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Business Intelligence Project Report

Maven Roaster Sales Performance for Sustainable Growth Project

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Table of content

1. Introduction 5
2. Roles and contribution of team members 5
3. Problem description 5
4. Overview of solution 5
5. Description of data 6
8. Dashboard design overview 10
8.1. Dashboard Layout 10
8.2. Dashboard Components 10
8.3. Interactivity 11
9. Implementation 11
9.1 Report Measures 11
9.2 Dashboard Layout 11
9.3 Visuals 12
9.3.2 Multi-Cards 12
9.3.3 Line Chart 12
9.3.4 Column Chart 13
9.3.5 Map 14
9.3.6 Buttons 14
10. Power BI features used: 14
11. Problems faced 15
12. Limitations 16
13. Future work 16
14. Conclusions 16
15. Alignment with Sustainable Development Goals (SDG) 17

Table of figures

Figure 1[Star Schema Model] 8
Figure 2[Relationships] 9
Figure 3[Dashboard Layout Overview] 10
Figure 4[Title Ribbon] 12
Figure 5[Slicers for Data Filtering] 12
Figure 6 [Multi-Cards Displaying Key Performance Indicators (KPIs)] 12
Figure 7[Line Chart of Total Sales by Month] 13
Figure 8 [Column Chart of Sales Volume by Hour of the Day] 13
Figure 9 [Map Visualization of Sales & Orders by Store Location] 14
Figure 10[Navigation Buttons for Store Locations] 14

List of Tables

Table 1 Roles and contribution……5

1. Introduction

In this report, we examine the Coffee Shop Sales dataset using Power BI dashboards. Understanding sales patterns and overall performance is essential for success in the competitive coffee shop market. Our aim is to build clear visualizations that reveal key insights from the data. By using Power BI dashboards, we can support smarter decision-making and provide valuable business insights. In the coffee retail industry, where decisions often need to be fast and precise, quickly interpreting data is vital. Power BI makes this possible by displaying information in straightforward, easy-to-read visuals.

2. Roles and contribution of team members

Student Name	Student ID	Contribution
Albatol Alqahtani	444008741	Visualization, Report Measures
Aljawharah Bin Omran	444008701	Data Preprocessing, visualization
Fulwh alzeer	444008735	Visualization, Report Measures
joudy althumayri	444008708	Data Preprocessing, visualization
Raghad Ababtain	444008728	Handling Missing Data, Report Measures

Table 2 Roles and contribution

3. Problem description

In the coffee shop industry, many businesses struggle to fully understand their sales data because they lack straightforward methods and the analytical skills needed to interpret it effectively. This makes it difficult to discover important trends and patterns or respond quickly to changes in customer preferences. As a result, opportunities for increasing sales and improving operations are often missed. Additionally, without a clear overview of sales performance across products, locations, and time periods, coffee shop managers may find it challenging to make informed decisions and drive their business toward greater success.

4. Overview of solution

To address this problem, we suggest using accessible tools like Power BI to create clear and simple charts and dashboards. This approach brings all the coffee shop sales data together in one place for quick and easy analysis. With these

visualizations, managers can easily spot what's working, what needs attention, and where there are opportunities for growth. This enables better decision-making, more efficient operations, and helps drive the coffee shop business forward.

5. Description of data

The dataset, "Coffee Shop Sales", was sourced from Kaggle. It contains transaction records for a coffee shop operating across multiple locations.
The static dataset consists of 4 tables, providing a comprehensive view of daily sales activities.

1. Transactions table:
   - This table contains detailed information about transactions and has features 11 columns and 149116 rows.
   - Including columns:
     - **transaction_id** : Unique sequential ID representing an individual transaction
     - **transaction_date** : Date of the transaction (MM/DD/YY)
     - **transaction_time** : Timestamp of the transaction (HH:MM: SS)
     - **transaction_qty** : Quantity of items sold
     - **store_id** : Unique ID of the coffee shop where the transaction took place
     - **store_location** : Location of the coffee shop where the transaction took place
     - **product_id** : Unique ID of the product sold
     - **unit_price** : Retail price of the product sold
     - **product_category** : Description of the product category
     - **product_type** : Description of the product type
     - **product_detail** : Description of the product detail

2. Product table:
   - This table contains data about product, including attributes product_id , product_type, product_category, product_detail.

