

POWER BI

Chapter 1: Introduction to Power BI

- What is Power BI
- Different Products of Power BI
- Competitive Advantages of Power BI

CHAPTER 2

Chapter 2: Getting Started with Power BI

- Setting Up Office365 Business Basic Trial Account
- Power BI Service License Comparison
- Downloading Power BI Desktop

CHAPTER 3

Chapter 3: Power BI Desktop Navigation

- Exploring Power BI Desktop Navigation
- Getting Familiar with Ribbon Menu
- Introduction to Visualizations and Fields Pane
- Getting started with Power Query Editor

CHAPTER 4

Chapter 4: Getting Data from Data Sources

- Getting Data in Power BI
- Getting Data from Excel

CHAPTER 5

Chapter 5: Data Transformation

- Removing Blank Rows from the Top
- Removing Blank Columns and Choosing Relevant Columns
- Renaming Column Names
- Understanding the Data Types
- Removing Errors
- Removing Duplicates

CHAPTER 6

Chapter 6: Introduction to Data Modeling

- Understanding Data Modeling

Contents

- Cardinality and Cross Filter Direction
- Deleting Relationships
- Creating New Relationships: Drag and Drop

CHAPTER 7

Chapter 7: Introduction to DAX

- What is DAX?

▪

CHAPTER 8

Chapter 8: Data Visualization

- Data Visualization in Power BI
- Creating a Card Visual
- Creating an Area Chart
- Creating a Bubble Map Visual
- Creating a Donut Chart
- Creating a Stacked Bar Chart
- Creating a Slicer

CHAPTER 9

Chapter 9: Publish and Share

- Save and Publish to My Workspace
- Sharing the Report

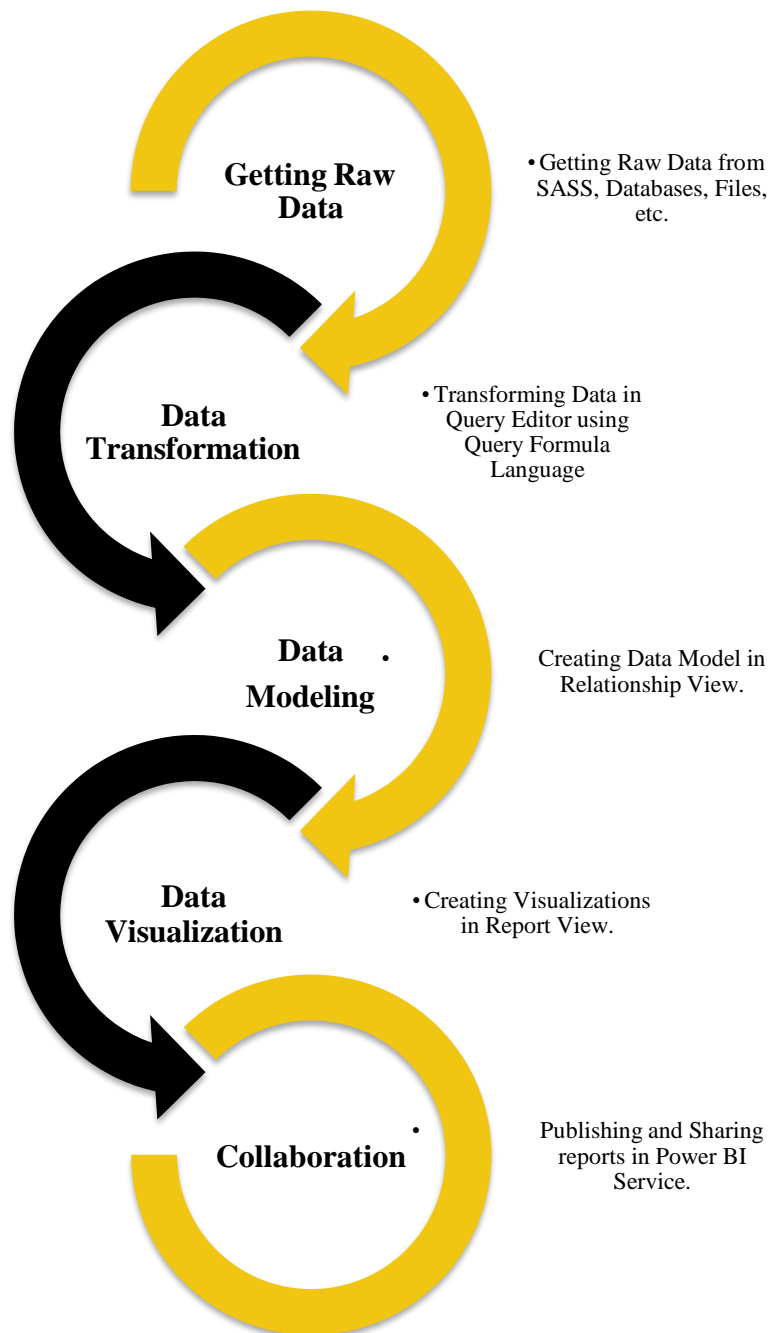
Chapter 1

Introduction to Power BI

- ✓ What is Power BI
- ✓ Different Products of Power BI
 - Power BI Desktop
 - Power BI Service
 - Power BI Report Server
 - Power BI Mobile
- ✓ Competitive Advantages of Power BI

What is Power BI

Power BI is a suite of self-service BI tools to analyze data and share insights. Power BI has four different products i.e., Power BI Desktop, Power BI Service, Power BI Report Server and Power BI Mobile app and every product has its own capabilities and limitations. All stages of developing a BI solution can be seen in the flowchart below and these will be discussed throughout the course.



