

Data Visualization Tools and Software

Aim: Visualizing Data, Creating Interactive Reports, Visualizing Tabular Data, Categorical Data, Data Trends, Geographical Data with Maps, other features

Tasks:

Visualizing data is one of the core parts and basic building blocks of Power BI. Creating visuals is one of the most effective ways to find and share your insights.

1. Create and customize simple visualizations
 - a. Create new bar charts, pie charts, and tree maps
 - b. Create combination charts
2. Create slicers
3. Map visualizations
 - a. Create bubble maps
 - b. Create shape maps
4. Matrices and tables
5. Create scatter, waterfall, and funnel charts
6. Modify colors in charts and visuals
 - a. Conditional formatting
7. Page layout and formatting
 - a. Add static elements

Model view

Model view shows all of the tables, columns, and relationships in your model. This view can be especially helpful when your model has complex relationships between many tables. Select the Model view icon near the side of the window to see a view of the existing model.

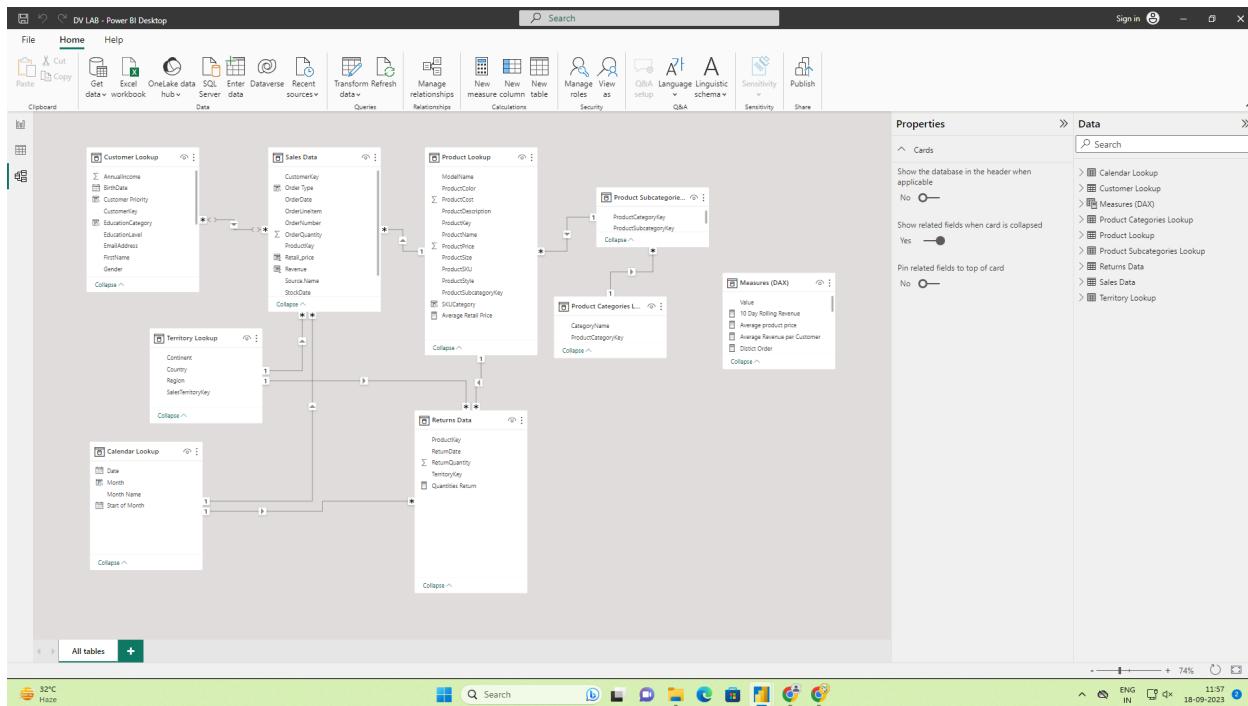


Fig.- Model view of model

Data tab

Data view helps you inspect, explore, and understand data in your Power BI Desktop model. It's different from how we view tables, columns, and data in the Power Query Editor.

The screenshot shows the Power BI Desktop interface with the 'Data' tab selected. The main area displays the 'Sales Data' table, which contains 56,048 rows of sales information. The columns include SourceName, OrderDate, StockDate, OrderNumber, ProductKey, CustomerKey, TerritoryKey, OrderLineItem, OrderQuantity, Order Type, Total Order Quantity, Retail price, and Revenue. A search bar at the top right allows filtering by various dimensions like Calendar, Customer, and Product categories. The bottom status bar shows the date as 18-09-2023 and the time as 11:36.

Fig.-Data view of model

The screenshot shows the Power BI Desktop interface with the 'Data' tab selected. The main area displays the 'Product Lookup' table, which contains 293 rows of product information. The columns include ProductKey, ProductSubCategoryKey, ProductSKU, ProductName, ModelName, ProductDescription, ProductColor, ProductSize, ProductStyle, and ProductC. A search bar at the top right allows filtering by various dimensions like Calendar, Customer, and Product categories. The bottom status bar shows the date as 18-09-2023 and the time as 12:23.

Fig.-Data view of model

Report tab

When you navigate to the Report tab, you can see a dashboard and a chart selected for data visualization. You can select different chart types as per your need. In our example, we have selected a Table type from available Visualizations.

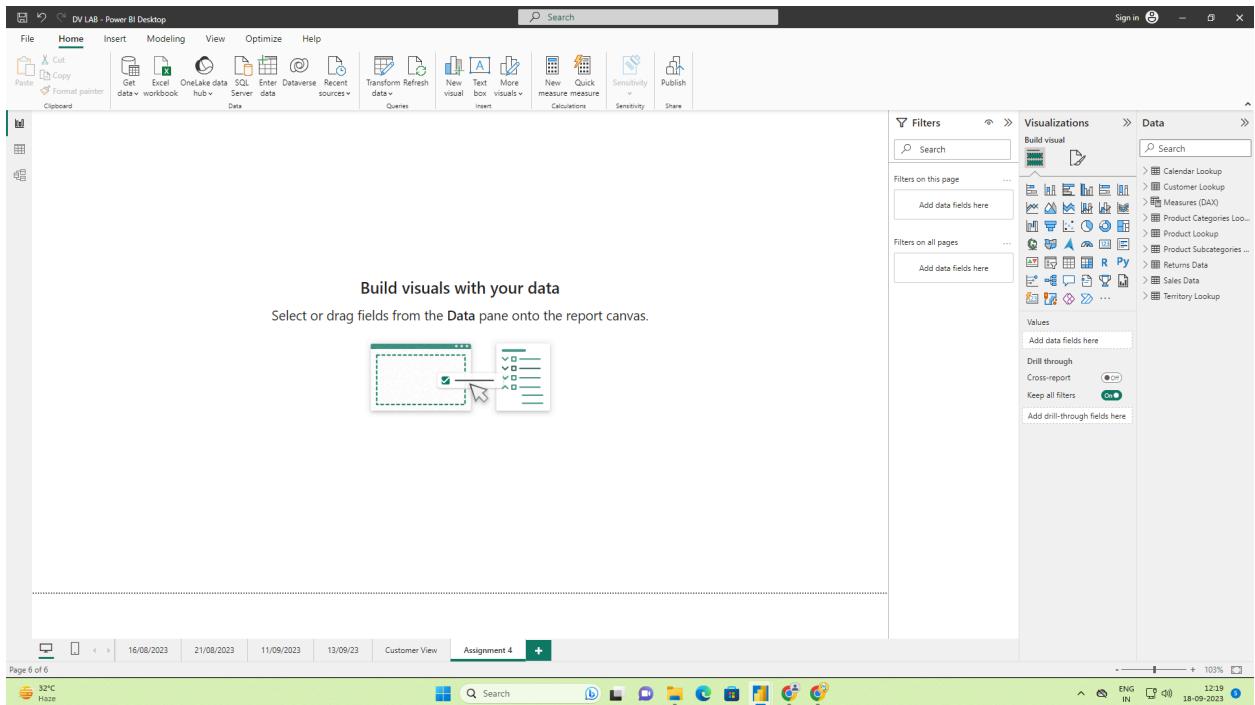


Fig.-Report tab of model

Creating Calculated Tables

To create a new table, navigate to the Data View tab on the left side of the screen, and then go to the Modeling option at the top of the screen.

