School of Computing

Big Data &Business Intelligence

Business Intelligence Solution

SALES ANALYSIS

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Contents

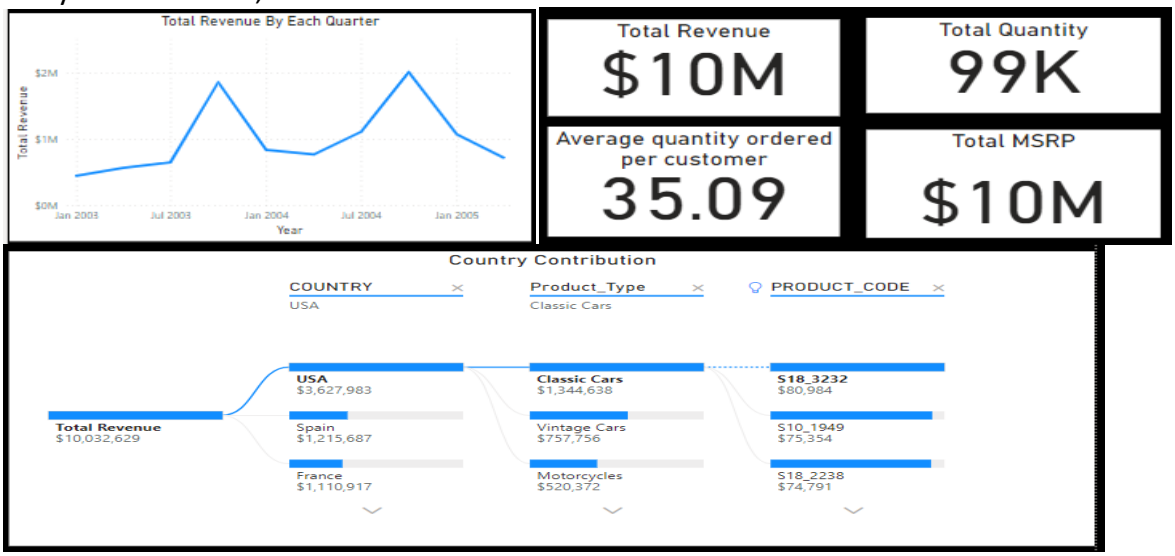
Section 1: Business Report:

Executive Summary:

Deslim is a corporation that sells automobiles, motorbikes, ships, trains, planes, trucks, and buses. Its markets are in America, Australia, and Europe, with America having the largest revenue share. The company trades with 19 nations in Europe, America, Australia, and Asia, with the United States and Spain accounting for most sales. To get a better understanding of its sales performance, the company has disclosed its financial activities from 2003 to 2005.

This analysis analyses the revenue performance of the company based on product categories from 2003 to 2005 using Power BI visuals.

This research, based on the available dataset, found that the company's revenue from 2003 to 2005 was $10 million, with the United States accounting for the majority of this revenue. For clarification, see fig. 1 below. There was a decline in sales and profit for the corporation every three months, from the first to the third.



Based on the primary research results, it was estimated that the company's revenue would increase steadily if it followed some of the following recommendations:

- Extend its market to include more than only the three continents and 19 nations in order to attract new clients.

- Starting a promotion in the first through third quarters might boost revenue and present a chance for new clients.
- Introducing customer appreciation gesture in form of discount and not always selling products too much below the MSRP
- Increase market campaign through adverts on many channels.

1.1 Introduction

Sample Sales Data was used which was gotten from Kaggle: Sample Sales Data (kaggle.com)
This data set has one table: which contain the sales data.

The company's income, costs, and profits can be examined using the data from this dataset in terms of the nation, product categories, and time trend.

1.2 Rationale for Choosing Dataset

The rationale and motivation for choosing an ICA for highlighting big data in marketing, retails, finance exhibition is to demonstrate the ability to leverage data analytics techniques to drive business decision-making and optimize sales performance. Additionally, the project proposal supports the industry 4.0 vision by embracing the digital transformation in the marketing, retails, finance sector.

Scope of Work and BI Questions

The goal of this BI project is to How can we optimize sales and customer satisfaction by analysing the historical order data, identifying key trends, and understanding customer behaviours and preferences?"
This broad question opens the door to various specific analyses and insights, such as:

- Which products have the highest and lowest sales? Are there specific product lines or categories that should be promoted or adjusted?
- What is the financial situation of the company
- How do sales vary across different regions or territories? Are there specific areas that show high potential or need additional attention?
- What are the trends in sales over time? Are there particular months or quarters that consistently perform better or worse?
- Which customers are most likely to order two diverse types of products the same time?

1.3 Key Findings

- What is the company’s financial situation?

A card display was used to view how the company financial situation is

Fig. 1 Card Showing Financial Situation.

Fig1 shows how company financial situation is and we can draw a conclusion that:

1. The revenue growth is 36.41%. Revenue of $10m was generated.
2. 99k of goods was sold.

Which product generated the highest revenue?
A bar chat was use to display answer to the question.

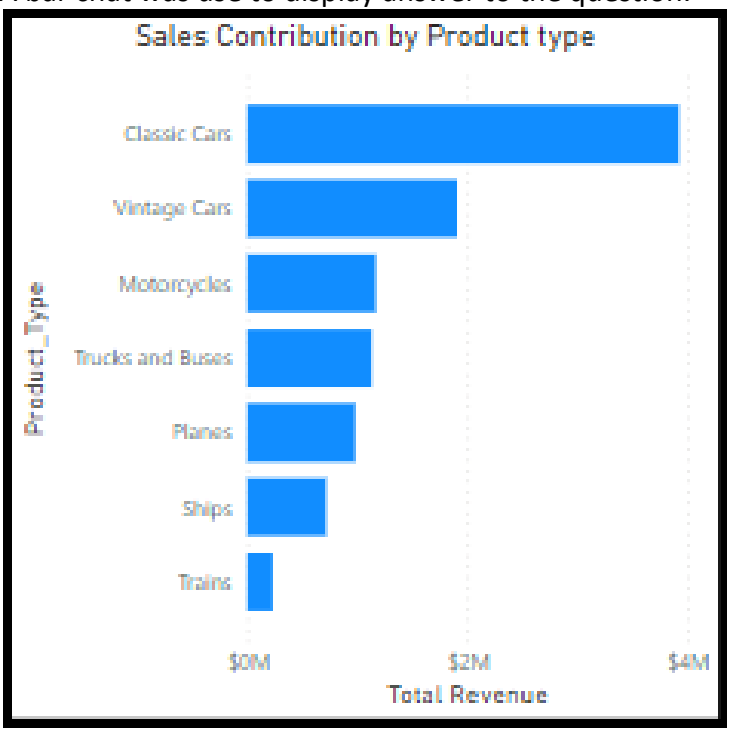


Fig. 2 Bar Chart Showing Sales By Product.

1. classic cars generated the highest revenue, followed by vintage cars

What is the key influencer that influences sales to decrease?

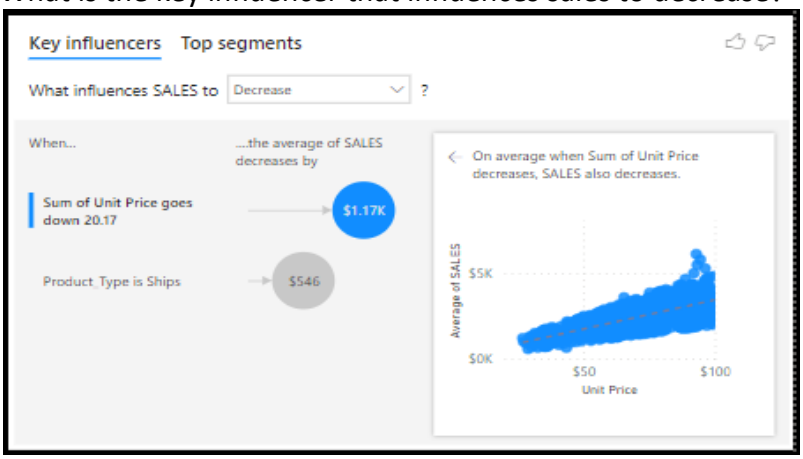


fig3 Key Influencer Showing What Influences Sales to Decrease

1. Fig 3 above shows that average of sales decreases and sum of unit price goes down by 20.17%
2. When the product type sold is ships, it decreases sales.

What is the sales velocity?

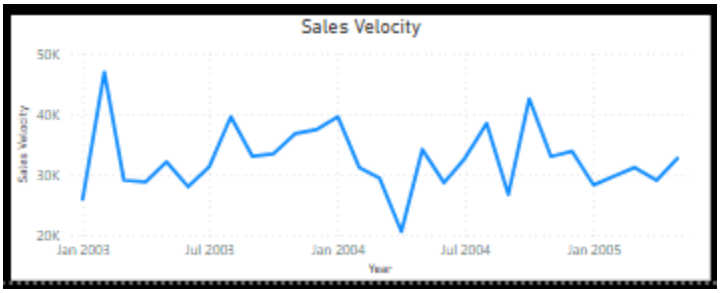


Fig. 3 Line Graph Showing Sales Velocity

The line chart was created with power Bi to analyse the how sales increases over the year and the months

What is the sales variance?

SALES VARIANCE

Product_Type	MSRP_sales value	Total Revenue	Sum of Sales_Variance
Vintage Cars	$1,815,146	$1,903,151	88,004.84
Trains	$197,044	$226,243	29,199.47
Motorcycles	$1,139,168	$1,166,388	27,220.34
Planes	$952,075	$975,004	22,928.57
Trucks and Buses	$1,110,388	$1,127,790	17,401.84
Ships	$699,304	$714,437	15,133.13
Classic Cars	$4,084,217	$3,919,616	-164,601.34
Total	**$9,997,342**	**$10,032,629**	**35,286.85**

Fig 4: Table Visual Showing Sales Variance
Power Bi visual was used to create the table chat . Product type was used to identify which product was sold above Manufactures suggested retail price.

1.4 Sales Trend Analysis

What is the Monthly sales year of year growth?

Line chart was used to show how the answer was represented, using power bi,

Date was placed in the x axis and monthly sales yoy growth that was created using dax function was placed on y axis

Fig. 5 Line Graph Showing Monthly Sales YOY Growth

From the above fig 5, it shows that revenue growth was high on November 2004 followed by April 2005

How revenue has been generated in each quarter?

To analyse this, line chart was introduced using power bi, to get this right, date was placed on x axis and total revenue was placed on y axis

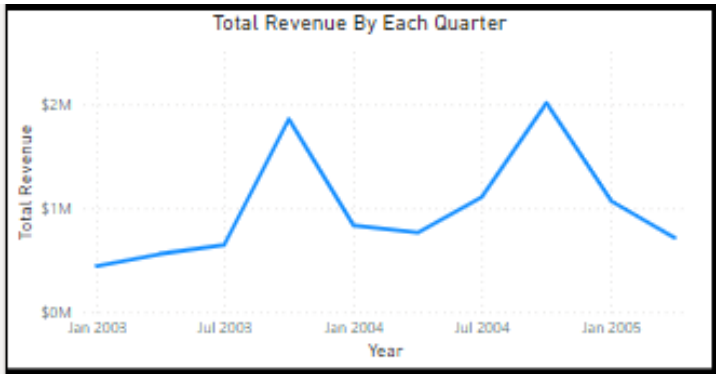


Fig.6 Line Graph Showing Total Revenue Generated Each Quarter.

From the chart, it shows that there was a decrease in the 3rd quarter and a high revenue generated in the 4th quarter.