Different Products of Power BI

Power BI Desktop:

Power BI Desktop is a free application that can be installed on a local computer. It lets you get data from multiple sources, transform raw data into clean, workable data, create data models, and develop fine-looking reports. You cannot create dashboards in the Power BI desktop.

Power BI Service:

The Power BI Service is built upon and protected by the Windows Azure Cloud platform. With Power BI Service, you can share your reports and dashboard with your co-workers and other stakeholders. It also allows you to create workspaces to collaborate on the development of reports. Data flows in Power BI Service allows you to transform transform the dataset, however you cannot create or amend data models.

Power BI Report Server:

Power BI Report Server is an on-premises report server and can host Power BI reports (.pbix), excel files and paginated reports (.RDL). It also comes with a web portal where you can display reports and KPI's.

Power BI Mobile:

All the reports and dashboards that you create, whether they're on-premises or in the cloud, become available in the Power BI mobile apps. These reports and dashboards can be viewed on iOS (iPad, iPhone, iPod Touch, or Apple Watch), Android or Windows device. See the below table to distinguish between the capabilities and limitations of Power BI Desktop vs. Service.

Features	Power BI Desktop	Power BI Service
Connecting To Multiple Data Sources	✓	✓
Data Transformation Using Query Editor	✓	✗
Data Modeling	✓	✗
Creating Calculated Columns And Measures	✓	✗
Creating Visuals & Reports	✓	✓
Creating And Sharing Dashboard	✗	✓
Creating And Managing Workspace Apps	✗	✓
Sharing Reports	✗	✓

Competitive Advantages of Power BI

- ✓ For 14 consecutive years, Gartner has recognized Microsoft as a Magic Quadrant Leader in analytics and business intelligence platforms.
- ✓ Power BI developers remain constantly engaged with the community and act upon bug fixes, recommendations, and feedbacks remarkably fast.
- ✓ It does not require significant initial learning to get started with Power BI as it is comparatively easier to navigate and more intuitive for new users.
- ✓ Microsoft Power BI offers one of the lowest per-user pricing options. Most of the features are given out for free and even Pro License just costs \$9.99 per month which is much cheaper than its competitors.
- ✓ Power BI can be integrated with Microsoft Teams, making it the most preferred option for remote work.
- ✓ It has an incredibly easy-to-use visualization tool; charts are interactive by default.
- ✓ It's very easy to import data from SQL servers both on-premises and in the cloud, flat files, Spark clusters, and almost all the popular online services.
- ✓ Power BI offers augmented analytics in the form of AI-infused experiences, including anomaly detection capabilities and smart narratives which utilizes Natural Language Generation (NLG) technique.

Chapter 2

Getting Started with Power BI

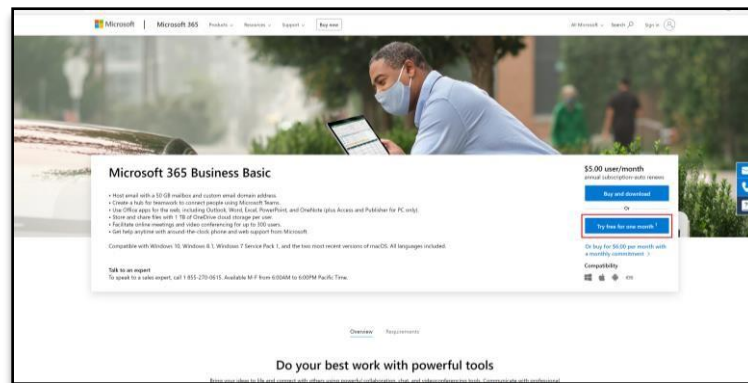
- ✓ Setting Up Office365 Business Basic Trial Account
- ✓ Power BI Service License Comparison
 - Power BI Free
 - Power BI Pro
 - Power BI Premium
- ✓ Downloading Power BI Desktop

Setting Up Office365 Business Basic Trial Account

Signing up for Power BI cannot be done using a personal email address and requires an email account on your company's website. However, this can be bypassed by signing up for an **Office365 Business Basic** trial account and using that to sign up for Power BI. You will be able to continue using Power BI even after your subscription has expired.

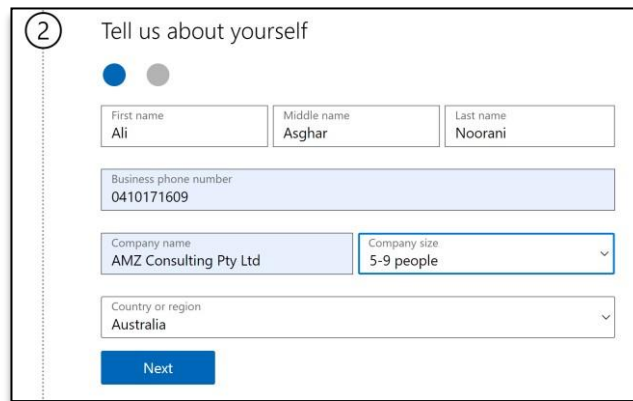
To get started:

1. On your internet browser, go to [Microsoft 365 Business Basic | Microsoft 365](#).
2. Click on **Try free for one month**.



