Sales Insights Dashboard Report

Prepared by: Tanmay Pathak

Table of Contents

1. Executive Summary

This project delivers a dynamic and interactive Sales Insights Dashboard that converts raw transactional data into a business intelligence asset. Developed using SQL Server and Power BI, the solution emphasizes a complete end-to-end approach, starting from data acquisition and transformation through to insightful visualization.

The core aim was to enable business users and stakeholders to derive quick and actionable insights from e-commerce sales data. The dashboard highlights country-level performance, customer behavior, product revenue trends, and seasonal patterns in sales. By leveraging powerful visualizations and robust back-end logic, the project offers a toolset for monitoring key metrics and making data-informed strategic decisions.

2. Project Objectives

The primary objective of this project was to build a scalable and insightful sales dashboard capable of answering key business questions from e-commerce data. The project goals were as follows:

- **SQL Mastery:** Enhance technical ability in writing efficient SQL queries, using advanced techniques such as CTEs, aggregations, and window functions for transforming raw sales data.
- **Interactive Visualization:** Translate complex datasets into a user-friendly, visually appealing dashboard that supports real-time analysis with slicers and drill-down capabilities.
- **Insight Derivation:** Identify revenue-driving products, peak sales periods, and loyal customers while also spotting growth bottlenecks or underperformance.
- **End-to-End Documentation:** Provide detailed records of data processing steps, schema design, Power BI visuals, and insights to ensure reproducibility and business alignment.

3. Data Source and Preparation

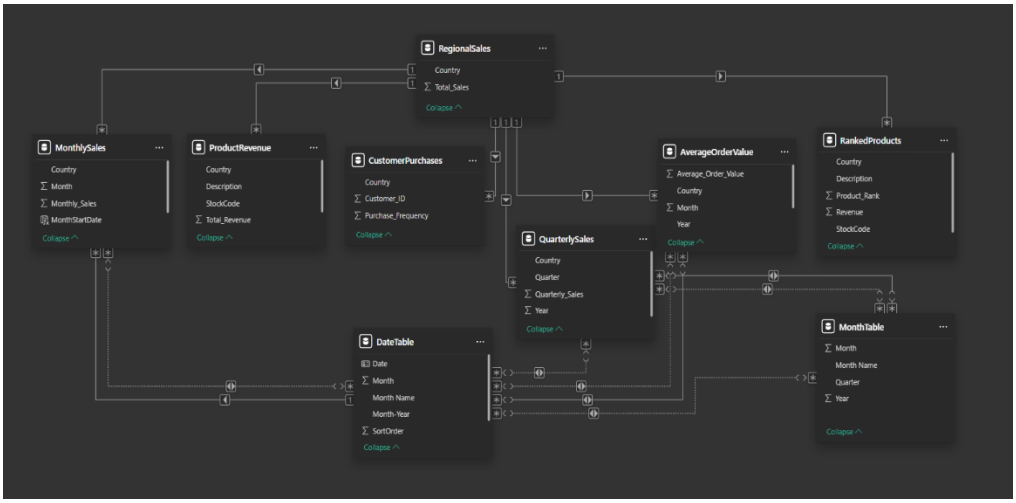

Figure 1: Power BI data model showing relationships across multiple tables.

To ensure reliability and usability of analytics, the raw dataset underwent a series of preparation steps before being modeled into Power BI:

- **Dataset Used:** Online Retail II UCI Dataset, a publicly available e-commerce dataset containing records of transactions including product codes, descriptions, quantities sold, unit prices, invoice dates, and customer IDs.
- **Initial Challenges Identified:**
    - The Invoice and StockCode columns were stored as text and contained invalid values.
    - Numerous rows lacked valid customer IDs or invoice dates, which are critical for transaction-level analysis.
- **Data Cleaning Steps:**
    - Invalid or non-numeric entries in the Invoice column were removed.
    - Null values in key columns like InvoiceDate and Customer_ID were identified and filtered out.
    - All relevant numeric and date fields were converted to appropriate data types (e.g., InvoiceDate to DATE).
    - A new column, Total_Sale_Amount, was calculated using the formula: Quantity * Price, to evaluate actual transaction value.
- **Date Dimension Table:** A comprehensive date table was created to support time-series analysis. It includes fields for Month, Month Name, Quarter, Year, and Month-Year combinations, ensuring robust filtering and visual clarity in Power BI., Customer ID, Country

- **Data Cleaning (SQL Phase 1):**
    - Removed duplicates and invalid invoice entries
    - Handled missing values (InvoiceDate and Customer_ID)
    - Standardized data types (e.g., converted InvoiceDate to DATE, ensured numerical formats)
    - Created new fields like Total_Sale_Amount = Quantity * Price