Create a new table **Measures (DAX)** from Enter data

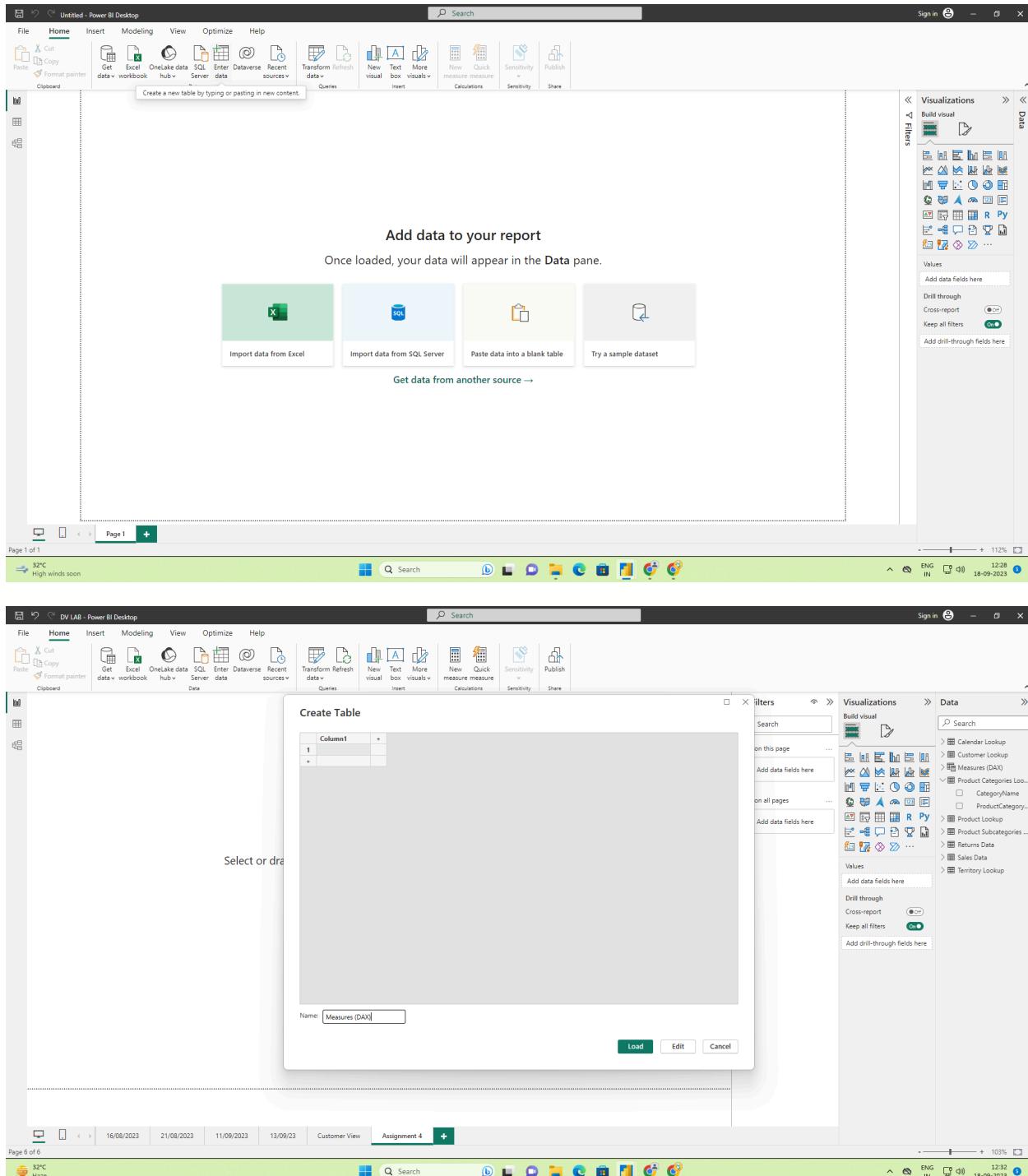


Fig.-Create a new table Measures (DAX)

Create a new measure

1. Total_Order

Total_Order = SUM('Sales Data'[OrderQuantity])

2. Bulk Orders

Bulk Orders = CALCULATE([Total_Order],
'Sales Data'[OrderQuantity]>1)

3. Red Sales

Red Sales = CALCULATE([Quantity Sold],'Product Lookup'[ProductColor] == "Red")

4. Quantities Sold

Quantities Sold = DISTINCTCOUNT('Sales Data'[ProductKey])

5. Week_End

Week_End = CALCULATE([Total_Order],'Calendar Lookup'[Day Name] == "Saturday")

6. Average product price

Average product price = AVERAGE('Product Lookup'[ProductPrice])

7. Over all Product price

Over all Product price = CALCULATE([Average product price],ALL ('ProductLookup'))

8. High Ticket Orders

High Ticket Orders = CALCULATE([Average product price],'Product
Lookup'[ProductPrice]>714.44)

or

High Ticket Orders (Filter) = CALCULATE(
[Average product price], FILTER('Product Lookup',
'Product Lookup'[ProductPrice]>[Over all Product price]))

9. Total Revenue

Total Revenue = SUMX('Sales Data','Sales
Data'[Retail_price]*'SalesData'[OrderQuantity])

or

Total Revenue (Relate) = SUMX('Sales Data',
RELATED('Product Lookup'[ProductPrice])*'Sales Data'[OrderQuantity])

10. Average Revenue per Customer

Average Revenue per Customer = DIVIDE([Total Revenue],[Total customer])

11. Total Cost

Total Cost = SUMX('Sales Data',
RELATED('Product Lookup'[ProductCost])*'Sales Data'[OrderQuantity])

12. Total Profit

Total Profit = [Total Revenue]-[Total Cost]

13. YTD Revenue

YTD Revenue = CALCULATE([Total Revenue],
DATESYTD('Calendar Lookup'[Date]))

14. Day Rolling Revenue

Day Rolling Revenue = CALCULATE([Total Revenue],
DATESINPERIOD('Calendar Lookup'[Date],MAX('Calendar Lookup'[Date]),-10,DAY))

15. Previous Month Revenue

Previous Month Revenue = CALCULATE([Total Revenue],
DATEADD('Calendar Lookup'[Date],-1,MONTH))

