**Project Name**

Repair and Parts Database Management System for Automotive Parts Supplier

**Project Members**

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**Project Aim**

The aim of our project is to develop a system to manage the sale, supply, and repair of automotive parts under warranty, ensuring efficient inventory tracking, repair management, and customer service.

**General Info About the Organizational Problem**

As an automotive parts supplier, the organization faces challenges in managing multiple processes such as sales, supply, and warranty-related repairs. This includes keeping track of sold parts, monitoring inventory levels, and handling repair or replacement requests under warranty.

**Solutions to the Problem**

The system will include a sales management system to log all parts sold, capturing details such as customer name, part ID, date of sale, and warranty period. It will also feature parts inventory tracking, providing a real-time inventory database to monitor stock levels, supplier details, reorder alerts, and storage locations for each part. Additionally, a warranty and repair management system will handle warranty claims, track parts under warranty, log repair requests, and record the status of repairs or replacements. To enhance communication and streamline transactions, the system will include a customer and supplier database, centralizing all relevant information.

**Software and Hardware to be Used in the Project**

In this project we will use Microsoft Office tools such as Word and Excel, Visual Paradigm, Draw.io, Google Scholar, Google Chrome, MySQL, SQLite3, python, Visual Studio, Power BI, and Qt Designer. For hardware we will be using laptops, desktop computers, printers and data storage.

**References Related to the Project**

Ahirrao, S. (n.d.). Auto Spare Parts Management System [GitHub repository]. GitHub. <https://github.com/AhirraoShubham/Auto-Spare-Parts-Management-System>

Chen, Z., Chen, W., Zhang, L., Gao, M., & Zhang, Q. (2023). Spare parts management in manufacturing systems based on digital twin and deep learning. Applied Sciences, 13(17), 9843. <https://www.mdpi.com/2076-3417/13/17/9843>

Jiarpakdee, J., & Lertsrisantad, P. (2024). Toward efficient management of vehicle spare parts inventory using predictive analytics and machine learning. Materials Today: Proceedings. <https://www.sciencedirect.com/science/article/pii/S2667305324000851>

Kaur, R., & Singh, M. (2023). A systematic review on inventory control of auto spare parts. International Journal of Scientific and Management Research, 6(9). <http://doi.org/10.37502/IJSMR.2023.6922>

Patil, P. (n.d.). Auto Spare Parts Management [GitHub repository]. GitHub. <https://github.com/pavanpatil45/Auto-Spare-Parts-Management>

**Part 1**

**1.1 Crow’s Foot Notation of the Entity Relationship Diagram**

A diagram of a sales diagram

Description automatically generated with medium confidence

**1.2 Functional Dependencies**

salesID → customerID, partID, salesDate,

customerID → customerName, address, phone, email

partID → partName, salePrice, stockLevel, supplierID, reorderLevel

supplierID → supplierName, address, phone, email, country

warrantyID → salesID, repairStatus, repairDate, warrantyStatus, warrantyPeriod

**1.3 Referential Integrity Constraints**

CUSTOMERS (customerID, customerName, address, phone, email)

PART\_INVENTORY (partID, part name, salePrice, stockLevel, *supplierID*, reorderLevel)

SALES (salesID, *customerID, partID*, salesDate, warrantyPeriod)

WHERE **CUSTOMERS.customerID** MUST EXIST IN **SALES.customerID**

AND **PART\_INVENTORY.partID** MUST EXIST IN **SALES.partID**

SUPPLIERS (supplierID, supplierName, address, email, phone, country)

PART\_INVENTORY (partID, partName, salePrice, stockLevel, *supplierID*, reorderLevel)

WHERE **SUPPLIERS.supplierID** MUST EXIST IN **PART\_INVENTORY.supplierID**

SALES (salesID, *customerID, partID*, salesDate, warrantyPeriod)

WARRANT\_REPAIR (warrantyID, *salesID,* repairStatus, repairDate, warrantyStatus)

WHERE **SALES.salesID** MUST EXIST IN **WARRANTY\_REPAIR.salesID**

**1.4 Sample Relational Tables**

(These are the sample tables that our SQL codes will create.)

**Sales**

|  |  |  |  |
| --- | --- | --- | --- |
| **salesID** | **customerID** | **partID** | **salesDate** |
| 8801 | 0001 | 7701 | 2024-01-10 |
| 8802 | 0002 | 7702 | 2024-02-15 |
| 8803 | 0003 | 7703 | 2024-02-17 |
| 8804 | 0004 | 7704 | 2024-02-18 |
| 8805 | 0005 | 7705 | 2024-02-19 |

**Customers**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **customerID** | **customerName** | **address** | **phone** | **email** |
| 0001 | John Doe | 123 Elm Street | 555-1234 | johndoe@example.com |
| 0002 | Jane Smith | 456 Oak Avenue | 555-5678 | janesmith@example.com |
| 0003 | Alice Johnson | 789 Pine Lane | 555-9101 | alicej@example.com |
| 0004 | Bob Brown | 321 Maple Street | 555-1122 | bobb@example.com |
| 0005 | Charlie White | 654 Birch Road | 555-3344 | charliew@example.com |

