Data Visualization Tools and Software

Aim: To create a dashboard in PowerBI for grocery store dataset.

Task:

1. Introduction to Data Modelling
2. Import Sample Data
3. Configure table and column properties
4. Create calculated columns and tables
5. Create quick measures.

a. Use DAX(Data Analysis Expression) for creating various expressions and filters

b. Optimize data models

4. Create Visualization

What is data modeling?

Data modeling is the process of analyzing and defining all the different data types your business collects and produces, as well as the relationships between those bits of data. By using text, symbols, and diagrams, data modeling concepts create visual representations of data as it's captured, stored, and used at your business. As your business determines how data is used and when, the data modeling process becomes an exercise in understanding and clarifying your data requirements.

The benefits of data modeling

By modeling your data, you can document what types of data you have, how you use it, and the data management requirements surrounding its usage, protection, and governance. The benefits of data modeling include:

- Creating a structure for collaboration between your IT and business teams.
- Revealing opportunities for improving business processes by defining data needs and uses.
- Saving time and money on IT and process investments through appropriate planning.
- Reducing errors (and error-prone redundant data entry) while improving data integrity.
- Increasing the speed and performance of data retrieval and analytics by planning for capacity and growth.
- Setting and tracking target key performance indicators tailored to your business objectives.
  it's not just about the results of data modeling, but how you get those results.

  Data modeling concept examples

  Now that you know what data modeling is and why it's important, let's look at the three different types of data modeling concepts as examples.

  1. **Conceptual data modeling**

  A conceptual data model defines the overall structure of your business and data. Used for organizing business concepts, your conceptual data model is defined by your business stakeholders and data engineers or architects. For instance, you may have customer, employee, and product data and each data bucket, known as entities, has relationships with other entities. Both the entities and the entity relationships are defined within your conceptual data model.

2. **Logical data modeling**

A logical data model builds upon the conceptual data model with specific attributes of data within each entity and the relationships between those attributes. For instance, Customer A buys Product B from Sales Associate C. This is your technical model of the rules and data structures as defined by data engineers, architects, and business analysts, helping drive decisions about what physical model your data and business require.

3. **Physical data modeling**

A physical data model is your specific implementation of the logical data model created by database administrators and developers. It is developed for a specific database tool and data storage technology, and with data connectors to serve the data throughout your business systems to users as needed. This is the "thing" the other models have been leading to—the actual implementation of your data estate.

Core modeling features

- Support for different types of data models
- Custom field creation with defined attributes
- User-defined relationships for constraints and entities
- Model subsets and model validation
- Atomic data elements definition
- Business vocabulary definition
- New model development from existing models
- Collaboration features

Usability features

- Object query
- Import and export capabilities
- Management of windows, toolbars and menus
- Easy-to-use graphical interface
- Diagram auto-layout
- Query creation with ordering, grouping, filters and joins

Create data

To create a data model in Power BI, you need to add all data sources in Power BI new report option. To add a data source, go to the Get data option.

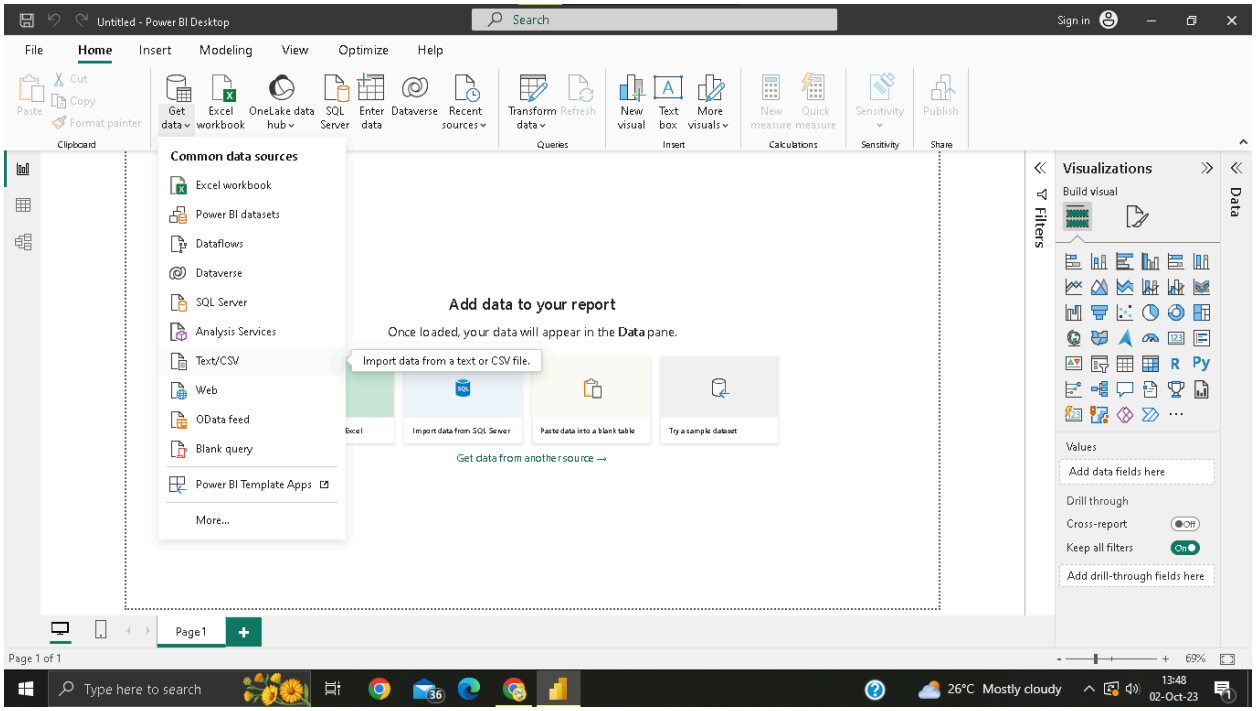


Fig.- Add all data sources in Power BI

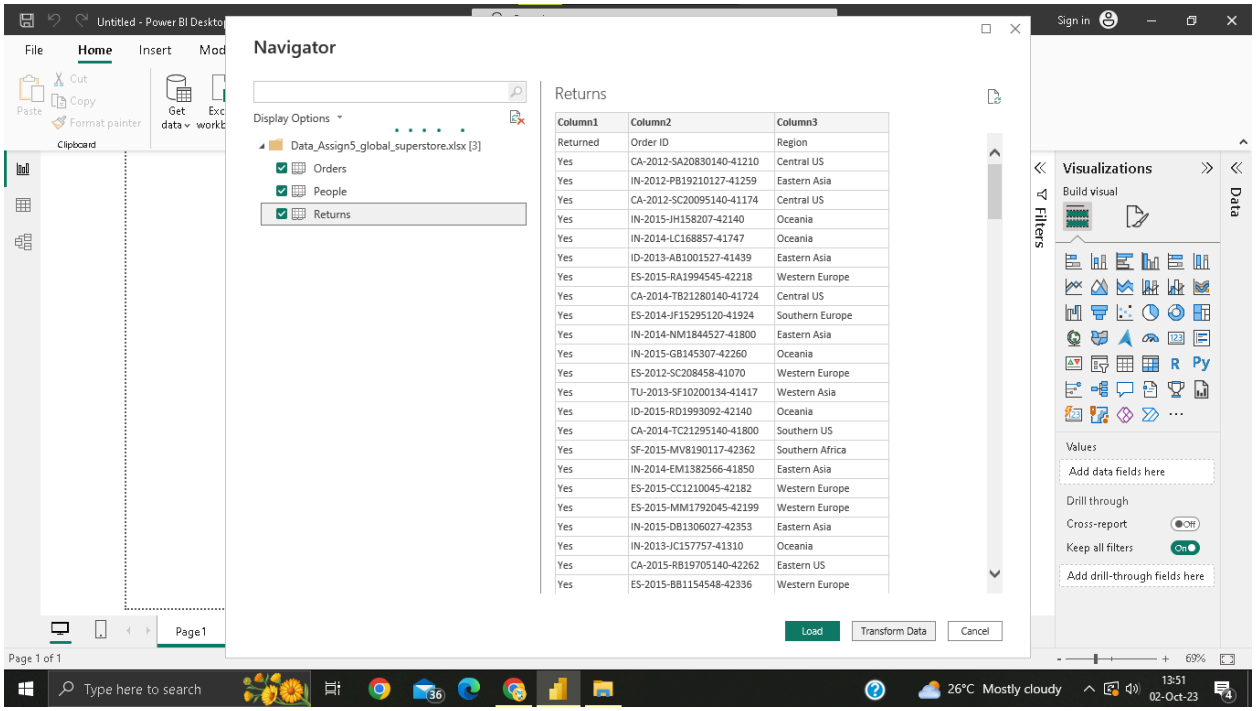


Fig.- Importing data from a CSV file

Remove Empty

When you have blank values in your data table, you can use Power Query transformations to remove the row with blank values.

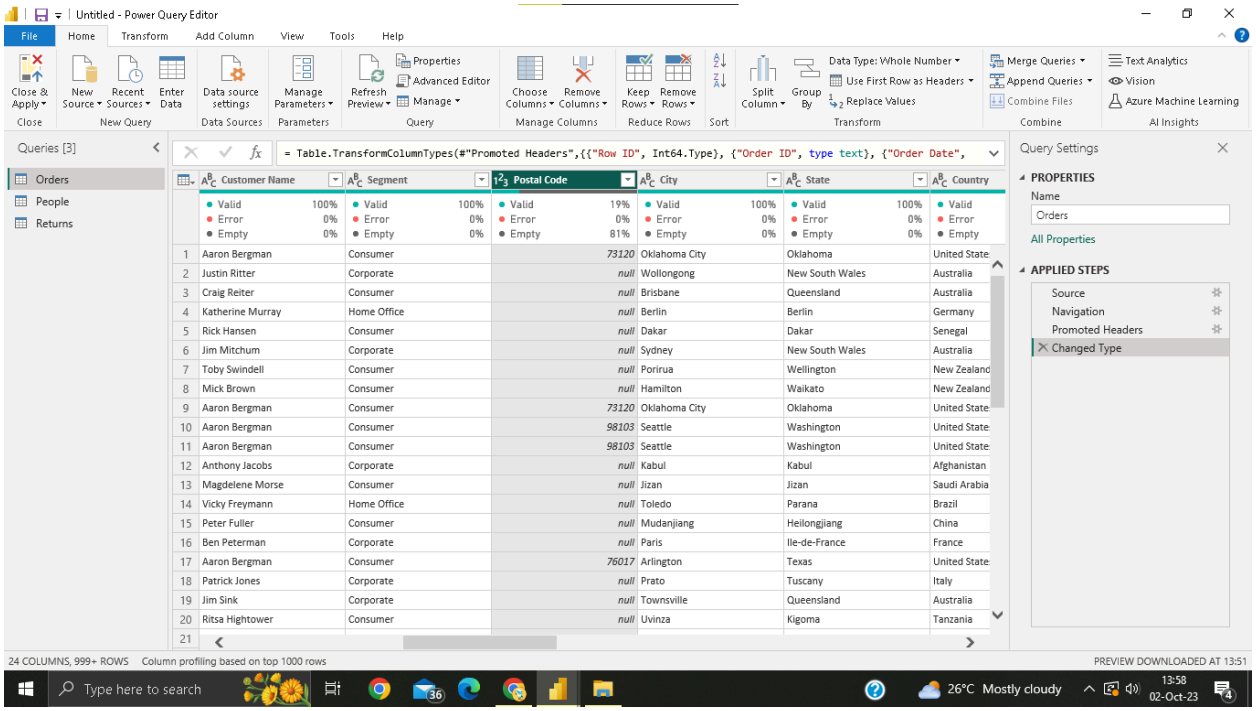


Fig.-Postal code column with empty rows

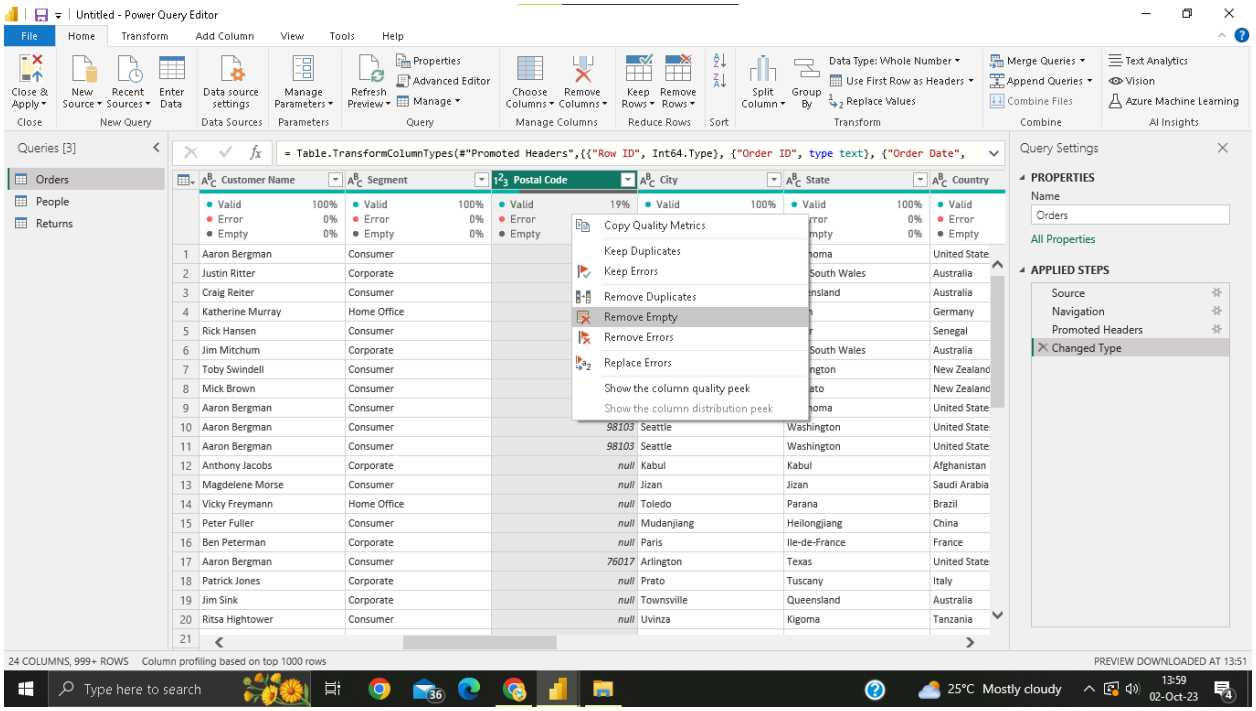


Fig.-Remove empty rows from postal code column

Use Headers as First Row

To promote the first row to column headers, select Home > Use First Row As Headers.