1.5 Geographical Analysis

This is map that uses coloured bubbles to represent the total number of sales by country. The larger the bubble, the greater the sales in each country.
The map was built in Power BI using the map visual. the country column from the Location table was used for the Location field and also used for the legend to differentiate which country , while the Total revenue measure that was created earlier create was used for the bubble size .
The graphic clearly shows that America has more sales than other country. Contribution

Fig. 7 World Map Showing Total Sales By Top 8 countries

This is decomposition tree that help to analyse total revenue explained by countries sales product type and product code. That uses split to show the country with highest sales and product most sold and product type.
The decomposition tree was built in Power BI using the decomposition visual.
The total revenue created with dax on the sales table was used in the analyse field while the country, product type and product code was used explain by field.
The visual clearly showed that USA contributed more in purchasing of classic cars and vintage cars than other countries
Number of customers per country

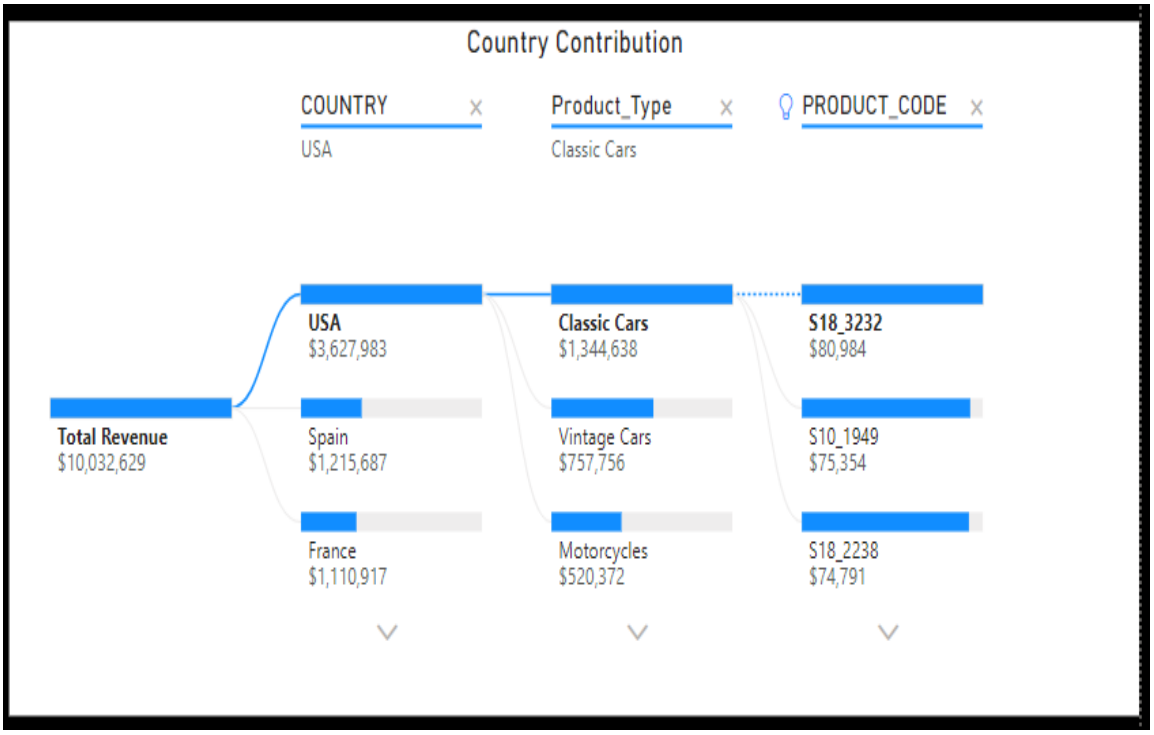


Fig.8 Decomposition Tree Showing Countries And Their Contribution.

Bar chart is used here to show number of customers from each country.
The bar chat was built in Power BI using the bar chart visual.
Country was used in the Y axis field while Customer was used in the X axis field.
the visual clearly showed that USA has the highest count of customer.

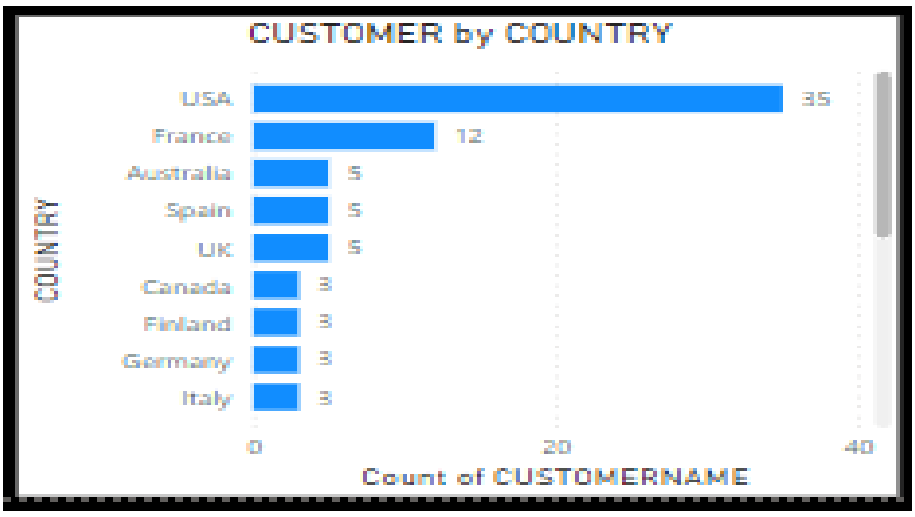


Fig 9 Bar Chart Showing Customer by Country

Funnel chart is used here to show Quantity ordered by each country.
The Funnel chart was built in Power BI using the Funnel chart visual.
Country was used in the Category field while Sum of Quantity was used in the value field.
The visual clearly showed that customers from USA made the most other.

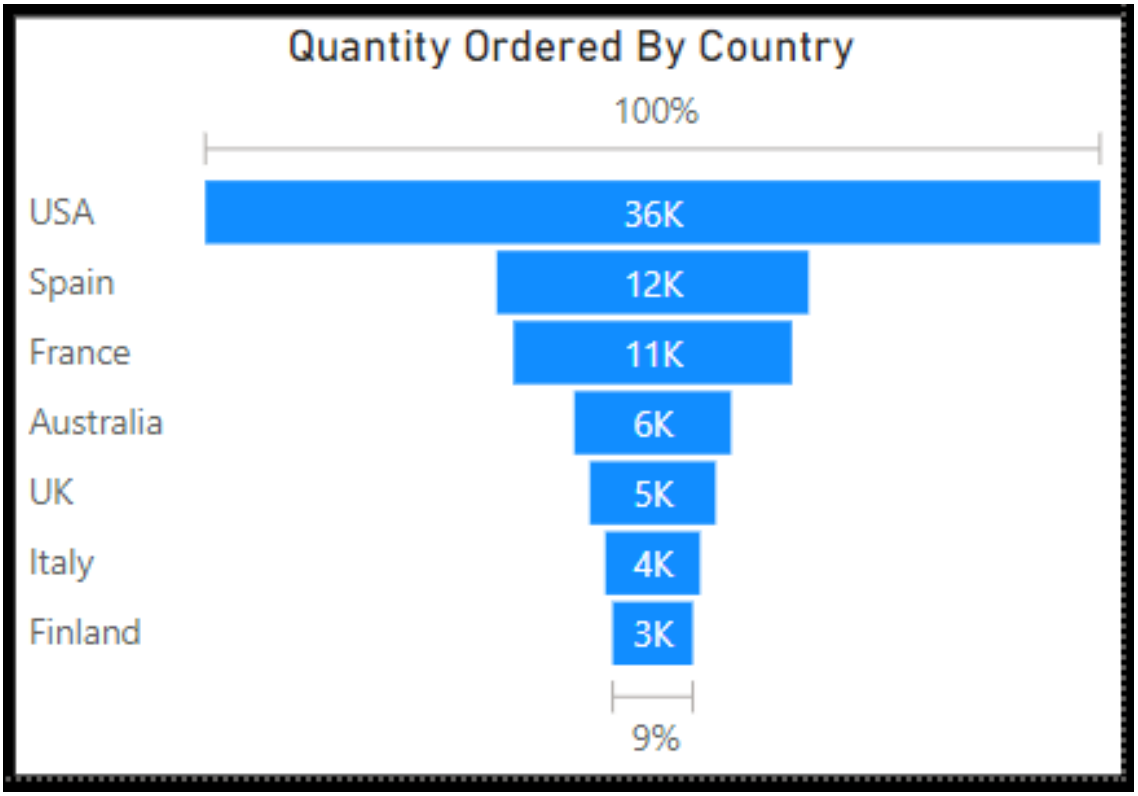


Fig.10 Funnel Chart Showing Quantity Ordered By Country.

1.6 Cross Sell Analysis

Which customers are most likely to order two diverse types of products the same time?

CUSTOMERNAME	Classic Cars	Motorcycles	Planes	Ships	Trains	Trucks and Buses	Vintage Cars	**Total**
Alpha Cognac	126		218	247			96	**687**
Amica Models & Co.	149			82	22	24	566	**843**
Anna's Decorations, Ltd	744	219				286	220	**1469**
Atelier graphique	156	71					43	**270**
Australian Collectables, Ltd	119		63	32			491	**705**
Australian Collectors, Co.	451	490	419			166	400	**1926**
Australian Gift Network, Co	117	121	88		33	91	95	**545**
Auto Assoc. & Cie.	87					164	386	**637**
Auto Canal Petit	368	633						**1001**
Auto-Moto Classics Inc.			120	63			104	**287**
AV Stores, Co.	628			257	120		773	**1778**
Baane Mini Imports	267	212			72	308	223	**1082**
Bavarian Collectables Imports, Co.			245	55			101	**401**
Blauer See Auto, Co.	466				89	81	175	**811**
Boards & Toys Co.	35			36			31	**102**
CAF Imports	91			245	29		103	**468**
Cambridge Collectables Co.	29		52	40		32	204	**357**
Canadian Gift Exchange Network	175					351	177	**703**
Classic Gift Ideas, Inc	96		98	65		132	277	**668**
Classic Legends Inc.	219			174	21	73	233	**720**
Clover Collections, Co.	202	58	115		50	37	28	**490**
Collectable Mini Designs Co.	286		240	247			181	**954**
Collectables For Less Inc.	382		113	24			276	**795**
Total	**33992**	**11663**	**10727**	**8127**	**2712**	**10777**	**21069**	**99067**

Fig. 11 Matrix Table Showing Customers and Goods They Purchase.

Cross sell analysis was adopted and Matrix table created here using power bi visuals is to show customers that ordered more than one product type and the amount they ordered , Customer name was used in the row field, product type was used in the column field while quantity ordered was used in the value field.

1.7 Product Analysis

Which product generated the highest revenue?

A bar chat was used to display answer to the question. Use the x axis for total income and the y axis for the product type.

