

POWER BI





Introducing Microsoft Power BI

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1. Business Intelligence (BI) Concepts

2. Introduction to Business Intelligence
3. The importance of Business Intelligence
4. The relation between Business Intelligence and Data Warehouse
5. Tools and Technologies in the Business Intelligence area

1.1 INTRODUCTION TO BUSINESS INTELLIGENCE

Business Intelligence (BI) involves the process of analyzing data using technology and presenting the findings to end users to support informed decision-making. By leveraging both historical and current data, BI tools provide a predictive perspective. These tools typically perform a variety of tasks, including data connection, data mining, data transformation, and data modeling through building relationships, complex calculations, report generation, dashboard creation, online analytical processing, and predictive analysis.

1.2 RELATION BETWEEN BUSINESS INTELLIGENCE AND DATA WAREHOUSE

To understand the relationship between Business Intelligence (BI) and data warehousing, let's first define what a data warehouse is.

Data Warehouse

A data warehouse is a large storage system that collects data from one or multiple sources to facilitate informed decision-making at any level within an organization. A typical data warehouse follows an ETL (Extract, Transform, Load) process.

ETL Process

Extract: The first step in data warehousing is extracting data from one or multiple sources to bring it into the data warehouse environment.

Transform: The extracted data may not be in the desired format, size, or structure. Therefore, it needs to be transformed to meet business requirements and objectives.

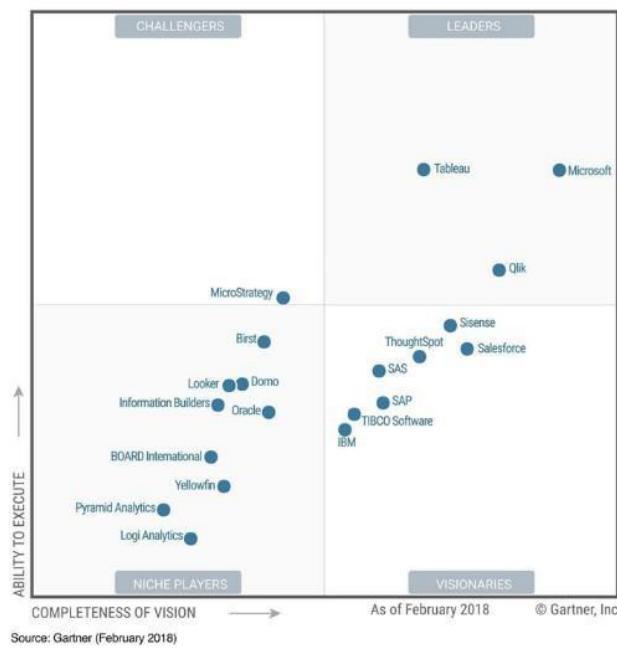
Load: Once the data is transformed, it is ready to be loaded into the target tables within the data warehouse.

A Business Intelligence tool uses data from a data warehouse to generate reports and assist end users in making informed decisions. Therefore, we can consider a data warehouse as an integral part of the overall Business Intelligence process.

1.3 BI TOOLS

- Microsoft Power BI
- Tableau
- Sisense
- Looker
- datapine
- Zoho Analytics
- Yellowfin
- Answer Dock
- Hotjar
- ReportPlus
- QlikView
- SAP BusinessObjects Lumira
- SAP Crystal Reports
- SAP Business Intelligence
- Vista
- Clootrack

Figure 1. Magic Quadrant for Analytics and Business Intelligence Platforms



2. MICROSOFT POWER BI (MSPBI) INTRODUCTION

1. Power BI introduction and overview
2. Power BI Architecture
3. Introduction and Power BI in Desktop
4. Why Choose Power BI over Excel

2.1 POWER BI INTRODUCTION AND OVERVIEW

Power BI is a collection of software/tools that work in synchronization to turn unrelated data sources into meaningful and interactive insights. Power BI supports hundreds of data sources, including common ones like Excel spreadsheets, Text/CSV files, SQL databases, Oracle databases, and more.

Power BI Applications

- **Power BI Desktop:** A Windows desktop application for creating reports and data visualizations.
- **Power BI Service:** An online SaaS (Software as a Service) platform for sharing and collaborating on reports.
- **Power BI Mobile:** Mobile applications for viewing and interacting with reports on Android, iOS, and Windows phones.
- **Power BI Report Server:** Used to publish Power BI reports to an on-premises report server after creating them in Power BI Desktop.

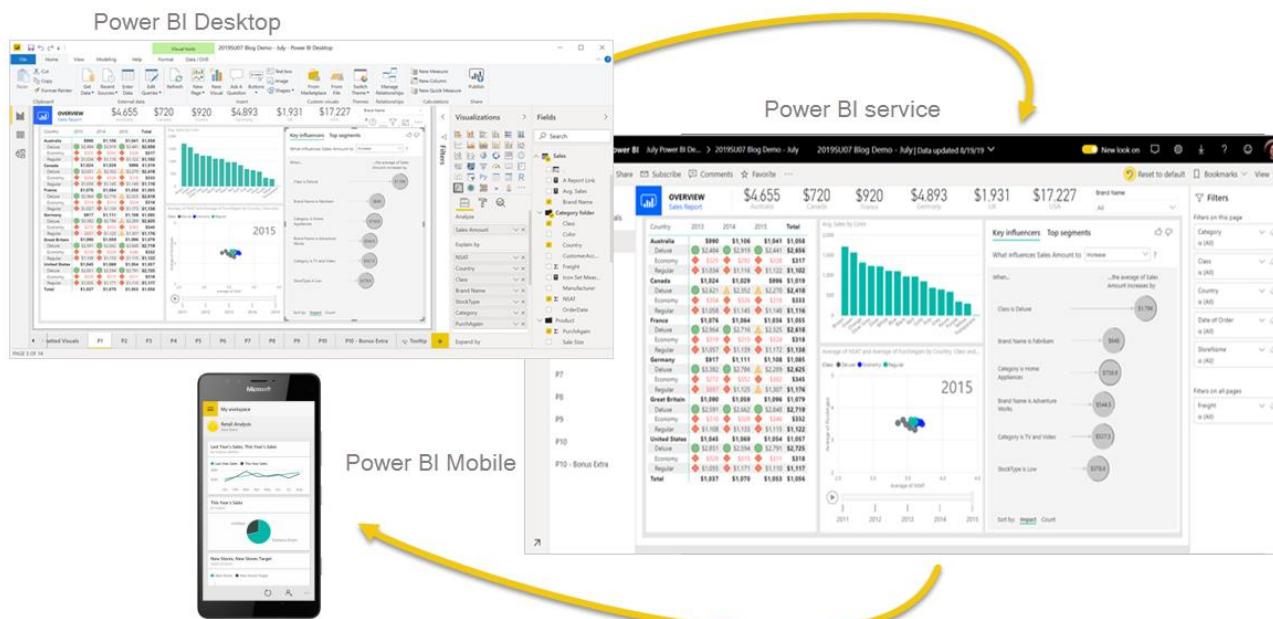
Power BI Components

- **Power Query:** For data mash-up and transformation.
- **Power Pivot:** For in-memory tabular data modeling.
- **Power View:** For creating and viewing data visualizations.
- **Power Map:** For visualizing 3D geospatial data.
- **Power Q&A:** For natural language question and answer.

Power BI Desktop is the development tool available to data analysts and other report creators. While the Power BI service allows you to organize, manage, and distribute your reports and other Power BI items. Power BI Desktop is available to download for free either through the Windows store or directly online.

You can access the Power BI service at app.powerbi.com with a school or work account. If your organization doesn't already use Power BI, you can still explore the service by getting a free trial or signing up for a free [Microsoft 365 Developer account](#).

Power BI Mobile allows consumers to view reports in a mobile-optimized format. You can create these optimized report views in Power BI Desktop.



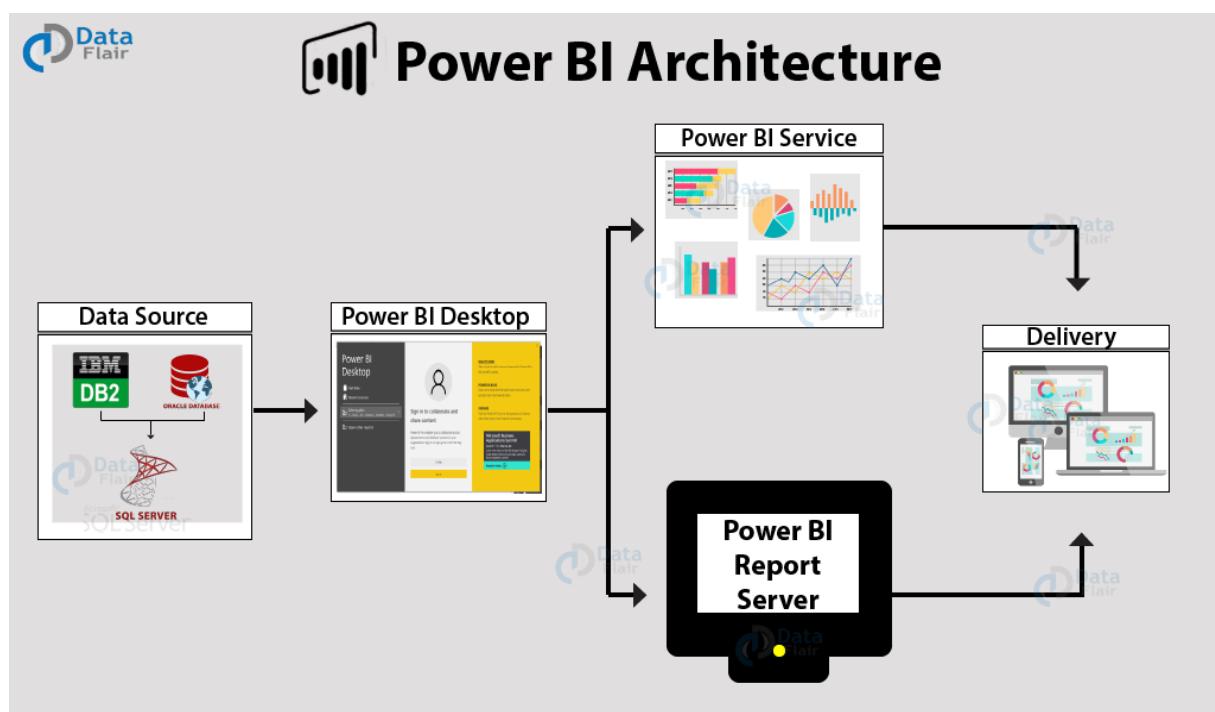
Explore the flow of Power BI

There's a common flow when creating reports with Power BI. First, you start with Power BI Desktop to connect to data and create the report. Then you publish the report to the Power BI service and distribute to consumers.

The flow of Power BI is:

1. Connect to data with Power BI Desktop.
2. Transform and model data with Power BI Desktop.
3. Create visualizations and reports with Power BI Desktop.
4. Publish report to Power BI service.
5. Distribute and manage reports in the Power BI service.

The Power BI service also allows you to create high-level dashboards that drill down to reports, and apps to easily group related reports to users in a simple format.



2.2 INTRODUCTION TO POWER BI DESKTOP

Power BI Desktop is a client-side tool known as a companion development and authoring tool. This desktop-based software is loaded with tools and functionalities to connect to data sources, transform data, data modeling and creating reports. You can download and install Power BI Desktop in your system for free. Using Power BI Desktop features, one can do data cleansing, create business metrics and data models, define the relationship between data, define hierarchies, create visuals and publish reports.

To learn more, please review the blog at the link below.

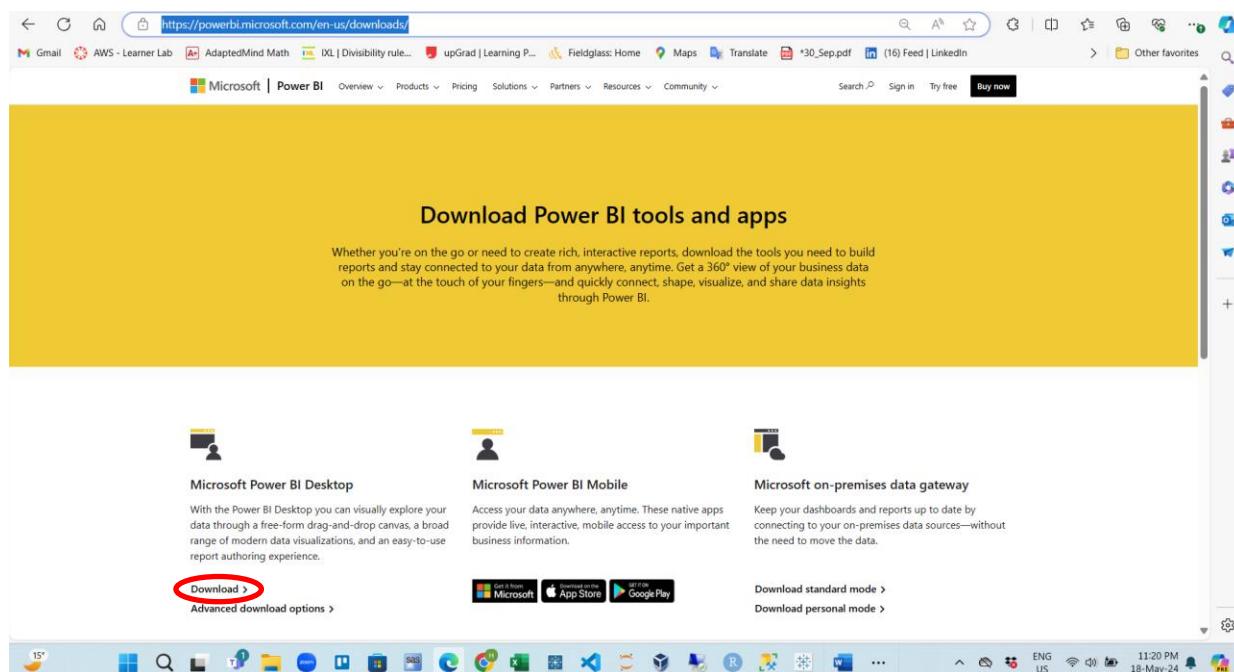
<https://data-flair.training/blogs/power-bi-architecture/>

3. INTRODUCTION & GETTING STARTED

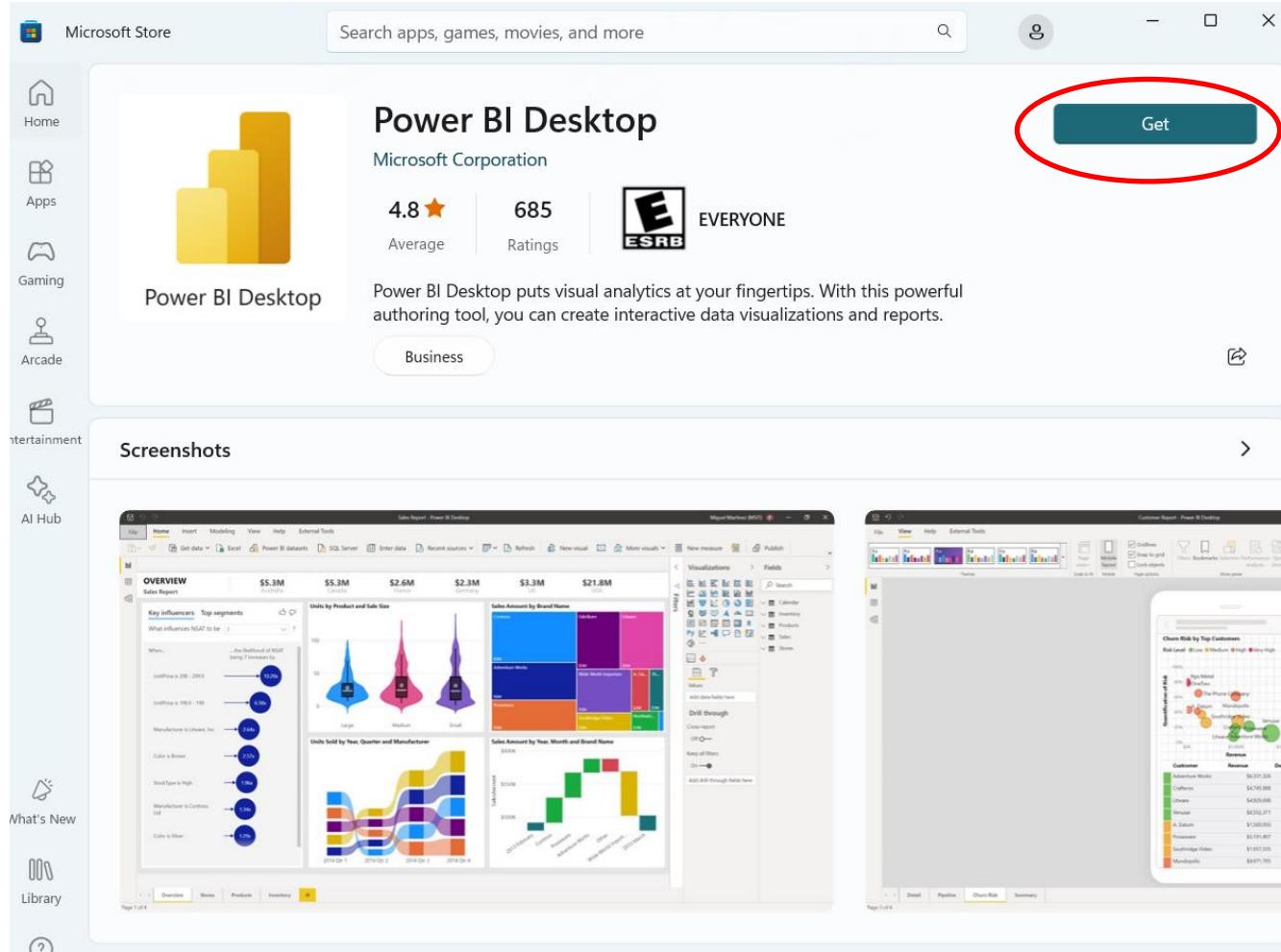
- How to get Power BI desktop
- Power BI Desktop Interface
- Change Default Settings

3.1 HOW TO GET POWER BI DESKTOP?

Go to [Downloads | Microsoft Power BI](https://powerbi.microsoft.com/en-us/downloads/)
and hit the download button of Microsoft Power BI Desktop



Then get it.



And then open it.

Power BI Desktop

Microsoft Corporation

4.8 ★ 685 Ratings

EVERYONE

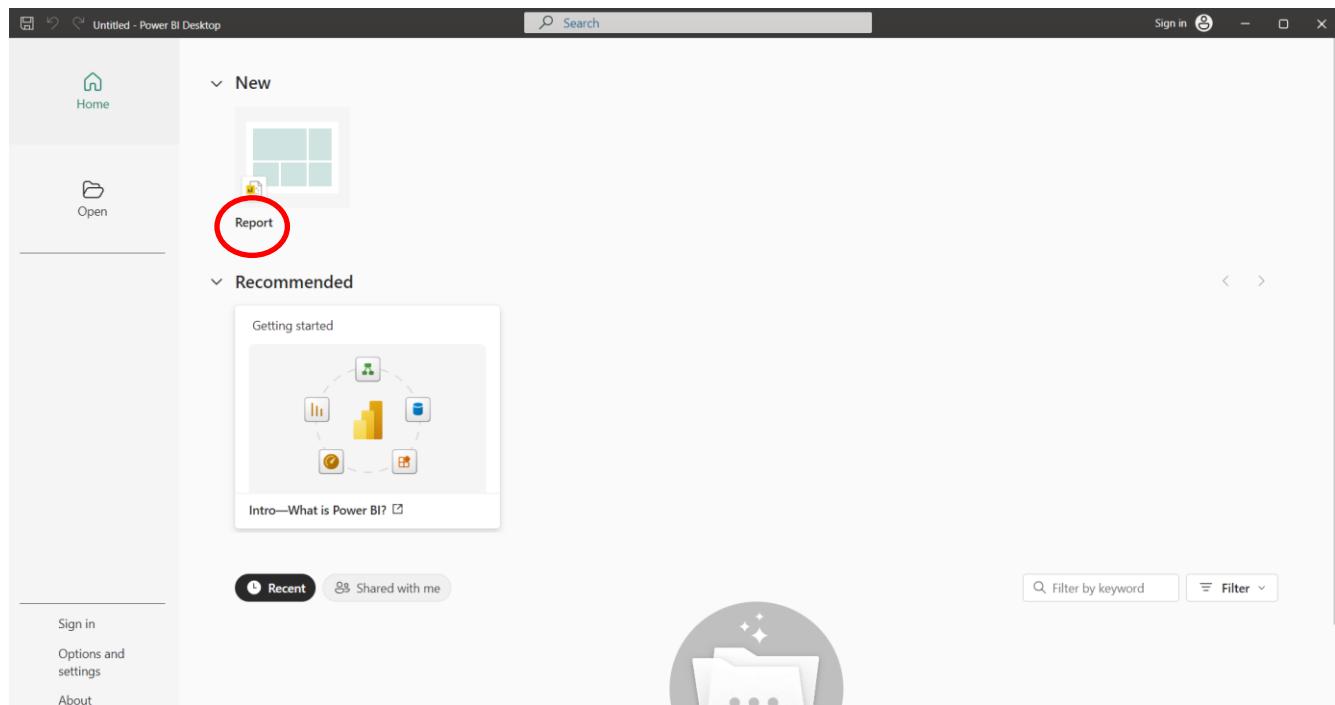
Power BI Desktop puts visual analytics at your fingertips. With this powerful authoring tool, you can create interactive data visualizations and reports.