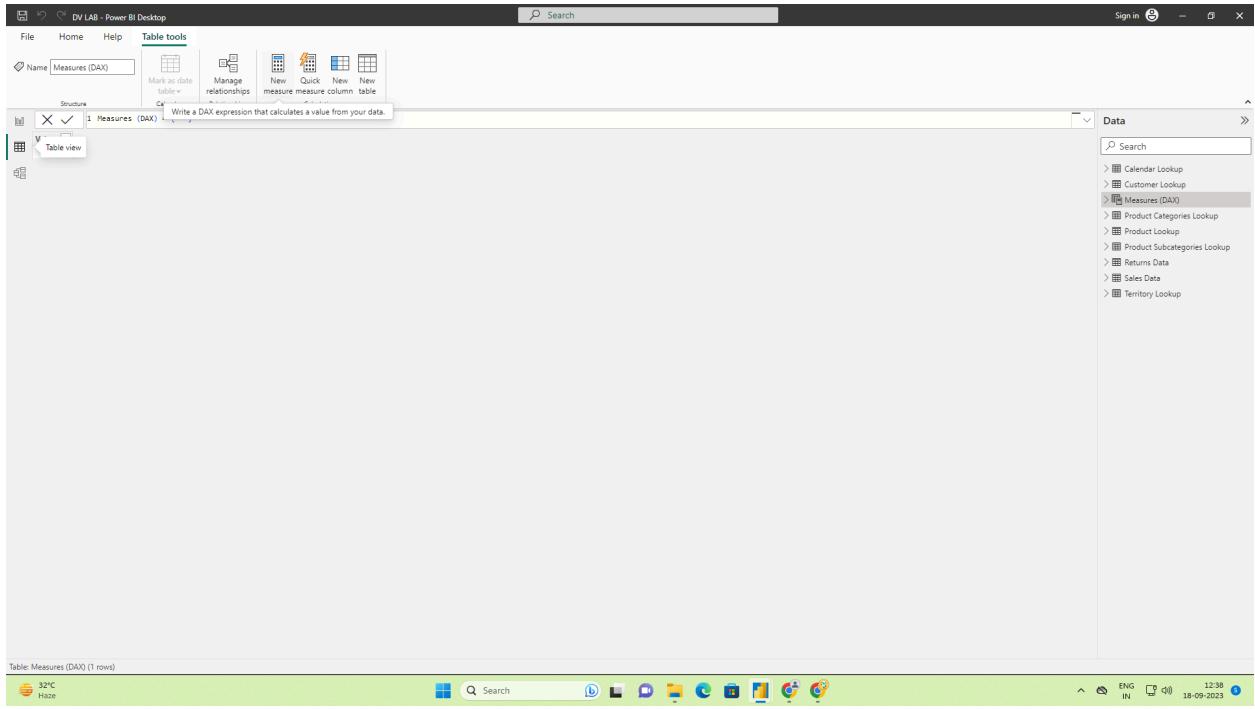


Fig.-Created Measures From Table Tool

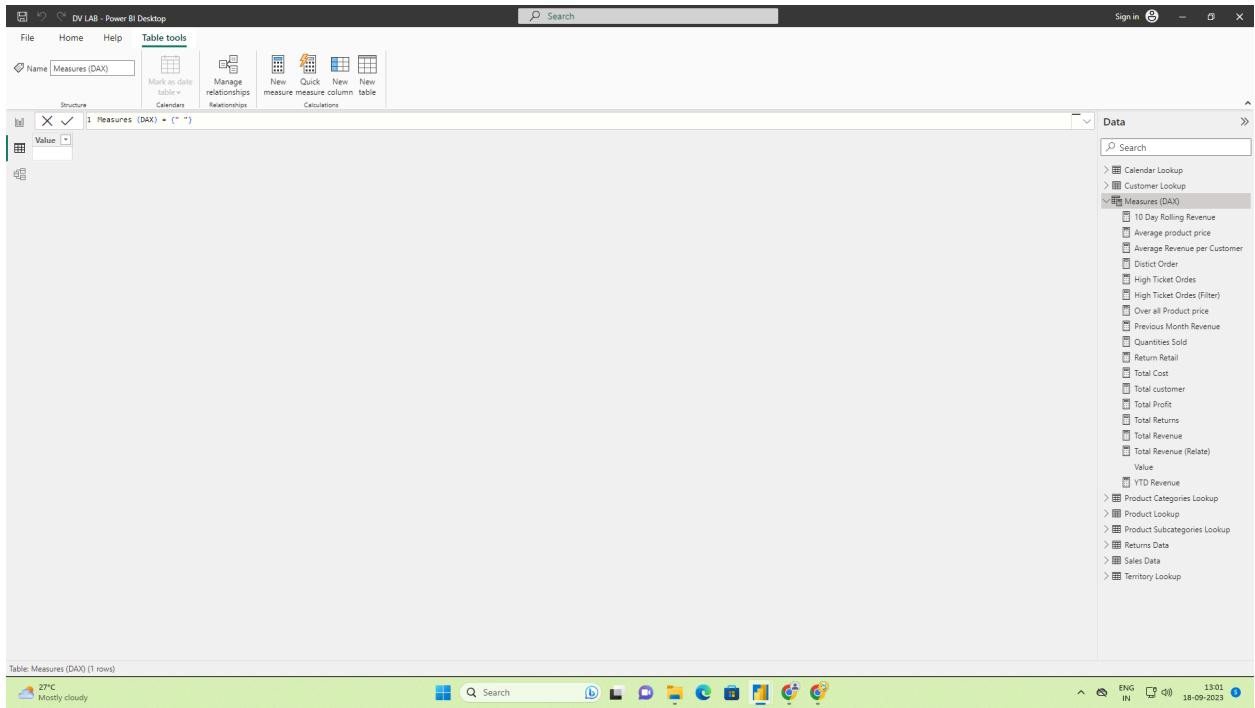


Fig.-Created Measures in Table Measures (DAX)

Matrix

The matrix visual is similar to a table. A table supports two dimensions and the data is flat, meaning duplicate values are displayed and not aggregated.

This screenshot shows a Power BI report titled "Customer View" with the page number 6 of 6. The main area displays a matrix visual with the following data:

CategoryName	Average product price	High Ticket Orders	Over all Product price	Total Revenue	Average Revenue per Customer
Accessories	34.26	59.68	₹ 714,4374	₹ 9,06,673.11	50.32
Clothing	432.19	\$1,191.43	₹ 714,4374	₹ 3,65,418.62	20.28
Components	1,541.38	\$1,879.44	₹ 714,4374	₹ 2,36,42,495.10	1,312.16
Total	714.44	\$1,689.89	₹ 714,4374	₹ 2,49,14,586.82	1,382.76

The Power BI interface includes a ribbon menu at the top, a data source pane on the left, and a visualizations pane on the right. The visualizations pane lists various measures and data items such as "10 Day Rolling Revenue", "Average Revenue per Customer", and "Product Categories Lookup".

This screenshot shows the same Power BI report with the matrix visual now including additional columns: Start of Month, Total Cost, and Total Profit. The data is as follows:

CategoryName	Average product price	High Ticket Orders	Over all Product price	Total Revenue	Average Revenue per Customer	Start of Month	Total Cost	Total Profit	YTD Revenue	10 Day Rolling Revenue	Previous Month Revenue
Accessories	34.26	59.68	₹ 714,4374	₹ 9,06,673.11	50.32	01 June 2022	10,55,409.84	7,71,577.29	91,85,449.45	6,16,273.84	17,68,432.51
Clothing	432.19	\$1,191.43	₹ 714,4374	₹ 3,65,418.62	20.28	01 May 2022	10,17,678.17	7,50,754.34	73,58,462.31	5,58,615.66	15,27,813.72
Components	1,541.38	\$1,879.44	₹ 714,4374	₹ 2,36,42,495.10	1,312.16	01 April 2022	8,83,987.16	6,43,826.56	55,90,029.81	5,51,374.93	14,48,596.12
Total	714.44	\$1,689.89	₹ 714,4374	₹ 2,49,14,586.82	1,382.76	01 December 2021	9,45,624.57	6,89,684.23	93,24,203.79	4,90,293.68	11,33,913.05
						01 February 2022	7,71,667.40	5,67,573.89	26,13,619.96	4,58,640.35	12,74,378.67
						01 March 2022	8,35,143.00	6,13,453.12	40,62,216.08	4,34,584.23	13,39,241.29
						Total	1,44,56,871.39	1,04,57,715.43	91,85,449.45	6,16,273.84	2,30,87,599.68

Fig.- Matrix for Measures (DAX) in Report tab

Add Image

In Power BI, you can insert an image directly into a report page, matrix, or slicer visual.

The screenshot shows the Power BI Desktop interface with a report titled "Customer View". On the left, there's a visual area containing a red warehouse icon with the word "WAREHOUSE" below it. To the right is a matrix table with columns for "High Ticket Orders", "Over all Product price", "Total Revenue", and "Average Revenue per Customer". The table contains data for various product categories like Accessories, Clothing, Components, and Bikes, along with a total row. The Power BI ribbon is visible at the top, and the Windows taskbar is at the bottom.

Add Shapes

We can add text boxes, shapes, and smart narrative visuals to reports in Power BI Desktop

This screenshot shows the same Power BI Desktop setup as above, but with four large, semi-transparent orange rounded rectangles overlaid on the warehouse image. These shapes are part of a "Smart Narrative" visualization, which is currently selected in the ribbon. The matrix table and other interface elements remain the same.

Fig.- Add Shapes in Report tab

Card

A card is a type of visual element in Power BI that displays a single value or metric.

Create Card for
Total Customer,
Total Cost,
Total Profit,
Total Revenue

The screenshot shows the Power BI Desktop interface with a report tab open. On the left, there's a navigation bar with 'File', 'Home', 'Insert', 'Modeling', 'View', 'Optimize', 'Help', 'Format', 'Data / Drill', and a search bar. The 'Insert' tab is selected. The main area features a warehouse-themed background image. On the left side of the image, four orange rounded rectangular cards display the following metrics:

- 18K Total customer
- 14.46M Total Cost
- 10.46M Total Profit
- ₹ 24.91M Total Revenue

Below these cards is a table titled 'Warehouse Data' with columns: CategoryName, Average product price, High Ticket Orders, Over all Product price, Total Revenue, and Average Revenue per Customer. The data includes categories like Components, Clothing, Bikes, Accessories, and a total row. To the right of the cards is another table titled 'Start of Month' with columns: Start of Month, Total Cost, Total Profit, YTD Revenue, 10 Day Rolling Revenue, and Previous Month Revenue. This table shows monthly data from January 2020 to June 2020. The bottom right corner of the interface shows a sidebar with 'Visualizations' and 'Data' sections, along with various filters and settings.

Fig.- Add Cards in Report tab

Create Group

To create a group of visuals in Power BI Desktop, select the first visual from the canvas, then holding the CTRL button, click one or more additional visuals that you want in the group.

Create Group of all Shapes Rename as Background

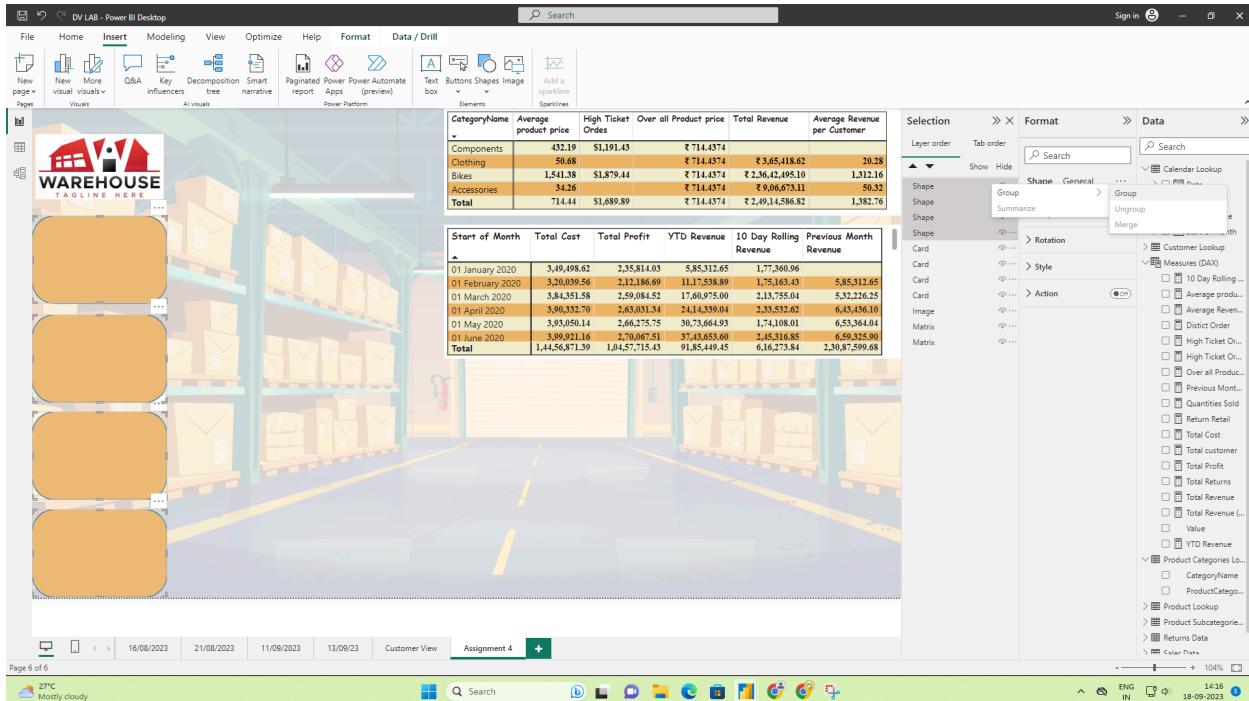


Fig.- Create Group Of Shape in Report tab
and Create Group of All cards and rename as Value

