

Database Systems Project

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1. Conceptual Model

1.1 Sources of Entity Types & Relationship Types:

Business Rule		Entity Types	Relationship Types
ID	Description		
1	An Acquisition Transaction event involves IMI acquiring a Vehicle from a Supplier, who could be a Vendor, a Private Collector, or Customer involved in a trade-in. Each Acquisition Transaction has a unique identifier (AT_ID), transaction amount (AT_Amount), vehicle mileage (AT_Mileage), event date (AT_Date), and the Branch at which it occurred.	Acquisition_Transaction, Vehicle, Supplier, Vendor, Private_Collector, Customer	Conduct, Supplies, Is Acquired In
2	For each Sales Transaction event there is single Vehicle, a single Sales Agent, a single Customer, a single Branch; each Vehicle could be involved in multiple Sales Transaction events; each Sales Agent could be involved in multiple Sales Transaction events; each Customer could be involved in multiple Sales Transaction events. Each Sales Transaction has a unique identifier (ST_ID), transaction amount (ST_Amount), vehicle mileage (ST_Mileage), and event date (ST_Date).	Sales_Transaction, Vehicle, Customer, Branch, Sale Agent	Is a Part Of, Is Involved In, Oversees, Fall Under
3	A Customer is a person or an organization involved in a Sales Transaction with IMI or purchased a Maintenance Service Order from IMI. Attributes recorded for all Customers include CID, Name, Address, Balance; additional attributes recorded for Person Customers include DOB, SSN.	Customer, Organization, Person, Sales_Transaction, Maintenance_Service_Order	Involved In, Purchases,
4	For each Vehicle there is a specific Vehicle Model (e.g. Toyota Camry), and a single owner, who is considered to be the Customer. Attributes recorded for each Vehicle include its identifier (VIN), Year, Colors, Mileage, License Number, State. Attributes recorded for each Vehicle Model include its identifier (VMID), Name, Start Year, End Year, Miles per Gallon.	Vehicle, Vehicle_Model, Customer, Color	Has a, Owns, Incorporates

5	Some Employees are classified as Managers, Sales Agents or Service Engineers, but there are employees who are neither Managers nor Sales Agents nor Service Engineers. In addition to the regular attributes of all Employees (e.g. EID, Name, DOB, Degree, address (i.e. E_Street, City, State, Zipcode), Marital Status, Hire Date, SSN), the Commission Rate is recorded for each Sales Agent, the Hourly Labor Charge Rate & SE_Level (i.e. Senior, Associate) is recorded for each Service Engineer, and the Promotion Date is recorded for each Manager.	Employees, Managers, Sales Agents, Service Engineers, Degree	Earns
6	Each Employee is assigned to a specific Branch; the start date & end date of this assignment are recorded, where the end date can be null.	Branch, Employee Assignment	Receive An, Belongs to
7	Each Branch is managed by a single Manager, with the corresponding start (BR_Start_Date) & end date (BR_End_Date) being recorded, where the end date can be null. Each Branch has a unique identifier (BR_ID), name (BR_Name), phone number (BR_Phone_Number) & location (BR_Street, City, State, ZipCode).	Branch, Manager, Management	Is Imposed on, Exercises,
8	Each Maintenance Service Order involves one or more Maintenance Service Items. Each Maintenance Service Order has a unique identifier (MO_ID), vehicle mileage (MO_Mileage), & event dates (MO_Start_Date), and is executed at a specific Branch.	Maintence_Service_Order, Maintenance_Service_Item Branch	Involves, Is Executed At
9	For a given Maintenance Service Item on a given Maintenance Service Order, a single Service Engineer is assigned. The corresponding local identifier (MSI_ID), Actual Start Date, Actual End Date, Charged Labor Cost & Charged Labor Hours are also recorded.	Maintenance_Servic_Item Service_Engineer	Is Assigned
10	Each Maintenance Problem (e.g. engine tune-up, tire rotation, oil change) has an identifier (MP_ID), description (MP_Description), a Standard Minimum Labor Cost, & Standard Minimum Labor Hours.	Maintenance_Problem	N/A
11	A set of one or more Vehicle Parts that are required to fix a given Maintenance Problem, a given Vehicle Part may be required in order to fix one or more Maintenance Problems.	Maintenance_Problem, Required_Parts, Vehicle_Part	Grouped In, Require
12	For each Vehicle Part, there is an identifier (Part_ID), description (PR_Description) and cost (PR_COST).	Vehicle	N/A
13	Each Maintenance Service Item corresponds to a single Maintenance Problem; each Maintenance Problem may correspond to a multiple Maintenance Service Items.	Maintenance_Service_Item, Maintenance_Problem	Corresponds to

14	Each Service Engineer is qualified to service one or more Maintenance Problems. Multiple Service Engineers may be qualified to service a given Maintenance Problem. The corresponding Last Qualified Date is recorded.	Service_Engineers, Qualifications, Maintenance_Problems	Obtain, Need
15	Each Maintenance Service Order involves a single Sales Agent, a single Vehicle & a single Customer; each Sales Agent could sell multiple Maintenance Service Orders; each Vehicle could be involved in multiple Maintenance Service Orders; each Customer could be involved in multiple Maintenance Service Orders.	Maintenance_Service_Order, Sales_Agent, Vehicle, Customer	Purchases, Sells, Is Maintained Under
16	Each Vendor has an identifier (VR_ID), name (VR_Name), years-in-business (VR_YRSBUS) & location (VR_Street, City, State, ZipCode).	Vendor	N/A
17	Each Private Collector has an identifier (PC_ID), name (PC_Name), reliability score (PC_RSCR) & location (PC_Street, City, State, ZipCode).	Private_Collector	N/A

Entities	Name of Entity	Classification	List of Attributes	Identifier
	ACQUISITION_TRANSACTION	Regular	BR_ID (FK) VIN (FK) SUP_ID (FK) AT_Amount AT_Mileage AT_Date	AT_ID
	SUPPLIER	Category	Sup_Type	Sup_ID
	VENDOR	Supertype	Sup_ID(fk) VR_Name VR_YRSBUS VR_Street VR_City VR_State VR_Zipcode	VR_ID
	PRIVATE_COLLECTOR	Supertype	Sup_ID (fk) PC_Name PC_RSCR PC_Street PC_City PC_State PC_Zipcode	PC_ID

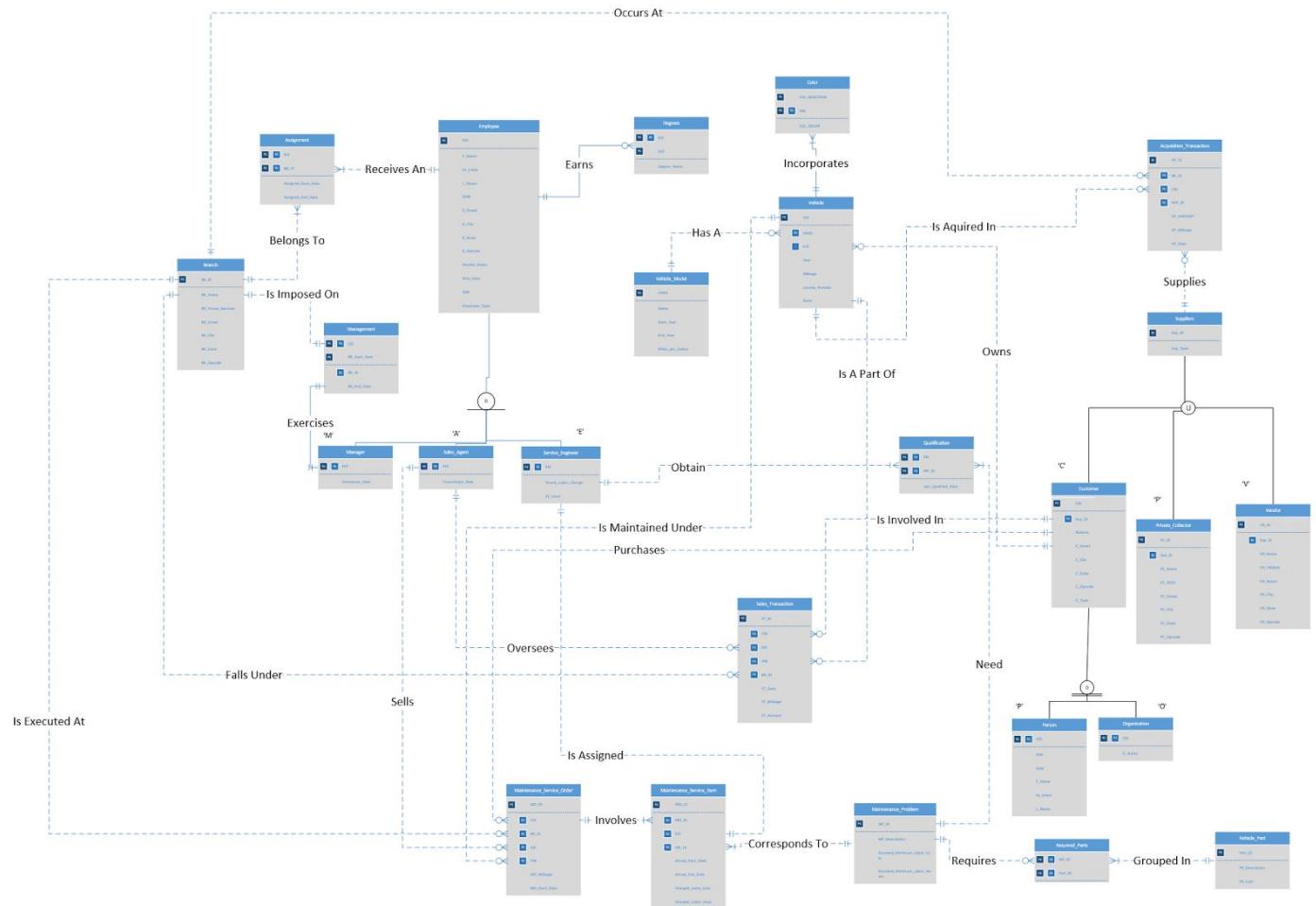
	CUSTOMER	Superclass	Sup_ID (fk) Balance C_Street C_City C_State C_Zipcode C_Type	CID
	PERSON	Subtype	F_Name M_Initial L_Name SSN DOB	CID
	ORGANIZATION	Subtype	O_Name	CID
	Sales_Transaction	Regular	CID (fk) EID (fk) VIN (fk) BR_ID (fk) ST_Amount ST_Mileage ST_Date	ST_ID
	VEHICLE	Regular	VMID (fk) CID (fk) Year Mileage License_Number State	VIN
	Color	Weak	Col_Color VIN(fk)	Col_Selection VIN
	VEHICLE_MODEL	Regular	Name Start_Year End_Year Miles_Per_Gallon	VMID
	EMPLOYEE	Supertype	F_Name M_Initial L_Name DOB E_Street E_City E_State E_Zipcode Marital_Status Hire_Date SSN Employee_Type	EID

	MANAGER	Subtype	EID (fk) Promotion_Date	EID
	SALES_AGENT	Subtype	EID (fk) Commission_Rate	EID
	SERVICE_ENGINEER	Subtype	EID (fk) Hourly_Labor_Charge SE_Level	EID
	Degree	Weak	Degree_Name EID(fk)	EID, DID
	BRANCH	Regular	BR_Name BR_Phone_Number BR_Street BR_City BR_State BR_Zipcode	BR_ID
	MANAGEMENT	Weak	EID (fk) BR_ID (fk) BR_End_Date	EID, BR_Start_Date
	MAINTENANCE_SERVICE_ORDER	Regular	CID (fk) BR_ID (fk) EID (fk) VIN (fk) MO_Mileage MO_Start_date	MO_ID
	MAINTENANCE_SERVICE_ITEM	Regular	MO_ID (fk) EID (fk) MP_ID (fk) Actual_Start_Date Actual_End_Date Charged_Labor_Cost Charged_Labor_Hour	MSI_ID
	MAINTENANCE_PROBLEM	Regular	MP_Description Standard_Minimum_Labor_Cost Standard_Minimum_Labor_Hour	MP_ID
	VEHICLE_PART	Regular	PR_Description PR_Cost	Part_ID
	REQUIRED_PARTS	Associative	MP_ID(fk) PART_ID (fk)	MP_ID PART_ID
	ASSIGNMENT	Associative	EID (fk) BR_ID (fk) Assigned_Start_Date Assigned_End Date	EID BR_ID
	QUALIFICATIONS	Associative	EID (fk)	EID

		MP_ID (fk) Last_Qualified_Date	MP_ID	
Categories	Name of Category	Names of Participating Entities	Identifier	
	Supplier	Vendor, Customer, Private_Collector	Sup_ID	
Relationships	Name of Relationship	Classification	Names of Participating Entities/Categories	List of Non-Identifier Attributes
	Is Acquired In	1:M	VEHICLE ACQUISITION_TRANSACTION	
	Occurs At	1:M	BRANCH ACQUISITION_TRANSACTION	
	Is A Part Of	1:M	VEHICLE SALES_TRANSACTION	
	Oversees	1:M	SALES_AGENT SALES_TRANSACTION	
	Is Involved In	1:M	CUSTOMER SALES_TRANSACTION	
	Falls Under	1:M	BRANCH SALES_TRANSACTION	
	Has A	1:M	VEHICLE VEHICLE_MODEL	
	Owns	1:M	VEHICLE CUSTOMER	
	Involves	1:M	MAINTENANCE_SERVICE_ORDER MAINTENANCE_SERVICE_ITEM	
	Is Executed At	1:M	BRANCH MAINTENANCE_SERVICE_ORDER	
	Is Assigned	1:1	MAINTENANCE_SERVICE_ITEM SERVICE_ENGINEER	

	Requires	1:M	MAINTENANCE_PROBLEM REQUIRED_PARTS	
	Grouped In	1:M	REQUIRED_PARTS VEHICLE_PART	
	Corresponds To	1:1	MAINTENANCE_SERVICE_ITEM MAINTENANCE_PROBLEM	
	Obtain	1:M	SERVICE_ENGINEER QUALIFICATION	
	Need	1:M	MAINTENANCE_PROBLEM, QUALIFICATION	
	Sells	1:M	SALES_AGENT MAINTENANCE_SERVICE_ORDER	
	Is Maintained Under	1:M	MAINTENANCE_SERVICE_ORDER VEHICLE	
	Purchases	1:M	CUSTOMER MAINTENANCE_SERVICE_ORDER	
	Incorporates	1:M	VEHICLE COLOR	
	Earns	1:M	EMPLOYEE, Degree	
	Supplies	1:M	ACQUISITION_TRANSACTION SUPPLIERS	
	Receives An	1:M	ASSIGNMENT EMPLOYEE	
	Belongs To	1:M	BRANCH ASSIGNMENT	
	Is Imposed On	1:1	BRANCH MANAGEMENT	
	Exercises	1:1	MANAGEMENT MANAGER	

1.2 Visual Representation of Entity-Relationship Model (ERM):



Assumptions:

From Business Rule 1, we have made the following assumptions and provided our justifications:

- We made the assumption that a Vehicle can be a part of multiple Acquisition Transactions, since it is possible for a previously acquired car to come back into IMI's possession in the future from another supplier.
- The business rules do not clearly define the cardinality between Branch and Acquisition Transaction, which is why we have made the assumption that an operating Branch could conduct multiple Acquisition Transactions. Since there is a high likelihood of this incident, we have altered the conceptual model diagram to account for this assumption.
- Additionally, a single supplier could be involved in many Acquisition Transactions. We are considering the long-term plans for the database, and it is highly likely that a supplier, whether that be a customer, vendor, or private collector, may complete multiple Acquisition Transactions over the course of the business relationship.

From Business Rule 2, we have made the following assumption and provided our justifications:

- We made the assumption that a single Branch may have multiple Sales Transactions over the course of the business cycle due to IMI's focus on the sales of luxury vehicles.

From Business Rule 4 we have made the following assumptions and provided our justifications:

- It is apparent in the business rules that a Vehicle corresponds to one and only one Vehicle Model, but it is unclear if a Vehicle Model can exist without a Vehicle. To resolve this ambiguity, we have made the assumption that a Vehicle Model could, in fact, exist without a Vehicle due to the fact that IMI can have a listed vehicle model without any quantity available for that vehicle.

- We also have assumed that a car would consist of multiple colors, hence the creation of the separate 'Colors' entity.

From Business Rule 5 we have made the following assumption and provided our justifications:

- We have assumed that an employee could have earned several Degree, hence the separate 'Degree' entity.

From Business Rule 6 we have made the following assumption and provided our justifications:

- We have assumed that an employee can be assigned to multiple locations over the course of their employment with IMI. This will allow for keeping track of the possible transfer of the employee to another branch.

From Business Rule 7 we have made the following assumption and provided our justifications:

- We have made the management entity a weak entity dependent on the manager entity, as management cannot exist without a manager.

From Business Rule 8 we have made the following assumption and provided our justifications:

- The business rules do not explicitly state the maximum quantity of Maintenance Service Orders for a branch, hence the safe assumption to allow a branch to execute multiple Maintenance Service Orders due to repairs being a common service within the business model.

1.3 Documentation of ERM

1.3.1 Entity Specification:

ACQUISITION_TRANSACTION

Textual Description: This entity describes the acquisition of cars from a supplier to a particular branch.

Attributes

- *BR_ID (FK)*

Textual Description: This represents a particular branch where the acquisition transaction has occurred.

Data Type: Integer

- Field Size: 8
- Domain: BR_ID > 0

- *VIN (FK)*

Textual Description: This represents the VIN number of the car that is being acquired in the transaction.

Data Type: Text

- Field Size: 17

- *SUP_ID (FK)*

Textual Description: This represents the a unique supplier who supplied the car for the acquisition.

Data Type: Integer

- Field Size: 8
- Domain: SUP_ID > 0

- *AT_Amount*

Textual Description: This represents the amount of money that will be provided to the supplier for the car.

Data Type: Currency

- Field Size: 7

- Number of Decimal Positions: 2
 - Domain: AT_Amount >= 0
- AT_Mileage
Textual Description: This represents the amount of miles on a given car.
Data Type: Integer
 - Field Size: 6
 - Domain: AT_MILEAGE >= 0
- AT_Date
Textual Description: This represents the date of the acquisition transaction.
Data Type: Date

Identifier Attribute

- AT_ID
Textual Description: This represents the unique acquisition transaction that is being documented.
Data Type: Integer
 - Field Size: 8
 - Domain: AT_ID > 0

SUPPLIER

Textual Description: This entity will represent any of the suppliers who could be vendors, customers, or private collectors that can be a part of an acquisition transaction.

Attributes

- Sup_Type
Textual Description: This attribute represents the type of supplier of the acquisition who could be a vendor, customer, or private collector.
Data Type: Text
 - Field Size: 1
 - Domain: Sup_Type = 'C' OR Sup_Type ='P' OR Sup_Type='V' OR Sup_Type = 'O'

Identifier Attribute:

- Sup_ID
Textual Description: This attribute represents the unique Supplier of an Acquisition Transaction
Data Type: Integer
 - Field Size: 8
 - Domain: Sup_ID > 0

VENDOR

Textual Description: This entity represents a vendor who would be a supplier for cars in an acquisition transaction.

Attributes:

- Sup_ID (FK)

Textual Description: This attribute represents the Vendor that supplies in an Acquisition Transaction

Data Type: Integer

 - Field Size: 8
 - Domain: Sup_ID > 0
- VR_Name

Textual Description: This attribute represents the vendor's name.

Data Type: Text

 - Field Size: 255
- VR_YRSBUS

Textual Description: The attribute represents the vendor's years in business

Data Type: Integer

 - Field Size: 3
 - Domain: VR_YRSBUS >= 0
- VR_Street

Textual Description: This attribute represents the street address where the vendor is located.

Data Type: Text

 - Field Size: 255
- VR_City

Textual Description: This attribute represents the city in which the vendor is located.

Data Type: Text

 - Field Size: 25
- VR_State

Textual Description: This attribute represents the state in which the vendor is located.

Data Type: Text

 - Field Size: 12
- VR_Zipcode

Textual Description: This attribute represents the zip code in which the vendor is located.

Data Type: Integer

 - Field Size: 5
 - Domain: VR_Zipcode between(11111 and 99999)

Identifier Attribute:

- VR_ID

Textual Description: The unique identifier of a Vendor

Data Type: Integer

- Field Size: 8
- Domain: VR_ID > 0

PRIVATE_COLLECTOR

Textual Description: This entity represents a kind of a supplier that is involved in an acquisition transaction.

Attributes

- Sup_ID (FK)

Textual Description: The supplier's unique identification number.
 Data Type: Integer

 - Field Size: 8
 - Domain: Sup_ID > 0
- PC_Name

Textual Description: The name of the Private Collector.
 Data Type: Text

 - Field Size: 255
- PC_RSCR

Textual Description: The private collector's reliability score.
 Data Type: Real Number

 - Field Size: 3
 - Number of Decimal Positions: 2
 - Domain: PC_RSCR between(1 and 5)
- PC_Street

Textual Description: The street address of the Private Collector.
 Data Type: Text

 - Field Size: 255
- PC_City

Textual Description: The city of the Private Collector.
 Data Type: Text

 - Field Size: 255
- PC_State

Textual Description: The state of private collector.
 Data Type: Text

 - Field Size: 255
- PC_Zipcode

Textual Description: The zipcode part of the address of the private collector.
 Data Type: Integer

 - Field Size: 5
 - Domain: PC_Zipcode between(11111 and 99999)

Identifying Attributes

- PC_ID

Textual Description: The unique identifier of the personal collector supplier.

Data Type: Integer

 - Field Size: 8
 - Domain: PC_ID > 0

CUSTOMER

Textual Description: This entity represents a kind of a supplier that is involved in an acquisition transaction.

Attributes

- Sup_ID (FK)

Textual Description: The supplier's unique identification number.

Data Type: Integer

 - Field Size: 8
 - Domain: Sup_ID > 0
- Balance

Textual Description: Customer's standing financial balance.

Data Type: Real Number

 - Field Size: 8
 - Number of Decimal Positions: 2
 - Domain: Nullable
- C_Street

Textual Description: The street part of the customer's address.

Data Type: Text

 - Field Size: 255
- C_City

Textual Description: The city part of the customer's address.

Data Type: Text

 - Field Size: 255
- C_State

Textual Description: The state part of the customer's address.

Data Type: Text

 - Field Size: 255
- C_Zipcode

Textual Description: The zipcode part of the customer's address.

Data Type: Integer

 - Field Size: 5
 - Domain: C_Zipcode between(11111 and 99999)
- C_Type

Textual Description: The type of the customer that varies between several pre-defined options.

Data Type: Text

 - Field Size: 1

- Domain: C_Type= 'P' OR C_Type = 'O'

Identifying Attributes

- CID

Textual Description: The customer's unique identification number.

Data Type: Integer

- Field Size: 8
- Domain: CID > 0

PERSON

Textual Description: This entity represents a kind of a customer that is involved in an acquisition transaction.

Attributes

- F_Name

Textual Description: The person's first name.

Data Type: Text

- Field Size: 255

- M_Initial

Textual Description: The person's middle name initial letter.

Data Type: Text

- Field Size: 1

- L_Name

Textual Description: The person's last name.

Data Type: Text

- Field Size: 255

- SSN

Textual Description: The person's social security number.

Data Type: Integer

- Field Size: 9

- Domain: SSN between(000000000 and 999999999)

- DOB

Textual Description: The person's date of birth.

Data Type: Date

- CID (FK)

Textual Description: The customer's unique identification number.

Data Type: Integer

- Field Size: 8

- Domain: CID > 0

ORGANIZATION

Textual Description: Organization is a type of a customer.

Attributes

- O_Name
Textual Description: The organization's full name.
Data Type: Text
 - Field Size: 255
- CID (FK)
Textual Description: The customer's unique identification number.
Data Type: Integer
 - Field Size: 8
 - Domain: CID > 0

SALES_TRANSACTION

Textual Description: The transaction between a sales agent and a customer, involving a car and taking place at a particular branch.

Attributes

- CID (FK)
Textual Description: The customer's unique identification number.
Data Type: Integer
 - Field Size: 8
 - Domain: CID > 0
- EID (FK)
Textual Description: The employee's unique identification number.
Data Type: Integer
 - Field Size: 8
 - Domain: EID > 0
- VIN (FK)
Textual Description: The vehicle's unique identification number.
Data Type: Text
 - Field Size: 17
- BR_ID (FK)
Textual Description: The branch's unique identification number.
Data Type: Integer
 - Field Size: 8
 - Domain: BR_ID > 0
- ST_Amount
Textual Description: The financial amount of the sales transaction.
Data Type: Real Number
 - Field Size: 8
 - Number of Decimal Positions: 2
 - Domain: ST_Amount > 0

- ST_Mileage
Textual Description: The sales transaction involves a vehicle and this attribute represents this vehicle's mileage.
Data Type: Integer
 - Field Size: 7
 - Domain: ST_Mileage >= 0
- ST_Date
Textual Description: The date of the sales transaction.
Data Type: Date

Identifying Attributes

- ST_ID
Textual Description: The sales transaction's unique identification number.
Data Type: Integer
 - Field Size: 8
 - Domain: ST_ID > 0

VEHICLE

Textual Description: The transaction between a sales agent and a customer, involving a car and taking place at a particular branch.

Attributes

- VMID (FK)
Textual Description: The unique identifier of the vehicle model.
Data Type: Integer
 - Field Size: 8
 - Domain: VMID > 0
- CID (FK)
Textual Description: The customer's unique identification number.
Data Type: Integer
 - Field Size: 8
 - Domain: CID > 0
- Year
Textual Description: The year of production of the vehicle
Data Type: Integer
 - Field Size: 4
 - Domain: Year BETWEEN (1800 and 3000)
- Mileage
Textual Description: The current mileage of the vehicle.
Data Type: Integer
 - Field Size: 7
 - Domain: Mileage>0

- License_Number
Textual Description: The current license plate number of the vehicle.
Data Type: Text
 - Field Size: 8
- State
Textual Description: The state where the vehicle is registered.
Data Type: Text
 - Field Size: 255

Identifying Attributes

- VIN
Textual Description: The vehicle's unique identifier.
Data Type: Text
 - Field Size: 17

COLOR

Textual Description: The colors used for a particular vehicle.

Attributes

- Col_Color
Textual Description: The attribute determines the color of a particular segment of the car.
Data Type: Text
 - Field Size: 255

Identifying Attributes

- VIN (FK)
Textual Description: The vehicle's unique identifier.
Data Type: Text
 - Field Size: 17
- Col_Selection
Textual Description: The attribute determines where in the vehicle the color is used.
Data Type: Text
 - Field Size: 255

VEHICLE_MODEL

Textual Description: The model of the vehicle, independent from a particular vehicle with a VIN number.

Attributes

- Name
Textual Description: Name of the vehicle model.
Data Type: Text
 - Field Size: 255

- Start_Year
Textual Description: Determines when the vehicle model started to be produced.
Data Type: Integer
 - Field Size: 4
 - Domain: Start_Year < End_Year
- End_Year
Textual Description: Determines when the vehicle model ceased to be produced.
Data Type: Integer
 - Field Size: 4
 - Domain: End_Year > (Start_Year + 1)
 - Domain: Nullable
- Miles_Per_Gallon
Textual Description: The attribute represents the predicted average miles per gallon of the vehicle model.
Data Type: Integer
 - Field Size: 3
 - Domain: Miles_Per_Gallon > 0

Identifying Attributes:

- VMID
Textual Description: The unique identifier of the vehicle model.
Data Type: Integer
 - Field Size: 8
 - Domain: VMID > 0

EMPLOYEE

Textual Description: A person who is employed by IMI

Attributes:

- F_Name
Textual Description: The Employee's first name
Data Type: Text
 - Field Size: 35
- M_Initial
Textual Description: The Employee's middle initial
Data Type: Text
 - Field Size: 1
 - Domain: Nullable
- L_Name
Textual Description: The Employee's last name
Data Type: Text
 - Field Size: 35

- DOB
Textual Description: The Employee's Date of Birth
Data Type: Date
 - DOB > 1990-01-01
- E_Street
Textual Description: The Employee's street address of residence
Data Type: Text
 - Field Size: 255
- E_City
Textual Description: The Employee's city of residence
Data Type: Text
 - Field Size: 255
- E_State
Textual Description: The Employee's state of residence
Data Type: Text
 - Field Size: 255
- E_Zipcode
Textual Description: The Employee's zipcode of residence
Data Type: Integer
 - Field Size: 5
 - Domain: E_Zipcode between(11111 and 99999)
- Marital_Status
Textual Description: The Employee's marital status
Data Type: Text
 - Field Size: 1
 - Domain: Marital_Status= 'M' OR Marital_Status='S'
- Hire_Date
Textual Description: The Date in which the Employee was hired
Data Type: Date
- SSN
Textual Description: The Social Security Number of an Employee
Data Type: Integer
 - Field Size: 9
 - Domain: SSN Between (111111111 and 999999999)
- Employee_Type
Textual Description: This represents where an employee is a manager, sales associate, service engineer, or other.
Data Type: Text
 - Field Size: 1
 - Domain: Employee_Type = 'M' OR Employee_Type ='A' OR Employee_Type='E' OR Employee_Type = 'O'

Identifying Attribute:

- EID

Textual Description: The unique identifier for the Employee

Data Type: Integer

- Field Size: 8
- Domain: EID > 0

MANAGER

Textual Description: An employee Job Position type

Attributes:

- Promotion_Date

Textual Description: The date in which the Employee has been promoted to Manager

Data Type: Date

Identifier Attribute:

- EID

Textual Description: The unique identifier for each employee

Data Type: Integer

- Field Size: 8
- Domain: EID > 0

SALES_AGENT

Textual Description: This entity represents a sales agent, a type of an employee.