Screenshots

Description

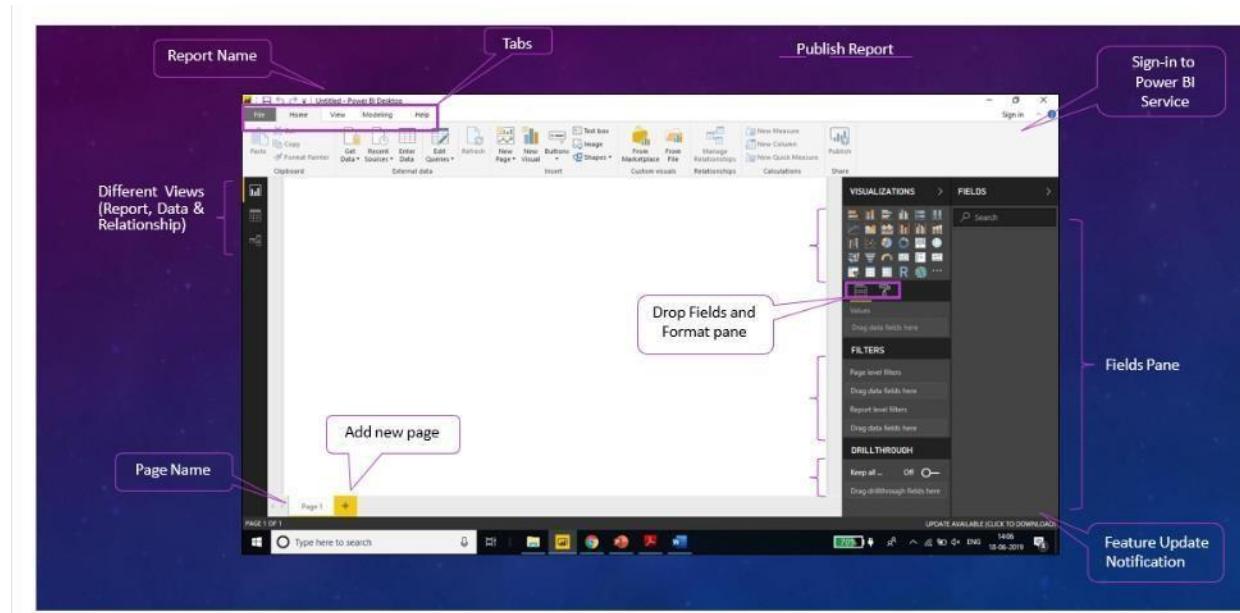
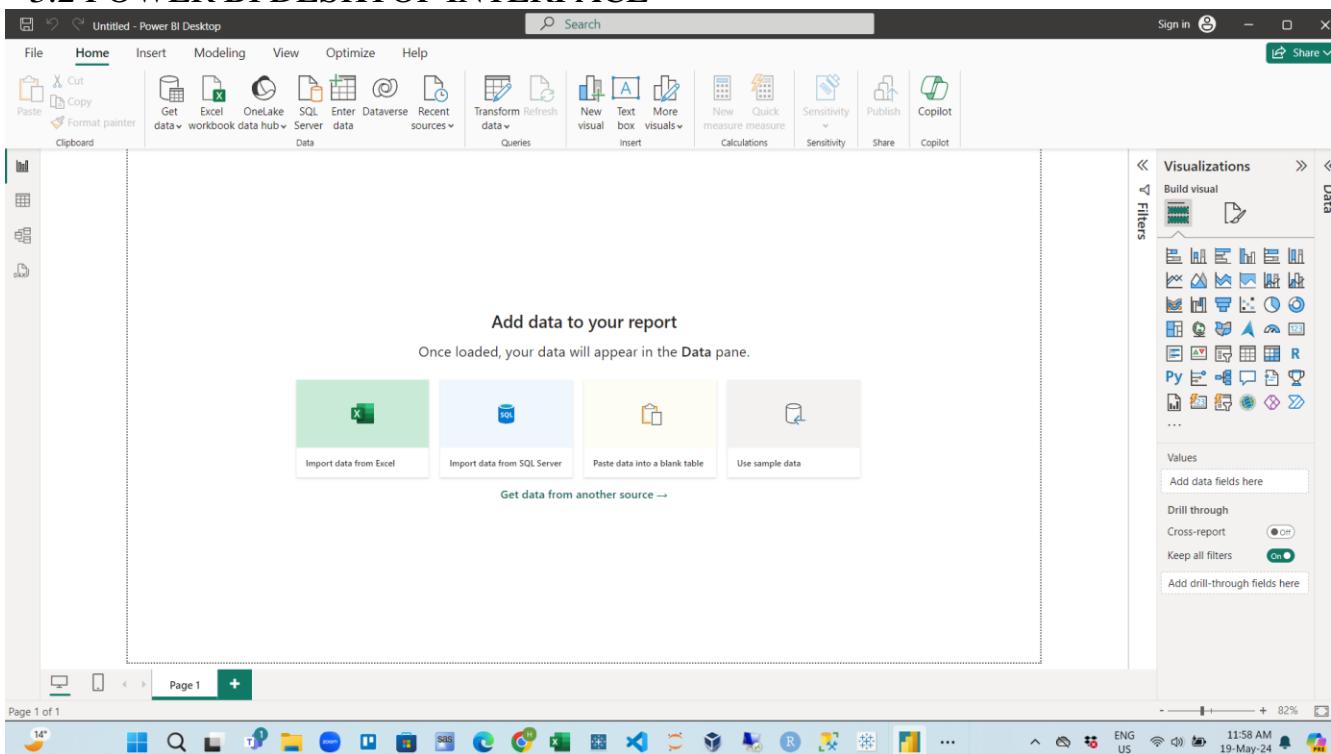
https://learn.microsoft.com/en-us/training/modules/get-started-with-power-bi/?WT.mc_id=powerbi_home_inproduct_introcard

You will be prompted to sign-in but sign-in is required only when it comes to publishing the report to PowerBI.com, rest of the whole model can be created without sign-in. Note: Sign-in can be done only using an official email ID. i.e. it cannot accept personal email IDs like Gmail, yahoo etc.



Select Report

3.2 POWER BI DESKTOP INTERFACE



- Report Name: We can rename the report while saving the same for the first time.
- Views:
 - Report View – Under this we can use different visualizations to build report.
 - Data View – Once data is being loaded to PBI Desktop, the same can be seen here in the form of tables and fields. Here we can create calculated columns and measures.
 - Relationship View – This view is useful to build relationships to create data model.

Report View

Report View is where you create and design your visualizations. It offers a canvas for building interactive reports using various visualization types such as charts, graphs, and maps. Key features include:

- **Visualizations Pane:** Access different types of charts and visuals.
- **Fields Pane:** Drag and drop fields from your dataset to create visuals.
- **Formatting Options:** Customize the appearance of your visuals, including colors, labels, and tooltips.
- **Filters Pane:** Apply filters to control which data is displayed in your visuals.
- **Bookmarks:** Capture and share specific views of your report for storytelling and presentations.

Data View

Data View allows you to inspect and manipulate the underlying data in a spreadsheet-like format. It's useful for:

- **Viewing Raw Data:** See the data exactly as it appears in your dataset.
- **Data Inspection:** Check for data accuracy and identify any issues that might need cleaning or transformation.
- **Creating Calculated Columns:** Add new columns to your dataset using DAX (Data Analysis Expressions).

Model View

Model View focuses on the relationships between different tables in your dataset. This is crucial for ensuring data integrity and enabling complex data analysis. Key aspects include:

- **Relationships:** Define how tables relate to each other through keys and relationships (one-to-one, one-to-many).
- **Table Management:** Create, delete, and manage tables within your data model.
- **Calculated Columns and Measures:** Use DAX to create new data fields that are derived from your existing data.
- **Hierarchies:** Build hierarchies within your data to enable drill-down capabilities in your reports.

DAX Query View

DAX Query View (usually accessed via the **DAX Studio** or directly within Power BI Desktop for more advanced users) allows you to write and execute DAX queries to analyze and manipulate your data. DAX (Data Analysis Expressions) is a formula language used in Power BI for creating custom calculations. Key features include:

- **Writing DAX Queries:** Formulate complex calculations and aggregations.

- **Measure Creation:** Define measures that can be used in your visuals for dynamic calculations.
- **Calculated Columns:** Create columns that perform specific calculations row by row.
- **Performance Analysis:** Optimize your data models and queries to ensure efficient performance.

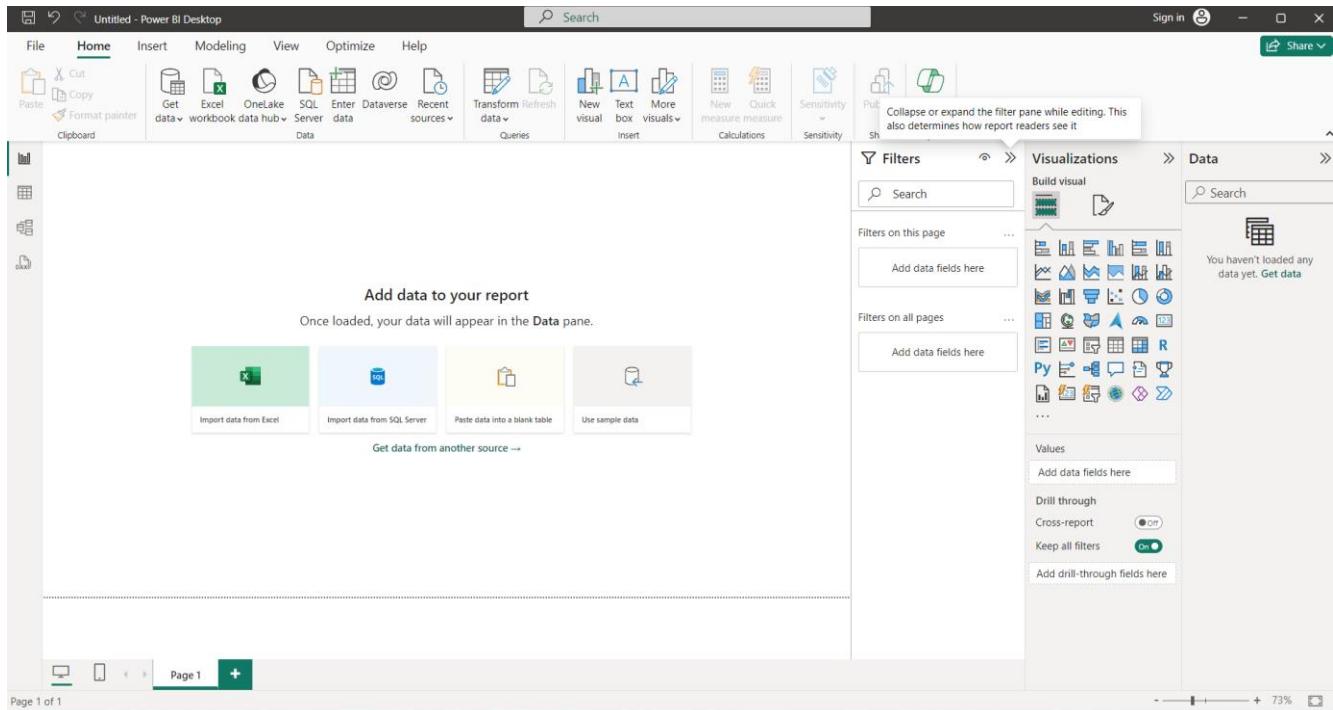
Summary

- **Report View:** Create and design interactive visualizations.
- **Data View:** Inspect and manage raw data.
- **Model View:** Define relationships and manage your data model.
- **DAX Query View:** Write and execute DAX queries for advanced data manipulation.

These views provide a comprehensive set of tools for data analysis, allowing you to transform raw data into insightful and actionable reports in Power BI.

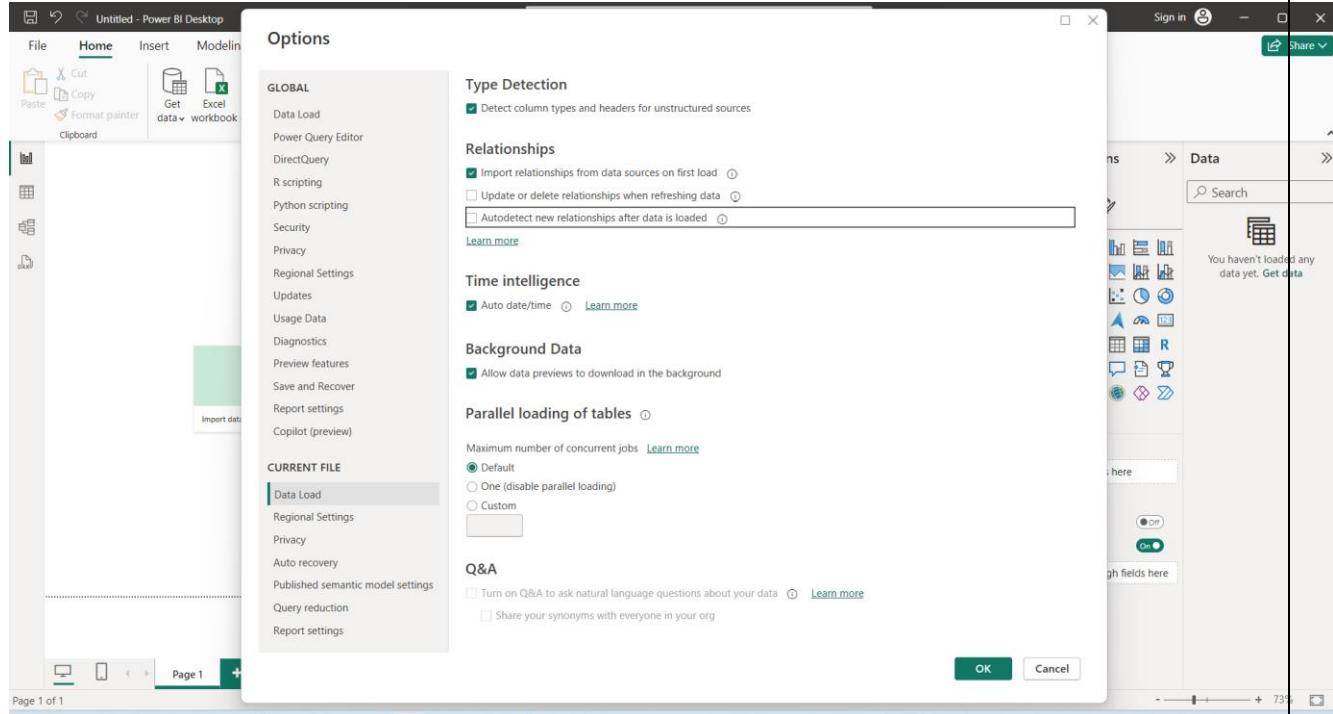
- Page Name: We can have multiple pages into a single report. Each page contributes a part of a report. It's just like "Sheet" tabs in MS Excel.
- Add New Page: By clicking the plus sign, we can add a new page in the report.
- Tabs:
 - Home: This is a general-purpose tab and used for connecting new data, editing queries etc.
 - View: One can set the view and even design the phone layout too.
- Help: It's a good resource to learn this program and even post your queries in PBI forums/community.

- Publish Report: This helps in publishing the reports created in Power BI desktop to Power BI Service.
- Sign-In: To publish the report or import new visualizations, one has to sign into the Power BI service.
- Visualization Pane: Here we can choose among many visualizations like charts, slicers, maps, etc.
- Filters Pane: PBI Desktop provides three levels of filters i.e. Visual, Page & Report level filters.
- Drill-Through Filter: Helps in accessing the detailed report of an item.
- Drop Fields pane: As every visualization needs one or multiple fields to show data into it. This pane facilitates dropping the desired fields from the fields pane.
- Format Pane: Every visualization has different formatting options; this pane helps in formatting the selected visualization.
- Fields Pane: Show all the connected data tables and fields.
- Feature Update Notification: This will show a notification for any new update released from the Microsoft PBI team.



3.3 CHANGE DEFAULT SETTINGS

- Go to File -> Options & Setting -> Options.
- Data Load – Deselect “Auto detect new relationships after data is loaded.”



- Regional Settings – select “English (United States)”

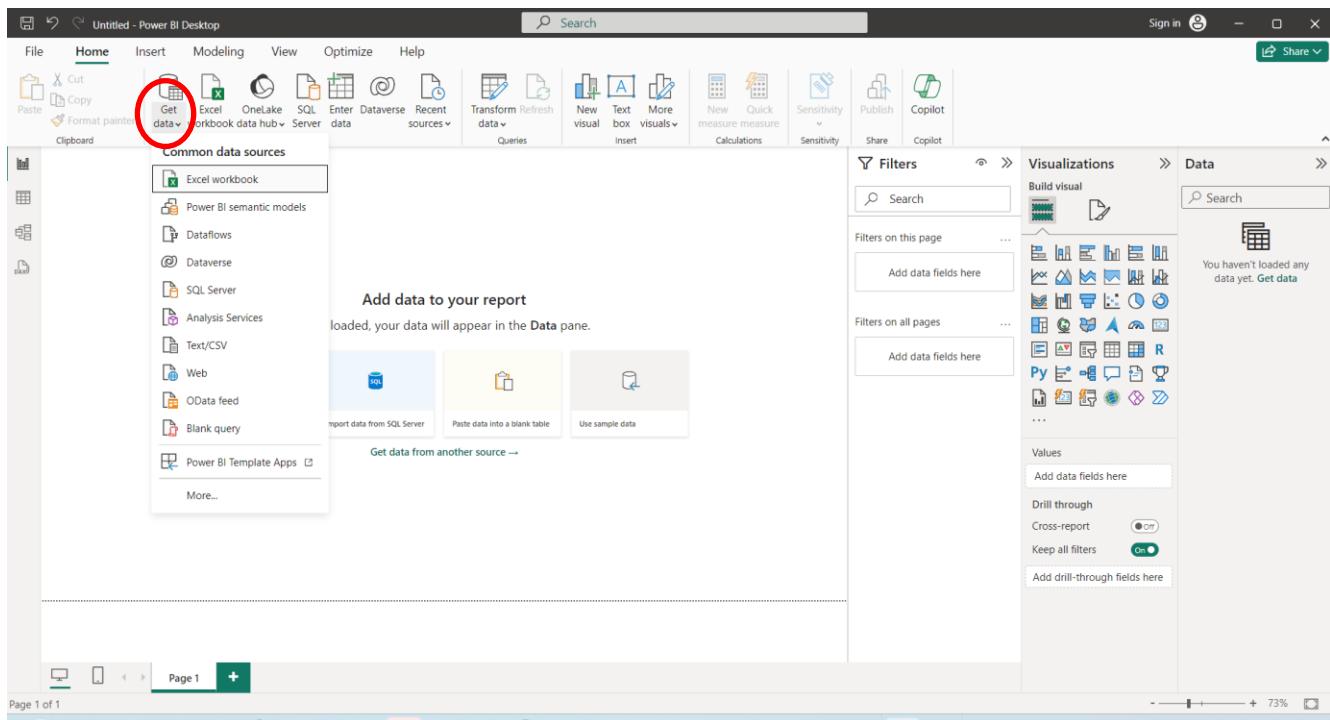
4. CONNECT TO VARIOUS DATA SOURCES

Connecting PowerBI with Different Data sources

- Connect to CSV files.
- Connect to Excel
- Connect to text.
- Connect to SQL Server
- Connect to a Web page.
- Enter data directly.
- Analysis Services Tabular data
- Connect to Direct SQL Query

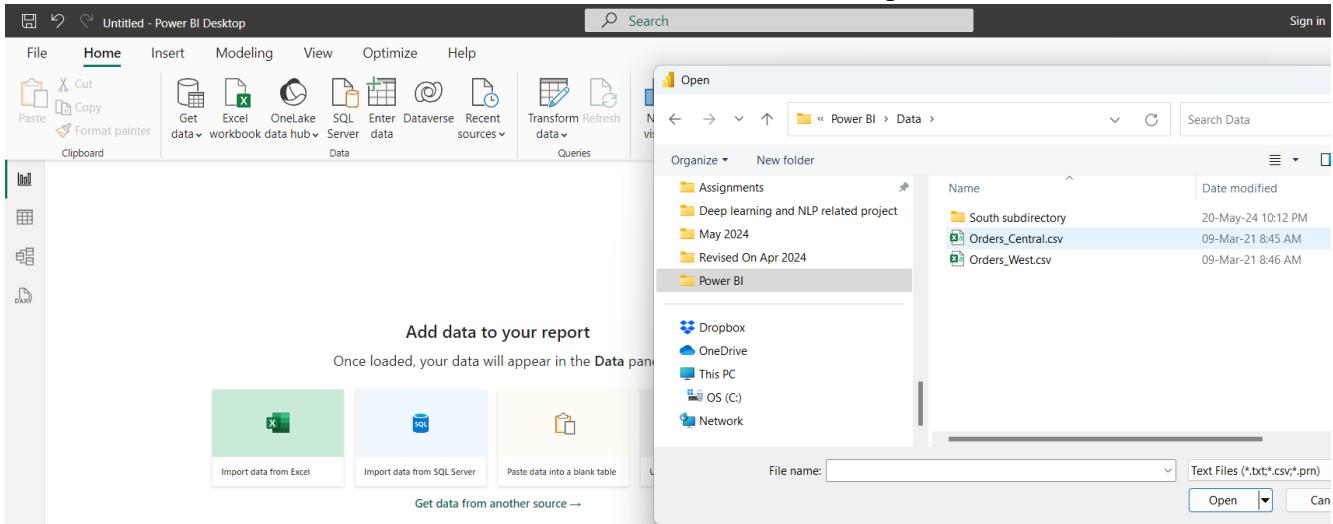
What is the purpose of the ‘Get Data’ icon in Power BI?