3. Fill out the form with your existing email address and click **Next**.

4. Click on **Set up an account**.
5. Enter your details.
6. Click **Next**.



The screenshot shows a registration form titled 'Tell us about yourself' with a progress indicator showing the first of two steps is active. The form contains the following fields:

- First name: Ali
- Middle name: Asghar
- Last name: Noorani
- Business phone number: 0410171609
- Company name: AMZ Consulting Pty Ltd
- Company size: 5-9 people (selected from a dropdown menu)
- Country or region: Australia (selected from a dropdown menu)

A blue 'Next' button is located at the bottom of the form.

7. Fill up the details required in the **sign-up** form.
8. Keep track of the new email address and wait a few minutes for the setup to complete.

You have successfully registered for an **Office365 Business Basic** account.

Power BI Service License Comparison

Changes in Microsoft Licenses have been coming in fast and it is advisable to subscribe to Power BI blogs to remain up to date with the latest announcements at: <https://powerbi.microsoft.com/en-us/blog/>

There are three types of Power BI licenses/subscriptions that are listed on the pricing page:

Power BI Free:

Power BI Free is included in all Office 365 Plans, and you can sign up for Power BI Free any time you like. With Power BI Free, some of the features that you get are as follows:

- ✓ You can consume a data capacity of upto 1 GB/user.
- ✓ With this license, you can import data from 70+ data sets.
- ✓ It also allows the users to have free access to Power BI Desktop and Power BI Online.

Power BI Pro:

Power BI Pro costs \$9.99/user/month (\$13.36 AUD). It is also included in Office 365 Enterprise E5. With Power BI Pro, some of the features that you get are as follows:

- ✓ Everything you get with Power BI Free License +
- ✓ You can consume a data capacity of upto 10 GB/user.
- ✓ With this license, you can import data from 70+ data sets and you can also share reports with other users.
- ✓ Consumers of the report also require a Pro license.

Power BI Premium:

Power BI Premium is an subscription and not a user license and this upgrade is rather expensive (\$5000-\$20000/month), so only the larger companies will get use out of it. With Power BI Premium, you get the following:

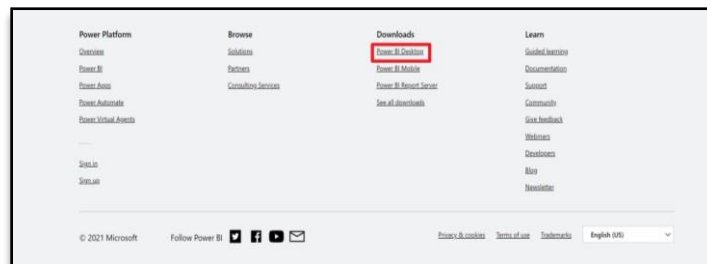
- ✓ You can work with datasets up to 50 GB in size.
- ✓ Your company gets its own dedicated capacity of 100 TB. So, you're not relying on Microsoft's shared capacity hence your operations can't be slowed down.
- ✓ It also allows users with free licenses to consume shared reports and dashboards with a Premium Capacity Workspace.

Downloading Power BI Desktop

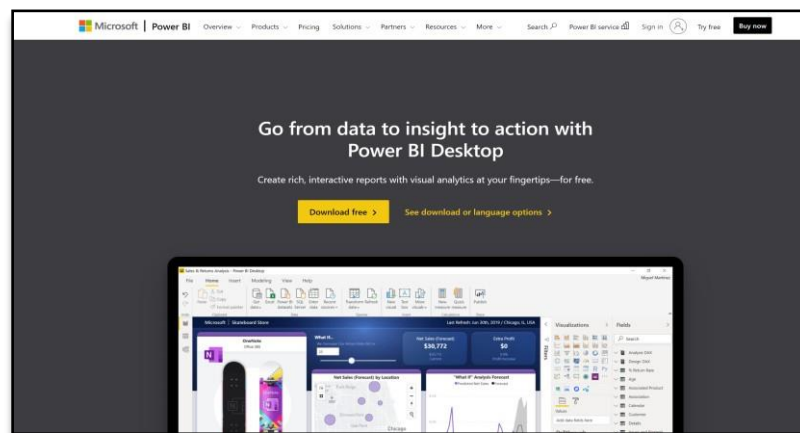
The online version of Power BI, known as Power BI Service, has certain data modeling and visualization limitations. Power BI Desktop includes additional data visualization capabilities and enables you to build data models that you can import into Power BI Service.

To download Power BI desktop:

1. On the browser, go to www.powerbi.com
2. Scroll down to the end of the page.
3. Click on **Power BI Desktop**.

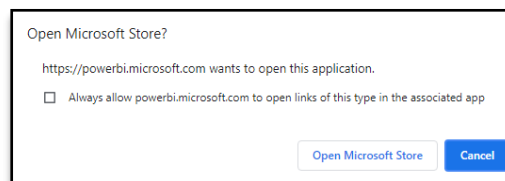


4. Click **Download Free**.



A pop-up appears as Power BI is available at the Microsoft Store for Windows users.

