

Introduction to Various Data Visualization tools

Data visualization is the practice of translating information into a visual context, such as a map or graph, to make data easier for the human brain to understand and pull insights from. It is the representation of information and data through use of common graphics, such as charts, plots, infographics, and animations. Data visualization is a powerful way for people, especially data professionals, to display data so that it can be interpreted easily.

Data Visualization enables decision-makers of any enterprise or industry to look into analytical reports and understand concepts that might otherwise be difficult to grasp.

Benefits of Data Visualization:

- It is easy to understand the information with graphics
- It made data to be represented in attractive way
- Shows complex relationships
- Helps to process large datasets
- Useful for identifying trends
- Minimizes ambiguity

Data visualization tools provide the ability to see and understand data trends, outliers, and patterns in an easy, intuitive way. There are various data visualization tools available. One must choose the tool based on various factors such as its ease of use, types of graphical representations the tool can produce, size of the dataset the tool can handle etc. some of Data Visualization tools are Tableau, Power BI, Google Charts, Jupyter, Grafana etc.

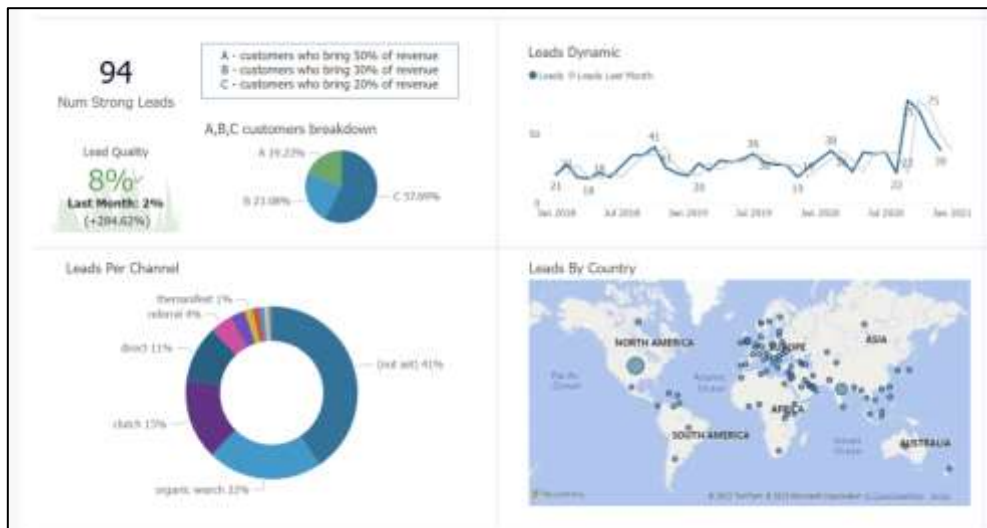
The following are some common **types of data visualizations**:

Table: A table is data displayed in rows and columns, which can be easily created in a Word document or Excel spreadsheet.

Chart or graph: Information is presented in tabular form with data displayed along an x and y axis, usually with bars, points, or lines, to represent data in comparison.

Geospatial visualization: Data is depicted in map form with shapes and colours that illustrate the relationship between specific locations, such as a choropleth or heat map.

Dashboard: Data and visualizations are displayed, usually for business purposes, to help analysts understand and present data.



Introduction to Tableau and Installation

Tableau is a data visualization tool that provides pictorial and graphical representations of data. It is used for data analytics and business intelligence. Tableau provides limitless data exploration without interrupting flow of analysis. With an intuitive drag and drop interface, user can uncover hidden insights in data and make smarter decisions faster.

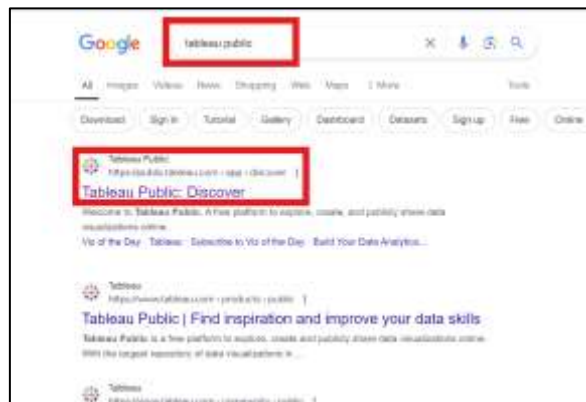
Tableau is a Business Intelligence tool for visually analysing the data. Users can create and distribute an interactive and shareable dashboard, which depict the trends, variations, and density of the data in the form of graphs and charts. Tableau can connect to files, relational and Big Data sources to acquire and process data. The software allows data blending and real-time collaboration, which makes it very unique. It is used by businesses, academic researchers, and many government organizations for visual data analysis. It is also positioned as a leader Business Intelligence and Analytics Platform in Gartner Magic Quadrant.

As a leading data visualization tool, Tableau has many desirable and unique features. Its powerful data discovery and exploration application allows you to answer important questions in seconds. You can use Tableau's drag and drop interface to visualize any data, explore different views, and even combine multiple databases easily. It does not require any complex scripting. Anyone who understands the business problems can address it with a visualization of the relevant data. After analysis, sharing with others is as easy as publishing to Tableau Server.



Installation of Tableau

Search tableau Public -> click on tableau public discover



In navigation bar, click on create -> Download tableau desktop public edition



Fill the details with college email id

Almost there!

It only takes 15 seconds to fill out. If you're already registered, [sign in](#).

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By registering, you confirm that you agree to the processing of your personal data by Salesforce as described in the [Privacy Statement](#).

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If download doesn't start click on windows in the notification.



Double click on the downloaded file “TableauPublicDesktop-64bit-2024-2-3.exe”

Complete the installation using admin privileges.

There are five key components to Tableau:

- **Tableau Desktop**—A desktop application that allows users to collect, transform, and visualize the data. Tableau Desktop is available only with a subscription. The data visualizations can be saved both locally and online.
- **Tableau Public**—A free version of Tableau software that provides most of the functionalities present in the Desktop version. Unlike Tableau Desktop, it can only accommodate CSV, Excel, and text files. There is a limit of 15 million rows of data and any work you do cannot be saved locally - only on Tableau Server.
- **Tableau Reader**—A read-only application for opening and reading Tableau file types.
- **Tableau Online**—A cloud version of Tableau software that provides a way to publish and share dashboards online. It's fully hosted by Tableau.
- **Tableau Server**—Like Tableau Online, it allows users to host and store data visualizations created with Tableau. The difference from Tableau Online is that it's not fully hosted by Tableau, but rather on public cloud platforms like AWS, Google Cloud Platform, and Microsoft Azure.

Tableau Features

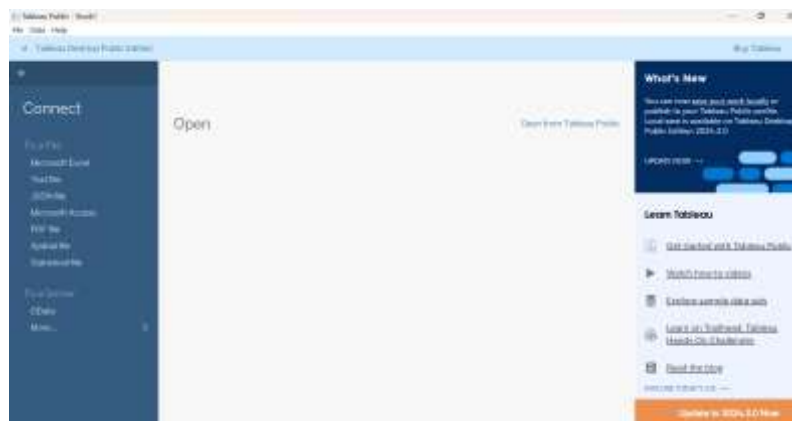
- **Speed of Analysis** – As it does not require high level of programming expertise, any user with access to data can start using it to derive value from the data.
- **Self-Reliant** – Tableau does not need a complex software setup. The desktop version which is used by most users is easily installed and contains all the features needed to start and complete data analysis.
- **Visual Discovery** – The user explores and analyses the data by using visual tools like colours, trend lines, charts, and graphs. There is very little script to be written as nearly everything is done by drag and drop.
- **Blend Diverse Data Sets** – Tableau allows you to blend different relational, semi structured and raw data sources in real time, without expensive up-front integration costs. The users don't need to know the details of how data is stored.
- **Architecture Agnostic** – Tableau works in all kinds of devices where data flows. Hence, the user need not worry about specific hardware or software requirements to use Tableau.
- **Real-Time Collaboration** – Tableau can filter, sort, and discuss data on the fly and embed a live dashboard in portals like SharePoint site or Salesforce. You can save your view of data and allow colleagues to subscribe to your interactive dashboards so they see the very latest data just by refreshing their web browser.
- **Centralized Data** – Tableau server provides a centralized location to manage all of the organization's published data sources. You can delete, change permissions, add tags, and manage schedules in one convenient location. It's easy to schedule extract refreshes and manage them in the data server. Administrators can centrally define a schedule for extracts on the server for both incremental and full refreshes.

Getting to know Tableau

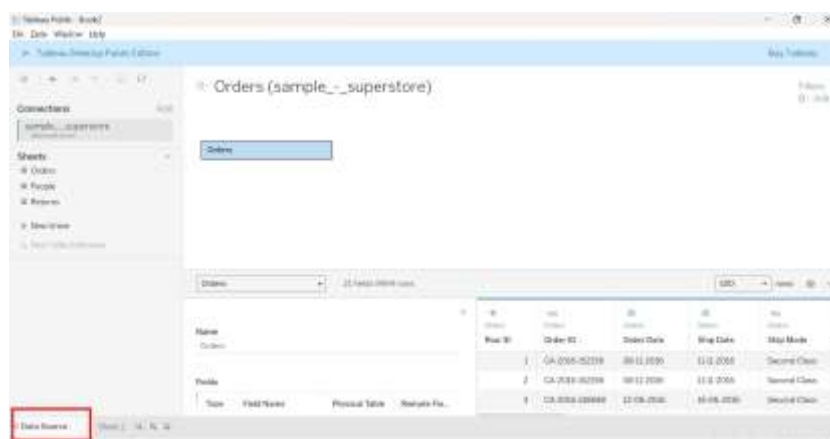
- **Connect to Data view**

Connecting to Data and preparing data for visualization in Tableau supports connecting to a wide variety of data, stored in a variety of places. For example, data might be stored on computer in a spread sheet or a text file, or in a big data, relational, or cube (multidimensional) database on a server in enterprise or the data can be from a public domain available on the web.

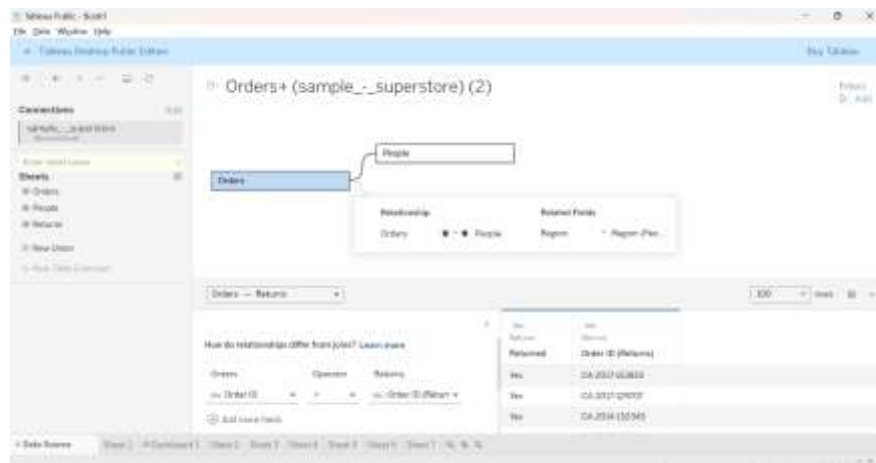
Data can be imported in Tableau Public from Connect panel on left side.