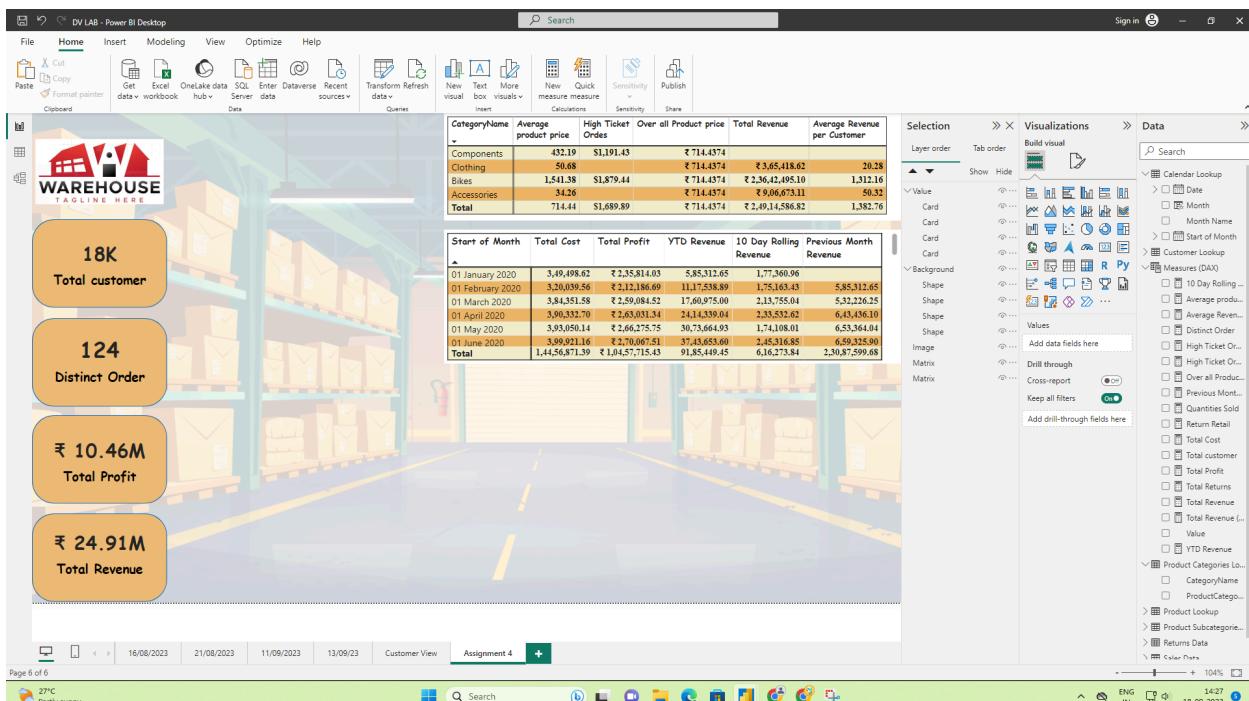


Fig.- Create Group Of Cards in Report tab

Report Metrics:

- 18K Total customer
- 124 Distinct Order
- ₹ 10.46M Total Profit
- ₹ 24.91M Total Revenue

Table Data:

Start of Month	Total Cost	Total Profit	YTD Revenue	10 Day Rolling Revenue	Previous Month Revenue
01 January 2020	₹ 3,49,498.62	₹ 2,35,814.03	₹ 5,85,312.65	₹ 1,7,369.96	
01 February 2020	₹ 3,20,039.56	₹ 2,12,186.69	₹ 11,75,538.89	₹ 1,7,51,63.43	₹ 5,85,312.65
01 March 2020	₹ 3,84,515.58	₹ 2,59,084.52	₹ 17,60,975.00	₹ 2,13,755.04	₹ 5,32,226.25
01 April 2020	₹ 3,90,332.70	₹ 2,63,031.34	₹ 24,14,339.04	₹ 2,33,532.62	₹ 6,43,436.10
01 May 2020	₹ 3,93,650.14	₹ 2,66,275.75	₹ 30,73,664.93	₹ 1,7,41,08.01	₹ 6,53,364.04
01 June 2020	₹ 3,99,921.16	₹ 2,70,067.51	₹ 37,43,633.60	₹ 2,45,116.85	₹ 6,59,325.90
Total	₹ 14,44,56,871.39	₹ 1,04,57,715.43	₹ 91,85,449.45	₹ 6,16,273.84	₹ 20,87,599.68

Fig.- Create Group Of Cards And Shape in Report tab

Slicer

Slicers are another way of filtering. They're displayed on the report page, and narrow the portion of the dataset that's shown in the other report visualizations.

Create Slicer With Product Category

Slicer Options:

- Accessories
- Clothing
- Bikes
- Components

Report Metrics:

- 18K Total customer
- 124 Distinct Order
- ₹ 10.46M Total Profit
- ₹ 24.91M Total Revenue

Table Data:

Start of Month	Total Cost	Total Profit	YTD Revenue	10 Day Rolling Revenue	Previous Month Revenue
01 January 2020	₹ 3,49,498.62	₹ 2,35,814.03	₹ 5,85,312.65	₹ 1,7,369.96	
01 February 2020	₹ 3,20,039.56	₹ 2,12,186.69	₹ 11,75,538.89	₹ 1,7,51,63.43	₹ 5,85,312.65
01 March 2020	₹ 3,84,515.58	₹ 2,59,084.52	₹ 17,60,975.00	₹ 2,13,755.04	₹ 5,32,226.25
01 April 2020	₹ 3,90,332.70	₹ 2,63,031.34	₹ 24,14,339.04	₹ 2,33,532.62	₹ 6,43,436.10
01 May 2020	₹ 3,93,650.14	₹ 2,66,275.75	₹ 30,73,664.93	₹ 1,7,41,08.01	₹ 6,53,364.04
01 June 2020	₹ 3,99,921.16	₹ 2,70,067.51	₹ 37,43,633.60	₹ 2,45,116.85	₹ 6,59,325.90
Total	₹ 14,44,56,871.39	₹ 1,04,57,715.43	₹ 91,85,449.45	₹ 6,16,273.84	₹ 20,87,599.68

Fig.-Slicer of Product_Category in Report tab

Line And Stacked Column Chart

The Line and Stacked Column Chart is a combo chart that combines the Line chart and Column chart together in one visual. By combining these two visuals together, we can make a very quick comparison between two sets of measures. The main benefit of this type of chart is that you can have one or two Y axes.

Create Line and Stacked Column Chart

Start of month (X axis),
 Total Revenue (Column Y axis),
 Total Profit (Line Y axis).