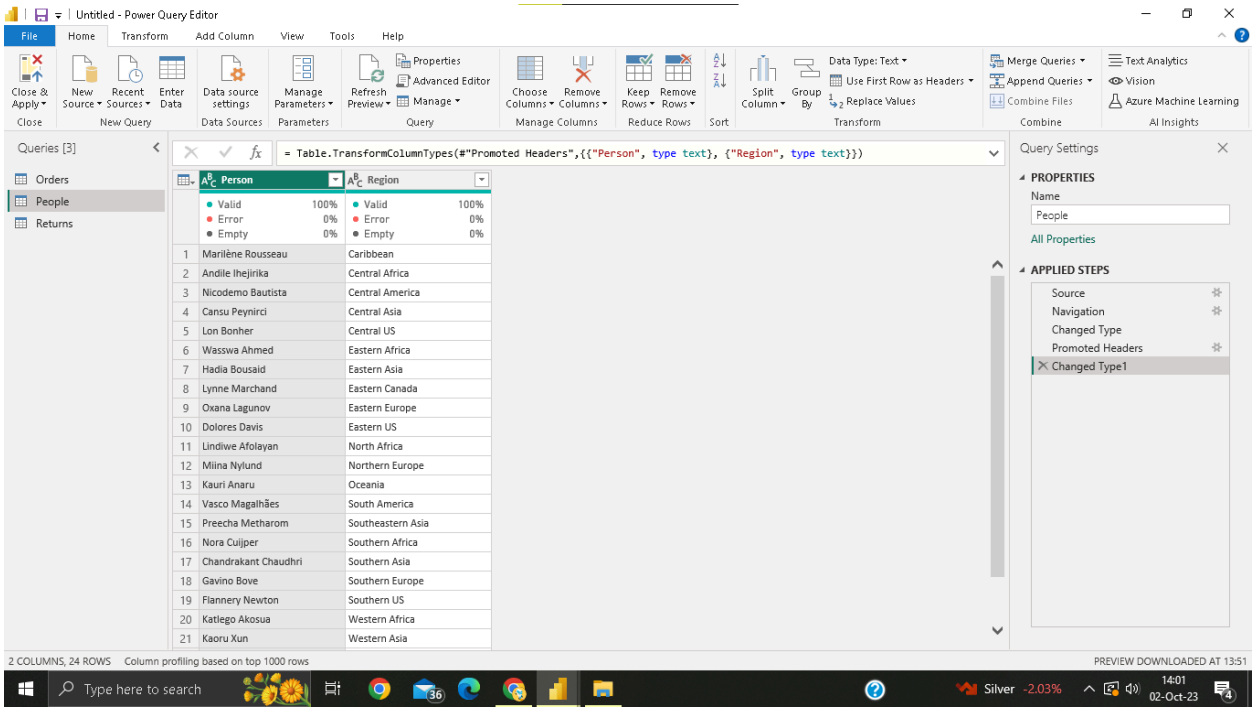


Fig.-Use First Row As Headers in People Table

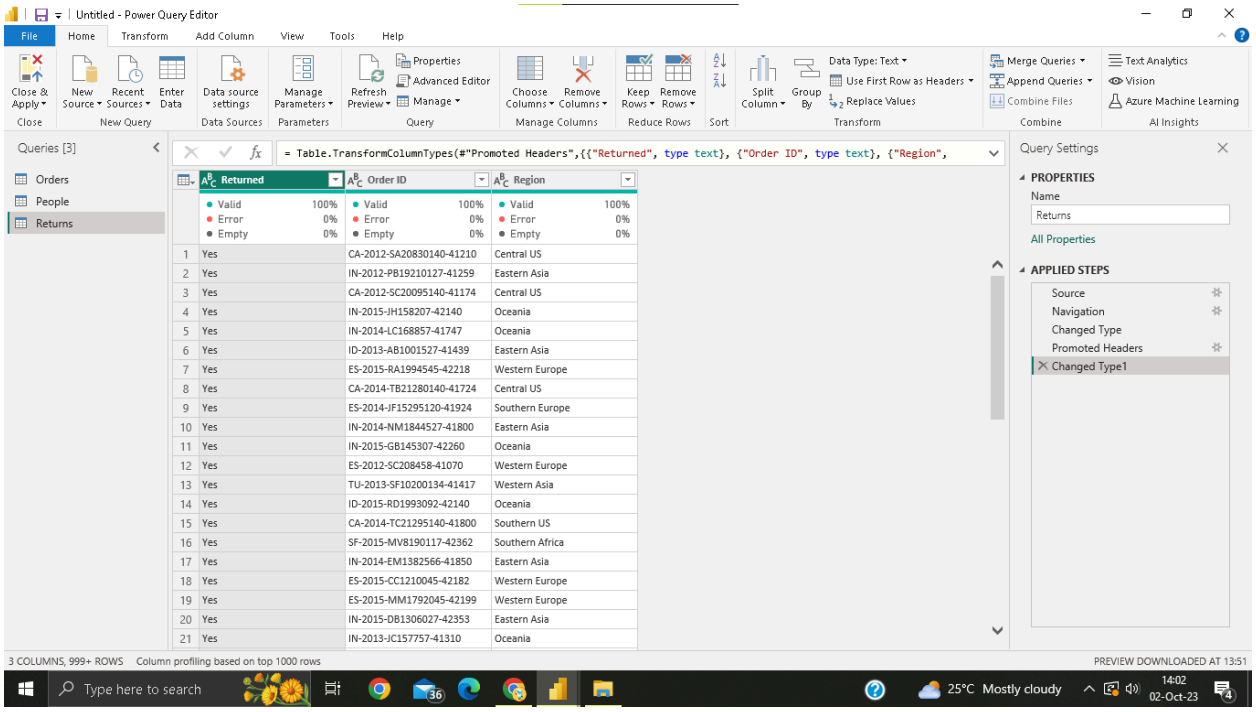


Fig.-Use First Row As Headers in Returns Table

Column Quality

Shows the percentage of rows within a column that are valid, empty, or errors.

