businesses:
  1. Apex Auto Service Co., LTD
  2. Repair Smith Mobile Auto Repair Service
  3. Star Car Wash
- Methodologies
- Information System Theory



## Feasibility Study

- Social Analysis
- Technical Analysis
- Cost-Benefits Analysis
- No Go, Go Decision



## Social Analysis

User employee	Impacts of the system on their jobs
<b>Manager/ Owner</b>	<b>Negative</b> - Limited knowledge = training needed. - Unfamiliarity with new system = increase workload, pressure <b>Positive</b> - Easier in recording details and scheduling for bookings, - keeping records of customers and repair costs, - monitoring employee performance & customer complaints/suggestions
<b>Repair Technician/ Mechanic</b>	<b>Positive</b> - Fairly assigned tasks, get training and supervised with customers' booking feedback on performance. - Function to keep customer updated with service progress.

## Social Analysis

User employee	Impacts of the system on their jobs
<b>Detailer Technician</b>	<p><b>Positive</b></p> <ul style="list-style-type: none"> <li>- Fairly assigned tasks, gaining precise information about booked customers for Home service/ Pick up service methods, get training and supervised with customers' feedbacks, function to keep customer updated with service progress.</li> </ul>
<b>Service Manager</b>	<p><b>Positive</b></p> <ul style="list-style-type: none"> <li>- customer's feedback for supervision and improvement in services, trainings for low-performing service technicians, ability to gain feedback on Home services technicians' performance</li> </ul> <p><b>Negative</b></p> <ul style="list-style-type: none"> <li>- Training must be provided,</li> <li>- Reduced Service managers' productivity from customer complaints if most fellow technicians performed badly.</li> </ul>

## Social Analysis

User employee	Impacts of the system on their jobs
<b>Receptionist/ Admin staff</b>	<p><b>Positive</b></p> <ul style="list-style-type: none"> <li>- Admin staffs perform customer relationship management activities easier.</li> <li>- Perform after-sales services easily.</li> <li>- Reduced workload to answer all the contacts.</li> </ul>

## Technical Analysis

Hardware, Software, Misc requirement for each branches		
Hardware	Software	Other/ Misc
<ul style="list-style-type: none"> <li>➤ 2 Core i3 CPU, 4GB ram, 650W PSU, 500GB HDD office PC Rigs (with PC, Mouse, Keyboard)</li> <li>➤ Ethernet Cables</li> <li>➤ 1 printer</li> <li>➤ Budget android phones for Home service/ Pick up service team who don't own mobile with touch screen</li> </ul>	<ul style="list-style-type: none"> <li>➤ Windows 10 Pro</li> <li>➤ A browser app</li> <li>➤ Subscriptions for website hosting</li> <li>➤ Domain</li> </ul>	<ul style="list-style-type: none"> <li>➤ Internet Service Provider plan and router</li> <li>➤ Backup inverter/ Power station for electrical outages</li> </ul>

## Cost Benefit Analysis

Development Cost			
Item	Quantity	Costs in dollar	Total in dollar
Core i3 CPU, 4GB ram, 650W PSU, 500GB HDD office PC Rigs (with PC, Mouse, Keyboard)	6	\$ 420	\$ 2,520
Internet Service Provider installation	3	\$ 30	\$ 90
Canon MF743Cdw All-in-One Printer	3	\$ 600	\$ 1,800
Android Mobile phones for Home service/ Pick up service teams (optional*)	15	\$ 200	\$ 3,000
Backup power station for router	3	\$ 200	\$ 600
System Development Fees	1	\$ 1500	\$ 1,500
Booking System Training Fees	3	\$ 300	\$ 900
Windows 10 Pro	6	\$ 200	\$ 1200
<b>Total Development Cost</b>			\$ 8,610 to \$ 11,610
Operational Costs (for 1 year)			
Item	Costs per month in dollar		Total in dollar
Internet Service Provider Subscription	\$ 150		\$ 1,800
Web hosting Subscription + Domain	\$ 100		\$ 1,200
<b>Total Operational Cost (for 1 year)</b>			\$ 3,000

## Cost Benefit Analysis

Benefits	
<b>Tangible Benefits (for 1 year)</b>	
Decrease expenses (reduced administrative and transactional fees)	\$ 3,500
Increase in sales and profits, Reduced garage space unavailability due to booking management system for both Garage services and Home/ Pickup services (estimated.)	\$ 25,630
<b>Intangible Benefits</b>	
Streamlined and convenient services	
Un-overwhelming/ Fairly scheduled work tasks	
Improved Productivity	
Easier to offer after-sales services/ keeping in touch with customers	
Improved customer retention/ loyalty	
Work Efficiency in accepting bookings, managing bookings and scheduling for workers	
Transparency of processes and services between business and customers	
Well-managed Garage Space in branches	
<b>Total Benefits</b>	<b>\$ 29,130</b>

## Cost Benefit Analysis

Net Benefits
= Benefits (for 1 year) – Development cost (for 1 year)
= \$ 29,130 - \$ 11,610
= \$ 17,520

Return of Investment %
= [Net Benefits / Development cost (for 1 year)] x 100
= (\$ 17,520 / \$ 11,610) x 100
= 151%

Payback Period
= Development Cost (for 1 year) / Net Benefits
= \$ 11,610 / \$ 17,520
= 0.66 (approximately over 7 months)