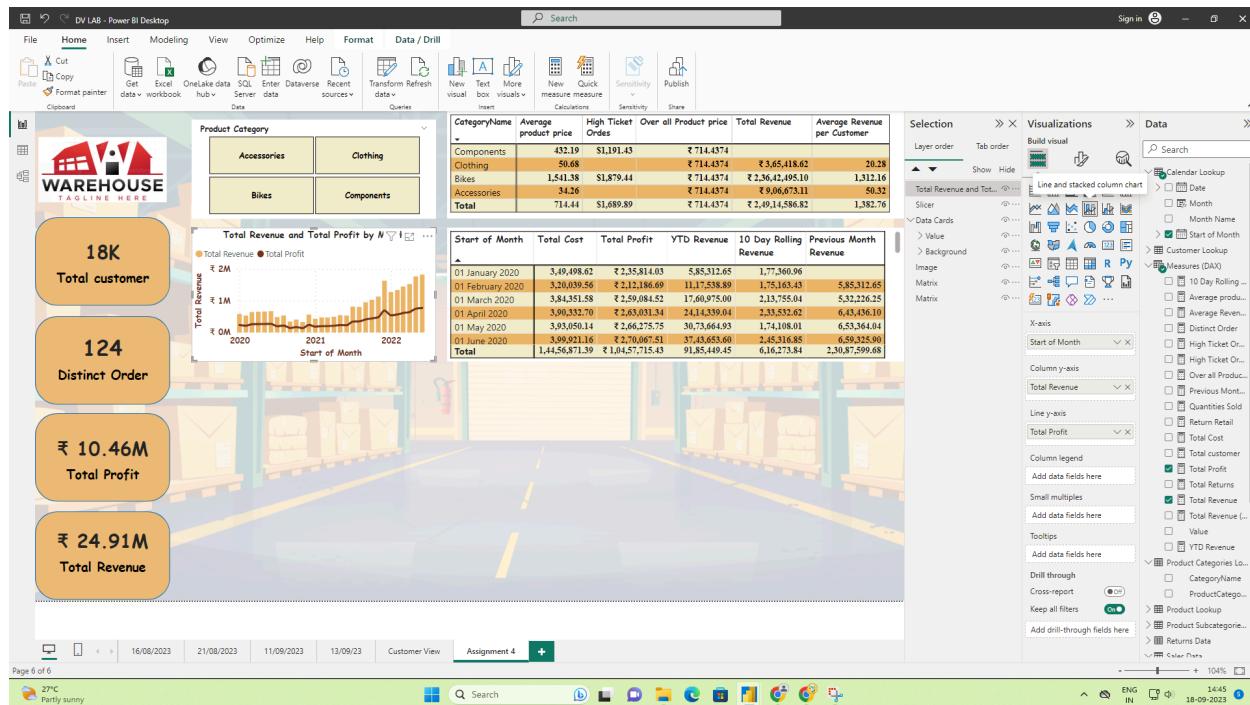


Fig.-Line And Stacked Column Chart in Report tab

Pie Chart

Pie Chart in Power BI. Pie Chart in Power BI is a built-in visualization chart available with all versions of Power BI. The pie chart is a round-shaped circle chart where each category data set is shown in a pie shape based on the value of each data label.

Create pie chart with Total Profit By SubcategoryName

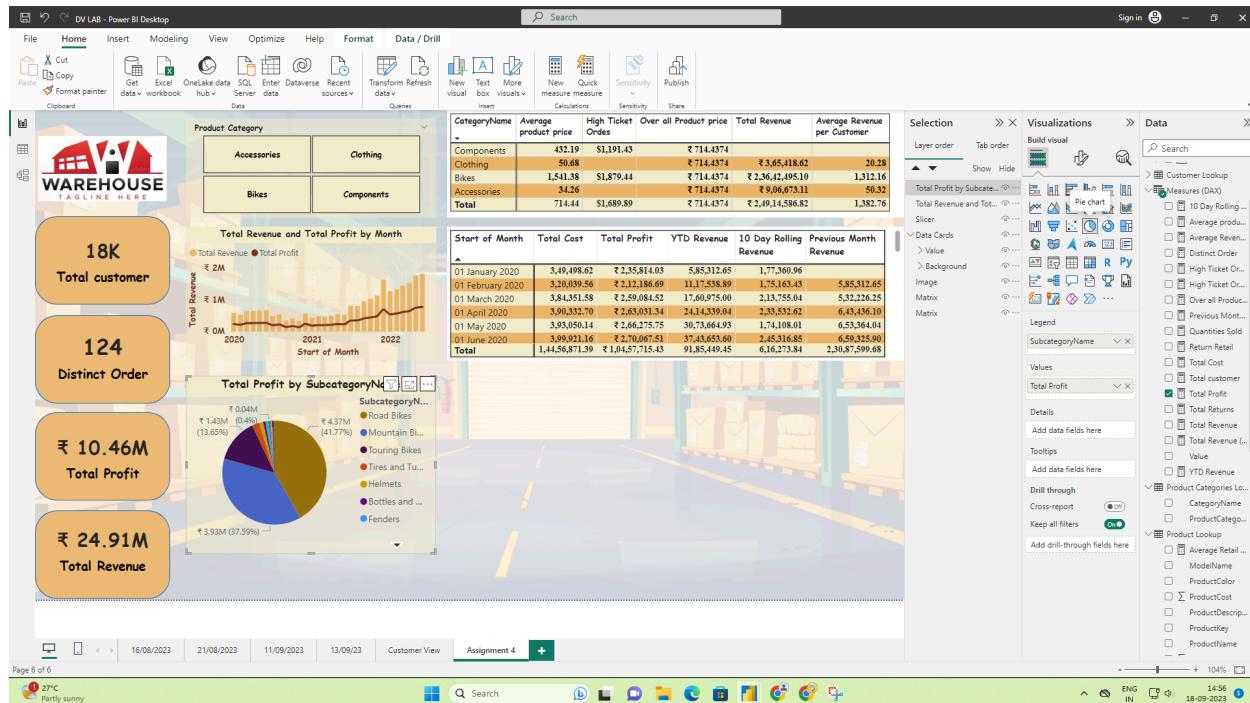


Fig.-Line And Stacked Column Chart in Report tab

Map Visualisations

The map is a kind of vision part of Power BI visualization software.