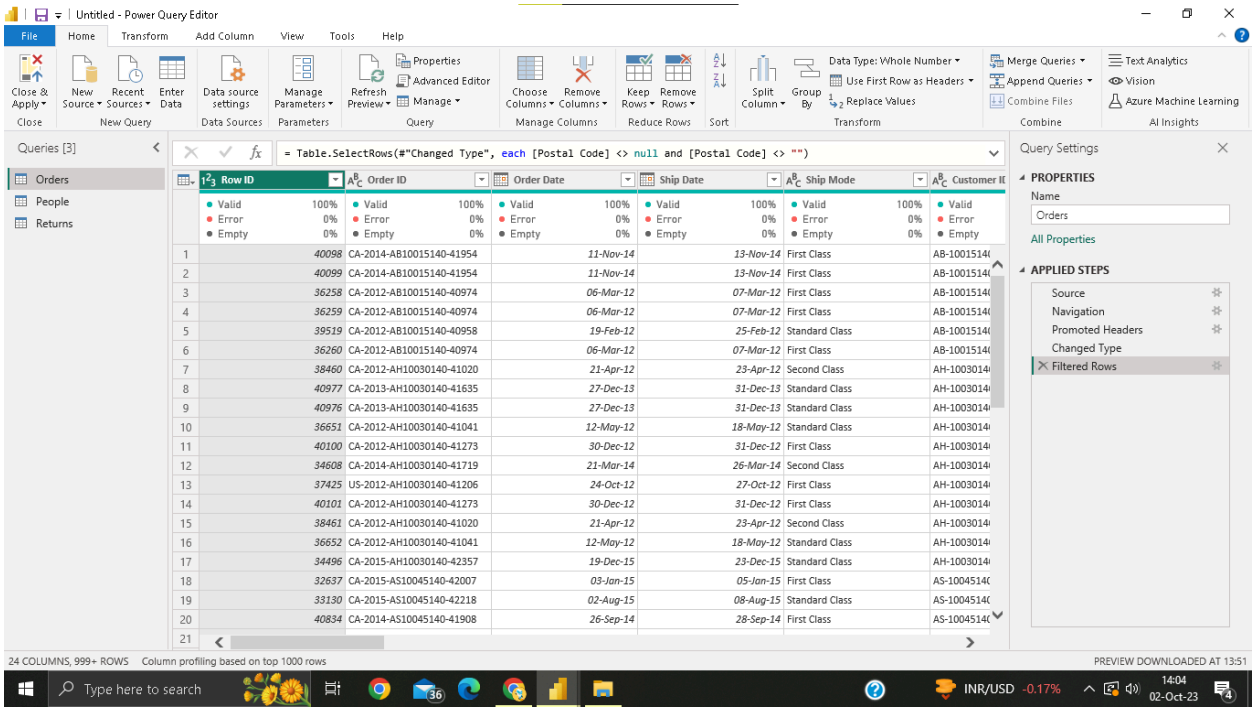


Fig.-Column quality details of Orders Table

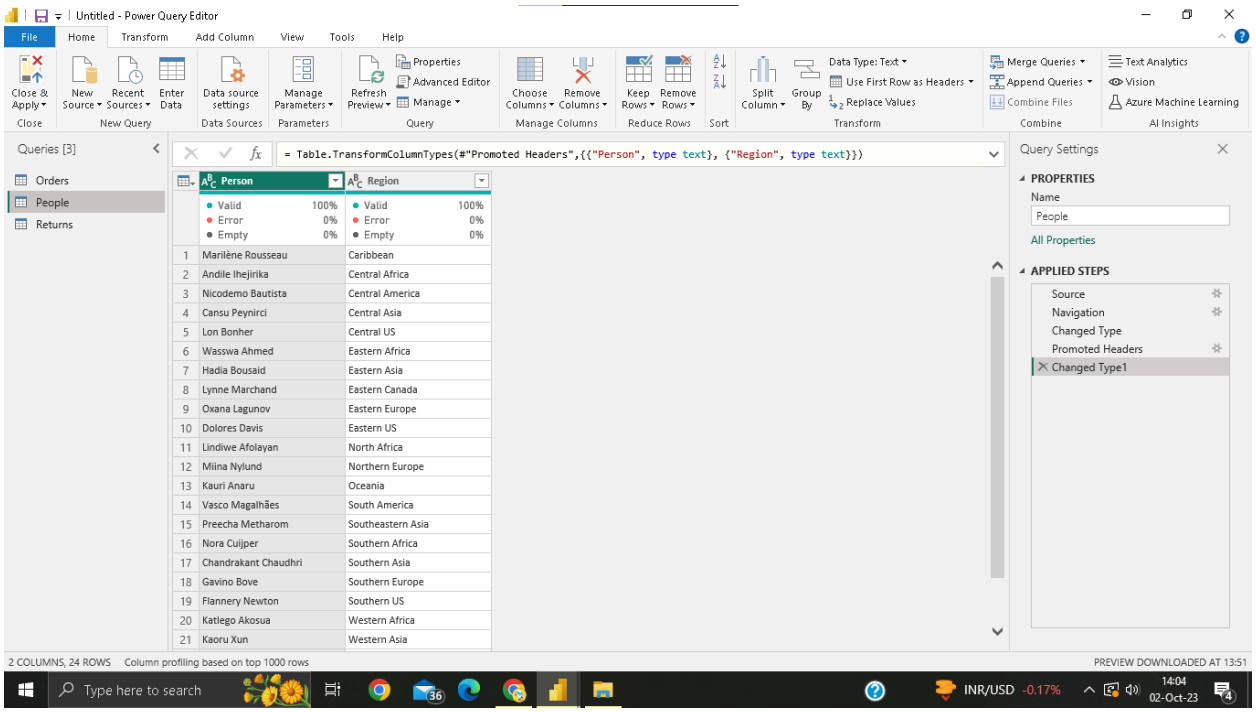


Fig.-Column quality details of People Table

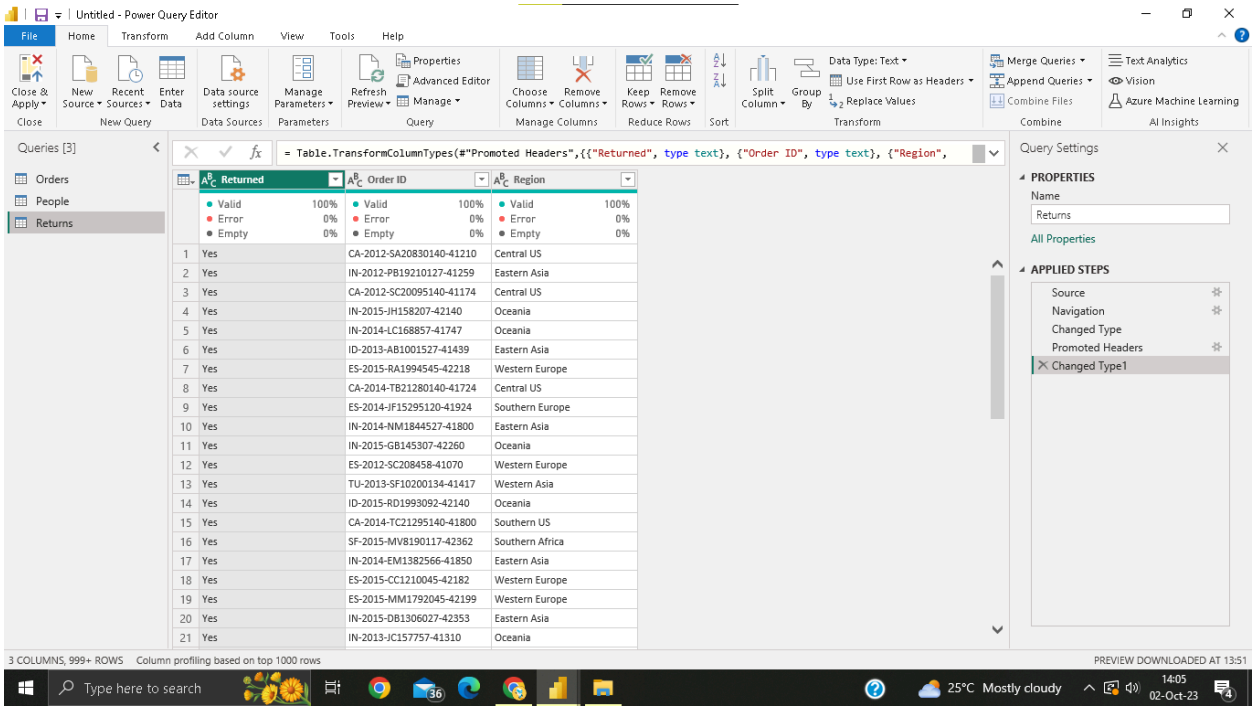


Fig.-Column quality details of Returns Table

Save your work

When our query is where we want , select Close & Apply from Power Query Editor's File menu. This action applies the changes and closes the editor.

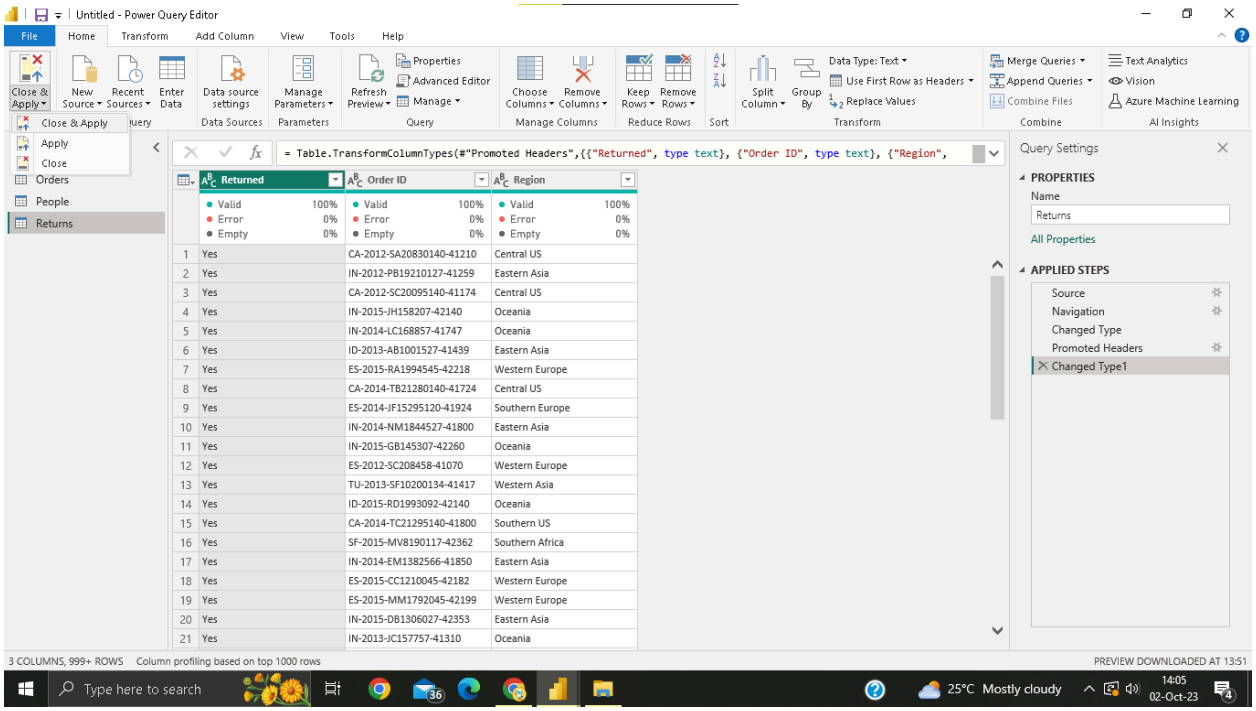


Fig.-Save and Close the Power Query editor

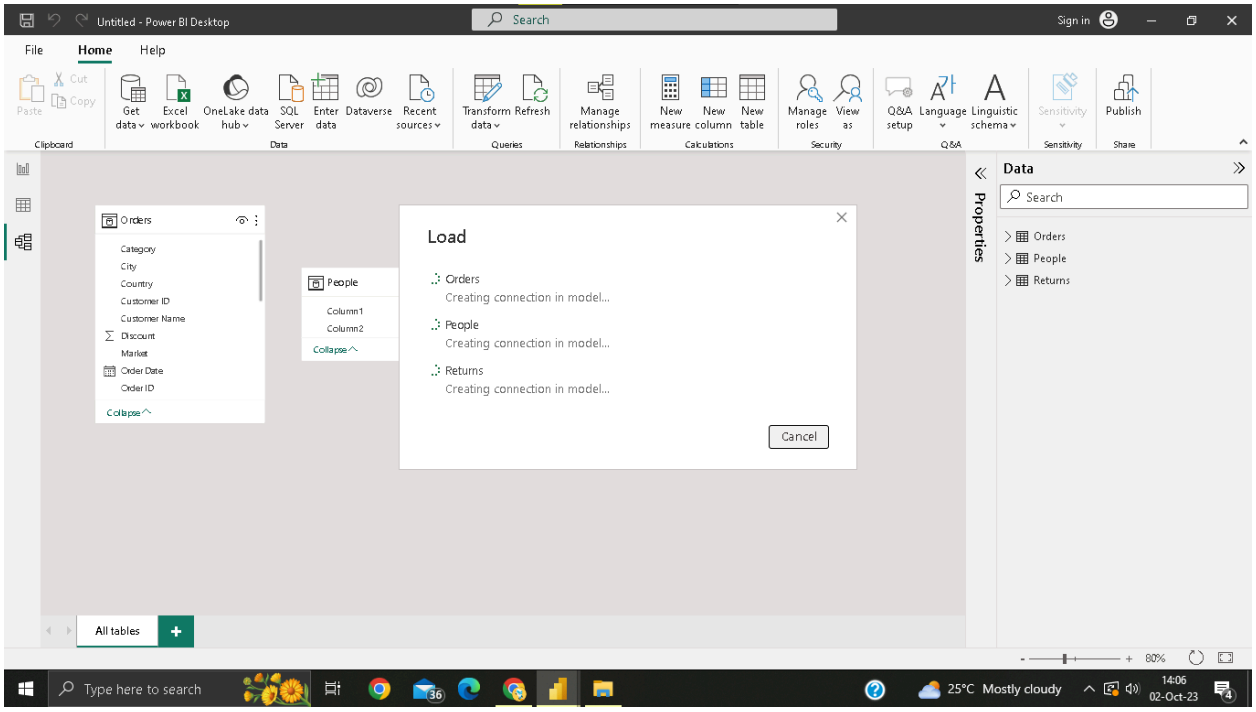


Fig.-Creating model

Report tab

When you navigate to the Report tab, you can see a dashboard and a chart selected for data visualization.

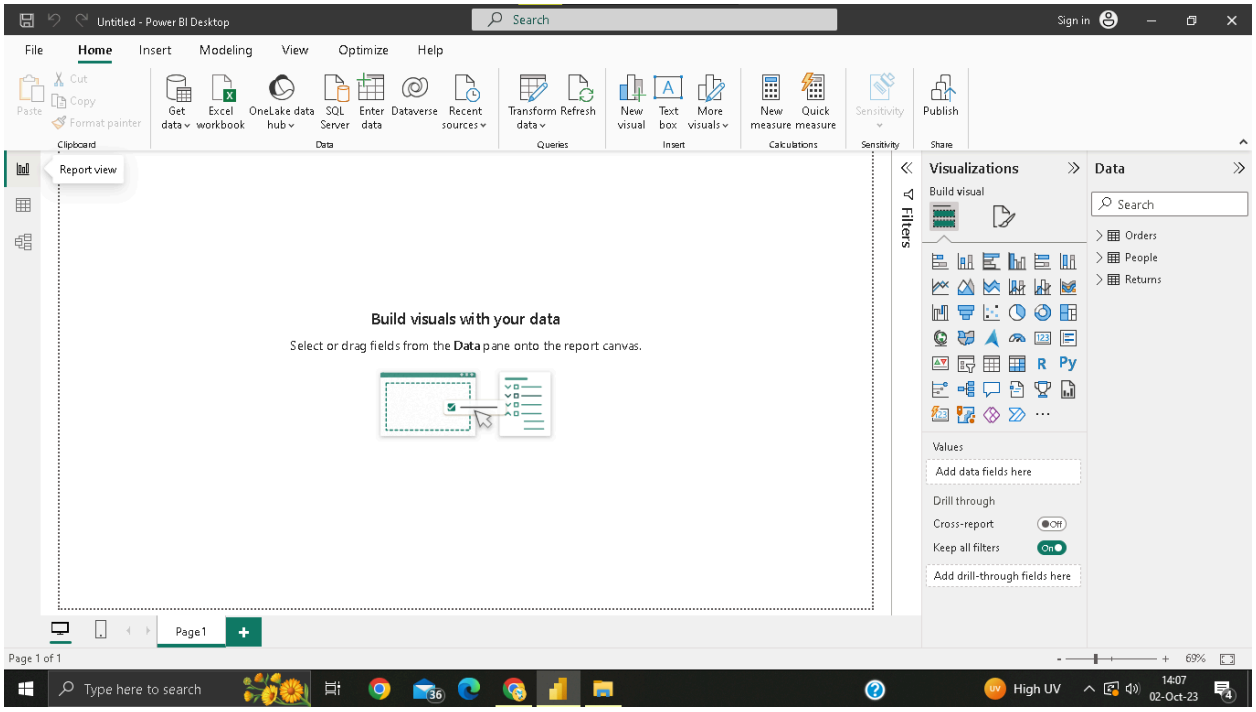


Fig.-Report view of model

Data tab

When you go to the Data tab, you can see all the data as per the defined Relationship from the data sources.