3. Store table:
   - This table contains data about coffee shop stores, including attributes store_id, store_location.
4. Date table:
   - This table contains data about date including attributes such as day, month, year, quarter that splits year into 4 sections each has 3 months.

6. Data Preparation

Throughout the project, we reshaped and pre-processed each table separately to ensure it was fully ready for analysis before moving to the next stage. Each table underwent specific cleaning, restructuring, and enhancement steps based on its role within the data model, and these transformations were carefully applied to maintain accuracy, consistency, and usability across the dataset.

6.1. Transactions Table:

- Columns were renamed for better clarity:
  - Transaction_ID to Transaction Id
  - transaction_date to Date
  - transaction_time to Time
  - transaction_qty to Quantity
  - unit_price to Unit Price
- The "Total Price" column was created by multiplying **Quantity** and **Unit Price**, then formatted as a Decimal Number for financial calculations.
- A new "Hour" column was extracted from the Time column to support time-based analysis.
- Data types were adjusted:
  - Date to Date type
  - Time to Time/Hour
  - Total Price to Decimal Number
- No duplicate removal was performed on the Transactions table, as maintaining original transaction records was necessary for analysis.

6.2. Stores Table:

- A separate Stores dimension table was created containing:
  - Store ID
  - Store Location

Duplicates were removed to maintain unique store records. •

- Store names were standardized for consistency across the model.

6.3 Product Table:

- A separate Products dimension table was created using fields from the Transactions data:
  - Product ID
  - Product Category
  - Product Type
  - Product Detail
- Duplicates were removed to ensure that each product entry was unique.

- Product attributes were cleaned and standardized to improve consistency and support effective product-level analysis.

6.4. Date Table:

- A Date dimension table was generated based on the "Date" column from Transactions.
- New columns were created to support time intelligence:
  - **Year**
  - **Month**
  - **Day**
  - **Quarter**
- The Date field was set to the Date data type, and all time attributes were extracted properly.

6.5. Handling Missing Data:

- All tables were inspected for missing (null) values during the data preparation phase.
- Using Power BI's "Column Quality" and "Column Profile" tools, no missing values were found in the Transactions, Stores, or Date tables.

As a result, no data imputation or missing value treatments were necessary. •

7. Visual Model

In our star schema model, the tables are interconnected, primarily revolving around the "Transactions" table shown in Figure 1, which serves as the fact table in our model. The dimension tables, such as "Stores" and "Products," provide descriptive context to the transactions. We chose the star schema approach for its simplicity, strong performance benefits, and suitability for analytical queries and reporting in Power BI.

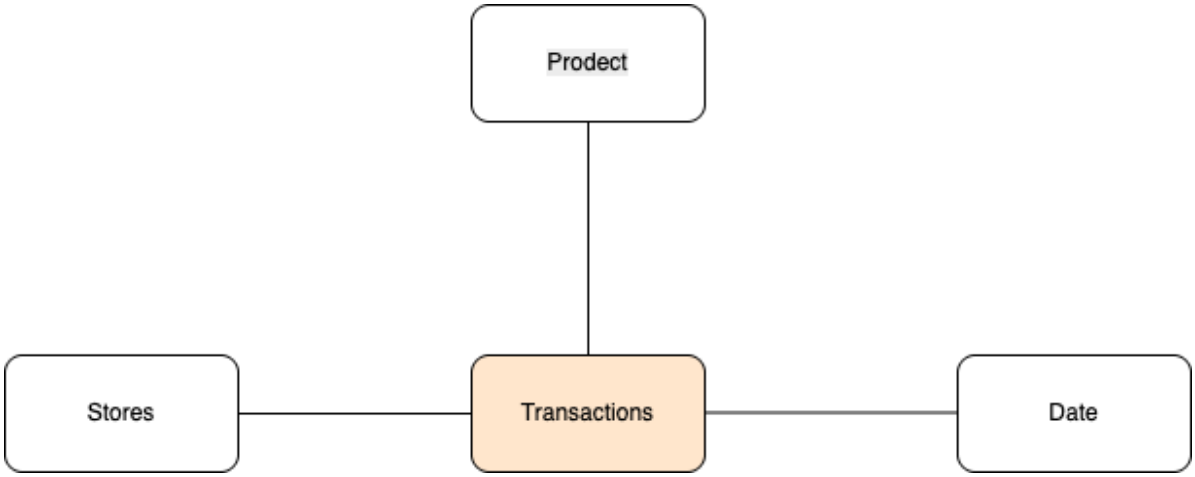

Figure 1[Star Schema Model]

Here's how the relationships are structured throughout the model:

1. **Stores Table:**
   - It maintains a one-to-many relationship with the "Transactions" table using the store_id column, since it is the common key between them.
   - We've utilized cross-filtering for this relationship as shown in Figure 2, meaning that filtering on "Stores" will automatically filter related "Transactions".