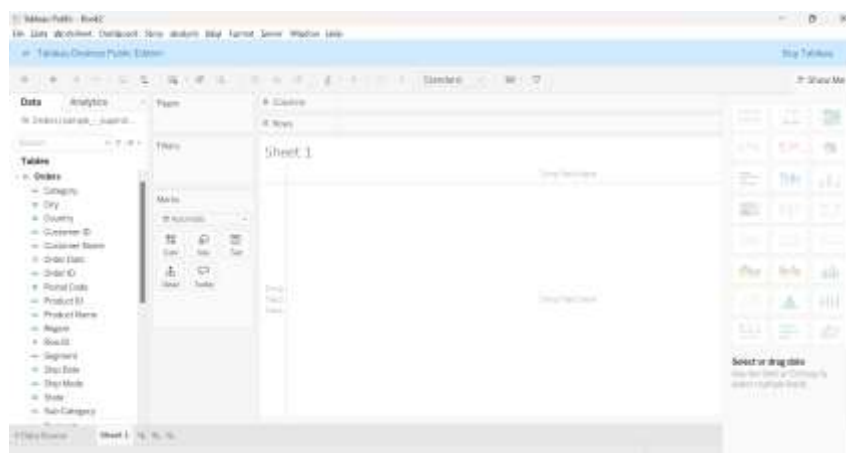
On opening a new file, Data source page will be visible. In this page, left panel shows list of all available tables. Upon dragging and dropping each table, we can see the dimension and values present in tables. Tableau automatically identifies the data type of each column.



We can also see the relationship between different tables on adding more tables. There is many to many relationship between Orders and People tables.



By clicking on Sheet1 at the bottom creates a data extract which improves query performance.



POWER BI

What is Power BI?

Power BI is a business intelligence tool that allows you to connect to various data sources, visualize the data in reports and dashboards, and then share them with anyone you want. Power BI is a Data Visualization and Business Intelligence tool that converts data from different data sources to interactive dashboards and BI reports.

What is Power BI Used for?

Power BI is a tool in the category of Business Intelligence (BI). The purpose of BI is to track Key Performance Indicators (KPIs) and uncover insights in business data so as to better inform decision-making across the organization. Power BI is used in different ways depending on the role of the individual, from developers, analysts, managers, and directors, to everyone in between.

How Does Power BI Compare to Other Tools Like Tableau and Excel?

Power BI and Tableau are both business intelligence tools and have a lot of overlap in terms of their capabilities. There are 2 key differences between Power BI and Tableau:

- 1) Power BI only works on Windows, whereas Tableau supports both Windows and MacOS.
- 2) Pricing options differ between Power BI and Tableau. However, Tableau is generally the more expensive option.

Why Power BI?

“DATA “-----Analysis and Decision Making

Organizations need a tool that can help them understand the large amount of data that they are collecting. It is a powerful data visualization and analysis tool that allows **businesses to turn raw data into actionable insights and reports.**

Microsoft Power BI comes with a **free or paid version**. The free version only provides Power BI tools like **Power BI Desktop** and **Power Q&A** to dashboards. Whereas, in the Pro version they provide services like **live report sharing**, **Power View**, and more Power BI apps.

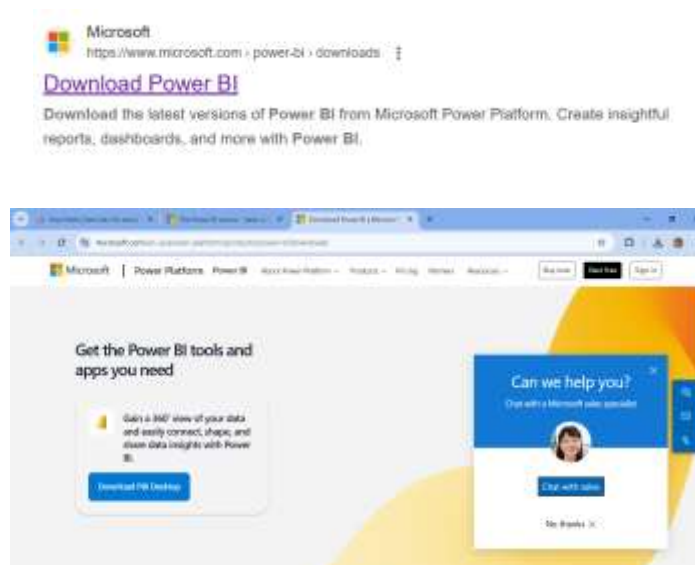
Key Differences Between Power BI and Tableau

Power BI	Tableau
Power BI uses DAX for measuring and calculating columns.	Tableau deploys MDX for dimensions and measures.
Power BI is best for a limited volume of data.	Tableau can handle huge columns of data and still offer better performance.
Power BI offers many data points for data visualization.	Tableau has better data visualization.

Download and Installing Power BI Desktop

Power BI Desktop is available in both 32-bit and 64-bit versions. To download the latest version, you can use the following link – <https://www.microsoft.com/en-us/power-platform/products/power-bi/downloads>

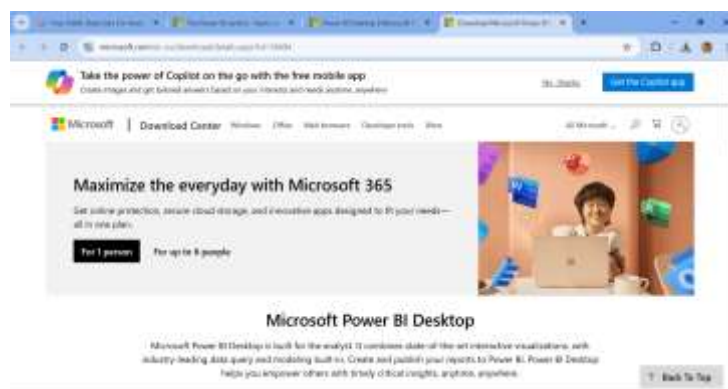
- 1) Search “download Microsoft Power BI”, select



- 2) Click on Products → Power BI → Desktop



- 3) Click on Advanced Download option



- 4) Select the Language as English and Click on download , choose PBIDesktopSetup_x64.exe



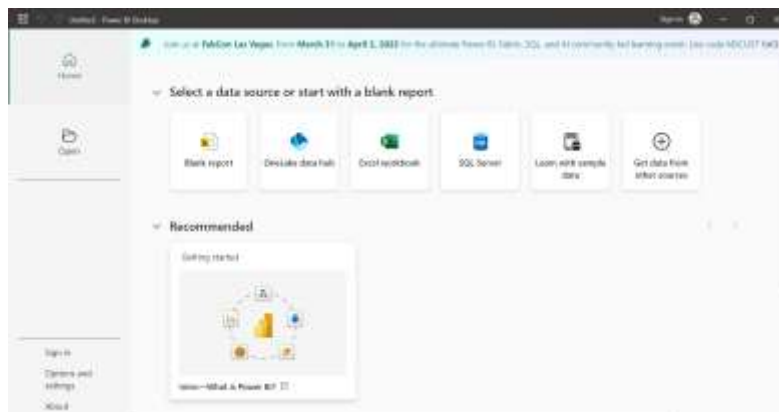
- 5) Download Begins and you will get exe file which will be downloaded in your downloads folder



- 6) Double click on the .exe file, to get the installation wizard



- 7) Click on Next button until you get Finish button and finally installation will be done.
- 8) Once the Installation is done, double click on Power BI App.

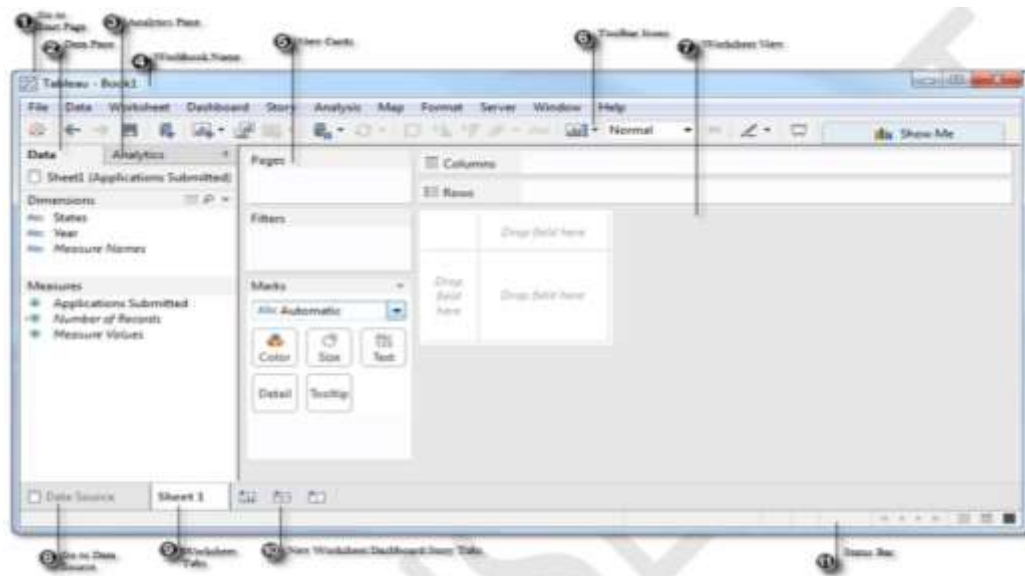


PROGRAM 1

Getting Started – Tableau Workspace, Tableau Terminologies, Basic Functionalities.

Dataset used: sample_-_superstore.xls

Working with Tableau that focuses on understanding the Tableau Workspace, Tableau terminologies, and basic functionalities.



- (1) Go to Start Page: Toggle between the active sheet and the Desktop Start Page.
- (2) Data Pane: Includes dimensions and measures, populated from your selected data source. May also include calculated fields, parameters, or sets.
- (3) Analytics Pane: Includes options you can use to apply reference lines, forecasts, trend lines, to add totals to crosstabs, and to build boxplots.
- (4) Workbook Name: The file name of our workbook.
- (5) View Cards: Used for modifying the worksheet.
- (6) Toolbar Icons: Icons are available for quick access to popular features.
- (7) Worksheet/View: Workspace for building your visualizations.
- (8) Go to Data Source: Returns you to the data source specification page.
- (9) Worksheet Tabs: Click to view a specific worksheet, dashboard, or story.
- (10) New Worksheet, Dashboard, and Story Tabs: Click to create a new Worksheet, Dashboard, or Story.
- (11) Status Bar: Displays data about the fields and marks included in the view.

Tableau Workspace Setup:

Connect to Data:

- Open Tableau, and on the "Start Page," select Connect -> To a File -> Excel File.
- Browse to the location of "sample_-_superstore.xls" and open it.

Data Preview:

- After loading, Tableau will show a preview of the data. You can rename columns if necessary.
- Click on the "Sheet 1" tab at the bottom to go to your first worksheet.

Tableau Terminologies:

Dimensions: These are qualitative fields. In sample_-_superstore.xls, examples include Order, People, and Returns.

Filters: Used to limit the data displayed in the view.

Measures: These are quantitative fields used for calculations. Examples are Longitude and Latitude.

Rows and Columns Shelf: Drag dimensions and measures to the Rows or Columns shelves to build the structure of your visualization.