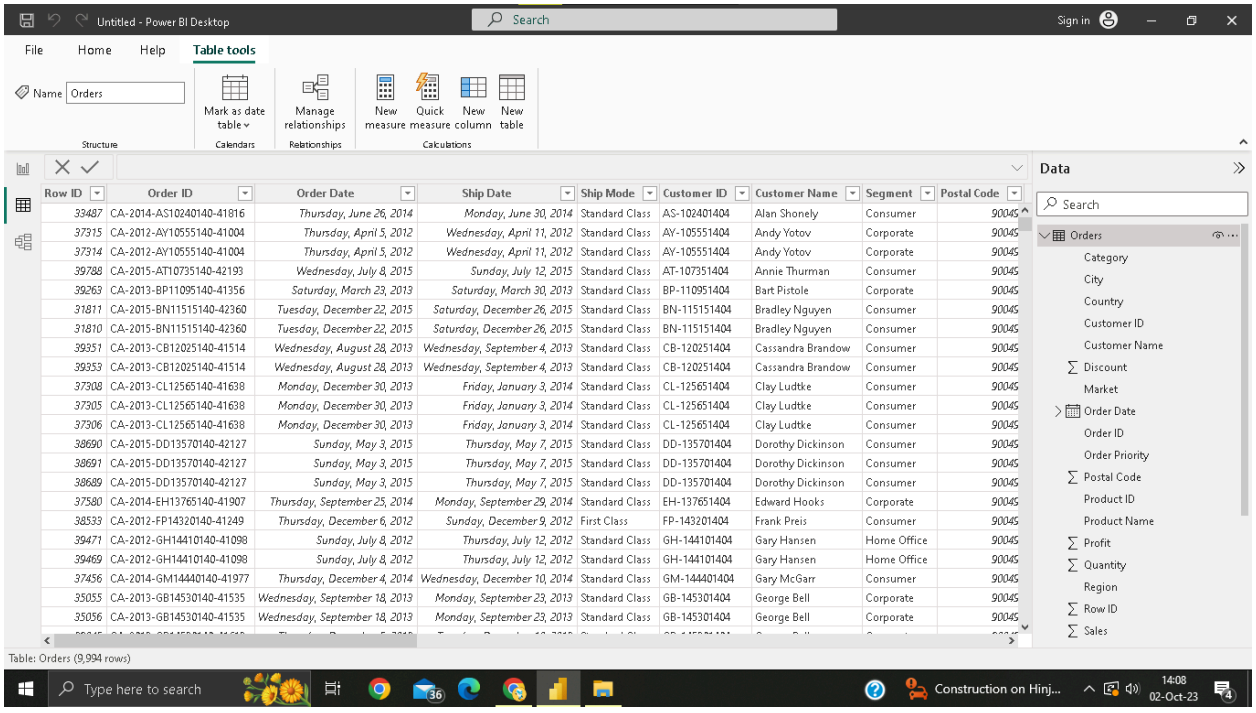


Fig.-Table view of Orders model

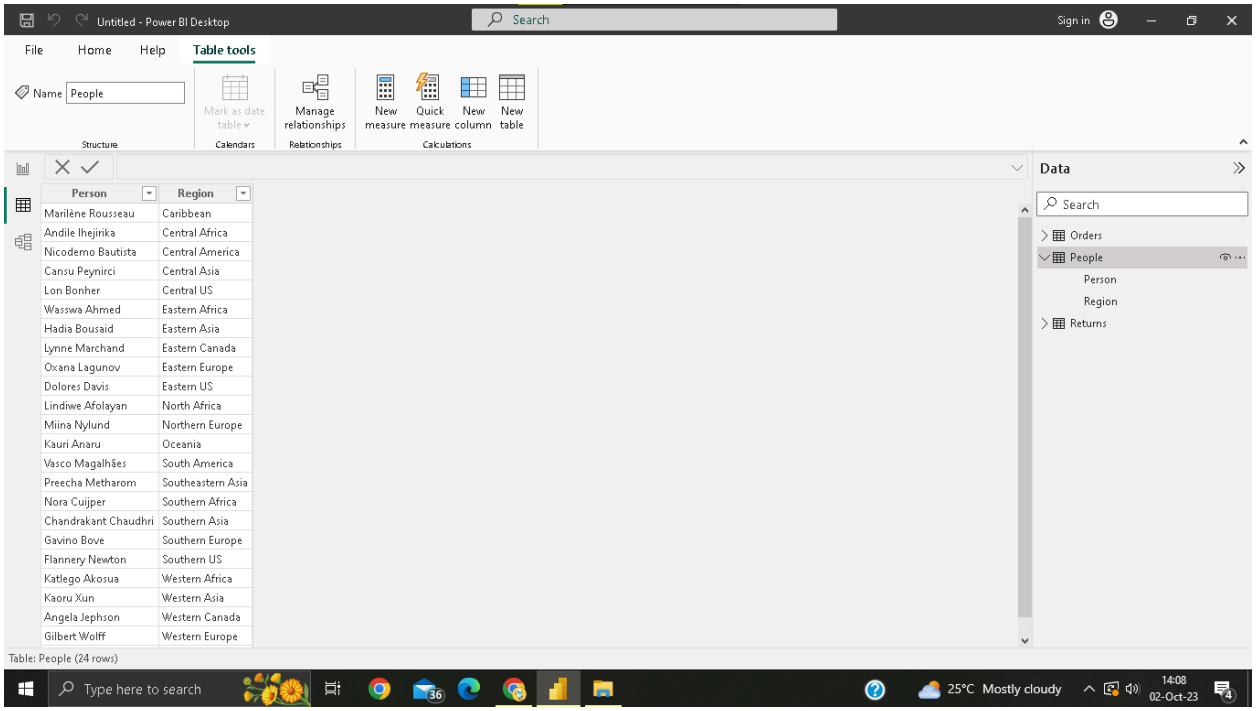


Fig.-Table view of People model

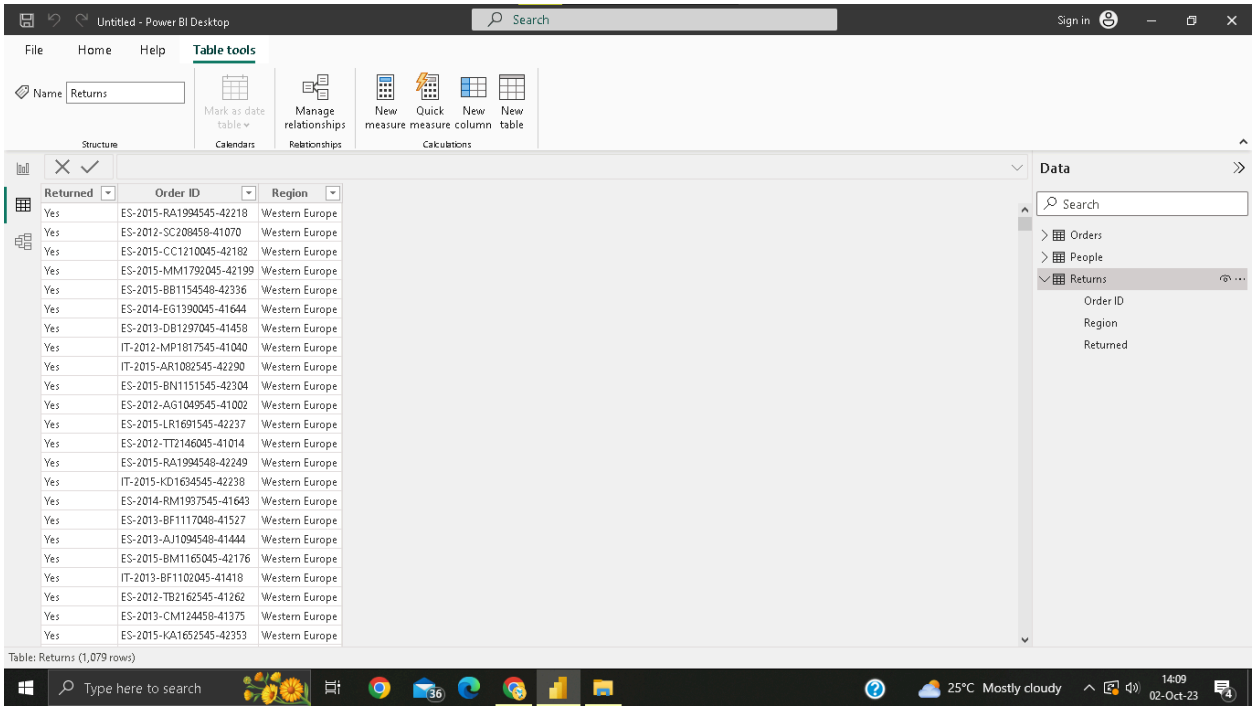


Fig.-Table view of Returns model

Model tab

In the Model tab, you can see the relationship between data sources.

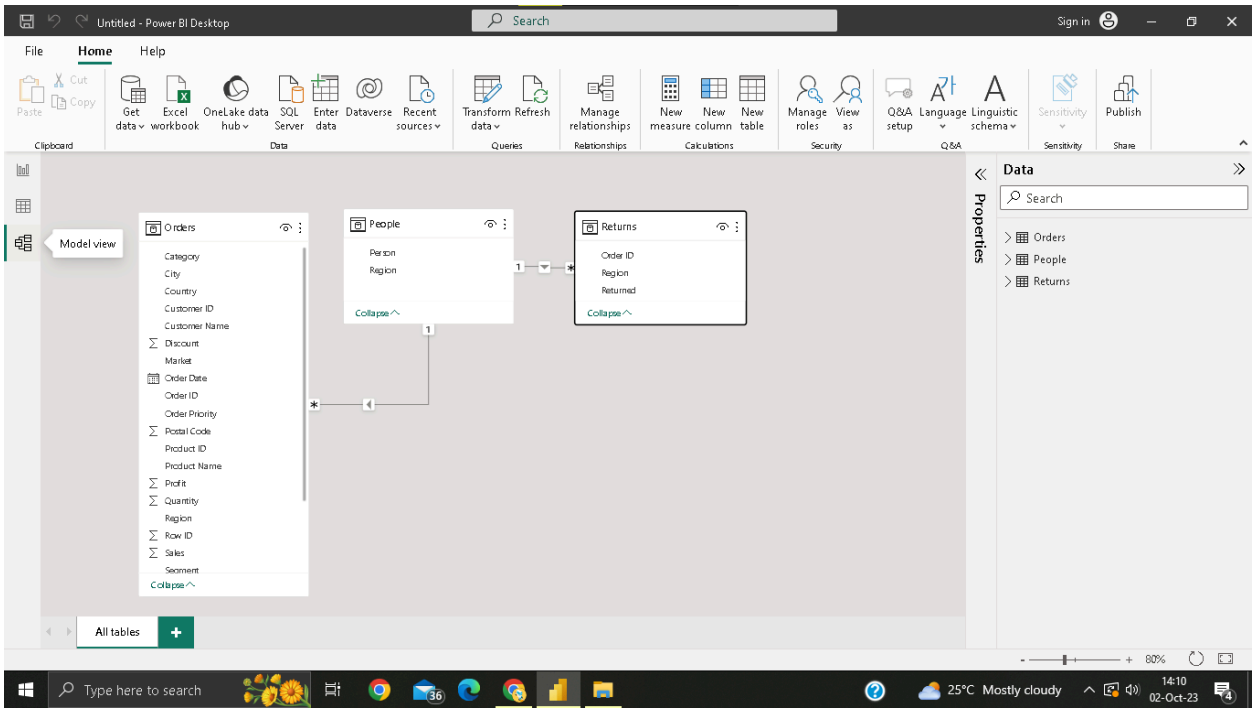


Fig.- Model view of model

Add New Columns

let us create a new column Delivery Days in Orders Table

```
Delivery Days = IF([Ship Date].[Date]-[Order Date].[Date] > 27, 0, [Ship Date].[Date]-[Order Date].[Date])
```

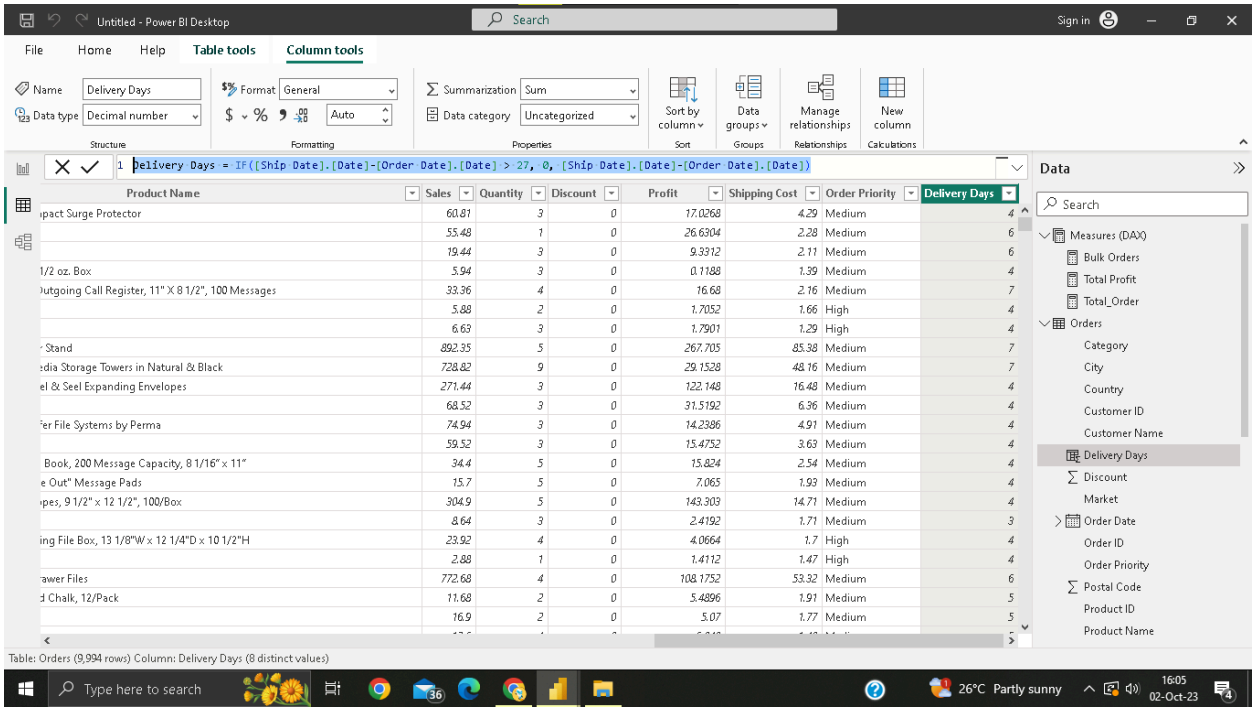


Fig.-Create new column Delivery Days in Orders Table

Add New Table

Select "Transform Data." In the Query Editor, select the data you want to use in your new table. Click on the "Add Column" tab and select "Table."