Attributes:

- Commission_Rate

Textual Description: The commission rate of the sales agent per transaction.

Data Type: Real Number

- Field Size: 3
- Number of Decimal Positions: 2
- Domain: Commission_Rate > 0

Identifier Attributes:

- EID

Textual Description: The unique identifier for each employee

Data Type: Integer

- Field Size: 8
- Domain: EID > 0

SERVICE_ENGINEER

Textual Description: This entity represents a service engineer, a type of an employee.

Attributes:

- Hourly_Labor_Charge

Textual Description: The hourly wage of the engineer.

Data Type: Real Number

- Field Size: 5
 - Number of Decimal Positions: 2
 - Domain: Hourly_Labor_Charge >= 7.25
- SE_Level
Textual Description: The qualification SE_Level of the service engineer.
Data Type: Text
 - Field Size: 9
 - Domain: SE_Level = 'Senior' OR SE_Level = 'Associate'

Identifying Attributes

- EID (FK)
Textual Description: The unique identifier of an employee.
Data Type: Integer
 - Field Size: 8
 - Domain: EID > 0

Degree

Textual Description: This entity represents educational Degree of employees.

Attributes:

- Degree_Name
Textual Description: Name of the Degree.
Data Type: Text
 - Field Size: 255

Identifying Attributes:

- EID (FK)
Textual Description: The unique identifier of an employee.
Data Type: Integer
 - Field Size: 8
 - Domain: EID > 0
- DID
Textual Description: The unique identifier of a Degree.
Data Type: Integer
 - Field Size: 8
 - Domain: DID > 0

BRANCH

Textual Description: This entity represents a branch of the dealership.

Attributes:

- BR_Name
Textual Description: Name of a branch.
Data Type: Text
 - Field Size: 255

- BR_Phone_Number
Textual Description: The main phone number of a branch.
Data Type: Integer
 - Field Size: 10
 - Domain: BR_Phone_Number between(1111111111 and 9999999999)
- BR_Street
Textual Description: Street part of the branch's address.
Data Type: Text
 - Field Size: 255
- BR_City
Textual Description: City part of the branch's address.
Data Type: Text
 - Field Size: 255
- BR_State
Textual Description: State part of the branch's address.
Data Type: Text
 - Field Size: 255
- BR_Zipcode
Textual Description: Zipcode part of the branch's address.
Data Type: Integer
 - Field Size: 5
 - Domain: E_Zipcode between(11111 and 99999)

Identifying Attributes:

- BR_ID
Textual Description: The unique identifier of a branch.
Data Type: Integer
 - Field Size: 8
 - Domain: EID > 0

MANAGEMENT

Textual Description: This entity represents the management relationship between a manager and a branch.

Attributes:

- BR_End_Date
Textual Description: The day the management relationship ended.
Data Type: Date
 - Domain: BR_End_Date >= BR_Start_Date
 - Domain: Nullable
- BR_ID (FK)
Textual Description: The unique identifier of a branch.
Data Type: Integer
 - Field Size: 8

- Domain: BR_ID > 0

Identifying Attributes:

- EID (FK)

Textual Description: The unique identifier of an employee.

Data Type: Integer

- Field Size: 8
- Domain: EID > 0

- BR_Start_Date

Textual Description: The day the management relationship started.

Data Type: Date

- Domain: BR_Start_Date <= BR_End_Date

MAINTENANCE_SERVICE_ORDER

Textual Description: This entity represents a order for maintenance service.

Attributes:

- CID (FK)

Textual Description: The unique identifier of the customer filing the order.

Data Type: Integer

- Field Size: 8
- Domain: MO_ID > 0

- BR_ID (FK)

Textual Description: The unique identifier of the branch the order is filed at.

Data Type: Integer

- Field Size: 8
- Domain: BR_ID > 0

- EID (FK)

Textual Description: The unique identifier of the employee creating the order.

Data Type: Integer

- Field Size: 8
- Domain: EID > 0

- VIN (FK)

Textual Description: The unique identifier of the vehicle involved in the order.

Data Type: Text

- Field Size: 17

- MO_Mileage

Textual Description: The mileage of the vehicle at the time of the creation of the service maintenance order.

Data Type: Integer

- Field Size: 7
- Domain: MO_Mileage > 0

- MO_Start_Date

Textual Description: The date of the creation of the service maintenance order.

Data Type: Date

Identifying Attributes:

- MO_ID

Textual Description: The unique identifier of a Maintenance Service Order.

Data Type: Integer

- Field Size: 8
- Domain: MO_ID > 0

MAINTENANCE_SERVICE_ITEM

Textual Description: This entity represents an item involved in a Maintenance Service Order.

Attributes:

- MO_ID (FK)

Textual Description: The unique identifier of the Maintenance Service Order.

Data Type: Integer

- Field Size: 8
- Domain: MO_ID > 0

- EID (FK)

Textual Description: The unique identifier of the employee filing the maintenance service item.

Data Type: Integer

- Field Size: 8
- Domain: EID > 0

- MP_ID (FK)

Textual Description: The unique identifier of the maintenance problem related to the maintenance service item.

Data Type: Integer

- Field Size: 8
- Domain: EID > 0

- Actual_Start_Date

Textual Description: The date work was started on the maintenance service item.

Data Type: Date

- Domain: Actual_Start_Date <= Actual_End_Date

- Actual_End_Date

Textual Description: The date the work was finished on the maintenance service items.

Data Type: Date

- Domain: Actual_End_Date >= Actual_Start_Date

- Charged_Labor_Cost

Textual Description: Total cost associated with the handling of this item.

Data Type: Real Number

- Field Size: 8

- Number of Decimal Positions: 2
 - Domain: Charged_Labor_Cost > 0
- Charged_Labor_Hour
Textual Description: Total labor hours spent handling this item.
Data Type: Integer
 - Field Size: 5
 - Domain: Charged_Labor_Hour > 0

Identifying Attributes:

- MSI_ID
Textual Description: The unique identifier of the maintenance service item involved in the Maintenance Service Order.
Data Type: Integer
 - Field Size: 8
 - Domain: MSI_ID > 0

MAINTENANCE_PROBLEM

Textual Description: This entity represents a maintenance problem reported.

Attributes:

- MP_Description
Textual Description: The textual description of the maintenance problem reported.
Data Type: Text
 - Field Size: 255
- Standard_Minimum_Labor_Cost
Textual Description: The minimum labor cost predicted for the handling of the problem.
Data Type: Real Number
 - Field Size: 8
 - Number of Decimal Positions: 2
 - Domain: Standard_Minimum_Labor_Cost > 0
- Standard_Minimum_Labor_Hour
Textual Description: The minimum labor hours predicted for the handling of the problem.
Data Type: Integer
 - Field Size: 5
 - Domain: Standard_Minimum_Labor_Hour > 0

Identifying Attributes:

- MP_ID
Textual Description: The unique identifier of the maintenance service problem.
Data Type: Integer
 - Field Size: 8
 - Domain: MP_ID > 0

VEHICLE_PART

Textual Description: This attribute represents a vehicle part filed with the dealership.

Attributes:

- PR_Description
Textual Description: The description of the filed vehicle part.
Data Type: Text
 - Field Size: 255
- PR_Cost
Textual Description: The cost of the filed vehicle part.
Data Type: Real Number
 - Field Size: 8
 - Number of Decimal Positions: 2
 - Domain: PR_Cost > 0

Identifying Attributes:

- Part_ID
Textual Description: The unique identifier of the vehicle part.
Data Type: Integer
 - Field Size: 8
 - Domain: Part_ID > 0

REQUIRED_PARTS

Textual Description: The vehicle parts required to solve a maintenance problem.

Identifying Attributes:

- MP_ID (FK)
Textual Description: The unique identifier of the maintenance service problem.
Data Type: Integer
 - Field Size: 8
 - Domain: MP_ID > 0
- Part_ID (FK)
Textual Description: One of the required vehicle parts.
Data Type: Integer
 - Field Size: 8
 - Domain: Part_ID > 0

ASSIGNMENT

Textual Description: This entity records the assignment of an employee to a branch.

Attributes:

- Assigned_Start_Date
Textual Description: The day the employee was assigned to branch.
Data Type: Date
 - Domain: Assigned_Start_Date <= Assigned_End_Date

- Assigned_End_Date

Textual Description: The day the employee was discharged from a branch.
 Data Type: Date

 - Domain: Assigned_End_Date >= Assigned_Start_Date
 - Domain: Nullable

Identifying Attributes:

- EID (FK)

Textual Description: The unique identifier of an employee.
 Data Type: Integer

 - Field Size: 8
 - Domain: EID > 0
- BR_ID (FK)

Textual Description: The unique identifier of a branch.
 Data Type: Integer

 - Field Size: 8
 - Domain: BR_ID > 0

QUALIFICATIONS

Textual Description: This attribute specifies the Qualification that a Service Engineer must have in order to service a Maintenance Problem

Attributes:

- Last_Qualified_Date

Textual Description: This states the date the Service Engineer received that Qualification
 Data Type: Date

Identifying Attributes:

- EID (FK)

Textual Description: This identifies the Service Engineer who earned this Qualification
 Data Type: Integer

 - Field Size: 8
 - Domain: EID > 0
- MP_ID (FK)

Textual Description: The unique identifier of a maintenance problem.
 Data Type: Integer

 - Field Size: 8
 - Domain: MP_ID > 0

1.3.2 Relation Specification:

1. Name: Is Acquired In
 - a. Textual Description: This relation describes the vehicle that would be acquired by IMI in an acquisition.
 - b. Participating Entities:
 - i. VEHICLE
 - ii. ACQUISITION_TRANSACTION
 - c. Connectivity: 1:M
2. Name: Occurs At
 - a. Textual Description: This relation describes the Branch where the acquisition of a vehicle will occur.
 - b. Participating Entities:
 - i. BRANCH
 - ii. ACQUISITION_TRANSACTION
 - c. Connectivity: 1:M
3. Name: Is A Part Of
 - a. Textual Description: This relation describes the vehicle that would be sold in a sales transaction.
 - b. Participating Entities:
 - i. VEHICLE
 - ii. SALES_TRANSACTION
 - c. Connectivity: 1:M
4. Name: Oversees
 - a. Textual Description: This relation describes the sales agent who will oversee a specific sales transaction.
 - b. Participating Entities:
 - i. SALES_AGENT
 - ii. SALES_TRANSACTION
 - c. Connectivity: 1:M
5. Name: Is Involved In
 - a. Textual Description: This relation describes the customer who will be purchasing a car in a sales transaction.
 - b. Participating Entities:
 - i. CUSTOMER
 - ii. SALES_TRANSACTION
 - c. Connectivity: 1:M

6. Name: Falls Under
 - a. Textual Description: This relation describes at which branch the sales transaction will occur.
 - b. Participating Entities:
 - i. BRANCH
 - ii. SALES_TRANSACTION
 - c. Connectivity: 1:M
7. Name: Has A
 - a. Textual Description: This relation describes a specific vehicle model having a particular vehicle.
 - b. Participating Entities:
 - i. VEHICLE
 - ii. VEHICLE_MODEL
 - c. Connectivity: 1:M
8. Name: Owns
 - a. Textual Description: This relation describes that a customer can own a vehicle.
 - b. Participating Entities:
 - i. VEHICLE
 - ii. CUSTOMER
 - c. Connectivity: 1:M
9. Name: Involves
 - a. Textual Description: This relation describes that a Maintenance Service Order could have multiple maintenance service items.
 - b. Participating Entities:
 - i. MAINTENANCE_SERVICE_ORDER
 - ii. MAINTENANCE_SERVICE_ITEM
 - c. Connectivity: 1:M
10. Name: Is Executed At
 - a. Textual Description: This relation describes the branch at which the Maintenance Service Order is executed.
 - b. Participating Entities:
 - i. BRANCH
 - ii. MAINTENANCE_SERVICE_ORDER
 - c. Connectivity: 1:M
11. Name: Is Assigned
 - a. Textual Description: This relation describes the service engineer who is assigned to a specific maintenance service item on a Maintenance Service Order.

- b. Participating Entities:
 - i. MAINTENANCE_SERVICE_ITEM
 - ii. SERVICE_ENGINEER
- c. Connectivity: 1:1

12. Name: Requires

- a. Textual Description: This relation describes that maintenance problem may require parts in order for the problem to be fixed.
- b. Participating Entities:
 - i. MAINTENANCE_PROBLEM
 - ii. REQUIRED_PARTS
- c. Connectivity: 1:M

13. Name: Grouped In

- a. Textual Description: This relation describes that a vehicle part may be grouped in the necessary required parts for a maintenance problem.
- b. Participating Entities:
 - i. REQUIRED_PARTS
 - ii. VEHICLE_PART
- c. Connectivity: 1:M

14. Name: Corresponds To

- a. Textual Description: This relation describes that every maintenance service item has a maintenance problem that corresponds to the maintenance service item.
- b. Participating Entities:
 - i. MAINTENANCE_SERVICE_ITEM
 - ii. MAINTENANCE_PROBLEM
- c. Connectivity: 1:1

15. Name: Obtain

- a. Textual Description: This relation describes that a service engineer must obtain certain qualifications for handling certain maintenance problems.
- b. Participating Entities:
 - i. SERVICE_ENGINEER
 - ii. QUALIFICATION
- c. Connectivity: 1:M

16. Name: Need

- a. Textual Description: This relation describes what qualifications are needed to complete a specific maintenance problem.
- b. Participating Entities:
 - i. MAINTENANCE_PROBLEM
 - ii. QUALIFICATION

- c. Connectivity: 1:M

17. Name: Sells

- a. Textual Description: This relation describes the sales agent who sells a Maintenance Service Order to a customer.
- b. Participating Entities:
 - i. SALES_AGENT
 - ii. MAINTENANCE_SERVICE_ORDER
- c. Connectivity: 1:M

18. Name: Is Maintained Under

- a. Textual Description: This relation describes the vehicle that is being maintained under a specific Maintenance Service Order.
- b. Participating Entities:
 - i. MAINTENANCE_SERVICE_ORDER
 - ii. VEHICLE
- c. Connectivity: 1:M

19. Name: Purchases

- a. Textual Description: This relation describes the customer who purchases the Maintenance Service Order.
- b. Participating Entity:
 - i. CUSTOMER
 - ii. MAINTENANCE_SERVICE_ORDER
- c. Connectivity: 1:M

20. Name: Incorporates

- a. Textual Description: This relation describes a color incorporated in a car.
- b. Participating Entities:
 - i. VEHICLE
 - ii. COLOR
- c. Connectivity: 1:M
- d. Existence Constraints: This relationship cannot exist without the vehicle entity existing since a vehicle's colors cannot exist separately from a vehicle.

21. Name: Earns

- a. Textual Description: This relation describes the Degree that a particular employee may have earned.
- b. Participating Entities:
 - i. EMPLOYEE
 - ii. Degree
- c. Connectivity: 1:M

d. Existence Constraints: This relationship is contingent on the fact that there are employees at the branch. If there were no employees at the branch, then this relationship cannot exist because there would be no employees to have earned Degree.

22. Name: Supplies

- a. Textual Description: This relation describes the suppliers who supply cars in an acquisition transaction.
- b. Participating Entities:
 - i. ACQUISITION_TRANSACTION
 - ii. SUPPLIERS
- c. Connectivity: 1:M

23. Name: Receives An

- a. Textual Description: This relation describes a particular assignment received by an employee.
- b. Participating Entities:
 - i. ASSIGNMENT
 - ii. EMPLOYEE
- c. Connectivity: 1:M

24. Name: Belongs To

- a. Textual Description: This relation describes the assignment of an employee to a branch.
- b. Participating Entities:
 - i. BRANCH
 - ii. ASSIGNMENT
- c. Connectivity: 1:M

25. Name: Is Imposed On

- a. Textual Description: This relation describes the branch is under the control of management.
- b. Participating Entities:
 - i. BRANCH
 - ii. MANAGEMENT
- c. Connectivity: 1:1

26. Name: Exercises

- a. Textual Description: This relation describes a manager exercising his management duties.
- b. Participating Entities:
 - i. MANAGEMENT
 - ii. MANAGER
- c. Connectivity: 1:1

- d. Existence Constraint: This relationship is contingent on the fact that a manager is necessary to manage a branch. If there is no manager, then manager could not exercise his management ability.

2.0 Relational Data Model

2.1 Initial RDM

	Entity	Relation
REGULAR ENTITIES	Acquisition Transaction	Acquisition_Transaction(AT_ID, BR_ID, VIN, SUP_ID, AT_Amount, AT_Mileage, AT_Date)
	Sales Transaction	Sales_Transaction(ST_ID, CID, EID, VIN, BR_ID, ST_Amount, ST_Mileage, ST_Date)
	Vehicle	Vehicle (VIN, VMID, CID, Year, Mileage, License_Number, State)
	Vehicle Model	Vehicle_Model(VMID, Name, Start_Year, End_Year, Miles_Per_Gallon)
	Branch	Branch(BR_ID, BR_Name, BR_Phone_Number, BR_Street, BR_City, BR_State, BR_Zipcode)
	Maintenance Service Order	Maintenance_Service_Order(MO_ID, CID, BR_ID, EID, VIN, MO_Mileage, MO_Start_Date)
	Maintenance Service Item	Maintenance_Service_Item(MSI_ID, MO_ID, EID, MP_ID, Actual_Start_Date, Actual_End_Date, Charged_Labor_Cost, Charged_Labor_Hour)
	Maintenance Problem	Maintenance_Problem(MP_ID, MP_Description, Standard_Minimum_Labor_Cost, Standard_Minimum_Labor_Hour)
	Vehicle Part	Vehicle_Part(Part_ID, PR_Description, PR_Cost)
	Required Parts	Required_Parts(MP_ID, Part_ID)

	Assignment	Assignment(EID, BR_ID, Assigned_Start_Date, Assigned_End_Date)
	Qualifications	Qualifications(EID, MP_ID, Last_Qualified_Date)
WEAK ENTITIES	Color	Color(Col_Selection, VIN, Col_Color)
	Degree	Degree(EID, DID, Degree_Name)
	Management	Management (EID, BR_Start_Date, BR_ID, BR_End_Date)
SUPERTYPE ENTITIES	Vendor	Vendor (VR_ID, VR_Name, VR_YRSBUS, VR_Street, VR_City, VR_State, VR_Zipcode, Sup_ID)
	Private Collector	Private_Collector(PC_ID, Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_City, PC_State, PC_Zipcode)
	Customer	Customer(CID, Sup_ID, Balance, C_Type, C_Street, C_City, C_State, C_Zipcode)
	Employee	Employee(EID, F_Name, M_Initial, L_Name, DOB, E_Street, E_City, E_State, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type)
SUBTYPE ENTITIES	Person	Person(CID, F_Name, M_Initial, L_Name, SSN, DOB)
	Organization	Organization (CID, O_Name)
	Manager	Manager(EID, Promotion_Date)
	Sales Agent	Sales_Agent(EID, Commission_Rate)
	Service Engineer	Service_Engineer(EID, Hourly_Labor_Charge, SE_Level)
CATEGORIES	Supplier	Supplier(Sup_ID, Sup_Type)
M:M RELATIONSHIPS	N/A	emp

2.2 Initial RDM with Functional Dependencies

1. Acquisition_Transaction(AT_ID, BR_ID, VIN, SUP_ID, AT_Amount, AT_Mileage, AT_Date)
 - a. Functional Dependencies:
 - i. $AT_ID \rightarrow BR_ID, VIN, SUP_ID, AT_Amount, AT_Mileage, AT_Date$
 - b. Justification: Business rule 1 is explicit in stating that there is a unique identifier for each Acquisition Transaction, AT_ID. This unique identifier can serve as the candidate key for the acquisition transaction relation to determine the following attributes: BR_ID, VIN, SUP_ID, AT_Amount, AT_Mileage, AT_Date.
 - c. Evaluation of relation in 3rd Normal Form:

Acquisition_Transaction(AT_ID, BR_ID, VIN, SUP_ID, AT_Amount, AT_Mileage, AT_Date) $AT_ID \rightarrow BR_ID, VIN, SUP_ID, AT_Amount, AT_Mileage, AT_Date$		
PK?	AT_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	This is because $AT_ID \rightarrow BR_ID, VIN, SUP_ID, AT_Amount, AT_Mileage, AT_Date$.	
1NF?	This relation does not have any multivalued attributes	YES - it is in 1st NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	This relationship is in 1NF and its PK consist of a single Attribute.	Yes - It is in 2nd NF.
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	This relation is in 2NF and there are no transitive dependencies.	Yes - It is in 3rd NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

2. Supplier(Sup_ID, Sup_Type)

a. Functional Dependencies:

$$\text{i. } \text{Sup_ID} \rightarrow \text{Sup_Type}$$

b. Justification: The supplier relation is developed from business rule 1 to encompass the various suppliers of vehicles: private collectors, vendors, and customers. We have chosen a unique identifier, Sup_ID, to serve as the candidate key in the relation to determine the type of supplier.

c. Evaluation of relation in 3rd Normal Form:

Supplier(Sup_ID, Sup_Type) Sup_ID → Sup_Type		
PK?	Sup_ID	
		The PK is the determinant of an FD that includes all of the attributes of the Relation.
		This is because $\text{Sup_ID} \rightarrow \text{Sup_Type}$
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF.
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	This relation is in 1NF and its PK consists of a single Attribute.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no <i>Partial Dependencies</i> Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one <i>Partial Dependency</i> Then it is NOT in 2NF 	
3NF?	This relation is in 2NF and there are no transitive dependencies.	Yes - It is in 3rd NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 <i>Transitive Dependency</i> Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 <i>Transitive Dependency</i> Then it is in 3NF 	

3. Vendor (VR_ID, VR_Name, VR_YRSBUS, VR_Street, VR_City, VR_State, VR_Zipcode, Sup_ID)

a. Functional Dependencies:

$$\text{i. } \text{VR_ID} \rightarrow \text{VR_Name}, \text{VR_YRSBUS}, \text{VR_Street}, \text{VR_Zipcode}, \text{Sup_ID}$$

$$\text{ii. } \text{VR_Zipcode} \rightarrow \text{VR_City}, \text{VR_State}$$

- b. Justification: Business rule 16 is explicit in stating that there will be a identifier, VR_ID, for the vendor relation. Since this attribute is unique, it can serve as the candidate key for the relation to determine the following attributes: VR_Name, VR_YRSBUS, VR_Street, VR_Zipcode, Sup_ID. In addition to the first functional dependency with VR_ID, the Zipcode of the vendor address, VR_ZIPCODE, is able to determine the city and state of the vendor, VR_City and VR_State.
- c. Evaluation of relation in 3rd Normal Form:

<p>Vendor (VR_ID, VR_Name, VR_YRSBUS, VR_Street, VR_City, VR_State, VR_Zipcode, Sup_ID)</p> <p>$VR_ID \rightarrow VR_Name, VR_YRSBUS, VR_Street, VR_Zipcode, Sup_ID$</p> <p>$VR_Zipcode \rightarrow VR_City, VR_State$</p>		
PK?	VR_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	<p>Since($VR_ID \rightarrow VR_Name, VR_YRSBUS, VR_Street, VR_Zipcode, Sup_ID$) & ($VR_Zipcode \rightarrow VR_City, VR_State$) then $VR_ID \rightarrow VR_City, VR_State$</p> <p>Thus $VR_D \Rightarrow VR_Name, VR_YRSBUS, VR_Street, VR_Zipcode, Sup_ID, VR_City, VR_State$</p>	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF.
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	This relation is in 1NF and its PK consists of a single Attribute.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	This relation is in 2NF and there is 1 transitive dependency. ($VR_Zipcode \rightarrow VR_City, VR_State$)	No it is not in 3rd NF there we must decompose the relation into 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

d. Decomposition:

Decompose Relation in 2NF into Relations in 3NF		
Vendor (<u>VR_ID</u> , VR_Name, VR_YRSBUS, VR_Street, VR_City, VR_State, VR_Zipcode, <i>Sup_ID</i>) $\{VR_ID \rightarrow VR_Name, VR_YRSBUS, VR_Street, VR_Zipcode, Sup_ID$ $VR_Zipcode \rightarrow VR_City, VR_State\}$		
	PK	VR_ID
	Transitive Dependencies (TDs)	VR_ZIPCODE \rightarrow VR_CITY, VR_STATE
Step 1	Identify the <i>Determinant</i> of each TD	VR_ZIPCODE
Step 2	For each TD, use all of its <i>Attributes</i> to form a new Relation	Location (<u>VR_ZIPCODE</u>, VR_CITY, VR_STATE)
Step 3	Remove the <i>Dependent Attributes</i> of each TD from the original Relation	Vendor (<u>VR_ID</u> , VR_Name, VR_YRSBUS, VR_Street, VR_Zipcode, <i>Sup_ID</i>)

4. Private_Collector(PC_ID, *Sup_ID*, PC_Name, PC_RSCR, PC_Street, PC_City, PC_State, PC_Zipcode)
- Functional Dependencies:
 - $PC_ID \rightarrow Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_Zipcode$
 - $PC_Zipcode \rightarrow PC_City, PC_State$

b. Justification: Business rule 17 is explicit in stating that there will be a identifier, PC_ID, for the private collector relation. Since this attribute is unique, it can serve as the candidate key for the relation to determine the following attributes: Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_Zipcode. In addition to the first functional dependency with PC_ID, the zipcode of the private collector's address, PC_ZIPCODE, is able to determine the city and state of the private collector, PC_City and PC_State.

c. Evaluation of relation in 3rd Normal Form:

Private_Collector(PC_ID, Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_City, PC_State, PC_Zipcode) $PC_ID \rightarrow Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_Zipcode$ $PC_Zipcode \rightarrow PC_City, PC_State$		
PK?	PC_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	Since $(PC_ID \rightarrow Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_Zipcode)$ $) \& (PC_Zipcode \rightarrow PC_City, PC_State)$ then $PC_ID \rightarrow PC_City, PC_State$ Thus $PC_ID \Rightarrow Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_Zipcode, PC_City, PC_State$	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1st NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	This relation is in 1NF and its PK consists of a single attribute.	Yes it is in 2NF.
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	This relation is in 2NF and there is 1 transitive dependency. ($PC_Zipcode \rightarrow PC_City, PC_State$)	No it is not in 3rd NF therefore we must decompose the relation into 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

d. Decomposition

Decompose Relation in 2NF into Relations in 3NF		
Private_Collector(PC_ID, Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_City, PC_State, PC_Zipcode) PC_ID → Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_Zipcode PC_Zipcode → PC_City, PC_State		
	PK	PC_ID
	Transitive Dependencies (TDs)	PC_ZIPCODE → PC_CITY, PC_STATE
Step 1	Identify the <i>Determinant</i> of each TD	PC_ZIPCODE
Step 2	For each TD, use all of its <i>Attributes</i> to form a new Relation	Location (PC_ZIPCODE, PC_CITY, PC_STATE)
Step 3	Remove the <i>Dependent Attributes</i> of each TD from the original Relation	Private_Collector(PC_ID, Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_Zipcode)

5. Customer(CID, Sup_ID, Balance, C_Type, C_Street, C_City, C_State, C_Zipcode)

a. Functional Dependencies:

- i. CID → Sup_ID, Balance, C_Type, C_Street, C_Zipcode
- ii. C_Zipcode → C_City, C_State

- b. Justification: Business rule 3 is explicit in stating that there will be a identifier, CID, for the customer relation. Since this attribute is unique, it can serve as the candidate key for the relation to determine the following attributes: Sup_ID, Balance, C_Type, C_Street, C_Zipcode. In addition to the first functional

dependency with CID, the zipcode of the customer's address, C_ZIPCODE, is able to determine the city and state of the customer, C_City and C_State.