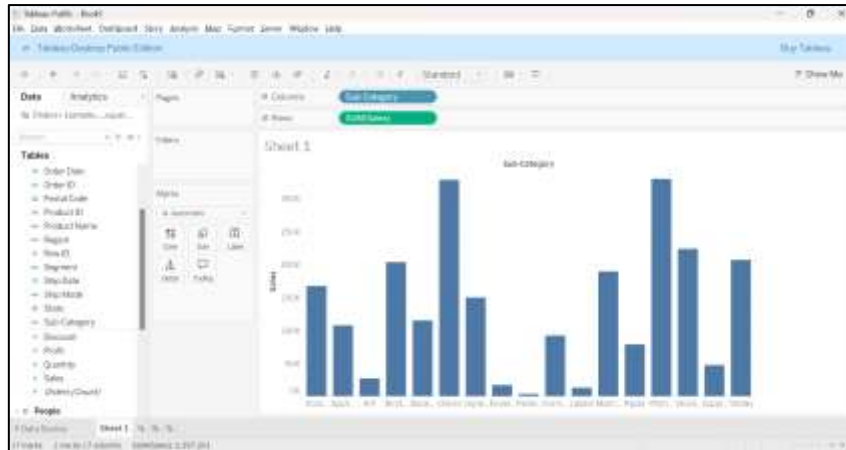
Marks: Controls the appearance of the data. You can set marks to be circles, bars, or other shapes and control size, colour, and label.

Pages Shelf: Used for creating animations or segmenting your view by categories.

Basic Functionalities:

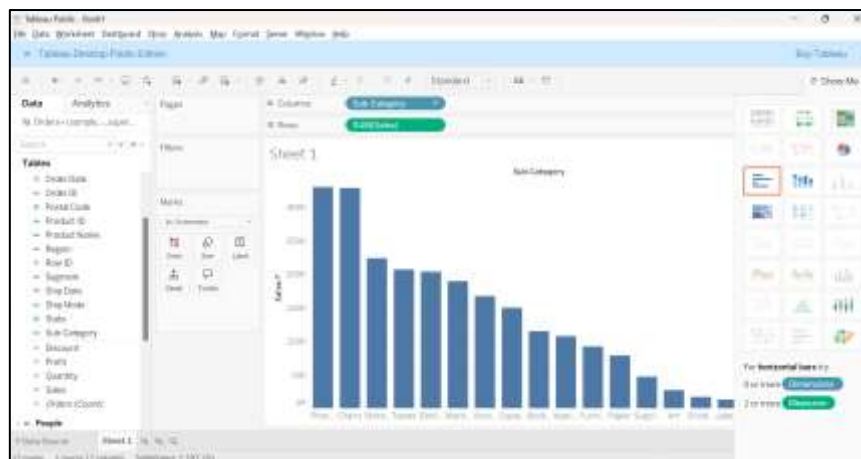
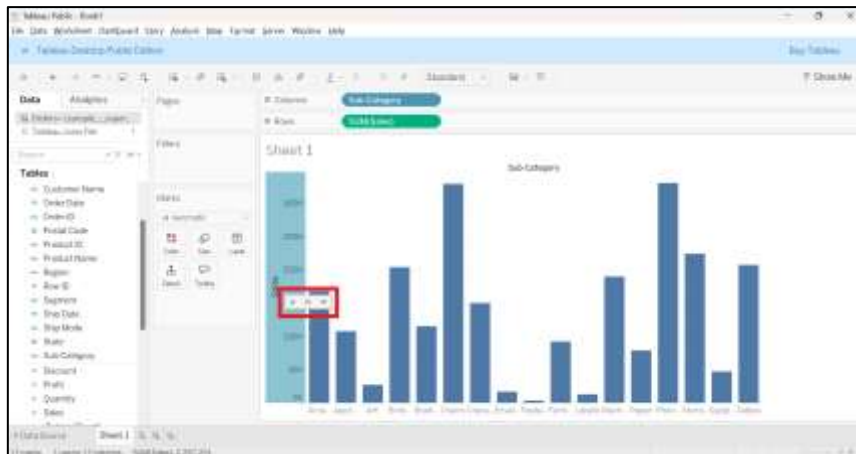
1) Basic Visualization (Bar Chart of Global Sales by Genre):

- In your worksheet, drag Sub-Category to the Columns shelf.
- Drag Sales to the Rows shelf.
- You should see a bar chart. If the data isn't aggregating correctly, check if the aggregation is set to SUM by right-clicking Sales -> Measure -> Sum.



2) Sorting:

Click on the Sales axis and sort descending to show the genres with the most sales first.

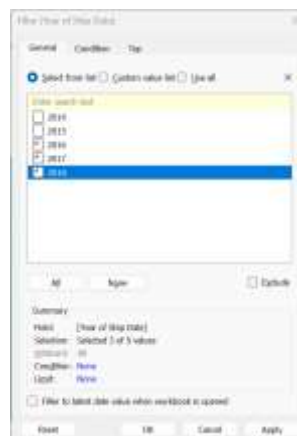


3) Filtering:

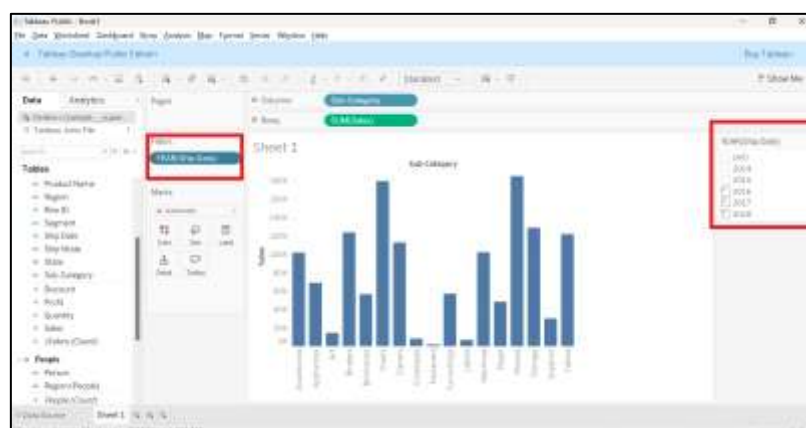
- Drag Ship Date to the Filters shelf.
- Choose Year as field to filter.

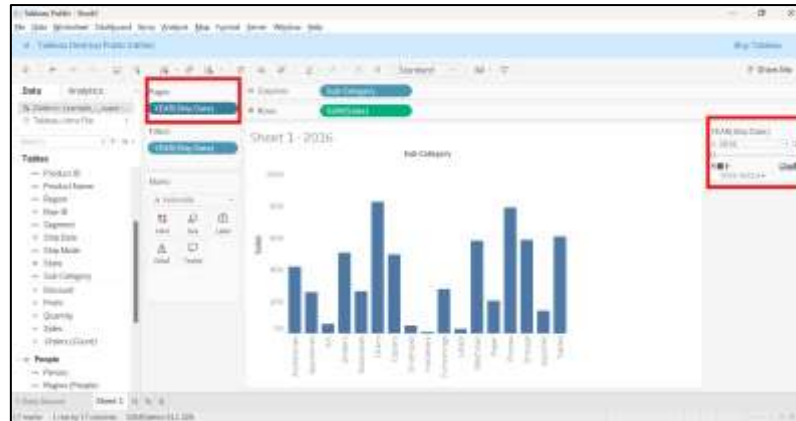


- Choose the range of years you want to display (e.g., 2016-2018).



- Add Ship Date to the Pages shelf to create a dynamic view of how sales changed over time. To do so, select drop down menu in Ship Date present in filter and select “Show Filter”



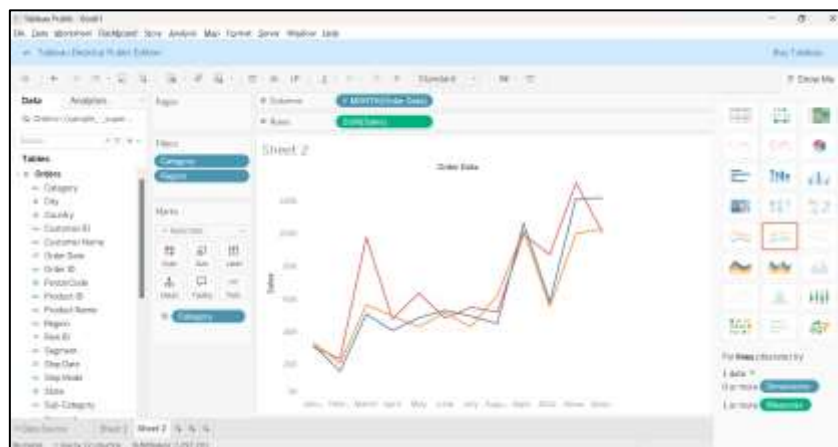


4) Additional Features

Dashboards: Combine different sheets to create a comprehensive dashboard. Go to the Dashboard tab, drag your created sheets to the layout, and arrange them accordingly.

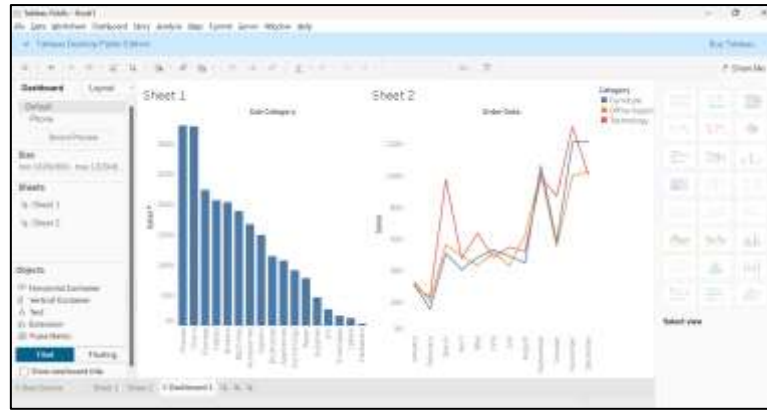
a. Add one more worksheet - Sales Trend by Ship Date

- Drag Order Date to the Columns.(Select month as filter)
- Drag Sales to the Rows.
- Create a line chart to show how global sales have trended over time.
- Add Category to the Marks
- Apply colour to Category



b. Go to the Dashboard tab in Tableau.

c. Add multiple visualizations to a single dashboard. (To increase dashboard size - select size-Automatic)



- d. Arrange charts (e.g., a line chart for yearly sales, a bar chart for top category, etc.).

PROGRAM 2:

Connecting to Data Source – Connecting to Database, Different types of Tableau Joins.

Dataset used: Tableau Joins File.xlsx, Contains 3 sheets: Demographics, Salary, Job Title

1) Connecting to Excel Files in Tableau:

- Open Tableau and click on Connect in the left pane.
- Under To a File, choose Microsoft Excel.
- Browse and select your Excel file (Tableau Joins File.xlsx).
- Tableau will display the sheets from the Excel file in the Data Source tab.
- Drag the relevant sheets to the workspace.

2) Tableau Joins File.xlsx Dataset: has three Excel sheets

Demographics:

- EmployeeID
- Nameof Employee
- Employee Age
- Employee Gender

Salary:

- EmployeeID
- EmployeeSalary

Salary:

- EmployeeID
- Employee Name
- Job Title

These sheets have a relationship based on the EmployeeID, and you can join them using this field.

Drag and drop Demographics table- Right click-select open- that allows you to do following types of joins. Now Drag and drop Salary table - That allows you to do join of your choice.

3) Types of Joins in Tableau:

Once both tables are in the Data Source tab, Tableau automatically suggests an inner join, but you can modify the type of join depending on the scenario.

(i) Inner Join:

Description: Returns only records where there is a match in both tables.