let us create a new Table State_Total_Orders and Total sales

```
State_Total_Orders = SUMMARIZE(Orders,Orders[State],Orders[Region],"Total Quantity Sold",SUM(Orders[Quantity]))
```

```
Total sales = SUMMARIZE(Orders,Orders[Product ID],Orders[Product Name],Orders[Region],"Total Quantities Sold",SUM(Orders[Sales]))
```

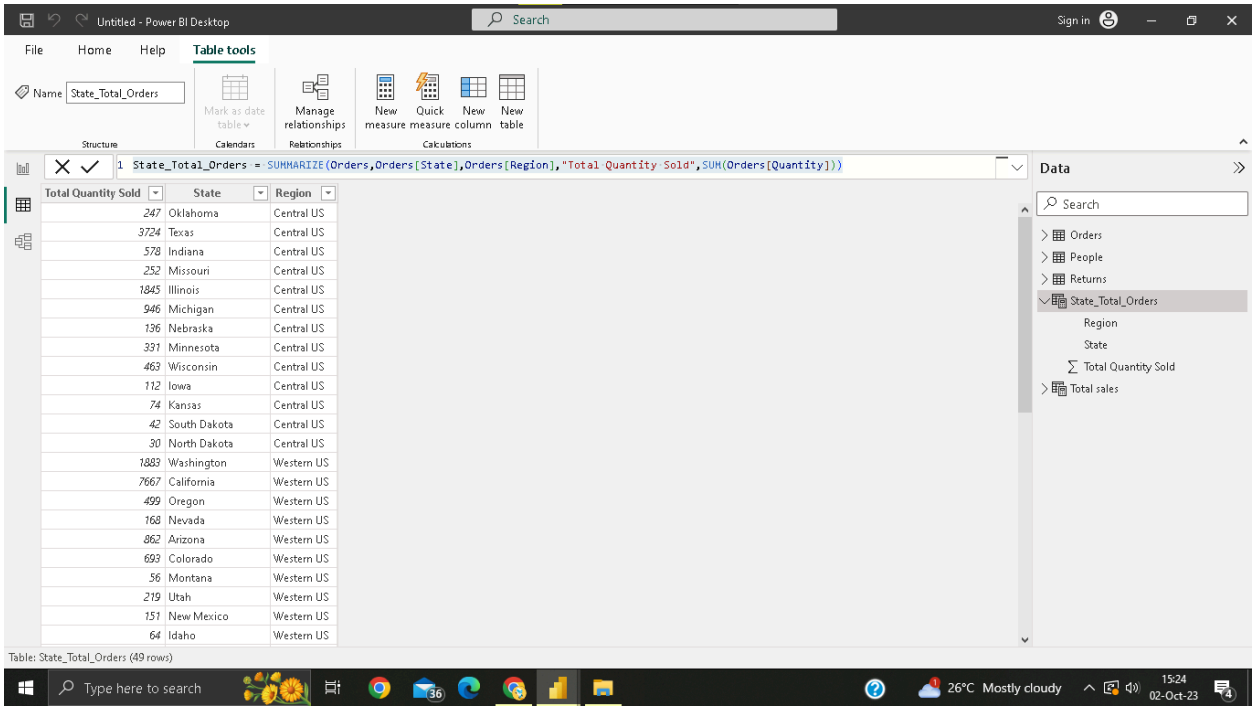


Fig.-Create a new table State_Total_Orders

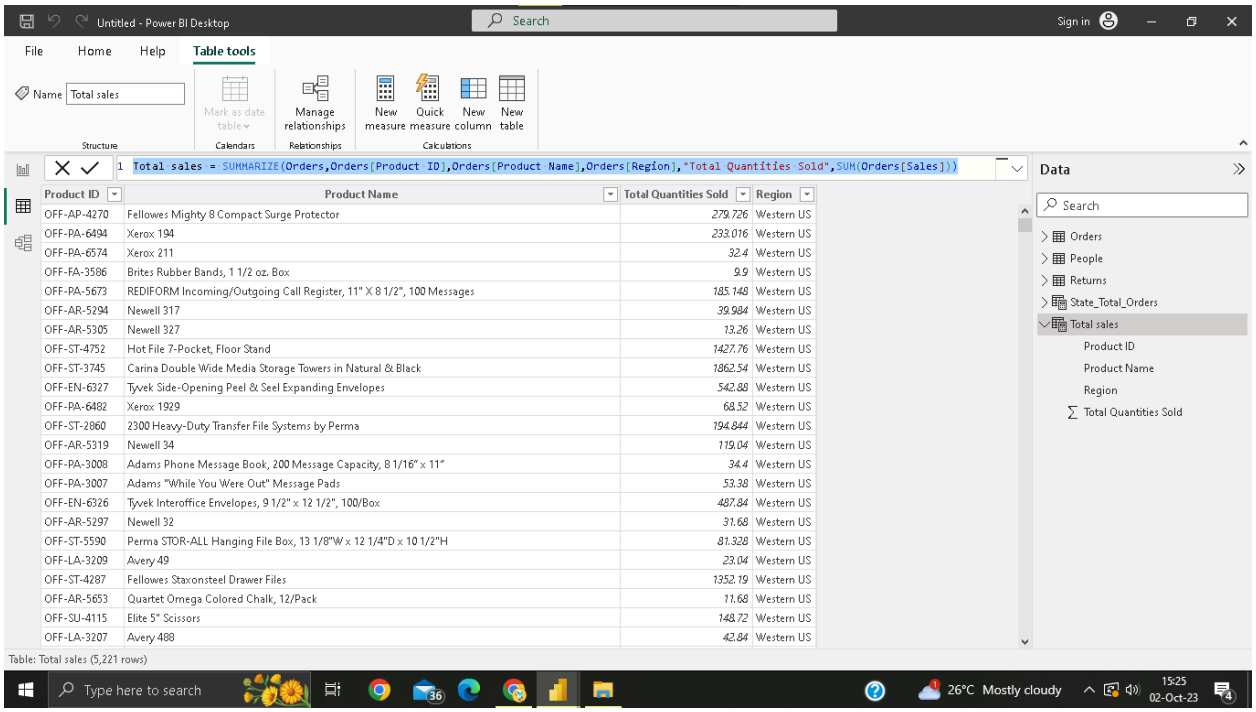


Fig.-Create a new table Total sales

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**

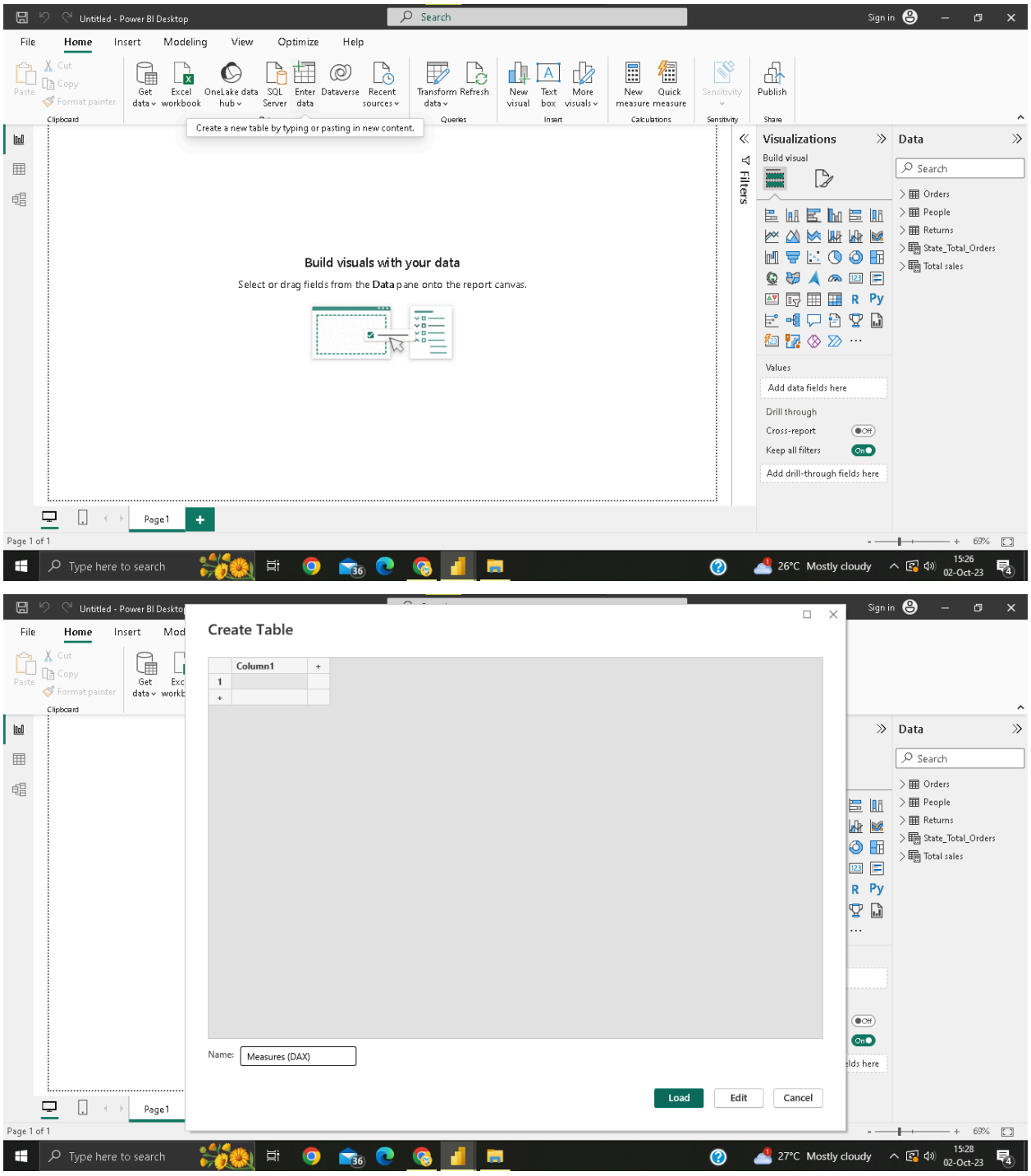


Fig.-Create a new table Measures (DAX)

Create a new measure

1. **Bulk Orders**

```
Bulk Orders = CALCULATE([Total_Order],'Orders'[Quantity]>3)
```

2. **Total Profit**

```
Total Profit = SUM(Orders[Profit])
```

3. **Total_Order**

```
Total_Order = SUM(Orders[Quantity])
```

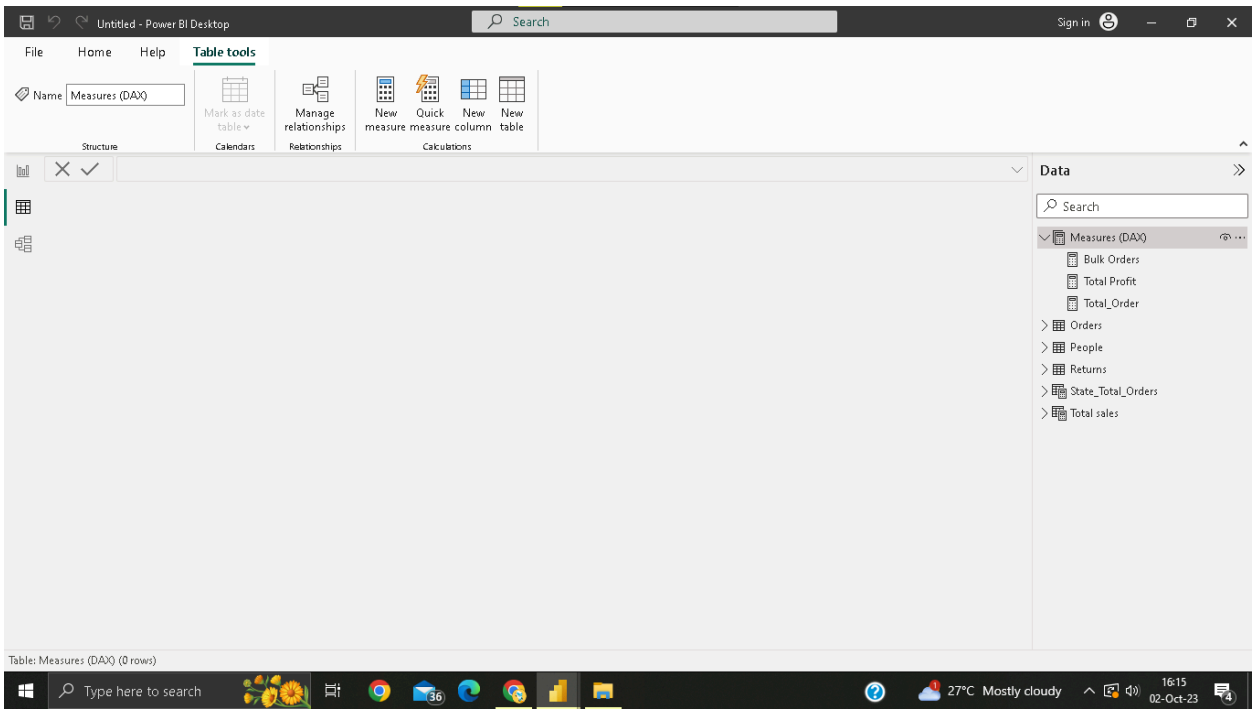


Fig.-Created Measures in Table Measures (DAX)

Add relationships

A relationship can be created in one of two ways firstly, by selecting 'Manage Relationships from the 'Home'
Secondly, by clicking and dragging the column that you want the relationship to be formed from one table onto the column of another table.