When users click on the Get Data icon in Power BI, a drop-down menu appears, and it shows all data sources from which data can be ingested. Data can be directly ingested from any source including files in Excel, CSV, XML, JSON, PDF, and SharePoint formats and databases such as SQL, Access, SQL Server Analysis Services, Oracle, IBM, MySQL, and much more. Also, Power BI datasets and Power BI data flows are compatible. Data can also be taken in from Azure and other online sources.



4.1 CONNECT TO CSV/TEXT FILES

Home Tab -> Get Data -> Click on Text/CSV -> Choose File -> Open



When we click on the open button, a new dialogue box will get open. In which, following delimiter can be selected to extract the data—

- Comma
- Colon
- Equal sign
- Semicolon
- Space
- Tab
- --Custom--
- --Fixed width--

Untitled - Power BI Desktop

File Home Insert Modeling View Optimize Help

Get data Excel OneLake workbook data hub

Clipboard

Orders_Central.csv

File Origin Delimiter Data Type Detection

1252: Western European (Windows) Comma Based on first 200 rows

Row ID	Order ID	Ship Mode	Customer	Country	City	State	Postal Code		
15	US-2016-118983	Standard Class	Gene Hale	Corporate	United States	Fort Worth	Texas	76106 C	
16	US-2016-118983	Standard Class	Gene Hale	Corporate	United States	Fort Worth	Texas	76106 C	
17	CA-2015-105893	Standard Class	Steve Nguyen	Home Office	United States	Madison	Wisconsin	53711 C	
22	CA-2017-137330	Standard Class	Steve Nguyen	Corporate	United States	Fremont	Nebraska	68025 C	
23	CA-2017-137330	Standard Class	Steve Nguyen	Corporate	United States	Fremont	Nebraska	68025 C	
35	CA-2018-107727	Second Class	Gene Hale	Corporate	United States	Houston	Texas	77095 C	
36	CA-2017-117590	First Class	GH-14485	Gene Hale	Corporate	United States	Richardson	Texas	75080 T
37	CA-2017-117590	First Class	GH-14485	Gene Hale	Corporate	United States	Richardson	Texas	75080 F
38	CA-2016-117415	Standard Class	SN-20710	Steve Nguyen	Home Office	United States	Houston	Texas	77041 C
39	CA-2016-117415	Standard Class	SN-20710	Steve Nguyen	Home Office	United States	Houston	Texas	77041 F
40	CA-2016-117415	Standard Class	SN-20710	Steve Nguyen	Home Office	United States	Houston	Texas	77041 F
41	CA-2016-117415	Standard Class	SN-20710	Steve Nguyen	Home Office	United States	Houston	Texas	77041 T
42	CA-2018-120999	Standard Class	LC-16930	Linda Cazamas	Corporate	United States	Naperville	Illinois	60540 T
45	CA-2017-118255	First Class	ON-18715	Odella Nelson	Corporate	United States	Eagan	Minnesota	55122 T
46	CA-2017-118255	First Class	ON-18715	Odella Nelson	Corporate	United States	Eagan	Minnesota	55122 C
47	CA-2015-146703	Second Class	PO-18865	Patrick O'Donnell	Consumer	United States	Westland	Michigan	48185 C
50	CA-2016-115742	Standard Class	DP-13000	Darren Powers	Consumer	United States	New Albany	Indiana	47150 C
51	CA-2016-115742	Standard Class	DP-13000	Darren Powers	Consumer	United States	New Albany	Indiana	47150 C
52	CA-2016-115742	Standard Class	DP-13000	Darren Powers	Consumer	United States	New Albany	Indiana	47150 F
53	CA-2016-115742	Standard Class	DP-13000	Darren Powers	Consumer	United States	New Albany	Indiana	47150 F

Extract Table Using Examples Load Transform Data Cancel

Import data from Excel

Page 1 +

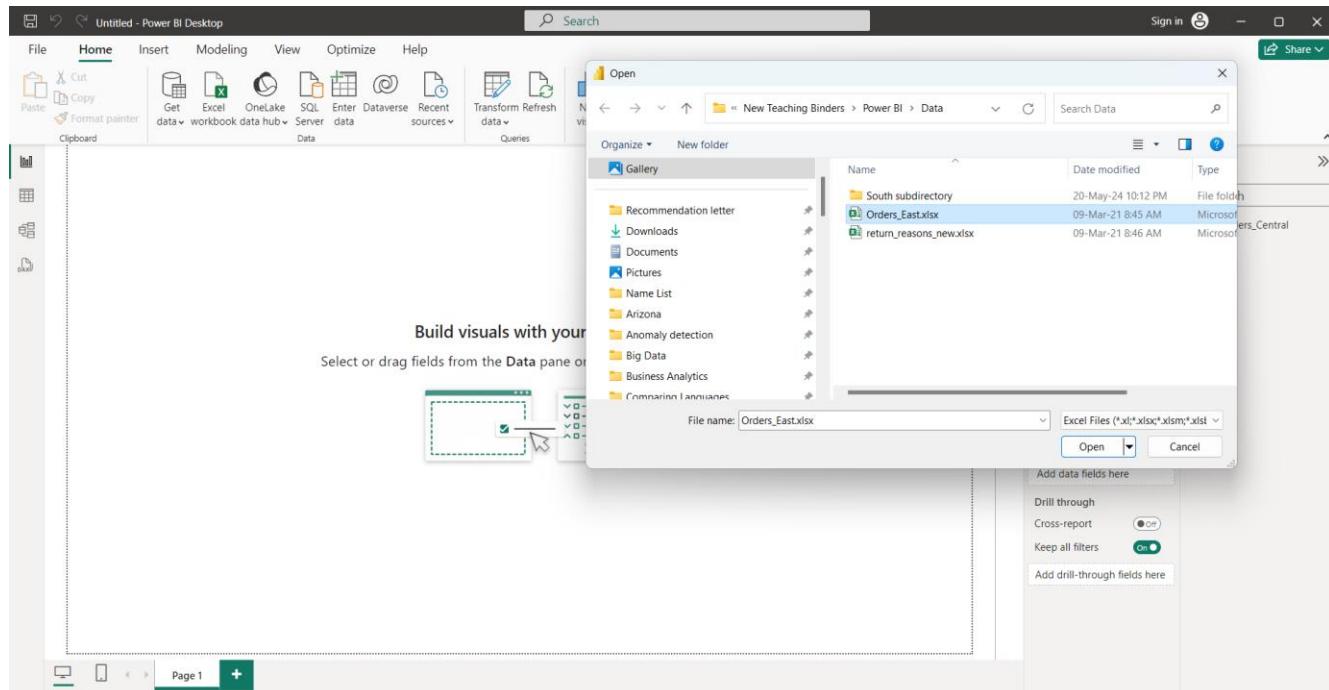
73%

Load the dataset from Get data.

4.2. CONNECT TO EXCEL FILES

Home Tab -> Get Data -> Click on Excel -> Choose File -> Open

Choose which dataset you want to choose- For a long dataset search via navigator.



Select particular excel sheet and load or transform the dataset.

The screenshot shows the Power BI Desktop interface. In the center, the Navigator pane displays a list of datasets under 'Orders East.xlsx [1]'. The 'Orders_East' dataset is selected and highlighted with a red circle. Below the Navigator, a preview of the 'Orders_East' table is shown, containing columns: Category, City, Country, Customer ID, and Customer Name. At the bottom of the preview, there is a green button labeled 'Transform Data' with a red circle around it, and a 'Cancel' button. To the right of the preview, the 'Visualizations' pane is open, showing various chart and report icons. The status bar at the bottom indicates 'Page 1 of 1' and the date '08-Jul-24'.

The screenshot shows the Power BI Desktop interface with the 'Home' tab selected in the ribbon. The main canvas area is empty, displaying the message 'Build visuals with your data' and the instruction 'Select or drag fields from the Data pane onto the report canvas.' To the right, the 'Visualizations' pane is open, showing various chart and report icons. The status bar at the bottom indicates 'Page 1 of 1' and the date '08-Jul-24'.

4.3. CONNECT TO SQL SERVER

Home Tab -> Get Data-> Choose SQL server Database or More-> Choose SQL server database -> Connect.

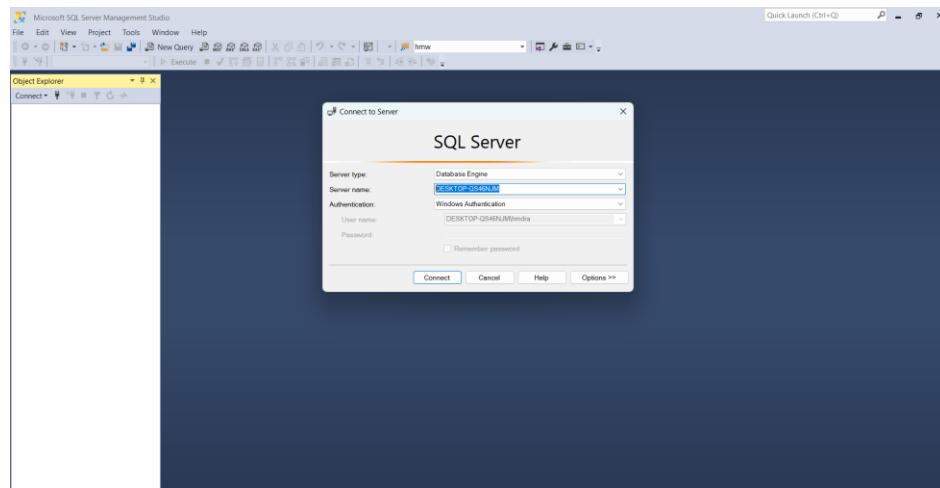
4.3.1. Following is the list of available fields to connect the Power BI desktop to the SQL Server Database

4.3.2. Server- In this section, we will provide the default SQL server Instance.

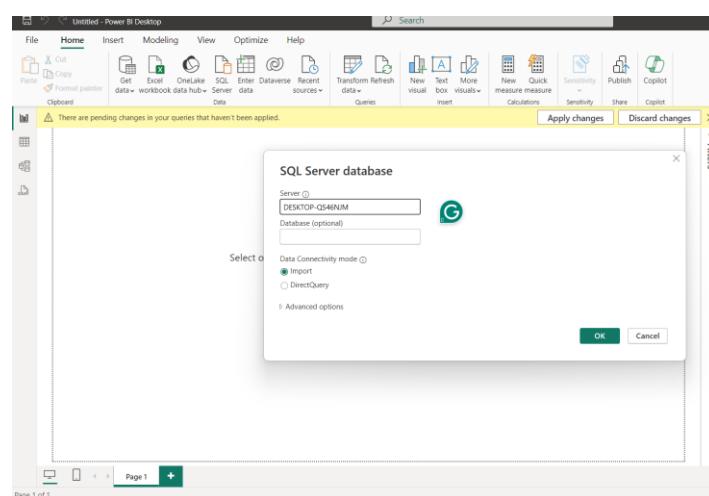
4.3.3. Database- If we want to use custom SQL query then this option is required.

4.3.4. Data Connectivity Mode- Choose whether we want to import or directly connect through query.

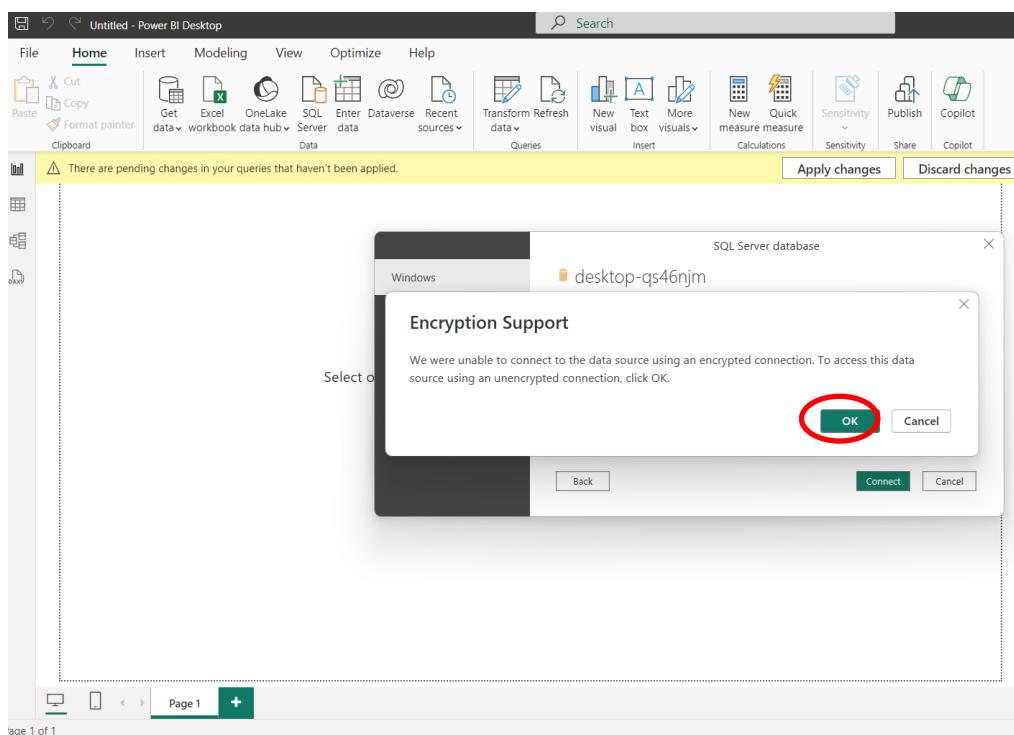
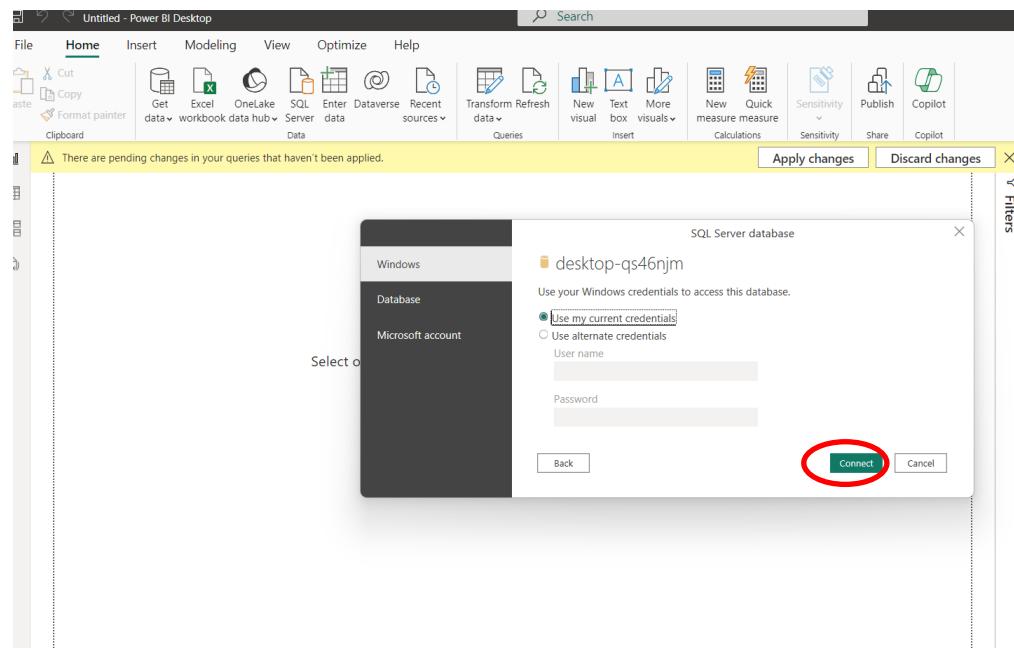
Open your SQL server and copy your Server name



Paste the name and press OK



Windows – Here we can access the SQL Server database using our Windows credentials.



Once PBI Desktop is connected to the SQL server, it will open up a navigator to choose the files or tables we would like to connect to in our model.

After selecting the tables that need to be added in the model, we can click on “Load” to load them into PBI environment directly.

The screenshot shows the Power BI Data Editor interface. The top navigation bar includes File, Home, Insert, Modeling, View, Optimize, and Help. The Home tab is selected. The ribbon below has options like Cut, Copy, Paste, Get data, Excel, OneLake, and Clipboard. A message "There are pending changes in your queries that haven't been applied." is displayed. The main area is the Navigator pane, which lists various datasets and tables. A table named "tblprice" is selected and shown in a preview grid. The grid contains columns "Item" and "wholesale". The data in the grid is as follows:

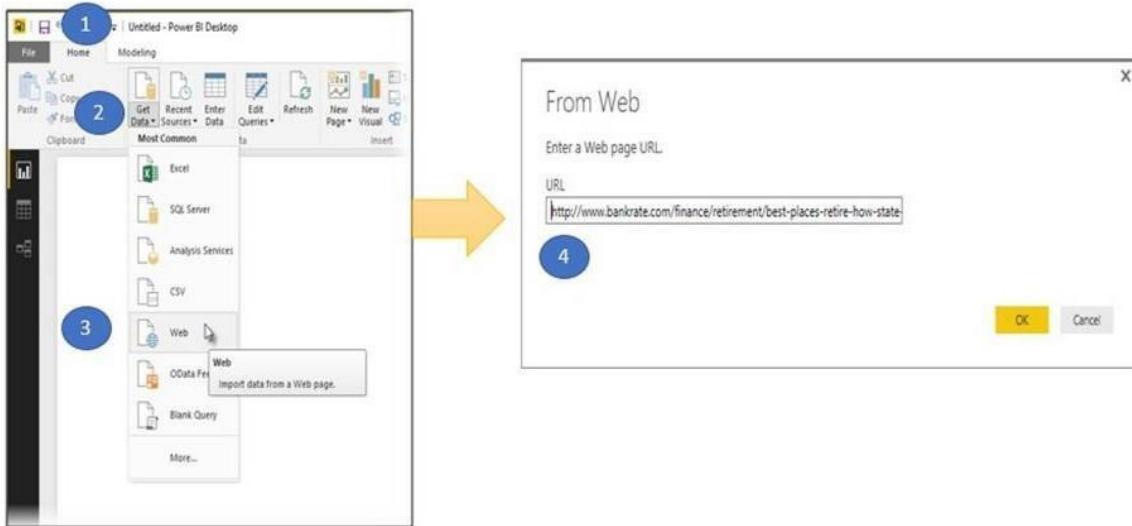
Item	wholesale
apple	1.30
orange	1.21
banana	1.10
Grape	3.30
Apple	1.30
carrot	1.51
watermelon	1.51
pineapple	3.20
avocado	3.60
a	2.40
apple	1.30
orange	1.21
apple	1.30
Grape	3.50
apple	1.30
orange	1.21
apple	1.30
Grape	3.50
Apple	1.30
carrot	1.51
watermelon	1.51
pineapple	3.20
avocado	3.60
a	2.40

At the bottom right of the Navigator pane, there are buttons for "Load", "Transform Data", and "Cancel". The "Load" button is circled in red.