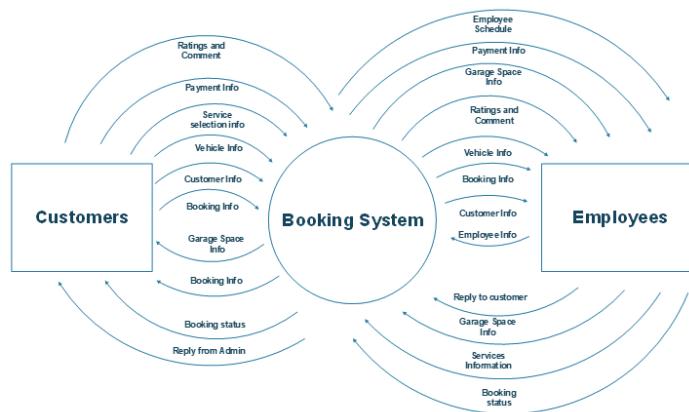
## No Go, Go Decision

Criteria	Description	Yes	No
<b>Acceptance by users</b>	Social Analysis had mostly positive impacts on the employees. The customers are also most likely to accept the change, due to convenience in making Bookings, eliminate queueing time mostly and transparency in viewing services, stages of on-services.	✓	
<b>Compatibility for business expansion</b>	Have ability to scale up with business. The new proposed system can easily support new branches or new services and increased workers.	✓	
<b>Impact in Operation efficiency, Productivity and Quality Controlling</b>	Can make majority of job roles to be more efficient and maintain productivity. Rating and comment sections will help service quality, worker performance to be better.	✓	
<b>More Benefits compared to Costs</b>	Tangible benefits > the costs (By \$ 17,520). Intangible benefits from the proposed system can help solve the current business problems significantly.	✓	
<b>Return of Investment &gt; 70% per year</b>	The profit return by implementing the system will double up the amount invested (150% ROI).	✓	
<b>Payback Period &lt; 2 years</b>	Will take the business over 7 months to fully recover their financial investment for the system. (0.66).	✓	

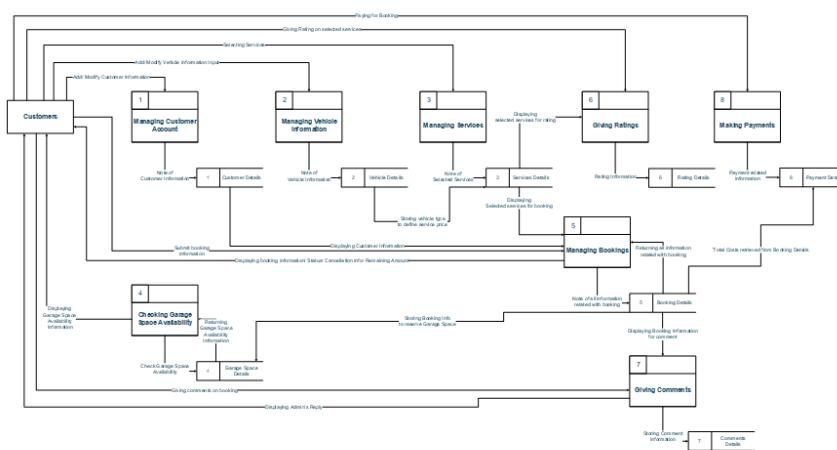
## Fact-Finding

Date	Info Gathering Method	Person	Questions/ Activity
1 <sup>st</sup> Oct, 2022	Interview	Manager	<ul style="list-style-type: none"> <li>-May I know about the background, history of AutoCare company?</li> <li>-Aims or Goals for the AutoCare company in the future?</li> <li>-What kind of services are offered in AutoCare?</li> <li>-How many employees are in AutoCare company? Their roles and how they are positioned for operations?</li> <li>-additional questions during interview</li> </ul>
3 <sup>rd</sup> Oct, 2022	Interview	Manager	<ul style="list-style-type: none"> <li>-Is there any issues that AutoCare company experiencing? What are they?</li> <li>-Previous attempts, Ideas that stakeholders had to resolve the issues</li> <li>-More detailed questions according to answer on issues</li> <li>-More detailed questions according to their needs to resolve issues</li> <li>-additional questions during interview</li> </ul>
5 <sup>th</sup> Oct, 2022	Observation	Employees	Activity process starting from customer booking, Drive-in to servicing, making payments and after sales activities