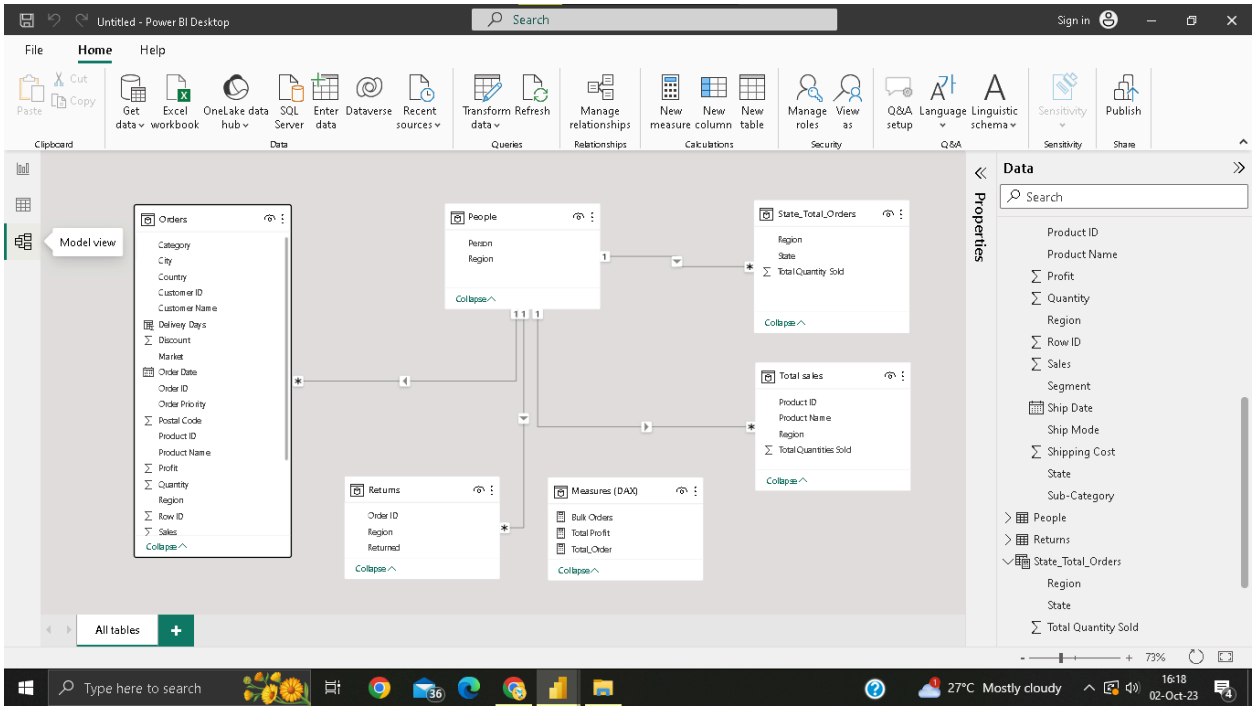


Fig.- Model view of model after Adding relationships

Add Image

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

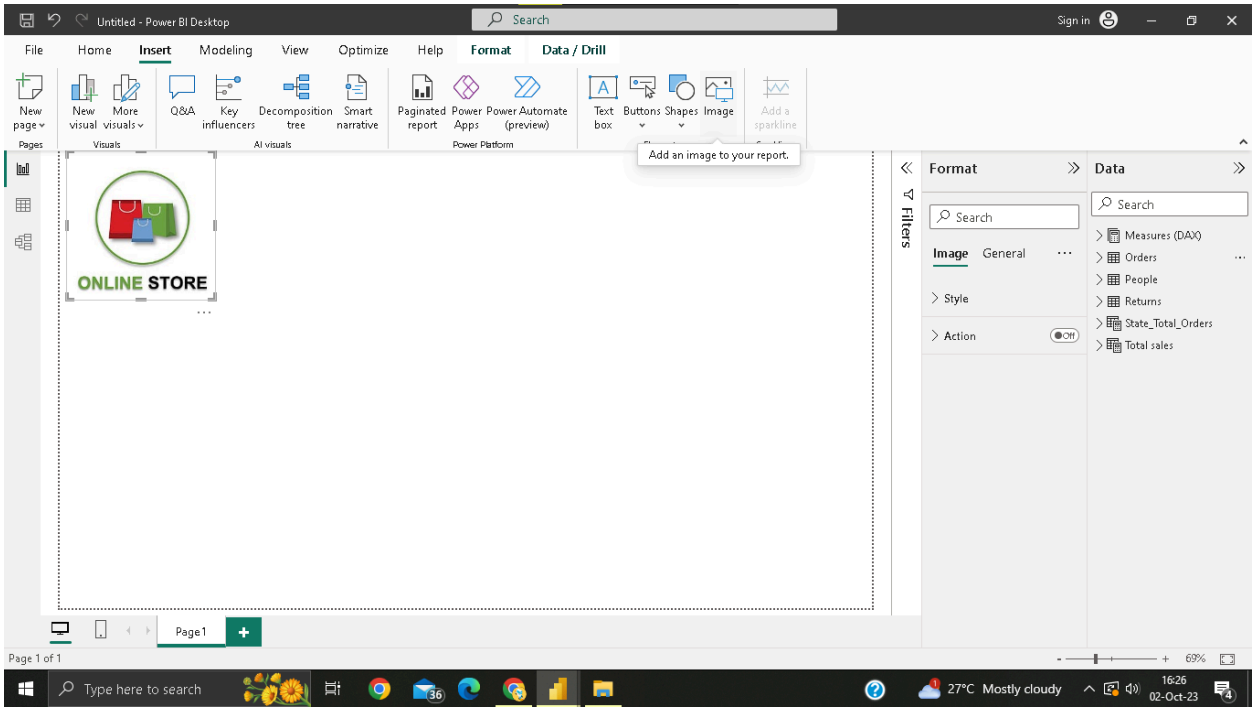


Fig.- Add Image in Report tab

Add Shapes and Cards

We can add text boxes, shapes, and smart narrative visuals to reports in Power BI Desktop
A card is a type of visual element in Power BI that displays a single value or metric.

Create Card for
Total Order,
Sum of Sales,
Total Profit,
Count of Return.

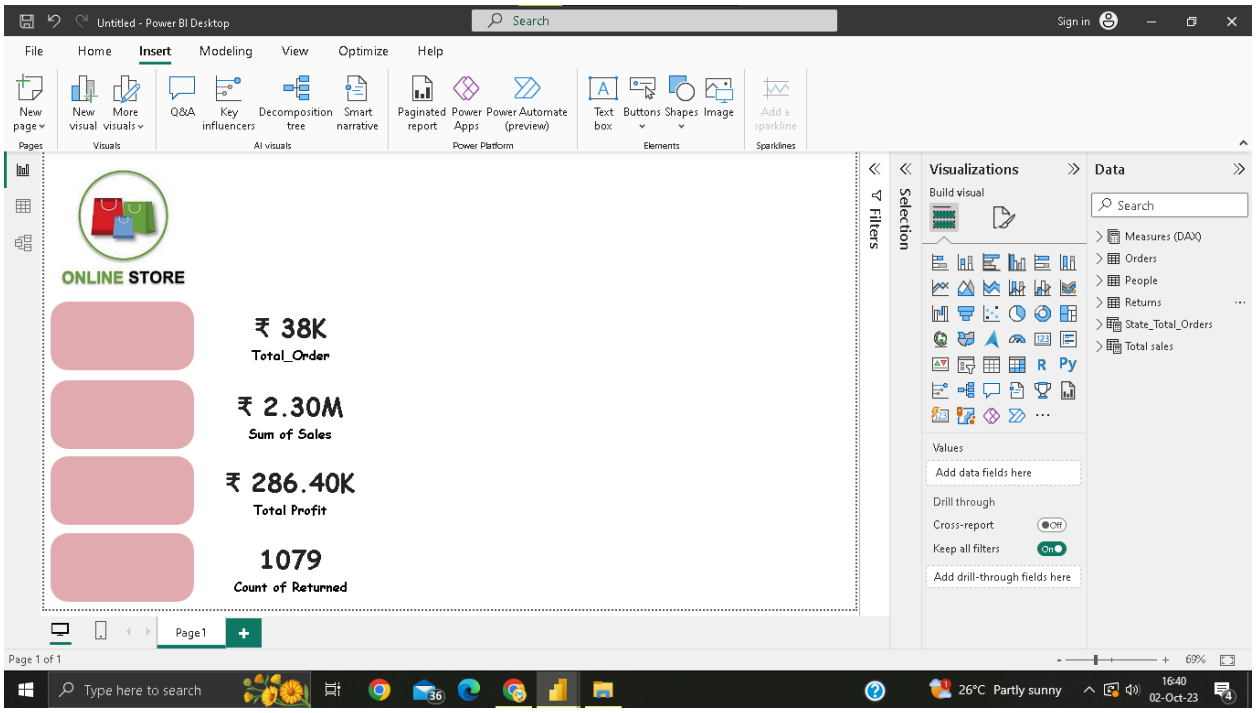


Fig.- Add Shapes And Cards in Report tab

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 Shapes Group and Create Group of All cards and rename as Cards Group