- c. Evaluation of relation in 3rd Normal Form:

Customer(CID, Sup_ID, Balance, C_Type, C_Street, C_City, C_State, C_Zipcode) CID → Sup_ID, Balance, C_Type, C_Street, C_Zipcode C_Zipcode → C_City, C_State		
PK?	CID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	Since (CID → Sup_ID, Balance, C_Type, C_Street, C_Zipcode) & (C_Zipcode → C_City, C_State) then CID → C_City, C_State Thus CID ⇒ Sup_ID, Balance, C_Type, C_Street, C_City, C_State, C_Zipcode	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	This relation is in 1NF and its PK consists of a single attribute.	Yes it is in 2NF.
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	This relation is in 2NF and there is 1 transitive dependency. (C_Zipcode → C_City, C_State)	No it is not in 3rd NF therefore the relation will need to be decomposed into 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

- d. Decomposition

Decompose Relation in 2NF into Relations in 3NF

Customer(CID, Sup_ID, Balance, C_Type, C_Street, C_City, C_State, C_Zipcode)
CID → Sup_ID, Balance, C_Type, C_Street, C_Zipcode
C_Zipcode → C_City, C_State

	PK	CID
	Transitive Dependencies (TDs)	C_ZIPCODE → C_CITY, C_STATE
Step 1	Identify the <i>Determinant</i> of each TD	C_ZIPCODE
Step 2	For each TD, use all of its <i>Attributes</i> to form a new Relation	Location (C_ZIPCODE, C_CITY, C_STATE)
Step 3	Remove the <i>Dependent Attributes</i> of each TD from the original Relation	Customer(CID, Sup_ID, Balance, C_Type, C_Street, C_Zipcode)

6. Person(CID, F_Name, M_Initial, L_Name, SSN, DOB)

a. Functional Dependencies:

i. CID → F_Name, M_Initial, L_Name, SSN, DOB

b. Justification: Business rule 3 is implicit in stating that a person entity will be a subtype of a customer. Since the person relation acts as subtype it will use the same candidate key from the customer relation, CID. This unique identifier is able to determine the following attributes: F_Name, M_Initial, L_Name, SSN, DOB.

c. Evaluation of relation in 3rd Normal Form:

Person(CID, F_Name, M_Initial, L_Name, SSN, DOB) CID → F_Name, M_Initial, L_Name, SSN, DOB	
PK?	CID
The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	CID → F_Name, M_Initial, L_Name, SSN, DOB

1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	This relation is in 1NF and its PK consists of a single attribute.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	This relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

7. Organization (CID, O_Name)

- Functional Dependencies:
 - $CID \rightarrow O_Name$
- Justification: Business rule 3 is implicit in stating that an organization entity will be a subtype of a customer. Since the organization relation acts as subtype it will use the same candidate key from the customer relation, CID. This unique identifier is able to determine the following attributes: O_Name.
- Evaluation of relation in 3rd Normal Form:

Organization (CID, O_Name) $CID \rightarrow O_Name$		
PK?	CID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	$CID \rightarrow O_Name$	
1NF?	It does not have any multivalued attributes.	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	

2NF?	The relation is in 1NF and its PK consists of a single attribute.	Yes it is in 2NF.
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no <i>Partial Dependencies</i> Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one <i>Partial Dependency</i> Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 <i>Transitive Dependency</i> Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 <i>Transitive Dependency</i> Then it is in 3NF 	

8. Sales_Transaction(ST_ID, CID, EID, VIN, BR_ID, ST_Amount, ST_Mileage, ST_Date)
- Functional Dependencies:
 - $ST_ID \rightarrow CID, EID, VIN, BR_ID, ST_Amount, ST_Mileage, ST_Date$
 - Justification: Business rule 2 states explicitly that there is a unique identifier for every sales transaction, ST_ID. This unique identifier serves as the candidate key because it can determine the following attributes: CID, EID, VIN, BR_ID, ST_Amount, ST_Mileage, ST_Date).
 - Evaluation of relation in 3rd Normal Form:

Sales_Transaction(ST_ID, CID, EID, VIN, BR_ID, ST_Amount, ST_Mileage, ST_Date) $ST_ID \rightarrow CID, EID, VIN, BR_ID, ST_Amount, ST_Mileage, ST_Date$		
PK?	ST_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	$ST_ID \rightarrow CID, EID, VIN, BR_ID, ST_Amount, ST_Mileage, ST_Date$	
1NF?	This relation does not have multivalued attribute	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	This relation is in 1NF and its PK consists of a single attribute.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF 	

	<ul style="list-style-type: none"> o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no <i>Partial Dependencies</i> Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one <i>Partial Dependency</i> Then it is NOT in 2NF
3NF?	<p>The relation is in 2NF and there is no 1 transitive dependency.</p> <p>Yes it is in 3NF.</p>
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 <i>Transitive Dependency</i> Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 <i>Transitive Dependency</i> Then it is in 3NF

9. Vehicle (VIN, VMID, CID, Year, Mileage, License_Number, State)

- Functional Dependencies:
 - $VIN \rightarrow VMID, CID, Year, Mileage, License_Number, State$
- Justifications: Business rule 4 is explicit in stating that every vehicle has a identifier, VIN. This VIN attribute can be used as the candidate key for the vehicle relation due to the uniqueness and determining factor of the VIN. The VIN will determine the following attributes: VMID, CID, Year, Mileage, License_Number, State.
- Evaluation of relation in 3rd Normal Form:

Vehicle (VIN, VMID, CID, Year, Mileage, License_Number, State) $VIN \rightarrow VMID, CID, Year, Mileage, License_Number, State$		
PK?	VIN	
The PK is the determinant of an FD that includes all of the attributes of the Relation.		
	$VIN \rightarrow VMID, CID, Year, Mileage, License_Number, State$	
1NF?	This relation does not have any multivalued attribute	Yes it is in 1NF
Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF		
2NF?	This relation is in 1NF and its PK consists of a single attribute.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no <i>Partial Dependencies</i> Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one <i>Partial Dependency</i> Then 	

	it is NOT in 2NF	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

10. Color(Col_Selection, VIN, Col_Color)

- Functional Dependencies:
 - $\text{Col_Selection}, \text{VIN} \rightarrow \text{Col_Color}$
- Justification: As stated in business rule 4, information regarding a vehicle's colors would be retained in the database. The color relation is a weak entity of the vehicle entity since this relation could not exist without vehicles. The color relation must contain the primary key of the vehicle relation, VIN, as well as a new identifying attribute for color, Col_Selection. Together these two attributes, form the candidate key for determining the color name.
- Evaluation of relation in 3rd Normal Form:

Color(<u>Col_Selection</u> , VIN, Col_Color) $\text{Col_Selection}, \text{VIN} \rightarrow \text{Col_Color}$		
PK?	Col_Selection, VIN	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	Col_Selection, VIN \rightarrow Col_Color	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	This relation is in 1NF and its PK consists of a multiple attributes and there are no partial dependencies	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	

3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 <i>Transitive Dependency</i> Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 <i>Transitive Dependency</i> Then it is in 3NF 	

11. Vehicle_Model(VMID, Name, Start_Year, End_Year, Miles_Per_Gallon)

a. Functional Dependencies:

- i. $VMID \rightarrow Name, Start_Year, End_Year, Miles_Per_Gallon$
- b. Justification: Business rule 4 states there is an identifier for each model of vehicle, VMID. This VMID is unique and thus can serve as the candidate key for the vehicle model relation. This candidate key can determine the following attributes in the relation: Name, Start_Year, End_Year, Miles_Per_Gallon.
- c. Evaluation of relation in 3rd Normal Form:

Vehicle_Model(VMID, Name, Start_Year, End_Year, Miles_Per_Gallon) $VMID \rightarrow Name, Start_Year, End_Year, Miles_Per_Gallon$		
PK?	VMID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	$VMID \rightarrow Name, Start_Year, End_Year, Miles_Per_Gallon$	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a single Attribute	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no <i>Partial Dependencies</i> Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one <i>Partial Dependency</i> Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF 	

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| | <ul style="list-style-type: none"> o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF |
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12. Employee(EID, F_Name, M_Initial, L_Name, DOB, E_Street, E_City, E_State, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type)

a. Functional Dependencies:

i. $EID \rightarrow F_Name, M_Initial, L_Name, DOB, E_Street, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type$

ii. $E_Zipcode \rightarrow E_City, E_State$

b. Justification: Business rule 5 is implicit in stating that there will be a unique identifier, EID, for the employee relation. Since this attribute is unique, it can serve as the candidate key for the relation to determine the following attributes: F_Name, M_Initial, L_Name, DOB, E_Street, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type. In addition to the first functional dependency with EID, the Zipcode of the employee address, E_ZIPCODE, is able to determine the city and state of the employee, E_City and E_State.

c. Evaluation of relation in 3rd Normal Form:

Employee(EID, F_Name, M_Initial, L_Name, DOB, E_Street, E_City, E_State, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type) $EID \rightarrow F_Name, M_Initial, L_Name, DOB, E_Street, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type$ $E_Zipcode \rightarrow E_City, E_State$
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PK?	EID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	<p>Since $(EID \rightarrow F_Name, M_Initial, L_Name, DOB, E_Street, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type)$ & $(E_Zipcode \rightarrow E_City, E_State)$ then $EID \rightarrow E_City, E_State$</p> <p>Thus $EID \Rightarrow F_Name, M_Initial, L_Name, DOB, E_Street, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type, E_City, E_State$</p>	

1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	

2NF?	The Relation is in 1NF & its PK consists of a single Attribute	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is at least 1 transitive dependency. ($E_Zipcode \rightarrow E_City$, E_State)	No it is not in 3NF therefore we will need to decompose the relation into 3NF
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

d. Decomposition

Decompose Relation in 2NF into Relations in 3NF

Employee(EID, F_Name, M_Initial, L_Name, DOB, E_Street, E_City, E_State, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type)

$EID \rightarrow F_Name, M_Initial, L_Name, DOB, E_Street, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type$

$E_Zipcode \rightarrow E_City, E_State$

	PK	EID
	Transitive Dependencies (TDs)	$E_ZIPCODE \rightarrow E_CITY, E_STATE$
Step 1	Identify the Determinant of each TD	E_ZIPCODE

Step 2	For each TD, use all of its <i>Attributes</i> to form a new Relation	Location (E_ZIPCODE, E_CITY, E_STATE)
Step 3	Remove the <i>Dependent Attributes</i> of each TD from the original Relation	Employee(EID, F_Name, M_Initial, L_Name, DOB, E_Street, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type)

13. Manager(EID, Promotion_Date)

a. Functional Dependencies:

i. $EID \rightarrow Promotion_Date$

b. Justification: The manager relation is a subtype of the employees relation, which utilizes the unique identifier EID. The manager relation also utilizes the unique identifier EID to serve as the candidate key which determines the commission rate.

c. Evaluation of relation in 3rd Normal Form:

Manager(EID, Promotion_Date) EID \rightarrow Promotion_Date		
PK?	EID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	$EID \rightarrow Promotion_Date$	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a single Attribute	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	

3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

14. Sales_Agent(EID,Commission_Rate)

a. Functional Dependencies:

i. $EID \rightarrow Commission_Rate$

b. Justification: The sales agent relation is a subtype of the employees relation, which utilizes the unique identifier EID. The sales agent relation also utilizes the unique identifier EID to serve as the candidate key which determines the commission rate.

c. Evaluation of relation in 3rd Normal Form:

Sales_Agent(EID, Commission_Rate)		
i.	$EID \rightarrow Commission_Rate$	
PK?	EID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	$EID \rightarrow Commission_Rate$	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a single Attribute	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF 	

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| | <ul style="list-style-type: none"> o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF |
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15. Service_Engineer(EID, Hourly_Labor_Charge, SE_Level)

a. Functional Dependencies:

i. $EID \rightarrow Hourly_Labor_Charge, SE_Level$

b. Justification: The service engineers relation is a subtype of the employees relation, which utilizes the unique identifier EID. The service engineers relation also utilizes the unique identifier EID to serve as the candidate key which determines the hourly labor charge and SE_Level.

c. Evaluation of relation in 3rd Normal Form:

Service_Engineer(EID, Hourly_Labor_Charge, SE_Level)	
EID \rightarrow Hourly_Labor_Charge, SE_Level	
PK?	EID

The PK is the determinant of an FD that includes all of the attributes of the Relation.

EID \rightarrow Hourly_Labor_Charge, SE_Level		
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF

Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF

2NF?	The Relation is in 1NF & its PK consists of a single Attribute	Yes it is in 2NF
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- o If the Relation is not in 1NF Then it is NOT in 2NF
- o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF
- o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF
- o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF

3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
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- o If the Relation is not in 2NF Then it is NOT in 3NF
- o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF
- o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF

16. Management (EID, BR_Start_Date, BR_ID, BR_End_Date)

a. Functional Dependencies:

i. $EID, BR_Start_Date \rightarrow BR_End_Date, BR_ID$

b. Justification: The management relation serves as an intermediary relation between the manager relation and the branch relation and as a weak entity of the manager entity. We have chosen this management relation to represent a specific manager's, EID, start and end date at a particular branch, BR_ID. The EID and the BR_Start_Date serve as a joint candidate key to determine the BR_ID and the end date.

c. Evaluation of relation in 3rd Normal Form:

Management (<u>EID</u> , <u>BR_Start_Date</u> , <u>BR_ID</u> , <u>BR_End_Date</u>) $EID, BR_Start_Date \rightarrow BR_End_Date, BR_ID$		
PK?	EID, BR_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	$EID, BR_Start_Date \rightarrow BR_End_Date, BR_ID$	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a multiple attribute and there are no Partial Dependency.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

17. Degree(EID, DID, Degree_Name)

- a. Functional Dependencies:
 - i. EID, DID → Degree_Name
- b. Justification: As stated in business rule 5, information regarding Degree earned by an employee would be retained in the database. The Degree relation is a weak entity of the Employee entity since this relation could not exist without employees. The Degree relation must contain the primary key of the employee relation, EID, as well as a new identifying attribute for Degree, DID. Together these two attributes, form the candidate key for determining the Degree name.
- c. Evaluation of relation in 3rd Normal Form:

Degree(<u>EID</u> , <u>DID</u> , Degree_Name) EID, DID → Degree_Name		
PK?	EID, DID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	EID, DID → Degree_Name	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a multiple attribute and there are no Partial Dependency.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no <i>Partial Dependencies</i> Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one <i>Partial Dependency</i> Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 <i>Transitive Dependency</i> Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 <i>Transitive Dependency</i> Then it is in 3NF 	

18. Branch(BR_ID, BR_Name, BR_Phone_Number, BR_Street, BR_City, BR_State, BR_Zipcode)

a. Functional Dependencies:

- i. $BR_ID \rightarrow BR_Name, BR_Phone_Number, BR_Street, BR_Zipcode;$
- ii. $BR_Zipcode \rightarrow BR_City, BR_State$

b. Justification: Business rule 7 is explicit in stating that there will be a unique identifier, BR_ID, for the Branch relation. Since this attribute is unique, it can serve as the candidate key for the relation to determine the following attributes: BR_Name, BR_Phone_Number, BR_Street, BR_Zipcode. In addition to the first functional dependency with BR_ID, the Zipcode of the branch, BR_ZIPCODE, is able to determine the city and state of the branch, BR_City and BR_State.

c. Evaluation of relation in 3rd Normal Form:

Branch(BR_ID, BR_Name, BR_Phone_Number, BR_Street, BR_City, BR_State, BR_Zipcode)

$BR_ID \rightarrow BR_Name, BR_Phone_Number, BR_Street, BR_Zipcode;$

$BR_Zipcode \rightarrow BR_City, BR_State$

PK?	BR_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	Since $(BR_ID \rightarrow BR_Name, BR_Phone_Number, BR_Street, BR_Zipcode)$ $\& (BR_Zipcode \rightarrow BR_City, BR_State)$ then $BR_ID \rightarrow BR_City, BR_State$ Thus $BR_ID, BR_Name, BR_Phone_Number, BR_Street, BR_Zipcode, BR_City, BR_State$	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a single Attribute	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is at least 1 transitive dependency. $(BR_Zipcode \rightarrow BR_City, BR_State)$	No it is not in 3NF. Therefore the relation will need to be decomposed into 3NF.

<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 <i>Transitive Dependency</i> Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 <i>Transitive Dependency</i> Then it is in 3NF 		

d. Decomposition

Decompose Relation in 2NF into Relations in 3NF

Branch(BR_ID, BR_Name, BR_Phone_Number, BR_Street, BR_City, BR_State, BR_Zipcode)

BR_ID → BR_Name, BR_Phone_Number, BR_Street, BR_Zipcode;
BR_Zipcode → BR_City, BR_State

	PK	BR_ID
	Transitive Dependencies (TDs)	BR_ZIPCODE → BR_CITY, BR_STATE
Step 1	Identify the <i>Determinant</i> of each TD	BR_ZIPCODE
Step 2	For each TD, use all of its <i>Attributes</i> to form a new Relation	Location (BR_ZIPCODE, BR_CITY, BR_STATE)
Step 3	Remove the <i>Dependent Attributes</i> of each TD from the original Relation	Branch(BR_ID, BR_Name, BR_Phone_Number, BR_Street, BR_Zipcode)

19. Maintenance_Service_Order(MO_ID, CID, BR_ID, EID, VIN, MO_Mileage, MO_Start_Date)

- Functional Dependencies:
 - $MO_ID \rightarrow CID, BR_ID, EID, VIN, MO_Mileage, MO_Start_Date$
- Justification: Business rule 8 is explicit that the Maintenance Service Order entity will have a unique identifier, MO_ID. MO_ID can serve as the candidate key for the relation and because of its uniqueness determine the following attributes: CID, BR_ID, EID, VIN, MO_Mileage, MO_Start_Date.
- Evaluation of relation in 3rd Normal Form:

Maintenance_Service_Order(<u>MO_ID</u> , <u>CID</u> , <u>BR_ID</u> , <u>EID</u> , <u>VIN</u> , MO_Mileage, MO_Start_Date) $MO_ID \rightarrow CID, BR_ID, EID, VIN, MO_Mileage, MO_Start_Date$		
PK?	MO_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	$MO_ID \rightarrow CID, BR_ID, EID, VIN, MO_Mileage, MO_Start_Date$	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a single attribute.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

20. Maintenance_Service_Item(MSI_ID, MO_ID, EID, MP_ID, Actual_Start_Date, Actual_End_Date, Charged_Labor_Cost, Charged_Labor_Hour)

- Functional Dependencies:
 - $MSI_ID \rightarrow MO_ID, EID, MP_ID, Actual_Start_Date, Actual_End_Date, Charged_Labor_Cost, Charged_Labor_Hour$

- b. Justification: Business rule 9 states that there will be a local identifier attribute, MSI_ID, which can serve as a candidate key for the Maintenance Service Item entity. This local identifier, MSI_ID, is unique and can determine the dependent attributes: MO_ID, EID, MP_ID, Actual_Start_Date, Actual_End_Date, Charged_Labor_Cost, Charged_Labor_Hour.
- c. Evaluation of relation in 3rd Normal Form:

<p>Maintenance_Service_Item(MSI_ID, MO_ID, EID, MP_ID, Actual_Start_Date, Actual_End_Date, Charged_Labor_Cost, Charged_Labor_Hour)</p> <p>$\text{MSI_ID} \rightarrow \text{MO_ID}, \text{EID}, \text{MP_ID}, \text{Actual_Start_Date}, \text{Actual_End_Date}, \text{Charged_Labor_Cost}, \text{Charged_Labor_Hour}$</p>		
PK?	MSI_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	$\text{MSI_ID} \rightarrow \text{MO_ID}, \text{EID}, \text{MP_ID}, \text{Actual_Start_Date}, \text{Actual_End_Date}, \text{Charged_Labor_Cost}, \text{Charged_Labor_Hour}$	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a single attribute.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

21. Maintenance_Problem(MP_ID, MP_Description, Standard_Minimum_Labor_Cost, Standard_Minimum_Labor_Hour)
- a. Functional Dependencies:

- i. $\text{MP_ID} \rightarrow \text{MP_Description}, \text{Standard_Minimum_Labor_Cost}, \text{Standard_Minimum_Labor_Hour}$

b. Justification: Business rule 10 explicitly states that maintenance problems will have a identifier. This identifier, MP_ID, will serve as a candidate key that will define the description as well as the standard minimum labor cost as well as the standard minimum labor hour.

c. Evaluation of relation in 3rd Normal Form:

<p>Maintenance_Problem(MP_ID, MP_Description, Standard_Minimum_Labor_Cost, Standard_Minimum_Labor_Hour) $MP_ID \rightarrow MP_Description, Standard_Minimum_Labor_Cost,$ $Standard_Minimum_Labor_Hour$</p>		
PK?	MP_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	$MP_ID \rightarrow MP_Description, Standard_Minimum_Labor_Cost,$ $Standard_Minimum_Labor_Hour$	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a single attribute.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

22. Vehicle_Part(Part_ID, PR_Description, PR_Cost)

a. Functional Dependencies:

i. $Part_ID \rightarrow PR_Description, PR_Cost$

- b. Justification: Business rule 12 is explicit in stating that there will be a unique identifier for vehicle parts. This unique identifier, Part_ID, serves as the candidate key and is sufficient to determine the cost and the description of the part.
- c. Evaluation of relation in 3rd Normal Form:

Vehicle_Part(<u>Part_ID</u> , PR_Description, PR_Cost) Part_ID → PR_Description, PR_Cost		
PK? The PK is the determinant of an FD that includes all of the attributes of the Relation.	Part_ID	
		Part_ID → PR_Description, PR_Cost
1NF? Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF? o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF	The Relation is in 1NF & its PK consists of a single attribute.	Yes it is in 2NF
3NF? o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.

23. Required_Parts(MP_ID, Part_ID)

- a. Functional Dependencies:
- i. N/A
- b. Justification: There are no functional dependencies since there are no non prime attributes.
- c. Evaluation of relation in 3rd Normal Form:

Required_Parts(<u>MP_ID</u> , <u>Part_ID</u>) N/A
--

PK?	MP_ID, Part_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	N/A	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF ; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a multiple attribute and there are no Partial Dependency.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

24. Assignment(EID, BR_ID, Assigned_Start_Date, Assigned_End_Date)

a. Functional Dependencies:

i. $EID, BR_ID \rightarrow Assigned_Start_Date, Assigned_End_Date$

b. Justification: The assignment relation serves as an entity that lives in between the Employee and the Branch entity. Due to the relationships laid out in the ERD and assumptions we have made explicit earlier in this document, the Assignment relation takes the candidate key from the Employee table, EID, and the candidate key from the Branch table, BR_ID. These two identifies allow us to determine the assigned start date and the assigned end date of an employee at a particular branch.

c. Evaluation of relation in 3rd Normal Form:

Assignment(EID, BR_ID, Assigned_Start_Date, Assigned_End_Date) EID, BR_ID \rightarrow Assigned_Start_Date, Assigned_End_Date

PK?	EID, BR_ID	
	The PK is the determinant of an FD that includes all of the attributes of the Relation.	
	EID, BR_ID → Assigned_Start_Date, Assigned_End_Date	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a multiple attribute and there are no Partial Dependency.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

25. Qualifications(EID, MSI_ID, Last_Qualified_Date)

a. Functional Dependencies:

i. EID, MSI_ID → Last_Qualified_Date

b. Justification: Since this relation is formed from an associative entity, which includes the Service Engineer and the Maintenance Service Item, the candidate key of the Qualifications has a dual candidate keys which include the EID from the Service Engineer entity and MSI_ID from the Maintenance Service Item entity.

c. Evaluation of relation in 3rd Normal Form:

Qualifications(EID, MP_ID, Last_Qualified_Date) EID, MSI_ID → Last_Qualified_Date	
PK?	EID, MP_ID
	The PK is the determinant of an FD that includes all of the attributes of the Relation.

	EID, MP_ID → Last_Qualified_Date	
1NF?	This relation does not have any multivalued attributes	Yes it is in 1NF
	Does the Relation have any Multivalued Attribute? If YES, it is not in 1NF; otherwise it is in 1NF	
2NF?	The Relation is in 1NF & its PK consists of a multiple attribute and there are no Partial Dependency.	Yes it is in 2NF
	<ul style="list-style-type: none"> o If the Relation is not in 1NF Then it is NOT in 2NF o If the Relation is in 1NF & its PK consists of a single Attribute Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there are no Partial Dependencies Then it is in 2NF o If the Relation is in 1NF & its PK consists of a multiple Attributes & there is at least one Partial Dependency Then it is NOT in 2NF 	
3NF?	The relation is in 2NF and there is no 1 transitive dependency.	Yes it is in 3NF.
	<ul style="list-style-type: none"> o If the Relation is not in 2NF Then it is NOT in 3NF o If the Relation is in 2NF & there is at least 1 Transitive Dependency Then it is NOT in 3NF o If the Relation is in 2NF & there is NO 1 Transitive Dependency Then it is in 3NF 	

2.3 Final RDM

	Entity	Relation
REGULAR ENTITIES	Acquisition Transaction	Acquisition_Transaction(AT_ID, BR_ID, VIN, SUP_ID, AT_Amount, AT_Mileage, AT_Date)
	Sales Transaction	Sales_Transaction(ST_ID, CID, EID, VIN, BR_ID, ST_Amount, ST_Mileage, ST_Date)
	Vehicle	Vehicle (VIN, VMID, CID, Year, Mileage, License_Number, State)
	Vehicle Model	Vehicle_Model(VMID, Name, Start_Year, End_Year, Miles_Per_Gallon)
	Branch	Branch(BR_ID, BR_Name, BR_Phone_Number, BR_Street, BR_Zipcode)
	Maintenance Service Order	Maintenance_Service_Order(MO_ID, CID, BR_ID, EID, VIN, MO_Mileage, MO_Start_Date)
	Maintenance Service Item	Maintenance_Service_Item(MSI_ID, MO_ID, EID, MP_ID, Actual_Start_Date, Actual_End_Date, Charged_Labor_Cost, Charged_Labor_Hour)
	Maintenance Problem	Maintenance_Problem(MP_ID, MP_Description, Standard_Minimum_Labor_Cost, Standard_Minimum_Labor_Hour)
	Vehicle Part	Vehicle_Part(Part_ID, PR_Description, PR_Cost)
	Required Parts	Required_Parts(MP_ID, Part_ID)
	Assignment	Assignment(EID, BR_ID, Assigned_Start_Date, Assigned_End_Date)
	Qualifications	Qualifications(EID, MP_ID, Last_Qualified_Date)

	*Location	*Location(Zipcode, City, State)
WEAK ENTITIES	Color	Color(Col_Selection, VIN, Col_Color)
	Degree	Degree(EID, DID, Degree_Name)
	Management	Management (EID, BR_Start_Date, BR_ID, BR_End_Date)
SUPERTYPE ENTITIES	Vendor	Vendor(VR_ID, VR_Name, VR_YRSBUS, VR_Street, VR_Zipcode, Sup_ID)
	Private Collector	Private_Collector(PC_ID, Sup_ID, PC_Name, PC_RSCR, PC_Street, PC_Zipcode)
	Customer	Customer(CID, Sup_ID, Balance, C_Type, C_Street, C_Zipcode)
	Employee	Employee(EID, F_Name, M_Initial, L_Name, DOB, E_Street, E_Zipcode, Marital_Status, Hire_Date, SSN, Employee_Type)
SUBTYPE ENTITIES	Person	Person(CID, F_Name, M_Initial, L_Name, SSN, DOB)
	Organization	Organization (CID, O_Name)
	Manager	Manager(EID, Promotion_Date)
	Sales Agent	Sales_Agent(EID, Commission_Rate)
	Service Engineer	Service_Engineer(EID, Hourly_Labor_Charge, SE_Level)
CATEGORIES	Supplier	Supplier(Sup_ID, Sup_Type)
M:M RELATIONSHIPS	N/A	N/A

*The Location relation serves as the conglomeration of the various location relations that were decomposed in the previous section. Since all of these relations would contain the same data, we have merged the variety of location relations into a single relation.