How to Create in Tableau:

- Drag Demographics and Salary sheets into the canvas.
- Tableau automatically detects the common field (EmployeeID). If not, manually select it.
- Choose Inner Join in the Join Type options.
- Result: You will see only employees whose employee id matches in both Demographics and Salary table.

(ii) Left Join:

Description: Returns all records from the left table (Demographics), and matched records from the right table (salary). If there's no match, NULL values are returned for fields from the right table.

How to Create in Tableau:

- In the join settings, select Left Join.
- Result: All employees will be returned, even if data missing in Salary. Salary information will be NULL for those without a match.

(iii) Right Join:

Description: Returns all records from the right table (Salary), and matched records from the left table (Demographics). If there's no match, NULL values are returned for fields from the left table.

How to Create in Tableau:

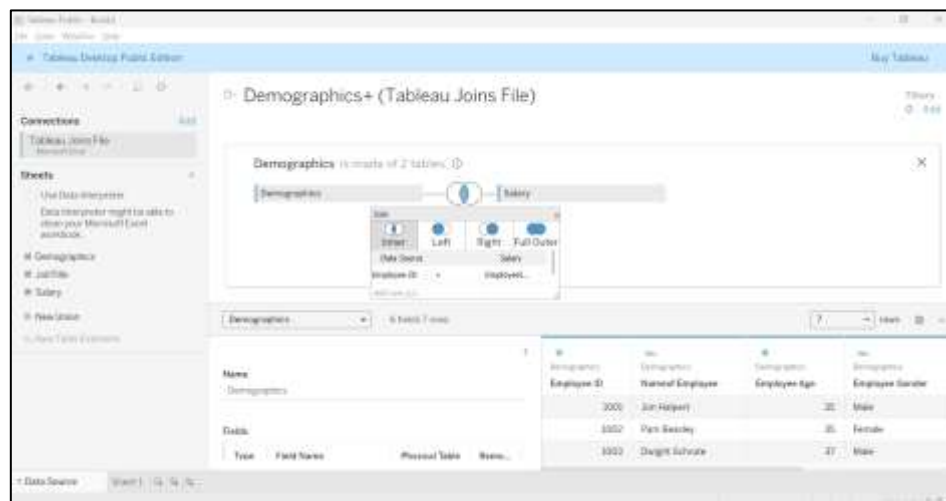
- Select Right Join.
- Result: You will see all salary, even if they don't have employee id. Employee information will be NULL for those salary with no matching employee id.

(iv) Full Outer Join:

Description: Returns all records when there is a match in either the left (Demographics) or right (Job Title) table. If there's no match, NULL values are returned for the missing side.

How to Create in Tableau:

- Select Full Outer Join.
- Result: You will see all employees and all salary, even if they don't have a match in the other table. NULL values will appear where there's no corresponding record.

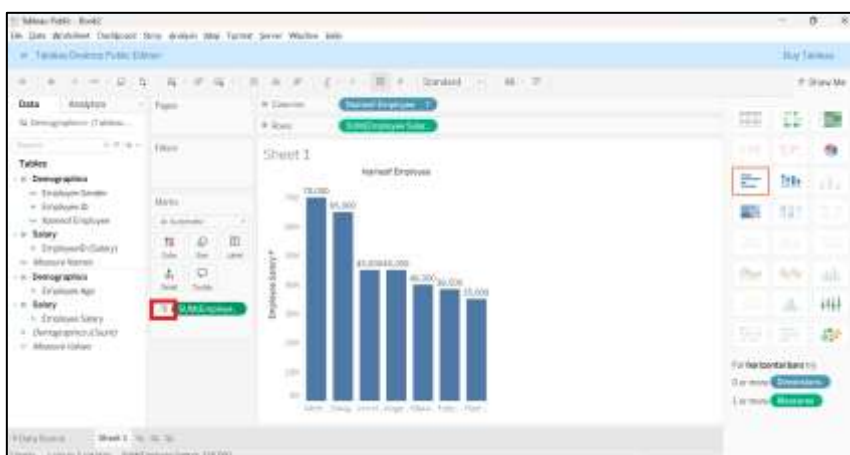
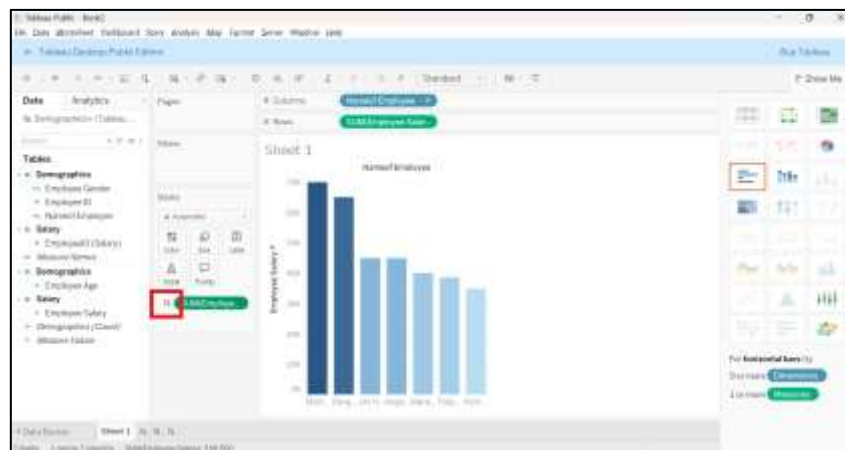


4) Creating a Visualization Based on Joins:

After performing the joins, you can build different visualizations. Press on Sheet 1:

For example:

- Bar Chart: Number of employees and their salary.
- Drag NameofEmployee to Columns.
- Drag EmployeeSalary to Rows.
- This chart will display the number of employees and their salary based on the type of join. Sort it in decending.
- Drag EmployeeSalary to Marks - Select color Color, Label



PROGRAM 3:

Creating a View - formatting charts, adding filters, creating calculated fields and defining parameters

Dataset used: vgsales file

Step 1: Connect to Data

1. Open Tableau Desktop.
2. Connect to Your Data Source:
 - a) Click on Connect on the left sidebar.
 - b) Choose your data source by selecting text file and load your vgsales dataset into Tableau.

Step 2: Create a Basic Visualization

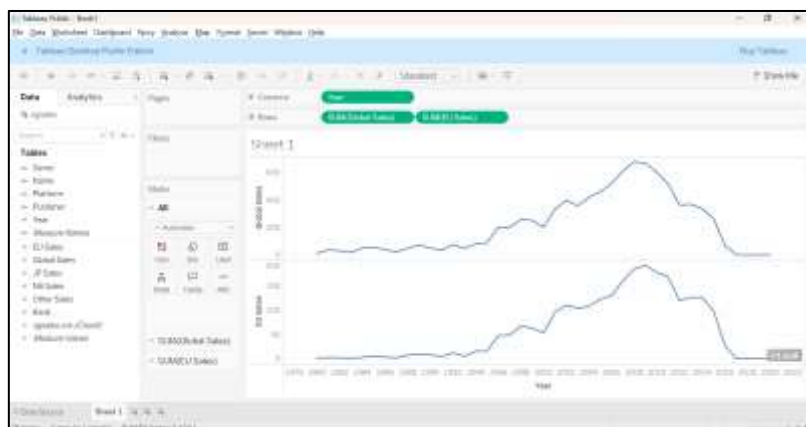
Create a New Worksheet:

- a) Click on the Sheet tab at the bottom of the screen.

Drag Fields to Shelves:

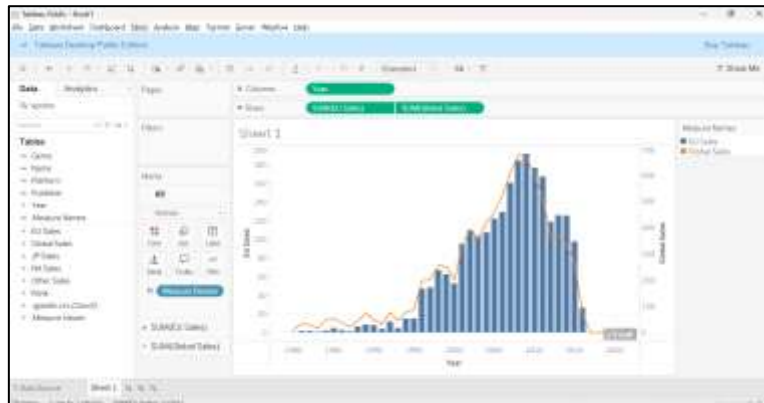
- a) Drag Year to the Columns shelf.
- b) Drag Global Sales to the Rows shelf.
- c) Drag EU Sales to the Rows shelf.

That gives the line graph visualization.



Change Visualization Type:

In the Show Me panel on the right, select a bar chart or any other type that suits your needs.



Step 3: Format the Chart

Format Axes:

- Right-click on the Global Sales axis and select Format.
- In the Format pane, adjust the font style & size as needed.



Add Titles and Annotations:

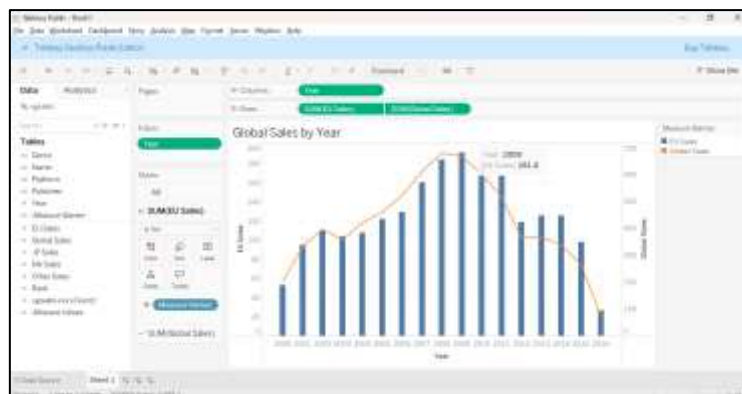
- Click on the chart title area and enter a descriptive title - Global Sales by Year.
- Add annotations if needed to highlight specific data points – Right click the on the chart which you want to highlight - Select Annotate - Select Mark - Press Ok



Step 4: Add Filters

Add a Filter for Year:

Drag Year to the Filters shelf. Choose the range of years you want to display (e.g., 2000-2016).



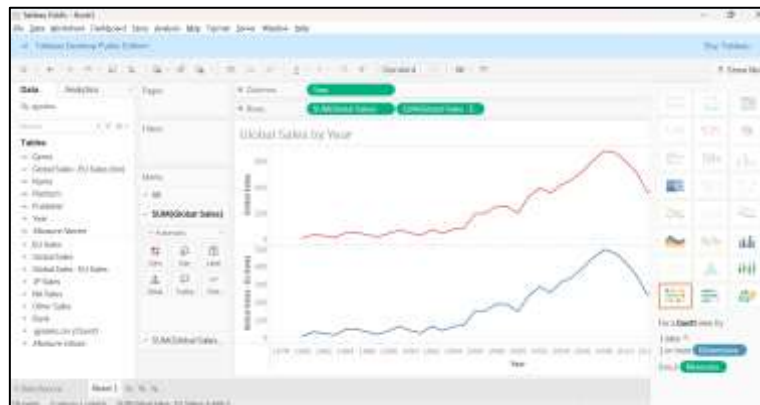
Step 5: Create Calculated Fields

Create a Calculated Field for Sales Category:

- Right-click on Global Sales - Select Create - Calculated Field.
- Give name to your calculations as Global Sales - EU Sales
- Do calculations as per your need - [Global Sales] - [EU Sales]
- Press Ok

Add Calculated Fields to Visualization:

- Drag Global Sales-EU Sales to the Rows shelf to show Global Sales over Year with Global Sales-EU Sales over Year.



