

Retail Sales Analysis & Business Intelligence Project

1. Introduction

This project presents a complete end-to-end data analysis and business intelligence solution for a retail store.

The store faced a temporary closure and later resumed operations. After reopening, the store owner needed a clear understanding of sales performance, customer behavior, product profitability, promotion effectiveness, and inventory status in order to maximize revenue and make informed business decisions.

The main objective of this project is to transform raw transactional data into structured, analyzable information that supports strategic decision-making using SQL, Python, Excel, and Power BI.

2. Problem Statement

After reopening, the store encountered several challenges:

- Lack of visibility into total sales and profit performance
- Difficulty identifying the most profitable products and categories
- Unclear impact of promotions and discounts on sales volume
- Poor understanding of customer distribution by location and gender
- Risk of inventory shortages during promotional periods

Although data was available, it was not organized or analyzed in a way that could support effective business decisions.

This project addresses the problem of converting raw operational data into meaningful insights that help optimize sales, promotions, pricing, and inventory planning.

3. Database Design

The database was designed using a relational model in SQL Server, following normalization principles to ensure data consistency, integrity, and scalability.

The design was documented using an Entity Relationship Diagram (ERD), which clearly defines entities, attributes, and relationships.

Main tables include:

- Customers: stores customer demographic and geographic information
- Categories: defines product categories

- Products: stores product details including price and cost
- Orders: represents customer orders
- Order_Details: contains transactional sales data (quantity and unit price)
- Promotions: stores promotion campaigns
- Promotion_Products: links promotions to products (many-to-many relationship)
- Discounts: stores product-level discount information
- Price_History: tracks price changes over time
- Inventory_Transactions: tracks stock movements (IN and OUT)

This structure allows detailed analysis across sales, pricing, customers, promotions, and inventory.

4. Data Preparation and Processing

Realistic data was inserted into all tables to simulate real business operations:

- Products were assigned realistic prices and costs based on category
- Customers were distributed across real Egyptian cities to enable geographic analysis
- Orders and order details were created to represent actual sales transactions
- Promotions and discounts were applied to selected products
- Inventory transactions were recorded to reflect stock inflow before promotions and stock outflow during sales periods
- Price history records were maintained to capture price changes before, during, and after promotions

SQL queries were used to calculate total sales, profit, profit margins, promotion impact, and inventory movement.

5. Tools and Technologies Used

The project integrates multiple tools to simulate a real-world analytics workflow:

- SQL Server for database storage and management
- SQL for querying, aggregation, and analysis
- Python for data generation and automation
- ERD for database modeling

- Excel for static analysis and reporting
- Power BI for interactive dashboards and business intelligence

6. Power BI Dashboard

An interactive Power BI dashboard was developed and organized into multiple pages:

Executive Overview

Displays total sales, total orders, total profit, average order value, and yearly trends.

Products and Profit Analysis

Shows quantity sold by product, revenue versus cost, profit by product, and profit margin by category.

Customers and Geography

Includes total customers, gender distribution, sales by city using map visualization, and top customers by revenue.

Promotions and Pricing Impact

Analyzes products under promotion, average discount percentage, promotion budget, and sales before, during, and after promotions.

Inventory and Stock

Displays total stock in, stock out, current stock levels, and monthly stock movement trends.

7. Excel Report (Static Analysis)

A static Excel report was created to support formal documentation and offline analysis.

The Excel report includes:

Sheet 1: Summary

Total revenue, total orders, and average order value.

Sheet 2: Product Analysis

Product name, quantity sold, and total revenue.

Sheet 3: Promotion Impact

Sales before promotion, during promotion, after promotion, and percentage change.

Unlike Power BI, the Excel report is non-interactive and suitable for printing or official submission.

8. Key Insights

- Electronics generate the highest revenue, while Clothing shows higher profit margins.
- Promotions significantly increase sales volume for selected products.
- Sales tend to decline after promotions end, indicating short-term promotional impact.
- Inventory stock-out increases during promotions, highlighting the need for better stock planning.
- Customer distribution varies by city, enabling targeted regional strategies.

9. Business Recommendations

Based on the analysis, the following recommendations are proposed:

- Focus promotions on high-margin products rather than only high-volume products.
- Use best-selling products to cross-promote weaker products.
- Plan inventory levels carefully before launching promotions.
- Design region-specific marketing strategies based on geographic sales performance.
- Track profit and margin in addition to total sales volume.

10. Conclusion

This project demonstrates how structured database design, SQL analysis, and business intelligence tools can be used together to convert raw data into actionable business insights.

The final solution provides a comprehensive analytical framework that supports data-driven decision-making in sales, pricing, promotions, customer analysis, and inventory management.