5. Click **Open Microsoft Store**.



6. Run the setup file to install **Power BI Desktop**.

7. Select **Finish** to run it.



8. On the startup screen, select **Sign In** and enter your Office365 Business Basic email address and password.
9. You can now use Power BI Desktop and access the complete array of features.

Chapter 3

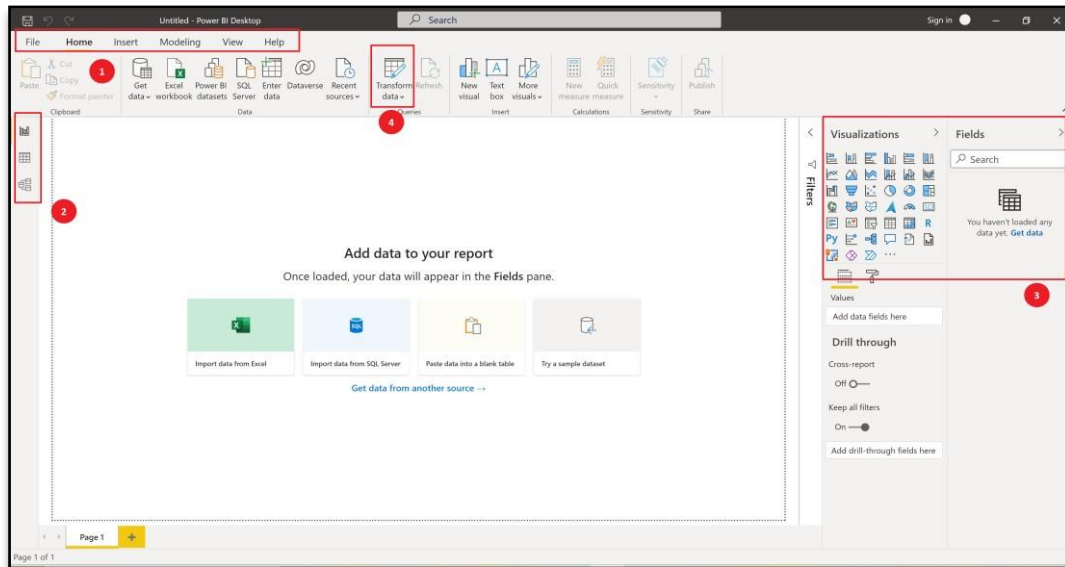
Power BI Desktop Navigation

- ✓ Exploring Power BI Desktop Navigation
- ✓ Getting Familiar with Ribbon Menu
 - File
 - Home
 - Insert
 - Modeling
 - View
 - Help
- ✓ Getting Familiar with Tab Menu
 - Report
 - Data
 - Relationships
- ✓ Introduction to Fields, Visualization and Filters Pane
 - Fields Pane
 - Visualizations Pane
 - Filters Pane
- ✓ Getting started with Power Query Editor
 - Ribbon Menu
 - Queries Pane
 - Query Settings
 - Data View

Exploring Power BI Desktop Navigation

Power BI Desktop is a free desktop application, which lets you import data from different sources, transform it and then convert it to visually compelling reports and dashboards. It also lets you share your reports on the web via Power BI Service. In this section, we will introduce you to different menus and sections of Power BI Desktop.

Power BI Desktop has four different sections for navigation purposes:

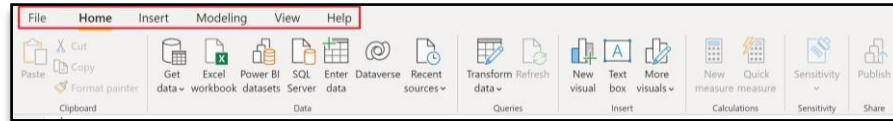


1. Ribbon Menu
2. Tab Menu
3. Visualizations and Fields Pane
4. Power Query Editor

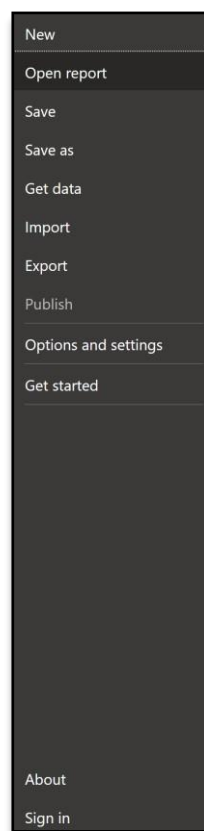
We will discuss these in detail one by one in the next section.

Getting Familiar with Ribbon Menu

Power BI Desktop's Ribbon menu, like those of other Microsoft products, includes a variety of options to interact with the application. Let us discuss some of them briefly.



File: Once you are in the report view, on the upper left corner you have the File menu containing various options related to the file.

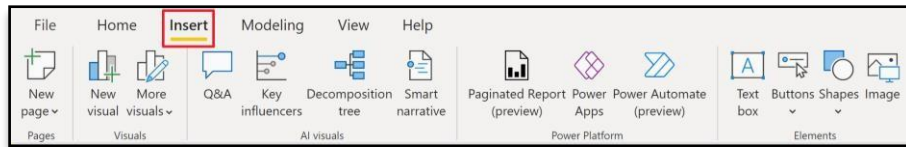


Home: Home tab in the ribbon menu consists of various sub-sections that provide options to help you with report creation and publishing.