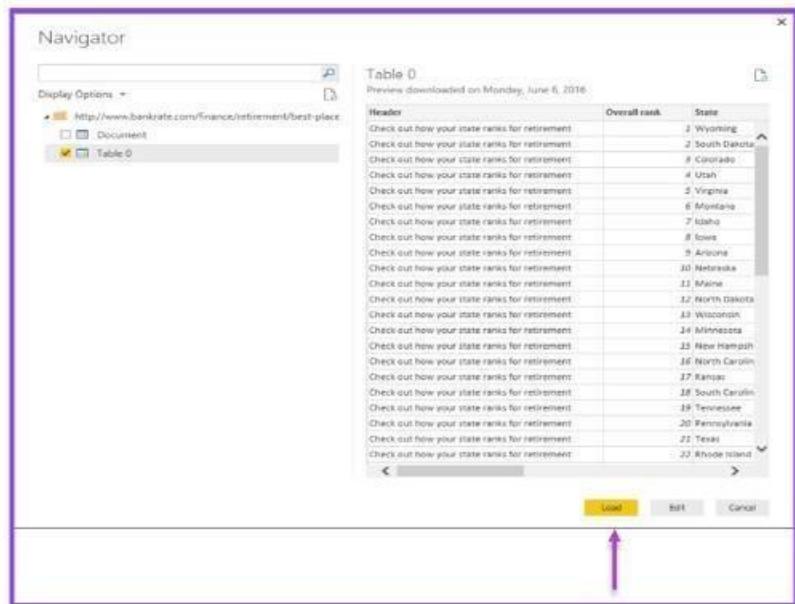
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4.5 CONNECT TO A WEB PAGE

Home Tab -> GetData -> Web data -> Type the URL -> Connect.



Once Power BI desktop connects with the web page, it presents the data available in the navigator window. When we click on any table showing inside the navigator pane, it will display the preview of data. When we select the Load option in the navigator, Power BI imports the selected item data and makes them visible inside the Fields Tab.

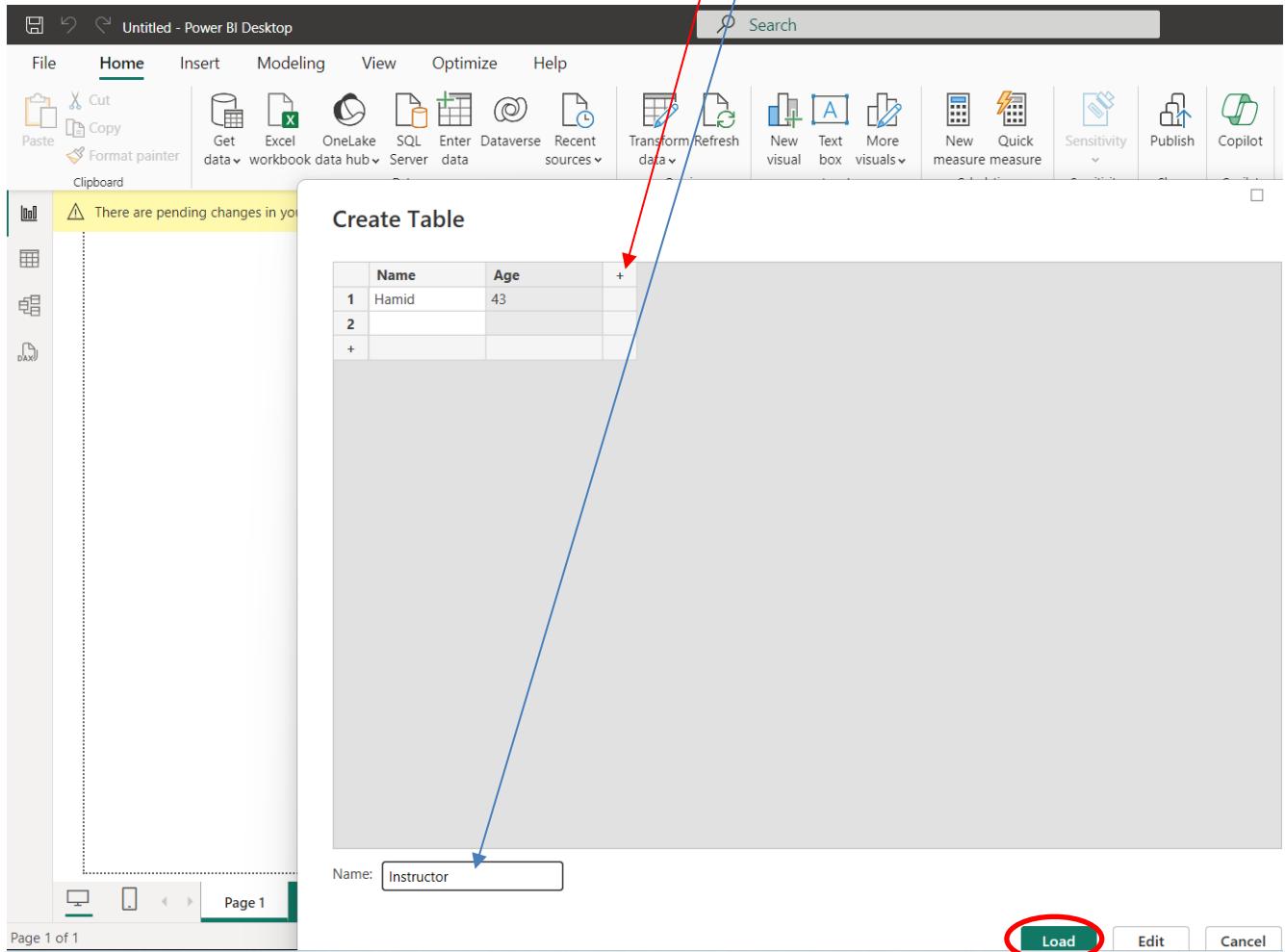


4.6 ENTER DATA DIRECTLY

Home Tab -> Enter Data This will trigger the “Create Table” dialogue box.

The screenshot shows the Power BI Desktop application window. The 'Home' tab is selected in the ribbon. On the far left, there's a vertical navigation pane with icons for Home, Insert, Modeling, View, Optimize, and Help. In the center, a 'Create Table' dialog box is open, prompting the user to enter data. The dialog box contains a table with one column labeled 'Column1'. To the right of the dialog box are the 'Visualizations' and 'Data' panes, which typically contain various data sources and visualization options. A yellow status bar at the bottom left indicates there are pending changes.

To Insert a new Column or row just click on the Plus sign which is showing on both sides of the Column and Row. At the bottom, we can define Table Name, for example – Customer data.



4.8 CONNECT TO DIRECT SQL QUERY

Home -> Get Data -> SQL server database -> Type server Name -> Type Database (Optional) -> Click on Direct Query. Enter the credentials to access the database. Note: The rest of the steps are the same as discussed in “Connect to SQL Server Database”.



5. POWER QUERY FOR DATA TRANSFORMATION

- Using SQL Different versions of Power Query
- Power Query Introduction
- Query Editor
- Manipulation in Power Query

5.2. POWER QUERY

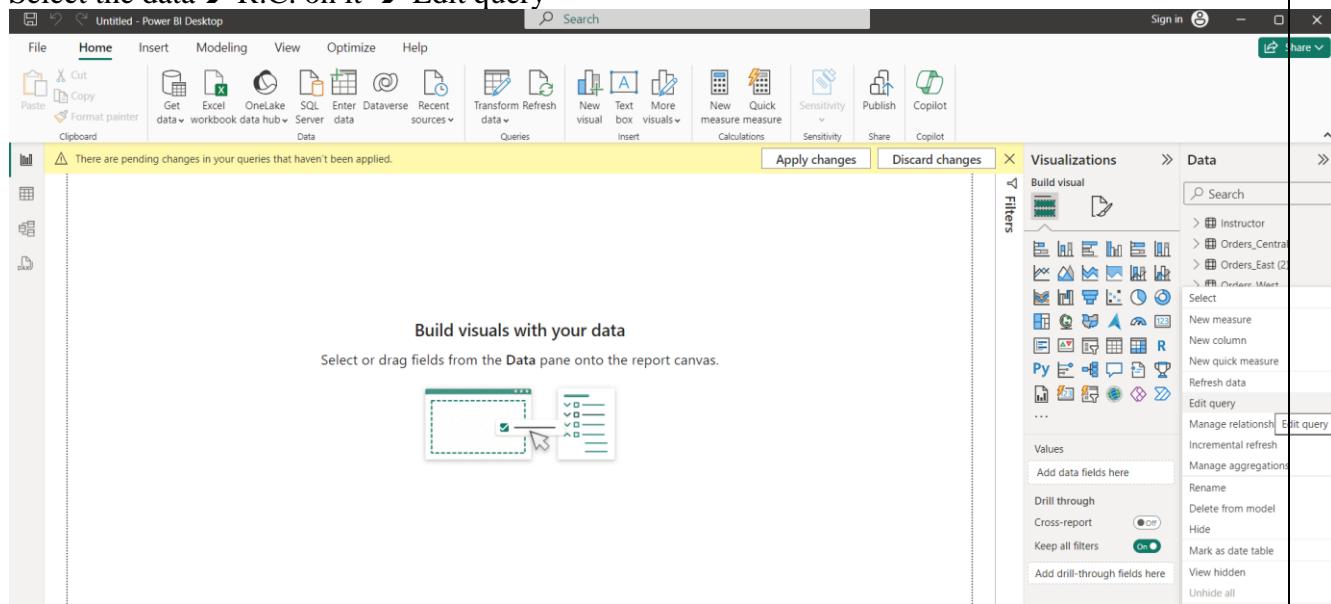
Power Query acts as an “ETL” tool for Power BI i.e. it Extracts data from one or multiple sources, Transforms that data and finally Loads it into the Power BI environment.

It also facilitates an “Applied Steps” feature, where whatever we do, will get recorded as steps and upon updating the source data, all those steps will get applied to them automatically this way the creator of the report does not have to repeat the steps.

5.3. HOW TO OPEN POWER QUERY EDITOR?

The power query editor is a separate window that either of the following ways can access:

- Select the data → R.C. on it → Edit query



Untitled - Power Query Editor

File **Home** **Transform** **Add Column** **View** **Tools** **Help**

Lose & Apply **New Source** **Recent Sources** **Enter Data** **Data source settings** **Manage Parameters** **Refresh Preview** **Properties** **Advanced Editor**

Queries [6]

- Orders_Central
- Orders_East
- tblprice
- Orders_East (2)
- Instructor
- Orders_West

Transform

Sort **Choose Columns** **Remove Columns** **Keep Rows** **Remove Rows** **Split Column** **Group By** **Replace Values**

Combine **Merge Queries** **Append Queries** **Combine Files**

Text Analytics **Vision** **Azure Machine Learning** **AI Insights**

Query Settings

PROPERTIES

Name: Orders_West

All Properties

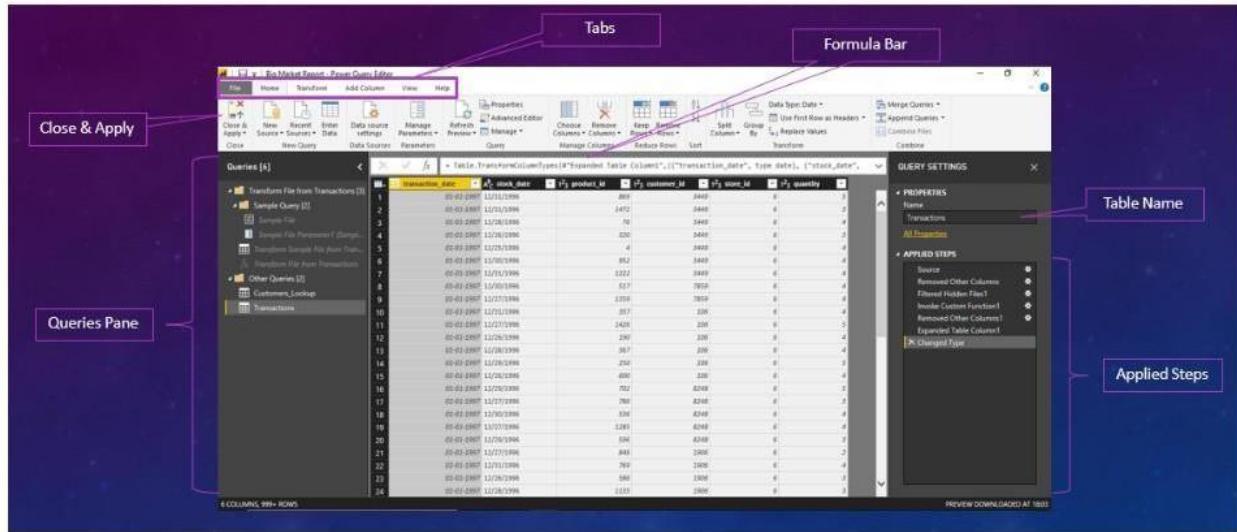
APPLIED STEPS

Source: Promoted Headers

Changed Type

Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID
1	3836 CA-2015-100363	08-Apr-15 12:00:00 AM	15-Apr-15 12:00:00 AM	Standard Class	JM-15655
2	3837 CA-2015-100363	08-Apr-15 12:00:00 AM	15-Apr-15 12:00:00 AM	Standard Class	JM-15655
3	3836 CA-2015-100363	08-Apr-15 12:00:00 AM	15-Apr-15 12:00:00 AM	Standard Class	JM-15655
4	3837 CA-2015-100363	08-Apr-15 12:00:00 AM	15-Apr-15 12:00:00 AM	Standard Class	JM-15655
5	4565 CA-2015-101175	09-Dec-15 12:00:00 AM	14-Dec-15 12:00:00 AM	Standard Class	DM-12955
6	68 CA-2015-106376	05-Dec-15 12:00:00 AM	10-Dec-15 12:00:00 AM	Standard Class	BS-11590
7	69 CA-2015-106376	05-Dec-15 12:00:00 AM	10-Dec-15 12:00:00 AM	Standard Class	BS-11590
8	68 CA-2015-106376	05-Dec-15 12:00:00 AM	10-Dec-15 12:00:00 AM	Standard Class	BS-11590
9	69 CA-2015-106376	05-Dec-15 12:00:00 AM	10-Dec-15 12:00:00 AM	Standard Class	BS-11590
10	3223 CA-2015-108189	02-Oct-15 12:00:00 AM	05-Oct-15 12:00:00 AM	First Class	ES-14080
11	3224 CA-2015-108189	02-Oct-15 12:00:00 AM	05-Oct-15 12:00:00 AM	First Class	ES-14080
12	3225 CA-2015-108189	02-Oct-15 12:00:00 AM	05-Oct-15 12:00:00 AM	First Class	ES-14080
13	3226 CA-2015-108189	02-Oct-15 12:00:00 AM	05-Oct-15 12:00:00 AM	First Class	ES-14080
14	3227 CA-2015-108189	02-Oct-15 12:00:00 AM	05-Oct-15 12:00:00 AM	First Class	ES-14080
15	3228 CA-2015-108189	02-Oct-15 12:00:00 AM	05-Oct-15 12:00:00 AM	First Class	ES-14080
16	3229 CA-2015-108189	02-Oct-15 12:00:00 AM	05-Oct-15 12:00:00 AM	First Class	ES-14080
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20	3226 CA-2015-108189	02-Oct-15 12:00:00 AM	05-Oct-15 12:00:00 AM	First Class	ES-14080

5.4. POWER QUERY EDITOR INTERFACE



5.4.1. **Queries pane:** This will show all the queries or the data with which our model is connected to.

5.4.2. **Applied Steps:** List of steps that has been recorded while using the Power Query Editor. When the data in the data source is updated then we need to just refresh our Power BI model and all the transformation steps which has been recorded by the Query Editor will get applied to updated data and that saves lots of repetitive work and time.

5.4.3. **Table Name:** We can rename the table name to something that helps in recognizing the same in the Power BI environment.

5.4.4. **Formula Bar:** Power BI uses . The same can be seen here for each applied step recorded by Query Editor.

5.4.5. Tabs:

5.4.6. **File:** General customizations related to the Query Editor window can be done here.

5.4.7. **Home:** Major options can be found under this tab like et Data, Append &Merge Query, Data source settings, etc.

5.4.8. **Transform:** This helps in transforming the existing column(s) like changing the data types, changing formatting, Pivot or Unpivot columns etc. (Note: These operations will be applied only on the selected column(s)).

5.4.9. **Add Column:** This adds a new column based on calculation or an existing column.

5.4.10. **View:** Here we can turn on or off the formula bar, whitespace, etc.

5.4.11. **Help:** It's a good resource to learn this program and even post your queries in PBI forums/community.

5.4.12. **Close & Apply:** Once transformation of the data is done, hitting this button, Power Query will load the data into Power BI and apply all the recent changes.

5.5.DATA TYPES

Make sure the suitable data type must be assigned to each column.

The screenshot shows the Power Query Editor interface. In the center, there is a table with columns: Row ID, Order ID, Order Date, and Ship Date. The 'Order Date' column is currently set to 'Whole Number'. A red arrow points from the text 'Data Type' to the 'Data Type' dropdown menu, which is open and displays various options like Decimal Number, Fixed decimal number, Whole Number, Percentage, Date, Time, Duration, Text, True/False, and Binary. The 'Whole Number' option is highlighted. To the right of the table, there is a 'Properties' pane with 'Name' set to 'Orders_West' and an 'APPLIED STEPS' pane showing 'Source' and 'Promoted Headers'.

5.6.Transformation procedure happens in Power Query

What is Power Query? Power Query is an ETL tool that helps you clean, shape, and modify data utilizing instinctive interfaces without doing anything. M-code is a new programming language that is used in power queries.

Remove Columns

The screenshot shows the Power Query Editor interface. In the center, there is a table with columns: Row ID, Order ID, Order Date, Ship Date, and Ship Mode. The 'Ship Mode' column is highlighted with a red arrow pointing to the 'Remove Columns' button in the ribbon. The 'Properties' pane shows 'Name' set to 'Orders_West' and the 'APPLIED STEPS' pane shows 'Source', 'Promoted Headers', and 'Changed Type'.

Remove Rows

The screenshot shows the Power Query Editor interface with the 'Transform' tab selected. In the ribbon, the 'Transform' tab is highlighted. On the far right, the 'APPLIED STEPS' pane is open, showing a step labeled 'Changed Type' with a red arrow pointing to it. The main area displays a table with columns: Row ID, Order ID, Order Date, Ship Date, Ship Mode, and Customer ID. The 'Order Date' column is currently set to 'Whole Number' type.

Splitting Columns

The screenshot shows the Power Query Editor interface with the 'Transform' tab selected. In the ribbon, the 'Transform' tab is highlighted. On the far right, the 'APPLIED STEPS' pane is open, showing a step labeled 'Changed Type' with a red arrow pointing to it. The main area displays a table with columns: Row ID, Order ID, Order Date, Ship Date, Ship Mode, and Customer ID. The 'Order Date' column is currently set to 'Text' type. A red arrow points to the 'Split Column' button in the ribbon's transform group.

5.7.MERGE & APPEND QUERIES

Merge Queries

This allows us to join two tables based on one common column (like the Vlookup function in Excel)

- Example: Merging Sales & Product table based on Product key in both the tables.

The screenshot shows the Power Query Editor interface with the 'Merge Queries' button highlighted by a red arrow. The query 'Orders West' is displayed in the main pane, showing a table with columns: Row ID, Order ID, Order Date, Ship Date, Ship Mode, and Customer ID. The 'APPLIED STEPS' pane on the right shows 'Source' and 'Promoted Headers'.

Append Queries

It allows us to combine two or more tables that share the same table structure and data types.

- Example: Appending two years of sales data.

The screenshot shows the Power Query Editor interface with the 'Append Queries' button highlighted by a red arrow. The query 'Orders West' is displayed in the main pane, showing a table with columns: Row ID, Order ID, Order Date, Ship Date, Ship Mode, and Customer ID. The 'APPLIED STEPS' pane on the right shows 'Source' and 'Promoted Headers'.

