

Business Intelligence Solution Implementation for Axon: Enhancing Sales Data Management and Analysis

1. Introduction

1.1 Purpose and Scope

Document Purpose: This document is here to guide the setup of a tool that helps Axon, a classic car seller, better understand and manage their sales data. The goal is to make it easier for Axon's team to make smart decisions about their business.

Document Scope: In simple terms, this document covers the plan to set up a tool using Microsoft PowerBI and SQL. We're going to organize and clean up the sales data so that it's easy to understand. We'll also create reports and charts to show the sales team and managers how things are going. The aim is to make sure everyone at Axon can quickly and confidently use the tool to improve the way they do business.

1.2 Overview of the Business Problem

A small company Axon, which is a retailer selling classic cars, is facing issues in managing and analyzing their sales data. The sales team is struggling to make sense of the data and they do not have a centralized system to manage and analyze the data. The management is unable to get accurate and up-to-date sales reports, which is affecting the decision-making process.

The goal of the project is to design and implement a BI solution using PowerBI and SQL that can help the company manage and analyze their sales data effectively.

2. Project Overview

2.1 Company Background

A small company Axon, which is a retailer selling classic cars, Vintage Cars, Motorcycles Trucks and Busses, Planes, Ships, Trains, etc.

2.2 Current Sales Data Management Challenges

Outline the current challenges Axon is experiencing in managing sales data.

- facing issues in managing and analyzing their sales data.
- The sales team is struggling to make sense of the data
- They do not have a centralized system to manage and analyze the data.
- The management is unable to get accurate and up-to-date sales reports, which is affecting the decision-making process.

2.3 Importance of Business Intelligence

Implementing a Business Intelligence (BI) solution at Axon brings several benefits. Leaders can now make informed decisions with easy access to accurate and current information. Axon can understand its sales data better, identifying trends to improve product sales. Operations are streamlined, reducing errors and increasing efficiency through automated tasks. The userfriendly dashboards enable different teams to access the data they need without technical assistance. BI aids in future planning by predicting trends, managing inventory, and supporting overall business decisions. The emphasis on data-driven decision-making promotes organizational effectiveness. Axon stays competitive by responding swiftly to market changes, and BI helps in customer relationship management, ensuring better customer treatment. Importantly, BI ensures compliance with industry rules, monitors key indicators, and maintains data security, providing Axon with a powerful tool for efficient and informed business management.

3. Objectives

The objectives of the BI project:

- The goal at Axon is to enhance the way sales data is managed and understood.
- A system is being developed to accurately track sales information from various sources, ensuring consistency.
- This system will enable the sales team and managers to closely analyze customer behaviour and overall sales trends, fostering quicker decision-making.
- The emphasis is on creating a user-friendly system for both teams, encouraging widespread adoption.
- Utilizing advanced analysis techniques, the aim is to extract meaningful insights for future planning and business improvement.
- The focus on clear and visually appealing reports in PowerBI promotes quick comprehension.
- The overarching aim is to foster a culture where everyone trusts and uses data for decision-making, ensuring efficiency in operations. Additionally, the system is designed to be adaptable to future business needs, encouraging collaboration among different company teams through shared access to sales data.