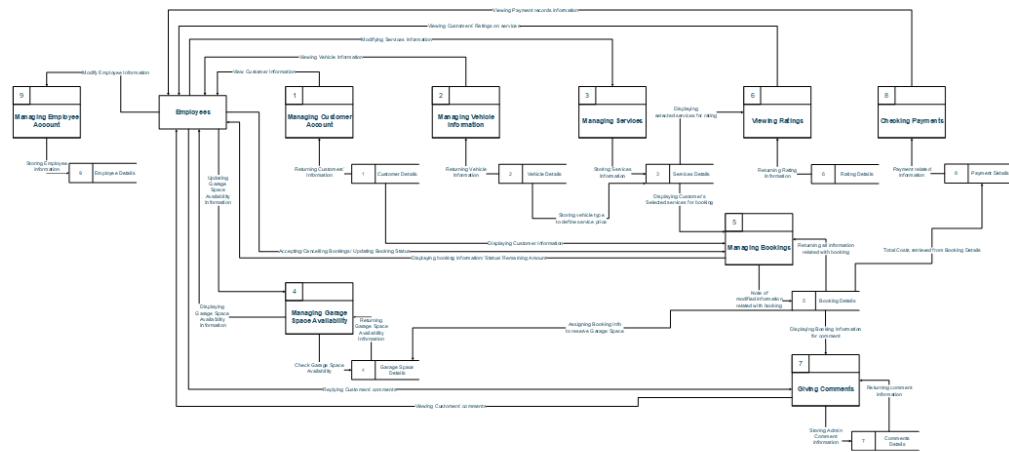
## Context Diagram



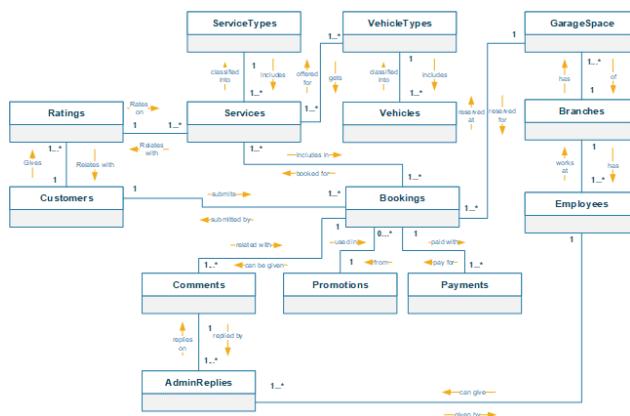
## Data Flow Diagrams (Customer side)



## Data Flow Diagrams (Employees side)



## Entity Relationship Diagram (w/o dummy tables)



## Normalization

Normalization on Process of customer making, submitting and paying for a booking

UNF	Lvl	INF	2NF	3NF
(Customer Name)	1	(Booking No) (PK)	(Booking No)	(Customer ID) (PK)
(Customer Phone)	1	(Customer Name)	(Customer Name)	(Customer Name)
(Customer Email)	1	(Customer Phone)	(Customer Phone)	(Customer Phone)
(Customer Address)	1	(Customer Email)	(Customer Email)	(Customer Email)
(Vehicle Name)	1	(Customer Address)	(Customer Address)	(Customer Address)
(Vehicle Type)	1	(Vehicle Name)	(Customer)	
(Vehicle Type Desc)	1	(Address)	(Customer Address)	
(Vehicle Model)	1	(Vehicle Type)	(Customer)	
(License No)	1	(Vehicle Type Desc)	(Address)	
(Vehicle Image)	1	(Vehicle Model)	(Customer Address)	
(Primary Color)	1	(License No)	(Vehicle Model)	
(Service Type Name)	1	(Vehicle Image)	(License No)	
(Service Type Desc)	1	(Primary Color)	(Vehicle Model)	
(Service No)	2	(Booking Date)	(Vehicle ID) (PK)	(Vehicle ID) (PK)
(Service Name)	2	(Served Location)	(Vehicle Type ID) (PK)	(Vehicle Type ID) (PK)
(Service Desc)	2	(Booking Start Time)	(Vehicle Name)	(Customer ID) (FK)
(Service Duration)	2	(Booking End Time)	(Vehicle Type)	(Customer ID) (FK)
(Service Status)	2	(Booking Total Cost)	(License No)	(Customer ID) (FK)
(Booking No) (PK)	1	(Booking Date)	(Vehicle Image)	(Customer ID) (FK)
(Booking Date)	1	(Remaining Amount)	(Primary Color)	(Customer ID) (FK)
(Booking Start Time)	1	(Payment Method)	(Booking No) (PK)	(Promotion ID) (FK)
(Booking End Time)	1	(Total Costs)	(Booking End Time)	(Garage Space ID) (FK)
(Total Costs)	1	(Branch No)	(Promotion ID) (PK)	(Branch No) (PK)
(Promotion Code)	1	(Branch Location)	(Branch No) (PK)	(Branch Location)
(Promotion Discount Amount)	1	(Garage Space No)	(Branch Location)	(Branch Location)
		(Booking No) (PK)	(Branch Location)	(Branch Location)
		(Payment Method)	(Branch Location)	(Branch Location)
		(Promotion Discount Amount)	(Branch Location)	(Branch Location)
		(Booking No) (PK)	(Branch Location)	(Branch Location)
		(Service No)	(Branch Location)	(Branch Location)

### Entities retrieved from normalization

Customers,  
VehicleTypes,  
Vehicles,  
Bookings,  
Promotions,  
Payments,  
Branches,  
GarageSpaces,  
BookedServices,  
VehicleTypeServices,  
Services,  
ServiceTypes