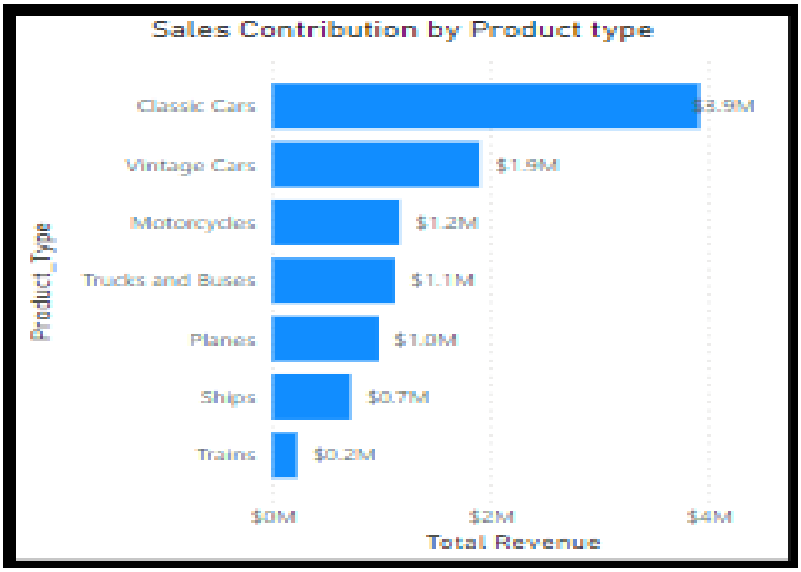


Fig. 12 Bar Chart Showing Sales Contribution by Product.

1. From fig.12, its clear that classic cars generated the highest revenue, followed by vintage cars.

What is the product contribution margin?

This is a line visual created with power bi used to show the product distribution contribution margin, where Product Contribution Margin was placed on Y axis and product type on X axis.
The Dax function used to create the contribution margin.

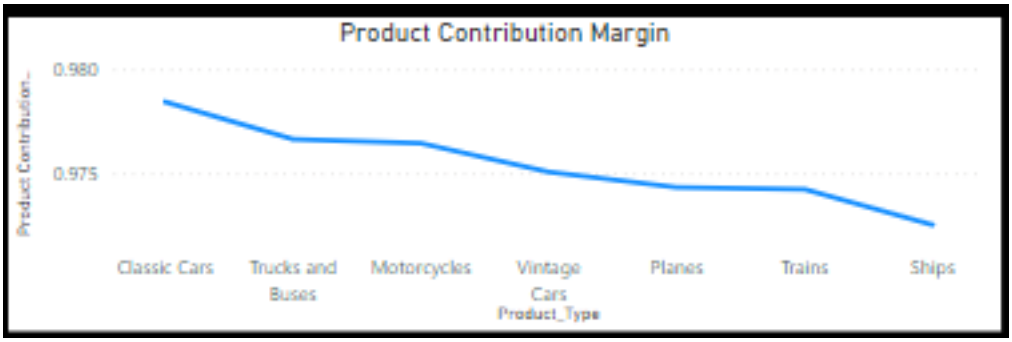


Fig13 Line Graph Showing Contribution Margin.

From fig13 above the contribution margin show that classic cars have the highest contribution following by trucks and buses.

How much revenue was generated by products each year?

The Metrix chart was used from power Bi to analyse the how each product generated revenue each year.

Product Revenue Each Year

Product_Type	2003	2004	2005	Total
Classic Cars	$1,484,785	$1,762,257	$672,573	$3,919,616
Motorcycles	$370,896	$560,545	$234,948	$1,166,388
Planes	$272,258	$502,672	$200,074	$975,004
Ships	$244,821	$341,438	$128,178	$714,437
Trains	$72,802	$116,524	$36,917	$226,243
Trucks and Buses	$420,430	$529,303	$178,057	$1,127,790
Vintage Cars	$650,988	$911,424	$340,739	$1,903,151
Total	$3,516,980	$4,724,163	$1,791,487	$10,032,629

Fig.14 Matrix Table Showing Product Revenue Each Year.

From fig 14. it shows that the year 2004 had the highest sales revenue.

1.19 Summary and Recommendation

The three most important factors that determine the operation of your organisation are profit, revenue, and cost. Even with substantial sales, a business that experiences larger costs than revenues will not be profitable and will eventually have to close when its cash reserves are depleted. In order to maintain its appeal to shareholders, the company needs to decide whether to concentrate on increasing profits or revenue, or both, by lowering its cost of sales. Based on the findings on the historical analysis of the company's performance for the past 6 years, the following can be concluded:

1. The company is into the sales of 5 categories of products, Classic cars, vintage cars, motorcycles, planes, truck and buses ships and trains.
2. The company went into the sales in 2003.
3. The company has been selling most product below MSRP WHICH IS THE KEY INFLUENCER TAHT MADE SALES TO DECREASE.
4. The company does it trade across 19 countries between Europe, America, Australia, and Asia.
5. United States has the highest geographical market share.
6. The company experienced a recession in revenue/profit between every first second and third quarter.

7. THERE WAS REVENUE INCREASE IN 2004 AND DECREASE IN 2005
8. THE VELOCITY AT WHICH DEAL MOVES, FROM 2003 TO 205 DECREASED
9. Classic cars have been sold below msrp without indicating any discount applicable.

From the above findings, it has been projected that there won't be much growth if the company continue selling products below MSRP.
To do better in promoting business for higher profit, the following suggestions should be considered.

- To be able to attract new clients, it should broaden its market outside the 19 nations and 3 continents.
- Starting a promotion in the first through third quarters might boost revenue and present a chance for new clients.
- Introducing customer appreciation gesture in form of discount and not always selling products below MSRP
- Review it online presence to analyse the company online traffic and develop plans to enhance customer online experience.
- Increase market campaign through adverts on many channels.

2. Section 2: Appendix: BI Design

"This section offers a summary of the pre-processing steps employed by Power BI to generate the visuals in the report. The dataset, which contains Sample Sales Data (kaggle.com) , was sourced from Kaggle. This dataset was instrumental in analysing the company's revenue, cost, and profit in terms of country, product categories, and time trends.

After the dataset is downloaded, it can be loaded by selecting 'Get data from another source' in the 'Display report' menu canvas area. From the bottom of the 'Navigator' window, select 'load', followed by the 'transform data' option located on the home tab of the Power BI desktop." This rephrasing maintains the original meaning while using different wording and sentence structure. It also improves readability by breaking up the text into smaller, more digestible sentences.

2.1 Data Pre-Processing or Data Cleansing

Data pre-processing and cleaning are essential steps in the data analysis and machine learning workflow. They involve preparing raw data for analysis by addressing issues like missing values, inconsistencies, and noise. Here are the typical steps involved in data pre-processing and cleaning.

2.1.1 **Data Collection** **Loading the Data**

Using power bi to load the data which This is done via the 'Get Data' button on the home tab. This drops down from the get data button shows the different ways to load the data depending on the file as shown in type. Fig.15

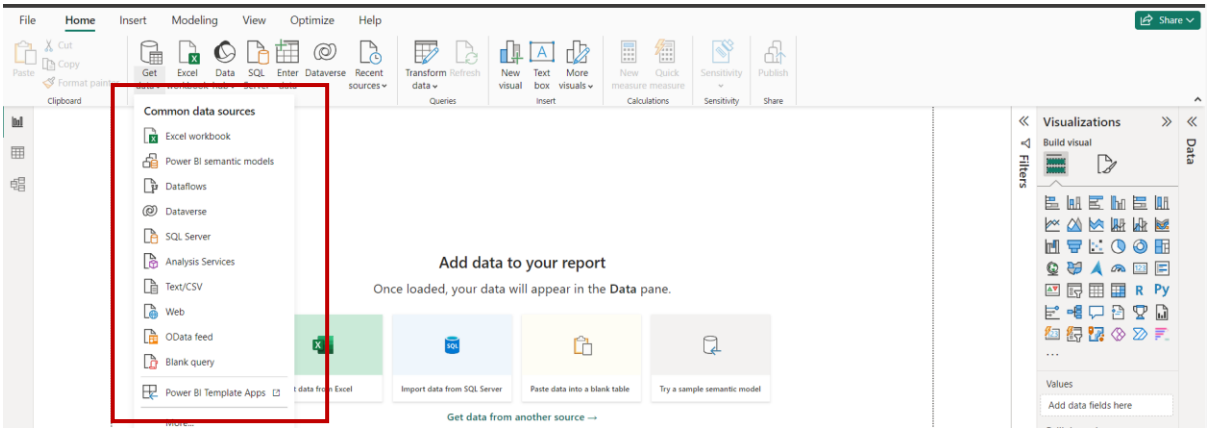


Fig.15 Drop Down Showing Ways To Load Data In Power Bi

In this project, our data is in CSV Because of that, text/CSV was selected which is salesdatasample was picked. on the dialog box, top rows were shown. Three options under it to either load transformation or cancel. As shown in Fig 16.

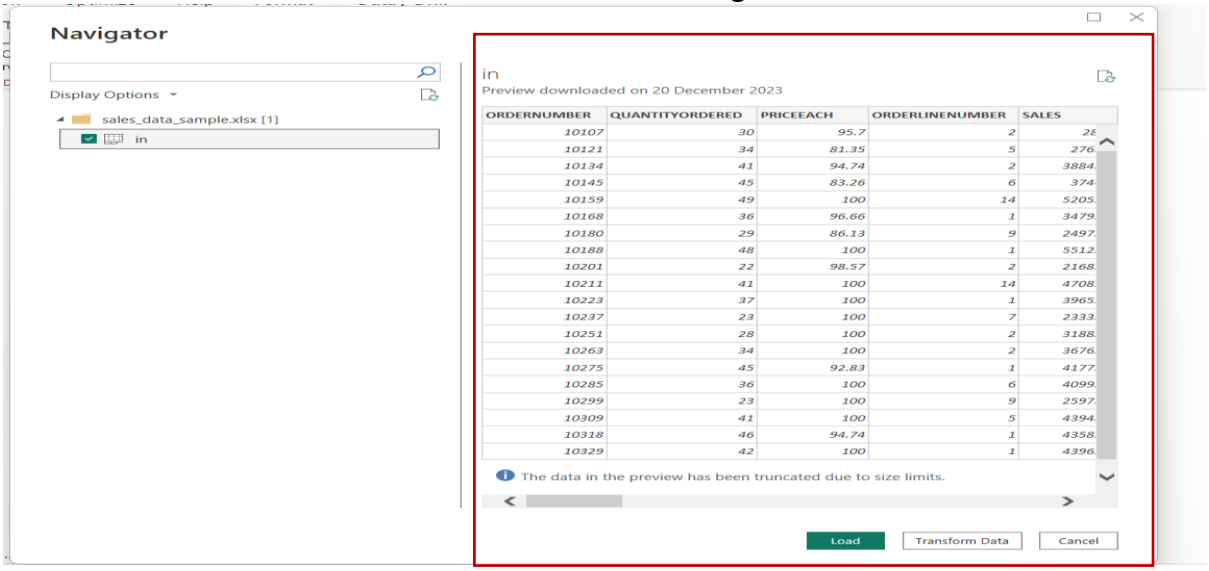


Fig.16: Data Importation Dialog Box

To be able to successfully import our data set, load option was selected. The result as seen in Fig.17