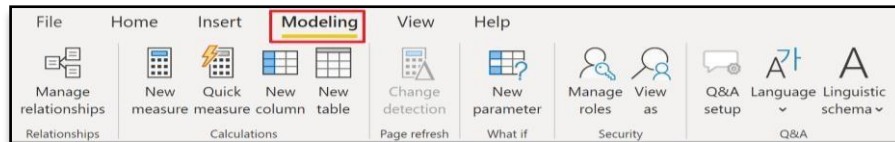


Insert: This tab of the ribbon menu contains all the options related to adding new components to the report.

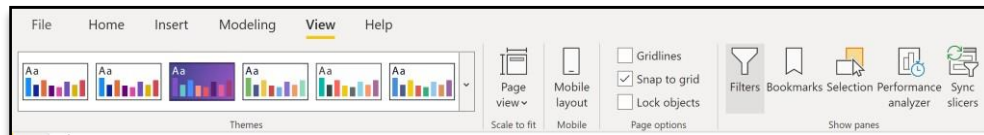
CHAPTER 3: POWER BI DESKTOP NAVIGATION



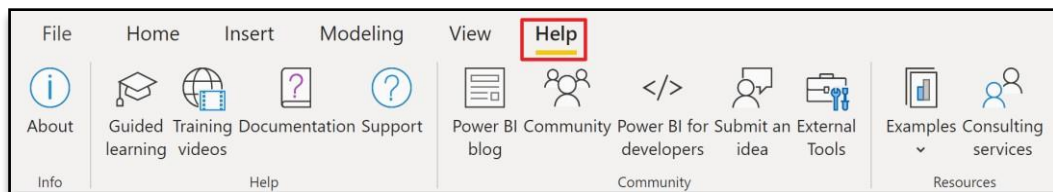
Modeling: – This tab of the ribbon menu contains all options related to data modeling.



View: – This tab of the ribbon menu contains options related to the user interface.

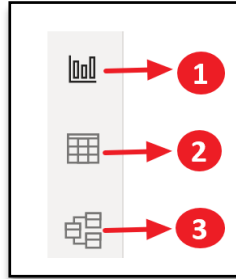


Help: – This tab of the ribbon menu contains multiple options to get help from.



Getting Familiar with Tab Menu

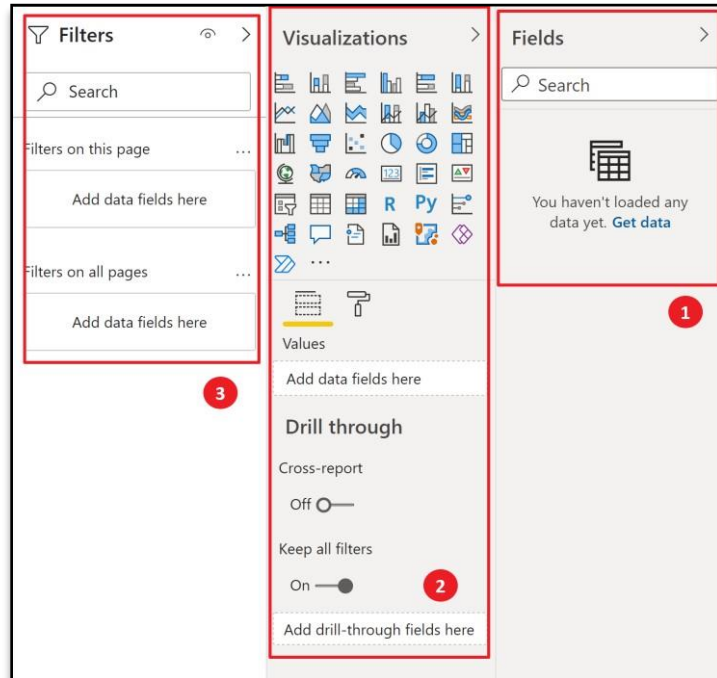
On the left side of the application, you will see three tabs. Let us explore them from top to bottom.



1. **Report:** This allows you to access the canvas where you can create your report using different visual techniques.
2. **Data:** All your datasets are visualized in tabular format here in this section.
3. **Relationships:** - You can visually see the relationship between tables here. You can also rearrange and connect different tables to form a data model.

Introduction to Visualizations and Fields Pane

On the right side of the application, you can find the Field, Visualizations and Filters pane.



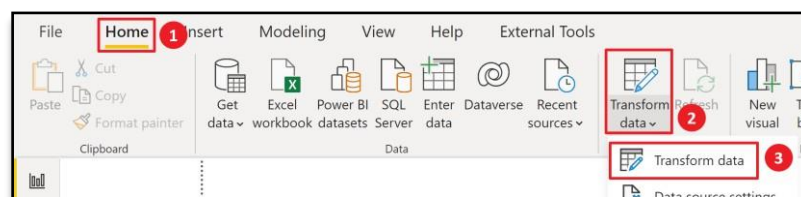
1. **Fields Pane:** This pane contains all the tables in your datasets/data models and their respective fields/columns.
2. **Visualizations Pane:** All visuals and their relevant configuration options are found in this tab.
3. **Filters Pane:** In the Filters pane, you can configure new filters, and update existing filters.