In Power Query, there is no step to undo or **ctrl+Z** will also not work thus follow the following procedure to remove applied steps

Untitled - Power Query Editor

File Home Transform Add Column View Tools Help

Close & Apply New Source Recent Enter Data Data source settings Manage Parameters Refresh Advanced Editor Properties Choose Columns Remove Columns Keep Rows Remove Rows Split Column Group By Data Type: Whole Number Use First Row as Headers Merge Queries Append Queries Combine Files Text Analytics Vision Azure Machine Learning AI Insights

Queries [6]

Orders_Central
Orders_East
tblprice
Orders_East (2)
Instructor
Orders_West

Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID
1	3836 CA-2015-100363	08-Apr-15 12:00:00 AM	15-Apr-15 12:00:00 AM	Standard Class	JM-15655
2	3837 CA-2015-100363	08-Apr-15 12:00:00 AM	15-Apr-15 12:00:00 AM	Standard Class	JM-15655
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5	4565 CA-2015-101175	09-Dec-15 12:00:00 AM	14-Dec-15 12:00:00 AM	Standard Class	DM-12955
6	68 CA-2015-106376	05-Dec-15 12:00:00 AM	10-Dec-15 12:00:00 AM	Standard Class	BS-11590
7	69 CA-2015-106376	05-Dec-15 12:00:00 AM	10-Dec-15 12:00:00 AM	Standard Class	BS-11590
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10	3223 CA-2015-108189	02-Oct-15 12:00:00 AM	05-Oct-15 12:00:00 AM	First Class	ES-14080
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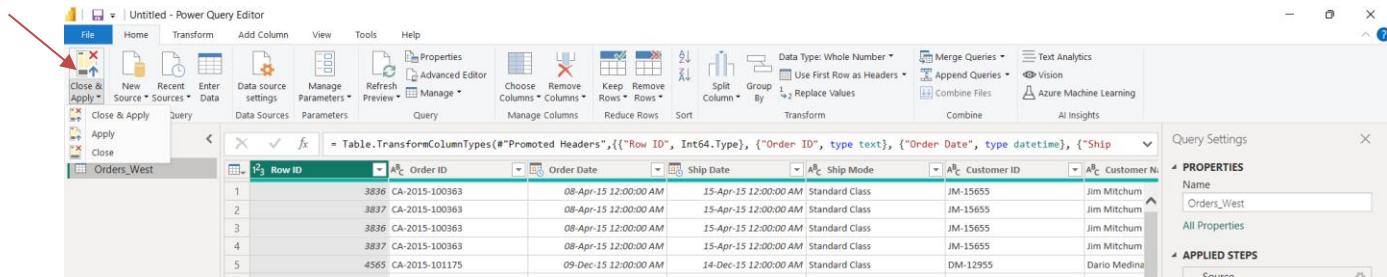
Query Settings

PROPERTIES
Name: Orders_West
All Properties

APPLIED STEPS

- Source
- Promoted Headers
- Changed Type** (highlighted with a red circle)

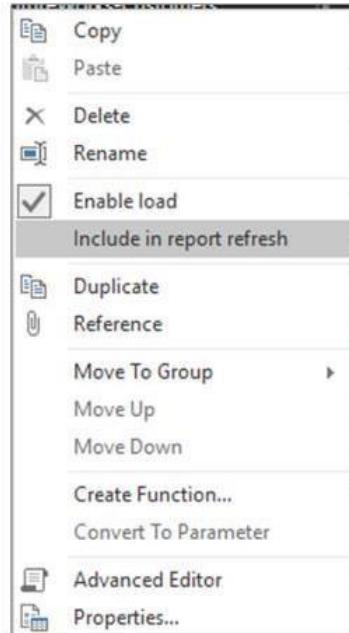
5.8.Choose Apply and close



The screenshot shows the Power Query Editor window with the ribbon at the top. The 'File' tab is selected, and the 'Close & Apply' button is highlighted with a red arrow. Below the ribbon is a toolbar with various icons for data management and transformation. A table titled 'Orders_West' is displayed in the main area, showing columns for Row ID, Order ID, Order Date, Ship Date, Ship Mode, Customer ID, and Customer Name. The table has 5 rows of data. On the right side, there is a 'Query Settings' pane with sections for 'PROPERTIES' (Name: Orders_West) and 'APPLIED STEPS'.

5.9.INCLUDE IN REPORT REFRESH

Once we click the “Refresh” command from the home tab in Power BI desktop window, it will refresh all the queries presenting Query editor. But queries which won’t change often like lookup table (e.g. Product table, Territory Table etc.), we can set it to exclude from refresh by right clicking on the query in Query editor window and deselecting “include in Report Refresh” option.



5.10.DEFINING DATA CATEGORIES

Data Categories are used to define geographical data. This will help in plotting the same on the 3D map, where the “Bing map” will recognize these fields.

To define the same, select the respective column and then go to Modelling tab in Power BI desktop and choose the related option.



6. Data Modelling in PowerBI

- Data Model
- Lookup Tables
- Primary & Foreign Key
- Creating Table Relationships
- Snowflake Schemas
- Editing Relationships
- Relationship Cardinality
- Filter
- Introduction to DAX
- Calculated Columns
- Measures
- Implicit & Explicit Measures
- Calculated Tables
- Row Context vs Set Context
- Advanced calculations using Calculate functions.
- Time Intelligence Functions

6.2. DATA MODEL

6.2.1. When the collection of two or more independent tables are connected through relationships based on common fields forms a Data Model.

6.2.2. Data Modelling helps in building custom calculations on the existing tables, which can further be used directly into Power BI visualizations.

6.3. WITHOUT DATA MODEL

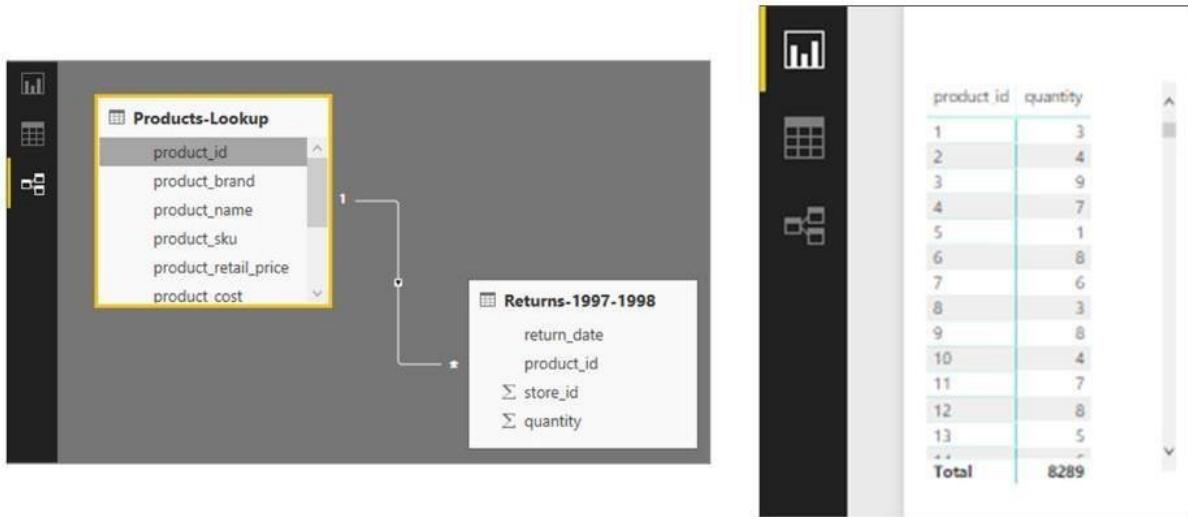
In our sample data, if the relationship between returns table and products table do not exist then using the fields in the report view from both tables will leads to independent and meaningless results.

The screenshot shows the PowerBI desktop interface with two tables side-by-side. On the left is the 'Products-Lookup' table, which contains columns for product_id, product_brand, product_name, product_sku, product_retail_price, and product_cost. On the right is the 'Returns-1997-1998' table, which contains columns for return_date, product_id, store_id, and quantity. There is no visible relationship or connection between the two tables.

product_id	quantity
1	8289
2	8289
3	8289
4	8289
5	8289
6	8289
7	8289
8	8289
9	8289
10	8289
11	8289
12	8289
13	8289
Total	8289

6.4.WITH DATA MODEL

Now both returns and Product tables are connected. Here, we are getting the correct result.



6.5.BUILDING RELATIONSHIPS

This can be done by either picking up common keys and dropping them on related table or by using “Manage Relationship” option.

Note: In Power BI, the terms "Data Table" and "Lookup Table" (also known as "Dimension Table") are used to describe different types of tables that serve specific purposes within the data model. Understanding these concepts is essential for effective data modeling and analysis.

Data Table

A Data Table, often referred to as a Fact Table, contains the core data and metrics that you want to analyze. These tables are typically large and include quantitative data, such as sales figures, transaction amounts, or other measurable events. Each row in a Data Table represents a single record or transaction, and it usually includes:

- **Measures:** Quantitative data that you want to analyze (e.g., sales revenue, number of units sold).
- **Foreign Keys:** References to related Lookup Tables (e.g., ProductID, CustomerID, DateID).

Example:

A **Sales Data Table** might include the following columns:

- SaleID (unique identifier for each sale)

- ProductID (reference to a product)
- CustomerID (reference to a customer)
- DateID (reference to a date)
- QuantitySold
- SalesAmount

Lookup Table (Dimension Table)

A Lookup Table, or Dimension Table, contains descriptive information about the dimensions of the data. These tables provide context and additional details for the data in the Data Table. Each row in a Lookup Table represents a unique entity (e.g., a product, customer, or date) and typically includes:

- **Primary Key:** A unique identifier for each entity (e.g., ProductID, CustomerID, DateID).
- **Attributes:** Descriptive information about the entity (e.g., ProductName, CustomerName, Date).

Example:

A **Product Lookup Table** might include the following columns:

- ProductID (unique identifier for each product)
- ProductName
- ProductCategory
- ProductPrice

Relationship Between Data Table and Lookup Table

In Power BI, you create relationships between Data Tables and Lookup Tables using the foreign keys in the Data Table and the primary keys in the Lookup Table. This allows you to filter and slice the data based on the attributes in the Lookup Tables.

Example:

If you have a Sales Data Table and a Product Lookup Table, you can create a relationship between the ProductID in the Sales Data Table and the ProductID in the Product Lookup Table. This relationship enables you to analyze sales data by product attributes, such as product name or category.

Data Table (Sales):

SaleID	ProductID	CustomerID	DateID	SalesAmount
1	101	201	202001	150.00
2	102	202	202001	200.00

Lookup Table (Product):

ProductID	ProductName	ProductCategory
101	Widget A	Category 1
102	Widget B	Category 2

By creating a relationship between `ProductID` in both tables, you can analyze total sales by product name or category.

Summary

- **Data Table (Fact Table):** Contains quantitative data and foreign keys.
- **Lookup Table (Dimension Table):** Contains descriptive information and primary keys.
- **Relationships:** Connect Data Tables and Lookup Tables to enable comprehensive data analysis.

6.6. UNDERSTANDING “SNOWFLAKE” SCHEMAS

In a Snowflake schema, a Lookup table has a primary key that doesn't exist as a foreign key in a Data table but rather in another Lookup table. This intermediary Lookup table is then connected to the Data table. This structure creates a chain of relationships among the tables, forming a snowflake-like pattern.

Example:

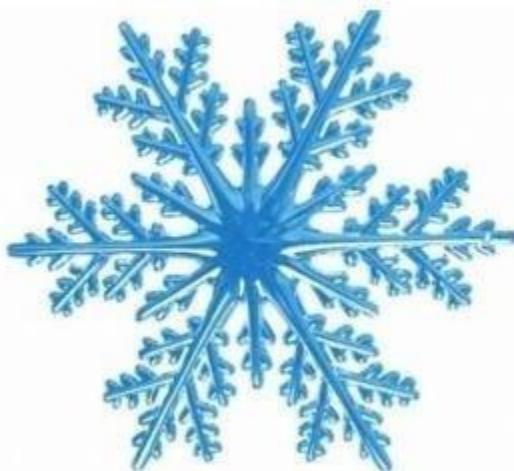
Consider a sales database where we have the following tables:

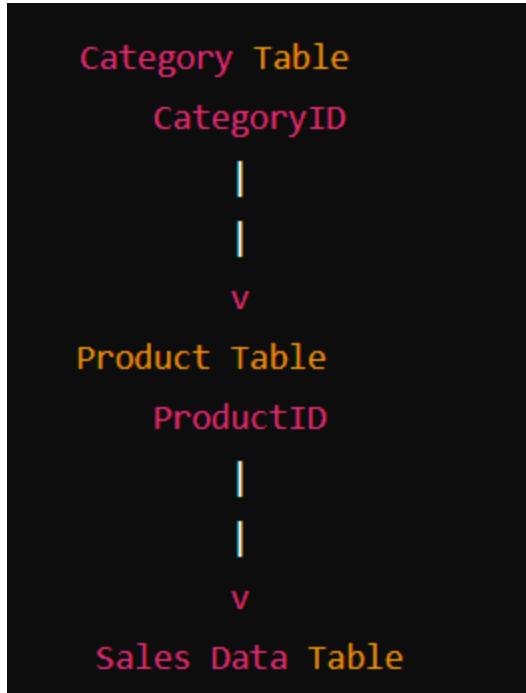
1. **Sales Data Table:** Contains transactional data.
2. **Product Lookup Table:** Contains details about products.
3. **Category Lookup Table:** Contains details about product categories.

In this schema:

- The **Product Lookup Table** has a primary key ProductID.
- The **Category Lookup Table** has a primary key CategoryID.
- The **Sales Data Table** references ProductID as a foreign key.
- The **Product Lookup Table** references CategoryID as a foreign key to categorize products.

The ProductID in the **Product Lookup Table** connects to the **Sales Data Table**, and the CategoryID in the **Category Lookup Table** connects to the **Product Lookup Table**. Thus, there is an indirect relationship between the **Sales Data Table** and the **Category Lookup Table**.

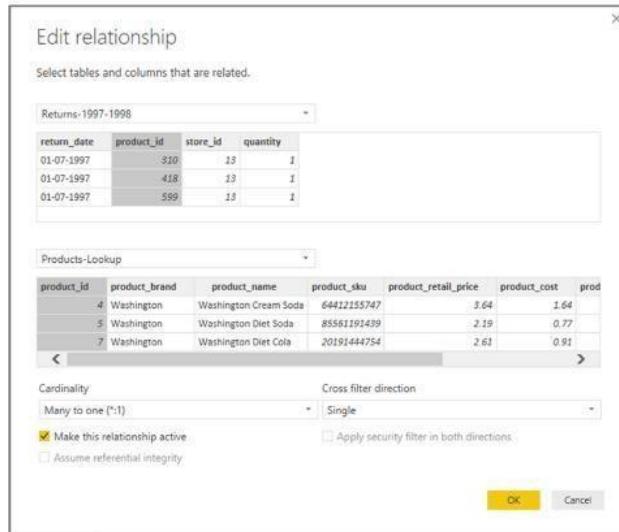




In this structure, the **Sales Data Table** is indirectly linked to the **Category Lookup Table** through the **Product Lookup Table**, creating a Snowflake schema. This type of schema normalizes the data, reducing redundancy and potentially improving query performance by splitting the data into additional tables.

6.7.EDITING EXISTING RELATIONSHIPS

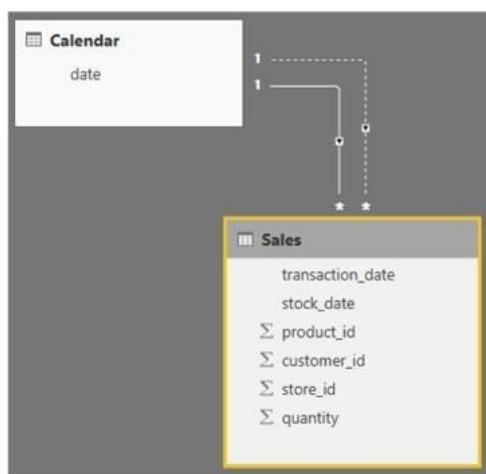
In the relationship view either one can double-click on the relationship thread or can go to Home -> Manage Relationships.



6.8.ACTIVE AND INACTIVE RELATIONSHIPS

Having two foreign keys in a data table can facilitate two relationships with one Lookup Table at the same time. But only one can be activated at one time. E.g. The date field in the calendar lookup table can have two relationships with the Sales table with “Transaction Date” and Stock Date” field. But only one can remain active at one time.

Note: An inactive relation will be shown as a dotted line in the relationship view.



6.9.RELATIONSHIP CARDINALITY

Cardinality refers to the uniqueness of values in a column. Here, high cardinality means a higher number of unique values and low cardinality means a higher number of repetitive values.

6.10. FILTER FLOW

Filter flow passes downstream from lookup tables to data tables

6.11.BOTH-WAY FILTER

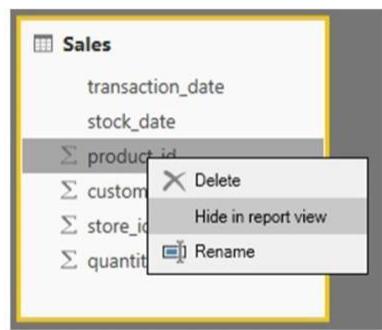
We can have a two-way filter too i.e. it can flow from the Lookup table to the Data table and at the same time Data table to the lookup table.

Note: This can be dangerous to have a both-way filter when we have more than one Data table in the model.



6.12.HIDING FOREIGN KEYS

It is quite usual for any user to use a foreign key, which will give us an incorrect result. To make user forcefully use a Primary key, we can hide the foreign keys from the report view.



6.13.INTRODUCTION TO DAX

Understanding Data Analysis Expressions (DAX) in Power BI

Data Analysis Expressions (DAX) is a powerful formula language used in Power BI, Excel, and SQL Server Analysis Services (SSAS) for data modeling and reporting. DAX enables you to create custom calculations and aggregations to generate new insights from existing data in your model. Here's a detailed explanation of how DAX can be used:

Key Components of DAX

1. Functions: DAX includes a wide range of functions, such as aggregation, time intelligence, logical, and mathematical functions, that you can use to perform complex calculations.
2. Operators: DAX supports operators (e.g., +, -, *, /) that allow you to perform arithmetic operations on your data.
3. Calculated Columns: Columns that you add to your data model using DAX formulas. These columns are calculated row-by-row and are stored in your data model.
4. Measures: Dynamic calculations that are not stored in the data model but are computed on the fly during query execution. Measures are typically used in aggregations, such as sums, averages, counts, etc.

6.14.CALCULATED COLUMNS

These are new formula-based columns that can be added to the tables. These are calculated based on the entire column or table. It understands row context, so for basic statistical functions like sum, count, average etc. this will not be useful.

Definition: Columns that you add to your data model using DAX formulas. These columns are evaluated and stored in the model.

Use Case: Useful when you need to extend your data model with additional columns that are derived from existing columns.

Performance: Calculated columns can increase the size of your data model because they are stored and recalculated each time the data is refreshed.

Example: Adding a calculated column to combine first and last names.

`FullName = [FirstName] & " " & [LastName]`

6.15.MEASURES

Measures are used to create new calculated values. These also works on entire columns or tables and entertain filter context. These values can't be seen in data view.

Definition: Calculations that are defined using DAX and are computed dynamically when queried. Measures are not stored in the data model.

Use Case: Ideal for creating aggregations and complex calculations that need to be performed on the fly, such as sums, averages, and ratios.

Performance: Measures are efficient because they are calculated at query time and do not add to the data model size.

Example: Creating a measure to calculate total sales.

$TotalSales = SUM(Sales[SalesAmount])$

6.16.MEASURES VS. CALCULATED COLUMNS

Measures

- Creates new calculated value.
- Understand filter context.
- Works on entire column or table
- Can only be seen in Report view.
- Doesn't increase file size.

Calculated Columns

- Create a new column.
- Understand row context.
- Works on entire column or table
- Can be seen in both Data and Report view.
- Increase file size.

Using DAX in Power BI

1. Creating a Calculated Column

Go to the Data view or Model view in Power BI.

Select the table where you want to add the column.

Click on “New Column” in the Modeling tab.

Enter the DAX formula for the calculated column.

Example: Adding a calculated column to calculate profit.

$Profit = Sales[SalesAmount] - Sales[Cost]$

2. Creating a Measure

Go to the Data view or Model view in Power BI.

Select the table where you want to add the measure.

Click on “New Measure” in the Modeling tab.

Enter the DAX formula for the measure.

Example: Creating a measure to calculate average sales.

$AverageSales = AVERAGE(Sales[SalesAmount])$

Common DAX Functions

SUM: Adds all the numbers in a column.

TotalSales = SUM(Sales[SalesAmount])

AVERAGE: Calculates the average of numbers in a column.

AverageSales = AVERAGE(Sales[SalesAmount])

IF: Returns one value if a condition is true and another value if it's false.

ProfitMargin = IF(Sales[SalesAmount] > 0, Sales[Profit] / Sales[SalesAmount], 0)

CALCULATE: Evaluates an expression in a modified filter context.

TotalSalesLastYear = CALCULATE(SUM(Sales[SalesAmount]), SAMEPERIODLASTYEAR(Dates[Date]))

RELATED: Returns a related value from another table.