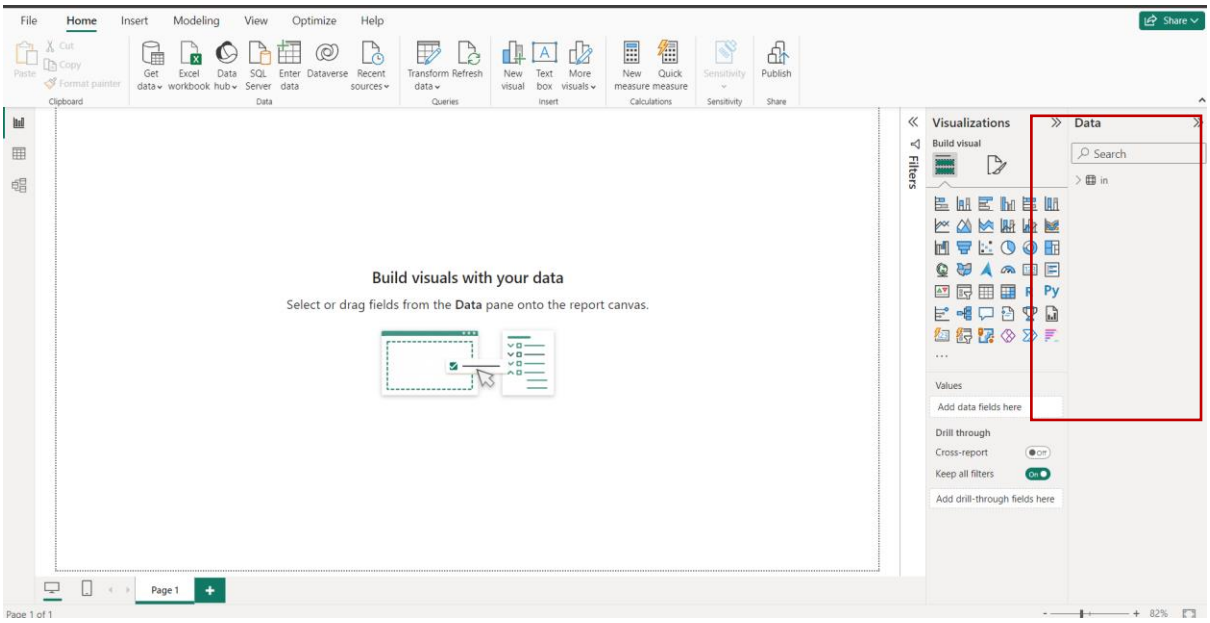


Fig17: Sales Table Successfully Loaded In Power Bi

Data Cleaning

The following stage will be data cleansing and pre-processing in Power Query. As seen in Fig. 15, the Transform data drop down on the main tab was selected. Transform data was selected, which launched the Power Query Editor, as illustrated in Fig.18.

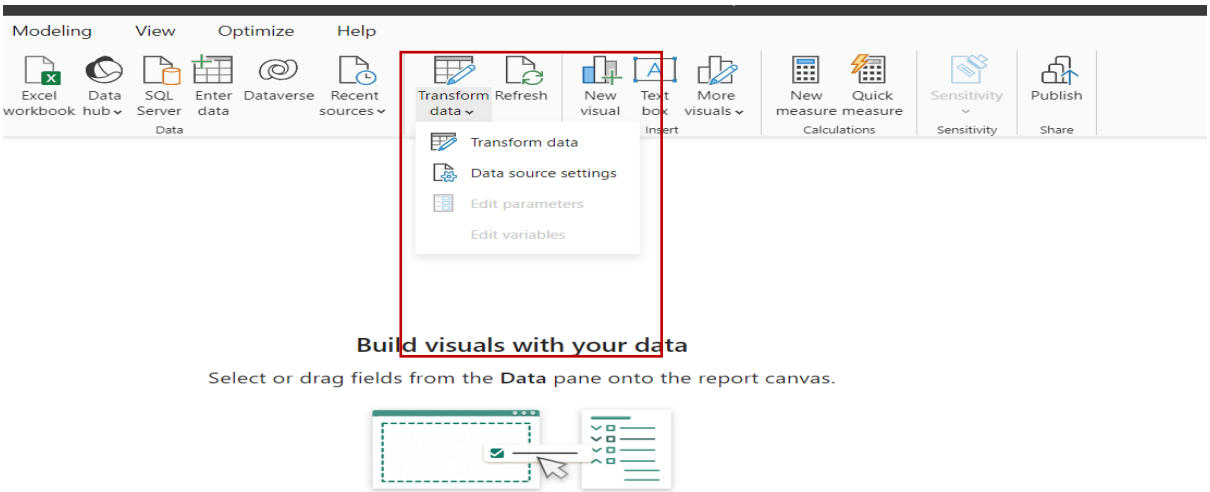


Fig.18: Data Transformation Drop Down

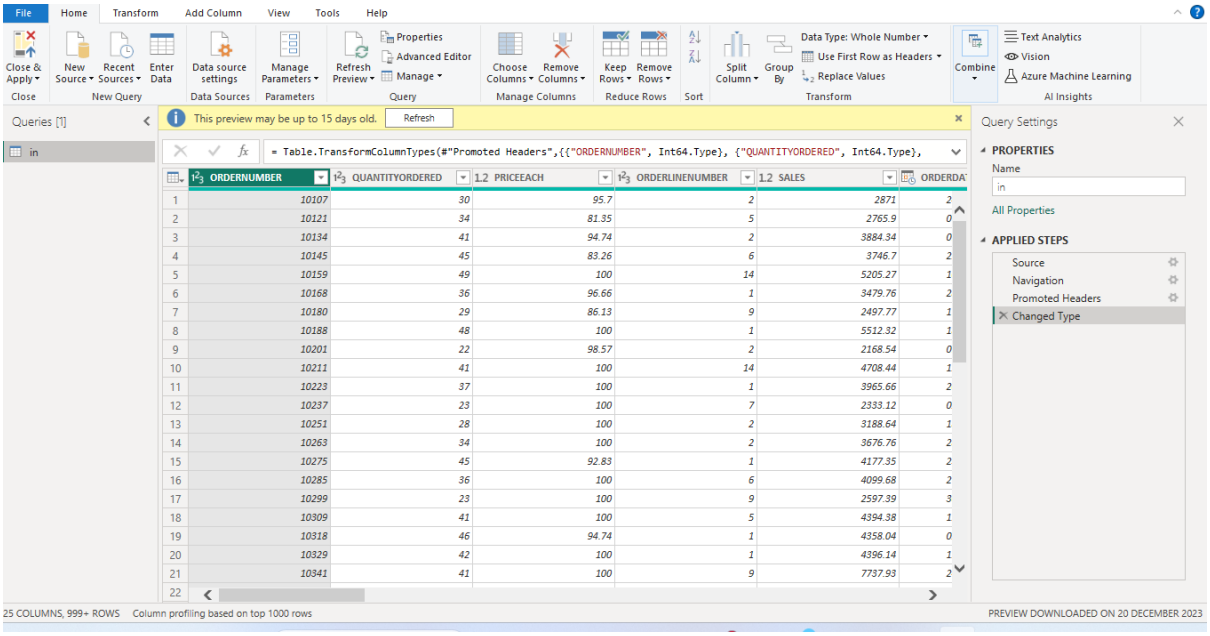


Fig. 19. Power Query Editor

Removing columns

These columns were not needed in the project, so it was decided to be removed

M Formula to Remove Columns:

Table.RemoveColumns(#"Changed Type",{"QTR_ID", "MONTH_ID", "YEAR_ID", "PHONE", "ADDRESSLINE1", "ADDRESSLINE2", "STATE", "POSTALCODE", "TERRITORY", "CONTACTLASTNAME", "CONTACTFIRSTNAME"})

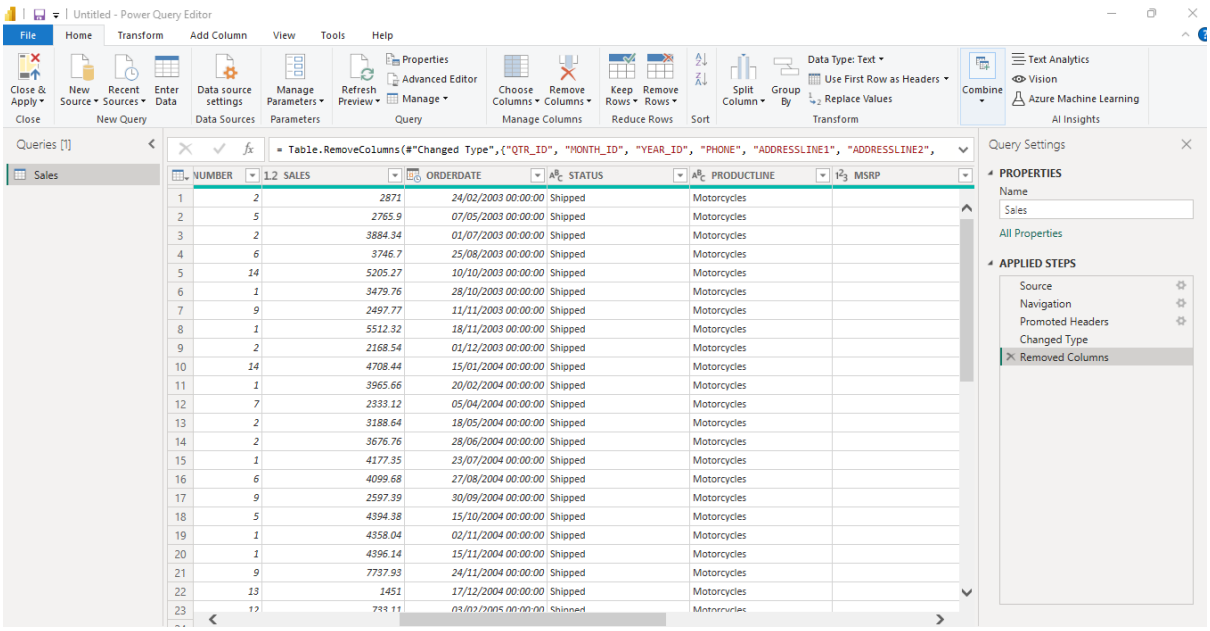


Fig. 20. Columns Removed

Renaming columns

Table name was renamed from IN to Sales and Some columns were renamed PRICEEACH to Unit Price ORDERDATE to Date, PRODUCTLINE to Product type. This was achieved by double clicking on the headers, then type in the new names followed by the enter key.

Mformular for renaming PRICEEACH

= Table.RenameColumns(#"Removed Columns",{{"PRICEEACH", "Unit Price"}})

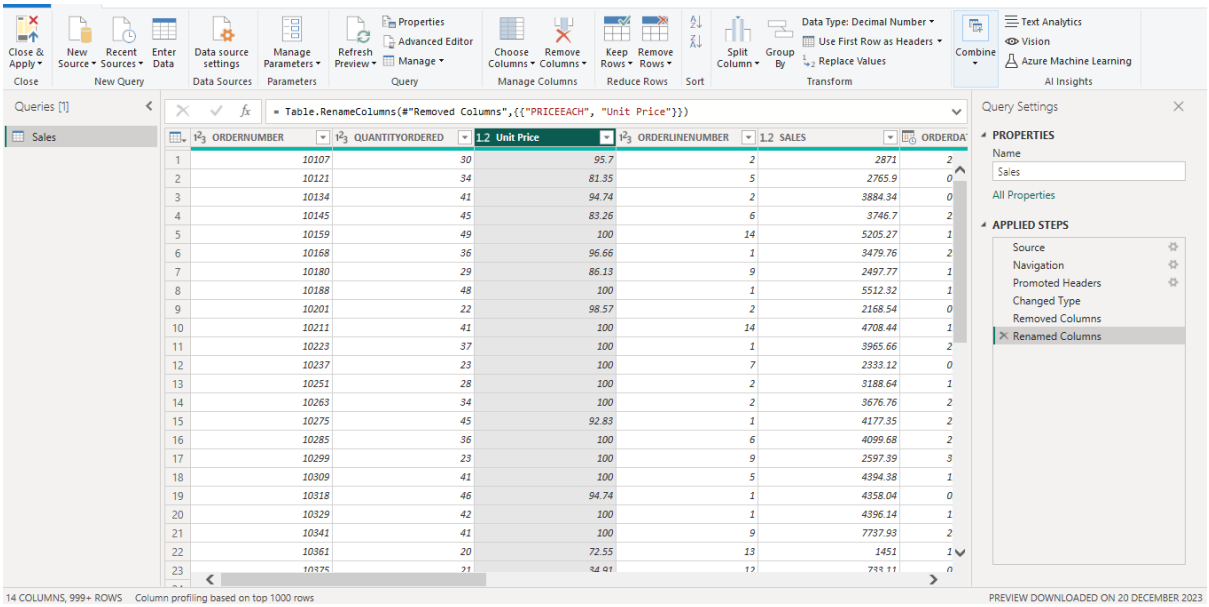


Fig. 21. Renaming Column

2.1 .2 Data Modelling.