4. Data Source

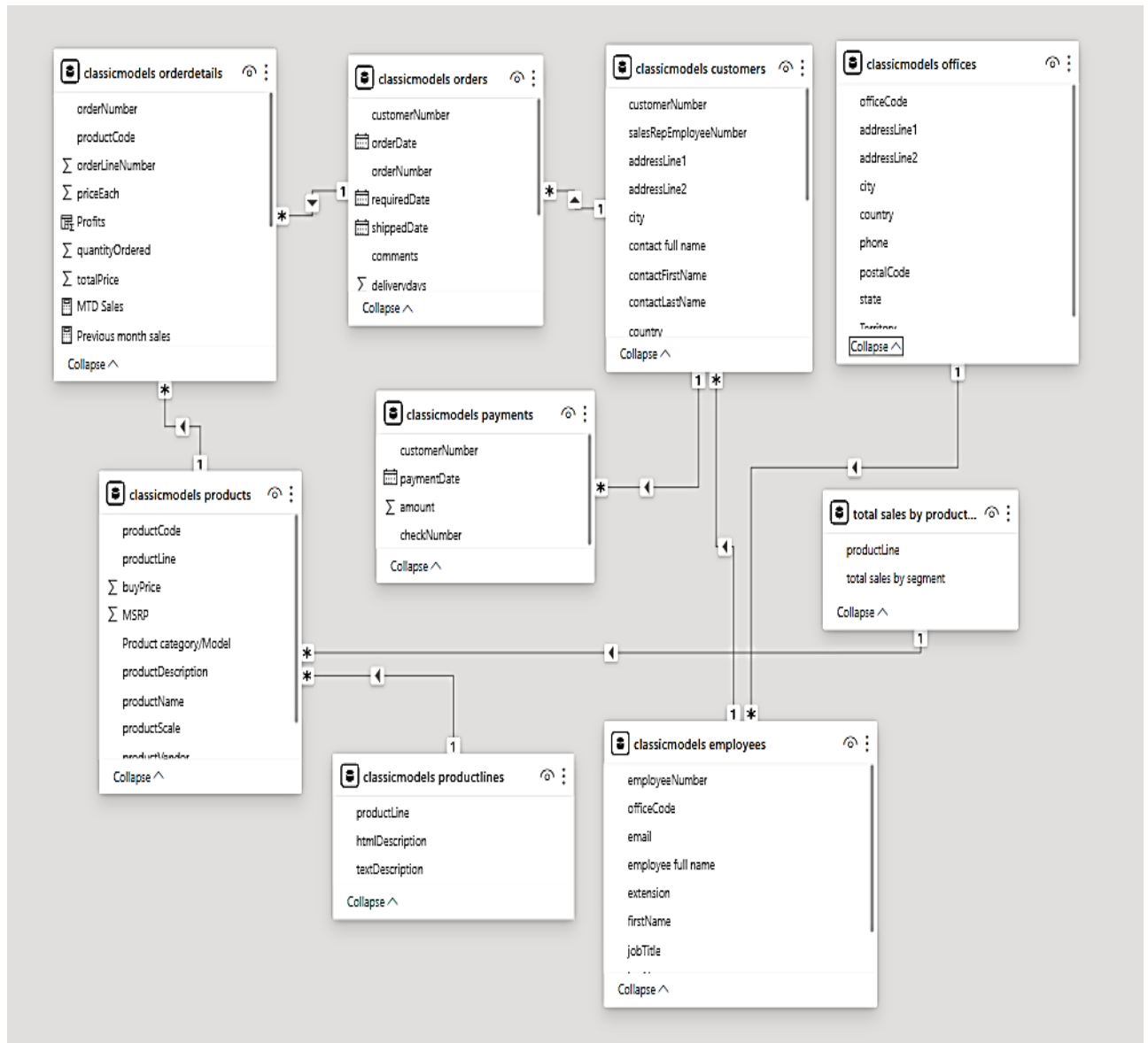
4.1 MySQL Database

A short description of the data tables included that contains typical business data such as customers, employees, products, product lines, offices, orders, order details, payments, etc.

The MySQL sample database schema consists of the following 8 tables:

- Customers: stores customer's data.
- Products: stores a list of scale model cars.
- Product Lines: stores a list of product line categories.
- Orders: stores sales orders placed by customers.
- OrderDetails: stores sales order line items for each sales order.
- Payments: stores payments made by customers based on their accounts.
- Employees: stores all employee information as well as the organization structure such as who reports to whom.
- Offices: stores sales office data

4.2 Relevant Tables and Relationships



5. Tools Selection

These tools and technologies can be used to extract, clean, and analyze sales data and build interactive dashboards and reports. They are widely used in the field of Business Intelligence (BI) and can be leveraged to solve a variety of data-related problems.

1. Microsoft PowerBI.
2. MySQL

6. Data Extraction and Cleaning

6.1 Data Extraction

- Connect to MySQL database.
- Identify relevant tables (e.g., Customers, Products).
- Write SQL queries to select needed data.
- Test and optimize SQL queries.