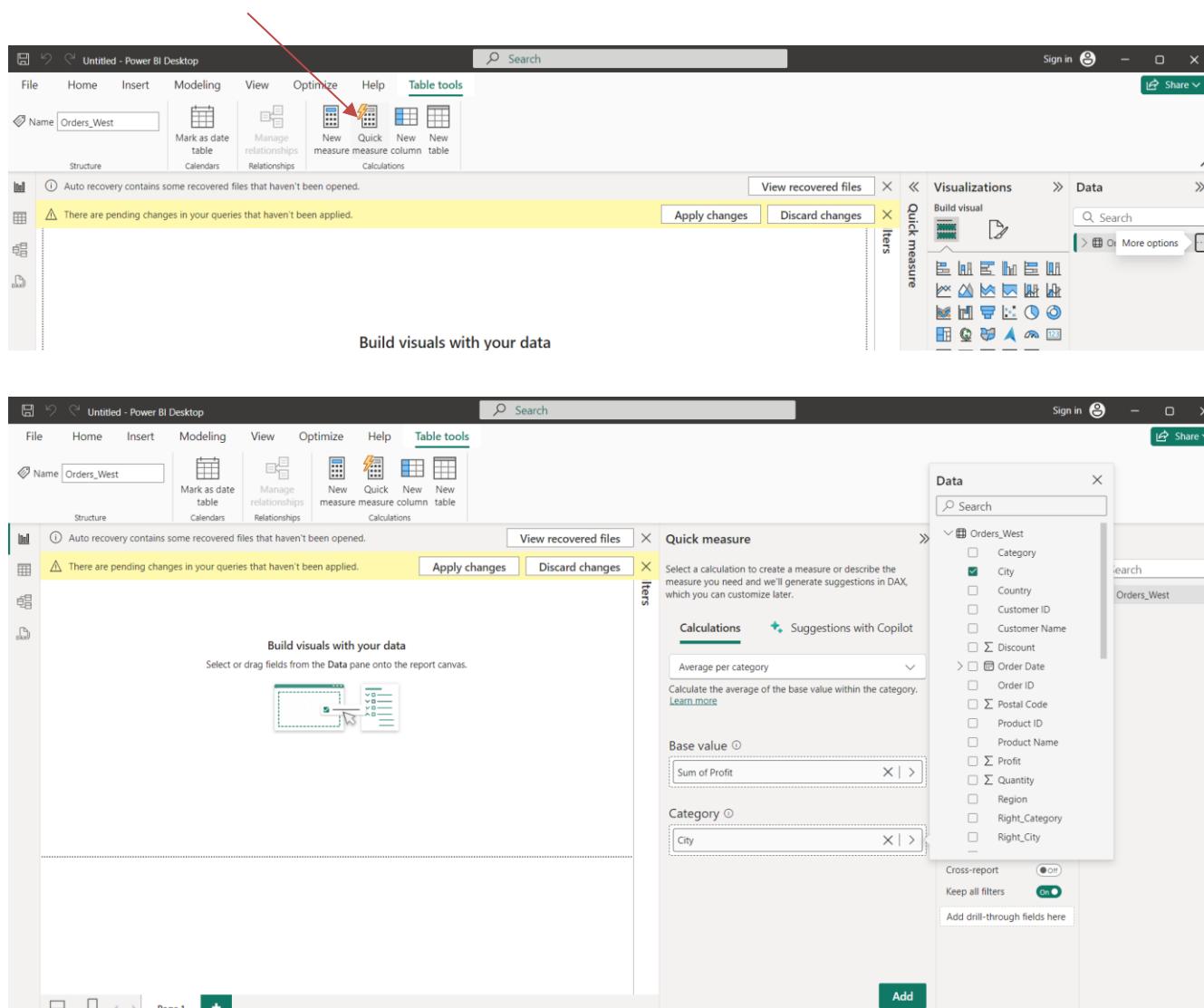
ProductCategory = RELATED(Product[Category])

Summary

DAX is an essential part of data modeling and reporting in Power BI. By using DAX, you can create calculated columns and measures to derive new insights and perform complex calculations. Understanding the difference between calculated columns and measures, and how to use various DAX functions, will enhance your ability to create powerful and efficient data models.

Measures can be added either by right-clicking within the table or by using “Quick Measures”.

<https://learn.microsoft.com/en-us/power-bi/transform-model/desktop-quick-measures>



6.17. IMPLICIT & EXPLICIT MEASURES

6.17.1. Implicit Measures These are being created when we drag a numerical field into the values pane of a visualization in the report view and choose any pre-defined calculation on the same as Sum, count, average etc. These can be accessed only in the visualization where these have been created.

6.17.2. Explicit Measures These are being created by entering the DAX function. These can be accessed anywhere in the report and can be used in other DAX calculations too.

6.18.CALCULATED TABLES

Calculated Tables are the new tables to be added to the model using DAX. Usually, we import data from different sources and use them as tables in Data and report view but Calculated tables are being created using DAX on existing data.

6.19.DAX Operators

ARITHMETIC OPERATORS

Arithmetic operator	Meaning
+ (plus sign)	Addition
- (minus sign)	Subtraction or sign
* (asterisk)	Multiplication
/ (forward slash)	Division
^ (caret)	Exponentiation

COMPARISON OPERATORS

Comparison operator	Meaning
=	Equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
<>	Not equal to

LOGICAL OPERATORS

Logical operator	Meaning
&& (double ampersand)	Creates an AND condition between two expressions that each have a Boolean result. If both expressions return TRUE, the combination of the expressions also returns TRUE; otherwise the combination returns FALSE.
(double pipe symbol)	Creates an OR condition between two logical expressions. If either expression returns TRUE, the result is TRUE; only when both expressions are FALSE is the result FALSE.
IN	Creates a logical OR condition between each row being compared to a table. Note: the table constructor syntax uses curly braces.

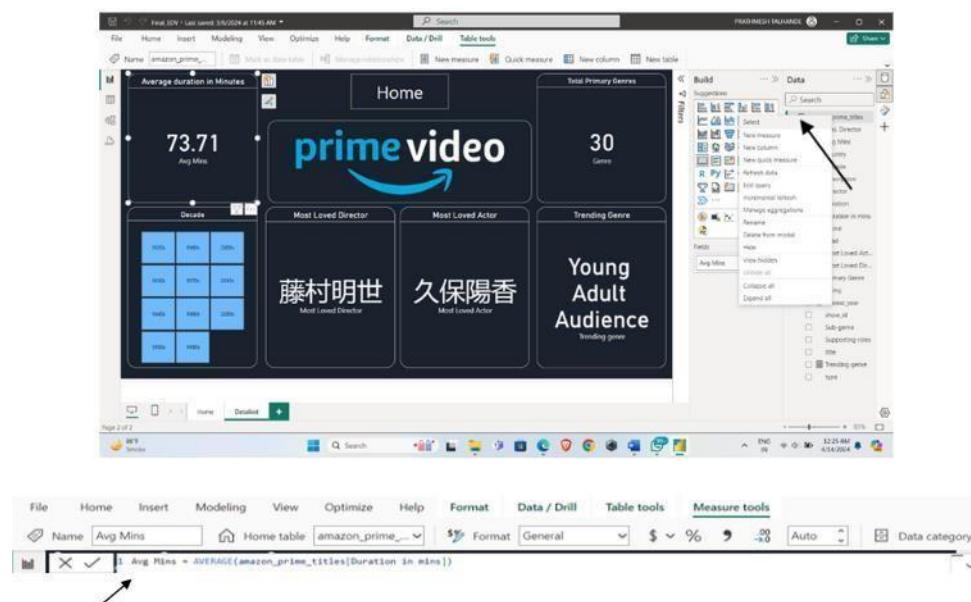
6.20.What is DAX ?

It is a formula expression language called (DAX) that can be used with various visualization tools like Power BI. It is also known as a functional language, where the full code is kept inside a function.



6.21.How to apply DAX ?

Go to dataset, right click and click on measure or table



6.22. All About DAX

New Measure is created with writing DAX in code language for mathematical operations and will not retain extra data storage in your working data. While New table is created by same by writing DAX but table create new calculated column and will retain space in your working space.

What are the data types of Dax?

Data types of Dax are: 1) Numeric, 2) Boolean, 3) Date Time, 4) String, and 5) Decimal.

Benefits of using Variables in DAX.

Here, are benefits of using DAX function: · By declaring and evaluating a variable, the variable can be reused multiple times in a DAX expression, which helps you to avoid additional queries of the source database. · Variables can make DAX expressions more useful and logical.

· Variables is only scoped, which should be measure or query which can't be among measures.

7. REPORTS IN POWERBI

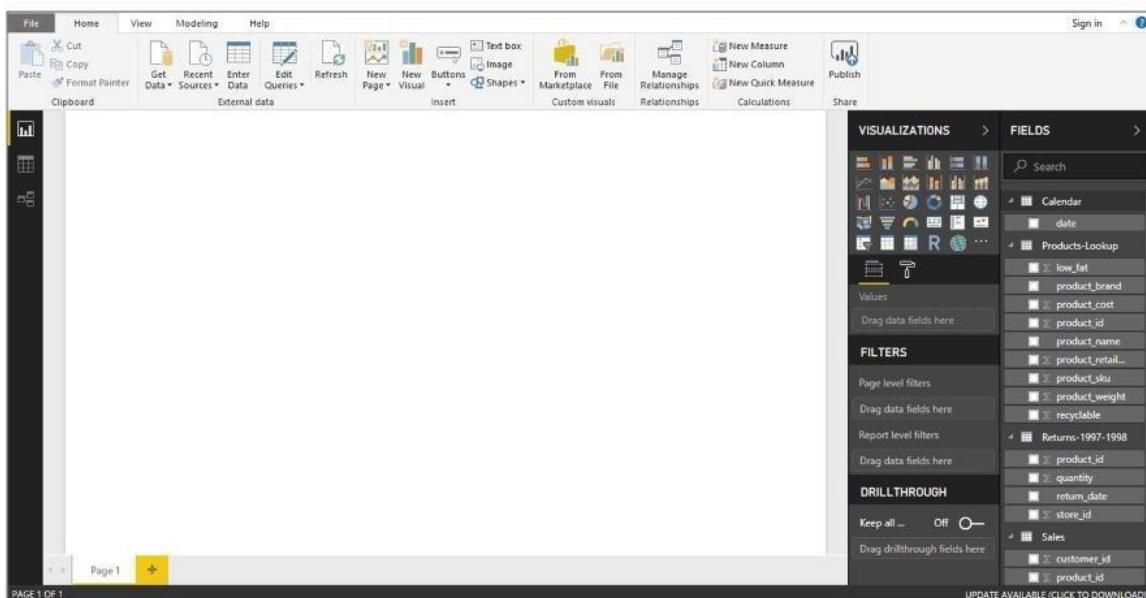
- Connect to Direct SQL Query in Power BI Desktop
- Create a new Power BI report.
- The report editor in Power BI
- Add a page to a Power BI report.
- Add a filter to a report in Power BI
- Save a report in Power BI
- About filters and highlighting in Power BI reports
- How to use report filters
- Analyze in Excel
- Other Miscellaneous operations

7.2.CONNECT TO DIRECT SQL QUERY IN DESKTOP

DirectQuery – no data is imported or copied into Power BI Desktop. For relational sources, the selected tables and columns appear in the Fields list. For multi-dimensional sources like SAP Business Warehouse, the dimensions and measures of the selected cube appear in the Fields list. As you create or interact with a visualization, Power BI Desktop queries the underlying data source, which means you're always viewing current data. Many data modeling and data transformations are available when using DirectQuery, though with some limitations. When creating or interacting with a visualization, the underlying source must be queried and the time necessary to refresh the visualization is dependent on the performance of the underlying data source. When the data necessary to service the request has recently been requested, Power BI Desktop uses recent data to reduce the time required to display the visualization. Selecting Refresh from the Home ribbon will ensure all visualizations are refreshed with current data.



REPORT VIEW (INTERFACE)

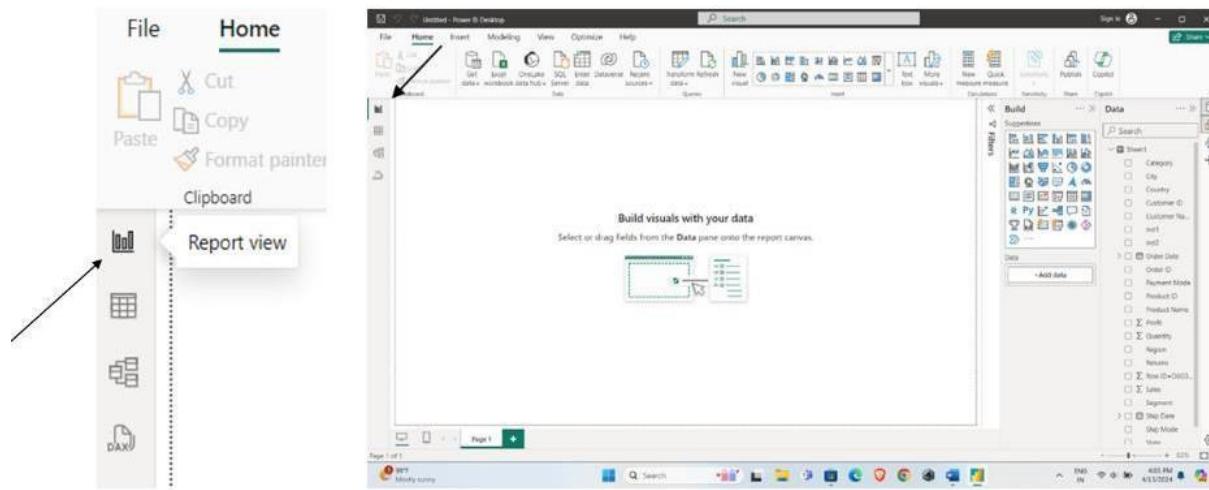


7.3. There are 3 different types of views in PowerBI.

- 7.3.1. Report View: Users can add visualizations and additional report pages and publish the same on the portal from here.
- 7.3.2. Table/Data View: Data shaping can be performed through Query Editor tools.
- 7.3.3. Model/Relationship View: Users can manage relationships between datasets in this view.

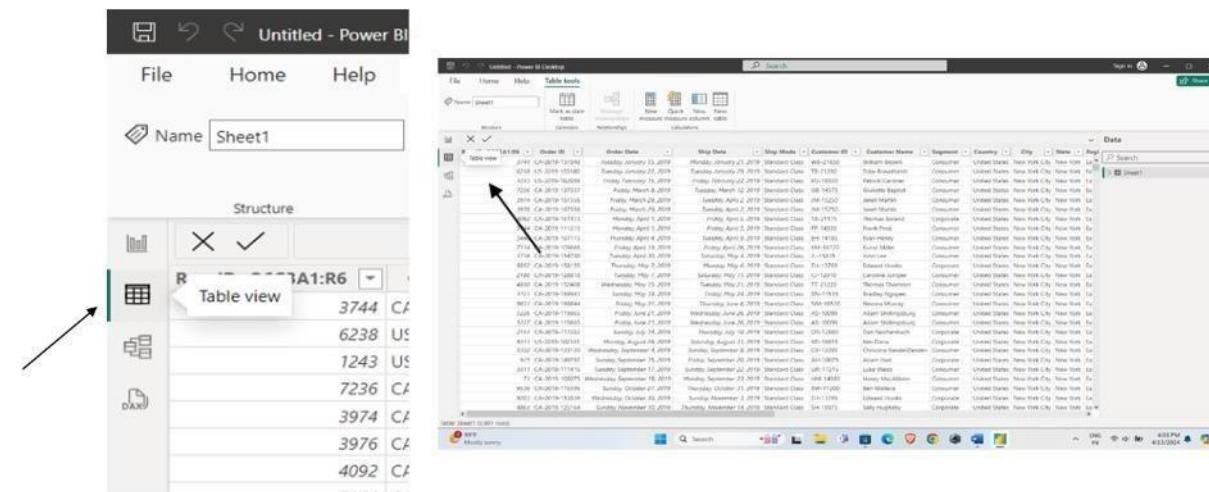
7.4.REPORT VIEW

Report view – For making reports using different visualization charts. "Report" view is where you create, design, and interact with visualizations based on your data.



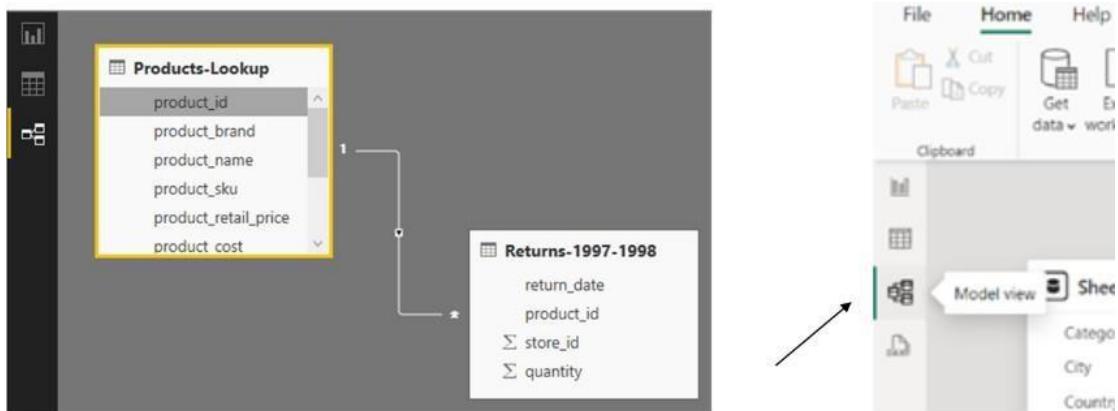
7.5.TABLE VIEW

Table view – "Table view" is a feature that allows you to interact with your data in a tabular format, like how data appears in a spreadsheet.



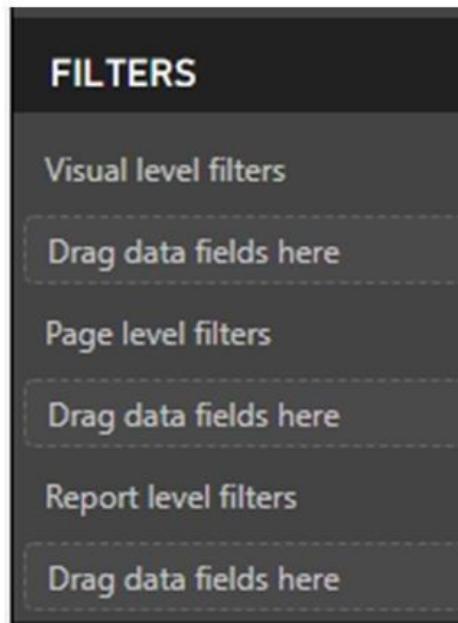
7.6.MODEL VIEW

Model view – "Model view" is a feature that allows you to view and manage the relationships between different data tables within your dataset.



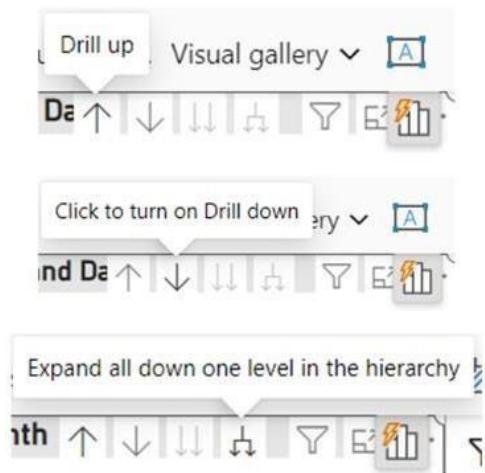
7.7.POWER BI DESKTOP FILTERS

- 7.7.1. Visual Level Filter: This is applied only to the active visual.
- 7.7.2. Page Level Filter: This gets applied to all the visuals in the existing page.
- 7.7.3. Report Level Filter: This is applied to all the visuals in all the existing pages in the report.



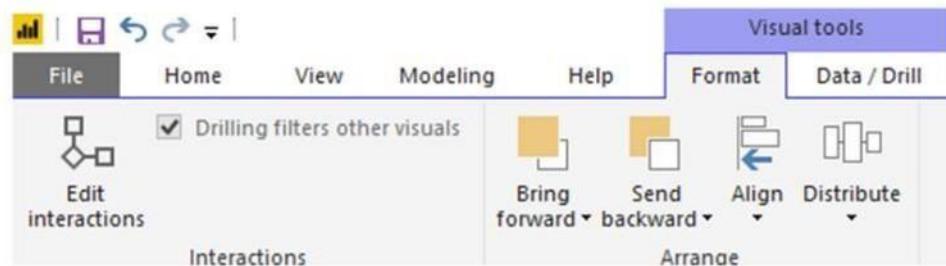
7.8.How can we filter data in Power BI?

Data can be filtered using various filters that are available in Power BI, implicitly. There are basically three types of filters, namely, Page- level filters, Drillthrough filters, and Report-level filters.



7.9.REPORT INTERACTIONS

By default, all the visualizations are connected to each other and filtering items in one visual will impact others too. Through “Edit interactions” we can prevent certain visualizations to get filtered.