Step 6: Create a Parameter:

Right click on “Genre” select create -> Parameter

- Name: "Select Genre"
- Data Type: String
- Values: List (e.g., "Action", "Adventure", "Shooter") or Add values from Genre.

Create Parameter

Name:

Properties

Data type: String (Display format: Action)

Current value: Action (Value when workbook opens: Current value)

Allowable values

☐ All ☒ List ☐ Range

Value	Display As
Action	Action
Adventure	Adventure
Fighting	Fighting
Misc	Misc
Platform	Platform
Puzzle	Puzzle
Racing	Racing

☒ Fixed ☐ When workbook opens

Add values from ▼

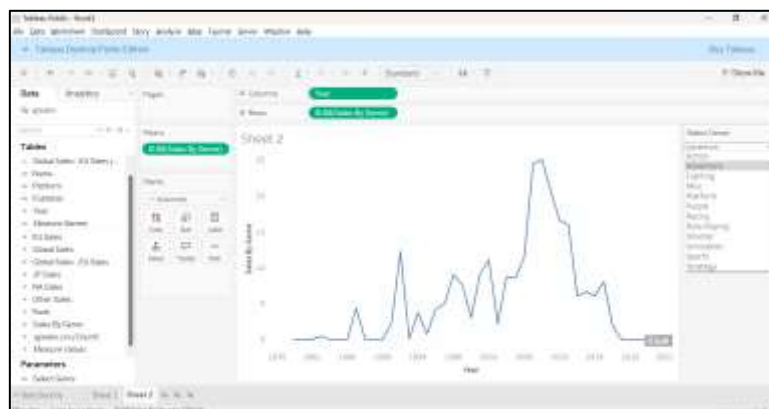
Remove Selected ▼

Cancel OK

Create a Calculated Field:

- Name: "Sales by Genre"
- Formula: IF [Genre] = [Select Genre] THEN [Global Sales] ELSE 0 END Build the Visualization:
- Columns: Drag "Year".
- Rows: Drag "Sales by Genre".

At the right side of your sheet you can select required Genre and can see different Visualization



Visualization by Genre: Fighting

Visualization by Genre: Puzzle

Program 4

Dashboard Design and Storytelling – Components of Dashboard, Understanding how to place worksheets in Containers, Action filters and its types.

Dataset:

IHME_GBD_2010_MORTALITY_AGE_SPECIFIC_BY_COUNTRY_1970_2010.csv

Creating A Story With Tableau Public

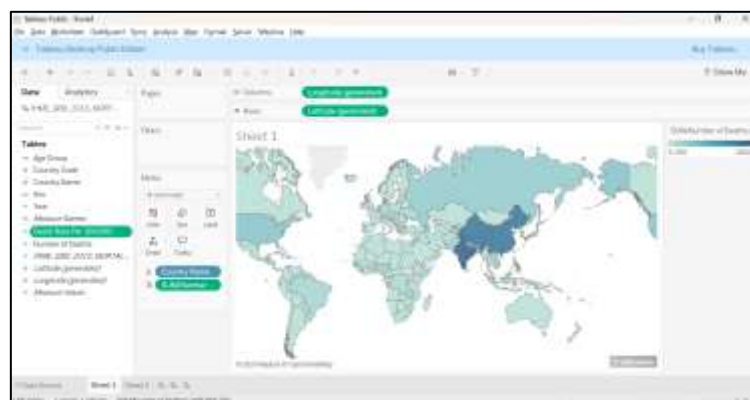
With Tableau public, you are able to organize your data in order to tell a meaningful story. This is beneficial when you are doing a presentation, creating an article, or uploading to a website, as it helps your audience understand your data.

Stories are created through assembling the different worksheets and dashboards. We can highlight important data points, add text box and pictures to help convey our story. However, there are many different ways to tell a story. For example, one technique is called “tailoring in” where the story starts with a big picture view and zooms in on a specific detail.

In contrast, a story can also be told by starting with a case and zooming out to that big picture view. We are going to return to our health expenditure worksheets to create a tailoring in story and illustrate the changes in Canada’s spending in a meaningful way.

For Sheet 1:

Add country name to column and no of deaths to rows. Select country map.



For Sheet 2:

Add year to column, and Death Rate Per 100,000 to row. Consider country name in mark and select colour for differentiation. (Select few countries)



To begin, select “New Story” at the bottom right of your screen.

- Drag “Sheet 1” and “Sheet 2” on to “Drag a sheet here”. We can rename each storyboard by clicking “Add a caption”. Rename Sheet 1 to “Number of Death in each country”.
- Use the arrows located on the side of the caption field to navigate to Sheet 2. Click on “Add a caption” and rename Sheet 2 to “Death rate per 100000”.
- In this story, we are going to narrow in and draw attention to the province or territory that has more deaths. Drag an additional copy of “Sheet 1” and drop it between the two existing sheets. Select “Add a caption” and rename it to “India”.
- On the map, click on the province India and then navigate to the caption field and select “Keep Only”. Your screen will show India highlighted from the rest of World.



- Select the right arrow to navigate to “Number of Death in each country”. Hover over the line representing India and select the data point representing no of deaths during the year 2000. Then click “Update”.
- We can add a textbox to label the highlighted pointed by dragging “Drag to add text” on to the line graph. Write a key message in the textbox, such as “India had the highest Death rate in 2000 of 704719 per 100000”. Select “OK”.



- You can edit the text box by selecting “More options” which will open a drop-down menu. Expand the text box by dragging the borders in order to show the full message.
- We have now created a story with three sheets of how India had the highest death rate in the year 2000. If you choose to add a dashboard, it will allow your audience to play with data.

Creating A Dashboard With Tableau

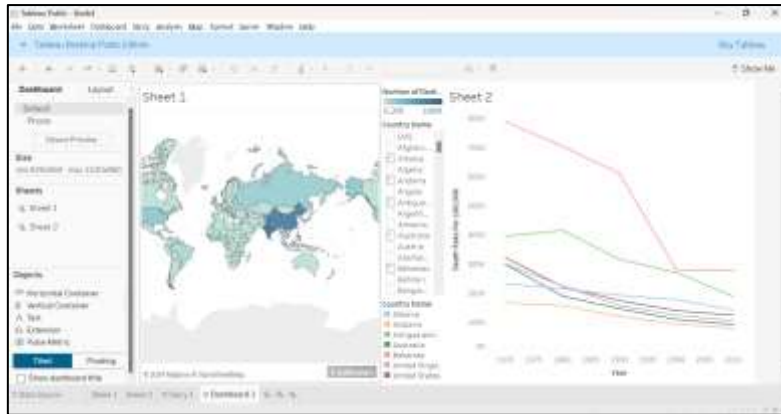
Dashboards are a great way to combine your data visualizations and have them interact with one another. A lot of businesses use dashboards to keep up-to-date in real time about key performance indicators at a glance. In this example, we will combine just two of our data visualizations, the map and the line graph from the first section of the tutorial, but in reality, it can be used to combine many visualizations at once.

The first step in creating your dashboard is to open up the Dashboard tab at the bottom of the screen:



This is your Dashboard Sheet. On the left side you can see that there is a list of the sheets you have made from your current data source.

To build your dashboard, drag the sheet you want in to the centre where it says Drop sheets here. For our purposes, we will need to drag Sheet 1 and Sheet 2 where the map and line graph are saved. When you drag, you will notice an area of your screen will shade over where your graph will drop when you put it down. Organize your dashboard to look like the following:



Now to add titles to the graphs that were chosen, double click on the automatic titles generated based on the sheet name, and a new window should appear, type in a title that describes the graph.

We can also add additional titles and objects to the dashboard by choosing an object from the Objects side panel and dragging it to the dashboard. We are going to add titles to the bottom line graph to differentiate between the Canada line and the provinces.

Program 5

**Introducing Power BI –Components and the flow of work. Power BI Desktop Interface-
The Report has five main areas.**

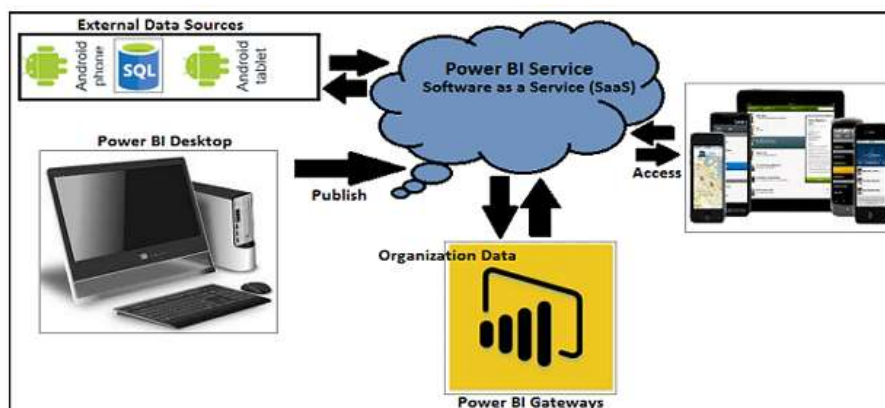
Power BI includes the following components –

Power BI Desktop – This is used to create reports and data visualizations on the dataset.

Power BI Gateway – You can use Power BI on-premises gateway to keep your data fresh by connecting to your on-premises data sources without the need to move the data. It allows you to query large datasets and benefit from the existing investments.

Power BI Mobile Apps – Using Power BI mobile apps, you can stay connected to their data from anywhere. Power BI apps are available for Windows, iOS, and Android platform.

Power BI Service – This is a cloud service and is used to publish Power BI reports and data visualizations



Flow of Work

- A typical Power BI workflow involves more than one type of content.
- A Power BI designer (yellow in the diagram) collects data from semantic models, brings it into Power BI Desktop for analysis, and creates reports full of visualizations that highlight interesting facts and insights.
- The designer pins visualizations from reports to dashboards, and shares the reports and dashboards with business users like you (black in the diagram).



A visualization (or visual), is a type of chart built by Power BI designers. The visuals display the data from reports and semantic models. Because they're highly interactive, you can slice, filter, highlight, change, and even drill into visualizations.

For more info, see [Interact with visuals in reports, dashboards, and apps](#).



A semantic model is a container of data. For example, it might be an Excel file from the World Health Organization. It might also be a company-owned database of customers, or it might be a Salesforce file. And it might be all three if the designer combines them into a single model. Designers manage semantic models. The data contained in semantic models is used to build reports, dashboards, and apps that designers share with you.



A dashboard is a single screen with tiles of interactive visuals, text, and graphics. A dashboard collects your most important metrics, or a focused set of metrics, on one screen, to tell a story or answer a question. The dashboard content comes from one or more reports and one or more semantic models.

For more info, see [Dashboards for the Power BI service business users](#).



A report is one or more pages of interactive visuals, text, and graphics that together make up a single report. Power BI bases a report on a single semantic model. Often, the designer organizes report pages to each address a central area of interest or answer a single question.