**Part\_Inventory**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **partID** | **partName** | **salePrice** | **stockLevel** | **supplierID** | **reorderLevel** |
| 7701 | Brake Pads | 50.00 | 100 | 9901 | 20 |
| 7702 | Oil Filter | 15.00 | 200 | 9902 | 50 |
| 7703 | Air Filter | 20.00 | 150 | 9903 | 30 |
| 7704 | Spark Plug | 8.00 | 300 | 9904 | 40 |
| 7705 | Fuel Pump | 120.00 | 50 | 9905 | 10 |

**Supplier**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **supplierID** | **supplierName** | **address** | **email** | **phone** | **country** |
| 9901 | Auto Supplies Co. | 101 Industrial Park | contact@autosupplies.com | 555-2233 | USA |
| 9902 | Car Parts World | 202 Mechanic Ave | info@carpartsworld.com | 555-4455 | Germany |
| 9903 | Vehicle Components Ltd. | 303 Repair Road | sales@vehiclecomponents.com | 555-6677 | UK |
| 9904 | Engine Essentials | 404 Drive Blvd | support@engineessentials.com | 555-8899 | Japan |
| 9905 | Performance Parts Inc. | 505 Racing St | orders@performanceparts.com | 555-1010 | Italy |

**Warranty\_Repair**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **warrantyID** | **salesID** | **repairStatus** | **repairDate** | **warranty\_period** | **warrantystatus** |
| 1111 | 8801 | 1 (TRUE) | 2024-02-01 | 2 | Active |
| 1112 | 8802 | 0 (FALSE) | NULL | 2 | Expired |
| 1113 | 8803 | 0 (FALSE) | 2024-12-11 | 3 | Expired |
| 1114 | 8804 | 1 (TRUE) | 2024-04-01 | 1 | Active |
| 1115 | 8805 | 1 (TRUE) | NULL | 3 | Active |

We do not need to normalize these tables as they are already in BCNF.

**Part 2**

**2.1 Conceptual Entity Relationship Diagram**

**A diagram of a sales diagram

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**2.2** **Logical Entity Relationship Diagram**

A diagram of a company

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**2.3 Physical Entity Relationship Diagram**

**A diagram of parts and parts

Description automatically generated**

**Part 3**

**3.1 SQL Code Examples**

Creating the CUSTOMERS Table

**A computer screen shot of a black screen

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Inserting Data into the CUSTOMERS Table

A computer screen with text and numbers

Description automatically generated

**3.2 Table Examples**

CUSTOMER Table

A screenshot of a computer

Description automatically generated

PART\_INVENTORY Table

A screenshot of a computer

Description automatically generated

**3.3 Triggers**

Trigger 1

A screen shot of a computer code

Description automatically generated

The trigger automatically checks and updates the warranty status in the WARRANTY\_REPAIR table after each update. This ensures the record's status is kept up-to-date based on the sales date and warranty period.

**3.4 Stored Procedure**

Fetches all sales and warranty statuses for a customer based on their ID, including part details (e.g., part name) and any related repair information (repair status, date).

metin, ekran görüntüsü, yazılım, multimedya yazılımı içeren bir resim

Açıklama otomatik olarak oluşturuldu

Output:

An example of getting information about the customer with customerid 1:



**metin, ekran görüntüsü, makbuz, yazı tipi içeren bir resim

Açıklama otomatik olarak oluşturuldu**

**3.5 Sample Queries**

Example 1

This query returns the best-selling items.

A screen shot of a computer code

Description automatically generated

Output:

|  |  |
| --- | --- |
| **partname** | **total\_sales** |
| **Air Filter** | 3 |
| **Starter Motor** | 2 |
| **Cylinder Head** | 2 |
| **Piston** | 2 |
| **Oil Pump** | 2 |
| **Gaskets** | 2 |
| **Radiator** | 2 |
| **Oil Filter** | 2 |
| **Manifolds** | 2 |
| **Spark Plug** | 2 |
| **Water Pump** | 2 |
| **Injection (Diesel) Pump** | 2 |
| **Transmission** | 2 |
| **Differential** | 2 |
| **Connecting Rod** | 1 |
| **Fuel Pump** | 1 |
| **Control Arm** | 1 |

Example 2

This query returns sales that are currently under repair and have an active warranty.

metin, ekran görüntüsü, yazı tipi içeren bir resim

Açıklama otomatik olarak oluşturuldu

Output:

|  |  |  |  |
| --- | --- | --- | --- |
| **warrantid** | **salesid** | **repairstatus** | **repairdate** |
| **1** | 25 | In Progress | 2024-01-15 |
| **5** | 17 | In Progress | 2024-09-01 |
| **10** | 15 | In Progress | 2024-12-31 |
| **12** | 2 | In Progress | 2024-11-10 |
| **17** | 12 | In Progress | 2024-12-20 |

**3.6 Interface Design**

This interface lists customers, allows the user to enter a new customer, and deletes an incorrect customer by the user.

A screenshot of a computer

Description automatically generated

Add Customer:

A screenshot of a computer

Description automatically generated

Delete Customer:

A screenshot of a computer

Description automatically generated

**3.7 Power BI Analysis**

Example 1

This table shows the warranty status of the repaired parts and the stage of the repair.

A graph of blue rectangular bars

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Example 2

A table of numbers with text

Description automatically generated

This table lists the relationship between saleid, customerid, partid and warranty status.