8. Reports and Visualization types in Power BI

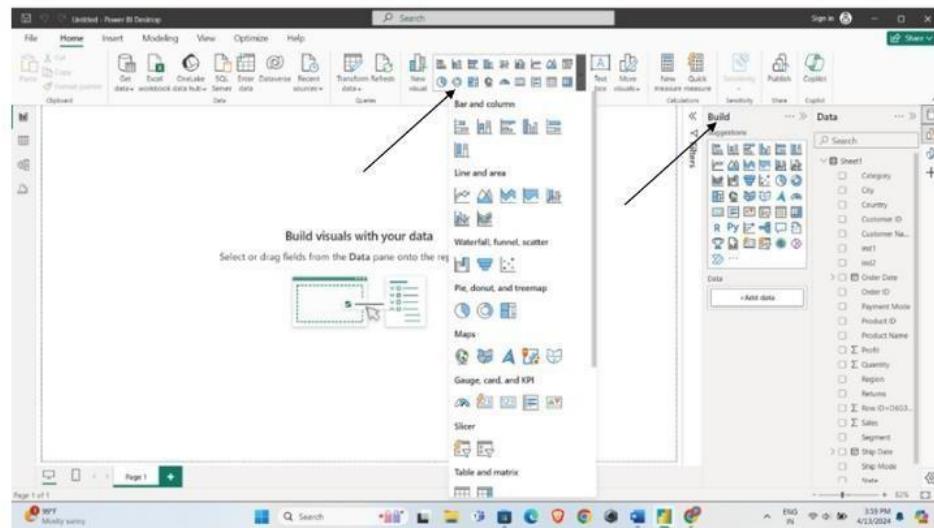
- Types of visualization in a Power BI report
- Custom visualization to a Power BI report
- Types of visualization in a Power BI report
- Add a custom visualization to a Power BI report
- Download a custom visual from the gallery
- Getting started with color formatting and axis properties
- Change how a chart is sorted in a Power BI report
- Move, resize, and pop out a visualization in a Power BI report
- Drill down in a visualization in Power BI

9. TYPES OF VISUALIZATION IN A POWER BI REPORT

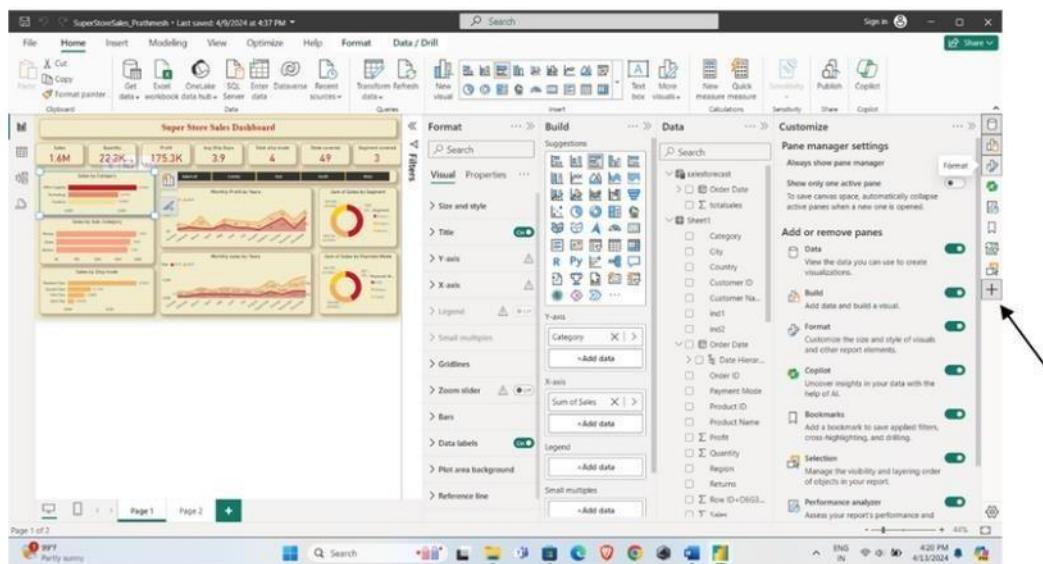
- Area
- Stacked Area
- Bar/Column
- Clustered Bar/Column
- 100% Stacked Bar/Column
- Combo •Ribbon
- Tree map
- 3D Map
- Filled Map
- Card/KPI
- Slicer
- Table
- Matrix
- Doughnut
- Funnel
- Gauge
- Line
- Pie
- Scatter
- Waterfall

TYPES OF VISUALIZATION IN A POWER BI REPORT

Accessing the different visualizations from PowerBI Report view: -26 Charts are provided default and More can be imputed with paid login id. Charts are visible under Build portion.

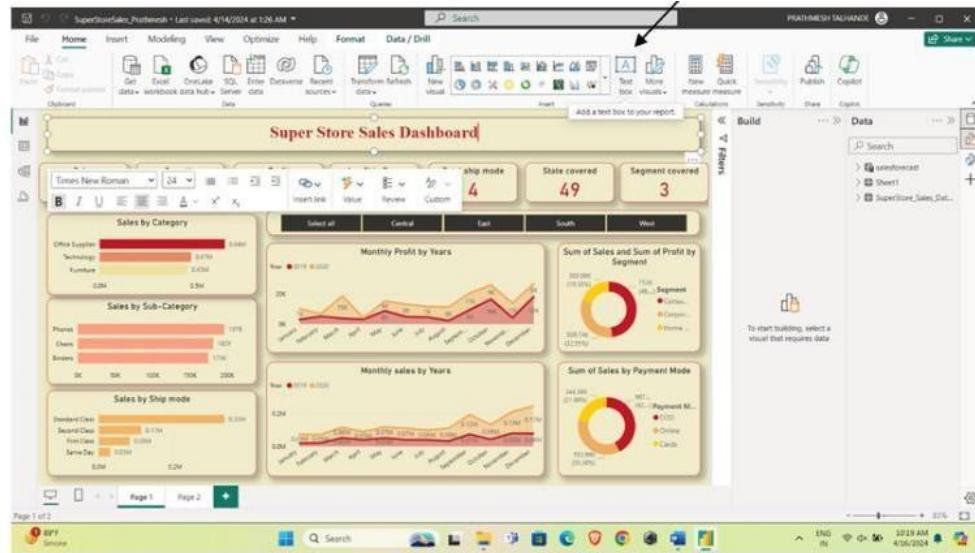


Activating all the pane from format option at rightmost side of the report view



Making visualizations in report view

Making title for visualization using Text Box option available on top and with formatting option visible in white strip we can entitle the visualization.



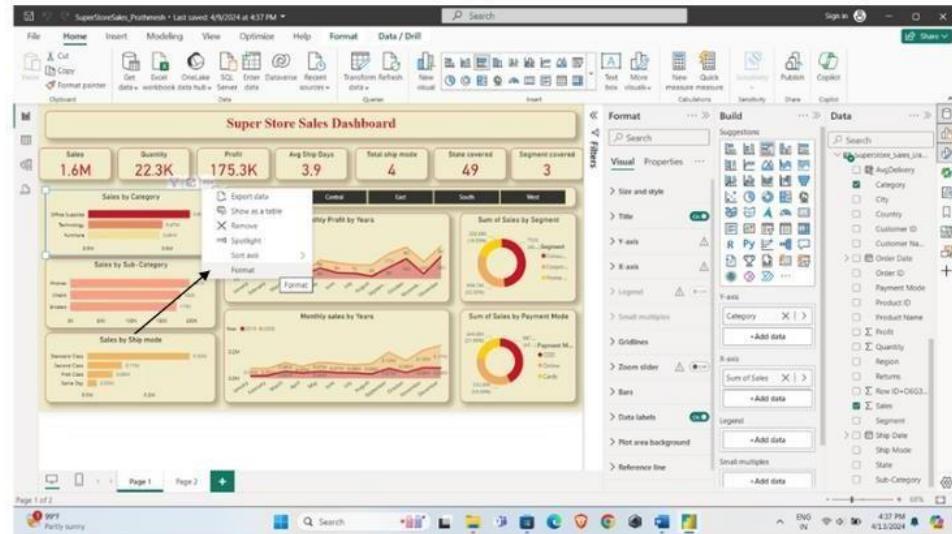
Creating bar graph visualization

Choose horizontal bar graph option from insert or build suggestions. Choose values for x-axis and y-axis Build option, click on 3 dots available on top of bar graph to get option like Export data, Show as a table, Remove, Spotlight, Sort axis and Format.



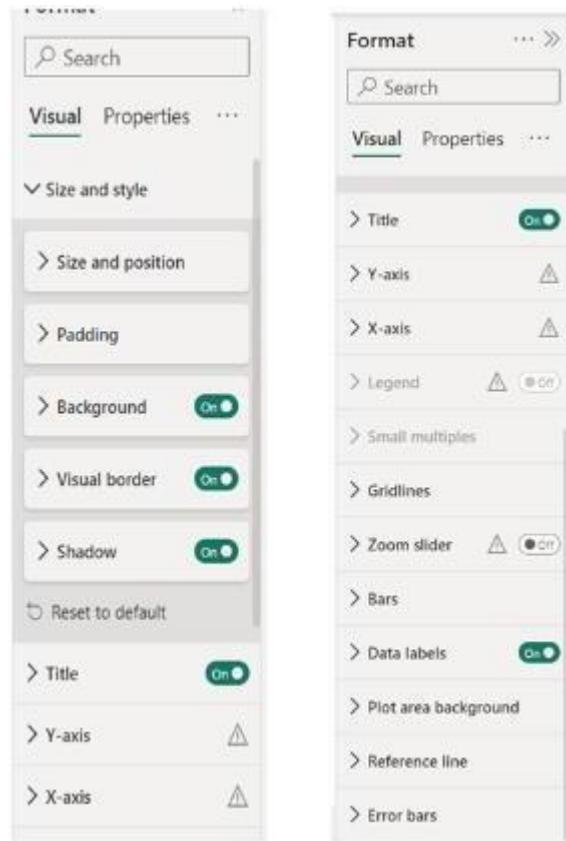
Formatting the Visualization

Format Pane: The "Format" tab contains several sections, each with its own set of formatting options. These options may vary depending on the type of visualization you've selected.



Explore different formatting option to create visualization.

- Data colors: Customize the colors used within the visualization, including data series colors, background colors, and font colors.
- Data labels: Control the appearance of data labels, including font size, color, position, and formatting.
- Title: Customize the title of the visualization, including font size, color, alignment, and formatting options.
- X-axis / Y-axis: Format axis labels, titles, scales, and other properties specific to the X and Y axes.
- Legend: Adjust the appearance and position of the legend, including font size, color, orientation, and visibility.
- Shapes: Add shapes or lines to the visualization and customize their appearance, such as color, style, and thickness.
- Tooltip: Customize the tooltip that appears when hovering over data points in the visualization, including the information displayed and formatting options.
- Small multiples: Instead of viewing a single large chart, small multiples allow users to compare different categories or dimensions within the same chart type.



Exporting Data

Users can export the data displayed in visualizations such as charts, tables, matrices, and other visual elements.

This screenshot illustrates the process of exporting data from a Power BI dashboard. On the left, the 'Super Store Sales' dashboard is shown with several visualizations: a card for 'Sales' (1.6M), 'Quantity' (22.3K), 'Profit' (175.3K), and 'Avg Ship Date' (3.9). Below these are two bar charts: 'Sales by Category' and 'Sales by Sub-Category'. A context menu is open over the 'Sales by Category' chart, with the 'Export data' option highlighted. To the right, the 'Power BI Desktop' application window is visible, showing the 'Data' view with a data source named 'Super Store Sales'. The 'Home' tab is selected in the ribbon. Arrows point from the 'Export data' option in the dashboard's context menu to the 'Save' button in the Power BI desktop ribbon, indicating the path to export the data.

Show as table

"Show as table" is a feature that allows you to view the data underlying a visualization in a tabular format

The screenshot shows a Power BI interface with two visualizations: "Sales by Category" and "Sales by Sub-Category". A context menu is open over the "Sales by Category" chart, with the "Show as table" option highlighted. To the right, the "Format" pane is visible, showing data labels for the chart.

Category	Sum of Sales	Sum of Profit
Office Supplies	413,710.90	74,710.25
Technology	415,619.99	80,846.45
Furniture	491,539.81	93,996.03

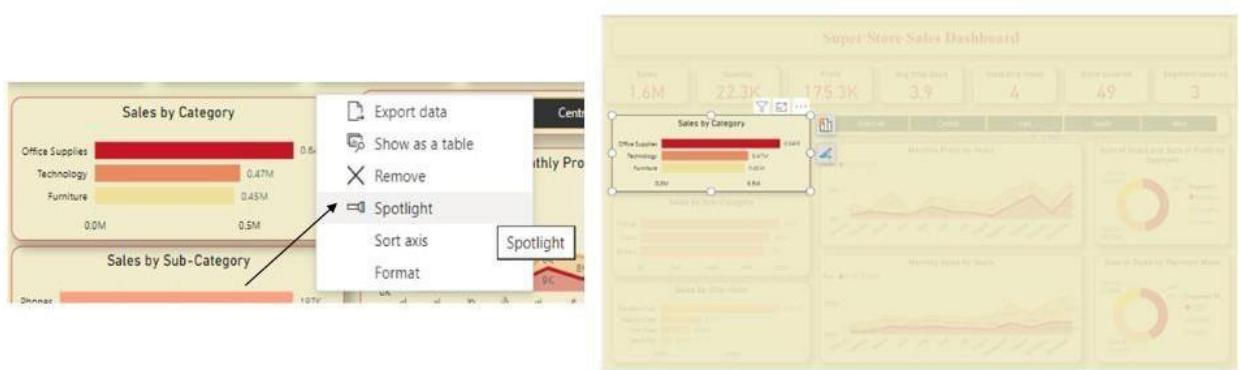
Removing

Option to remove particular visualization.

The screenshot shows the same Power BI interface as before, but the context menu over the "Sales by Category" chart now has the "Remove" option highlighted.

Spotlight

To create spotlight on visualization



Sorting graph



Focus mode

Focus mode in Power BI allows users to view a visual or a report in full-screen mode, providing a distraction-free environment for focused analysis.



Types of Visualization

9.2.Card

"Card" visualization is a simple yet powerful way to display a single value or a key performance indicator (KPI)



9.3.Bar graph

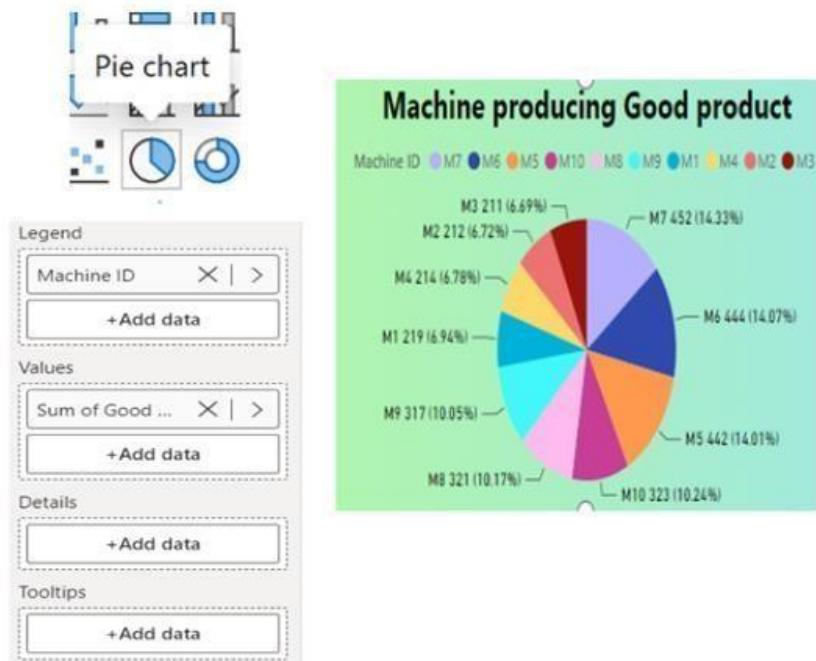


horizontal, vertical, joint-bar, stack-bar, clustered bar



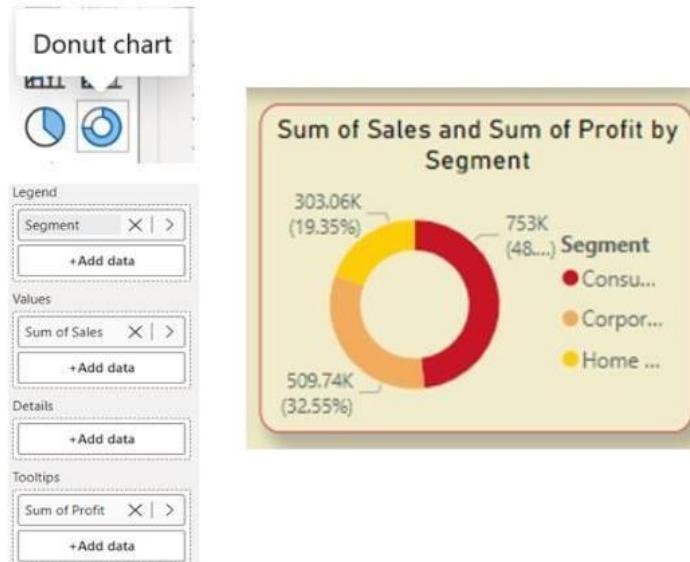
9.4.Pie chart

- 9.4.1. Legend: Color-coded key showing categories or segments.
- 9.4.2. Value: Numerical data associated with each segment.
- 9.4.3. Tooltip: Additional info displayed on hover.
- 9.4.4. Details: Specific data points or records behind each segment.



9.5.Ring Chart/Donut

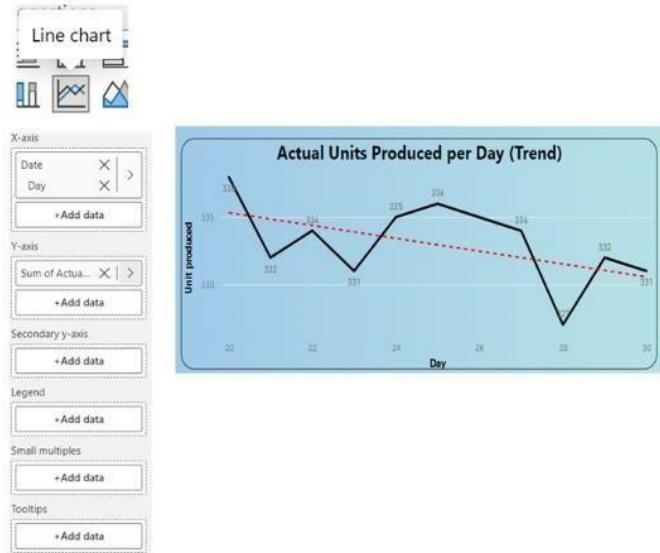
- 9.5.1. Legend: Color-coded key showing categories or segments.
- 9.5.2. Value: Numerical data associated with each segment.
- 9.5.3. Tooltip: Additional info displayed on hover.
- 9.5.4. Details: Specific data points or records behind each segment.



9.6.Line chart

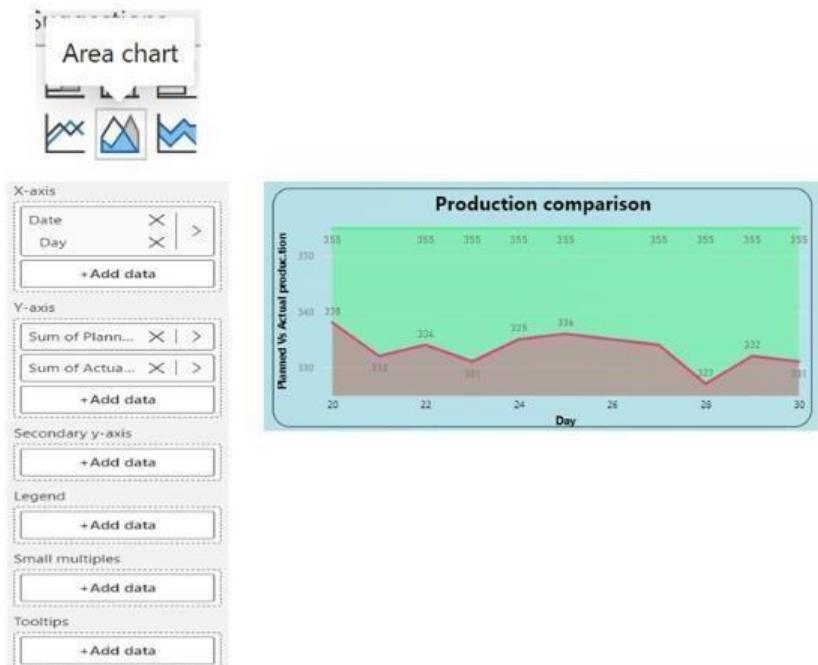
line chart is a type of visualization used to represent data trends over time or any ordered dimension

- 9.6.1. Secondary Axis: Allows plotting two measures with different scales on the same chart.
- 9.6.2. Small Multiple: Displays multiple charts, each representing a subset of data, for comparison.
- 9.6.3. Legend: Color-coded key identifying categories or measures represented in the chart.



9.7.Area Chart

- 9.7.1. Secondary Y-axis: Allows plotting two measures with different scales on the same chart.
- 9.7.2. Legend: Color-coded key identifying categories or measures represented in the chart.
- 9.7.3. Tooltip: Provides additional information when hovering over data points.