6.2 Data Cleaning

Queries used to handle missing values and duplicates



1. `Describe` function gives us the detailed overview of the table like (datatypes, null values, pk & fk keys)

CODE:

```
describe table name;
```

2. Queries to check the primary key and fk

CODE:

```
SELECT * FROM
  INFORMATION_SCHEMA.KEY_COLUMN_USAGE
WHERE
  TABLE_NAME = 'give the table name in your structure';
```

3. Find duplicate rows

Identifying rows in the customers table where there are duplicates based on all the columns listed in the GROUP BY clause.

Where it groups the rows by the specified column and counts the number of occurrences for each value.

The HAVING count > 1 condition filters out values that appear only once, leaving you with rows that have duplicates.

CODE:

```
SELECT
  customerNumber, customerName, contactFirstName, contactLastName,
  contactNumber, addressLine1, addressLine2, city, state,
  postalCode, country, salesRepEmployeeNumber, creditLimit,
  COUNT(*) AS count
FROM
  customers
GROUP BY
  customerNumber, customerName, contactLastName, contactFirstName,
  phone, addressLine1, addressLine2, city, state, postalCode,
  country, salesRepEmployeeNumber, creditLimit
HAVING
  count > 1;
```

4. Identify columns with missing values

CODE:

```
SELECT customerNumber, customerName, contactFirstName,
       contactLastName, contactNumber, addressLine1, addressLine2,
       city, state, postalCode, country, salesRepEmployeeNumber,
       creditLimit,
       CASE WHEN customerNumber IS NULL THEN 1 ELSE 0 END +
       CASE WHEN customerName IS NULL THEN 1 ELSE 0 END +
       CASE WHEN contactFirstName IS NULL THEN 1 ELSE 0 END +
       CASE WHEN contactLastName IS NULL THEN 1 ELSE 0 END +
       CASE WHEN contactNumber IS NULL THEN 1 ELSE 0 END +
       CASE WHEN addressLine1 IS NULL THEN 1 ELSE 0 END +
       CASE WHEN addressLine2 IS NULL THEN 1 ELSE 0 END +
       CASE WHEN city IS NULL THEN 1 ELSE 0 END +
       CASE WHEN state IS NULL THEN 1 ELSE 0 END +
       CASE WHEN postalCode IS NULL THEN 1 ELSE 0 END +
       CASE WHEN country IS NULL THEN 1 ELSE 0 END +
       CASE WHEN salesRepEmployeeNumber IS NULL THEN 1 ELSE 0 END +
       CASE WHEN creditLimit IS NULL THEN 1 ELSE 0 END AS missing_count
FROM
  customers;
```

5. Identify inconsistent data

CODE:

```
SELECT
DISTINCT *
FROM customers;
```

7. Data Loading into PowerBI

Explaining the process of loading cleaned data into PowerBI.

- Open PowerBI Desktop.
- Connect to data source and import extracted data.
- Use Power Query Editor for additional cleaning and transformation.
- Load cleaned data into PowerBI data model.
- Verify relationships between tables.
- Set up scheduled data refresh if needed.
- Save PowerBI project file for future use.

8. Data Modelling

8.1 Data Transformation using DAX functions, measures:

Calculating Year, Quarter and Month to Date Sales measure:

CODE:

Month

```
MTD Sales = CALCULATE('classicmodels orderdetails'[Total Sales Price],  
DATESMTD('classicmodels orders'[orderDate].[Date]))
```

Quarter

```
QTD Sales = CALCULATE('classicmodels orderdetails'[Total Sales Price],  
DATESQTD('classicmodels orders'[orderDate].[Date]))
```

Year

```
YTD Sales = CALCULATE('classicmodels orderdetails'[Total Sales Price],  
DATESYTD('classicmodels orders'[orderDate].[Date]))
```


Calculating Previous Period Sales measure:

CODE:

Month vies

```
Previous month sales = CALCULATE([Total Sales Price], PREVIOUSMONTH('classicmodels orders'[orderDate].[Date]))
```

```
Previous month sales pp = CALCULATE([Total Sales Price], PARALLELPERIOD('classicmodels orders'[orderDate].[Date],-1,MONTH))
```