3.0 Implementation of Final RDM in Oracle

3.1 Base Tables:

Table Name:	Acquisition Transaction	Entity / Relationship	Acquisition_Transaction	
Developer:	Jesse Castellani			
Screenshot of Associated SQL DDL:				
<input checked="" type="checkbox"/> Autocommit	Rows 10			
<pre>create table Acquisition_Transaction(AT_ID NUMBER(8,0) PRIMARY KEY, BR_ID NUMBER(8,0) REFERENCES BRANCH(BR_ID), VIN VARCHAR2(17) REFERENCES VEHICLE(VIN), SUP_ID NUMBER(8,0) REFERENCES SUPPLIER(SUP_ID), AT_Amount NUMBER(7,2), AT_Mileage NUMBER(6,0), AT_Date DATE, CONSTRAINT AT_Amount CHECK (AT_Amount >= 0), CONSTRAINT AT_Mileage CHECK (AT_Mileage >= 0), CONSTRAINT AT_ID CHECK (AT_ID > 0));</pre>				
Results Explain Describe Saved SQL History				
Table Name:	Sales Transaction	Entity / Relationship	Sales_Transaction	
Developer:	Joanna Senseng			
Screenshot of Associated SQL DDL:				

Autocommit Rows   

```

create table Sales_Transaction(
ST_ID NUMBER(8,0) PRIMARY KEY,
CID NUMBER(8,0) references customer(cid),
EID NUMBER(8,0) references employee(eid),
VIN VARCHAR2(17) references vehicle(vin),
BR_ID NUMBER(8,0) references branch(BR_ID),
ST_Amount NUMBER(8,2),
ST_Mileage NUMBER(7,0),
ST_Date DATE,
CONSTRAINT ST_ID CHECK (ST_ID > 0),
CONSTRAINT ST_Amount CHECK (ST_Amount > 0),
CONSTRAINT ST_Mileage CHECK (ST_Mileage >= 0)
);

```

[Results](#) [Explain](#) [Describe](#) [Saved SQL](#) [History](#)

Table Name:	Vehicle	Entity / Relationship	Vehicle
Developer:	Tomas Sakal		

Screenshot of Associated SQL DDL:

Autocommit Rows   

```

create table Vehicle(
VIN VARCHAR2(17) PRIMARY KEY,
VMID NUMBER(8,0) references Vehicle_Model(vmid),
CID NUMBER(8,0) references customer(cid),
Year NUMBER(4, 0),
Mileage NUMBER(7,0),
License_Number VARCHAR2(8),
State VARCHAR2(255),
CONSTRAINT Mileage CHECK (Mileage > 0),
CONSTRAINT Year CHECK (Year between 1800 and 3000)
);

```

[Results](#) [Explain](#) [Describe](#) [Saved SQL](#) [History](#)

Table Name:	Vehicle Model	Entity / Relationship	Vehicle_Model			
Developer:	Jesse Castellani					
Screenshot of Associated SQL DDL:						
<pre> create table Vehicle_Model(VMID NUMBER(8,0) PRIMARY KEY, Name VARCHAR2(255), Start_Year NUMBER(4,0), End_Year NUMBER(4,0), Miles_Per_Gallon NUMBER(3,0), CONSTRAINT VMID CHECK (VMID > 0), CONSTRAINT Start_Year CHECK (Start_Year < End_Year), CONSTRAINT End_Year CHECK (End_Year > (Start_Year + 1))); </pre> <p>Results Explain Describe Saved SQL History</p>						

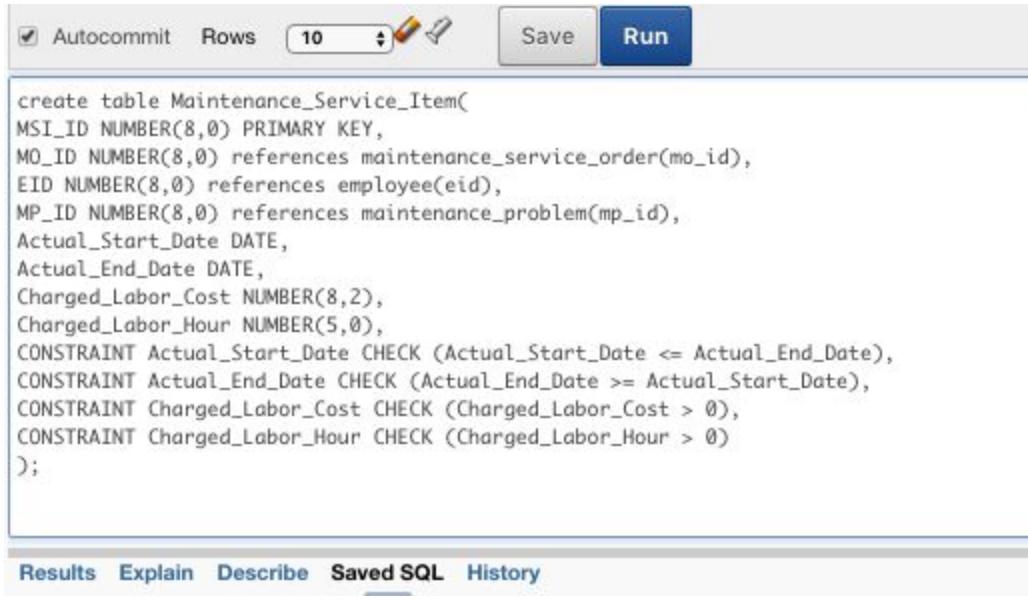
Table Name:	Branch	Entity / Relationship	Branch			
Developer:	Joanna Senseng					
Screenshot of Associated SQL DDL:						
<pre> create table Branch(BR_ID NUMBER(8,0) PRIMARY KEY, BR_Name VARCHAR2(255), BR_Phone_Number NUMBER(10,0), BR_Street VARCHAR2(255), BR_Zipcode NUMBER(5,0) references Location(Zipcode), CONSTRAINT BR_ID CHECK (BR_ID > 0), CONSTRAINT BR_Phone_Number CHECK (BR_Phone_Number between 1111111111 and 9999999999), CONSTRAINT BR_Zipcode CHECK (BR_Zipcode between 11111 and 99999)); </pre> <p>Results Explain Describe Saved SQL History</p>						

Table Name:	Maintenance Service Order	Entity / Relationship	Maintenance_Service_Order			
Developer:	Tomas Sakal					
Screenshot of Associated SQL DDL:						
<pre> create table Maintenance_Service_Order(MO_ID NUMBER(8,0) PRIMARY KEY, CID NUMBER(8,0) references customer(cid), BR_ID NUMBER(8,0) references branch(br_id), EID NUMBER(8,0) references employee(eid), VIN VARCHAR2(17) references vehicle(vin), MO_Mileage NUMBER(7,0), MO_Start_Date DATE, CONSTRAINT MO_Mileage CHECK (MO_Mileage > 0)); </pre> <p>Autocommit Rows 10 Save Run</p> <p>Results Explain Describe Saved SQL History</p>						

Table Name:	Maintenance Service Item	Entity / Relationship	Maintenance_Service_Item
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Developer: Jesse Castellani

Screenshot of Associated SQL DDL:



The screenshot shows the Oracle SQL Developer interface with the following details:

- Autocommit:** Checked.
- Rows:** Set to 10.
- Save:** Button.
- Run:** Button.

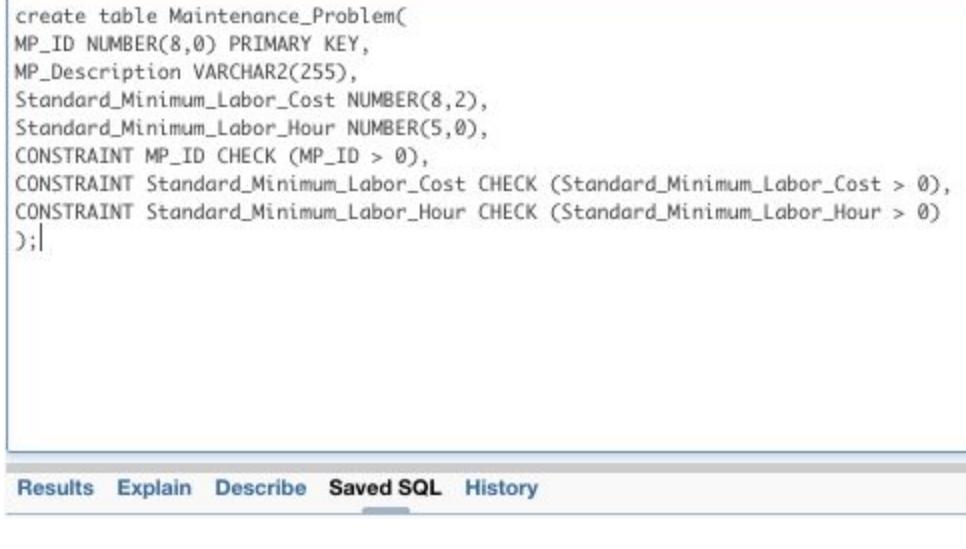
```
create table Maintenance_Service_Item(
MST_ID NUMBER(8,0) PRIMARY KEY,
MO_ID NUMBER(8,0) references maintenance_service_order(mo_id),
EID NUMBER(8,0) references employee(eid),
MP_ID NUMBER(8,0) references maintenance_problem(mp_id),
Actual_Start_Date DATE,
Actual_End_Date DATE,
Charged_Labor_Cost NUMBER(8,2),
Charged_Labor_Hour NUMBER(5,0),
CONSTRAINT Actual_Start_Date CHECK (Actual_Start_Date <= Actual_End_Date),
CONSTRAINT Actual_End_Date CHECK (Actual_End_Date >= Actual_Start_Date),
CONSTRAINT Charged_Labor_Cost CHECK (Charged_Labor_Cost > 0),
CONSTRAINT Charged_Labor_Hour CHECK (Charged_Labor_Hour > 0)
);
```

Below the code editor, there is a navigation bar with the following tabs: Results, Explain, Describe, **Saved SQL**, and History.

Table Name:	Maintenance Problem	Entity / Relationship	Maintenance_Problem
--------------------	---------------------	------------------------------	---------------------

Developer: Joanna Senseng

Screenshot of Associated SQL DDL:



The screenshot shows the Oracle SQL Developer interface with the following details:

- Autocommit:** Checked.
- Rows:** Set to 10.
- Save:** Button.
- Run:** Button.

```
create table Maintenance_Problem(
MP_ID NUMBER(8,0) PRIMARY KEY,
MP_Description VARCHAR2(255),
Standard_Minimum_Labor_Cost NUMBER(8,2),
Standard_Minimum_Labor_Hour NUMBER(5,0),
CONSTRAINT MP_ID CHECK (MP_ID > 0),
CONSTRAINT Standard_Minimum_Labor_Cost CHECK (Standard_Minimum_Labor_Cost > 0),
CONSTRAINT Standard_Minimum_Labor_Hour CHECK (Standard_Minimum_Labor_Hour > 0)
);
```

Below the code editor, there is a navigation bar with the following tabs: Results, Explain, Describe, **Saved SQL**, and History.

Table Name:	Vehicle_Part	Entity / Relationship	Vehicle_Part
Developer:	Tomas Sakal		
Screenshot of Associated SQL DDL:			
<pre>create table Vehicle_Part(Part_ID NUMBER(8,0) PRIMARY KEY, PR_Description VARCHAR2(255), PR_Cost NUMBER(8,2), CONSTRAINT Part_ID CHECK (Part_ID > 0), CONSTRAINT PR_Cost CHECK (PR_Cost > 0));</pre>			

Table Name:	Required Parts	Entity / Relationship	Required_Parts
Developer:	Tomas Sakal		
Screenshot of Associated SQL DDL:			
<pre>create table Required_Parts(MP_ID NUMBER(8,0) references maintenance_problem(mp_id), Part_ID NUMBER(8,0) references vehicle_part(part_id), primary key (mp_id, part_id));</pre>			
<p style="text-align: center;"> Results Explain Describe Saved SQL History </p>			

Table Name:	Assignment	Entity / Relationship	Assignment			
Developer:	Tomas Sakal					
Screenshot of Associated SQL DDL:						
<input checked="" type="checkbox"/> Autocommit Rows <input type="button" value="10"/>   <input type="button" value="Save"/> <input type="button" value="Run"/> <pre>create table Assignment(EID NUMBER(8,0) references employee(eid), BR_ID NUMBER(8,0) references branch(br_id), Assigned_Start_Date DATE, Assigned_End_Date DATE, primary key (eid, br_id), CONSTRAINT Assigned_Start_Date CHECK (Assigned_Start_Date <= Assigned_End_Date), CONSTRAINT Assigned_End_Date CHECK (Assigned_End_Date >= Assigned_Start_Date));</pre> <p>Results Explain Describe Saved SQL History</p>						

Table Name:	Qualifications	Entity / Relationship	Qualifications			
Developer:	Tomas Sakal					
Screenshot of Associated SQL DDL:						
<input checked="" type="checkbox"/> Autocommit Rows <input type="button" value="10"/>   <input type="button" value="Save"/> <input type="button" value="Run"/> <pre>create table Qualifications(EID NUMBER(8,0) references employee(eid), MP_ID NUMBER(8,0) references maintenance_problem(mp_id), Last_Qualified_Date DATE, primary key (eid, mp_id));</pre>						

Table Name:	Location	Entity / Relationship	Location			
Developer:	Joanna Senseng					
Screenshot of Associated SQL DDL:						
<pre>create table Location(Zipcode NUMBER(5,0) PRIMARY KEY, City VARCHAR2(255), State VARCHAR2(255), CONSTRAINT Zipcode CHECK (Zipcode between 11111 and 99999));</pre>						

Table Name:	Color	Entity / Relationship	Color			
Developer:	Tomas Sakal					
Screenshot of Associated SQL DDL:						
<pre>create table Color(Col_Selection VARCHAR2(255), VIN VARCHAR2(17) references vehicle(vin), Col_Color VARCHAR2(255), primary key (col_selection, vin));</pre> <p>Results Explain Describe Saved SQL History</p>						

Table Name:	Degree	Entity / Relationship	Degree			
Developer:	Tomas Sakal					
Screenshot of Associated SQL DDL:						
<pre> create table Degree(EID NUMBER(8,0) references employee(eid), DID NUMBER(8,0), Degree_Name VARCHAR(255), primary key (eid, did), CONSTRAINT DID CHECK (DID > 0)); </pre> <p>Results Explain Describe Saved SQL History</p>						

Table Name:	Management	Entity / Relationship	Management			
Developer:	Jesse Castellani					
Screenshot of Associated SQL DDL:						
<pre> create table Management(EID NUMBER(8,0) references employee(eid), BR_ID NUMBER(8,0) references branch(br_id), BR_Start_Date DATE, BR_End_Date DATE, primary key (eid, br_start_date), CONSTRAINT BR_Start_Date CHECK (BR_Start_Date <= BR_End_Date), CONSTRAINT BR_End_Date CHECK (BR_End_Date >= BR_Start_Date)); </pre>						

Table Name:	Vendor	Entity / Relationship	Vendor	
Developer:	Joanna Senseng			
Screenshot of Associated SQL DDL:				
<pre>create table Vendor(VR_ID NUMBER(8,0) PRIMARY KEY, VR_Name VARCHAR2(255), VR_YRSBUS NUMBER(3,0), VR_Street VARCHAR2(255), VR_Zipcode NUMBER(5,0) references Location(Zipcode), Sup_ID NUMBER(8,0) references supplier(sup_id), CONSTRAINT VR_ID CHECK (VR_ID > 0), CONSTRAINT VR_YRSBUS CHECK (VR_YRSBUS >= 0));</pre>				
<input checked="" type="checkbox"/> Autocommit Rows <input type="button" value="10"/>   				
Results Explain Describe Saved SQL History				

Table Name:	Private Collector	Entity / Relationship	Private_Collector
Developer:	Tomas Sakal		
Screenshot of Associated SQL DDL:			
<input checked="" type="checkbox"/> Autocommit Rows <input type="button" value="10"/>   			
<pre>create table Private_Collector(PC_ID NUMBER(8,0) PRIMARY KEY, Sup_ID NUMBER(8,0) references supplier(sup_id), PC_Name VARCHAR2(255), PC_RSCR NUMBER(3,2), PC_Street VARCHAR2(255), PC_Zipcode NUMBER(5,0) references Location(Zipcode), CONSTRAINT PC_ID CHECK (PC_ID > 0), CONSTRAINT PC_RSCR CHECK (PC_RSCR between 1 and 5));</pre>			
<input checked="" type="checkbox"/> Autocommit Rows <input type="button" value="10"/>   			
Results Explain Describe Saved SQL History			

Table Name:	Customer	Entity / Relationship	Customer
Developer:	Jesse Castellani		
Screenshot of Associated SQL DDL:			
<pre> create table Customer(CID NUMBER(8,0) PRIMARY KEY, Sup_ID NUMBER(8,0) references supplier(sup_id), Balance NUMBER(8,2), C_Type VARCHAR2(1), C_Street VARCHAR2(255), C_Zipcode NUMBER(5,0) references Location(Zipcode), CONSTRAINT CID CHECK (CID > 0), CONSTRAINT C_Type CHECK (C_Type='P' OR C_Type='O')); </pre> <p>Results Explain Describe Saved SQL History</p>			

Table Name:	Employee	Entity / Relationship	Employee
Developer:	Joanna Senseng		
Screenshot of Associated SQL DDL:			
<pre> create table Employee(EID NUMBER(8,0) PRIMARY KEY, F_Name VARCHAR2(255), M_Initial VARCHAR2(1), L_Name VARCHAR2(255), DOB DATE, E_Street VARCHAR2(255), E_Zipcode NUMBER(5,0) references Location(Zipcode), Marital_Status VARCHAR2(1), Hire_Date DATE, SSN NUMBER(9,0), Employee_Type VARCHAR2(1), CONSTRAINT EID CHECK (EID > 0), CONSTRAINT Marital_Status CHECK (Marital_Status = 'M' OR Marital_Status='S'), CONSTRAINT SSN CHECK (SSN between 11111111 and 99999999), CONSTRAINT Employee_Type CHECK (Employee_Type='M' OR Employee_Type='A' OR Employee_Type='E' OR Employee_Type='O'), CONSTRAINT DOB CHECK (DOB > to_date('1900/01/01', 'yyyy/mm/dd'))); </pre>			

Table Name:	Person	Entity / Relationship	Person			
Developer:	Tomas Sakal					
Screenshot of Associated SQL DDL:						
<pre> create table Person(CID NUMBER(8,0) references customer(cid), F_Name VARCHAR2(255), M_Initial VARCHAR(1), L_Name VARCHAR(255), SSN NUMBER(9,0), DOB DATE, CONSTRAINT P_SSN CHECK (SSN between 000000000 and 999999999)); </pre> <p>Results Explain Describe Saved SQL History</p>						

Table Name:	Organization	Entity / Relationship	Organization			
Developer:	Jesse Castellani					
Screenshot of Associated SQL DDL:						
<pre> create table Organization(CID NUMBER(8,0) PRIMARY KEY references customer(cid), O_Name VARCHAR2(255)); </pre> <p>Results Explain Describe Saved SQL History</p>						

Table Name:	Manager	Entity / Relationship	Manager			
Developer:	Joanna Senseng					
Screenshot of Associated SQL DDL:						
 <pre>create table Manager(EID NUMBER(8,0) PRIMARY KEY references employee(eid), Promotion_Date DATE);</pre> <p>Results Explain Describe Saved SQL History</p>						

Table Name:	Sales Agent	Entity / Relationship	Sales_Agent			
Developer:	Tomas Sakal					
Screenshot of Associated SQL DDL:						
<pre>create table Sales_Agent(EID NUMBER(8,0) PRIMARY KEY references employee(eid), Comission_Rate NUMBER(3,2), CONSTRAINT Commission_Rate CHECK (Comission_Rate > 0));</pre>						

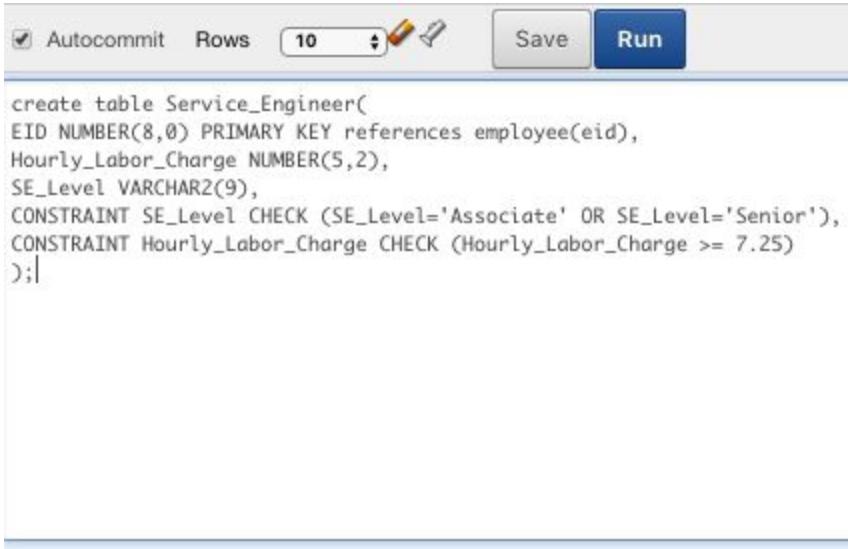
Table Name:	Service Engineer	Entity / Relationship	Service_Engineer			
Developer:	Jesse Castellani					
Screenshot of Associated SQL DDL:						
 <pre> create table Service_Engineer(EID NUMBER(8,0) PRIMARY KEY references employee(eid), Hourly_Labor_Charge NUMBER(5,2), SE_Level VARCHAR2(9), CONSTRAINT SE_Level CHECK (SE_Level='Associate' OR SE_Level='Senior'), CONSTRAINT Hourly_Labor_Charge CHECK (Hourly_Labor_Charge >= 7.25)); </pre>						

Table Name:	Supplier	Entity / Relationship	Supplier			
Developer:	Joanna Senseng					
Screenshot of Associated SQL DDL:						
<pre> create table Supplier(Sup_ID NUMBER(8,0) PRIMARY KEY, Sup_Type VARCHAR2(1), CONSTRAINT Sup_ID CHECK (Sup_ID > 0), CONSTRAINT Sup_Type CHECK (Sup_Type='C' OR Sup_Type='P' OR Sup_Type='V' OR Sup_Type='O')); </pre>						

3.2 Views:

3.2.1 Single Table Updatable Views:

View Name:	Hired After 2008	Developer :	Tomas Sakal			
Associated Department	HRM					
Screenshot of Associated Query:						
<pre> create view employee_after_2008_v as Select * From employee Where hire_date >= '01-01-2008' </pre>						

View Name:	Married Employee View	Developer :	Joanna Senseng			
Associated Department	HRM					
Screenshot of Associated Query:						
<pre> create view married_employee_v as Select * From employee Where marital_status='M' </pre>						

View Name:	Total Amount on Vehicles Sold	Developer :	Jesse Castellani
Associated Department	ACC		
<input checked="" type="checkbox"/> Autocommit Rows <input type="button" value="50"/>    <pre>create view total_sales_v as select count(ST_ID) as Vehicles_Sold, sum(ST_Amount) as Total_Value from Sales_Transaction</pre>			

3.2.2 Multi-Table Views:

View Name:	All Employees	Developer :	Tomas Sakal
Associated Department	HRM		
Join Type	Left Outer		
Screenshot of Associated Query:			

The screenshot shows a database interface with the following details:

- Autocommit:** Checked.
- Rows:** Set to 50.
- Buttons:** Save and Run.
- Query Text:**

```
Create view all_employees_v as
select e.eid,
       e.f_name,
       e.m_initial,
       e.l_name,
       e.dob,
       l.city,
       l.state,
       e.marital_status,
       e.hire_date,
       se.hourly_labor_charge,
       Se.se_level,
       a.commission_rate,
       m.promotion_date
  from employee e
 left outer join Service_engineer se
   On e.eid=se.eid
 left outer join Sales_agent a
   On e.eid=a.eid
 left outer join Manager m
   On e.eid=m.eid
 left outer join location l
  on e.e_zipcode=l.zipcode|
```

View Name:	Service Engineer Employees	Developer :	Tomas Sakal
Associated Department	HRM		
Join Type	Right Outer		
Screenshot of Associated Query:			

The screenshot shows a database interface with the following elements:

- Toolbar:** Includes "Autocommit" checked, "Rows" set to 50, and icons for Save and Run.
- Query Editor:** Displays the following SQL code:


```
Create view service_engineer_v as
select e.eid,
       e.f_name,
       e.m_initial,
       e.l_name,
       e.dob,
       l.city,
       l.state,
       e.marital_status,
       e.hire_date,
       se.hourly_labor_charge,
       se.se_level
  from service_engineer se
 right outer join employee e
    on e.eid=se.eid
 left outer join location l
   on e.e_zipcode=l.zipcode
  where e.employee_type='E'
```

View Name:	Managers Employees	Developer :	Jesse Castellani
Associated Department	HRM		
Join Type	Right Outer		
Screenshot of Associated Query:			

The screenshot shows a database interface with a toolbar at the top containing 'Autocommit' (checked), 'Rows' (set to 50), a dropdown menu, and three icons (Save, Run, and others). Below the toolbar is a code editor window displaying the following SQL code:

```
create view managers_v as
select e.eid,
       e.f_name,
       e.m_initial,
       e.l_name,
       e.dob,
       l.city,
       l.state,
       e.marital_status,
       e.hire_date,
       m.promotion_date
  from manager m
 right outer join employee e
    on e.eid=m.eid
 left outer join location l
   on e.e_zipcode=l.zipcode
 where e.employee_type='M'
```

View Name:	Sales Agent Employees	Developer :	Jesse Castellani
Associated Department	HRM		
Join Type	Left Outer		

Screenshot of Associated Query:

The screenshot shows a database query editor interface. At the top, there are buttons for 'Autocommit' (checked), 'Rows' (set to 50), a dropdown menu, 'Save', and a large blue 'Run' button. The main area contains the SQL code for creating a view:

```
Create view sales_agent_v as
select e.eid,
       e.f_name,
       e.m_initial,
       e.l_name,
       e.dob,
       l.city,
       l.state,
       e.marital_status,
       e.hire_date,
       a.commission_rate
  from employee e
 left outer join sales_agent a
    on e.eid=a.eid
 left outer join location l
    on e.e_zipcode=l.zipcode
   where e.employee_type='A'|
```

View Name:	Vehicles In Stock	Developer	Joanna Senseng
Associated Department	IVM		
Join Type	Left Outer		

Screenshot of Associated Query:

The screenshot shows a database query editor interface. At the top, there are buttons for 'Autocommit' (checked), 'Rows' (set to 50), a dropdown menu, 'Save', and a large blue 'Run' button. The main area contains the following SQL code:

```
create view vehicles_in_stock_v as
select vm.Name as Model,
vm.Miles_per_Gallon as MPG,
vh.VIN,
vh.Year as Production_Year,
vh.Mileage as Mileage,
vh.License_Number as License_Number
from ACQUISITION_TRANSACTION at
Left outer join Sales_transaction st
On at.vin=st.vin
Left outer join vehicle vh
On vh.vin=at.vin
Left outer join vehicle_model vm
On vm.vmid=vh.vmid
group by vh.vin,
vm.name,
vm.miles_per_gallon,
vh.year,
vh.mileage,
Vh.license_number
Having count(distinct AT_ID) > count(distinct ST_ID)
```

View Name:	Vehicle Models in Stock	Developer :	Jesse Castellani
Associated Department	IVM		

Join Type	Inner
Screenshot of Associated Query:	
<input checked="" type="checkbox"/> Autocommit Rows <input type="text" value="50"/>     <pre>create view models_in_stock_v as select vm.VMID, COUNT(vm.VMID) as Number_of_Cars, vm.Name, vm.Start_Year, vm.End_Year, vm.Miles_per_Gallon from vehicles_in_stock_v vs, vehicle vh, vehicle_model vm where vs.vin=vh.vin and vh.vmid=vm.vmid group by vm.Name, vm.Start_Year, vm.End_Year, vm.Miles_per_Gallon, vm.VMID</pre>	

View Name:	Number of Each Vehicle Purchased from Supplier	Developer :	Tomas Sakal
Associated Department	IVM		

Join Type	Left Outer
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Screenshot of Associated Query:

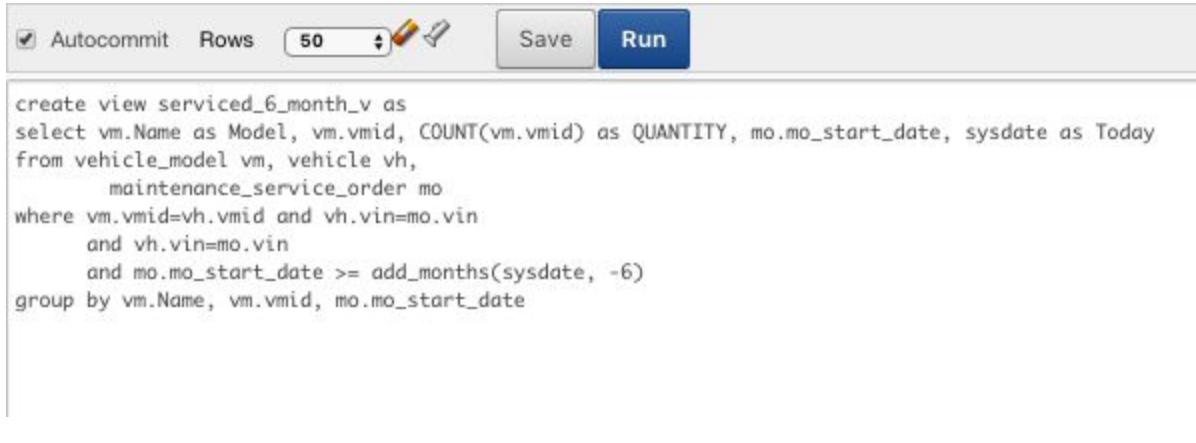
```

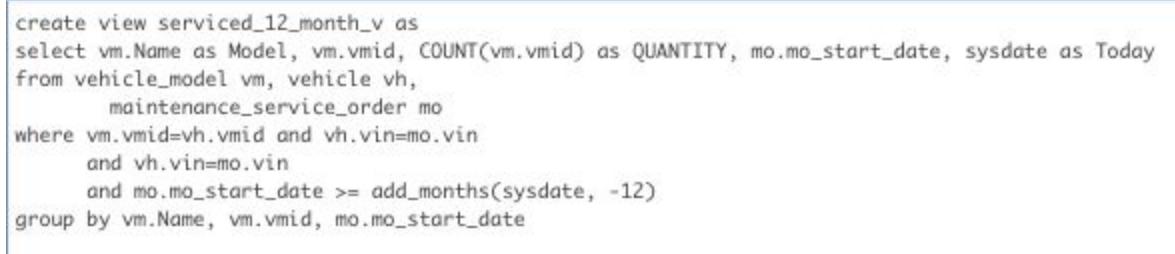
create view com_vehicle_model_sup_v as
select s.Sup_ID,
       F_Name || ' ' || M_Initial || ' ' ||
       L_Name || O_Name || PC_Name || VR_Name as Name,
       Sup_Type,
       vm.Name as Model,
       count(at.vin) as Count
  from vehicle_model vm
  Left outer join vehicle vh
  On vm.vmid=vh.vmid
  Left outer join acquisition_transaction at
  On vh.vin=at.vin
  Left outer join supplier s
  On at.sup_id=s.sup_id
  Left outer join customer c
  On c.sup_id=s.sup_id
  Left outer join private_collector pc
  On pc.sup_id=s.sup_id
  Left outer join vendor v
  On v.sup_id=s.sup_id
  Left outer join person p
  On p.cid=c.cid
  Left outer join organization o
  On o.cid=c.cid
  group by s.sup_id,
           vm.Name,
           F_Name || ' ' || M_Initial || ' ' ||
           L_Name || O_Name || PC_Name || VR_Name, Sup_Type
 having count(at.vin) > 0
 order by name asc

```

View Name:	Models Service 1 Month Ago	Developer :	Joanna Senseng			
Associated Department	MSM					
Join Type	Inner					
Screenshot of Associated Query:						
<p>The screenshot shows a database query editor interface. At the top, there are buttons for 'Autocommit' (checked), 'Rows' (set to 50), and 'Save/Run' (Run is highlighted). The main area contains the SQL code for creating the view:</p> <pre> create view serviced_1_month_v as select vm.Name as Model, vm.vmid, COUNT(vm.vmid) as QUANTITY, mo.mo_start_date, sysdate as Today from vehicle_model vm, vehicle vh, maintenance_service_order mo where vm.vmid=vh.vmid and vh.vin=mo.vin and vh.vin=mo.vin and mo.mo_start_date >= add_months(sysdate, -1) group by vm.Name, vm.vmid, mo.mo_start_date </pre>						

View Name:	Models Service 3 Months Ago	Developer :	Joanna Senseng			
Associated Department	MSM					
Join Type	Inner					
Screenshot of Associated Query:						
<p>The screenshot shows a database query editor interface. At the top, there are buttons for 'Autocommit' (checked), 'Rows' (set to 50), and 'Save/Run' (Run is highlighted). The main area contains the SQL code for creating the view:</p> <pre> create view serviced_3_month_v as select vm.Name as Model, vm.vmid, COUNT(vm.vmid) as QUANTITY, mo.mo_start_date, sysdate as Today from vehicle_model vm, vehicle vh, maintenance_service_order mo where vm.vmid=vh.vmid and vh.vin=mo.vin and vh.vin=mo.vin and mo.mo_start_date >= add_months(sysdate, -3) group by vm.Name, vm.vmid, mo.mo_start_date </pre>						

View Name:	Models Service 6 Months Ago	Developer :	Joanna Senseng			
Associated Department	MSM					
Join Type	Inner					
Screenshot of Associated Query:						
 <pre> create view serviced_6_month_v as select vm.Name as Model, vm.vmid, COUNT(vm.vmid) as QUANTITY, mo.mo_start_date, sysdate as Today from vehicle_model vm, vehicle vh, maintenance_service_order mo where vm.vmid=vh.vmid and vh.vin=mo.vin and vh.vin=mo.vin and mo.mo_start_date >= add_months(sysdate, -6) group by vm.Name, vm.vmid, mo.mo_start_date </pre>						

View Name:	Models Service 12 Months Ago	Developer :	Joanna Senseng			
Associated Department	MSM					
Join Type	Inner					
Screenshot of Associated Query:						
 <pre> create view serviced_12_month_v as select vm.Name as Model, vm.vmid, COUNT(vm.vmid) as QUANTITY, mo.mo_start_date, sysdate as Today from vehicle_model vm, vehicle vh, maintenance_service_order mo where vm.vmid=vh.vmid and vh.vin=mo.vin and vh.vin=mo.vin and mo.mo_start_date >= add_months(sysdate, -12) group by vm.Name, vm.vmid, mo.mo_start_date </pre>						

View Name:	Complete Information on Maintenance Record	Developer :	Jesse Castellani			
Associated Department	MSM					
Join Type	Left Outer					
Screenshot of Associated Query:						
<pre>Create view maintenance_record_v as select vh.VIN, vm.Name as Model, vh.Year as Production_Year, vh.License_Number as Plate, c.CID, p.F_Name ' ' p.M_Initial ' ' p.L_Name o.Name as Owner_Name, MP_Description as Problem, MO_Mileage as Mileage, Charged_Labor_Hour, Charged_Labor_Cost, e.F_Name ' ' e.M_Initial ' ' e.L_Name as Engineer_Name from maintenance_service_order mo Left outer join maintenance_service_item mi On mo.mo_id=mi.mo_id Left outer join maintenance_problem mp On mp.mp_id=mi.mp_id Left outer join vehicle vh On vh.vin=mo.vin Left outer join vehicle_model vm On vm.vmid=vh.vmid Left outer join customer c On c.cid=mo.cid Left outer join service_engineer se On se.eid=mo.eid Left outer join person p On p.cid=c.cid Left outer join organization o On o.cid=c.cid left outer join employee e on e.eid=mo.eid</pre>						

View Name:	Customer Spending on Vehicles	Developer :	Joanna Senseng, Tomas Sakal			
Associated Department	CSM					
Join Type	Left Outer					
Screenshot of Associated Query:						
 <pre> create view Com_Cus_Spending_v as select c.cid, F_Name ' ' M_Initial ' ' L_Name O_Name as Owner_Name, l.city, l.state, l.zipcode, c.balance, sum(st.st_amount) as Amount from customer c Left outer join sales_transaction st On c.cid = st.cid Left outer join person p On c.cid = p.cid Left outer join organization o on c.cid = o.cid Left outer join location l on c.c_zipcode = l.zipcode group by c.cid, F_Name ' ' M_Initial ' ' L_Name O_Name, L.city, L.state, L.zipcode, c.balance </pre>						

View Name:	Customer Spending on Service	Developer :	Joanna Senseng, Jesse Castellani			
Associated Department	CSM					
Join Type	Left Outer					
Screenshot of Associated Query:						
<pre> create view Service_Maintenance_v as select c.cid, F_Name ' ' M_Initial ' ' L_Name O_Name as Owner_Name, l.city, l.state, l.zipcode, c.balance, sum(Charged_Labor_Cost) as Spending from maintenance_service_order mo left outer join customer c on mo.cid = c.cid left outer join maintenance_service_item mi on mo.mo_id = mi.mo_id left outer join person p on c.cid = p.cid left outer join organization o on c.cid = o.cid left outer join location l on c.c_zipcode = l.zipcode where c.cid is not null group by c.cid, F_Name ' ' M_Initial ' ' L_Name O_Name, L.city, L.state, L.zipcode, c.balance </pre>						

View Name:	All Customers in Virginia	Developer :	Joanna Senseng			
Associated Department	CSM					
Join Type	Right Outer					
Screenshot of Associated Query:						
<pre> create view all_cus_virginia_v as select c.cid, c.c_zipcode, l.state, l.city from customer c right outer join location l on c.c_zipcode=l.zipcode where l.state = 'Virginia' </pre>						

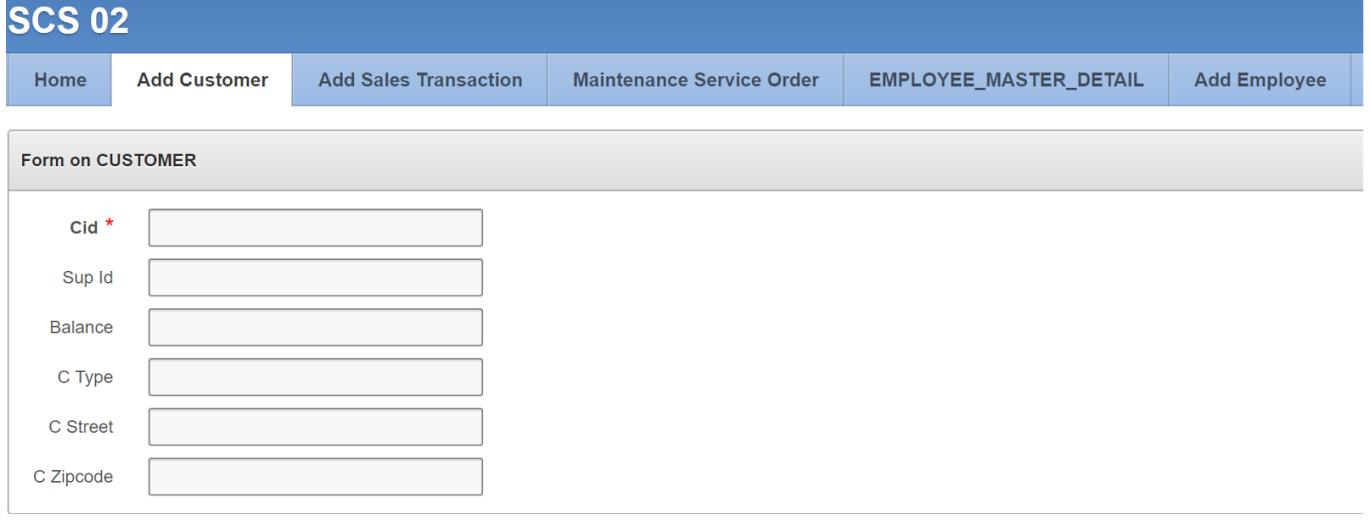
View Name:	Total Customer Spending	Developer :	Tomas Sakal			
Associated Department	ACC					
Join Type	Inner					
Screenshot of Associated Query:						
<pre> create view total_customer_spending_v as select sm.cid, sm.owner_name, sm.city, sm.state, sm.zipcode, sm.balance, sm.spending, s.amount, (select nvl(sm.spending,0)+nvl(s.amount,0) from Com_Cus_Spending s where s.cid=sm.cid) as Total_Spent from Service_Maintenance sm, Com_Cus_Spending s where sm.cid=s.cid </pre>						

View Name:	Total Paid to Vendors	Developer	Tomas Sakal			
Associated Department	ACC					
Join Type	Left Outer					
Screenshot of Associated Query:						
<input checked="" type="checkbox"/> Autocommit Rows <input type="button" value="50"/>   <input type="button" value="Save"/> <input type="button" value="Run"/> <pre>create view total_paid_vendor_v as select VR_ID, VR_Name, VR_YRSBUS, l.City, l.State, nvl(sum(AT_Amount),0) as total_paid_vendor from vendor v Left outer join supplier s On v.sup_id=s.sup_id Left outer join acquisition_transaction at On s.sup_id=at.sup_id Left outer join location l On l.zipcode=v.vr_zipcode group by VR_ID, VR_Name, VR_YRSBUS, l.City, l.State</pre>						

View Name:	Total Spent and Received from Maintenance	Developer :	Jesse Castellani			
Associated Department	ACC					
Join Type	Left Outer					
Screenshot of Associated Query:						
<pre> create view total_maintenance_v as select count(distinct mo.mo_id) as Vehicles_Serviced, sum(vp.pr_cost) as Value_of_Parts_Used, sum(mi.Charged_Labor_Cost) as Amount_From_Service_Orders from maintenance_service_order mo left outer join maintenance_service_item mi On mo.mo_id=mi.mo_id left outer join maintenance_problem mp on mi.mp_id=mp.mp_id left outer join required_parts rp on mp.mp_id=rp.mp_id left outer join vehicle_part vp on rp.part_id=vp.part_id </pre>						

4.0 Oracle Forms

4.1 Single Table Forms

Name of Team Member who Developed the Form	Joanna Senseng		
Form Name:	Add Customer	Table:	Customer
End-User	Branch Employee	Purpose:	To Add Customers to DB
Screenshot of Form Layout: 			
Screenshot of Form with relevant Data:			

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order EMPLOYEE_MASTER_DETAIL Add Employee

Form on CUSTOMER

Cid *	17
Sup Id	10
Balance	5500
C Type	P
C Street	155 W Franklin St
C Zipcode	33333

Screenshot Evidence that relevant Table was updated:

The screenshot shows a database management system interface. On the left, there is a sidebar with a dropdown menu set to 'Tables' and a search bar. Below the search bar is a list of tables: ACQUISITION_TRANSACTION, ASSIGNMENT, BRANCH, COLOR, CUSTOMER, DEGREE, EMPLOYEE, LOCATION, MAINTENANCE_PROBLEM, MAINTENANCE_SERVICE_ITEM, MAINTENANCE_SERVICE_ORDER, MANAGEMENT, MANAGER, ORGANIZATION, PERSON, PRIVATE_COLLECTOR, QUALIFICATIONS, REQUIRED_PARTS, SALES_AGENT, SALES TRANSACTION, SERVICE_ENGINEER, SUPPLIER, VEHICLE, VEHICLE_MODEL, VEHICLE_PART, and VENDOR. The CUSTOMER table is selected and shown in the main pane.

The main pane displays the CUSTOMER table with the following data:

EDIT	CID	SUP_ID	BALANCE	C_TYPE	C_STREET	C_ZIPCODE
	4	10	100	O	-	11111
	5	9	500	O	-	22222
	12	-	30000	O	709 Hopstop	22222
	17	10	5500	P	155 W Franklin St	33333
	1	1	500	P	12 West Franklin St	33333
	2	12	100	P	111 Silica Street	-
	3	-	0	P	-	67676
	7	-	3000	P	-	23434
	8	-	250	O	-	23220
	15	1	80000	O	808 Franklin Beat	22222
	16	2	70000	P	857 Franklin Populace	22222
	13	12	30000	P	828 Plague St	22222

row(s) 1 - 12 of 12

Name of Team Member who Developed the Form	Tomas Sakal																		
Form Name:	Add Sales Transaction	Table:	Sales_Transaction																
End-User	Branch Users	Purpose:	Add Sales Transaction to DB																
Screenshot of Form Layout:																			
SCS 02 <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25px; padding: 2px;">Home</td> <td style="width: 25px; padding: 2px;">Add Customer</td> <td style="width: 25px; padding: 2px;">Add Sales Transaction</td> <td style="width: 25px; padding: 2px;">Maintenance Service Order</td> <td style="width: 25px; padding: 2px;">Add Employee</td> <td style="width: 25px; padding: 2px;">SE</td> </tr> </table>				Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE										
Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE														
<p style="margin: 0;">Form on SALES_TRANSACTION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">St Id *</td> <td style="width: 85%;"><input type="text"/></td> </tr> <tr> <td>Cid</td> <td><input type="text"/></td> </tr> <tr> <td>Eid</td> <td><input type="text"/></td> </tr> <tr> <td>Vin</td> <td><input type="text"/></td> </tr> <tr> <td>Br Id</td> <td><input type="text"/></td> </tr> <tr> <td>St Amount</td> <td><input type="text"/></td> </tr> <tr> <td>St Mileage</td> <td><input type="text"/></td> </tr> <tr> <td>St Date</td> <td><input type="text"/> </td> </tr> </table>				St Id *	<input type="text"/>	Cid	<input type="text"/>	Eid	<input type="text"/>	Vin	<input type="text"/>	Br Id	<input type="text"/>	St Amount	<input type="text"/>	St Mileage	<input type="text"/>	St Date	<input type="text"/>
St Id *	<input type="text"/>																		
Cid	<input type="text"/>																		
Eid	<input type="text"/>																		
Vin	<input type="text"/>																		
Br Id	<input type="text"/>																		
St Amount	<input type="text"/>																		
St Mileage	<input type="text"/>																		
St Date	<input type="text"/>																		
Screenshot of Form with relevant Data:																			
SCS 02 <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25px; padding: 2px;">Home</td> <td style="width: 25px; padding: 2px;">Add Customer</td> <td style="width: 25px; padding: 2px;">Add Sales Transaction</td> <td style="width: 25px; padding: 2px;">Maintenance Service Order</td> <td style="width: 25px; padding: 2px;">Add Employee</td> <td style="width: 25px; padding: 2px;">SE</td> </tr> </table>				Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE										
Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE														
<p style="margin: 0;">Form on SALES_TRANSACTION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">St Id *</td> <td style="width: 85%;"><input type="text" value="7"/></td> </tr> <tr> <td>Cid</td> <td><input type="text" value="17"/></td> </tr> <tr> <td>Eid</td> <td><input type="text" value="1"/></td> </tr> <tr> <td>Vin</td> <td><input type="text" value="VEHICLE1VEHICLE13"/></td> </tr> <tr> <td>Br Id</td> <td><input type="text" value="1"/></td> </tr> <tr> <td>St Amount</td> <td><input type="text" value="5500"/></td> </tr> <tr> <td>St Mileage</td> <td><input type="text" value="65000"/></td> </tr> <tr> <td>St Date</td> <td><input type="text" value="07-Dec-16"/> </td> </tr> </table>				St Id *	<input type="text" value="7"/>	Cid	<input type="text" value="17"/>	Eid	<input type="text" value="1"/>	Vin	<input type="text" value="VEHICLE1VEHICLE13"/>	Br Id	<input type="text" value="1"/>	St Amount	<input type="text" value="5500"/>	St Mileage	<input type="text" value="65000"/>	St Date	<input type="text" value="07-Dec-16"/>
St Id *	<input type="text" value="7"/>																		
Cid	<input type="text" value="17"/>																		
Eid	<input type="text" value="1"/>																		
Vin	<input type="text" value="VEHICLE1VEHICLE13"/>																		
Br Id	<input type="text" value="1"/>																		
St Amount	<input type="text" value="5500"/>																		
St Mileage	<input type="text" value="65000"/>																		
St Date	<input type="text" value="07-Dec-16"/>																		

Screenshot Evidence that relevant Table was updated:

The screenshot shows the Oracle Database SQL Developer interface. On the left, there's a tree view of tables: ACQUISITION_TRANSACTION, ASSIGNMENT, BRANCH, COLOR, CUSTOMER, DEGREE, EMPLOYEE, LOCATION, MAINTENANCE_PROBLEM, MAINTENANCE_SERVICE_ITEM, MAINTENANCE_SERVICE_ORDER, MANAGEMENT, MANAGER, ORGANIZATION, PERSON, PRIVATE_COLLECTOR, QUALIFICATIONS, REQUIRED_PARTS, SALES_AGENT, SALES_TRANSACTION, SERVICE_ENGINEER, SUPPLIER, VEHICLE, VEHICLE_MODEL, VEHICLE_PART, and VEHICLE_TYPE. The SALES_TRANSACTION table is selected. The main area shows the table structure with columns: EDIT, ST_ID, CID, EID, VIN, BR_ID, ST_AMOUNT, ST_MILEAGE, and ST_DATE. There are 10 rows of data. The row with ST_ID 7, CID 17, EID 1, VIN VEHICLE1VEHICLE13, BR_ID 1, ST_AMOUNT 5500, ST_MILEAGE 65000, and ST_DATE 12/07/2016 is highlighted with a red box.

SALES_TRANSACTION										SQL
Table	Data	Indexes	Model	Constraints	Grants	Statistics	UI Defaults	Triggers	Dependencies	SQL
Query	Count Rows	Insert Row								
EDIT	ST_ID	CID	EID	VIN	BR_ID	ST_AMOUNT	ST_MILEAGE	ST_DATE		
	6	2	8	VEHICLE1VEHICLE16	1	65000	0	12/03/2016		
	8	-	8	VEHICLE1VEHICLE14	1	5500	500	11/23/2016		
	7	17	1	VEHICLE1VEHICLE13	1	5500	65000	12/07/2016		
	1	-	-	VEHICLE1VEHICLE13	-	55000	-	01/20/2016		
	2	-	-	VEHICLE1VEHICLE15	-	66000	130	01/25/2016		
	3	2	12	VEHICLE1VEHICLE12	-	-	1000	05/17/2016		
	4	5	-	-	-	14000	5000	05/18/2016		
	5	1	8	VEHICLE1VEHICLE14	1	35000	110	04/02/2015		
	9	3	8	VEHICLE1VEHICLE16	1	5500	500	11/22/2016		

Name of Team Member who Developed the Form	Jesse Castellani		
Form Name:	Maintenance Service Order	Table:	Maintenance_Service_Order
End-User	Sales Agent	Purpose:	To add maintenance service orders to the DB

Screenshot of Form Layout:

SCS 02

Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE_MD
------	--------------	-----------------------	---------------------------	--------------	-------

Form on MAINTENANCE_SERVICE_ORDER

Mo Id *	<input type="text"/>
Cid	<input type="text"/>
Br Id	<input type="text"/>
Eid	<input type="text"/>
Vin	<input type="text"/>
Mo Mileage	<input type="text"/>
Mo Start Date	<input type="text"/>

Screenshot of Form with relevant Data:

SCS 02

Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee
------	--------------	-----------------------	---------------------------	--------------

Form on MAINTENANCE_SERVICE_ORDER

Mo Id *	7
Cid	7
Br Id	1
Eid	4
Vin	VEHICLE1VEHICLE13
Mo Mileage	75000
Mo Start Date	10-Dec-16

Screenshot Evidence that relevant Table was updated:

The screenshot shows the Oracle Database SQL Developer interface. On the left, a tree view lists various database tables. In the center, the MAINTENANCE_SERVICE_ORDER table is displayed with the following data:

EDIT	MO_ID	CID	BR_ID	EID	VIN	MO_MILEAGE	MO_START_DATE
3	1	1	-	VEHICLE1VEHICLE12	5500	11/10/2015	
4	2	23	3	VEHICLE1VEHICLE17	4500	01/10/2015	
5	1	4	6	VEHICLE1VEHICLE14	8000	12/10/2015	
7	7	1	4	VEHICLE1VEHICLE13	75000	12/10/2016	
1	4	-	-	VEHICLE1VEHICLE11	18000	10/20/2016	
2	4	23	3	VEHICLE1VEHICLE17	6000	11/02/2016	
6	5	-	4	VEHICLE1VEHICLE13	-	11/05/2016	
8	-	-	-	VEHICLE1VEHICLE16	-	11/03/2016	

row(s) 1 - 8 of 8

Download

Name of Team Member who Developed the Form	Joanna Senseng		
Form Name:	Add Employee	Table:	Employee
End-User	HR Employees	Purpose:	To add employees to the DB
Screenshot of Form Layout:			

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee

Employee

Eid *	<input type="text"/>
Br Id	<input type="text"/>
F Name	<input type="text"/>
M Initial	<input type="text"/>
L Name	<input type="text"/>
Dob	<input type="text"/> 
E Street	<input type="text"/>
E Zipcode	<input type="text"/>
Marital Status	<input type="text"/>
Hire Date	<input type="text"/> 
Ssn	<input type="text"/>
Employee Type	<input type="text"/>

Screenshot of Form with relevant Data:

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee

Employee

Eid *	66
Br Id	1
F Name	Fleur
M Initial	
L Name	Delacour
Dob	19-Sep-90 
E Street	139 W Franklin St
E Zipcode	33333
Marital Status	S
Hire Date	12-Dec-14 
Ssn	222991111
Employee Type	M

Screenshot Evidence that relevant Table was updated:

SQL Workshop Object Browser Schema SCS

Tables ACQUISITION_TRANSACTION ASSIGNMENT BRANCH COLOR CUSTOMER DEGREE EMPLOYEE LOCATION MAINTENANCE_PROBLEM MAINTENANCE_SERVICE_ITEM MAINTENANCE_SERVICE_ORDER MANAGEMENT MANAGER ORGANIZATION PERSON PRIVATE_COLLECTOR QUALIFICATIONS REQUIRED_PARTS SALES_AGENT SALES TRANSACTION SERVICE_ENGINEER SUPPLIER VEHICLE VEHICLE_MODEL VEHICLE_PART VENDOR

EMPLOYEE

Table Data Indexes Model Constraints Grants Statistics UI Defaults Triggers Dependencies SQL

Query Count.Rows Insert Row

EDIT	EID	BR_ID	F_NAME	M_INITIAL	L_NAME	DOB	E_STREET	E_ZIPCODE	MARITAL_STATUS	HIRE_DATE	SSN	EMPLOYEE_TYPE
	6	1	Cho	-	Chang	05/06/1975	7 Floyd Avenue	11111	-	04/20/2006	333554444	E
	20	4	kokot	j	vyjebany	-	-	-	-	-	-	-
	1	4	Hermione	-	Granger	01/24/1975	323 West Broad Street	22222	S	04/24/2005	444007777	M
	2	1	Ron	-	Weasley	03/23/1980	32 W Cary St	-	M	12/14/2006	333004444	E
	3	23	Luna	-	Lovegood	11/23/1985	13 West Franklin St	67676	S	04/20/2007	333006767	E
	4	-	Harry	-	Potter	01/23/1980	-	-	-	01/02/2010	-	M
	66	1	Fleur	-	Delacour	09/19/1990	139 W Franklin St	33333	S	12/12/2014	222991111	M
	5	-	Severus	-	Snape	10/09/1985	45 Wizard Way	-	-	07/22/2006	445558888	E
	23	4	ajtakykokot	-	-	-	-	-	S	-	-	-

row(s) 16 - 24 of 24

4.2 Multi-Table Forms

Name of Team Member who Developed the Form	Joanna Senseng		
Form Name:	Maintenance Service Order	Tables / Views:	Master: Maintenance_Service_Order Detail: Maintenance_Service_Item
End-User:	Sales Agent	Purpose:	To add maintenance services orders and then add additional maintenance service items.

Screenshot of Form Layout: DML

The screenshot shows the SCS 02 application interface. The top navigation bar includes links for Home, Add Customer, Add Sales Transaction, Maintenance Service Order (which is currently selected), Add Employee, and SE_MD. Below the navigation bar, a sub-menu titled "Edit MAINTENANCE_SERVICE_ORDER" is displayed. This sub-menu contains fields for Mo Id, Cid, Br Id, Eid, Vin, Mo Mileage, and Mo Start Date. The Mo Start Date field includes a calendar icon.