## Normalization

Normalization on Process of customer giving rating

UNF	Lvl	INF	2NF	3NF
(Customer ID) (PK)	1	(Customer ID) (PK)	(Customer ID) (PK)	(Customer ID) (PK)
(Customer Name)	1	(Customer Name)	(Customer Name)	(Customer Name)
(Customer Phone)	1	(Customer Phone)	(Customer Phone)	(Customer Phone)
(Customer Email)	1	(Customer Email)	(Customer Email)	(Customer Email)
(Customer Address)	1	(Customer Address)	(Customer Address)	(Customer Address)
(Service No)	2	(Customer ID) (FK)	(Rating ID) (PK)	(Rating ID) (PK)
(Service Name)	2	(Service No)	(Customer ID) (FK)	(Customer ID) (FK)
(Service Desc)	2	(Service Name)	(Service No)	(Service No) (FK)
(Service Duration)	2	(Service Desc)	(Service Name)	(Rating Amount)
(Service Status)	2	(Service Duration)	(Service Desc)	(Rating Date)
(Service Price)	2	(Service Status)	(Service Duration)	
(Rating ID)	2	(Service Price)	(Service Status)	
(Rating Amount)	2	(Rating Amount)	(Service Price)	
(Rating Date)	2	(Rating Date)	(Rating Amount)	

### Entities retrieved from normalization

Customers, Ratings, Services

## Normalization

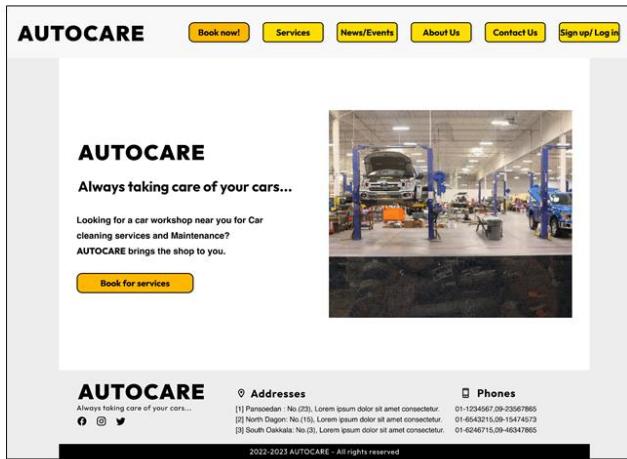
Normalization on Process of giving comment on booking and admin replying on comment

UNF	Lv1	1NF	2NF	3NF
(Booking ID) (PK)	1	(Booking ID) (PK)	(Booking ID) (PK)	(Booking ID) (PK)
(Comment Text)	2			
(Comment Timestamp)	2			
(Employee ID)	2	(Booking ID) (FK)	(Comment ID) (PK)	(Comment ID) (PK)
(Employee Name)	2	(Comment Text)	(Booking ID) (FK)	(Booking ID) (FK)
(Reply Text)	2	(Comment Timestamp)	(Comment Text)	(Comment Text)
(Reply Timestamp)	2	(Employee ID)	(Comment Timestamp)	(Comment Timestamp)
		(Employee Name)		
		(Reply Text)		
		(Reply Timestamp)		
			(Reply ID) (PK)	(Reply ID) (PK)
			(Comment ID) (FK)	(Comment ID) (FK)
			(Employee ID) (FK)	(Employee ID) (FK)
			(Employee Name)	(Employee Name)
			(Reply Text)	(Reply Text)
			(Reply Timestamp)	(Reply Timestamp)
				(Employee ID) (PK)
				(Employee Name)

### Entities retrieved from normalization

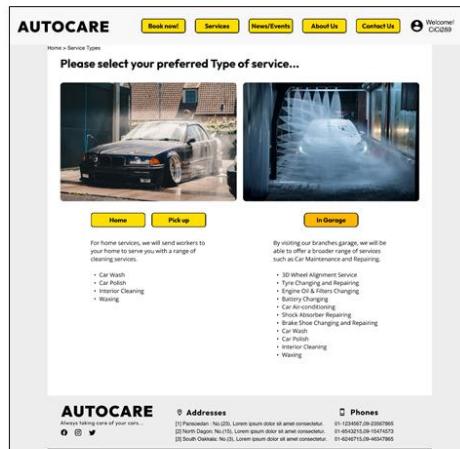
Bookings, Comments, AdminReplies, Employees

## User Interface Designs screens (Customers – Home)

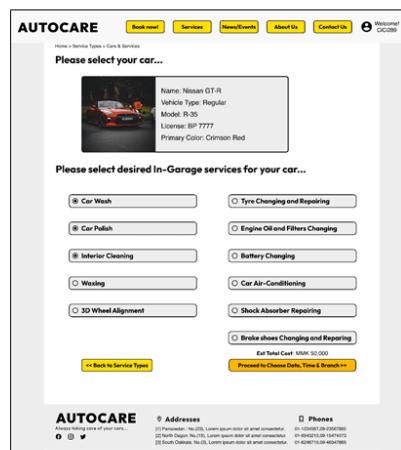


Interactive Prototype link: <https://www.figma.com/file/TsuhuXLidbsZOn4WVfAf/AUTOCARE-Booking-System-Prototype-Test?node-id=0%3A1&t=A7A1SmRmhQDK5gDx-1>

## User Interface Designs screens (Customers – Service Types)



## User Interface Designs screens (Customers – Car & Services )



## User Interface Designs screens (Customers – Date, Start Time and Branch)

The screenshot shows the 'Date & Branch' booking screen. At the top, there are tabs for Book now!, Services, News/Events, About Us, and Contact Us, with a 'Welcome! CC089' message. Below the tabs, a navigation bar includes Home, Service Types, Cars & Services, Date Time & Branch. The main area has three sections:

- Please select your convenient date for services...**: A two-month calendar grid from January 2023 to February 2023.
- Please select your desired Start Time...**: A grid of 12 time slots from 7:00 AM to 6:00 PM.
- Please select convenient Branch for services...**: Two boxes for Branch 1 (Available spaces: 10/30) and Branch 2 (Available spaces: 15/30), each with a 'Press to Change Payment Method' button.