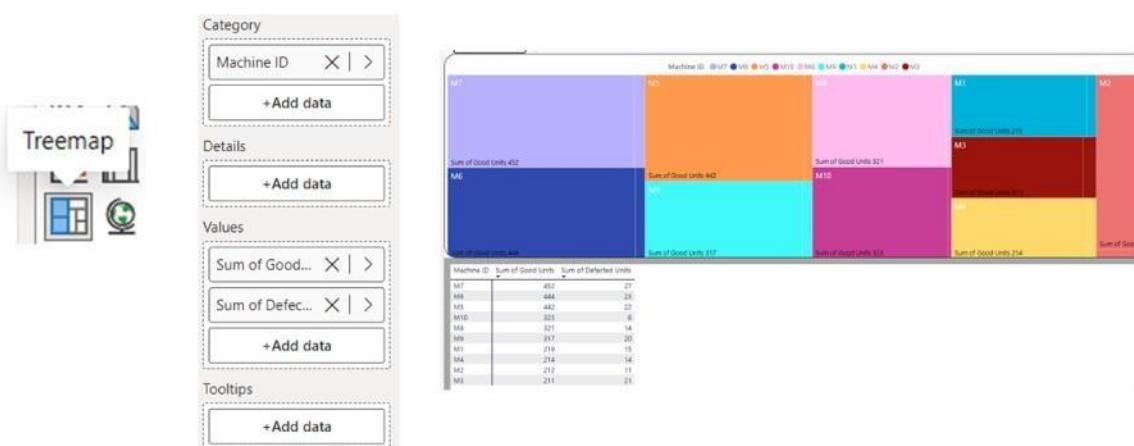
9.8.Stack Area Chart

A stacked area chart in Power BI is a type of visualization that displays multiple series of data as layers, stacked on top of each other. Each layer represents a different category or subgroup of the data, and the combined height of the layers at any given point represents the total value of the data for that category.



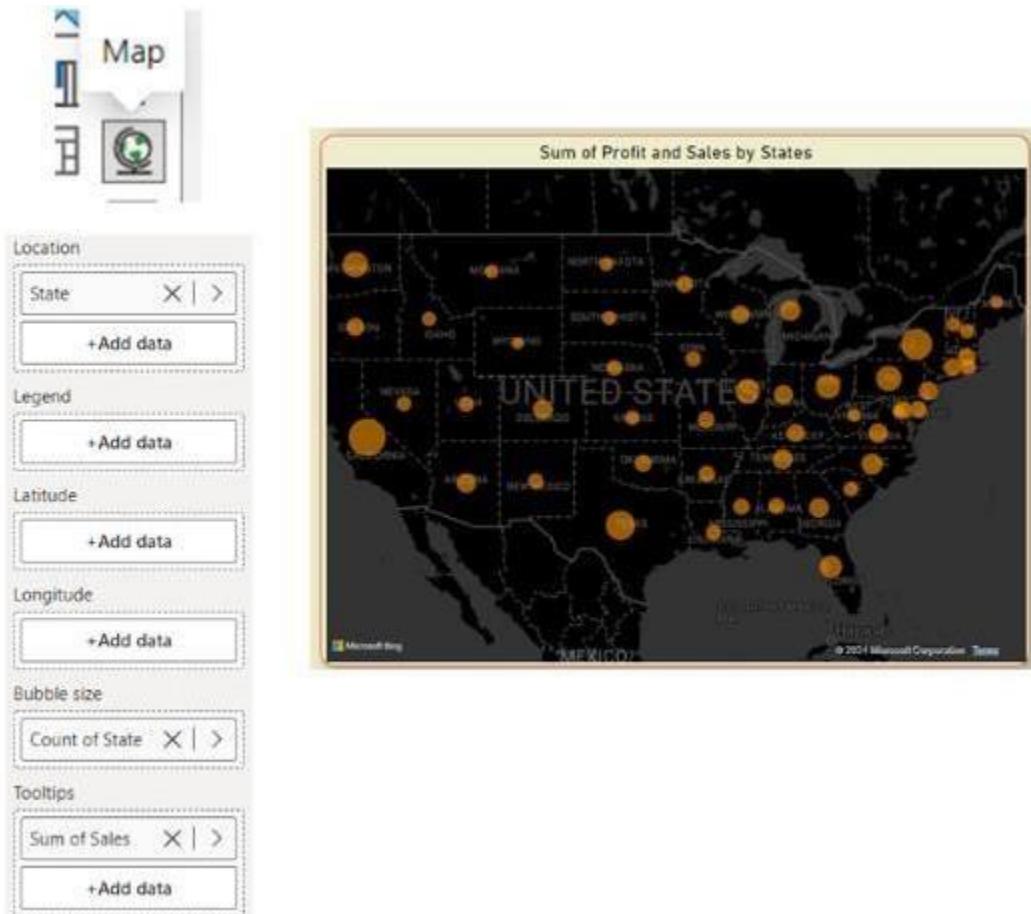
9.9.Tree map

A tree map in Power BI is a type of hierarchical visualization that displays hierarchical data as a set of nested rectangles. Each rectangle represents a category or group, and its size corresponds to a quantitative measure, such as sales revenue or population.



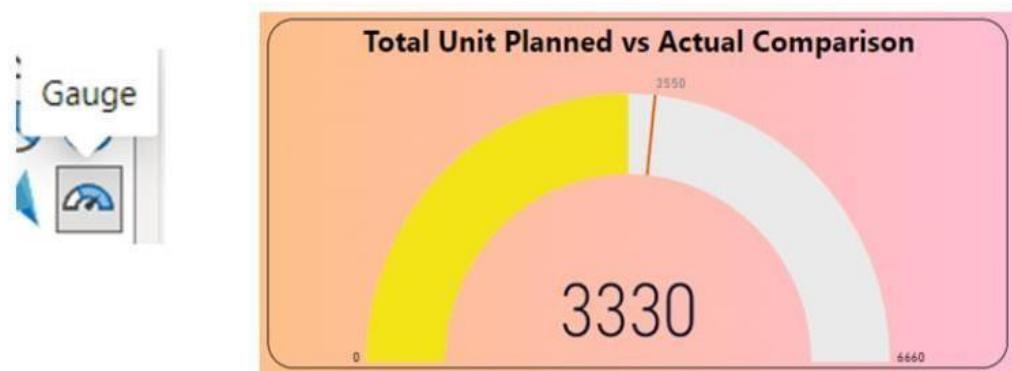
9.10. Map

- 9.10.1. Location: Represents geographic data points plotted on the map.
- 9.10.2. Legend: Color-coded key identifying categories or values on the map.
- 9.10.3. Latitude and Longitude: Coordinates specifying the location of each data point.
- 9.10.4. Bubble Size: Size of data markers representing quantitative measures on the map.
- 9.10.5. Tooltip: Provides additional information when hovering over data points.



9.11.Gauge Chart

A gauge chart in Power BI is a type of visualization used to display a single value within a predefined range or target. It resembles a speedometer or gauge found in dashboards and instruments. Single Value Representation: A gauge chart typically represents a single value, such as a key performance indicator (KPI), a progress metric, or a target attainment percentage.



9.12.Matrix

A matrix in Power BI is a data visualization tool that organizes data in rows and columns, similar to a spreadsheet or a pivot table.



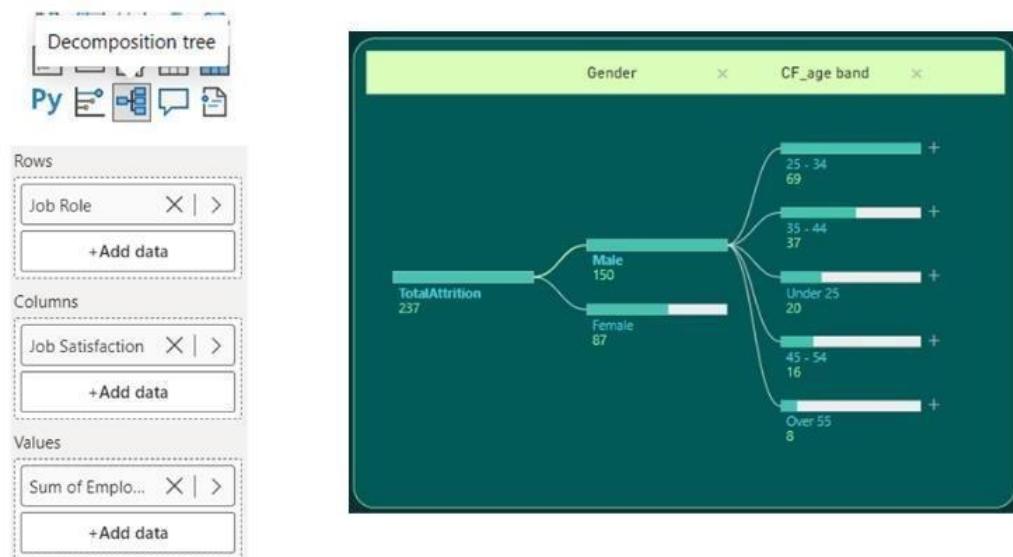
9.13.Slicer

Slicers are interactive visualizations that allow users to filter data across multiple visualizations and reports dynamically. They are typically used to filter data based on specific criteria, such as categories, time periods, or regions, enabling users to focus on relevant subsets of data.



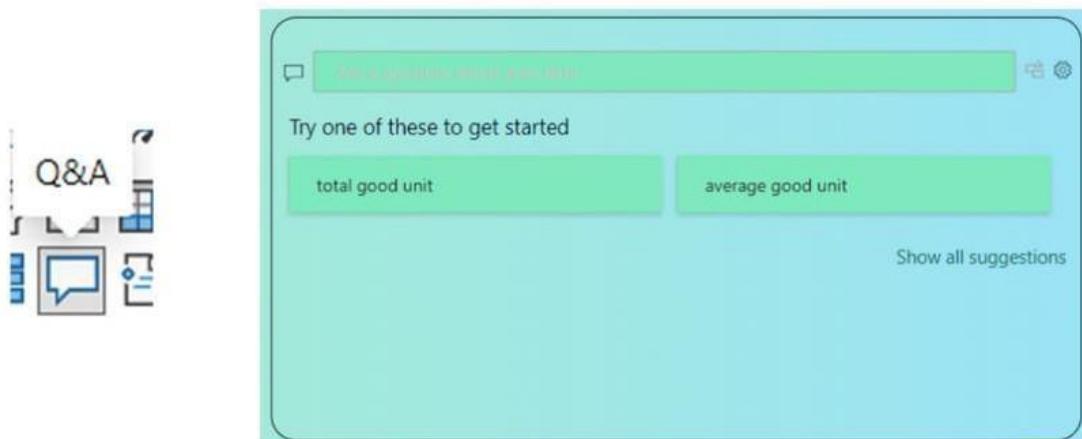
9.14.Decomposition Tree

The decomposition tree is a powerful visualization tool in Power BI that enables users to analyze and understand the factors driving a particular metric or measure.



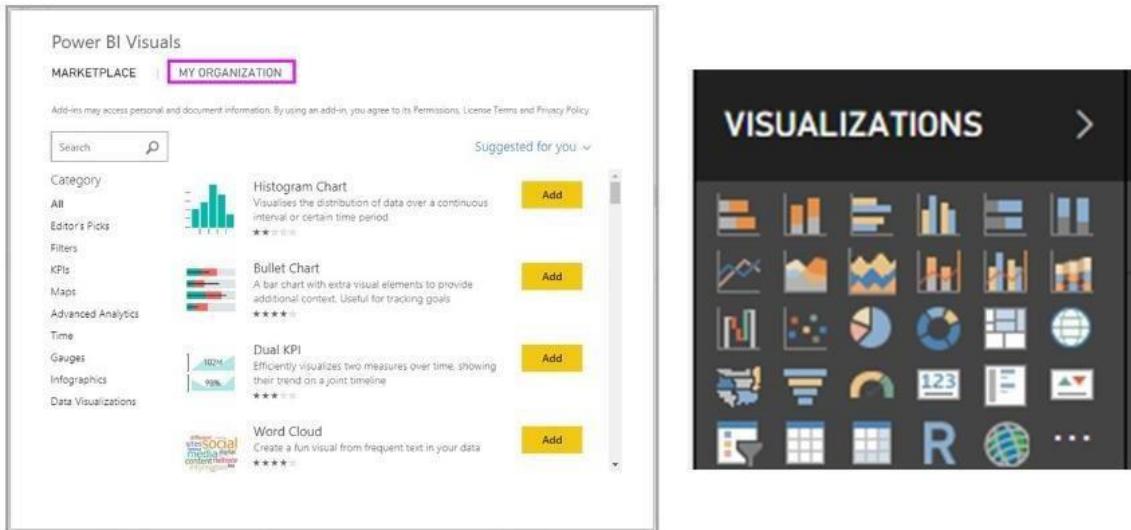
9.15.Q&A

- 9.15.1. Q&A (Question and Answer) is a feature in Power BI that allows users to ask questions about their data using natural language queries and receive instant visualizations and insights in response. Here's how it works:
- 9.15.2. Natural Language Queries: Users can type questions in plain English (or other supported languages) directly into the Q&A box in Power BI. They can ask questions about their data, such as "What were the sales last month?" or "Show me a pie chart of sales by region."
- 9.15.3. "Natural Language Processing (NLP): Power BI's Q&A feature utilizes natural language processing (NLP) technology to interpret and understand the user's query. It analyzes the text input to identify keywords, entities, and intents, allowing it to generate relevant visualizations and insights. Instant Visualizations: After interpreting the user's query, Power BI dynamically generates visualizations that best represent the requested information. It automatically selects the appropriate visualization type based on the data and the nature of the query.



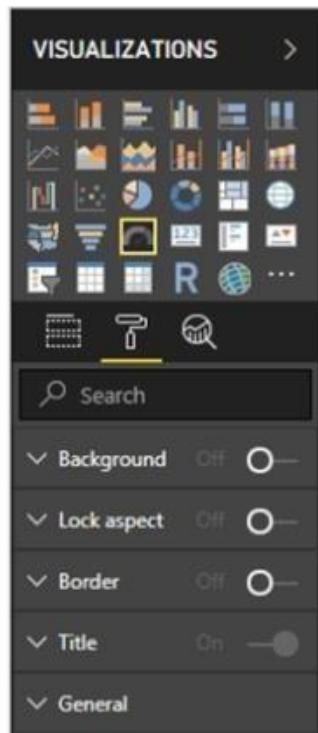
9.16.CUSTOM VISUALIZATION TO A POWER BI

Power BI also provides us an option to download custom visualization from the Microsoft App store.



VISUALIZATION SETTINGS

These settings are different for each visualization.



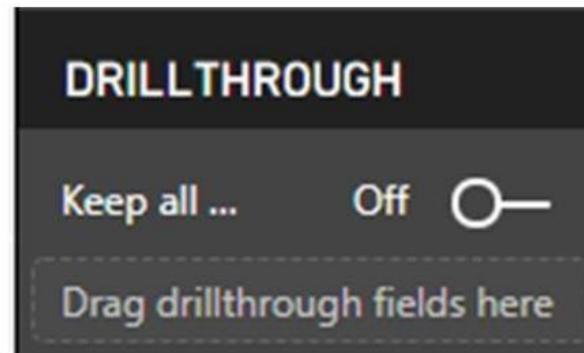
VISUALIZATION DRILL DOWN OPTION

When a visual has a hierarchy, it supports drill down/up feature e.g. putting “Product Category, Sub-Category and Product” into a matrix will automatically enable drill down/up feature.



DRILLTHROUGH FILTERS

It helps in creating a dedicated page for specific entities. A detailed page can be created for the user to dig-in from the dashboard. The moment we add a drill through filter, Power BI automatically adds a back button to go back to the overview.



10. Dashboard in Power BI

- Create a Power BI dashboard Dashboard tiles in Power BI
- Pin a tile to a Power BI dashboard from a report.
- Pin a tile to a Power BI dashboard from Excel.
- Publish PowerBI report.

POWER BI DASHBOARD

- This is a single page view of the overall story through visualizations. For detailed summary, user can visit the related reports.
- Dashboard is a feature of Power BI Service. This is unavailable in Power BI Desktop. A pro license if needed to access Power BI Service.

DIFFERENCE BETWEEN DASHBOARD & REPORT

DASHBOARD: -

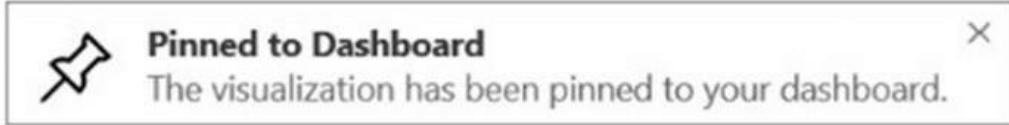
- Data source can be one or more reports or data sets
- Only One page
- Not available in PBI Desktop
- We can't do filtering or slicing in a Dashboard

REPORT: -

- Data source can be only single dataset per report
- One or more pages
- Available in PBI Desktop
- Filtering or slicing can be done here

TILES IN DASHBOARD

One can add a new tile from within the Dashboard. Clicking on these tiles will take back into the report. Even a whole report page can be pinned to dashboard. This is also considered as pinning a live tile because tiles from reports are synced and upon any update in report will update these tiles in dashboard too.



PIN AN ENTIRE REPORT PAGE TO PBI DASHBOARD

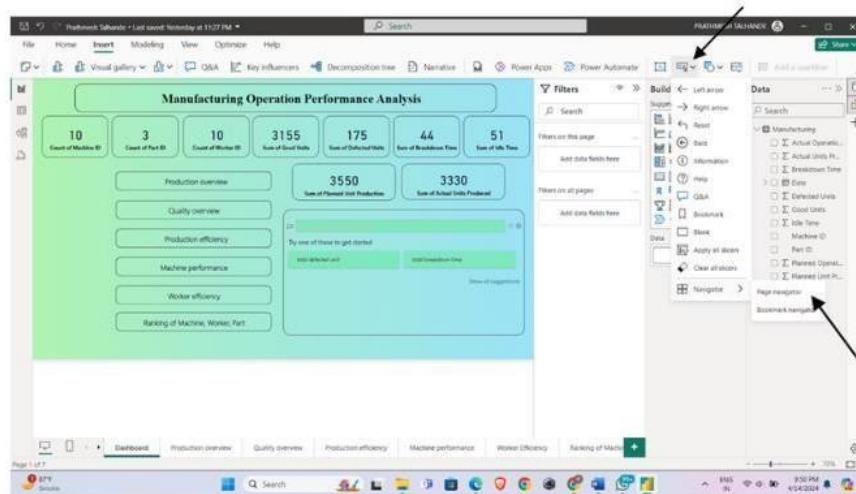
If the requirement is to pin more than one visualization in the dashboard then its better to pin the entire report. When we pin the complete page then the tiles become live, we can interact with them directly from the dashboard.

DATA ALERTS IN POWER BI SERVICE

Setting a data alert is possible with Power BI Pro license. Alerts can only beset on the tiles pinned from report visuals, and only on gauges, KPI's and cards. Alerts can't be set on the streaming tiles created directly on the dashboard.

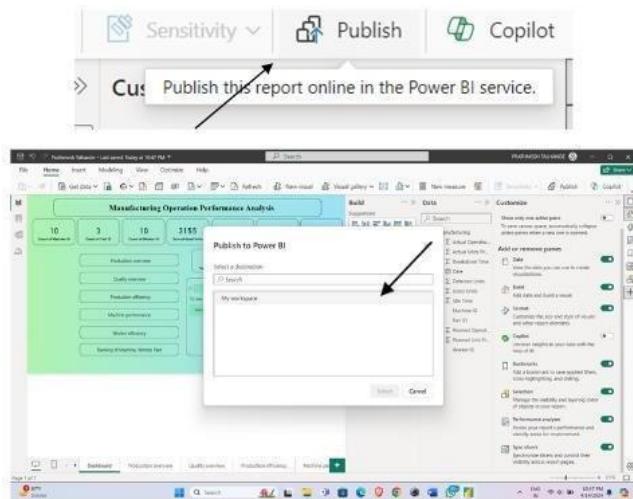
How do create actions and navigations in Power BI?

To Navigate to a certain report on click, you must Bookmark a page and assign the bookmark to a button or icon. Page navigation helps you direct you directly on required report view page or parameter.



11. Publishing the report

- Step 1 :- Login to PowerBI with your Login ID
- Step 2 :- Click on Publish in my workspace, Go to link which will appear after publish to access and preview PowerBI dashboard.



References:

1. <https://learn.microsoft.com/en-us/power-bi>
2. Introducing Microsoft Power BI By Alberto Ferrari and Marco Russo
https://r.search.yahoo.com/_ylt=AwrFYszXg41mgCMbyhoXFwx.;_ylu=Y29sbwNiZjEEcG9zAzEEdnRpZAMEc2VjA3Ny/RV=2/RE=1720579160/RO=10/RU=https%3a%2f%2fdownload.microsoft.com%2fdownload%2f0%2f8%2f1%2f0816F8D1-D1A5-4F60-9AF5-BC91E18D6D64%2fMicrosoft_Press_ebook_Introducing_Power_BI_PDF_mobile.pdf/RK=2/RS=9JIKjnp9VMiVnLLBqWdEq16PsTo-
3. <https://www.studocu.com/en-ca/document/sheridan-college/global-business-environment/power-bi-notes-1715312645/93720021>