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM

Edit MAINTENANCE_SERVICE_ORDER

Mo Id	<input type="text"/>
Cid	<input type="text"/>
Br Id	<input type="text"/>
Eid	<input type="text"/>
Vin	<input type="text"/>
Mo Mileage	<input type="text"/>
Mo Start Date	<input type="text"/> 

8 of 9

MAINTENANCE_SERVICE_ITEM Detail

<input type="checkbox"/> Msi Id	<input type="checkbox"/> Eid	<input type="checkbox"/> Mp Id	<input type="checkbox"/> Actual Start Date	<input type="checkbox"/> Actual End Date	<input type="checkbox"/> Charged Labor Cost	<input type="checkbox"/> Charged Labor Hour
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> 	<input type="text"/> 	<input type="text"/>	<input type="text"/>

Screenshot of Form with relevant Data

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD

Edit MAINTENANCE_SERVICE_ORDER

Mo Id	<input type="text"/> 9
Cid	<input type="text"/> 7
Br Id	<input type="text"/> 1
Eid	<input type="text"/> 66
Vin	<input type="text"/> VEHICLE1VEHICLE13
Mo Mileage	<input type="text"/> 75000
Mo Start Date	<input type="text"/> 05-DEC-16 

SCS 02

Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE_MD	MSO_MD	VM
------	--------------	-----------------------	---------------------------	--------------	-------	--------	----

Edit MAINTENANCE_SERVICE_ORDER

Mo Id	9
Cid	7
Br Id	1
Eid	66
Vin	VEHICLE1VEHICLE13
Mo Mileage	75000
Mo Start Date	05-DEC-16 <input type="button" value="Calendar"/>

9 of 9

MAINTENANCE_SERVICE_ITEM Detail

<input type="checkbox"/> Msi Id	Eid	Mp Id	Actual Start Date	Actual End Date	Charged Labor Cost	Charged Labor Hour
<input checked="" type="checkbox"/> 6	25	2	05-DEC-16 <input type="button" value="Calendar"/>	06-DEC-16 <input type="button" value="Calendar"/>	1500	10

1 - 1

Evidence that relevant Tables were updated:

Tables ▾

ACQUISITION_TRANSACTION
ASSIGNMENT
BRANCH
COLOR
CUSTOMER
DEGREE
EMPLOYEE
LOCATION
MAINTENANCE_PROBLEM
MAINTENANCE_SERVICE_ITEM
MAINTENANCE_SERVICE_ORDER
MANAGEMENT
MANAGER
ORGANIZATION
PERSON
PRIVATE_COLLECTOR
QUALIFICATIONS
REQUIRED_PARTS
SALES_AGENT
SALES_TRANSACTION
SERVICE_ENGINEER
SUPPLIER
VEHICLE
VEHICLE_MODEL
VEHICLE_PART
VENDOR

MAINTENANCE_SERVICE_ORDER

Table	Data	Indexes	Model	Constraints	Grants	Statistics	UI Defaults	Triggers	Dependencies	SQL
Query	Count Rows	Insert Row								
EDIT	MO_ID	CID	BR_ID	EID	VIN	MO_MILEAGE	MO_START_DATE			
<input type="button" value="Edit"/>	3	1	1	-	VEHICLE1VEHICLE12	5500	11/10/2015			
<input type="button" value="Edit"/>	4	2	23	3	VEHICLE1VEHICLE17	4500	01/10/2015			
<input type="button" value="Edit"/>	5	1	4	6	VEHICLE1VEHICLE14	8000	12/10/2015			
<input type="button" value="Edit"/>	7	7	1	4	VEHICLE1VEHICLE13	70000	11/30/2016			
<input type="button" value="Edit"/>	1	4	-	-	VEHICLE1VEHICLE11	18000	10/20/2016			
<input type="button" value="Edit"/>	2	4	23	3	VEHICLE1VEHICLE17	6000	11/02/2016			
<input type="button" value="Edit"/>	6	5	-	4	VEHICLE1VEHICLE13	-	11/05/2016			
<input type="button" value="Edit"/>	8	-	-	-	VEHICLE1VEHICLE16	-	11/03/2016			
<input type="button" value="Edit"/>	9	7	1	66	VEHICLE1VEHICLE13	75000	12/05/2016			

row(s) 1 - 9 of 9

[Download](#)

MAINTENANCE_SERVICE_ITEM								
Table	Data	Indexes	Model	Constraints	Grants	Statistics	UI Defaults	Triggers
Query	Count Rows	Insert Row						
EDIT	MSI_ID	MO_ID	EID	MP_ID	ACTUAL_START_DATE	ACTUAL_END_DATE	CHARGED_LABOR_COST	CHARGED_LABOR_HOUR
	3	1	3	2	11/02/2015	11/02/2015	20	1
	4	5	6	5	12/02/2015	12/02/2015	150	1
	5	2	3	-	01/02/2016	01/02/2016	40	-
	6	9	25	2	12/05/2016	12/06/2016	1500	10
	2	3	5	3	10/20/2015	10/20/2015	150	3
	1	-	-	1	02/01/2015	-	12	1

row(s) 1 - 6 of 6

Name of Team Member who Developed the Form	Tomas Sakal		
Form Name:	Vehicle	Tables / Views:	Master: Vehicle; Detail: Color
End-User:	Sales Agent	Purpose:	To add vehicles into the DB and also add their associated colors.
Screenshot of Form Layout:			
<p>The screenshot shows a form titled "Vehicle". It contains the following fields:</p> <ul style="list-style-type: none"> Vin: A text input field. Vmid: A text input field. Cid: A text input field. Year: A text input field. Mileage: A text input field. License Number: A text input field. State: A text input field. 			

SCS 02

Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE_MD	MSO_MD	VM_MD	V
------	--------------	-----------------------	---------------------------	--------------	-------	--------	-------	---

Vehicle

Vin	<input type="text"/>
Vmid	<input type="text"/>
Cid	<input type="text"/>
Year	<input type="text"/>
Mileage	<input type="text"/>
License Number	<input type="text"/>
State	<input type="text"/>

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COLOR Detail

<input type="checkbox"/> Vin	<u>Col Selection</u>	<u>Col Color</u>
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>



Screenshot of Form with relevant Data

SCS 02

Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE_MD	MSO_MD	VM_MD
------	--------------	-----------------------	---------------------------	--------------	-------	--------	-------

Vehicle

Vin	VEHICLE1VEHICLE66
Vmid	2
Cid	3
Year	2015
Mileage	200
License Number	VCURAMS1
State	New York

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD VC_MD

Vehicle

Vin	VEHICLE1VEHICLE66
Vmid	2
Cid	3
Year	2015
Mileage	200
License Number	VCURAMS1
State	New York

10 of 12

COLOR Detail

<input type="checkbox"/> Vin	Col Selection	Col Color
<input type="checkbox"/> VEHICLE1VEHICLE66	Seats	Black
<input type="checkbox"/> VEHICLE1VEHICLE66	Exterior	Black
<input type="checkbox"/> VEHICLE1VEHICLE66	Roof	Black
<input type="checkbox"/> VEHICLE1VEHICLE66	Trunk	Black

Evidence that relevant Tables were updated:

Tables ▾

ACQUISITION_TRANSACTION
ASSIGNMENT
BRANCH
COLOR
CUSTOMER
DEGREE
EMPLOYEE
LOCATION
MAINTENANCE_PROBLEM
MAINTENANCE_SERVICE_ITEM
MAINTENANCE_SERVICE_ORDER
MANAGEMENT
MANAGER
ORGANIZATION
PERSON
PRIVATE_COLLECTOR
QUALIFICATIONS
REQUIRED_PARTS
SALES_AGENT
SALES_TRANSACTION
SERVICE_ENGINEER
SUPPLIER
VEHICLE
VEHICLE_MODEL
VEHICLE_PART
VENDOR

VEHICLE

Table Data Indexes Model Constraints Grants Statistics UI Defaults Triggers Dependencies SQL

Query Count Rows Insert Row

EDIT	VIN	VMID	CID	YEAR	MILEAGE	LICENSE_NUMBER	STATE
	VEHICLE1VEHICLE13	3	3	2010	-	ORACLEDB	Washington
	VEHICLE1VEHICLE15	2	2	2016	10	HRPOTTER	Tomasville
	VEHICLE1VEHICLE16	5	-	2016	100	JAZZIEST	-
	VEHICLE1VEHICLE17	6	3	2016	30	HELLOCACC	Washington
	VEHICLE1VEHICLE01	2	2	2015	100000	DATABASS	Montana
	VEHICLE1VEHICLE02	6	3	-	30000	-	Pennsylvania
	VEHICLE1VEHICLE66	2	3	2015	200	VCURAMS1	New York
	VEHICLE1VEHICLE11	2	4	2014	15000	DATABASE	Virginia
	VEHICLE1VEHICLE12	1	1	2015	5000	DATADATA	California
	VEHICLE1VEHICLE99	2	3	2013	13000	PIZZAGAT	DC
	VEHICLE1VEHICLE14	1	-	2016	100	HELLOJES	Texas
	VEHICLE1VEHICLE98	2	1	2012	14000	WATERG	France

Tables ▾

COLOR

Table Data Indexes Model Constraints Grants Statistics UI Defaults Triggers Dependencies SQL

Query Count Rows Insert Row

EDIT	COL_SELECTION	VIN	COL_COLOR
	Interior	VEHICLE1VEHICLE66	Black
	Exterior	VEHICLE1VEHICLE66	Black
	Roof	VEHICLE1VEHICLE66	Black
	Trunk	VEHICLE1VEHICLE66	Black
	Seats	VEHICLE1VEHICLE13	Black
	Exterior	VEHICLE1VEHICLE13	Yellow
	Roof	VEHICLE1VEHICLE13	Pink
	Seats	VEHICLE1VEHICLE11	Black
	Exterior	VEHICLE1VEHICLE11	Red
	Seats	VEHICLE1VEHICLE12	Tan
	Exterior	VEHICLE1VEHICLE12	White
	Trunk	VEHICLE1VEHICLE13	Purple

Name of Team Member who Developed the Form	Jesse Castellani		
Form Name:	Vehicle Model	Tables / Views:	Master: Vehicle_Model Detail: Vehicle
End-User:	Inventory Agent	Purpose:	To add vehicles models to the DB and to add associated vehicles.
Screenshot of Form Layout			

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD

Edit VEHICLE_MODEL

Vmid	<input type="text"/>
Name	<input type="text"/>
Start Year	<input type="text"/>
End Year	<input type="text"/>
Miles Per Gallon	<input type="text"/>



Screenshot of Form with relevant Data

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD

Edit VEHICLE_MODEL

Vmid	<input type="text" value="10"/>
Name	<input type="text" value="Tesla Model 3"/>
Start Year	<input type="text" value="2014"/>
End Year	<input type="text" value="2016"/>
Miles Per Gallon	<input type="text" value="30"/>

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD

Edit VEHICLE_MODEL

Vmid	<input type="text" value="10"/>
Name	<input type="text" value="Tesla Model 3"/>
Start Year	<input type="text" value="2014"/>
End Year	<input type="text" value="2016"/>
Miles Per Gallon	<input type="text" value="30"/>

9 of 9

VEHICLE Detail

<input type="checkbox"/> Vin	Cid	Year	Mileage	License Number	State
<input type="checkbox"/> VEHICLE1VEHICLE77	7	2016	100	Kawaii7	New York

Evidence that relevant Tables were updated:

VEHICLE_MODEL

EDIT	VMID	NAME	START_YEAR	END_YEAR	MILES_PER_GALLON
1	2	McLaren 650S Spider	2013	2016	15
2	3	Nissan 370Z	2010	-	22
3	4	Honda Civic	2008	-	30
4	5	Mini Cooper	2010	2016	24
5	6	Volkswagen Beetle	2016	-	25
6	10	Tesla Model 3	2014	2016	30
7	1	Jeep Wrangler	2015	-	30
8	7	Nissan Sentra	2010	2016	30
9	8	Honda Accord	2012	2016	25

VEHICLE

EDIT	VIN	VMID	CID	YEAR	MILEAGE	LICENSE_NUMBER	STATE
1	VEHICLE1VEHICLE13	3	3	2010	-	ORACLEDB	Washington
2	VEHICLE1VEHICLE15	2	2	2016	10	HRPOTTER	Tomasville
3	VEHICLE1VEHICLE16	5	-	2016	100	JAZZIEST	-
4	VEHICLE1VEHICLE17	6	3	2016	30	HELLOCCC	Washington
5	VEHICLE1VEHICLE01	2	2	2015	100000	DATABASS	Montana
6	VEHICLE1VEHICLE02	6	3	-	30000	-	Pennsylvania
7	VEHICLE1VEHICLE66	2	3	2015	200	VCURAMS1	New York
8	VEHICLE1VEHICLE11	2	4	2014	15000	DATABASE	Virginia
9	VEHICLE1VEHICLE12	1	1	2015	5000	DATAADATA	California
10	VEHICLE1VEHICLE99	2	3	2013	13000	PIZZAGAT	DC
11	VEHICLE1VEHICLE14	1	-	2016	100	HELLOJES	Texas
12	VEHICLE1VEHICLE98	2	1	2012	14000	WATERG	France
13	VEHICLE1VEHICLE77	10	7	2016	100	Kawaii7	New York

Name of Team Member who Developed the Form	Tomas Sakal, Joanna Senseng, Jesse Castellani																										
Form Name:	Service Engineer	Tables / Views:	Master:Employee; Detail: Service_Engineer																								
End-User:	HR Employee	Purpose:	To add employees to the DB and then add attributes related to service engineers (e.g. se_level, and charge rate)																								
Screenshot of Form Layout: DML																											
SCS 02 <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25px; padding: 2px;">Home</td> <td style="width: 25px; padding: 2px;">Add Customer</td> <td style="width: 25px; padding: 2px;">Add Sales Transaction</td> <td style="width: 25px; padding: 2px;">Maintenance Service Order</td> <td style="width: 25px; padding: 2px;">Add Employee</td> <td style="width: 25px; padding: 2px; text-align: right;">SE_MD</td> </tr> </table>				Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE_MD																		
Home	Add Customer	Add Sales Transaction	Maintenance Service Order	Add Employee	SE_MD																						
Employee <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Eid</td> <td style="width: 85%;"><input type="text"/></td> </tr> <tr> <td>Br Id</td> <td><input type="text"/></td> </tr> <tr> <td>F Name</td> <td><input type="text"/></td> </tr> <tr> <td>M Initial</td> <td><input type="text"/></td> </tr> <tr> <td>L Name</td> <td><input type="text"/></td> </tr> <tr> <td>Dob</td> <td><input type="text"/> </td> </tr> <tr> <td>E Street</td> <td><input type="text"/></td> </tr> <tr> <td>E Zipcode</td> <td><input type="text"/></td> </tr> <tr> <td>Marital Status</td> <td><input type="text"/></td> </tr> <tr> <td>Hire Date</td> <td><input type="text"/> </td> </tr> <tr> <td>Ssn</td> <td><input type="text"/></td> </tr> <tr> <td>Employee Type</td> <td><input type="text"/></td> </tr> </table>				Eid	<input type="text"/>	Br Id	<input type="text"/>	F Name	<input type="text"/>	M Initial	<input type="text"/>	L Name	<input type="text"/>	Dob	<input type="text"/>	E Street	<input type="text"/>	E Zipcode	<input type="text"/>	Marital Status	<input type="text"/>	Hire Date	<input type="text"/>	Ssn	<input type="text"/>	Employee Type	<input type="text"/>
Eid	<input type="text"/>																										
Br Id	<input type="text"/>																										
F Name	<input type="text"/>																										
M Initial	<input type="text"/>																										
L Name	<input type="text"/>																										
Dob	<input type="text"/>																										
E Street	<input type="text"/>																										
E Zipcode	<input type="text"/>																										
Marital Status	<input type="text"/>																										
Hire Date	<input type="text"/>																										
Ssn	<input type="text"/>																										
Employee Type	<input type="text"/>																										

SCS 02

[Home](#)[Add Customer](#)[Add Sales Transaction](#)[Maintenance Service Order](#)[Add Employee](#)[SE_MD](#)

Employee

Eid

Br Id

F Name

M Initial

L Name

Dob

E Street

E Zipcode

Marital Status

Hire Date

Ssn

Employee Type

23 of 25

SERVICE_ENGINEER Detail



Eid

Hourly Labor Charge

Se Level

1 - 1

**Screenshot of Form with relevant Data:**

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD

Employee

Eid	<input type="text" value="30"/>
Br Id	<input type="text" value="23"/>
F Name	<input type="text" value="Salazar"/>
M Initial	<input type="text"/>
L Name	<input type="text" value="Slytherin"/>
Dob	<input type="text" value="05-Dec-80"/> 
E Street	<input type="text" value="666 Dovers Lane"/>
E Zipcode	<input type="text" value="22222"/>
Marital Status	<input type="text" value="M"/>
Hire Date	<input type="text" value="12-Sep-01"/> 
Ssn	<input type="text" value="703662002"/>
Employee Type	<input type="text" value="E"/>

SCS 02

[Home](#)[Add Customer](#)[Add Sales Transaction](#)[Maintenance Service Order](#)[Add Employee](#)[SE_MD](#)

Employee

Eid

Br Id

F Name

M Initial

L Name

Dob 

E Street

E Zipcode

Marital Status

Hire Date 

Ssn

Employee Type

23 of 24

SERVICE_ENGINEER Detail

<input type="checkbox"/>	<u>Eid</u>	<u>Hourly Labor Charge</u>	<u>Se Level</u>
	30		
	<input type="checkbox"/>	20	Senior

Evidence that relevant Tables were updated:

EMPLOYEE

EDIT	EID	BR_ID	F_NAME	M_INITIAL	L_NAME	DOB	E_STREET	E_ZIPCODE	MARITAL_STATUS	HIRE_DATE	SSN	EMPLOYEE_TYPE
	22	4	kokotjeden	A	Poteul	08/19/1991	-	33333	S	09/19/2008	565781234	M
	24	4	pica	k	kurva	12/01/1996	19 Legionarska	22222	S	12/01/2016	123456789	M
	25	4	picusvyjebany	-	Logreen	10/10/1980	878 Falcon Way	22222	S	10/04/2000	111786464	E
	26	3	Joe	B	Beaver	12/16/1990	807 Franklin Road	22222	S	12/01/2016	453657896	M
	8	1	Horace	-	Slughorn	10/23/1990	582 East Franklin Street	23220	M	04/02/2013	123549876	A
	7	4	Helena	C	Ravenclaw	02/24/1978	31 Marshall St	22222	M	11/22/2010	233995555	A
	9	1	Bill	V	Weasley	11/21/1975	908 Black St	33333	M	11/23/2010	765894653	E
	10	5	James	R	Potter	07/08/1965	193 Jump St	44444	S	10/22/2010	333445555	A
	11	3	George	A	Weasley	09/19/1991	8758 Collander Drive	43209	M	09/20/2010	765785757	A
	12	23	Lily	-	Potter	09/19/1989	900 Death St	67876	M	11/20/2005	987561234	A
	13	1	Albus	A	Dumbledore	09/10/1920	900 Jacklin St	44444	M	09/20/2000	809761234	M
	14	23	Dean	C	Thomas	05/17/1993	879 Jojo Road	33333	S	11/20/2009	333006666	M
	15	3	Viktor	C	Krum	09/12/1966	23 Jolly St	11111	M	09/06/2005	888776666	M
	16	5	Wyatt	-	Mun	11/06/1980	-	22222	S	11/22/2005	876561234	O
	30	23	Salazar	-	Slytherin	12/05/1980	666 Dovers Lane	22222	M	09/12/2001	703662002	E

SERVICE_ENGINEER

EDIT	EID	HOURLY_LABOR_CHARGE	SE_LEVEL
	9	8.75	Associate
	3	10	Associate
	6	12	Associate
	2	16	Senior
	5	18	Senior
	30	20	Senior

row(s) 1 - 6 of 6

Download

5. ORACLE Reports :

5.1 Single Table Reports:

Name of Team Member who Developed the Report:	Tomas Sakal		
Report Name:	Vendor_R	Table:	Vendor
End-User(s)	Sales Agent	Purpose:	Provides a list of vendors and their relevant information
Screenshot of Report Layout:			

The screenshot shows the Oracle Application Express interface. The title bar says "Edit Region" and "ORACLE Application Express". The URL is "128.172.188.10:8080/apex/f?p=4000:4651:7135740408206::RP,4651,960,420,601,4050,27,196,121,232,695,754,832,287,2000:FB_FLOW_ID,FB_FLOW_P". The workspace is "INFO364" and the user is "Logout". The main content area is titled "Edit Region" and shows "Region: 1 of 1 Name: Report 1". It has tabs for "Region Definition", "Report Attributes", "Saved Reports", and "Print Attributes". Buttons include "Cancel", "Delete", and "Apply Changes". A sidebar on the right is titled "Page Region" with the sub-section "Identification". It contains fields for "Page" (60 Vendor_R), "Title" (Report 1), and "Type" (Interactive Report). Under "Source", there is a code editor with the following SQL query:

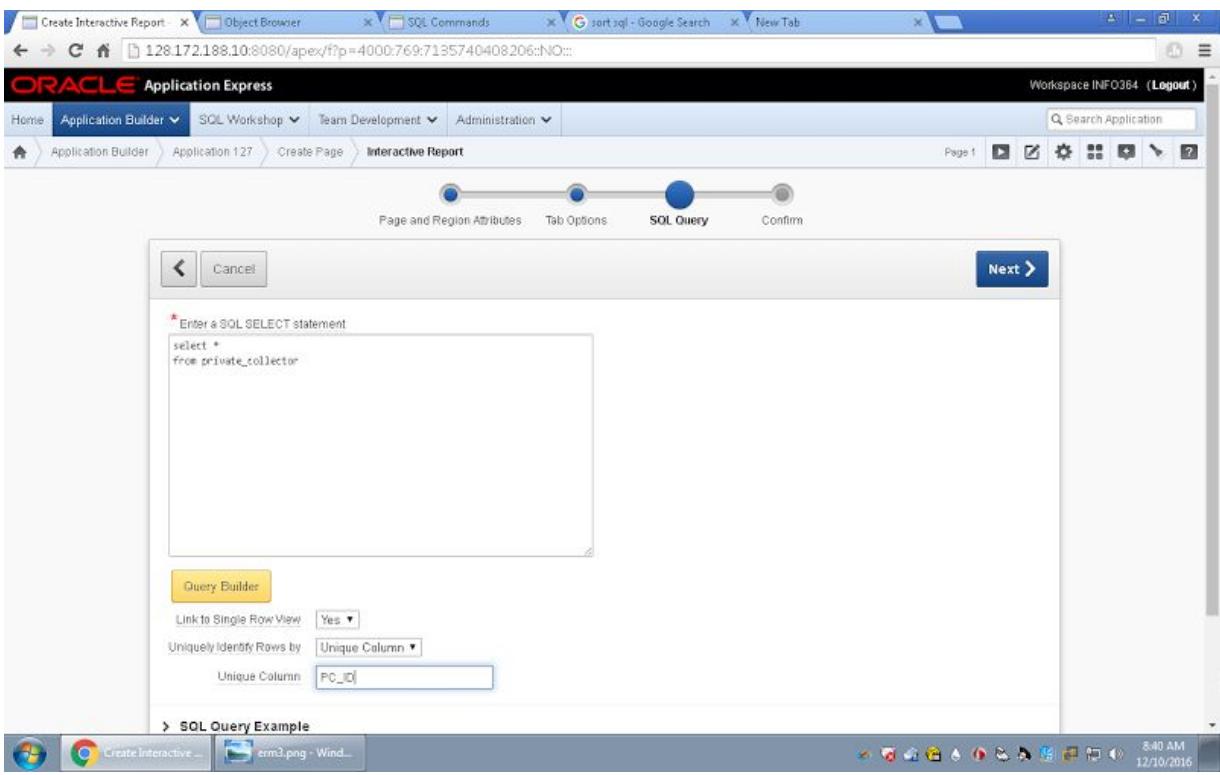
```
select *
from vendor
```

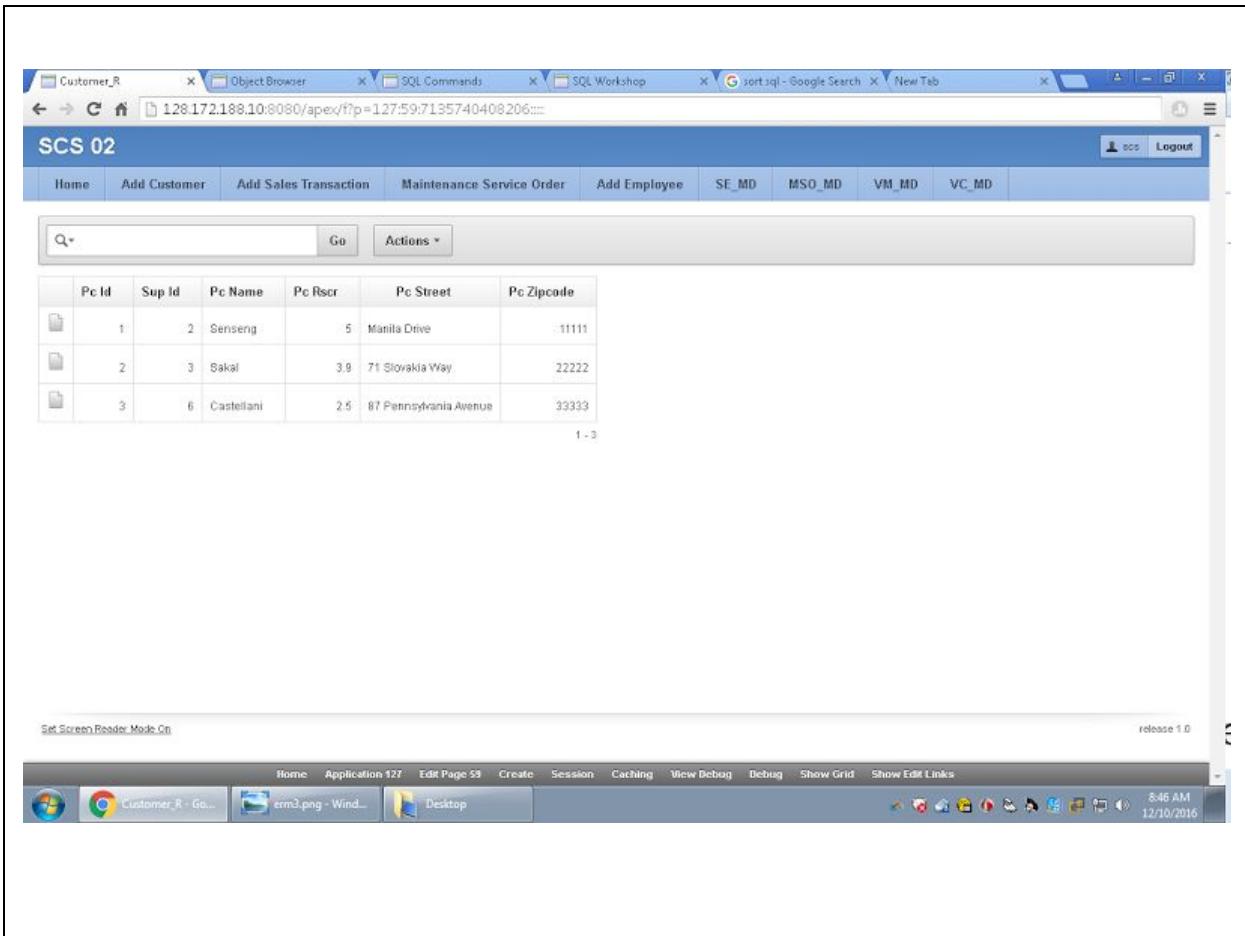
Screenshot of Report with relevant Output Data:

The screenshot shows the Oracle Application Express interface with the title bar "Vendor_R" and URL "128.172.188.10:8080/apex/f?p=127:60:7135740408206::". The workspace is "SCS 02" and the user is "Logout". The main content area displays a grid of vendor data with columns: Vr Id, Vr Name, Vr Yrsbus, Vr Street, Vr Zipcode, and Sup Id. The data is as follows:

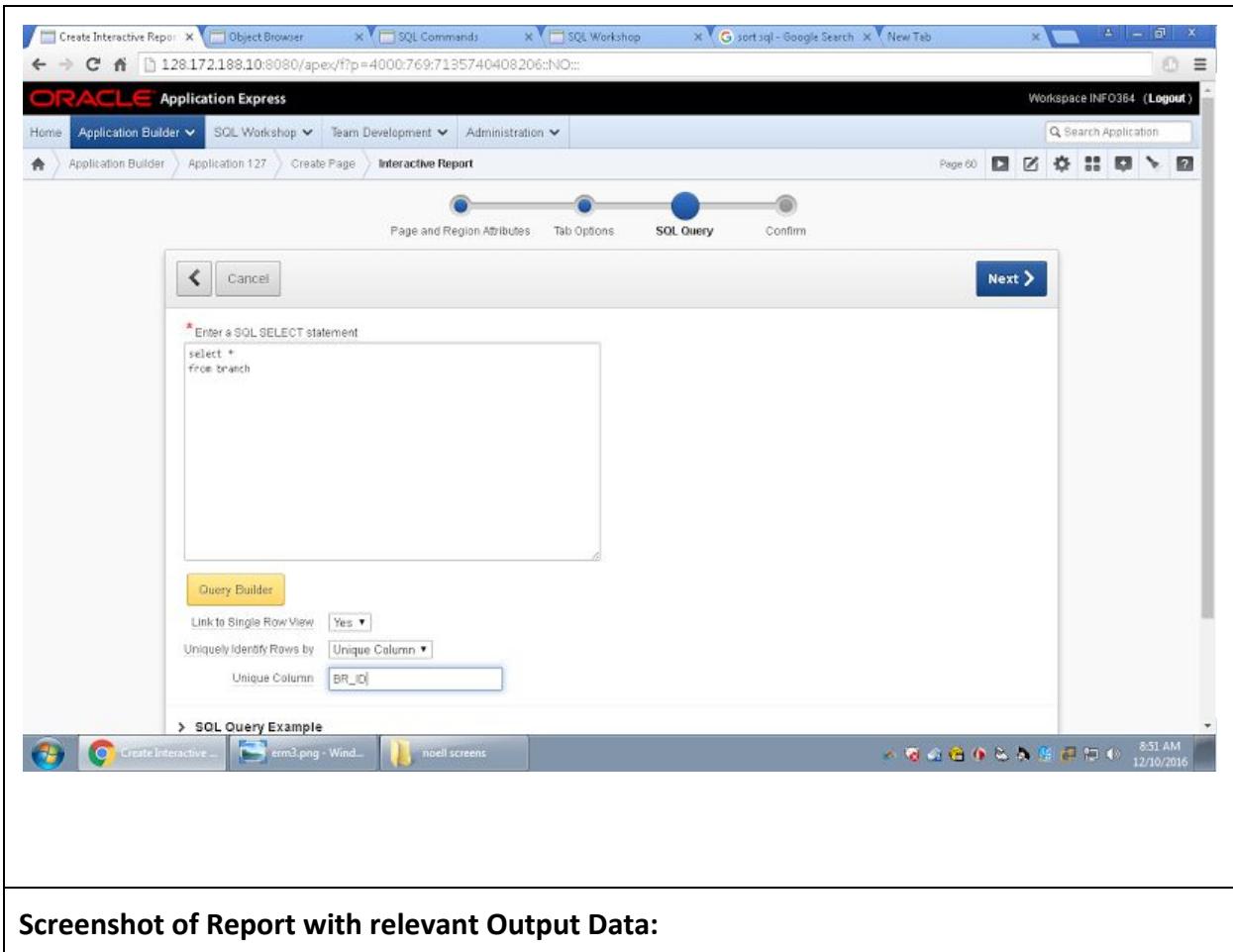
Vr Id	Vr Name	Vr Yrsbus	Vr Street	Vr Zipcode	Sup Id
1	Costco	5	504 Black Road	11111	5
2	CarMax	15	-	23220	13
3	User Enterprise	4	-	67676	14
4	Haus of Automobiles	5	-	-	15
5	Car Center	6	-	43209	16

At the bottom, there is a footer with links for "Set Screen Reader Mode On" and "Release 1.0". The taskbar at the bottom shows icons for Home, Application 127, Edit Page 60, Create, Session, Caching, View Debug, Debug, Show Grid, Show Edit Links, and a timestamp of "8:48 AM 12/10/2016".