Now the table has been cleaned, from the clean table, we will create fact and dimension tables

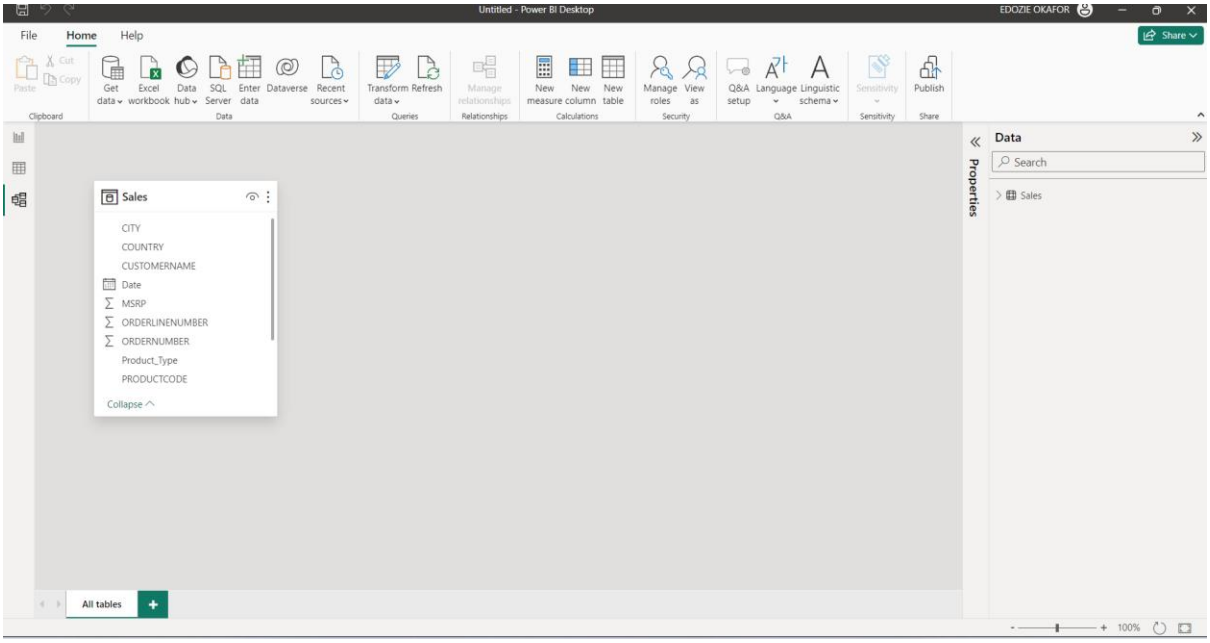


Fig. 22. Data Model

2.1.2 BI Data Modelling via Star Schema -Facts and Dimensions

Dimension tables are required to reduce confusion, prevent data duplication, and facilitate analysis and visualisation.
To create our dimension Tables, we must open the power query editor. The sales data table can be duplicated by right-clicking on the table and choosing to duplicate as shown in Fig.23

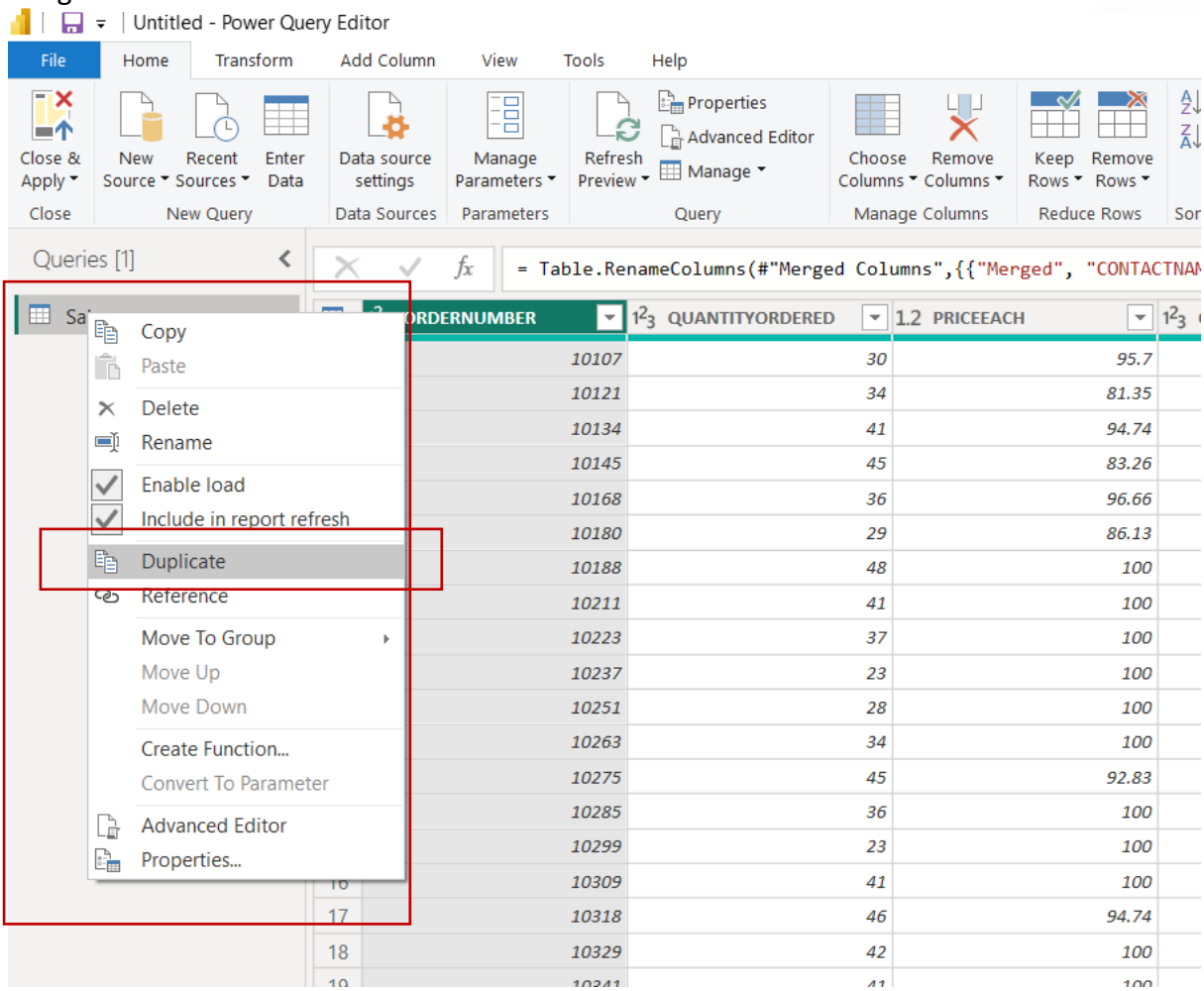


Fig. 23 Duplicating table To Create Dimention.

Four-dimension table was created, Customer_Dm, Date_dm, Location_Dm and product_Dm, our first table is Customer_dm, Order number and Customer name was selected and every other columns were removed by right clicking on the selected columns and follow the prompt as showed in Fig. 24

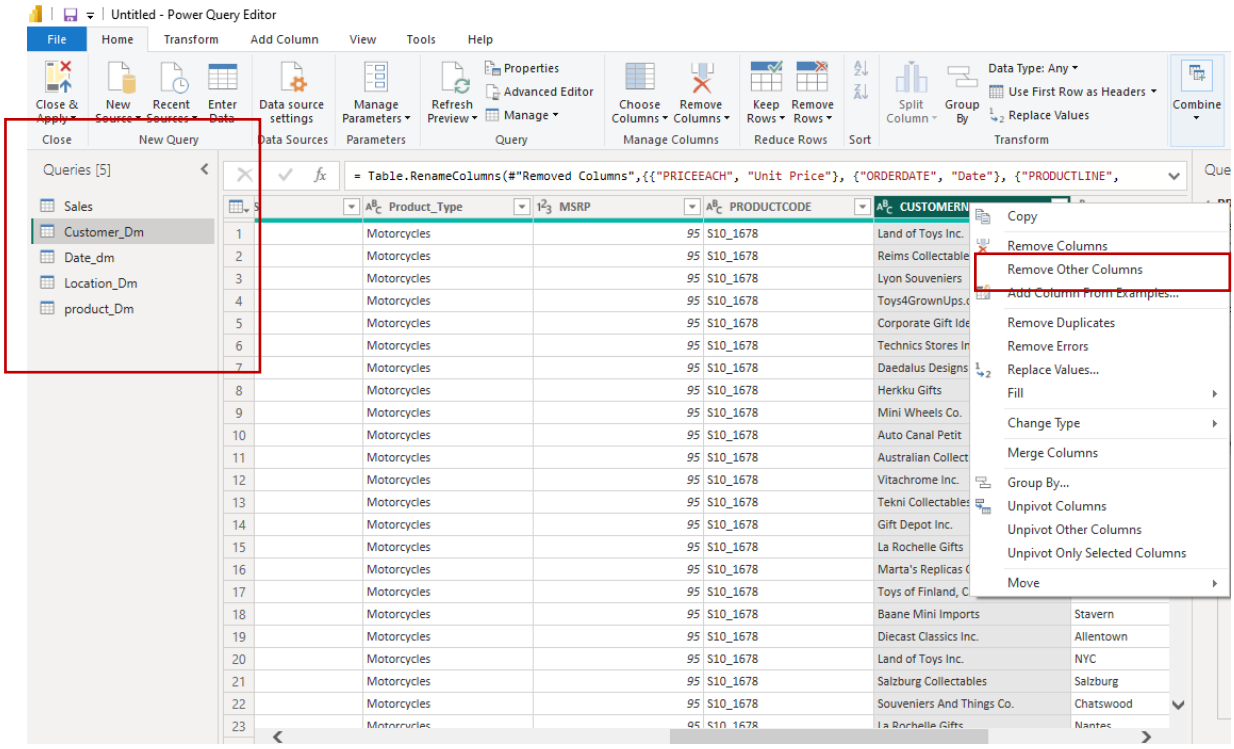


Fig. 24 Dimensions Created

We now have the columns we needed in this table, after column was selected and right clicked on which we used the duplicate option to remove duplicate..

