Retailer Database Management System

DBMS Laboratory Project – Phase I

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Database: Oracle Live SQL
Interface: Java JDBC Console Application
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Abstract

This project implements a **Retailer Database Management System** for a multi-store supermarket chain. The objective is to design and implement a relational database capable of efficiently storing, managing, and querying retail-related data such as products, brands, stores, customers, vendors, inventory, and sales. The project uses **Oracle DBMS** for backend data management and **Java JDBC** for interaction through a console-based interface. The design follows proper normalization (up to 3NF) to ensure data consistency, reduce redundancy, and enable analytical reporting.

Objectives

• Understand and apply database design principles.
• Design a normalized schema for retail management.
• Implement and populate relations in Oracle DBMS.
• Execute SQL queries for data analysis and reporting.
• Build a Java-based interface for database interaction.

Entity–Relationship Design

The detailed ER diagram (attached separately as *ER_Diagram.pdf*) models seven entities: **Store, Product, Brand, Customer, Vendor, Inventory,** and **Sale**. Key relationships include: Brand – Product (1–N) Product – Vendor (M–N) Store – Sale (1–N) Customer – Sale (1–N) Store – Product (M–N via Inventory) Each entity maintains referential integrity via foreign keys. Attributes such as product_name, price, city, and stock_qty describe the

entities. Cardinalities are clearly depicted in the ER diagram.

Normalization

All relations are normalized to **Third Normal Form (3NF)**: **1NF:** Atomic attributes with no repeating groups. **2NF:** Partial dependencies removed; full dependency on primary keys. **3NF:** Transitive dependencies eliminated (brand_name depends on brand_id, not product_id). This ensures minimal redundancy and high data integrity.

Relational Schema

Brand	brand_id (PK), brand_name
Product	product_id (PK), name, price, category, brand_id (FK)
Store	store_id (PK), store_name, city, state
Customer	cust_id (PK), cust_name, gender, email, phone
Vendor	vendor_id (PK), vendor_name, city, contact
Inventory	store_id (FK), product_id (FK), stock_qty
Sale	sale_id (PK), sale_date, quantity, total_amt, cust_id (FK), store_id (FK), product_id (FK)

Implementation

The database was implemented in **Oracle SQL Developer**, and the Java interface connects using the **JDBC API** via *ojdbc8.jar*. The program offers a command-line menu for: Viewing product listings Adding sales transactions Generating analytical reports Each Java class (*DBConnection.java*, *RetailerApp.java*) follows modular principles and clear exception handling.

Sample Queries

1. Top-selling products:
```
SELECT p.name, SUM(s.quantity)
FROM Sale s JOIN Product p ON s.product_id=p.product_id
GROUP BY p.name ORDER BY SUM(s.quantity) DESC FETCH FIRST 5 ROWS ONLY;
```

2. Revenue by state:
```
SELECT st.state, SUM(s.total_amt)
FROM Sale s JOIN Store st ON s.store_id=st.store_id
GROUP BY st.state;
```

3. High-value customers (> ■50,000):
```
SELECT c.cust_name, SUM(s.total_amt)
FROM Customer c JOIN Sale s ON c.cust_id=s.cust_id
GROUP BY c.cust_name HAVING SUM(s.total_amt)>50000;
```

Results and Discussion

The implemented database supports complex analytics while maintaining ACID properties. Relationships allow insights such as top-performing products and state-wise revenue. Normalization reduces anomalies, and the Java interface ensures accessibility for non-technical users.

Conclusion

The Retailer Database Project successfully demonstrates a complete DBMS lifecycle — from conceptual ER modeling to Oracle implementation and application-level integration. It provides a scalable, efficient, and well-structured foundation for future retail analytics or data mining applications.

References

1. Oracle SQL Developer Documentation – Oracle Corp.
2. Silberschatz, Korth & Sudarshan – Database System Concepts (7th Edition)
3. IEM Database Management Systems Lab Manual, 2025