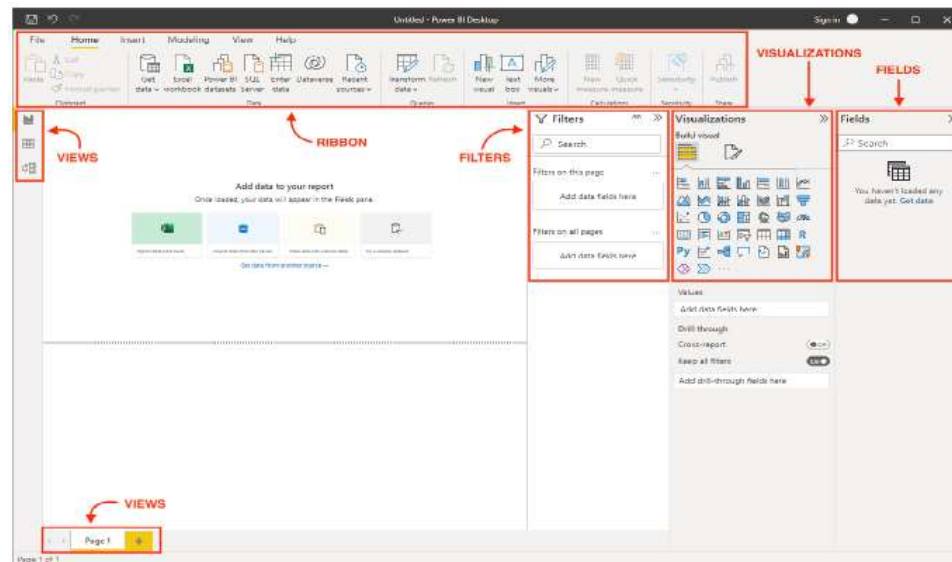


An app is a way for designers to bundle and share related dashboards, reports, and semantic models together. Business users receive some apps automatically but can go search for other apps created by colleagues or by the community. For example, out-of-the-box apps are available for external services you may already use, like Google Analytics and Microsoft Dynamics CRM.

Power BI Desktop Interface – The Report has five main areas

When you launch the application, Power BI Desktop will start with a blank report. Let's go over the components of the Power BI Desktop Interface.

- **Ribbon** - the top ribbon contains most of the controls and options needed for building the report.
- **Views** - this is made up of the report view, the data view, and the model view.
- **Canvas** - this is the main design area where visualizations and other elements are added.
- **Page selector** - for navigation to other pages in the report.
- **Filters** - fields can be added here to filter the data.
- **Visualizations** - this contains the list of available visualizations.
- **Fields** - this section contains the tables and fields that are available in the data model.



The Major Components of Power BI Desktop Interface are

Power Query Editor: It is the process of cleansing and transforming data and permits users to access datasets connecting from multiple sources. It is included on the Power BI desktop. Business users may view the data from distinct databases like MySQL, SQL servers, DB2, and many more.

Power View: It is a data visualization tool that assists users in developing stunning charts, and colourful maps, that turn data into a story.

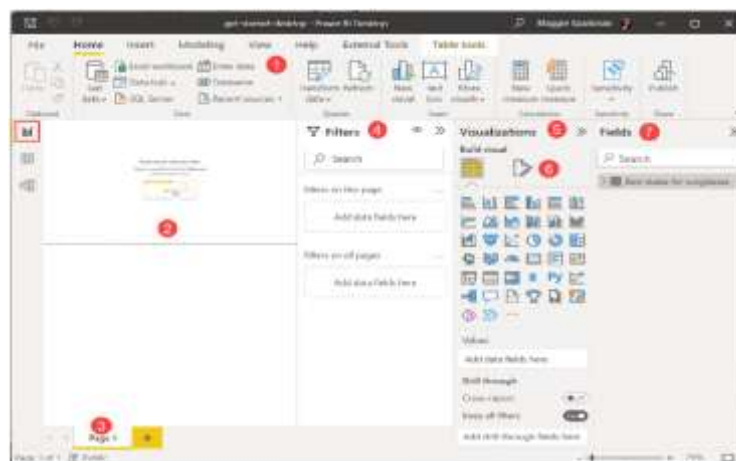
Power Map: It is a 3D map visualization tool to identify geospatial data on Map visuals. It helps organizations to examine the maximum sales production geographically, visualizing the demographic populations of specific regions.

Power Pivot: It is a Data Modelling technique that is used to create relationships between datasets. It performs complex computations by utilizing DAX functions.

Power Q & A: When dealing with giant datasets, it becomes crucial to get to know the in-depth details of the data. Luckily, it is done through natural language where users may ask questions and obtain the answer through Power Q & A.

Build reports :

In Power BI Desktop Report view, you can build visualizations and reports. The Report view has six main areas:

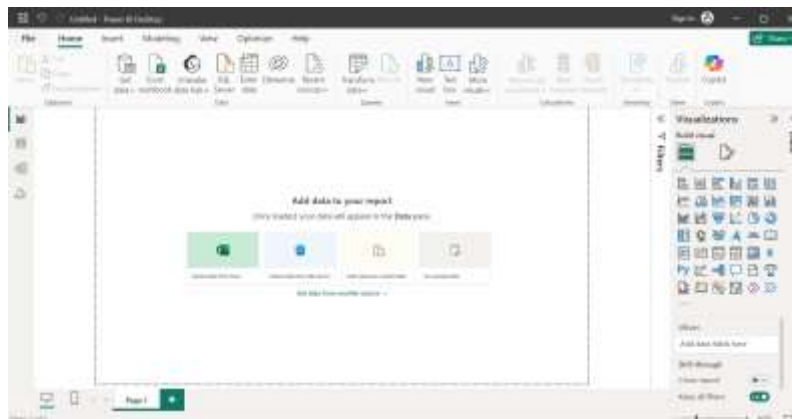


- 1) The ribbon at the top, which displays common tasks associated with reports and visualizations.
- 2) The canvas area in the middle, where you create and arrange visualizations.
- 3) The pages tab area at the bottom, which lets you select or add report pages.
- 4) The Filters pane, where you can filter data visualizations.
- 5) The Visualizations pane, where you can add, change, or customize visualizations, and apply drill through.
- 6) The Format pane, where you design the report and visualizations.
- 7) The Fields pane, which shows the available fields in your queries. You can drag these fields onto the canvas, the Filters pane, or the Visualizations pane to create or modify visualizations.

Program 6

Querying Data from CSV - Query Editor, Connecting the data from the Excel Source, Clean, Transform the data.

Power BI Desktop also includes the Power Query Editor, which opens in a separate window. In Power Query Editor, you can build queries and transform data, then load the refined data model into Power BI Desktop to create reports.

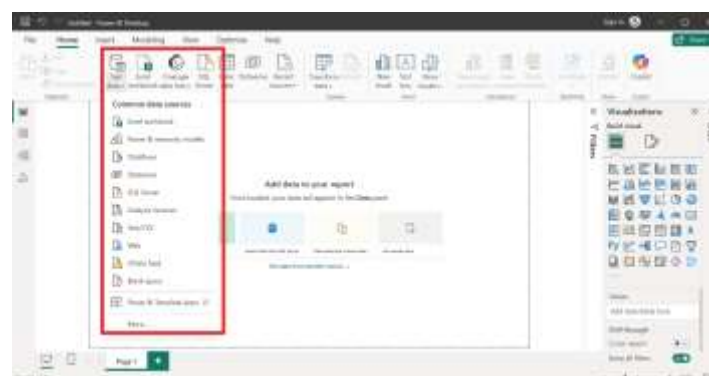


Along the left side of Power BI Desktop are icons for the three Power BI Desktop views: Report, Data, and Model, from top to bottom. The current view is indicated by the yellow bar along the left, and you can change views by selecting any of the icons.

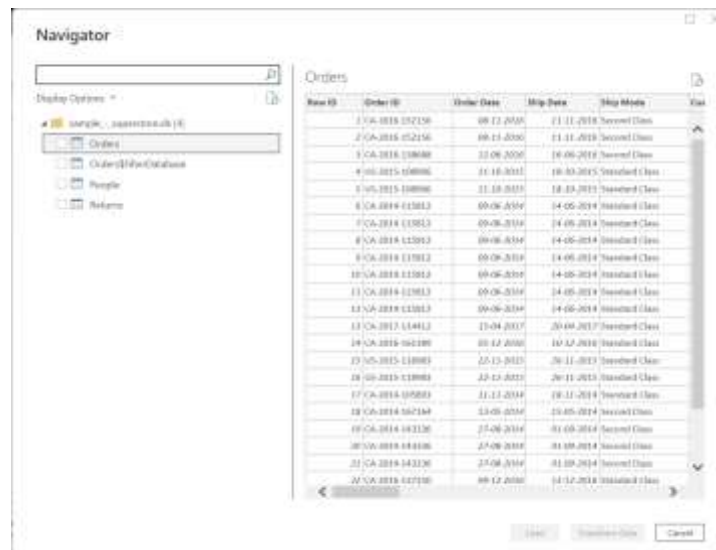
Connect to data (Get Data from different Sources)

With Power BI Desktop installed, we can connect to the world of data. To see the many types of data sources available,

Select Get Data in the Power BI Desktop Home tab, and in the Get Data window, scroll through the list of All data sources.(like Excel, CSV, Oracle....) On the Power BI Desktop Home tab, select Get Data > Excel workbook

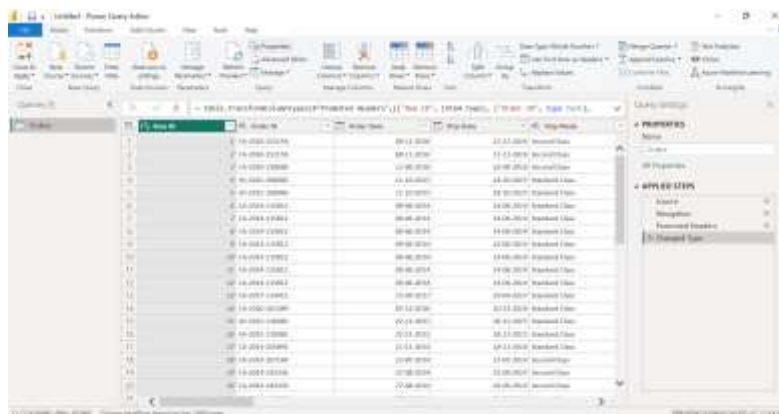


Click on the file you need and open the file, once you open the file below window with navigator appears, select the file (1nd option to see the contents of the file)



At this point you can select Load to load the table, or Transform data to make changes in the table before you load it.

When you select Transform data, Power Query Editor launches, with a representative view of the table. The Query Settings pane is on the right, or you can always show it by selecting Query Settings on the View tab of Power Query Editor.



Transforming the data

Once connected to a data source, you can adjust the data to meet your needs.

To transform the data, you provide Power Query Editor with step-by-step instructions for adjusting the data while loading and presenting it. Transforming doesn't affect the original data source, only this particular view of the data.

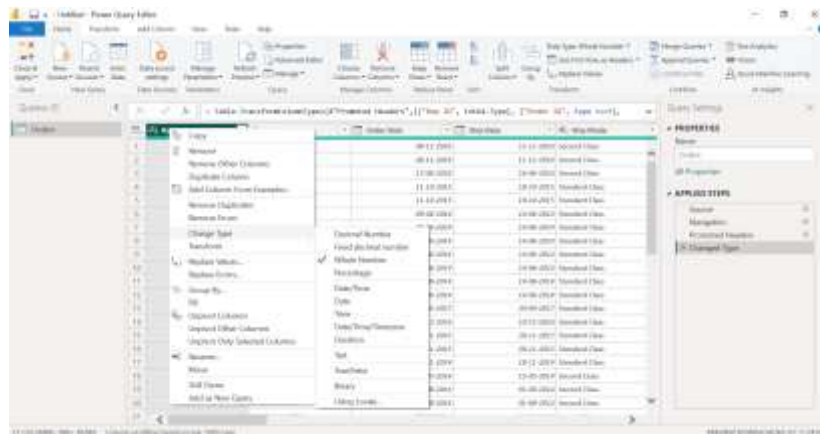
Transforming the data, **includes renaming columns or tables, removing rows or columns, or changing data types.**

Power Query Editor captures these steps sequentially under **Applied Steps** in the Query Settings pane.

Notice that the Applied Steps in Query Settings already contain a few steps. You can select each step to see its effect in the Power Query Editor.