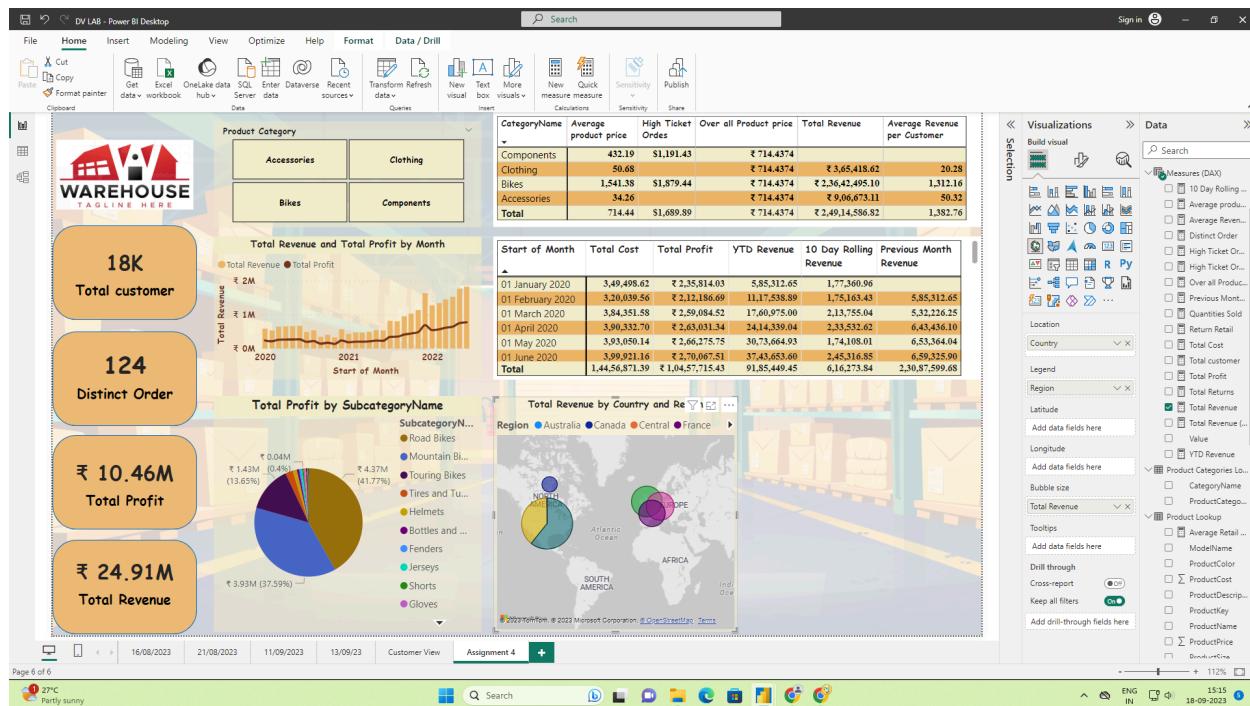


Fig.-Bubble maps

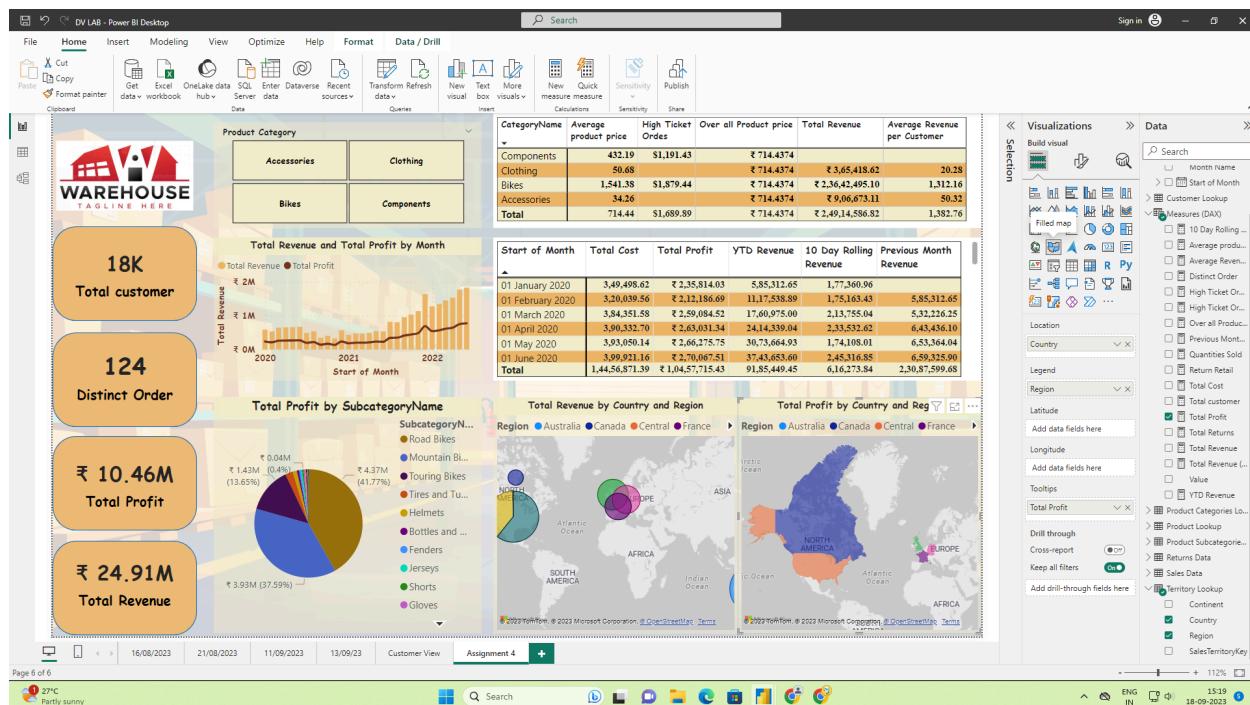


Fig.-Shape maps

Treemaps

Treemaps display hierarchical data as a set of nested rectangles. Each level of the hierarchy is represented by a colored rectangle called a branch node. Each branch contains smaller rectangles called leaf nodes. Power BI uses the measure value to determine the rectangle size for branches and leaves.

Create Treemaps with Return Retail By SubcategoryName

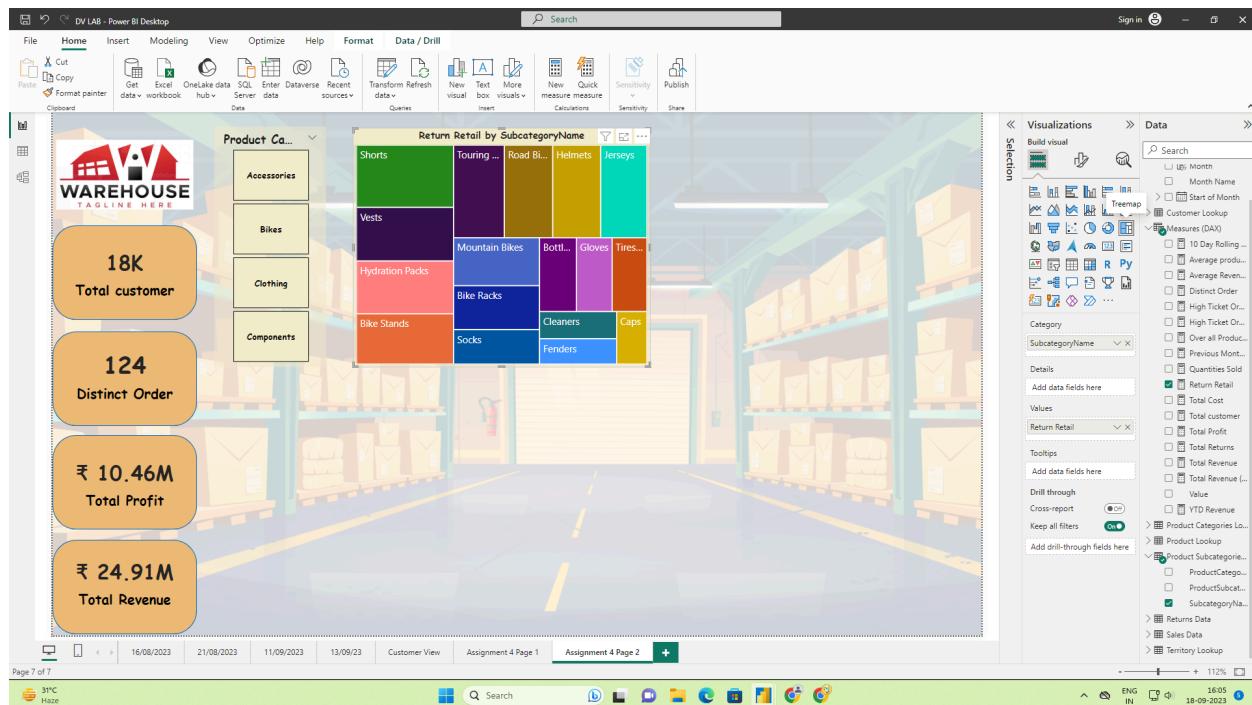


Fig.-Treemaps of Return by subcategories

Funnel chart

A funnel chart helps you visualize a linear process that has sequential, connected stages. A common use for a funnel chart is to track sales customers through stages.

Create Funnel chart with Total Return By SubcatagoryName

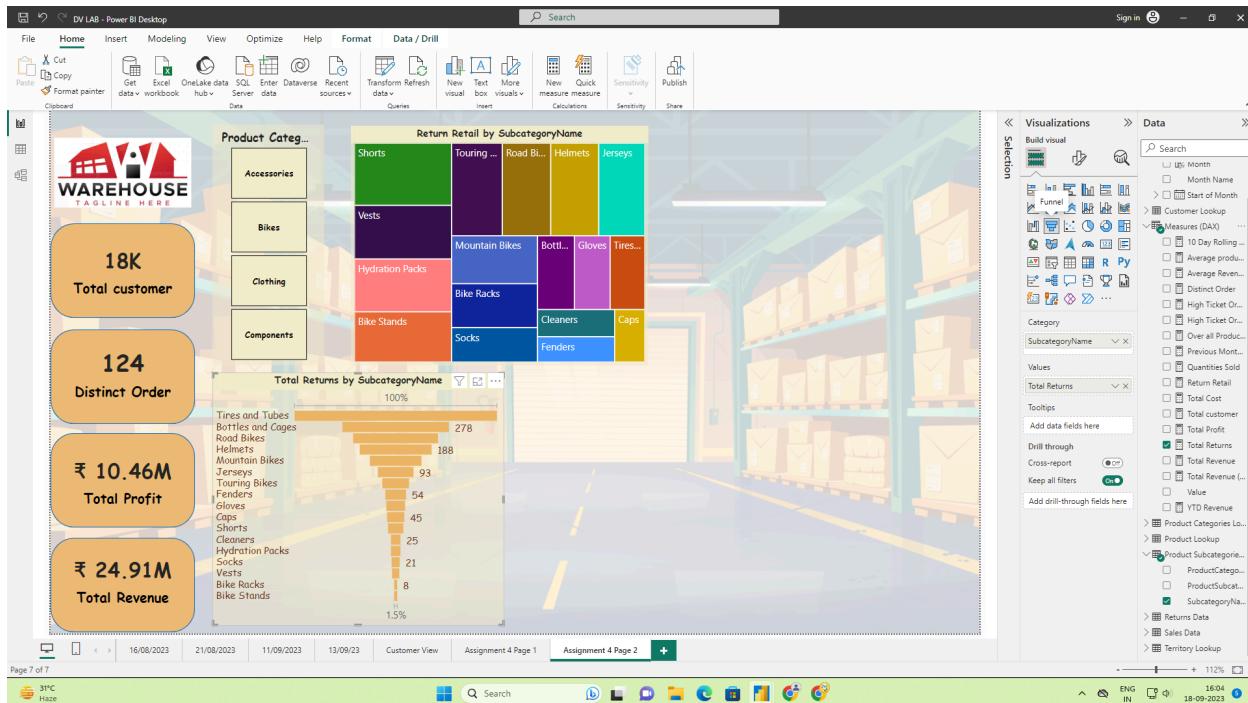


Fig.-Funnel chart of Total Return By SubcatagoryName

Waterfall Chart

Waterfall charts show a running total as Power BI adds and subtracts values. These charts are useful for understanding how an initial value (like net income) is affected by a series of positive and negative changes.