Getting started with Power Query Editor

Power Query Editor lets you clean and transform data for further analysis. It has multiple options to assist you in pre-processing of your datasets and make them usable for visualizations. It lets you record every step that you take to transform or clean data so that it can be reviewed, amended, or removed later if required.

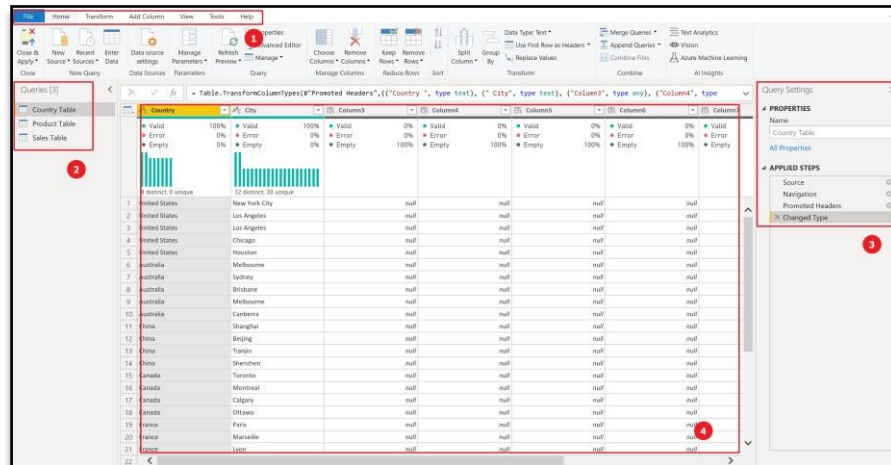
To open the Query Editor:

1. Click on the **Home** tab in the **Ribbon Menu**.
2. In the **Queries** section, click on **Transform Data**.
3. Now click on **Transform Data** to enter the **Query Editor**.



Getting Familiar with Power Query Editor

Let us explore the navigation options briefly.



1. **Ribbon Menu:** The Ribbon menu contains tabs with various options to help you in data cleaning and transformation.
2. **Queries Pane:** This pane contains all the tables.
3. **Query Settings:** All the steps performed on the data are recorded here during data cleaning and transformation.
4. **Data View:** This area shows a tabular view of your data.

Chapter 4

Getting Data from Data Sources

✓ Getting Data in Power BI

- File
- Database
- Power BI Platform
- Azure
- Online Services
- Other

✓ Getting Data from Excel

Getting Data in Power BI

Power BI supports connection to an ample number of data sources like File, Azure Cloud Services, SQL Databases, websites, and even from web applications like Salesforce and Google Analytics, etc. You can connect to these sources by clicking on the **Get Data** button in the **Home** ribbon. Some common data source categories are:

File:

File category contains different file types to choose from, including Excel, CSV, XML, PDF, Jason, etc. You can even connect to a folder containing multiple flat files.

Database:

Database category contains industry big names like Oracle, SAP Hana, Amazon Redshift, SQL, and IBM etc.

Power BI Platform:

This lets you connect with Power Platform sources.

Azure:

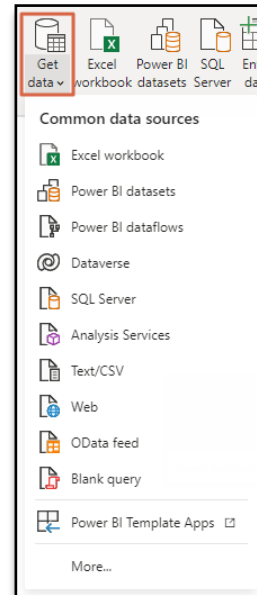
Microsoft has its own Cloud Service called Azure. This category contains a long list of Azure-based databases to connect to.

Online Services:

Online services section provides connectivity with SaaS tools such as Google & Adobe Analytics, Salesforce, Dynamics, Facebook, and GitHub to name a few.

Other:

You can also connect to other data sources like Web, R scripts, Hadoop files, ODBC, Active Directory and Microsoft Exchange here.



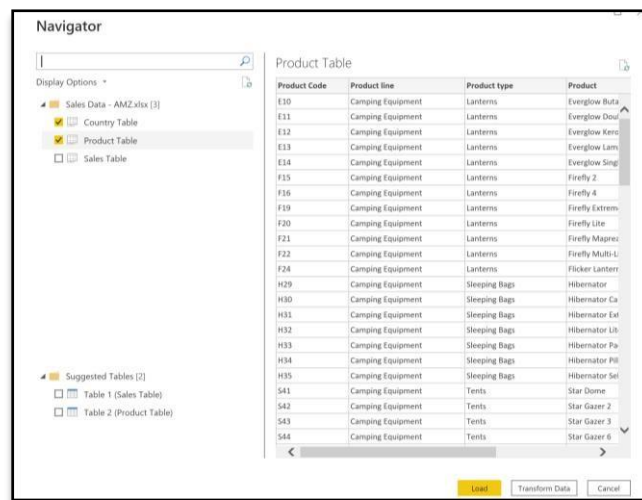
Getting Data from Excel

You can get the data from Microsoft Excel into Power BI by following the below-mentioned steps.