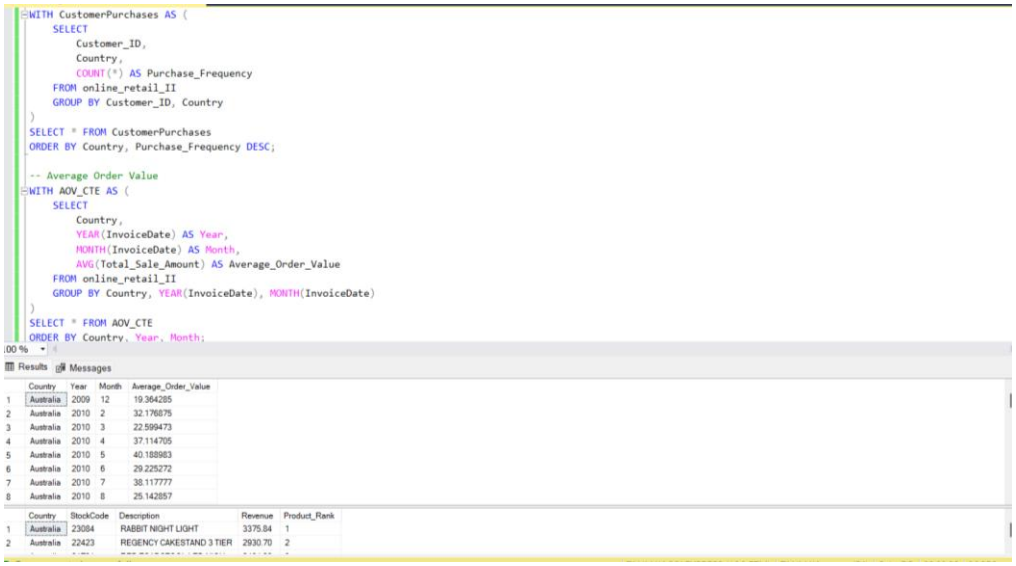

Figure 2: SQL query execution

4. SQL Query Development

Custom SQL scripts were written to prepare summarized data tables:

- **Regional Sales:** SUM(Total_Sale_Amount) grouped by Country
- **Monthly and Quarterly Sales Trends:** Aggregated sales grouped by YEAR() and MONTH() or QUARTER()
- **Product Revenue:** Revenue contribution of each product per country
- **Customer Purchases:** Purchase frequency grouped by Customer_ID
- **Average Order Value (AOV):** AVG(Total_Sale_Amount) by month and year
- **Top Products Ranking:** Used RANK() with PARTITION BY Country to list top 10 products per country

These SQL queries were loaded into Power BI as independent data tables.

5. Power BI Dashboard Design

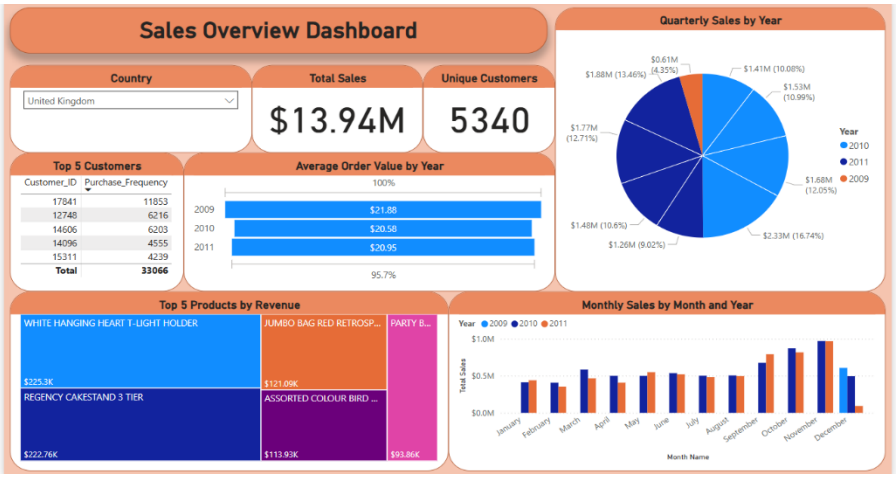

Figure 3: Single-page Power BI dashboard layout with KPIs and visuals.

The dashboard is designed on a **single page** and structured to offer a visually engaging and insightful summary of key sales metrics. Its design emphasizes clarity, usability, and interactivity for business users and analysts alike.