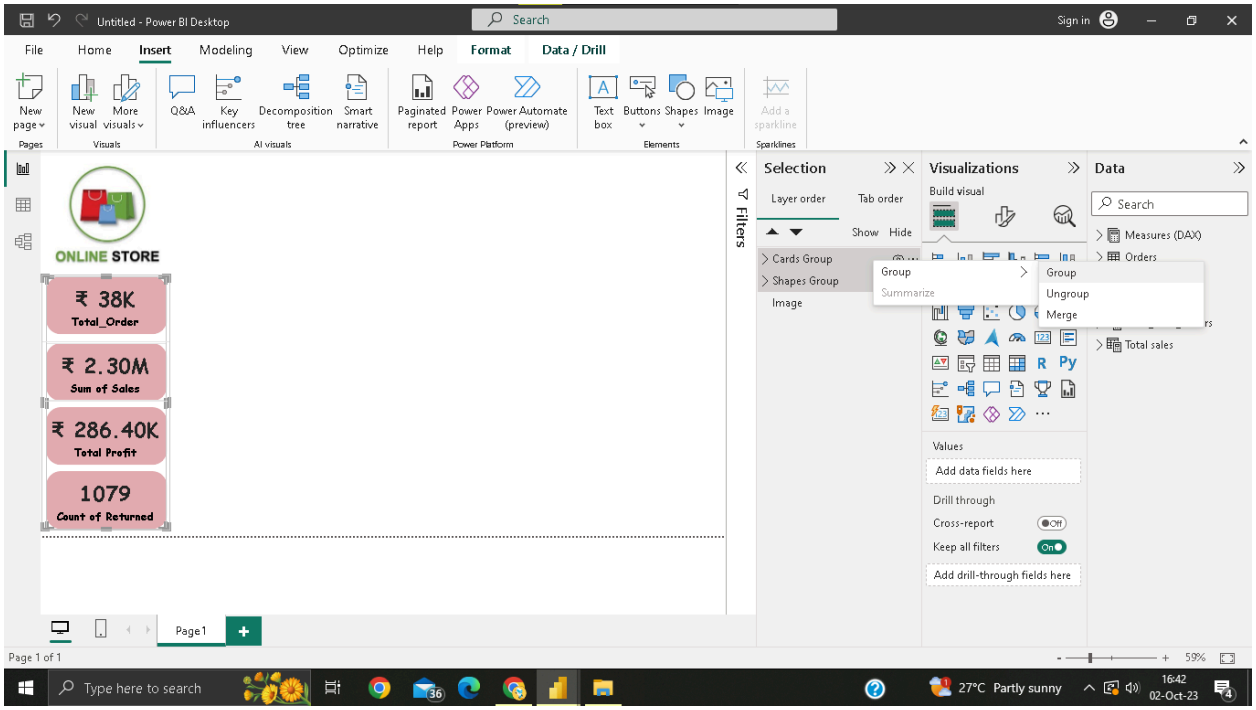


Fig.- Create Group Of Cards And Shape in Report tab

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 Year

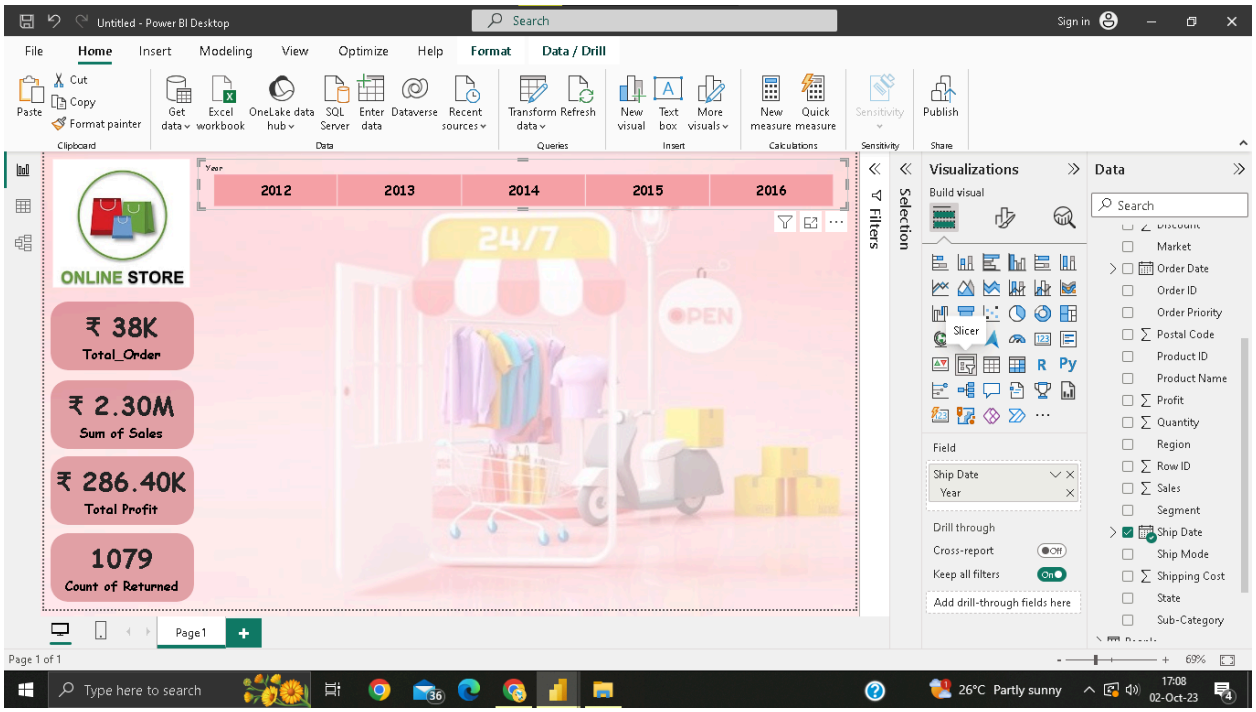


Fig.-Slicer of Year in Report tab

Doughnut Chart

A doughnut chart is similar to a pie chart in that it shows the relationship of parts to a whole.

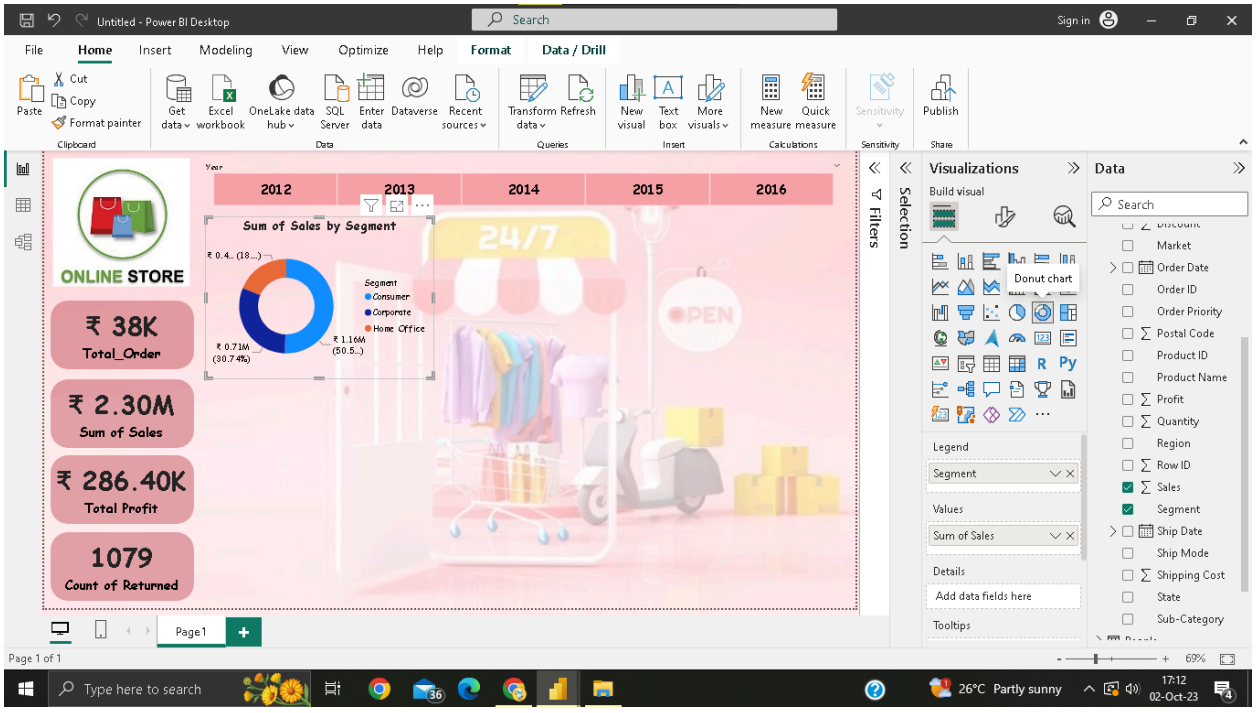


Fig.- Doughnut Chart of Sum of sales by Segment

Pie Chart

The pie chart is a round-shaped circle chart where each category data set is shown in a pie shape.

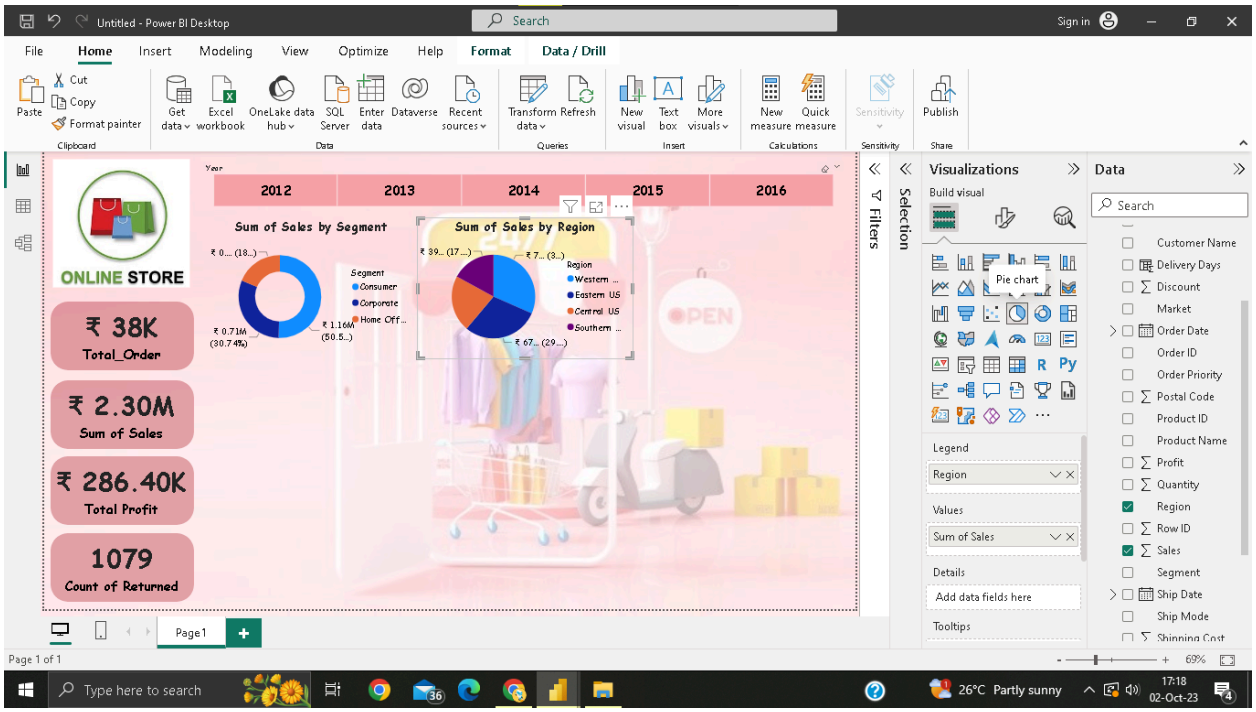


Fig.- Pi Chart of Sum of sales by Region

Clustered Column Chart

The Line and Clustered Column Chart is a combo chart that combines the Line chart and Column chart together in one visual.

Filters

Filters in Power BI sort data and information based on some selected criteria. That is, you can select particular fields or values within fields and view only the information related to that.

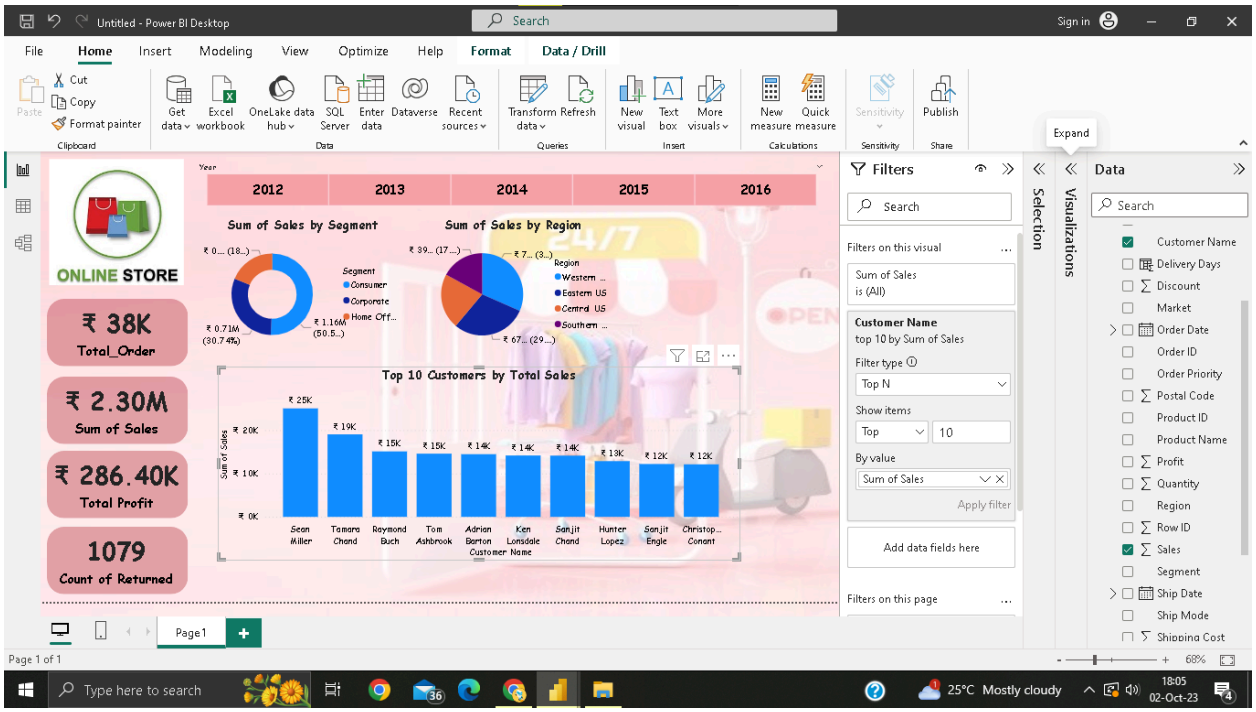


Fig.- Clustered Column Chart of Top 10 Customers by Total Sales

Clustered bar chart

A clustered bar chart is a horizontal chart, which could present multiple bars in the form of a cluster.