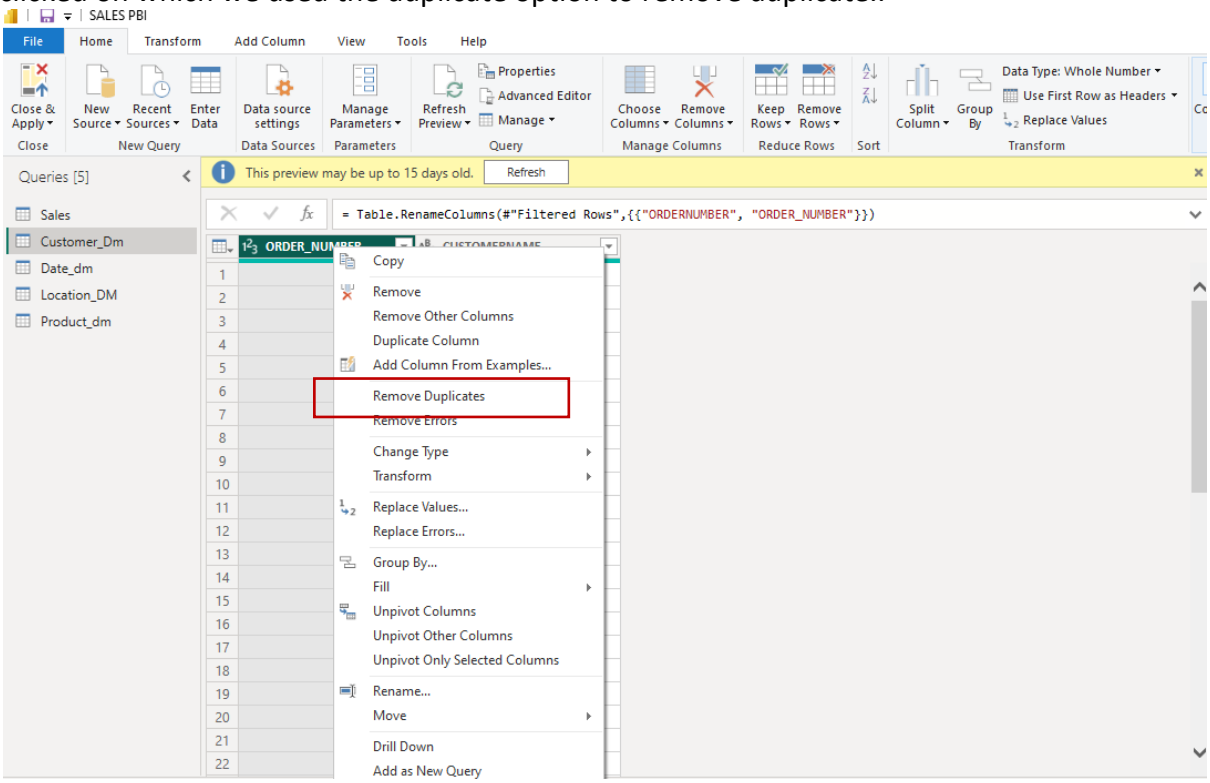


Fig. 25. Removing Duplicates

The next dimension table was date table the date format was changed to just date and then the date was duplicate date into another three columns, and renamed the duplicates as follows, Year, the type was changed to year, Month, the type was changed to month, Day the type was changed to date. As shown in Fig 23.

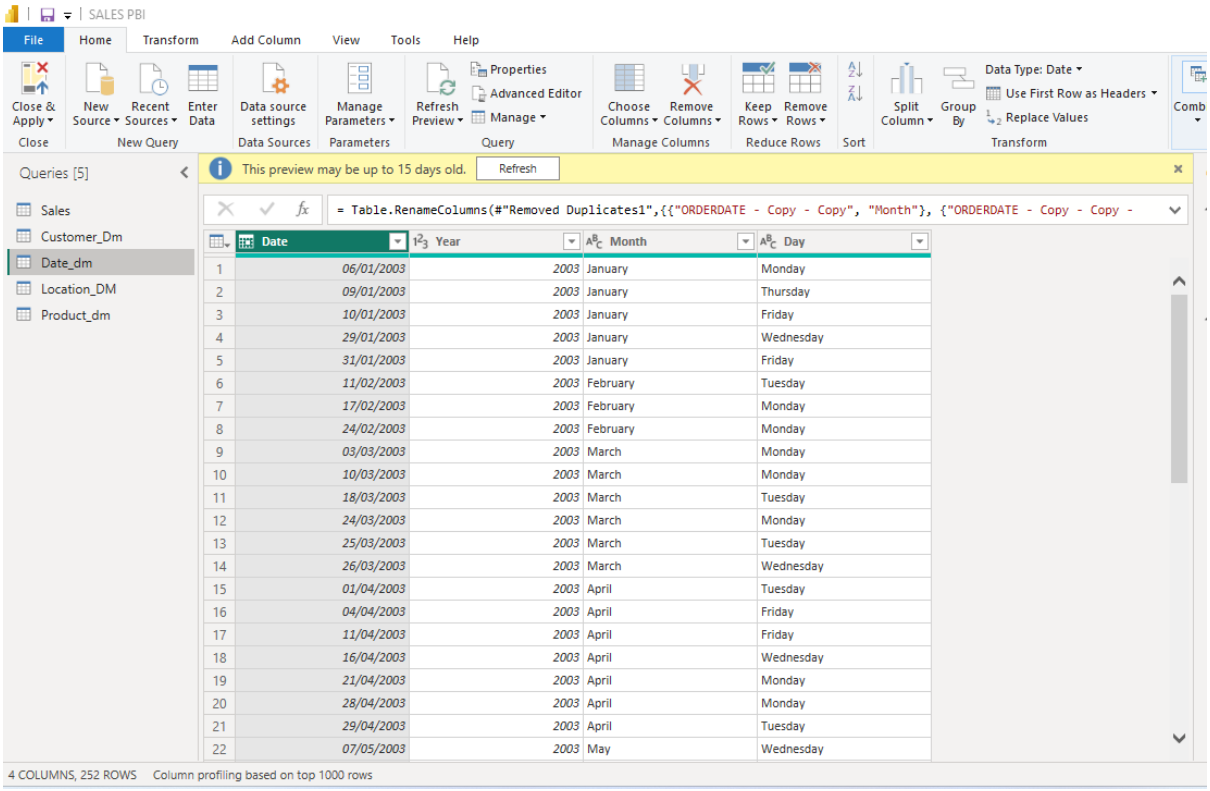


Fig. 26 Fact Tables and Dimensions

After the tables was created, our data model is perfect and ready for relationship creation of start schema.

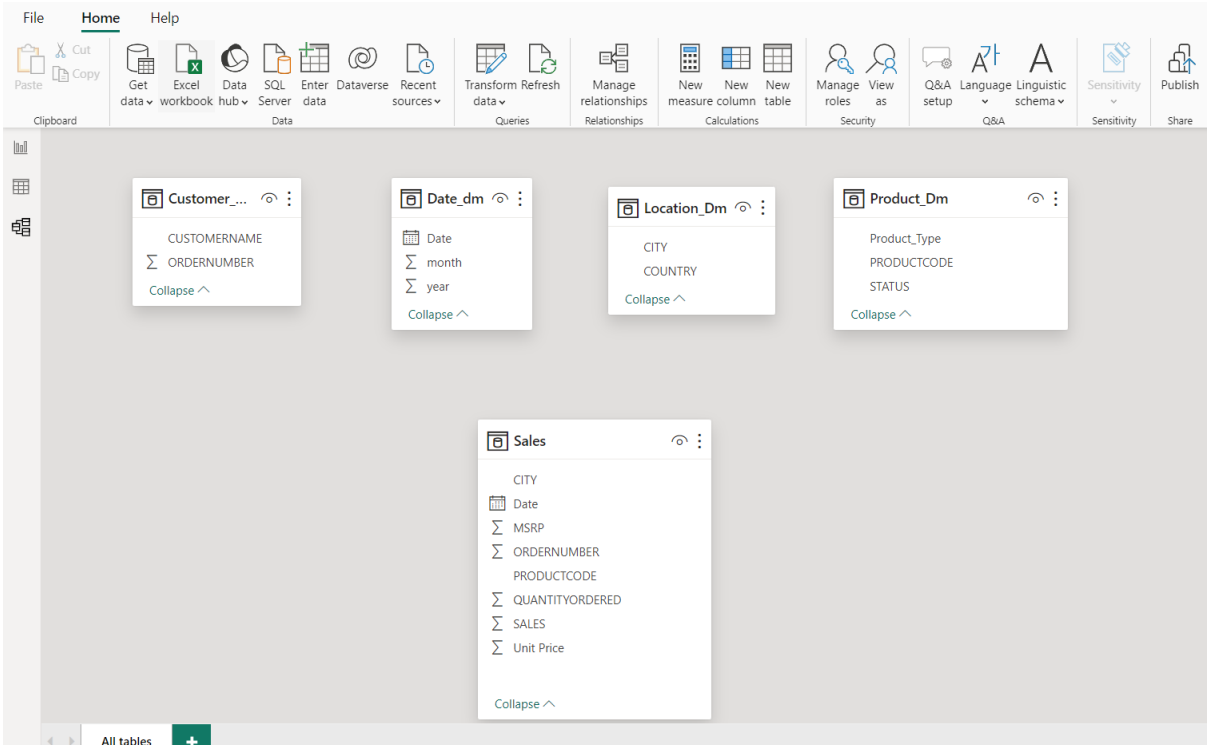


Fig . 27. Star Scheme without Relationship

Creating Relationships

Relationships between the tables in our model must be developed in order to execute the a nalysis required for this project.

To do so, select 'Manage relationships' from the data model section's main tab.

This opens a dialogue window, and the option 'New' is selected.

The first relationship is created by the linking column, 'OrderNumber', from Sales (fact table) and Ordernumber (dimension table). This results in creating Many to one relationship. This procedure is done for all the model's dimension tables.

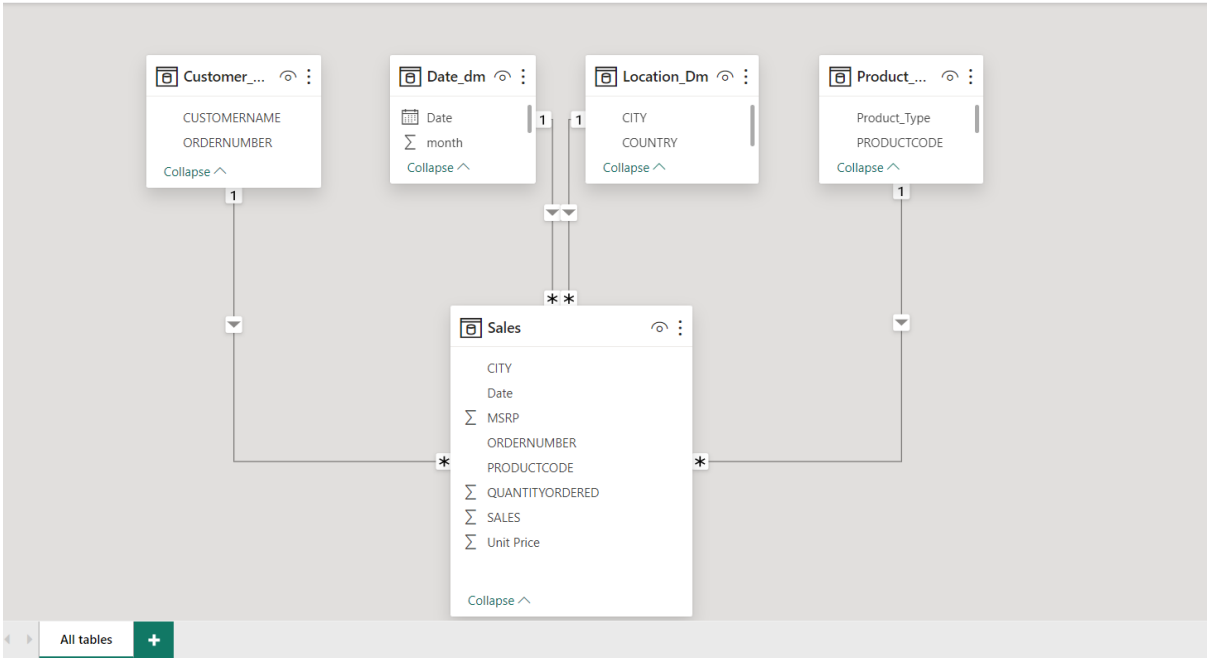


Fig.28 Star Schema Model After Creating Relationship.