At the bottom, there are links for Addressess, Phones, and a 'Back To Date Time & Branch' button.

## User Interface Designs screens (Customers – Payment)

The screenshot shows the 'Payment' screen. At the top, there are tabs for Book now!, Services, News/Events, About Us, and Contact Us, with a 'Welcome! CC089' message. Below the tabs, a navigation bar includes Home, Service Types, Cars & Services, Date Time & Branch, and Payments. The main area has two sections:

- Please select your preferred payment method...**: A list of payment methods: Cash Only, CB PAY, KBZ PAY, and WAVE PAY. 'Cash Only' is selected.
- Booking Summary**: Displays the booking details for 31st January 2023 at 11:00 AM. The summary table shows:
 

Service	Amount
Car Wash	MHK 5,000
Car Paint	MHK 20,000
Interior Cleaning	MHK 20,000
<b>SubTotal</b>	<b>MHK 50,000</b>
<b>Discount</b>	(-MHK 5,000)
<b>Net Costs</b>	<b>MHK 45,000</b>

 There is also a 'Add Promo Code:' input field and a 'Submit Booking' button.

At the bottom, there are links for Addressess, Phones, and a 'Back To Date Time & Branch' button.

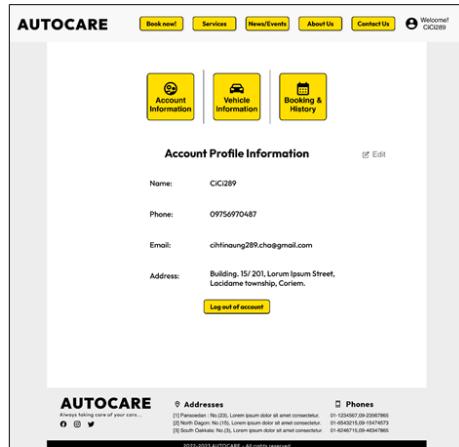
## User Interface Designs screens (Customers – Sign up)

The screenshot shows the 'Account Sign Up' page for Autocare. At the top, there is a navigation bar with links for 'Book now!', 'Services', 'News/Events', 'About Us', 'Contact Us', and 'Sign up / Log in'. Below the navigation bar, the title 'Account Sign Up' is displayed. A sub-instruction 'Sign up a new Autocare account to start booking for services!' is present. A note 'Already have an account? Log in here.' follows. The form contains fields for 'Name', 'Email', 'Password', 'Phone', 'Address', and 'Address (Township)'. A checkbox labeled 'By checking this button, you Agree to Privacy Policy and Terms of Use.' is shown. A yellow 'Sign up now! >' button is at the bottom. The footer features the Autocare logo and social media links for Facebook, Instagram, and Twitter. It also includes sections for 'Addresses' and 'Phones' with placeholder text and phone numbers.

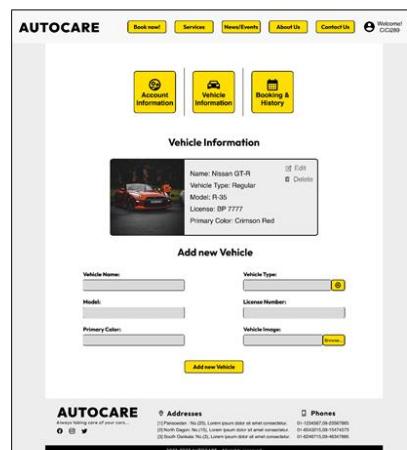
## User Interface Designs screens (Customers – Log in)

The screenshot shows the 'Account Log In' page for Autocare. The layout is similar to the sign-up page, with a navigation bar at the top. The title 'Account Log In' is centered above the login form. A note 'Log in to your Autocare account to start booking for services!' is above the form, followed by 'Don't have an account? Sign Up Here.' The form itself has fields for 'Email' and 'Password', with a 'Forgot Password?' link below the password field. A yellow 'Log into account >' button is at the bottom. The footer includes the Autocare logo and social media links, along with sections for 'Addresses' and 'Phones'.

## User Interface Designs screens (Customers – Account information)



## User Interface Designs screens (Customers – Vehicle Information)



## User Interface Designs screens (Customers – Booking History)

The screenshot shows the 'Booking History' section of the customer interface. At the top, there are three yellow buttons: 'Account Information', 'Vehicle Information', and 'Booking & History'. Below this is a table titled 'On-Going Bookings' with columns: No., Booking ID, Date & Time, Vehicle, Service Type, Services, Net Costs, and Booking Status. One row is visible: 'Bk-003' on 2-2-2023 at 17:00 AM, for a Nissan GT-R, In-Garage, Car Wash Interior Cleaning, 10,000, and 'Work in Progress'. Below this is another table titled 'Booking History' with similar columns. Two rows are listed: 'Bk-002' on 21-1-2023 at 10:00 AM and 'Bk-001' on 18-5-2023 at 9:00 AM, both for a Nissan GT-R, In-Garage, Car Wash Interior Cleaning, and 'Fully Paid'. The bottom of the page includes the 'AUTOCARE' logo, social media links, and a copyright notice: '2022-2023 AUTOCARE - All rights reserved'.