2. **Product Table:**
   - This table also has a one-to-many relationship with the "Transactions" table using the product_id column.
   - This relationship also utilizes cross-filtering, enabling seamless navigation and analysis between transactions and associated products, thereby ensuring comprehensive insights into product-related performance, as illustrated in Figure 2.

3. **Date Table:**
   - This table also has a one-to-many relationship with the "Transactions" table through the Date column.
   - Cross-filtering is enabled to allow time-based filtering across transaction records, as presented in Figure 2.

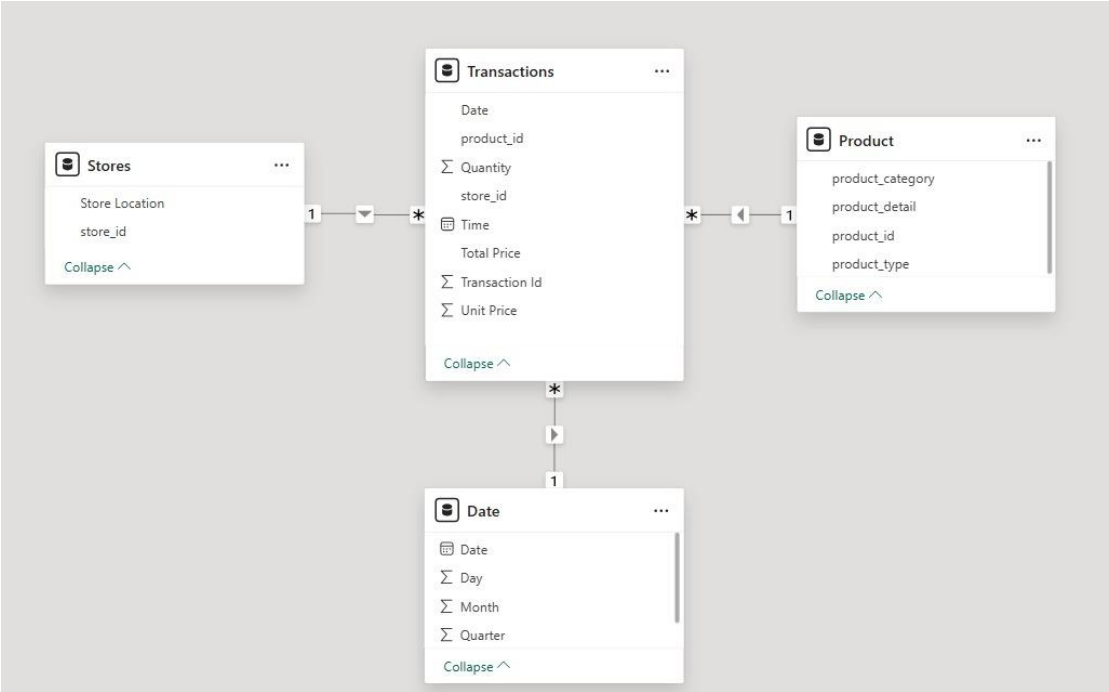

Figure 2[Relationships]

8. Dashboard design overview

The dashboard was carefully designed to provide a clear, interactive view of the coffee shop's sales performance, supporting strategic decision-making for sustainable growth. Each visual component was selected to deliver specific insights while ensuring a user friendly and intuitive experience.

8.1. Dashboard Layout

- The dashboard is structured into several sections, as shown in figure 3, with each section focusing on a distinct aspect coffee sales.
- Visuals are organized in a manner that enables the user to navigate the dashboard effortlessly and seamlessly.