2.2 DAX and M Language

DAX: Data Analysis Expressions (DAX) is the name of the formula expression language used in Analysis Services and Power BI. To perform intricate calculations and queries tables and columns, DAX formulas in tabular data models combine functions, operators, and values. The DAX formula was utilised in this report to generate new metrics such as total revenue, Average Unit Price, CY sales and PY sales used in calculating revenue growth rate, sales velocity, Monthly Sales YoY Growth, average order quantity per customer, product contribution margin,

- **Total Revenue = SUM(Sales[SALES])**

- **Average_Unit_Price = AVERAGE(Sales[Unit Price])**

- **CY Sales = VAR CY = MAX ('Date_Dm'[Year]) RETURN CALCULATE (SUM (Sales[SALES]), 'Date_Dm'[Year] = CY)**

- **PY Sales = CALCULATE([CY Sales],SAMEPERIODLASTYEAR('Date_Dm'[Date]))**

- **Revenue Growth Rate = DIVIDE([CY Sales]-[PY Sales],[PY Sales],BLANK())**

- **Sales Velocity = [Total Revenue] / COUNTROWS(VALUES('Sales'[ORDER_NUMBER]))**

- **Monthly Sales YoY Growth =** CALCULATE([Total Revenue], SAMEPERIODLASTYEAR('Date_dm'[Date]))

- **AverageOrderQuantityPerCustomer =** CALCULATE AVERAGE('Sales'[QUANTITYORDERED]), ALLEXCEPT('Customer_Dm', 'Customer_Dm'[CUSTOMERNAME])

- **Product Contribution Margin = ([Total Revenue] - [Total_cost]) / [Total Revenue]**

M-Language: Power Query M is a tool for combining, filtering, and mashing together data from manycompatible data sources. M-Language function was introduced Using a custom column to create Sales Variance MSRP sales value Product Frequency. The functions created are as follows:

- **Sales_Variance = Sales[Total Revenue]-Sales[MSRP_salesvalue]**

- **MSRP_salesvalue = Sales[MSRP]*Sales[QUANTITYORDERED]**

- **ProductFrequency =** CALCULATE(COUNTROWS('Product_dm'), ALLEXCEPT('Product_dm', 'Product_dm'[Product_Type]))

3. Dashboard

3.1Cover Page

- Textbox was created to show title
- Buttons was inserted for direction.

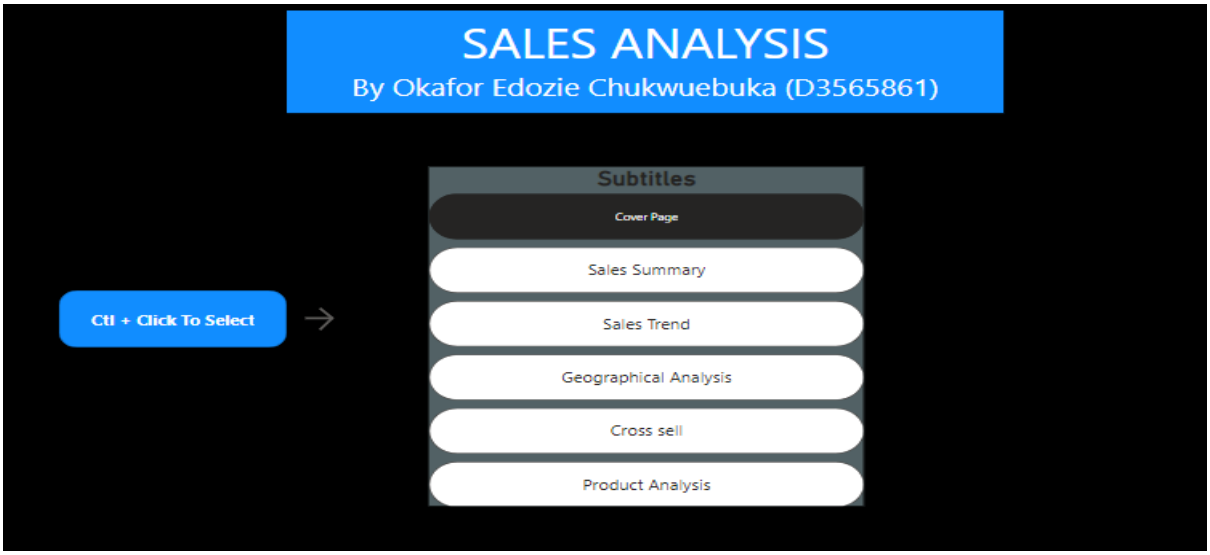


Fig. 29 Cover Page Dashboard

Sales Summary page

- Text box was created for title.
- Two arrows were created for navigation purpose.
- Card was used to show the 3 KPI which are total revenue, revenue growth, total quantity sold.
- Line chart was created to show the sales velocity by dropping date on the X-axis field and sales velocity on the Y-axis field.
- Two Key influencer was created to show what influences sales to increase and to decrease.
- Table was used to show the sales variance.

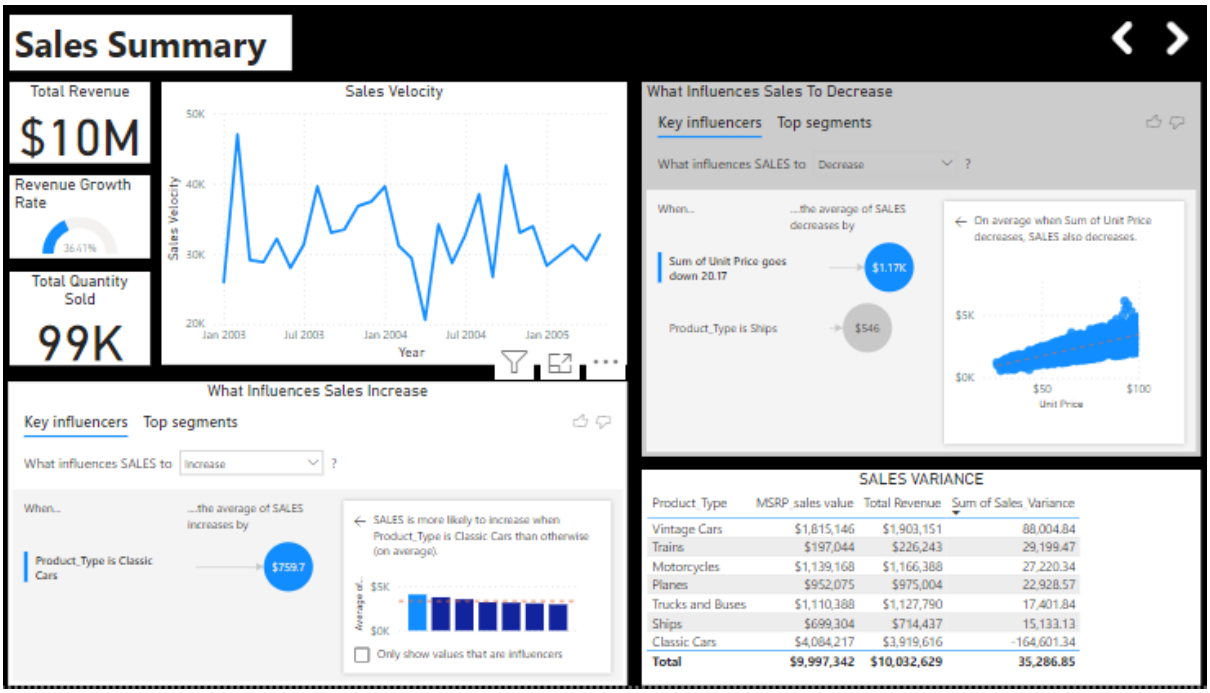


Fig. 30 Sales Summary Dashboard

Sales Trend analysis page

- Text box was created to show the title.
- Silencer was created to help with date selection.
- Two arrows were created for navigation purpose.
- Three-line charts was created to help us analyse revenue forecast, monthly year of year growth and revenue by each year.
- Matrix chart was created to help analyse what each product generated each year.

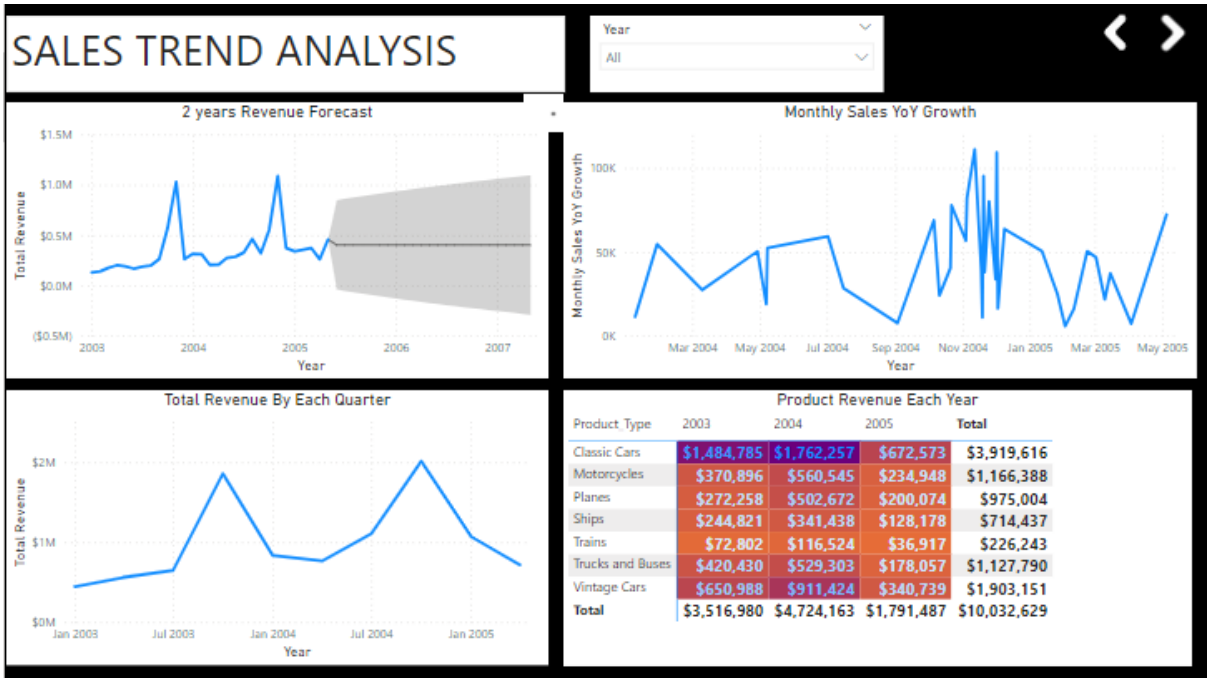


Fig. 31 Sales Trend Dashboard.