## User Interface Designs screens (Employees – Home/ Customers)

The screenshot shows the employee home screen with a sidebar menu on the left containing links like 'Customers', 'Bookings', 'Garage & Spares', 'Services & Types', 'Vehicles & Types', 'Ratings', 'Comments', 'Promotions', 'Payments', and 'Employees'. The main area has a search bar and a table titled 'List of Customers' with columns: CustomerID, Name, Phone, Email, Address, Update, and Delete. Five customer entries are listed. Below this is a form titled 'Add new Customer' with fields for Name, Email, Phone, Password, Address, and Address (Township). Buttons for 'Cancel' and 'Add' are at the bottom. The bottom of the page includes the 'AUTOCARE' logo and a copyright notice: '2022-2023 AUTOCARE - All rights reserved'.

## User Interface Designs screens (Employees – Top spending customers)

The screenshot shows the AUTOCARE application interface. On the left is a vertical navigation menu with items like Customers, Bookings, Garage & Spaces, Services & Types, Vehicles & Types, Ratings, Comments, Promotions, Payments, and Employees. The main area displays a table of customers with columns for CustomerID, Name, Phone, Email, Address, and Spending (MMK). A modal window titled 'Add new Customer' is open, containing fields for Name, Email, Phone, Password, Address, and Address (Township), along with 'Cancel' and 'Add' buttons.

CustomerID	Name	Phone	Email	Address	Spending (MMK)
Cus-001	CI-C289	09756970487	cjhnaung289.cha@gmail.com	Building, 15/201, Lourum ipsum...	50,000
Cus-002	Kyae Hay	09894135074	KyawH074.kh@gmail.com	Building, 21/201, SapaL Street...	30,000
Cus-004	U Mya Thaung	09752465665	MThaung123.m@gmail.com	Building, 35/101, ZidaWah Street...	20,000
Cus-005	U Keung Myat	09894060654	KaungMyat654@gmail.com	Building, 35/101, Kent Kaw Street...	15,000
Cus-006	U Kyaw Thinn	09765332475	KoKyawThinn.154@gmail.com	Building, 25/101, 140th Street...	10,000

## User Interface Designs screens (Employees – Bookings)

The screenshot shows the AUTOCARE application interface. The left navigation menu includes Customers, Bookings, Garage & Spaces, Services & Types, Vehicles & Types, Ratings, Comments, Promotions, Payments, and Employees. The main area displays three tables: 'List of Submitted Bookings', 'List of On-Going Bookings', and 'List of Previous Bookings'. The 'List of Submitted Bookings' table shows a booking for Kyae Hay on 3-2-2023 at 10:00 AM. The 'List of On-Going Bookings' table shows a booking for U Mya Thaung on 5-1-2023 at 11:00 AM. The 'List of Previous Bookings' table shows a booking for CI-C289 on 2-2-2023 at 10:00 AM. A modal window titled 'Create New Booking' is open, with fields for Date & Time, Filter by, Sort by, and Search, along with 'Cancel' and 'Create' buttons.

BookingID	Customer Name	Date	Time	Type	Branch Services	Net Cost	Accept	Cancel	Manage	
Bk-004	Kyae Hay	3-2-2023	10:00 AM	In-Garage	Br-1	Car Wash	5,000	✓	X	[Details]
Bk-005	U Mya Thaung	5-1-2023	5:00 PM	In-Garage	Br-2	Car Wash Oil Change	15,000	✓	X	[Details]
Bk-006	U Keung Myat	5-1-2023	11:00 AM	Home	-	Car Wash Interior Cleaning	10,000	✓	X	[Details]

## User Interface Designs screens (Employees – Branch, Garage & Spaces)

The screenshot shows the 'Garage Spaces and Status' section of the AUTOCARE application. At the top, there's a header with 'Welcome Admin1' and a 'Sign Out' button. Below it, a message displays 'Branch : 1 Name : PaZunTaung Branch Location : No.(23), Lorem ipsum dolor sit amet consectetur.' To the right, it says 'Available Spaces: 14/15'. On the left, a sidebar menu includes 'Customers >', 'Bookings >', 'Garage & Spaces >', 'Services & Types >', 'Vehicles & Types >', 'Ratings >', 'Comments >', 'Promotions >', 'Payments >', and 'Employees >'. The main area is titled 'Garage Spaces' and shows a grid of 15 numbered slots (1-15). Slots 1, 6, 11, and 12 are red and labeled 'Bk-003 10:00 AM-12:30 PM Set as Free ✓'. Other slots are green and labeled 'Set as Taken ✗'. A yellow 'Add new Garage Spaces' button is at the top right.