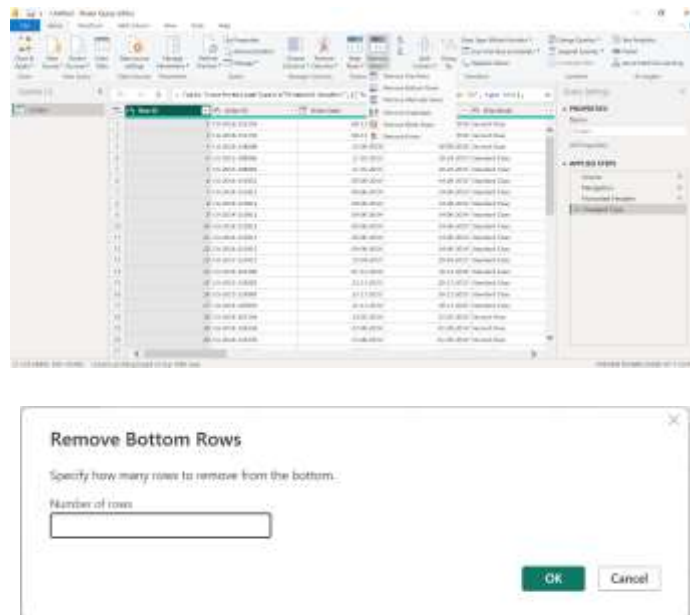
To Change a data type

- Select the column or columns to change.
- Hold down the Shift key to select several adjacent columns, or Ctrl to select non adjacent columns.
- Either right-click a column header, select Change Type,
- choose a new data type from the menu, or drop down the list next to Data Type in the Transform group of the Home tab,
- select a new data type.



To Reduce/Delete the Rows

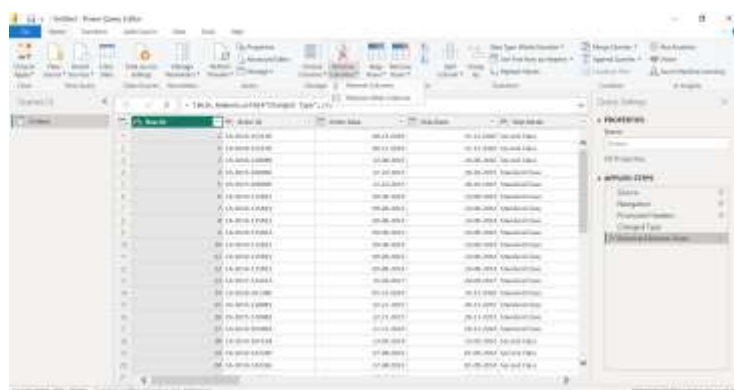
- From the Home tab select
- Remove Rows > Remove Bottom Rows.
- In the Remove Bottom Rows dialog box, enter 10, and then select OK.



The bottom 10 worst rows are removed from the table, and the step Removed Bottom Rows appears in Applied Steps.

To Remove columns

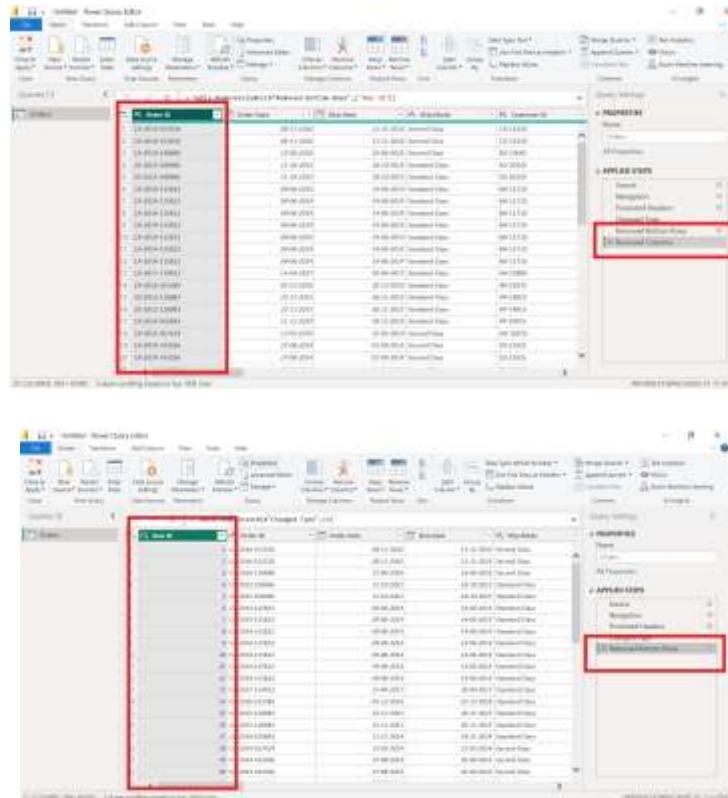
- From Home Tab Select Remove Columns.
- You can also right-click one of the selected column headers and select Remove Columns from the menu.
- The selected columns are removed, and the step Removed Columns appears in Applied Steps.



Applied steps in the Query setting pane

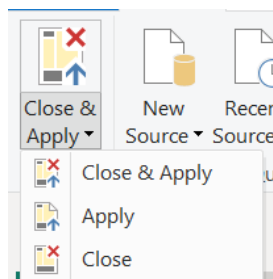
Right-click any step in the Applied Steps pane and choose to delete it, rename it, move it up or down in the sequence, or add or delete steps after it.

For intermediate steps, Power BI Desktop will warn you if the change could affect later steps and break your query.



Once all the required transformations are done the report should be created in the Power BI Desktop

- Apply the changes in Power Query Editor and load them into Power BI Desktop
- Selecting Close & Apply from the Home tab of the ribbon.
- You can also select just Apply to keep the query open in Power Query Editor while you work in Power BI Desktop.



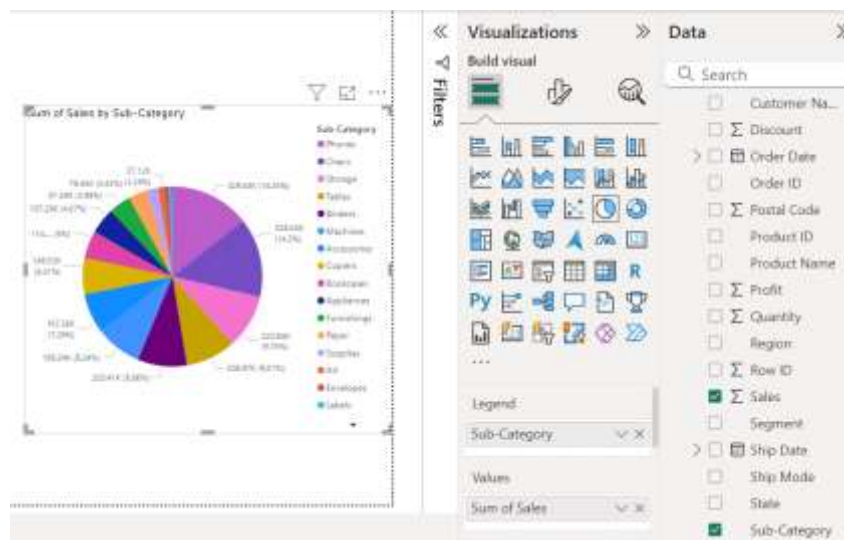
To reopen Power Query Editor from Power BI Desktop

Select Transform Data on the Home tab of the Power BI Desktop ribbon.

You can expand and collapse the Filters (Data), Visualizations, and Fields panes by selecting the arrows at the tops of the panes. Collapsing the panes provides more space on the canvas to build cool visualizations.

The Visualizations pane shows information about the visualization and lets you modify it.

- 1) The Fields option in the Visualization pane lets you drag data fields to Legend and other field wells in the pane.
- 2) The Format option lets you apply formatting and other controls to visualizations.
- 3) The icons show the type of visualization created. You can change the type of a selected visualization by selecting a different icon, or create a new visualization by selecting an icon with no existing visualization selected
- 4) The options available in the Fields and Format areas depend on the type of visualization and data you have.
- 5) Create Pie chart to show sales of each sub-category



Program 7

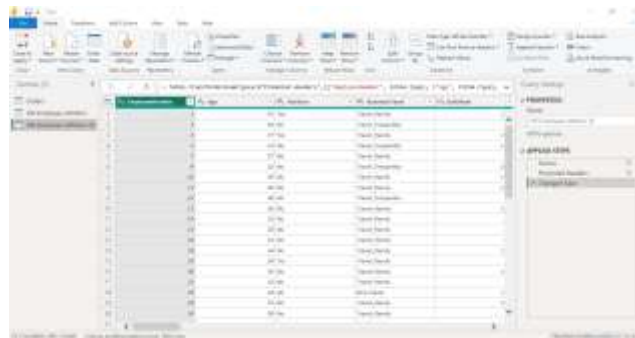
Creating Reports & Visualizations - Different types of charts, Formatting charts with Title, Colors

Dataset used: HR-Employee-Attrition.csv

17 Most Common Charts available in Power BI:

Bar Chart • Line Chart • Scatterplot • Sparkline • Pie Chart • Gauge • Waterfall Chart • Funnel Chart • Heat Map / Matrix • Histogram • Box Plot • Maps • Tables • Indicators • Area Chart • Radar or Spider Chart • Tree Map

- 1) Open Power BI Desktop
- 2) Click on Get data in ribbon pane
- 3) Click on Excel worksheet option
- 4) Choose specific dataset and open it. Example: HR-Employee-Attrition.csv
- 5) Click on Transform Data button
- 6) Power Query Editor window will open.



- 7) We have to perform some transformation on this table
- 8) If header is not specified, you can add a row on top, define the attribute name, and click on use first row as header.
- 9) Then, we have to create new column for attrition count.

For this, select attrition column → click on Add Column (in menu bar) → Select conditional column → new window will open then add details as follows. Once you are done with this, attrition count column will be added as a last row of the table.



- 10) Change the datatype of this column to whole number.
- 11) Click on **Close & Apply**



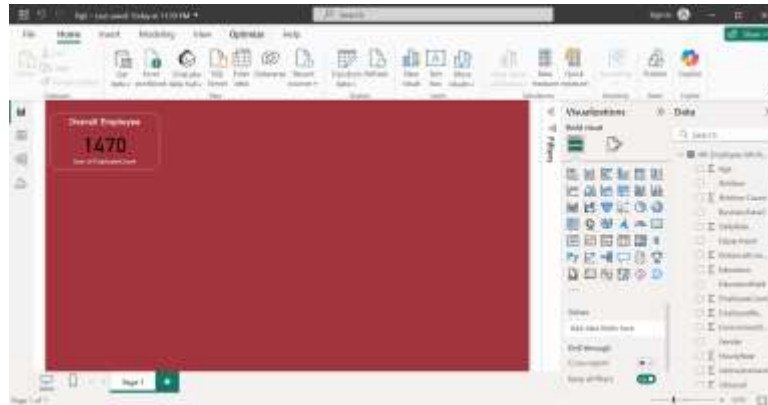
We will start with KPI Chart

A Key Performance Indicator (KPI) is a visual cue that communicates the amount of progress made toward a measurable goal.