Year vies

```
Previous year sales = CALCULATE(sum('classicmodels orderdetails'[totalPrice]), PREVIOUSYEAR('classicmodels orders'[orderDate].[Date]))
```

```
Previous year sales SPLY = CALCULATE([Total Sales Price], SAMEPERIODLASTYEAR('classicmodels orders'[orderDate].[Date]))
```

Calculating Profit, Order Quantity and Total Sales measure:

CODE:

Total Order Profits =

```
CALCULATE(  
    SUMX(  
        RELATEDTABLE('classicmodels orderdetails'),  
        'classicmodels orderdetails'[quantityOrdered] * ('classicmodels orderdetails'[priceEach] -  
RELATED('classicmodels products'[buyPrice])))
```

Profits =

```
'classicmodels orderdetails'[quantityOrdered] * ('classicmodels orderdetails'[priceEach] -  
RELATED('classicmodels products'[buyPrice]))
```

```
Total Sales Price = SUM('classicmodels orderdetails'[totalPrice])
```

```
Total Customer Profit =  
CALCULATE(  
    SUMX(  
        FILTER(  
            RELATEDTABLE('classicmodels orderdetails'),  
            'classicmodels orderdetails'[orderNumber] = MIN('classicmodels orders'[orderNumber])  
        ),  
        'classicmodels orderdetails'[quantityOrdered] * ('classicmodels orderdetails'[priceEach] -  
        RELATED('classicmodels products'[buyPrice]))  
    ),  
    ALLEXCEPT('classicmodels orders', 'classicmodels orders'[customerNumber])
```

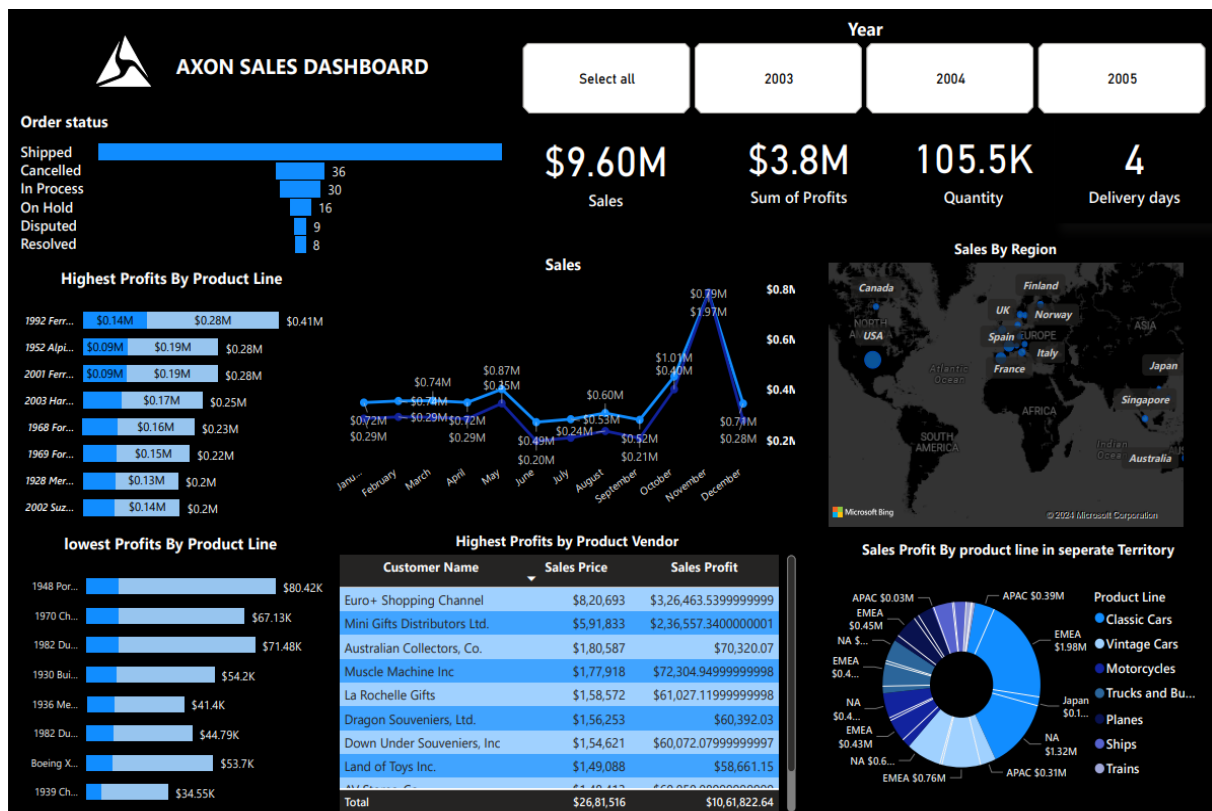
Profit For Order Quantity Sales and Profits For Last 6 Months:

CODE:

```
Profit last 6 months = CALCULATE([Total Order Profits], DATEADD('classicmodels  
orders'[orderDate].[Date],-6, MONTH))
```

```
Quantity sold last 3 months = CALCULATE(sum('classicmodels orderdetails'[quantityOrdered]),  
DATEADD('classicmodels orders'[orderDate].[Date],-3,MONTH))
```

9. Dashboard and Report Design



9.1 Design Principles

Power BI is a versatile set of tools that brings together diverse data sources, ranging from Excel spreadsheets to hybrid data warehouses. It simplifies the process of connecting, visualizing, and understanding data, catering to both cloud-based and on-premises sources. Designed for analysts, Power BI allows them to independently extract, transform, visualize, and share insights without constant IT involvement. The tool supports iterative analysis, empowering analysts to enhance reports over time with new measures or dimensions. Its user-friendly interface puts Business Intelligence creation directly in the hands of those who understand the data best, fostering collaboration and enabling flexible adaptation to evolving business needs.

1. Data

We have used the data that was exporter from MySQL after handling all the issues in the excel files format

2. Processing

Worked on Data Modelling where relationships are defined between the data to be analyzed and finally figuring out the best ways to plot that data such as using bar graphs and pie charts for comparison, scatter plots for distribution and dual axis lines for trends. For better understanding of the data

Insights

Different dashboards **were** crafted with drill down capabilities which helped to visually go through important information like:

- Sales throughout the specified time period and how they vary by Year, Quarter, Month, and Date
- Total sales and profit revenue breakdown by region provided the customer with further insight into, for example, which region had the highest sales and profits in relation to other regions.
- The most well-liked products, their performance in many categories that can be narrowed down to certain product lines, overall sales, and earnings Most least popular products and how they fare in different areas which can be drilled down to specific product lines, the total sales and profits
- Developed graphics on themes such as "sales," "profits," "quantity," and "delivery days" to facilitate planning about customer orders, quantity, sales, and profit margins.
- In contrast Products with the highest profitability compared to the lowest helped businesses decide which ones to keep making and which ones to cut back on.
- One can gain an understanding of how sales profit is allocated among various product lines in each territory by examining the Sales Profit by Product Line in Separate Territory report.
- The order status visual was developed to display the total number of orders that have been shipped, cancelled, resolved, in process, placed on hold, or disputed by a specific aspect. With the aid of an interactive visual report, we can observe the overall sales view.

Insights Obtained via the Dashboard

- The Customers of Classic model's company branches are located in 27 countries.
- The USA has the highest number of orders of total 112, followed by France 37 and Spain 36
- List of orders shipped from 2003-2005 total (303)
- Most sales by product line where Classic cars are top of the list
- Least sales were made in 2005.
- Most sales were made in 2004.
- Total sales recorded from 2003-2005 were 9.6 million
- Total profit made 3.8 M
- Classic cars and Vintage cars are most sales by product line
- In these three years—2003, 2004, and 2005—the USA has had the most income and sales, followed by Australia, Spain, and France.
- The Euro+ shopping channel was the biggest client, followed by Mini Gift Distributors Ltd.
- The sales pattern from 2003 to 2005 shows that November is the top month due to November being Thanksgiving month, which boosts sales. The highest total cost made by product line was Classic cars among vintage cars, planes, motorcycles, ships, trucks and trains.
- Among these top 5 nations, the product line for classic and vintage cars has expanded, while the number of ships and trains has decreased throughout that time. The most well-liked and visually appealing models for the public in these nations were the classic automobiles.