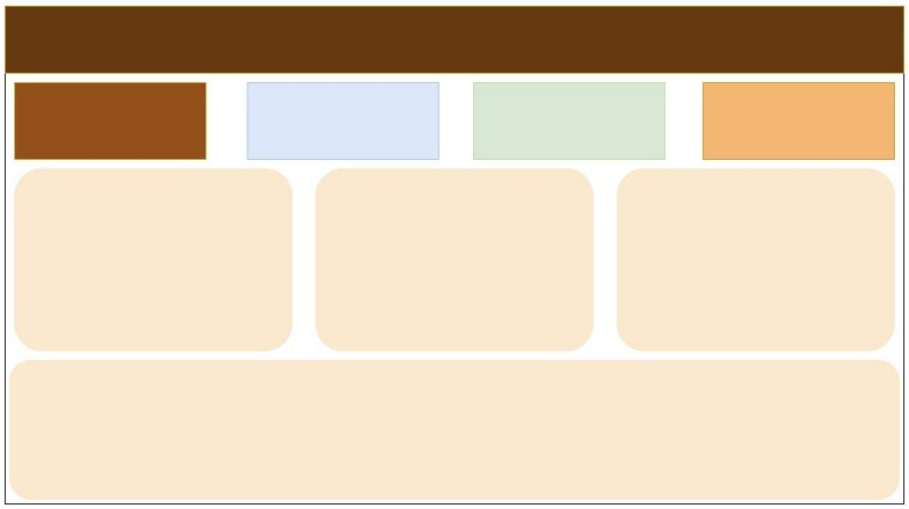

Figure 3[Dashboard Layout Overview]

8.2. Dashboard Components

- Various types of visualizations were used in the dashboard, including bar charts, line charts, and map visuals, to represent sales trends, time-based analysis, and store performance.
- KPI cards were utilized to display important business metrics such as Total Sales, Total Orders, Average Order Value, and Top Performing Store.
- Slicers were incorporated to enable dynamic filtering by product category, product type, store location, and date range.
- Simple shapes such as rectangles were deployed for organizing sections and improving dashboard structure.

8.3. Interactivity

Interactive elements including slicers, KPI cards, and cross-filtering between charts were implemented to allow users to customize their view and explore sales performance dynamically.

8.4 Canvas and color scheme

- The canvas was designed to balance clarity and visual appeal, ensuring that KPIs and key charts are immediately visible upon loading the dashboard.
- The color scheme revolves around natural shades of brown, orange, and green to align with the coffee shop theme while maintaining strong visual contrast.
- Corbel font was applied for formal headings to convey professionalism and elegance. For visualization labels, Segoe UI Bold was used to ensure clarity, modernity, and strong readability across different dashboard components.
- High contrast between text and background was maintained for accessibility and easy interpretation of the data.

9. Implementation

9.1 Report Measures

DAX measures:

- Avg Order Value: Computed by finding the average of the total price.
- Total Orders: Calculates the count of the Transaction Id values.
- Total Sales: Computed by finding the sum of the total price.
- Top Performing Store: identify the store location that generated the highest total sales based on the Total Price

9.2 Dashboard Layout

To ensure the dashboard title stands out, we applied a dark rectangular background, making it highly visible to users as shown in figure.4. The dashboard is divided into vertical and horizontal sections. On the left side, you'll find interactive elements like slicers, along with cards displaying key sales metrics such as Total Sales, Total Orders, and Avg Order Value. This section serves as a control panel, enabling users to tailor their view and explore specific data subsets with ease. The remaining space of the dashboard is dedicated to dynamic visuals, including graphs for Sales Volume by Hour of the Day and Total Sales by Month, which update based on user selections through the slicers, providing a detailed view of sales performance.

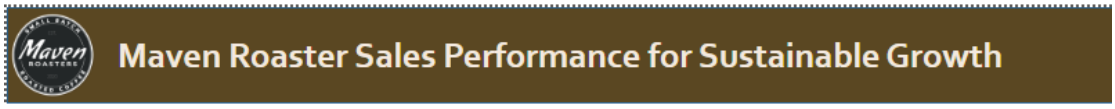

Figure 4[Title Ribbon]

9.3 Visuals

The developed Power BI dashboard uses a variety of visuals to make the data easier to understand and to highlight key insights about the coffee shop's performance. Each visual has a specific purpose to help users interact with the data and quickly spot trends or important information.

9.3.1 Slicers

Slicers are located at the bottom of the dashboard. They Allow users to filter data based on product category, product type, store location, and date range. This helps users focus on specific parts of the data easily.