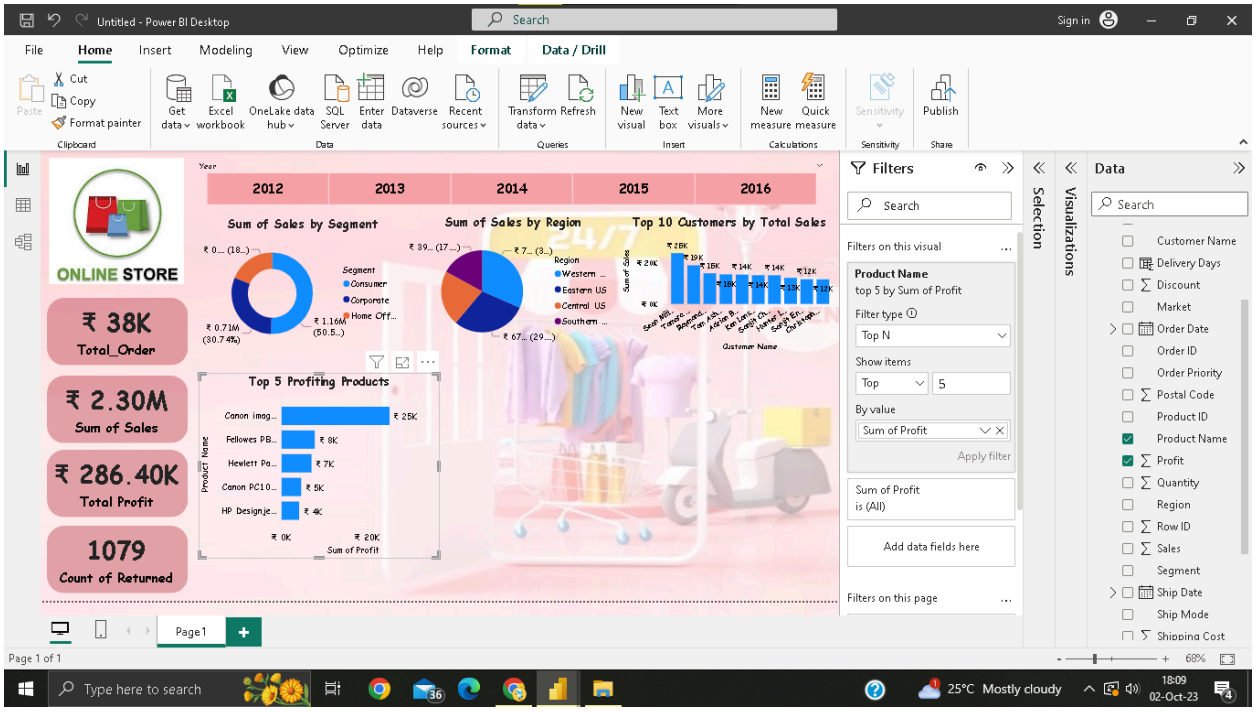


Fig.- Clustered bar chart of Top 5 Profiting Products

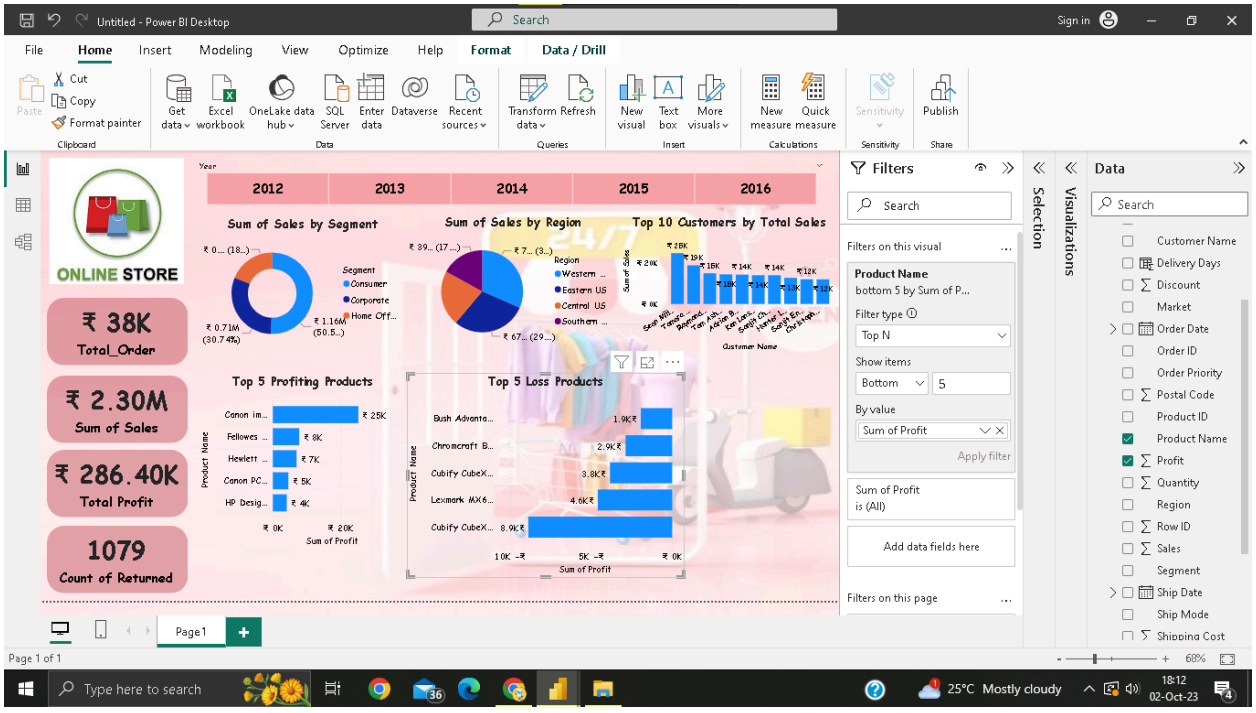


Fig.- Clustered bar chart of Top 5 Loss Products

Map Visualisations

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

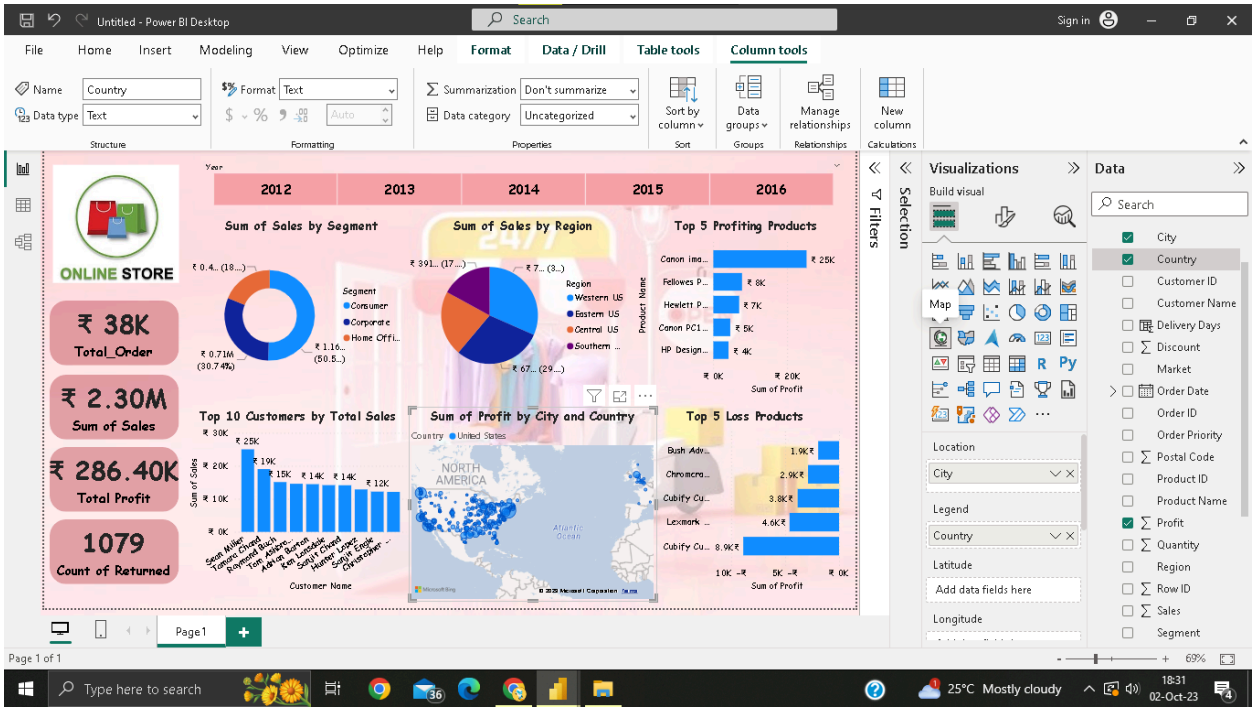
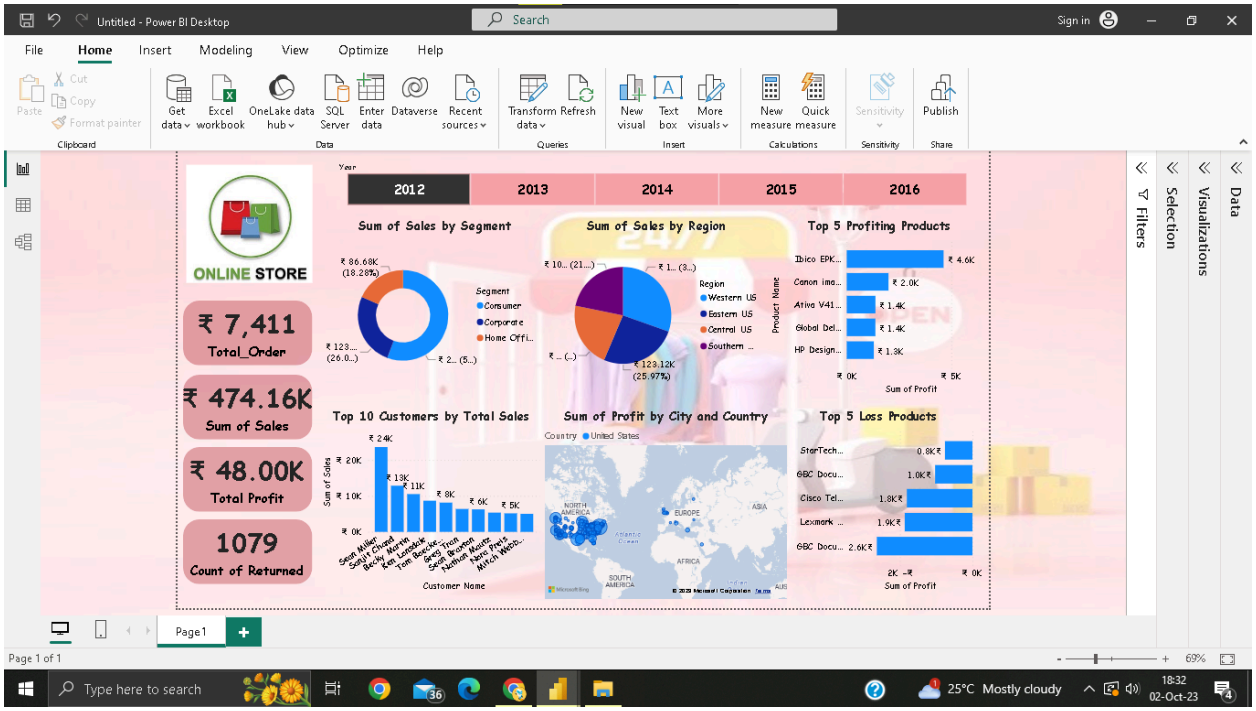


Fig.-Bubble maps (Sum of profit by City and Country)

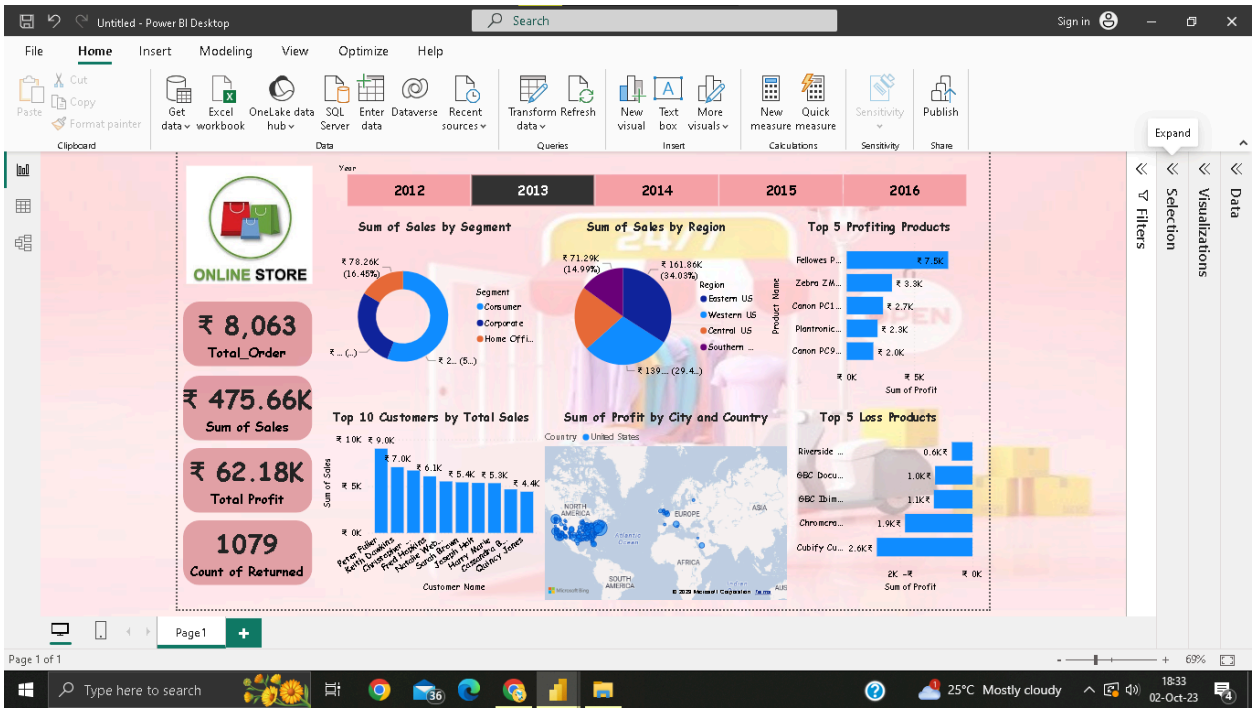
Report tab

Fig.-Report tab

Report tab of Year 2012



Report tab of Year 2013



Report tab of Year 2014

Report tab of Year 2015

Report tab of Year 2016