Name of Team Member who Developed the Report:	Jesse Castellani		
Report Name:	Private_Collector_R	Table:	Private_Collector
End-User(s)	Sales Agent	Purpose:	Provides a list of private collectors and their relevant information
Screenshot of Report Layout:  <p>The screenshot shows the Oracle Application Express interface for creating an interactive report. The top navigation bar includes tabs for Create Interactive Report, Object Browser, SQL Commands, and Shortsql - Google Search. The main menu bar has Home, Application Builder, SQL Workshop, Team Development, Administration, and a Logout option. Below the menu is a breadcrumb trail: Application Builder > Application 127 > Create Page > Interactive Report. The central workspace displays a wizard with four steps: Page and Region Attributes, Tab Options, SQL Query (which is selected), and Confirm. The SQL Query step contains a text area with the following SQL code:</p> <pre>select * from private_collector</pre> <p>Below the text area are buttons for Query Builder, Link to Single Row View (set to Yes), and Unique Column (set to FC_ID). A link to a SQL Query Example is also present.</p>			
Screenshot of Report with relevant Output Data:			



Name of Team Member who Developed the Report:	Joanna Senseng		
<hr/>			
Report Name:	Branch_R	Table:	Branch
End-User(s)	Manager, HR	Purpose:	Provides a list of branches and their relevant information
<hr/>			
Screenshot of Report Layout:			



Screenshot of Report with relevant Output Data:

Branch_R Object Browser SQL Commands SQL Workshop 128.172.188.10:8080/apex/f?p=127:61:7135740408206::: SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD VC_MD Logout

Br Id	Br Name	Br Phone Number	Br Street	Br Zipcode
1	Richmond IMI	8046664500	901 Park Avenue	23220
3	RAMS IMI	2338880000	-	43209
4	Senseng IMI	-	-	22322
5	Atlanta IMI	2321115555	-	11111
23	Seattle IMI	5025016566	24 North Read	-

1 - 5

Set Screen Reader Mode On release 1.0

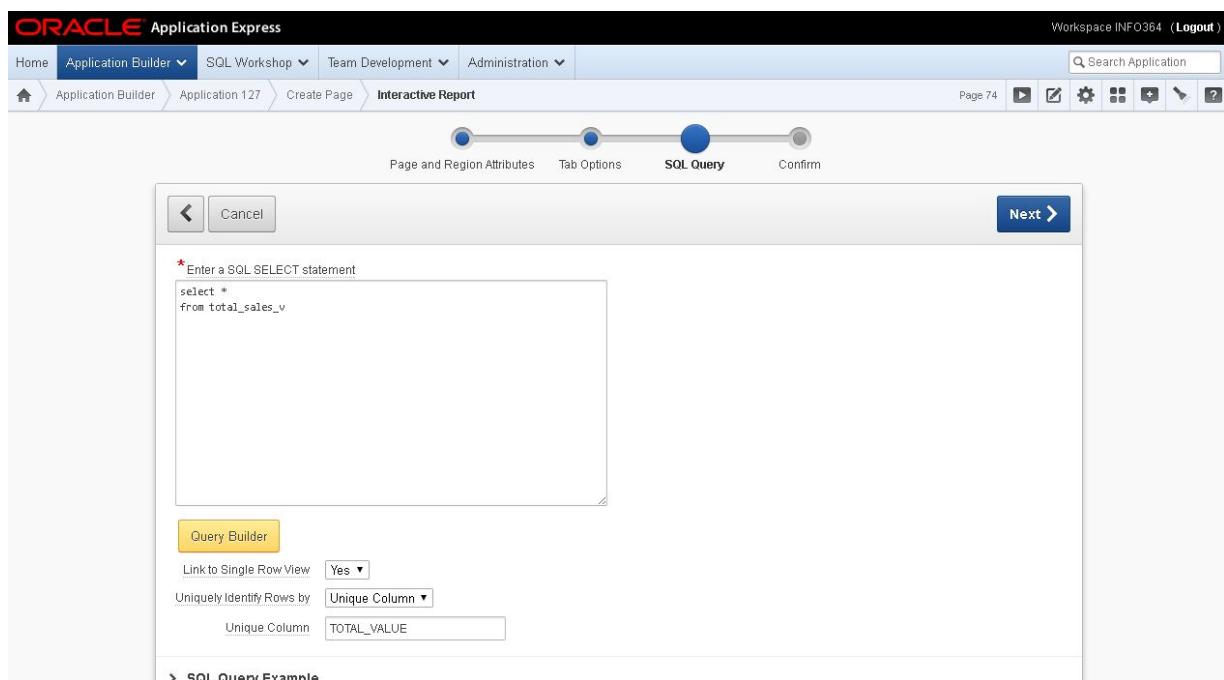
Home Application 127 Edit Page 61 Create Session Caching View Debug Debug Show Grid Show Edit Links

8:52 AM 12/10/2016

Name of Team Member who Developed the Report:	Tomas Sakal		
Report Name:	Total_Sales_R	Tables/Views:	Tables: Sales_transaction View: total_sales_v
End-User(s)	Manager, Sales Agent	Purpose:	Provides a report of the quantity of

			vehicles sold and its total value

Screenshot of Report Layout:



Screenshot of Report with relevant Output Data:

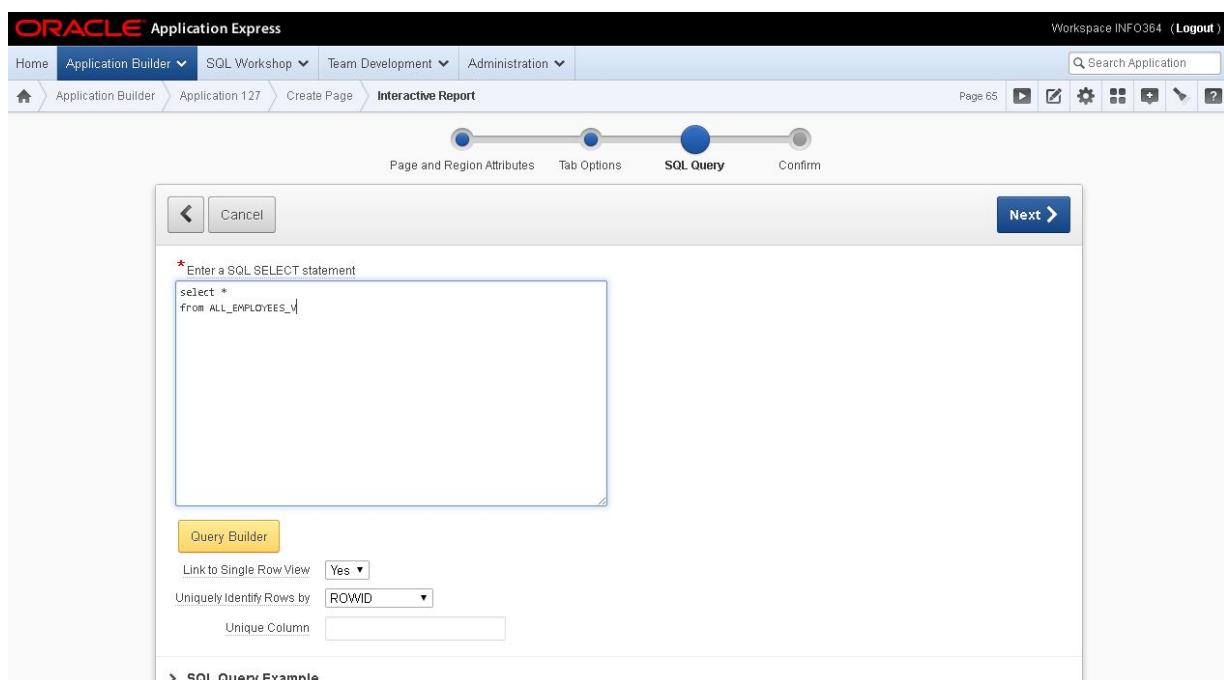
The screenshot shows the SCS 02 application interface. At the top, there is a blue header bar with the title "SCS 02" on the left and a user icon with "Logout" on the right. Below the header is a navigation menu with links: Home, Add Customer, Add Sales Transaction, Maintenance Service Order, Add Employee, SE_MD, MSO_MD, VM_MD, and VC_MD. A search bar with a dropdown arrow, a "Go" button, and an "Actions" dropdown are located above the main content area. The main content area displays a report grid titled "Vehicles Sold" with columns for "Total Value". One row is visible with the value "251500". At the bottom of the page, there is a footer with links: Set Screen Reader Mode On, release 1.0, Home, Application 127, Edit Page 75, Create, Session, Caching, View Debug, Debug, Show Grid, and Show Edit Links.

5.2 Multi-Table Report:

Name of Team Member who Developed the Report:	Joanna Senseng		
Report Name:	All_Employees_V	Tables/Views:	Tables: Employee, Service_engineer View: all_employees _V
End-User(s)	HR and Manager	Purpose:	Provides a list

			of service engineers and their relevant information
--	--	--	---

Screenshot of Report Layout:



Screenshot of Report with relevant Output Data:

SCS 02														SCS	Logout	
Home		Add Customer		Add Sales Transaction		Maintenance Service Order		Add Employee		SE_MD	MSO_MD	VM_MD	VC_MD			
<input style="width: 100px; height: 20px; border: 1px solid #ccc; padding: 2px; margin-right: 5px;" type="text" value="Q"/> Go Actions ▾																
Eid	F Name	M Initial	L Name	Dob	City	State	Marital Status	Hire Date	Hourly Labor Charge	Se Level	Commission Rate	Promot				
22	kokotjeden	A	Poteui	19-AUG-91	Jessetown	Philadelphia	S	19-SEP-08		-	-	-	-			
24	pica	k	kunva	01-DEC-96	Tomastown	Idaho	S	01-DEC-16		-	-	-	-			
25	picuswjebany	-	Logreen	10-OCT-80	Tomastown	Idaho	S	04-OCT-00		-	-	-	-			
26	Joe	B	Beaver	16-DEC-90	Tomastown	Idaho	S	01-DEC-16		-	-	-	-			
8	Horace	-	Slughorn	23-OCT-90	Richmond	Virginia	M	02-APR-13		-	-	.12	-			
7	Helena	C	Ravenclaw	24-FEB-78	Tomastown	Idaho	M	22-NOV-10		-	-	.15	-			
9	Bill	V	Weasley	21-	Jessetown	Philadelphia	M	23-NOV-10		8.75	Associate	-	-			

[Home](#) [Application 127](#) [Edit Page 66](#) [Create](#) [Session](#) [Caching](#) [View Debug](#) [Debug](#) [Show Grid](#) [Show Edit Links](#)

Name of Team Member who Developed the Report:	Tomas Sakal		
Report Name:	Sales_Agent_R	Tables/Views:	Table: employee, sales_agent

			View: sales_agent_v
End-User(s)	HR, Managers	Purpose:	Provides a list of sales agents and their relevant information

Screenshot of Report Layout:

The screenshot shows the Oracle Application Express interface for creating an interactive report. The top navigation bar includes Home, Application Builder (selected), SQL Workshop, Team Development, Administration, and a search bar. Below the navigation is a breadcrumb trail: Application Builder > Application 127 > Create Page > Interactive Report. The main content area has tabs: Page and Region Attributes, Tab Options, SQL Query (selected), and Confirm. The SQL Query tab contains a text input field with the query:

```
select * from sales_agent_v
```

. Below the input field are configuration options: Query Builder (button), Link to Single Row View (Yes dropdown), Uniquely Identify Rows by (Unique Column dropdown), Unique Column (EID dropdown), and a link to SQL Query Example.

Screenshot of Report with relevant Output Data:

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD VC_MD

Logout

Q Go Actions ▾

Eid	F Name	M Initial	L Name	Dob	City	State	Marital Status	Hire Date	Commission Rate
7	Helena	C	Ravenclaw	24-FEB-78	Tomastown	Idaho	M	22-NOV-10	.15
8	Horace	-	Slughorn	23-OCT-90	Richmond	Virginia	M	02-APR-13	.12
10	James	R	Potter	08-JUL-65	Joannavilles	California	S	22-OCT-10	.12
11	George	A	Weasley	19-SEP-91	Detroit	Pennslywania	M	20-SEP-10	.12
12	Lily	-	Potter	19-SEP-89	Seattle	Washington	M	20-NOV-05	.18

1 - 5

[Set Screen Reader Mode On](#)

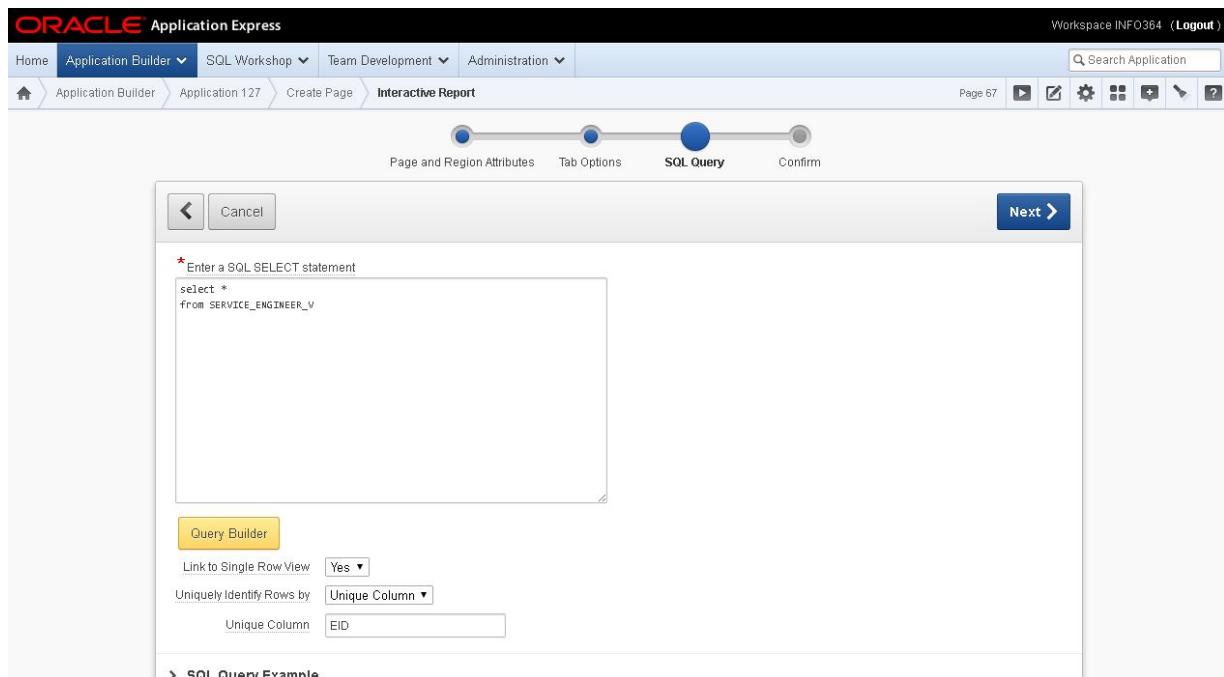
release 1.0

Home Application 127 Edit Page 67 Create Session Caching View Debug Debug Show Grid Show Edit Links

Name of Team Member who Developed the Report:	Jesse Castellani		
Report Name:	Service_Engineer_R	Tables/Views:	Table: Service_engineer and Employee View: service_engineer_v
End-User(s)	HR, Managers	Purpose:	Provides a list of service

		e:	engineers and their relevant information
--	--	----	--

Screenshot of Report Layout:



Screenshot of Report with relevant Output Data:

SCS 02
Logout

Home
Add Customer
Add Sales Transaction
Maintenance Service Order
Add Employee
SE_MD
MSO_MD
VM_MD
VC_MD

Q▼
Go
Actions ▾

	Eid	F Name	M Initial	L Name	Dob	City	State	Marital Status	Hire Date	Hourly Labor Charge	Se Level
	2	Ron	-	Weasley	23-MAR-80	-	-	M	14-DEC-06		16 Senior
	3	Luna	-	Lovegood	23-NOV-85	Seattle	Washington	S	20-APR-07		10 Associate
	5	Severus	-	Snape	09-OCT-85	-	-	-	22-JUL-06		18 Senior
	6	Cho	M	Chang	06-MAY-75	Atlanta	Georgia	M	20-APR-06		12 Associate
	9	Bill	V	Weasley	21-NOV-75	Jesettown	Philadelphia	M	23-NOV-10	8.75	Associate
	25	picuswjebany	-	Logreen	10-OCT-80	Tomastown	Idaho	S	04-OCT-00	-	-

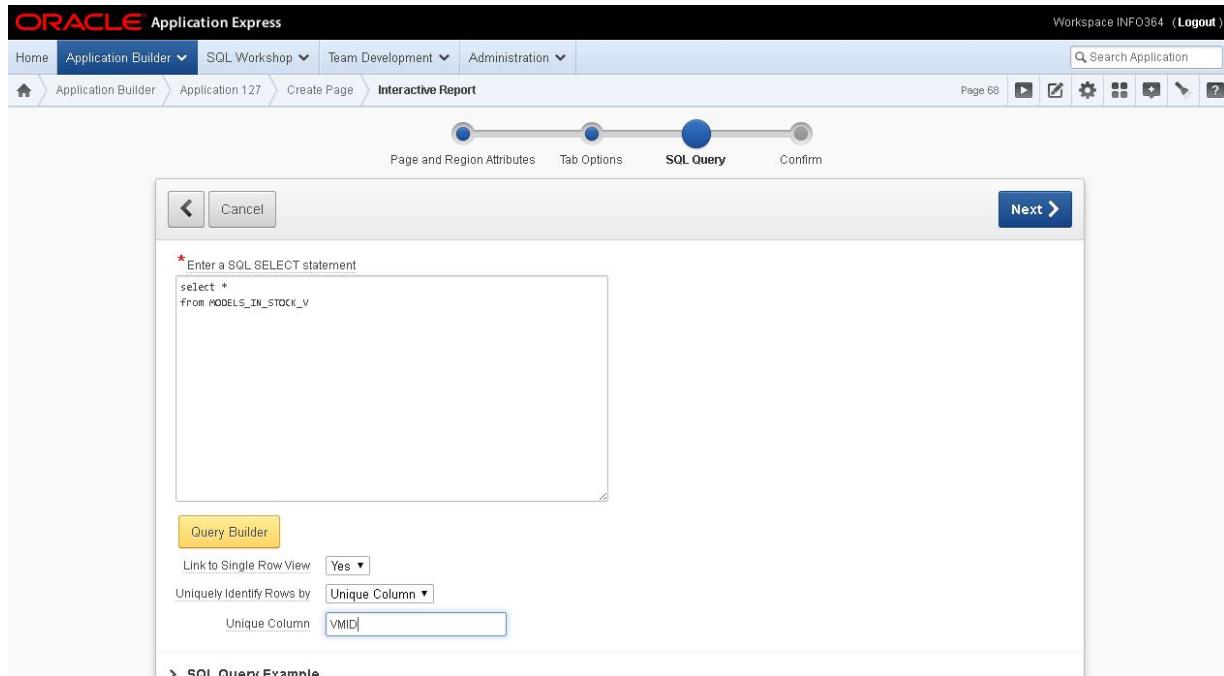
1 - 6

[Set Screen Reader Mode On](#)
release 1.0

Home
Application 127
Edit Page 68
Create
Session
Caching
View Debug
Debug
Show Grid
Show Edit Links

Name of Team Member who Developed the Report:		Joanna Senseng		
Report Name:	Models_In_Stock_R		Tables/Views:	Tables: Vehicles_in_stock_v, Vehicle, vehicle_model
End-User(s)	Sales Agent, Managers		Purpose:	Provides a list of the models in stock and their relevant information

Screenshot of Report Layout:



Screenshot of Report with relevant Output Data:

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD VC_MD

Logout

Q Go Actions ▾

Vmid	Number Of Cars	Name	Start Year	End Year	Miles Per Gallon
2	3	McLaren 650S Spider	2013	2016	15
6	2	Volkswagen Beetle	2016	-	25

1 - 2

[Set Screen Reader Mode On](#)

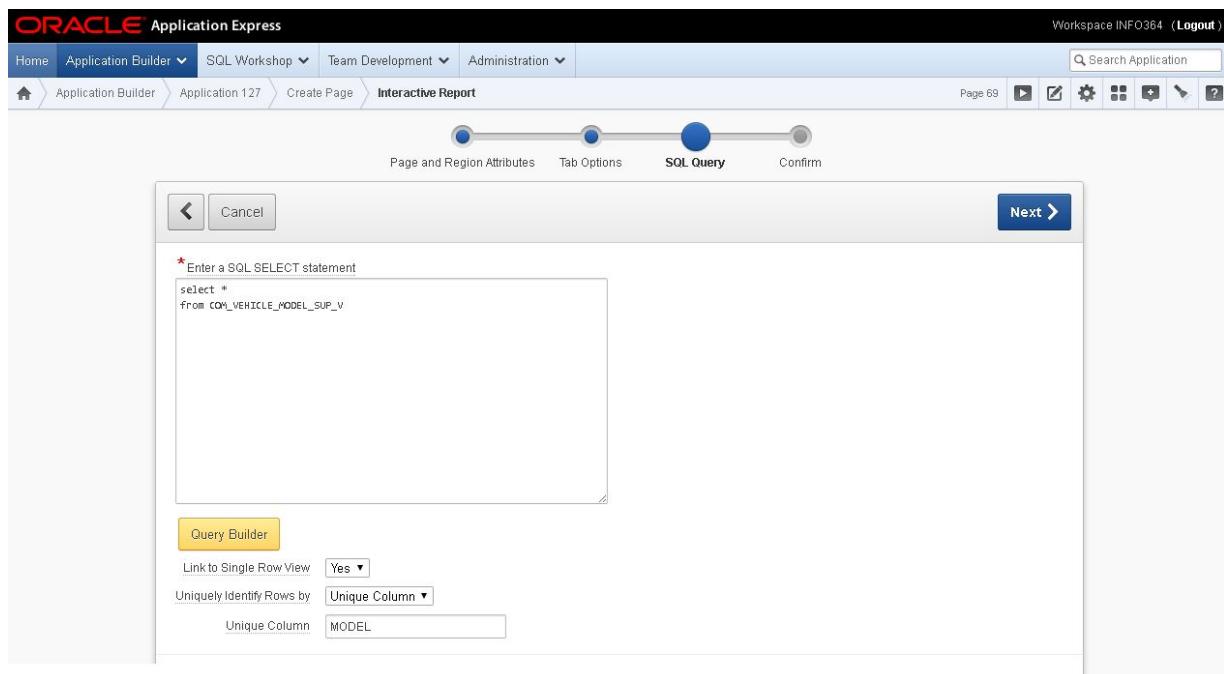
release 1.0

Home Application 127 Edit Page 69 Create Session Caching View Debug Debug Show Grid Show Edit Links

Name of Team Member who Developed the Report:	Tomas Sakal		
Report Name:	Com_Vehicle_Model_Sup_R	Tables/Views:	Tables: Vehicle_model , vehicle, acquisition_transaction, supplier, customer, private_collector, vendor, person, organization,

			Views: com_vehicle_ model_sup_v
End-User(s)	Sales Agent, Managers	Purpose:	Provides the name of supplier and supplier type with the car models and its quantities

Screenshot of Report Layout:



Screenshot of Report with relevant Output Data:

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD VC_MD

Logout

Q Go Actions ▾

	Name	Sup Type	Model	Count
CarMax	V	Jeep Wrangler	1	
CarMax	V	McLaren 650S Spider	1	
CarMax	V	Mini Cooper	1	
CarMax	V	Volkswagen Beetle	1	
Adam D Johnson	C	McLaren 650S Spider	1	
Adam D Johnson	C	Nissan 370Z	1	
Adam D Johnson	C	Volkswagen Beetle	1	
Costco	V	Jeep Wrangler	2	
Senseng	P	McLaren 650S Spider	1	

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[Set Screen Reader Mode On](#) release 1.0

Home Application 127 Edit Page 70 Create Session Caching View Debug Debug Show Grid Show Edit Links

Name of Team Member who Developed the Report:	Tomas Sakal		
Report Name:	Maintenance_Record_R	Tables/Views:	Tables: maintenance_service_order, maintenance_service_item, maintenance_problem, vehicle, vehicle_model, customer, service_engine

			er, person View: maintenance_record_v
End-User(s)	Service Engineer, Manager	Purpose:	Provides a list of vehicles identified by VIN and its relevant information, along with its maintenance seervice information (problem, cost, hours, labor and engineer who serviced the vehicle)
Screenshot of Report Layout:			

The screenshot shows the Oracle Application Express interface for creating an interactive report. The top navigation bar includes links for Home, Application Builder, SQL Workshop, Team Development, Administration, and a search bar. Below the navigation is a breadcrumb trail: Application Builder > Application 127 > Create Page > Interactive Report. A progress bar at the top indicates the current step is 'SQL Query'. The main form contains a text area for the SQL statement, which currently displays 'select * from maintenance_record_v'. Below this is a 'Query Builder' button. Configuration options include 'Link to Single Row View' set to 'Yes', 'Uniquely Identify Rows by' set to 'Unique Column', and 'Unique Column' set to 'VIN'. A link 'SQL Query Example' is also present.