Create Waterfall chart with Sum of OrderQuantity By Month Name

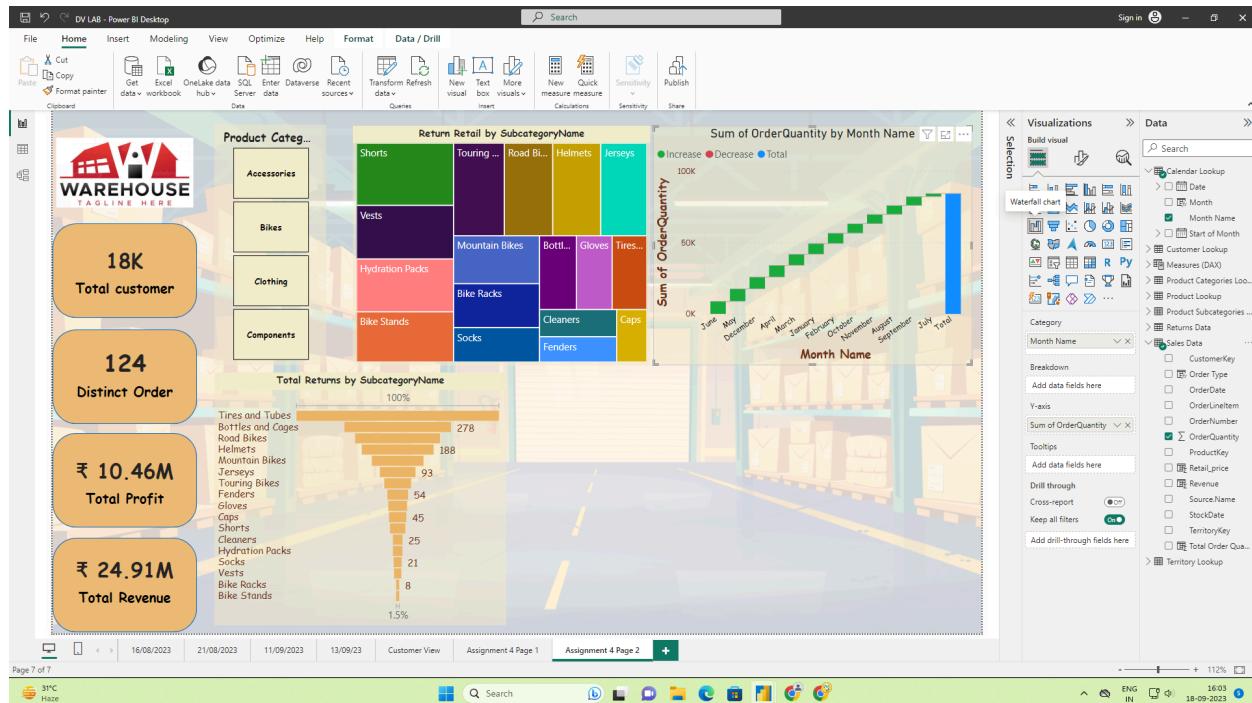


Fig.-Waterfall chart of Sum of OrderQuantity By Month Name

Scatter Chart

Scatter charts display data along a horizontal (x) and vertical (y) axis. The chart reveals how numerical values along the two axes are related. When data intersects on the two axes, Power BI displays a data point.

Create Scatter charts with Sum of Annual Income and Sum of Total Children by Education Level and Occupation

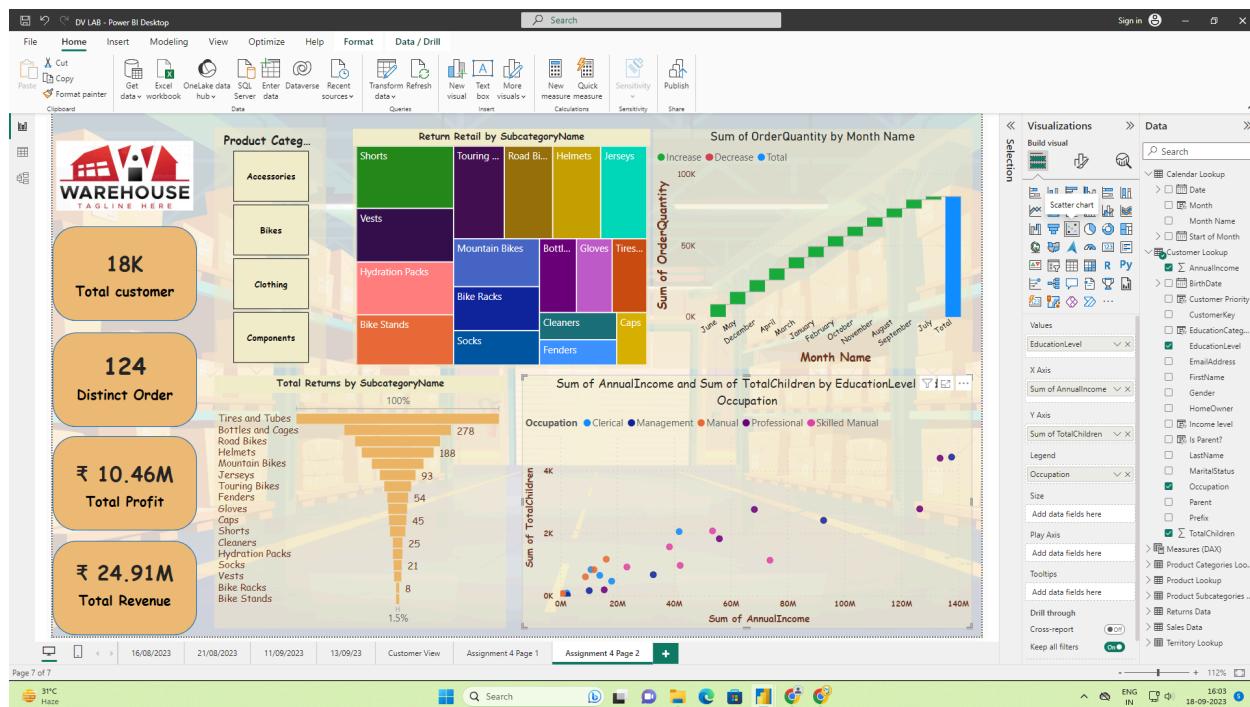


Fig.-Scatter charts of Sum of Annual Income and Sum of Total Children by Education Level and Occupation

Report tab of Accessories Product Category

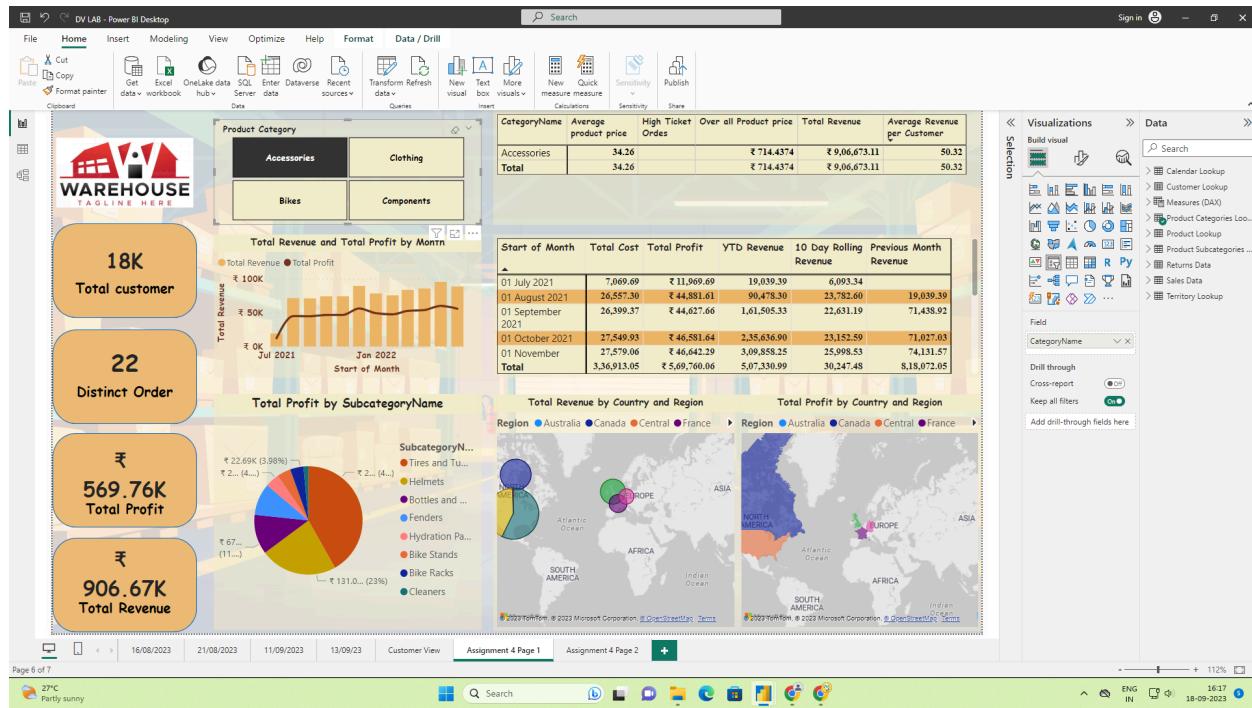
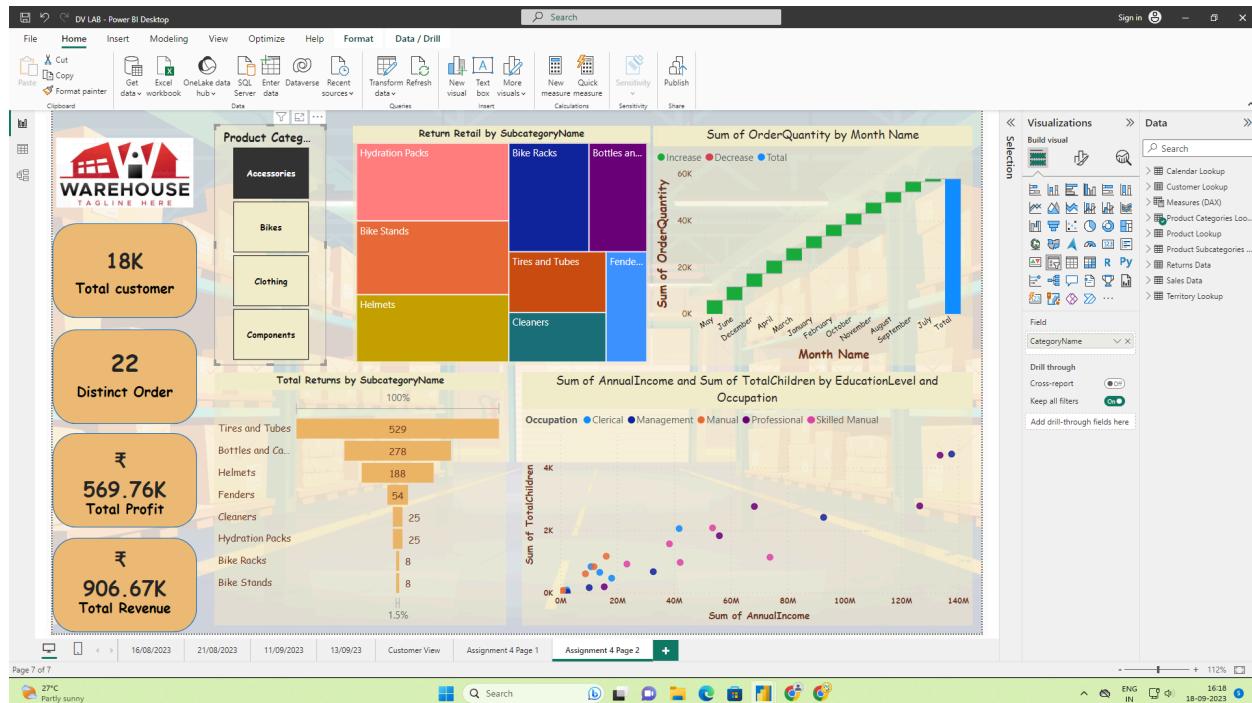