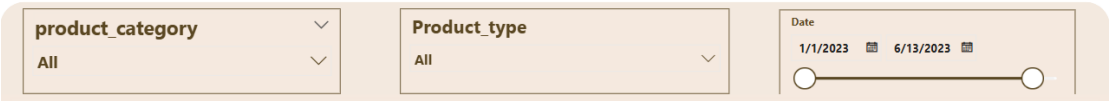

Figure 5[Slicers for Data Filtering]

9.3.2 Multi-Cards

Multi-cards are shown at the top of the dashboard. Show important numbers like Total Sales, Total Orders, Average Order Value, and Top Performing Store. They give a quick overview of key business metrics.

Figure 6 [Multi-Cards Displaying Key Performance Indicators (KPIs)]

9.3.3 Line Chart

The line chart displays total sales by month, helping to visualize trends over time and understand business growth or seasonal patterns

- **X-axis:** Months (January, February, etc.)
- **Y-axis:** Total Sales
- **Purpose***:* Shows sales trends over time.

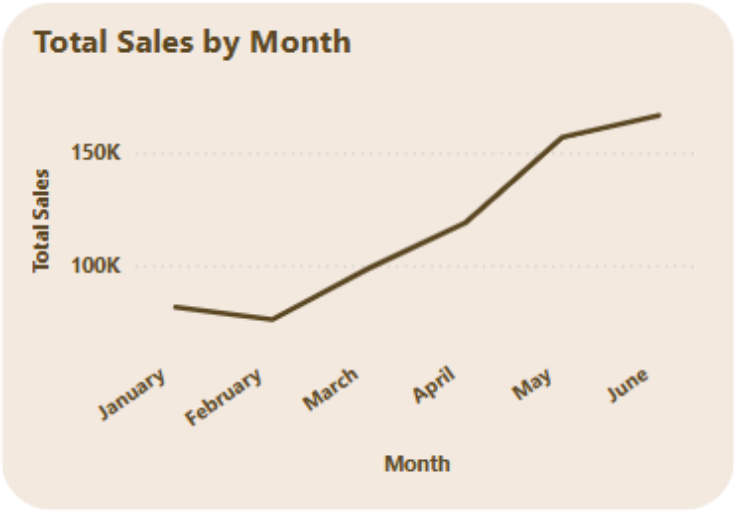

Figure 7[Line Chart of Total Sales by Month]

9.3.4 Column Chart

Shows sales volume by hour of the day. This helps identify rush hours in the coffee shop, supporting better staff planning and service during peak times.

- **X-axis:** Hours of the day (e.g., 0, 5, 10, 15, 20)
- **Y-axis:** Total Sales
- **Purpose***:* Highlights peak sales hours.

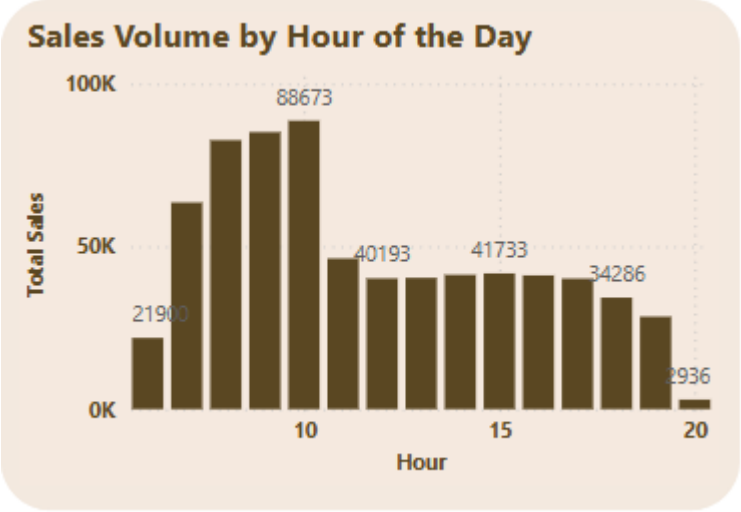

Figure 8 [Column Chart of Sales Volume by Hour of the Day]

9.3.5 Map

Visualizes sales and orders by store location on a map. Makes it easy to see which branches perform best in different areas.

Figure 9 [Map Visualization of Sales & Orders by Store Location]

9.3.6 Buttons

Buttons were added at the bottom of the dashboard to allow users to switch between different store locations (Astoria, Hell's Kitchen, Lower Manhattan). These buttons improve navigation and make it easier for users to focus on specific store data without manually filtering.