1. Click on **Excel Workbook** in the Data section of the Home tab in the Ribbon.



2. Browse to the location you saved the dataset on your computer to open it.



3. Click **Transform Data**.

Wait for the processing to finish and the Navigator windows to appear.

Chapter 5

Data Transformation

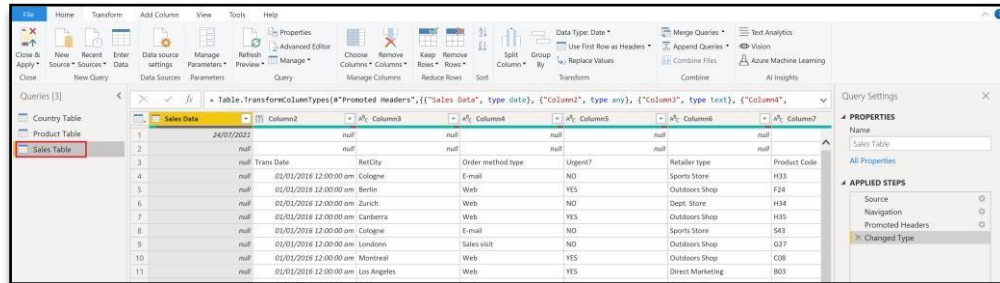
- ✓ Removing Blank Rows from the Top
- ✓ Using the First Row as a Header
- ✓ Removing Blank Columns and Choosing Relevant Columns
- ✓ Renaming Column Names
- ✓ Understanding the Data Types
 - Number Data Types
 - Decimal Number
 - Fixed Decimal Number
 - Whole number
 - Date/ Time Data Types
 - Date/Time
 - Date
 - Time
 - Text Data Type
 - Text
 - Boolean
- ✓ Removing Errors
- ✓ Removing Duplicates

Removing Blank Rows from the Top

As you can see there are some blank rows on the top. We will start by removing them.

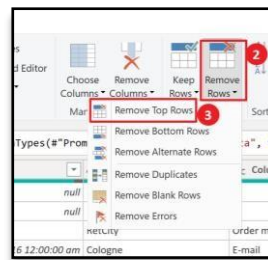
To Remove Top Rows:

1. Click on **Sales Table** Query on the left pane.



The top 2 rows are empty and need to be removed.

4. Select **Remove Rows** on the **Home** tab.
5. Click on **Remove Top Rows** from the dropdown list.



6. Type the number of rows, which in this case is 2.



7. Click **OK**.

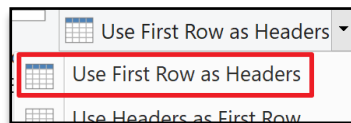
	Sales Data	Column2	Column3	Column4	Column5	Column6	Column7
1		Trans Date	RetCity	Order method type	Urgent?	Retailer type	Product Code
2		01/01/2016 12:00:00 am	Cologne	E-mail	NO	Sports Store	H33
3		01/01/2016 12:00:00 am	Berlin	Web	YES	Outdoors Shop	F24
4		01/01/2016 12:00:00 am	Zurich	Web	NO	Dept. Store	H34

Using the First Row as a Header

After removing the top 2 empty rows, we can see that Header still contains Column 1, Column 2, etc. However, our actual headings (Trans Date, Ret City, etc.) are still in Row 1.

To promote the first row to column header names:

1. Click on **Sales Table Query** on the left pane.
2. Select **Use First Row as Headers**.
3. Click on **Use First Row as Headers** from the drop-down.



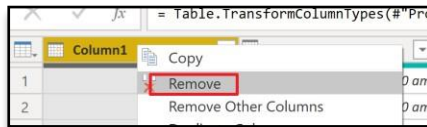
The column names in the first row will be promoted to column header names.

	Column1	Trans Date	RetCity	Order method type	Urgent?	Retailer type	Product Code
1	null	01/01/2016 12:00:00 am	Cologne	E-mail	NO	Sports Store	H33
2	null	01/01/2016 12:00:00 am	Berlin	Web	YES	Outdoors Shop	F24
3	null	01/01/2016 12:00:00 am	Zurich	Web	NO	Dept. Store	H34
4	null	01/01/2016 12:00:00 am	Canberra	Web	YES	Outdoors Shop	H35

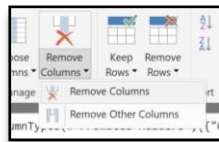
Removing Blank Columns and Choosing Relevant Columns

Now we will remove blank and irrelevant columns.

1. Click on **Sales Table Query** on the left pane.
2. Right Click on the **Column1** header to select the blank column.
3. Click on **Remove**.

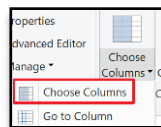


*Columns can also be removed by clicking on **Remove Columns** > **Remove columns**.*

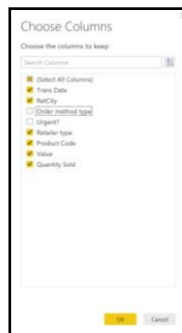


In addition, we don't need columns **Order Method Type** and **Urgent** for our analysis so we will remove them too. Another handy way to remove irrelevant columns (especially when dealing with large queries) is the **Choose Column** option.