Geographical Analysis Page

- Text box was created to show the title.
- Two arrows were created for navigation purpose.
- Silencer was created to help with date selection.
- Three cards were used to show the KPI for total revenue, total quantity sold and count of city.
- Decomposition tree was created to help analyse country contributions and it also help as a slicer for the Three KPI cards.
- World map was created showing total sales by top 8 counties.
- Bar chat was created to show numbers of customers from each country.
- Funnel chart was used to display quantity ordered by country.

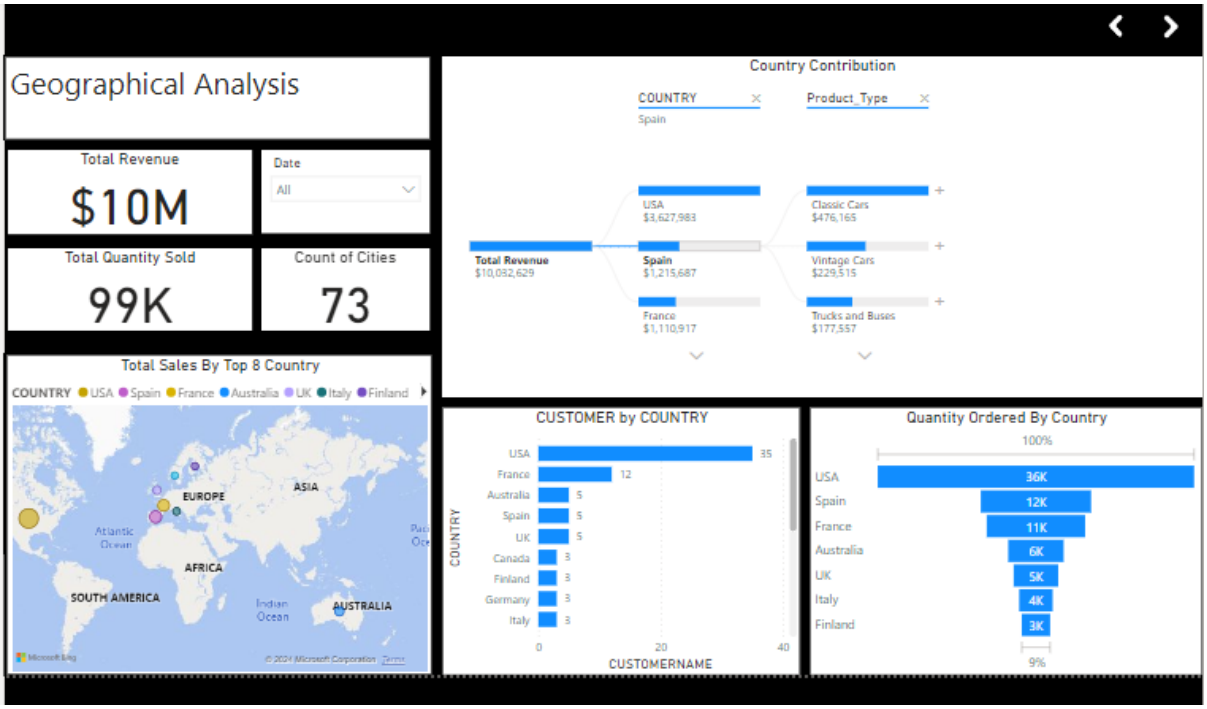
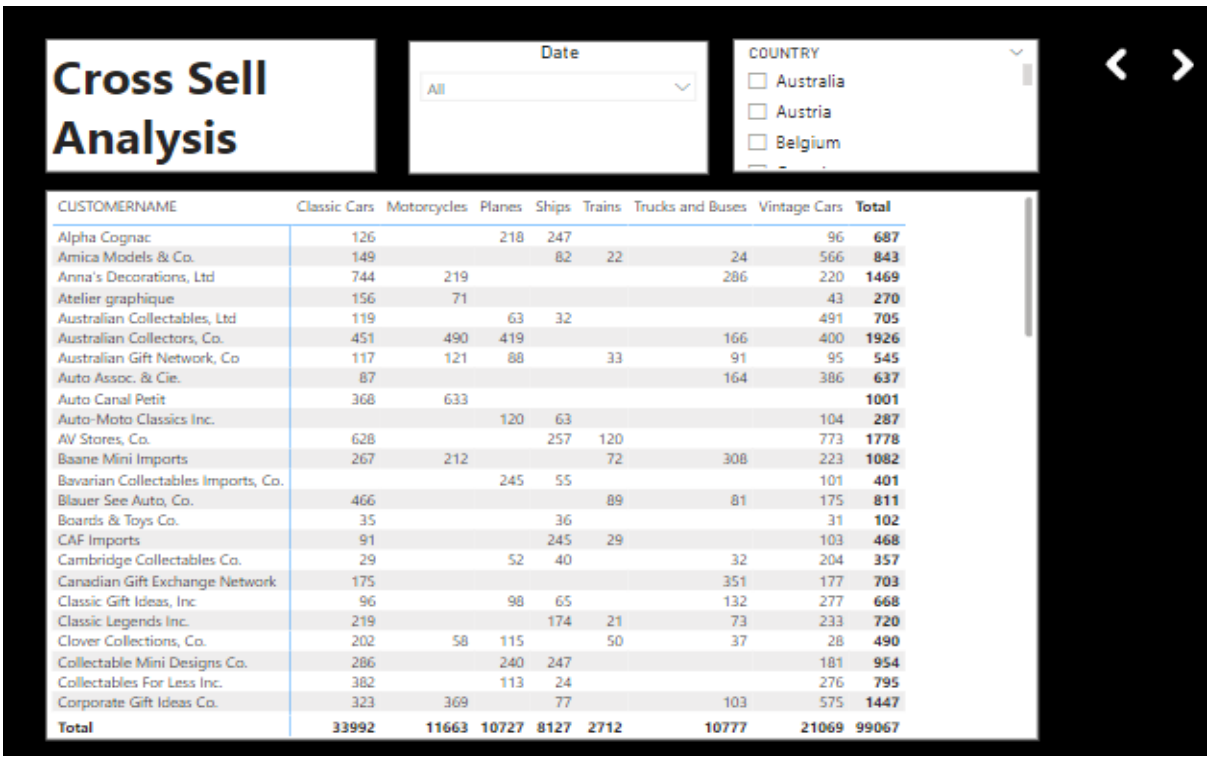


Fig. 32 Geographical Analysis Dashboard.

Cross sell Analysis Page.

- Text box was created to show the title.
- Two arrows were created for navigation purpose.
- Two Silencers was created to help with date and country selection.
- Matrix chart was created to show customers who purchased more than one product type at the same time.



CUSTOMERNAME	Classic Cars	Motorcycles	Planes	Ships	Trains	Trucks and Buses	Vintage Cars	Total
Alpha Cognac	126		218	247			96	**687**
Amica Models & Co.	149			82	22	24	566	**843**
Anna's Decorations, Ltd	744	219				286	220	**1469**
Atelier graphique	156	71					43	**270**
Australian Collectables, Ltd	119		63	32			491	**705**
Australian Collectors, Co.	451	490	419			166	400	**1926**
Australian Gift Network, Co	117	121	88		33	91	95	**545**
Auto Assoc. & Cie.	87					164	386	**637**
Auto Canal Petit	368	633						**1001**
Auto-Moto Classics Inc.			120	63			104	**287**
AV Stores, Co.	628			257	120		773	**1778**
Baane Mini Imports	267	212			72	308	223	**1082**
Bavarian Collectables Imports, Co.			245	55			101	**401**
Blauer See Auto, Co.	466				89	81	175	**811**
Boards & Toys Co.	35			36			31	**102**
CAF Imports	91			245	29		103	**468**
Cambridge Collectables Co.	29		52	40		32	204	**357**
Canadian Gift Exchange Network	175					351	177	**703**
Classic Gift Ideas, Inc	96		98	65		132	277	**668**
Classic Legends Inc.	219			174	21	73	233	**720**
Clover Collections, Co.	202	58	115		50	37	28	**490**
Collectable Mini Designs Co.	286		240	247			181	**954**
Collectables For Less Inc.	382		113	24			276	**795**
Corporate Gift Ideas Co.	323	369		77		103	575	**1447**
Total	**33992**	**11663**	**10727**	**8127**	**2712**	**10777**	**21069**	**99067**

Fig. 33. Cross Sell Analysis Dashboard.

Product Analysis

- Text box was created to show the title.
- Two arrows were created for navigation purpose.
- Four cards were created to show the KPI for total revenue, total quantity sold, average quantity ordered per customer, total msrp
- Line chart was created to show the contribution margin.
- Bar chart was created to show sales contribution by product type.
- Water fall chart was created to show the product purchase frequency

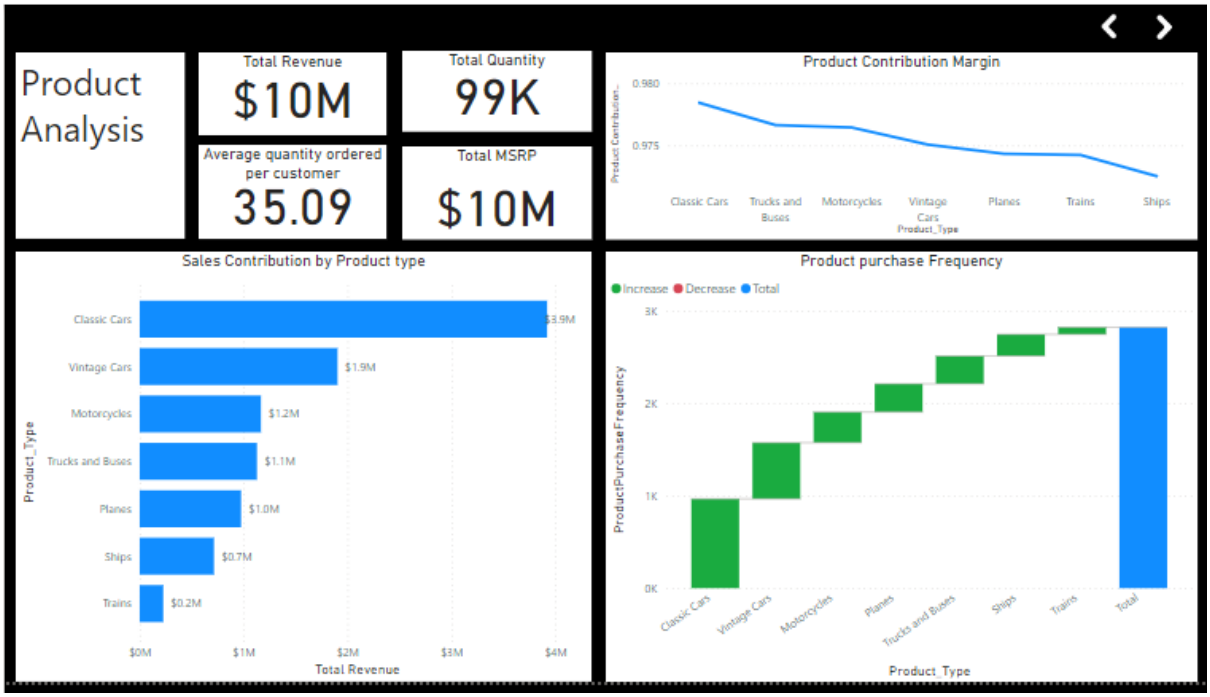


Fig. 34. Product Analysis Dashboard.

3. Summary/Conclusion:

This dashboard report empowers the company to monitor key business performance indicators (KPIs) such as sales, revenue, trends, and growth rates. It also facilitates comparison of How sales perform in each regional and analysis of product performance."

References

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