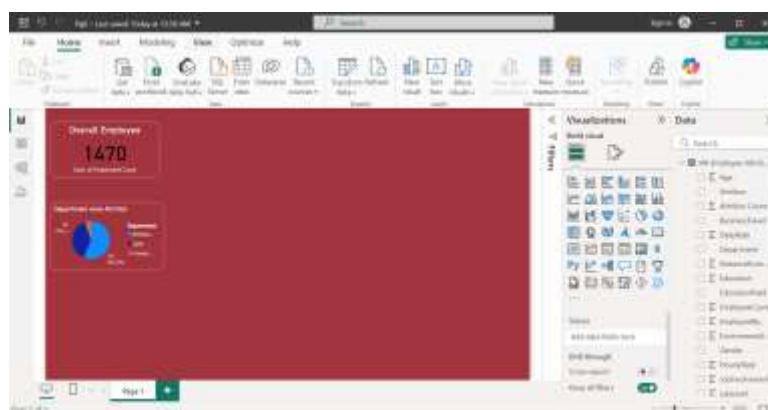
Now format this particular visual with title, size, colour.

- 1) Click on “Format your visual” in Visualization Pane
- 2) Go to General tab
 - a. click on Title → type “Overall Employees” in Text box, Horizontal alignment and colour of your choice
 - b. expand effects → OFF the background of KPI chart
 - c. Effects → ON visual border → change the color and 20 rounded corners
- 3) Now, go to Visual tab → OFF the category label
- 4) In visual tab, callout value → change the font color

Kindly Note: If you want same format for all visuals, complete the formatting with one of the visual, click on format painter and click on the visual for which you want the formatting. Little bit formatting will be required as properties for each visual will be different

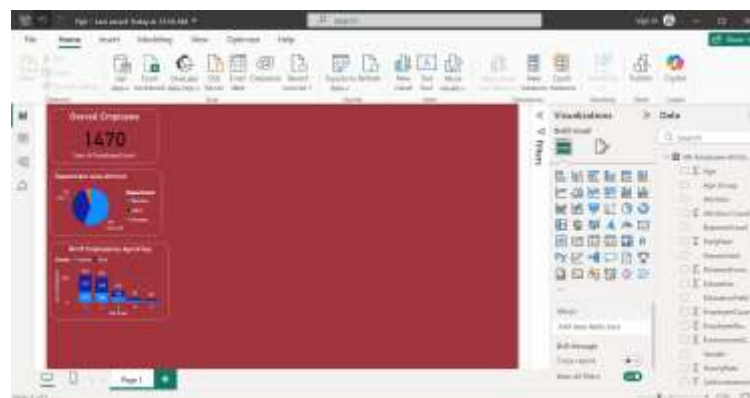


Select Pie Chart.

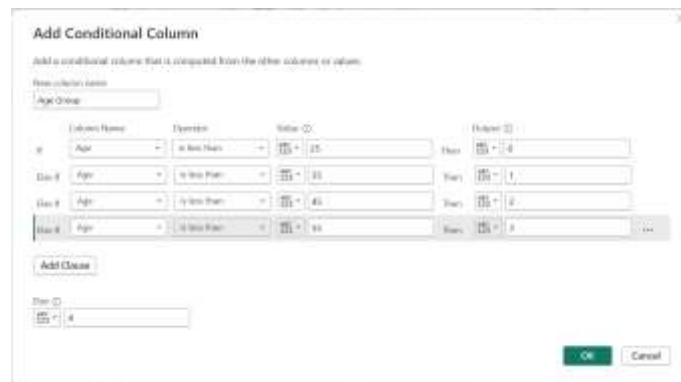


Now apply same steps for creating STACKED COLUMN CHART.

A column chart, commonly referred to as a vertical bar graph, is a visual tool utilized to display and compare numerical data across different categories. Each column within the chart corresponds to a specific category, with the height of the column proportionally representing the associated value.

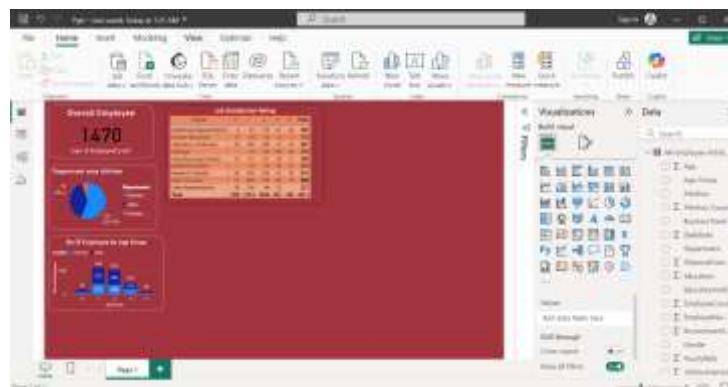


Optional: As you can see, age is not sorted correctly, so we have to create additional column. Once sort age column is created change the datatype of column if its not in whole number. Click on “Close & Apply”

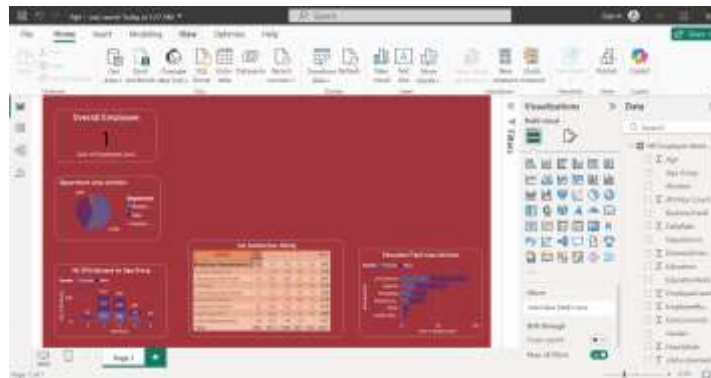


Now apply same steps for creating MATRIX.

The matrix visual is a type of table visual that supports a stepped layout. A table supports two dimensions, but a matrix makes it easier to display data meaningfully across multiple dimensions. Often, report designers include matrixes in reports and dashboards to allow users to select one or more element (rows, columns, cells) in the matrix to cross-highlight other visuals on a report page.



Format the row header & column header → text color & background color Also, format the Row grand total & column grand total

Now apply same steps for creating Stacked Bar Chart.**Now apply same steps for creating Donut**

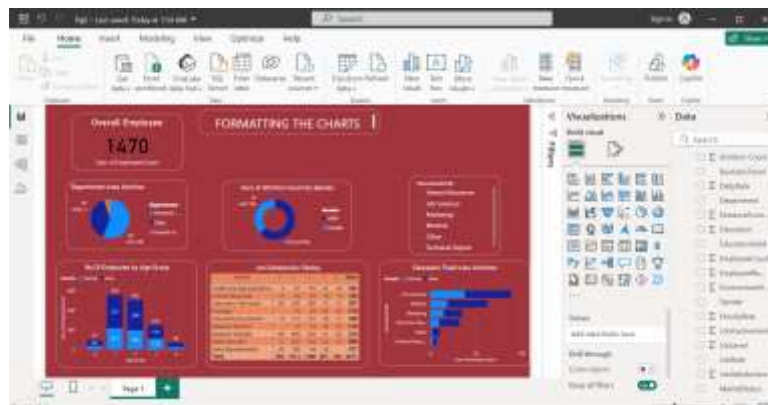
A doughnut chart is similar to a pie chart in that it shows the relationship of parts to a whole. The only difference is that the center is blank and allows space for a label or icon.

Doughnut charts work best when you use them to compare a particular section to the whole, rather than comparing individual sections with each other.

Slicers: A slicer is a standalone chart that can be used to filter the other visuals on the page. Slicers come in many different formats (category, range, date, etc.) and can be formatted to allow selection of only one, many, or all of the available values.

Slicers are a great choice to:

- Display commonly used or important filters on the report canvas for easier access.
- Make it easier to see the current filtered state without having to open a drop-down list.
- Filter by columns that are unneeded and hidden in the data tables.
- Create more focused reports by putting slicers next to important visuals.



Program 8

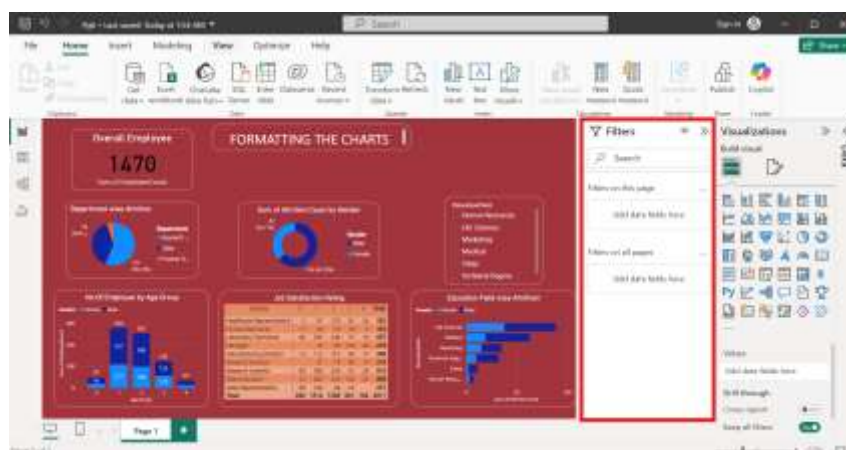
Dashboards - Filters in Power BI, Formatting dashboards

Filters remove all but the data you want to focus on.

Filter Pane: You can apply filters in the Filters pane, or make selections in slicers directly on the report page itself. The Filters pane shows the fields in individual visuals and any other filters the report designer adds.

There are four standard types of filters that you create in the Filters pane.

- **Visual filter** applies to a single visual on a report page. You see visual-level filters when you select a visual on the report canvas. Even if you can't edit a report, you can select a visual and filter it.
- **Page filter** applies to all the visuals on the report page.
- **Report filter** applies to all pages in the report.
- **Drill through filter** With drill through in the Power BI service and Power BI Desktop, you create a destination report page that focuses on a specific entity, such as a supplier. From the other report pages, users can right-click a data point for that entity and drill through to the focused page.



We will be using HR dataset (same used for Exp 7).

Extending same dashboard with using filters & let's format the final dashboard.

Let's apply filter for department (Particular visual).

- 1) Drag Department from Data Pane to Filters → Filters on this page textbox. → Basic Filtering
- 2) Now, you can see, HR dept. is selected and now in below picture, you can see that only HR data is visible, whereas, R&D and Sales data will not be shown.



- 3) Now, let's try for advanced filter

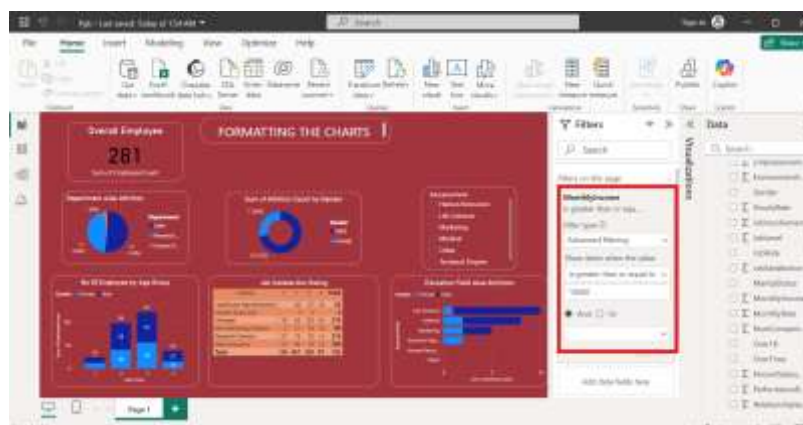
Let's find out results for **salary greater than equal to 10000**.

Drag and drop **Monthly Income** in filter

Filter type: advanced filtering

Show items when the value: is greater than or equal to

Value: 10000



- 4) Now, try for Top N filtering. Try to display top 4 Job roles having highest job satisfaction.
- Select “Job satisfaction rating” visual → In Filters Pane, Filters on this visual → Job Role →
- Filter type: Top N
- Show item: Top : 4
- By value: Sum of Job Satisfaction