## User Interface Designs screens (Employees – Services & Types)

The screenshot shows the 'Service Types & Services' section of the AUTOCARE application. At the top, there's a header with 'Welcome Admin1' and a 'Sign Out' button. Below it, a message displays 'Service ID: 0-001 Service Name: Car Wash Vehicle Type: compact Duration: 00:30 Price: 0.00 Status: Active'. To the right, it says 'Service Status: Active' with a yellow 'Edit/Print' button. On the left, a sidebar menu includes 'Customers >', 'Bookings >', 'Garage & Spaces >', 'Services & Types >', 'Vehicles & Types >', 'Ratings >', 'Comments >', 'Promotions >', 'Payments >', and 'Employees >'. The main area is divided into two sections: 'Service Types' and 'Services'. 'Service Types' contains fields for 'Service Type ID', 'Service Type Name', 'Service Type Description', and a 'Add new Service Type' button. 'Services' contains fields for 'Service ID', 'Service Name', 'Service Type', 'Vehicle Type', 'Service Description', 'Service Duration', and 'Service Status', with a 'Add new Service' button at the bottom. A yellow 'Edit/Print' button is also present in the 'Services' section.

## User Interface Designs screens (Employees – Vehicle Types & Vehicles)

The screenshot shows the AUTOCARE Employee interface. On the left, a vertical sidebar lists navigation options: Customers, Bookings, Garage & Spaces, Services & Types, Vehicles & Types, Ratings, Comments, Promotions, Payments, and Employees (which is selected). The main area is divided into two sections: "Vehicle Types" and "Vehicles".

**Vehicle Types:** A table lists vehicle types with columns for ID, Name, Description, and Manage. Entries include: VHT-001 Compact (Criteria: Smaller overall dimensions, Smaller engine capacity, HP), VHT-002 Medium (Criteria: Larger overall dimensions than compact, Smaller engine capacity, HP), VHT-003 Van (Criteria: Larger overall dimensions than medium, Larger engine capacity, HP), and VHT-004 Compact Trucks (Criteria: Larger overall dimensions than medium, Larger engine capacity, HP, with back storage). Buttons for Export/Print and Add new Vehicle Type are at the bottom.

**Vehicles:** A form for adding a new vehicle. Fields include: Vehicle ID, Vehicle Name, Vehicle Type (dropdown), Model, Image, License No., Primary Color, and a large text area for Vehicle Type Description. A "Add new Vehicle" button is at the bottom right.

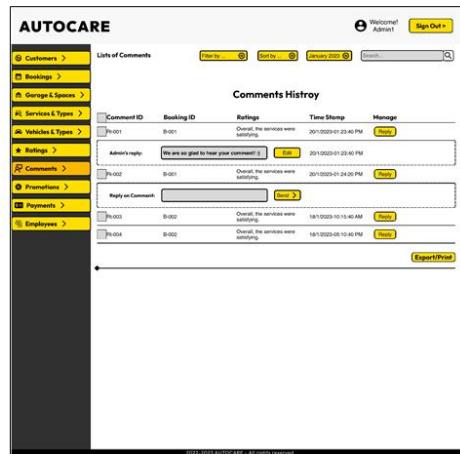
## User Interface Designs screens (Employees – Ratings)

The screenshot shows the AUTOCARE Employee interface. The sidebar navigation is identical to the previous screen, with Employees selected. The main area is divided into two sections: "Summarized Rating" and "Rating History".

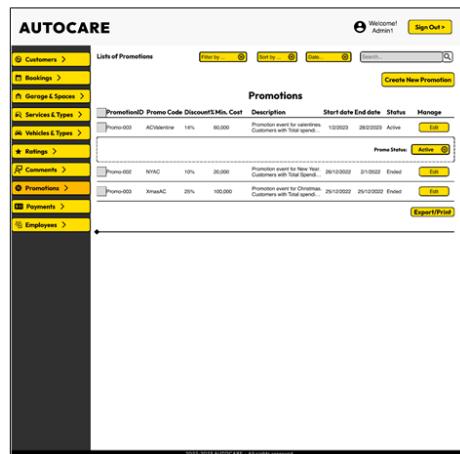
**Summarized Rating:** A table showing ratings for different services. Columns include: Service ID, Name, Service Type, Vehicle Type, Ratings (star icons), and Manage. Entries include: S-001 Car Wash In-Garage Compact (Rating: 5 stars), S-002 Car Wash Home Compact (Rating: 4 stars), and S-003 Interior Cleaning In-Garage Compact (Rating: 3 stars). A "Export/Print" button is at the bottom.

**Rating History:** A table showing individual rating history entries. Columns include: Rating ID, Customer ID, Service ID, Ratings, Time Stamp, and Manage. Entries include: RH-001 Cus-001 S-001 (Rating: 5 stars, Time Stamp: 30/1/2023 01:25:40 PM), RH-002 Cus-001 S-003 (Rating: 4 stars, Time Stamp: 30/1/2023 01:24:00 PM), RH-003 Cus-001 S-001 (Rating: 3 stars, Time Stamp: 18/1/2023 10:10:40 AM), and RH-004 Cus-003 S-001 (Rating: 2 stars, Time Stamp: 18/1/2023 05:10:40 PM). A "Export/Print" button is at the bottom.