Screenshot of Report with relevant Output Data:

The screenshot shows the SCS 02 application interface. The top navigation bar includes links for Home, Add Customer, Add Sales Transaction, Maintenance Service Order, Add Employee, SE_MD, MSO_MD, VM_MD, and VC_MD. A search bar and actions dropdown are also present. The main content area displays a table of vehicle maintenance records. The table has columns: Vin, Model, Production Year, Plate, Cid, Owner Name, Problem, Mileage, Charged Labor Hour, Charged Labor Cost, and Engineer Name. The data in the table includes:

Vin	Model	Production Year	Plate	Cid	Owner Name	Problem	Mileage	Charged Labor Hour	Charged Labor Cost	Engineer Name
VEHICLE1VEHICLE11	McLaren 650S Spider	2014	DATABASE	4	ITSC	Oil Change	18000	1	20	
VEHICLE1VEHICLE12	Jeep Wrangler	2015	DATADATA	1	Fleur Delacour	Engine Tune-up	5500	3	150	
VEHICLE1VEHICLE13	Nissan 370Z	2010	ORACLEDB	7	John B Potter	-	70000	-	-	Harry Potter
VEHICLE1VEHICLE13	Nissan 370Z	2010	ORACLEDB	7	John B Potter	Oil Change	75000	10	1500	Fleur Delacour
VEHICLE1VEHICLE13	Nissan 370Z	2010	ORACLEDB	5	RamDev	-	-	-	-	Harry Potter
VEHICLE1VEHICLE14	Jeep Wrangler	2016	HELLOJES	1	Fleur Delacour	Battery Replacement	8000	1	150	Cho M Chang
VEHICLE1VEHICLE16	Mini Cooper	2016	JAZZIEST	-	-	-	-	-	-	
VEHICLE1VEHICLE17	Volkswagen Beetle	2016	HELLOC	4	ITSC	-	6000	-	40	Luna Lovegood
VEHICLE1VEHICLE17	Volkswagen	Home Application 127 Edit Page 71 Create Session Caching View Debug Debug 0 Show Grid Show Edit Links							-	Luna Lovegood

Name of Team Member who Developed the Report:	Joanna Senseng		
Report Name:	Serviced_1_Month_R	Tables/Views:	Tables: vehicle_model, vehicle, maintenance_service_order View: serviced_1_month_v
End-User(s)	Service Engineer, Manager	Purpose:	Provides a list of vehicles that were serviced within 1 month
Screenshot of Report Layout:			

ORACLE Application Express

Workspace INFO364 (Logout)

Home Application Builder SQL Workshop Team Development Administration

Application Builder Application 127 Page 65 Edit Region

Region Definition Report Attributes Saved Reports Print Attributes

Cancel Delete Apply Changes < >

Region: 1 of 1 Name: Report 1

Show All Identification Source User Interface Grid Layout Attributes Header and Footer Conditions Read Only Security Configuration Customization Comments

Identification

Page: 65 SERVICED_1_MONTH_R
 Title: Report 1 exclude title from translation
 Type: Interactive Report

Source

Region Source

```
select *
from SERVICED_1_MONTH_V
```

Page Region

Use this page to edit region attributes. A region is an area on a page that serves as a container for content.

Return to Page

Tasks

Undo region source

Page Items

Page has no items

Screenshot of Report with relevant Output Data:

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD VC_MD

Logout

Q Go Actions ▾

	Model	Vmid	Quantity	Mo Start Date	Today
	Nissan 370Z	3	1	05-DEC-16	10-DEC-16
	Nissan 370Z	3	1	30-NOV-16	10-DEC-16

1 - 2

[Set Screen Reader Mode On](#)

release 1.0

Home Application 127 Edit Page 65 Create Session Caching View Debug Debug Show Grid Show Edit Links

Name of Team Member who Developed the Report:	Joanna Senseng		
Report Name:	Serviced_3_Month_R	Tables/Views:	Tables: vehicle_model, vehicle, maintenance_service_order View: serviced_3_month_v
End-User(s)	Service Engineer, Manager	Purpose:	Provides a list of vehicles that were serviced within 3 months
Screenshot of Report Layout:			

ORACLE Application Express

Workspace INFO364 (Logout)

Home Application Builder SQL Workshop Team Development Administration

Application Builder Application 127 Page 64 Edit Region

Region Definition Report Attributes Saved Reports Print Attributes

Region: 1 of 1 Name: Report 1

Show All Identification Source User Interface Grid Layout Attributes Header and Footer Conditions Read Only Security Configuration Customization Comments

Identification

Page: 64 SERVICED_3_MONTH_R

Title: Report 1 exclude title from translation

Type: Interactive Report

Source

Region Source

```
select *
from SERVICED_3_MONTH_V
```

Screenshot of Report with relevant Output Data:

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE MD MSO MD VM MD VC MD

Logout

Actions ▾

	Model	Vmid	Quantity	Mo Start Date	Today
McLaren 650S Spider	2	1	20-OCT-16	10-DEC-16	
Nissan 370Z	3	1	05-NOV-16	10-DEC-16	
Nissan 370Z	3	1	30-NOV-16	10-DEC-16	
Nissan 370Z	3	1	05-DEC-16	10-DEC-16	
Mini Cooper	5	1	03-NOV-16	10-DEC-16	
Volkswagen Beetle	6	1	02-NOV-16	10-DEC-16	

1 - 6

Set Screen Reader Mode On release 1.0

Home Application 127 Edit Page 64 Create Session Caching View Debug Debug Show Grid Show Edit Links

Name of Team Member who Developed the Report:	Joanna Senseng		
Report Name:	Serviced_6_Month_R	Tables/Views:	Tables: vehicle_model, vehicle, maintenance_service_order View: serviced_6_month_v
End-User(s)	Service Engineer, Manager	Purpose:	Provides a list of vehicles that were serviced within 6 months
Screenshot of Report Layout:			

ORACLE Application Express

Workspace INFO364 (Logout)

Home Application Builder SQL Workshop Team Development Administration

Application Builder Application 127 Create Page Interactive Report

Page 62 | Search Application

Page and Region Attributes Tab Options SQL Query Confirm

SQL Query

Enter a SQL SELECT statement

```
select *
from SERVICED_6_MONTH_R
```

Query Builder

Link to Single Row View Yes

Uniquely Identify Rows by Unique Column

Unique Column VMID

SQL Query Example

Screenshot of Report with relevant Output Data:

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD VC_MD

Logout

Actions ▾

	Model	Vmid	Quantity	Mo Start Date	Today
	McLaren 650S Spider	2	1	20-OCT-16	10-DEC-16
	Nissan 370Z	3	1	05-NOV-16	10-DEC-16
	Nissan 370Z	3	1	30-NOV-16	10-DEC-16
	Nissan 370Z	3	1	05-DEC-16	10-DEC-16
	Mini Cooper	5	1	03-NOV-16	10-DEC-16
	Volkswagen Beetle	6	1	02-NOV-16	10-DEC-16

1 - 6

[Set Screen Reader Mode On](#) release 1.0

Home Application 127 Edit Page 63 Create Session Caching View Debug Debug Show Grid Show Edit Links

Name of Team Member who Developed the Report:	Joanna Senseng		
Report Name:	Serviced_12_Month_R	Tables/Views:	Tables: vehicle_model, vehicle, maintenance_service_order View: serviced_12_month_v
End-User(s)	Service Engineer, Manager	Purpose:	Provides a list of vehicles that were serviced within 12 months
Screenshot of Report Layout:			

The screenshot shows the Oracle Application Express interface for creating an interactive report. The top navigation bar includes links for Home, Application Builder, SQL Workshop, Team Development, and Administration. The current page is 'Interactive Report' under 'Create Page'. A progress bar at the top indicates steps: 'Page and Region Attributes' (blue), 'Tab Options' (blue), 'SQL Query' (dark blue, selected), and 'Confirm' (grey). The main content area contains a text input field with the SQL query:

```
select *
from SERVICED_12_MONTH_V
```

Below the query, there are configuration options:

- Query Builder** button (highlighted in yellow).
- Link to Single Row View**: Yes.
- Uniquely Identify Rows by**: Unique Column.
- Unique Column**: VMID.

A link labeled '> SQL Query Example' is also present.

Screenshot of Report with relevant Output Data:

The screenshot shows the SCS 02 application interface. The top navigation bar includes links for Home, Add Customer, Add Sales Transaction, Maintenance Service Order, Add Employee, SE_MD, MSO_MD, VM_MD, and VC_MD. The main content area displays a table of service orders:

	Model	Vmid	Quantity	Mo Start Date	Today
	McLaren 650S Spider	2	1	20-OCT-16	10-DEC-16
	Nissan 370Z	3	1	05-NOV-16	10-DEC-16
	Nissan 370Z	3	1	30-NOV-16	10-DEC-16
	Nissan 370Z	3	1	05-DEC-16	10-DEC-16
	Mini Cooper	5	1	03-NOV-16	10-DEC-16
	Volkswagen Beetle	6	1	02-NOV-16	10-DEC-16

Page number 1 - 6 is shown at the bottom of the table.

At the bottom of the page, there are links for 'Set Screen Reader Mode On' and 'release 1.0'. The footer navigation bar includes links for Home, Application 127, Edit Page 62, Create, Session, Caching, View Debug, Debug, Show Grid, and Show Edit Links.

Name of Team Member who Developed the Report:	Jesse Castellani		
Report Name:	Total_Customer_Spending_R	Tables/Views:	Tables: Service_maintenance, com_cus_spending View: total_customer_spending_v
End-User(s)	Customer Service Employee Customer Service Manager	Purpose:	Provides a list of total spending of each customer
Screenshot of Report Layout:			

The screenshot shows the Oracle Application Express Interactive Report page. The top navigation bar includes links for Home, Application Builder, SQL Workshop, Team Development, Administration, and a search bar. Below the navigation is a breadcrumb trail: Application Builder > Application 127 > Create Page > Interactive Report. A progress bar at the top indicates the current step is "SQL Query". The main area contains a text input field with a SQL SELECT statement:

```
select cid, owner_name, city, state, zipcode,
balance as amount_owed,
spending as ms_total_spending,
amount as vh_purchased_total_spending,
total_spent
from total_customer_spending_v
```

Below the input field are several configuration options: "Query Builder" (highlighted in yellow), "Link to Single Row View" (set to Yes), "Uniquely Identify Rows by" (set to Unique Column), and "Unique Column" (set to CID). A "Next >" button is located in the top right corner of the input area.

Screenshot of Report with relevant Output Data:

The screenshot shows the SCS 02 application interface. The top navigation bar includes links for Home, Add Customer, Add Sales Transaction, Maintenance Service Order, Add Employee, SE_MD, MSO_MD, VM_MD, and VC_MD. A search bar and an "Actions" dropdown are also present. The main content area displays a grid of data:

Cid	Owner Name	City	State	Zipcode	Amount Owed	Ms Total Spending	Vh Purchased Total Spending	Total Spent
1	Fleur N Delacour	Jessetown	Philadelphia	33333	500	300	35000	35300
2	Bellatrix D Lestrange	Joannavilles	California	44444	100	-	65000	65000
4	ITSC	Atlanta	Georgia	11111	100	60	-	60
5	RamDev	Tomasstown	Idaho	22222	500	-	14000	14000
7	John B Potter	Williamsburg	Virginia	23434	3000	1500	-	1500

At the bottom of the grid, there is a page number indicator "1 - 5". The footer includes links for Set Screen Reader Mode On, release 1.0, and a navigation bar with Home, Application 127, Edit Page 72, Create, Session, Caching, View Debug, Debug, Show Grid, and Show Edit Links.

Name of Team Member who Developed the Report:		Jesse Castellani	
Report Name:	Customer_Overview_R	Tables/Views:	Tables: Customer, person, organization, location View: customer_overview_v
End-User(s)	Customer Service Employee Customer Service Manager	Purpose:	Provides a list of customers and how much of a balance the customer has with IMI.
Screenshot of Report Layout:			

Screenshot of Report with relevant Output Data:

Cid	Balance	Name	Ssn	Dob	C Street	City	State	Zipcode
1	500	Fleur N Delacour	543674545	20-OCT-80	12 West Franklin St	Jessetown	Philadelphia	33333
2	100	Bellatrix D Lestrange	999006666	27-SEP-80	111 Silica Street	Joannavilles	California	44444
3	0	Cedric L Diggory	122141555	02-DEC-91	666 Joanna Drive	Seattle	Washington	67676
4	100	ITSC		-	155 W Broad St	Atlanta	Georgia	11111
5	500	RamDev		-	756 Capitol Drive	Tomastown	Idaho	22222
7	3000	John B Potter	123456757	01-JAN-80	405 Dell Lane	Williamsburg	Virginia	23434
8	250	Jared B Morefield	987671234	09-AUG-00	23 Strawberry St	Richmond	Virginia	23220
12	30000	AutoSakal		-	709 Hopstop	Tomastown	Idaho	22222
13	30000	Adam D Johnson	567119998	10-OCT-90	828 Plague St	Jojostown	Hawaii	55555
15	80000	Hogwarts		-	808 Franklin Beat	Tomastown	Idaho	22222
16	70000	Neville K Longbottom	66001234	23-MAR-80	857 Franklin Populace	Tomastown	Idaho	22222
17	5500	Sirius V Black	888992345	01-DEC-78	155 W Franklin St	Jessetown	Philadelphia	33333

Name of Team Member who Developed the Report:	Jesse Castellani		
Report Name:	Com_Cus_Spending_R	Tables/Views:	Tables: Customer, sales_transacti on, person, organization, location Views: com_cus_spen ding_v
End-User(s)	Sales Agent, Manager	Purpose:	Provides a list of customers, their relevant information, and their spending
Screenshot of Report Layout:			

ORACLE Application Express

Workspace INFO364 (Logout)

Home Application Builder SQL Workshop Team Development Administration

Application Builder Application 127 Create Page Interactive Report

Page 72 | Search Application

Page and Region Attributes Tab Options SQL Query Confirm

SQL Query

Enter a SQL SELECT statement

```
select *
from COM_CUS_SPENDING_V
```

Next >

Query Builder

Link to Single Row View Yes

Uniquely Identify Rows by Unique Column CID

SQL Query Example

Screenshot of Report with relevant Output Data:

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD VC_MD

Logout

Cid	Owner Name	City	State	Zipcode	Balance	Amount
1	Fleur N Delacour	Jessetown	Philadelphia	33333	500	35000
2	Bellatrix D Lestrange	Jeanavilles	California	44444	100	65000
3	Cedric L Diggory	Seattle	Washington	67676	0	5500
4	ITSC	Atlanta	Georgia	11111	100	-
5	RamDev	Tomastown	Idaho	22222	500	14000
7	John B Potter	Williamsburg	Virginia	23434	3000	-
8	Jared B Morefield	Richmond	Virginia	23220	250	-
12	AutoSakai	Tomastown	Idaho	22222	30000	-
13	Adam D Johnson	Jojostown	Hawaii	55555	30000	-
15	Hogwarts	Tomastown	Idaho	22222	80000	-
16	Neville K Longbottom	Tomastown	Idaho	22222	70000	-
17	Sirius V Black	Jessetown	Philadelphia	33333	5500	5500

Home Application 127 Edit Page 73 Create Session Caching View Debug Debug Show Grid Show Edit Links

Name of Team Member who Developed the Report:	Tomas Sakal		
Report Name:	Total_Paid_Vendor_R	Tables/Views:	Tables: Vendor, supplier, acquisition_transaction, location View: total_paid_vendor_v
End-User(s)	Manager	Purpose:	Provides a list of vendors along with the total amount of payment
Screenshot of Report Layout:			

ORACLE Application Express

Workspace INFO364 (Logout)

Home Application Builder SQL Workshop Team Development Administration

Application Builder Application 127 Create Page Interactive Report

Page 73 | Search Application

Page and Region Attributes Tab Options SQL Query Confirm

SQL Query

Enter a SQL SELECT statement

```
select *
from total_paid_vendor_v
```

Query Builder

Link to Single Row View Yes

Uniquely Identify Rows by Unique Column

Unique Column VR_ID

SQL Query Example

Screenshot of Report with relevant Output Data:

SCS 02

Home Add Customer Add Sales Transaction Maintenance Service Order Add Employee SE_MD MSO_MD VM_MD VC_MD

Logout

Actions ▾

Vr Id	Vr Name	Vr Yrsbus	City	State	Total Paid Vendor
1	Costco	5	Atlanta	Georgia	63500
2	CarMax	15	Richmond	Virginia	134950
3	Uber Enterprise	4	Seattle	Washington	0
4	Haus of Automobiles	5	Tomasstown	Idaho	0
5	Car Center	6	Detroit	Pennsylvania	0

1 - 5

Set Screen Reader Mode On release 1.0

Home Application 127 Edit Page 74 Create Session Caching View Debug Debug Show Grid Show Edit Links

Name of Team Member who Developed the Report:		Tomas Sakal	
Report Name:	Total_Maintenance_R	Tables/Views:	Tables: Maintenance_serivce_order, Customer, maintenacne_service_item, person, organization, location View: service_mainte nance_v
End-User(s)	Service Engineer, Manager	Purpose:	Provides a list of the amount of vehicles serviced, along with the value for the parts used and amount from service orders.
Screenshot of Report Layout:			

The screenshot shows the Oracle Application Express interface for creating an interactive report. The top navigation bar includes links for Home, Application Builder, SQL Workshop, Team Development, Administration, and a search bar. The current page is 'Interactive Report' under 'Application Builder'. A progress bar at the top indicates steps: 'Page and Region Attributes', 'Tab Options', 'SQL Query' (which is selected), and 'Confirm'. The main content area contains a text input field with the SQL query: 'select * from total_maintenance_v'. Below the query are configuration options: 'Query Builder' (highlighted in yellow), 'Link to Single Row View' (set to 'Yes'), 'Uniquely Identify Rows by' (set to 'Unique Column'), and 'Unique Column' (set to 'AMOUNT_FROM_SERVICE_ORI'). A link 'SQL Query Example' is also present.

Screenshot of Report with relevant Output Data:

The screenshot shows the SCS 02 application interface. The top navigation bar includes links for Home, Add Customer, Add Sales Transaction, Maintenance Service Order, Add Employee, SE_MD, MSO_MD, VM_MD, and VC_MD. A search bar and an 'Actions' dropdown are also present. The main content area displays a table titled 'Maintenance Service Order' with the following data:

	Vehicles Serviced	Value Of Parts Used	Amount From Service Orders
	9	1350	3530

Below the table, the text '1 - 1' is displayed. At the bottom of the page, there are links for 'Set Screen Reader Mode On' and 'release 1.0'. The footer includes standard navigation links: Home, Application 127, Edit Page 76, Create, Session, Caching, View Debug, Debug, Show Grid, and Show Edit Links.

5.3 Report of Oracle Reports

Business Function	Information Requirements	Report Name(s)	Tables/Views	User(s)
HR Management (HRM)	Complete information about IMI employees, especially Sales Agent and Service Engineers	All_Employees	all_employees_v	HR managers, Branch Managers
		Sales_Agent_R	sales_agent_v	HR Managers, Branch Managers
		Service_Engineer_R	service_engineer_v	HR Managers, Branch Managers
		Branch_R	branch_v	HR Managers, Branch Managers
Inventory Management (IVM)	Complete information on each Vehicle Model currently kept in stock	Models_In_Stock_R	models_in_stock_v	Inventory Manager, Inventory employees, Sales Agent
	Complete information on each Vehicle Model obtained from each Supplier , including summary information.	Com_Vehicle_Model_Sup_R	com_vehichle_model_sup_v	Inventory Managers, Inventory Employees,
Maintenance Service Management	Complete information on the number and models of the Vehicles that	Serviced_1_Month_R	serviced_1_month_v	Service Manager, Service Engineers

(MSM)	were serviced in a last year, 6 months, and 3 months, and a last month	Serviced_3_Month_R	serviced_3_month_v	Service Manager, Service Engineers
		Serviced_6_Month_R	serviced_6_month_v	Service Manager, Service Engineers
		Serviced_12_Month_R	serviced_12_month_v	Service Manager, Service Engineers
	Complete information on the maintenance record of each serviced Vehicle (Vehicle information, type of problem, owner, Service Engineer who performed the maintenance, and cost of maintenance)	Maintenance_Record_R	Maintenance_record_v	Service Manager, Service Engineers
Customer Service Management (CSM)	Complete information on every customer including information regarding their: · Total spending on Vehicles · Total spending on service maintenance	Total_Customer_spending_R	total_customer_spending_v	Customer Service Employee Customer Service Manager
Accounting (ACC)	Complete information on spending of every Customer	Com_Cus_Spending_R	com_cus_spending_v	Accounting Manager, Accounting Employee Sales Agent
	Complete information regarding what was paid to each Vendor	Total_Paid_Vendor_R	tota_paid_vendor_v	Accounting Manager, Accounting Employee Sales Agent
	Complete information regarding what was received by IMI from the Sales of Vehicles (e.g. Number of Vehicles sold,	Total_Sales_R	total_sales_v	Accounting Manager, Accounting Employee Sales Agent

	Total Value of Sales)			
	Complete information regarding what was received by IMI from the Maintenance service (e.g. Number of Vehicles serviced, Total Value of Parts used, Total Dollar Amount of service orders)	Total_Maintenance_R	service_maintenance_v	Accounting Manager, Accounting Employee Sales Agent

6. Individual Team Member Report:

Name of Team Member:	Joanna Senseng
Project Component	Detailed Description of what you did
<i>1. Conceptual Model:</i>	With regards to the sources of entity and relationship types, I worked with my teammate, Jesse, on putting down the information drawn from business rules and drafting the initial documentation. With respect to the ERD, Tomas and I cooperated on creating the diagram without Jesse. For the documentation of the entity-relationship model, we were all physically present, so we completed the documentation

	together; I, specifically, started filling in information from the end, going backwards.
<i>2. Transformation of ERD to Relational Data Model</i>	The initial RDM was not as complex to complete, hence Tomas and I were able to go over it rather quickly and checking each other's work on the go. The functional dependencies and the normalizing of forms of the next part made things rather complicated, so it was very useful for the group that we all got together to complete this. For the final part, I had to leave our meeting earlier, so I reviewed all that Tomas and Jesse have done and corrected order of attributes and typos and formatted the documentation.
<i>3. Implementation of Final RDM in ORACLE</i>	In creating the base tables, I did some of the tables after dividing the tasks with Jesse and Tomas. Looking at the necessary attributes, its data types, and the additional information I needed, it proved to be challenging, but I definitely learned a lot. I combined the tables everyone created into views. Determining which and how to join the tables, especially the largest views of up to six tables, was a pleasure experience due to team collaboration.
<i>4. ORACLE Forms</i>	After creating the correct views, the forms were just a question of understanding the user interface and setting up the logic correctly. I did some forms alone and others together with Jesse or Tomas.
<i>5. ORACLE Reports</i>	In the ORACLE reports segment, similar process took place as during the segment 4., but with the difference that I was making sure everything was marked and documented correctly by completing the report of reports.

Description of what you learned:

I learned a lot of new things whilst working on this project with Jesse and Tomas. This project encapsulated all the lessons and concepts learned from class that resulted in a sound understanding of this topic. Although seldomly, I felt insecure about my knowledge and how I could contribute, Jesse and Tomas were very helpful and attributed to my growth in this class. I definitely know more about databases, SQL, and the navigation of Oracle Application Express now in comparison to the start of this class and this project.

Name of Team Member:	Tomas Sakal
Project Component	Detailed Description of what you did
<i>1. Conceptual Model:</i>	<p>For 1.1, I ended up reviewing the initial documentation, as I was unable to attend the common meeting when this was discussed. The entities, relationships and their attributes drawn from individual business rules was what I checked to be true and according to the assignment.</p> <p>For 1.2, together with Joanna I created the ERD in Visio and made sure every assumption that was made was correctly recorded.</p> <p>For 1.3, I was working on parts of the detailed documentation while meeting in person with the other team members. Helping others specify attributes' descriptions as well as myself inputting necessary information.</p>

<p><i>2. Transformation of ERD to Relational Data Model</i></p>	<p>For 2.1, I coordinated with Joanna to create a basic draft of what would later be the initial RDM. The format was the most difficult part, then we merely coordinated with Joanna on copying the right entities to the appropriate places.</p> <p>For 2.2, all of us got together and we went one by one complete the functional dependencies, as this was not of the easiest tasks for us to complete due to the incorporation of normal forms.</p> <p>For 2.3, Jesse and me got together to look over 2.2 and copy everything as appropriate to create the final RDM. We did it one by one together in order to avoid making mistakes.</p>
<p><i>3. Implementation of Final RDM in ORACLE</i></p>	<p>In this segment I created the following tables for 3.1: vehicle, maintenance service order, vehicle part, required parts, assignment, qualifications, color, degree, private collector, person, sales agent.</p> <p>After that, I used the created tables to create the following views for 3.2: hired after 2008, all employees, service engineer employees, number of each vehicle purchased from supplier, customer spending on vehicle, total customer spending, total paid to vendors.</p>
<p><i>4. ORACLE Forms</i></p>	<p>Similarly to the implementation of final RDM in ORACLE, I also completed some forms individually and teamed up with the others to create the more complex ones.</p>
<p><i>5. ORACLE Reports</i></p>	<p>The ORACLE reports were compiled again both individually and in groups of two or three for the more complex ones. For 5.3, I merely participated in the review process making sure no errors were made and correcting where applicable.</p>

Description of what you learned:

It was a pleasure to cooperate with my teammates Joanna and Jesse and get to know them better as we spent long hours both in mornings and evenings working on this interesting project. Having completed a database class before my arrival at VCU, this class as well as this project were a useful reinforcement and deepening of my previously acquired knowledge and skills.

Name of Team Member:	Jesse Castellani
Project Component	Detailed Description of what you did
<i>1. Conceptual Model:</i>	I cooperated with Joanna during the completion of the sources of entity types and relationship and relationship types. It was also left to me to check and correct minor mistakes in the entity-relationship diagram after it was drafted by the rest of the group. Due to the sheer volume of the documentation of the entity-relationship diagram our team succeeded in meeting to complete this part together. My role was similar to my peers' - completing the first third and participating in the review.

<p><i>2. Transformation of ERD to Relational Data Model</i></p>	<p>It was my role to review my teammates' work in the course of completion of the initial relational data model, which I did my best to do diligently and with attention to detail.</p> <p>While working on developing the initial relational data model in conjunction with functional dependencies and normal forms I was an active part of the team guiding our team efforts and contributing significantly to determining the normal forms and clarifying the accurate forms of functional dependencies.</p> <p>For the final relational data model, Tomas and I worked together to fill out the correct information with having in mind the changes made due to the newly determined functional dependencies and normal forms.</p>
<p><i>3. Implementation of Final RDM in ORACLE</i></p>	<p>In the course of the creation of the base tables, I completed my portion of the work that we decided would be assigned to me. Just as my teammates, I also created standalone tables with their attributes, corrected errors and created constraints.</p> <p>During the creation of views I was able to focus on setting up the ones that did not necessarily require too complex of an SQL statement, however when it came to the last, complex ones, I joined my teammates to expedite the process and avoid unnecessary errors.</p>
<p><i>4. ORACLE Forms</i></p>	<p>My role in part four ORACLE Forms was to create and assist my teammates in creating forms in the online user interface that was introduced to us. I created several forms by myself, others I created together with my teammates.</p>

<p><i>5. ORACLE Reports</i></p>	<p>As for the ORACLE Reports part of this project, I created several ORACLE reports by myself in the online user interface and others together with my teammates. I only participated in the review of the Report of Oracle Reports and ensuring no mistakes were made.</p>
<p>Description of what you learned:</p>	
<p>Working with my fellow teammates rigorously in the second half of the semester allowed me to further develop my interpersonal, leadership and organizational skills. What's more, the impact that this project has had on me is not purely personal in nature. The knowledge I've gained in both the theory and practice in the field of database design, creation, population and maintenance, although on, I'm certain, lower level than in practice in the private sector, will be very useful to me as I move forward in my career.</p>	