Fig.-Report tab of Accessories Product Category



Report tab of Clothing Product Category

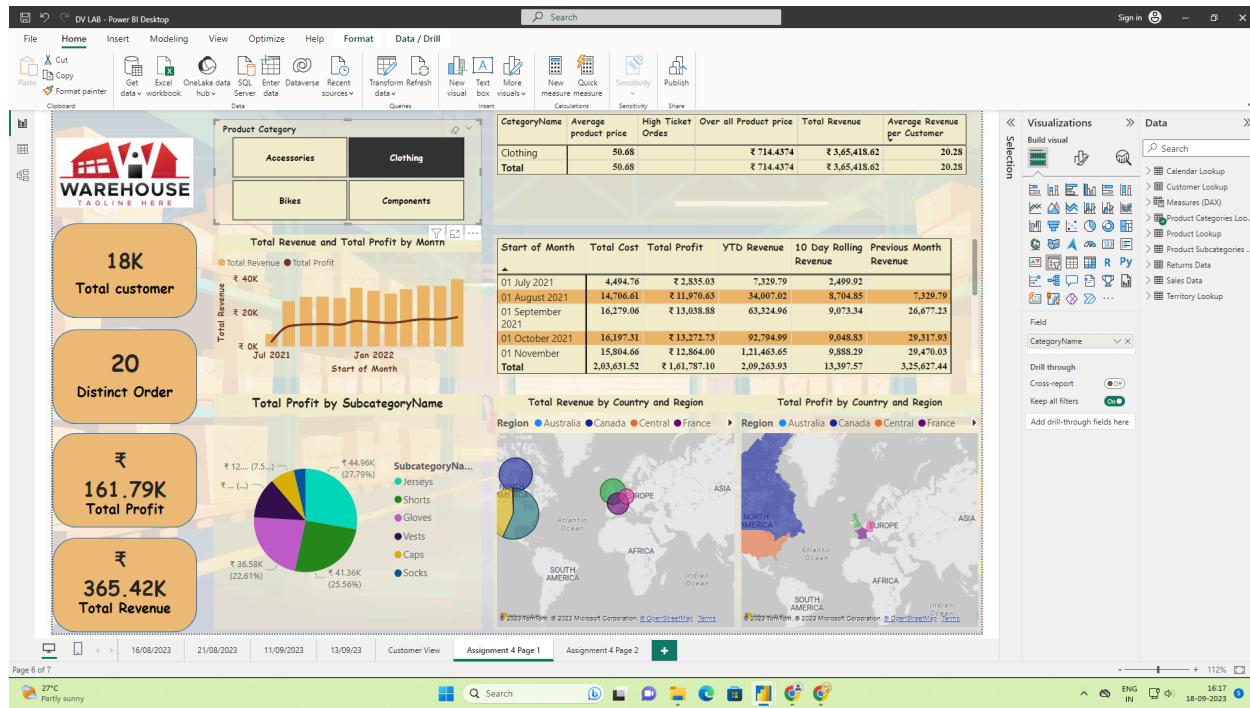
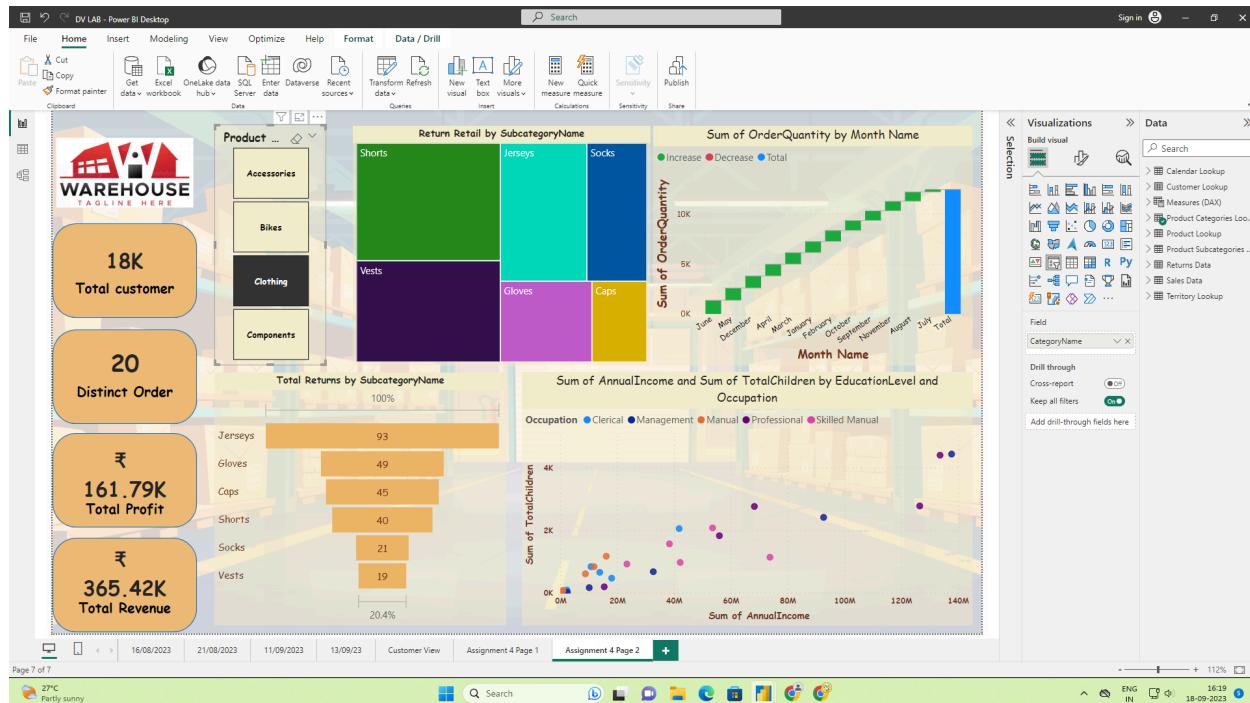


Fig.-Report tab of Clothing Product Category



Report tab of Bikes Product Category

The screenshot shows the Power BI Desktop application with the 'Report' tab selected. The interface includes a ribbon with Home, Insert, Modeling, View, Optimize, Help, Format, Data / Drill, and a search bar. On the left is a 'Coboard' pane with a warehouse logo and four summary cards. The main area contains several visualizations: a treemap of product categories (Accessories, Bikes, Clothing, Components), a bar chart of total revenue and profit by month, a pie chart of total profit by subcategory name (Road Bikes, Mountain Bikes, Touring Bikes), and two maps showing total revenue and profit by country and region. The right side features a 'Visualizations' pane with a list of available data sources and a 'Data' pane.

Fig.-Report tab of Bikes Product Category

This screenshot shows the same Power BI Desktop interface as the previous one, but with a different set of visualizations in the main report area. It includes a treemap for 'Return Retail by SubcategoryName' (Touring Bikes, Mountain Bikes, Road Bikes) and a scatter plot for 'Sum of OrderQuantity by Month Name' over time. Below these are two other charts: 'Sum of AnnualIncome and Sum of TotalChildren by EducationLevel and Occupation' and a bubble chart. The right-hand panes (Visualizations and Data) remain the same.

Report tab of Components Product Category

Fig.-Report tab of Components Product Category