## User Interface Designs screens (Employees – Comments)



## User Interface Designs screens (Employees – Promotions)



## User Interface Designs screens (Employees – Payments)

PaymentID	BookingID	Method	Payment Amount	Type	Date	Status	Due Date	Manage
Pay-001	B-006	CASH PAY	50.000	Partial	10/10/2023	Partial Payment Requested	20/10/2023	<button>Edit/Delete</button>
Pay-002	B-001	Cash Only	50.000	Full	15/10/2023	Fully Paid	-	<button>Edit</button>
Pay-003	B-002	Cash Only	50.000	Full	30/10/2023	Fully Paid	-	<button>Edit</button>

Export/Print

## User Interface Designs screens (Employees – Employees)

EmployeeID	Name	Gender	Address	Position	BranchID	DOB	Phone	Manage
Emp-001	Aung Thin	Male	No. 25, Kam Kae Street.	Manager	B-1	12/10/1975	09123456789	<button>Edit</button>
Emp-002	Ko Kyaw Khin	Male	No. 213, Wh Kyayng...	Technician	B-1	12/10/1980	09123456789	<button>Edit</button>
Emp-003	Aung Dan	Male	No. 25, Kam Kae Street.	Admin	B-1	12/10/1980	09123456789	<button>Edit</button>
Emp-004	Aung Kaung Khant	Male	No. 63A, Z Za Wah...	Admin	B-2	12/10/1980	09123456789	<button>Edit</button>

Export/Print

## Document for Evaluation

No.	Functional Requirements	Design Feature	Degree of Fulfillment			Comments
			Fully Met	Partially Met	Not Met	
<b>Customers</b>						
1	Create Customer Accounts	Form UI Design SQL Query				
	View Customer Information without passwords	List UI Design SQL Query	✓			
	Update specific Customer Information	List UI Design SQL Query				
	Generate report on most frequently visited customers within 2 months	SQL Query				
	Generate report on top spending customer of month	List UI Design SQL Query				
<b>VehicleTypes</b>						
2	Add new Vehicle Types	Form UI Design SQL Query				
	View Vehicle Type Information	List UI Design SQL Query	✓			
	Generate report on Most booked vehicle type according to booked services	SQL Query				
<b>Vehicles</b>						
3	Add new Vehicles	Form UI Design SQL Query				

4	View Vehicle Information + Type Name	List UI Design SQL Query		✓		
	Update Vehicle information	List UI Design SQL Query				
<b>ServiceTypes</b>						
	Create New Service Types	Form UI Design SQL Query	✓			
	View Service Type information	List UI Design SQL Query				
5	<b>Services</b>					
	Create New Services	Form UI Design SQL Query				
	View Service information according to Vehicle Type and Service Type	SQL Query	✓			
	Update Service information	List UI Design SQL Query				
	Top 3 Most Booked Services of the month	SQL Query				
6	<b>Bookings</b>					
	Create New Bookings	Form UI Design SQL Query		✓		
	View specific customer's Booking Information	List UI Design SQL Query				
	Update Booking Information for Cancel	List UI Design SQL Query				
	Update Booking Status	List UI Design SQL Query				

## Document for Evaluation

7	Generate report on Bookings lists for specific date, start time and end time, at specific Branch	SQL Query				
	Generate report on most booked months	SQL Query				
<b>Promotions</b>						
	Create new Promotion	List UI Design SQL Query	✓			
	View Promotion information	List UI Design SQL Query				
8	<b>Payments</b>					
	Make Record new Payment	Form UI Design SQL Query		✓		
	Generate report on Customers who have remaining 2nd payment	SQL Query				
	Make Record second payment	SQL Query				
	Generate report on Total revenue of month from bookings	SQL Query				
9	<b>Employees</b>					
	Create New Employee Accounts	List UI Design SQL Query	✓			
	View Employee information in specific branch	List UI Design SQL Query				
	Updating Employee Information	SQL Query				
10	<b>Branches</b>					
	Create Branches	List UI Design				

11	Updating Available Spaces	SQL Query	✓			
	Create Garage Space	List UI Design SQL Query				
	View Garage Space according to Branch	List UI Design SQL Query	✓			
	Update Garage Space	List UI Design SQL Query				
12	<b>Ratings</b>					
	Customer Rate on services	List UI Design SQL Query	✓			
	Generate report on Overall ratings of services	List UI Design SQL Query				
13	<b>Comments</b>					
	Customer comment on booking	List UI Design SQL Query	✓			
14	<b>AdminReplies</b>					
	Admin's Reply to Comments	List UI Design SQL Query		✓		
	View all related customer comment & admin replies for a specific booking	SQL Query				

## Conclusion (Achievement of Project Objectives)

Projective Objectives	Achieved	Not Achieved
To analyze the business and its goals, current situations, and identify the problems being encountered currently.	✓	
To define a scope for system of the proposed system project, define Aims of project and coherent objectives to achieve the aims and make necessary planning for the project.	✓	
To study and analyze about Database use for the project, evaluate Methodologies, Case Study Analysis about similar products/services and uses of Information Systems.	✓	
To analyze whether the project is feasible enough to implement.	✓	
To start gathering information necessary, designing system and functions for the proposed system.	✓	
To perform Structural, User Interface, Behavioral Designing and Database implementation phase for the proposed system.	✓	
To review and re-evaluate the system whether it meets the needs of AutoCare and their issues.	✓	

## Conclusion

Our proposed Online Car Service Booking System will help AUTOCARE in revolutionizing their business, by streamlining the booking process, increasing efficiency, and improving customer satisfaction.

It will not only save AUTOCARE's waste of time and man power, but it will also provide their customers with an unparalleled level of convenience.



Thank you very much for listening to this  
proposal till the end!  
Have a great day! 

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