Layout and Theme:

- The dashboard uses a warm, vibrant color scheme with consistent styling across all visuals.
- Card visuals and charts are placed strategically to ensure intuitive top-to-bottom, left-to-right reading flow.

Filters and Controls:

- A Country selector is prominently placed at the top for region-specific analysis.
- Year selection is integrated into visuals (e.g., bar and pie charts) through color legends.

Key KPIs (Card Visuals):

- **Total Sales:** Measures the full revenue generated from all transactions within the selected country. It gives a snapshot of financial scale.
- **Unique Customers:** Reflects how many individual customers contributed to sales. Useful to understand market penetration.
- **Average Order Value by Year:** Compares the year-over-year change in spending per order, indicating customer value trends.

Visual Components:

- **Top 5 Customers Table:** Highlights the most active customers based on purchase frequency, which helps in identifying key accounts.
- **Quarterly Sales Pie Chart:** Breaks down revenue contributions by quarter and year, revealing seasonality and performance fluctuations.

- **Top 5 Products Treemap:** Displays highest-earning products with revenue labels and color-coded size blocks for easy comparison.
- **Monthly Sales Column Chart:** Compares monthly sales over three years using a grouped column format, revealing monthly trends and seasonal peaks.

Interactivity Features:

- Hover tooltips provide exact values and contextual information.
- Charts respond dynamically to slicer selections, offering focused drilldowns.
- Titles and axes are formatted for clarity and consistency across visuals.

Overall, this single-page dashboard balances depth of information with ease of navigation, allowing users to derive fast, actionable insights without being overwhelmed.

6. Data Analysis & Insights

This section summarizes the key insights derived from the dashboard:

- **Sales Distribution by Region:** The United Kingdom dominates sales across all years, indicating its importance as a core market. This suggests regional marketing and supply chain strategies should prioritize UK-based operations.
- **Quarterly Sales Trends:** The dashboard highlights a clear seasonal spike in Q4 across years, particularly in 2011 where Q4 alone contributed $2.33M (16.74% of total annual sales). This could be associated with year-end promotions and holiday demand.
- **Top Customers and Loyalty Patterns:** The most frequent buyer (Customer_ID 17841) made over 11,800 transactions, reinforcing the presence of high-value repeat customers. Such insights can support the development of retention and loyalty programs.
- **Product-Level Performance:** Products like "WHITE HANGING HEART T-LIGHT HOLDER" and "REGENCY CAKESTAND 3 TIER" consistently ranked in the top 5, both in terms of revenue and frequency of purchase. This data can be leveraged to optimize inventory and marketing focus.
- **Spending Trends (AOV):** Average Order Value increased year-over-year, peaking in 2011 at $21.88. This reflects growing customer engagement and possibly effective upselling strategies.

7. Recommendations

- **Q4 Sales Optimization:** Boost stock and campaign efforts for Q4 months.
- **Retain Key Customers:** Implement loyalty programs targeting top purchasers.
- **Product Promotion:** Focus marketing around top revenue-generating products.
- **Expand in High Performing Regions:** Allocate more resources to high-contributing regions like the UK.

8. Skills Demonstrated

This project provided an excellent platform to demonstrate technical and analytical capabilities across the entire data pipeline:

- **SQL:**
    - Use of Common Table Expressions (CTEs) for modular query development
    - Grouping and aggregation to compute country, product, and time-based metrics
    - Application of window functions (RANK(), OVER) to identify top-performing products by region
- **Power BI:**
    - Created an intuitive dashboard interface with KPI cards, pie charts, tree maps, and column charts
    - Built responsive visuals using slicers and sync filters
    - Managed relationships in a multi-table model for optimized querying
- **Data Analysis:**
    - Detected patterns in seasonality and customer loyalty
    - Assessed revenue distribution by product and geography
    - Interpreted business KPIs to support data-driven recommendations
- **Design & Communication:**
    - Applied clean, consistent visual styling to enhance user experience
    - Documented each phase of the project to ensure transparency and repeatability

9. Conclusion

The Sales Insights Dashboard serves as a practical and impactful solution for e-commerce performance monitoring. By harnessing SQL and Power BI, this project bridges the gap between raw data and actionable business intelligence. It captures not only the high-level performance indicators but also uncovers granular insights into customer behavior and product sales.

The clarity of visuals, depth of metrics, and effective filtering mechanisms make this dashboard a valuable tool for sales teams and decision-makers. From identifying top-selling items and high-value customers to optimizing timing for promotional campaigns, the dashboard equips stakeholders with data to make informed, revenue-oriented decisions.

The project further reinforces critical data skills and visualization practices essential for modern BI professionals.