Figure 10[Navigation Buttons for Store Locations]

10. Power BI features used:

- **Power Query Editor**: We used the Power Query Editor extensively to clean and prepare the data for analysis. This included steps like changing data types, renaming columns, adding custom columns, extracting date and time components (year, month, day, hour). These transformations ensured the data was ready for reporting.
- **Custom Calculations (DAX Measures):** We created several custom measures using DAX to calculate key performance indicators (KPIs) such as top performance, total sales, total orders, and average order value. These calculations provided deeper insights and allowed for dynamic analysis across different dimensions.

- **Visualizations:** Various visuals were used to present data clearly and effectively. These included line charts for trends, column charts for comparisons, multi-cards for KPIs, maps for geographic analysis, slicers for filtering, and buttons for navigation between store locations.
- **Hierarchies**: Time-based hierarchies were implemented (year, quarter, month, day) to enhance time-series analysis. This allowed users to drill down from a yearly view to more detailed levels like months and days.

11. Problems faced

1. **Issues with Reference Tables**
   Initially, we tried to create reference tables for products, stores, and dates from the transaction table. However, when we removed unnecessary columns (like location from the stores table), errors appeared, especially when updating or applying changes. These errors occurred because some important columns were still being referenced in the transaction table.
   After researching the issue, we discovered that using duplicate tables instead of reference solved the problem. We duplicated the transaction table three times, renamed each table (Products, Stores, Dates), and kept only the relevant columns in each.
   Finally, after duplicating the tables, we established relationships between them in the model view, linking the dimension tables back to the transaction table, just like we would with reference tables.

2. **Maintaining Duplicates in the Transaction Table**
   While we removed duplicates from the dimension tables (products, stores, dates), we did not remove duplicates from the transaction table. This is because the transaction table represents every purchase made, and removing duplicates would affect the accuracy of sales records (e.g., if a customer bought coffee twice in a day, both transactions need to be recorded).

3. **Error in Total Price Formatting**
   When working on the Total Price metric, we faced an issue where the value couldn't be displayed in thousands or millions as currency. The error occurred because the data type of Total Price was set to Whole Number instead of Decimal Number, preventing proper calculations and formatting.
   The issue was resolved by changing the data type to Decimal Number, allowing for accurate calculations and currency formatting.

12. Limitations

While the dashboard provides valuable insights, there are a few limitations to consider:

1. **Data Source Limitations**
   The analysis is based on the available transaction data. If the data is incomplete or missing certain fields (such as customer demographics or product details), the insights might be limited.

2. **No Real-time Data Updates**
   The dashboard works with static data that does not update automatically. Any new transactions or changes in the data require manual refresh and reloading.

3. **Simplified Relationships**
   The relationships between tables were manually created and may not cover complex scenarios such as returns, discounts, or multiple customer touchpoints.

13. Future work

To enhance the Maven Roasters Sales Performance for Sustainable Growth dashboard, future work will focus on integrating predictive analytics for sales forecasting, adding advanced filtering options for deeper data segmentation, and incorporating real-time data updates to ensure more accurate decision-making. Additionally, we aim to incorporate more detailed customer insights and behavior analysis to refine marketing strategies and improve customer engagement. These improvements will foster better decision-making, streamline operations, and contribute to achieving long-term sustainable growth goals.

14. Conclusions

In conclusion, the use of Power BI dashboards to analyze the Coffee Shop sales dataset provides valuable insights into business performance and trends. The dashboards help gain a deeper understanding of sales trends, customer behavior, and store performance. Through data cleansing, predictive modeling, the coffee shop can enhance inventory management, forecast future sales, and respond proactively to market changes. These improvements will enable more informed, data-driven decisions, ultimately leading to better business outcomes and increased customer satisfaction.

15. Alignment with Sustainable Development Goals (SDG)

Our project aligns with SDG 8 - Decent Work and Economic Growth by analyzing the sales performance of Mave Roasters. Through key metrics like Total Sales and Avg Order Value, we assess the business's contribution to local economic growth and job creation. By understanding sales trends and store performance, the project highlights how the coffee shop drives economic activity, supports employment, and fosters sustainable business practices for long-term growth.

Appendices

A. Readme File – Report
B. Readme File – Dashboard