4. Select **Choose Columns** > **Choose Columns** from the Home tab.



5. Uncheck **Order method type** and **Urgent** columns.



6. Click **OK**.

Renaming Column Names

Now, we will rename columns. The intention is to make column names as easy as possible. You can rename a column in two ways:

- ✓ Right click on a column header and select rename.
- ✓ Double click on the column header and write a new name.

To Rename a column:

6. Click on **Sales Table** Query on the left pane.
7. Click on **Trans Date** and rename it to **Transaction Date**.
8. Click on **Value** column to rename it to **Sale Price**.
9. Click on **RetCity** and rename it to **Retailer City**.

Transaction Date	Retailer City	Product Code	Sale Price	Quantity Sold	Retailer Type
1/1/2016 12:00:00 AM	Brisbane	S48	5	340	Outdoors Shop
1/9/2016 12:00:00 AM	Montreal	S48	5	322	Outdoors Shop
1/14/2016 12:00:00 AM	London	S48	5	372	Outdoors Shop
1/19/2016 12:00:00 AM	Liverpool	S48	5	435	Outdoors Shop
1/22/2016 12:00:00 AM	London	S47	5	206	Outdoors Shop

Understanding the Data Types

Although Power BI can detect correct data types automatically, but at times, we may need to change them. Some Important Data Types are explained below:

Number Data Types:

- ✓ **Decimal Number:** This data type can store numbers with a decimal separator and the numbers can be up to 15 digits long. The decimal can be placed anywhere between numbers.
- ✓ **Fixed Decimal Number:** It has a fixed location of decimal occurrence, as it can only have a maximum of four digits to the right. The maximum length of this type of number is 19 digits. This type is ideally used for currency representation.
- ✓ **Whole number:** These numbers are a maximum of 19-digit long numbers with no decimal separator. It can be represented as both positive and negative.

Date/ Time Data Types:

- ✓ **Date/Time:** Both date and time values can be stored under this data type. Dates from 1900 to 9999 are supported.
- ✓ **Date:** Only date is supported with no time. It is suitable for scenarios where Time has no significance in the calculations.
- ✓ **Time:** Only time is supported with no date. It is suitable for scenarios where the Date has no significance in the calculations.

Text Data Type:

- ✓ **Text:** This data type is a Unicode character data string and can store anything from string, numbers, or dates in a text format. The maximum allowed length is 268,435,456 Unicode characters. Data stored under this data type will have no impact on numerical calculations.

Boolean:

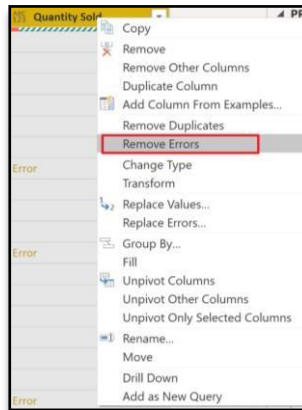
- ✓ **True/False:** This data type sets a value to either True or False only.

Removing Errors

Getting rid of erroneous values is also involved in the Data Transformation process. As you can see, we have some errors in **Quantity Sold** Column.

To remove errors:

1. Click on **Sales Table Query** on the left pane.
2. Right-click on the **Quantity Sold** column header.
3. Click on **Remove Errors** from the dropdown list.



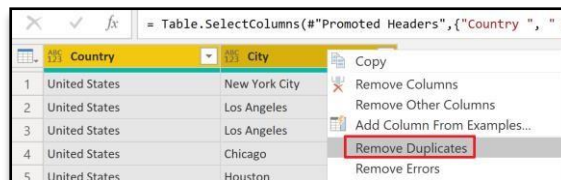
Removing Duplicates

Duplicates are one of the common problems in datasets. So far we have been working with **Sales Table**. In this exercise, we will be working with **Country Table**. As you can see **Los Angeles** in **United States** and **Melbourne** in **Australia** are duplicates.

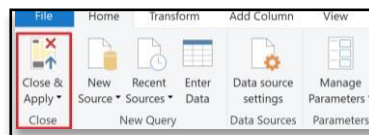
	Country	City
1	United States	New York City
2	United States	Los Angeles
3	United States	Los Angeles
4	United States	Chicago
5	United States	Houston
6	Australia	Melbourne
7	Australia	Sydney
8	Australia	Brisbane
9	Australia	Melbourne

You can cope up with this issue by following below mentioned steps.

1. Click on the **Country** column header, hold the **Shift** key and click on the **City** column header to select both.
2. Right-click on the **City** column header.
3. Click on **Remove Duplicates**.



4. Now click on “Close & Apply” at the top left corner.



Chapter 6

Introduction to Data Modeling

- ✓ Understanding Data Modeling
 - Primary Keys (or a Unique Identifier)
 - Foreign Keys
- ✓ Cardinality and Cross Filter Direction
 - Cardinality
 - Many to One (*:1)
 - One to One (1:1)
 - One to Many (1:*)
 - Many to Many (*:*)
 - Cross Filter Direction
 - Single
 - Both
- ✓ Deleting Relationships
- ✓ Creating New Relationships: Drag and Drop

Understanding Data Modeling

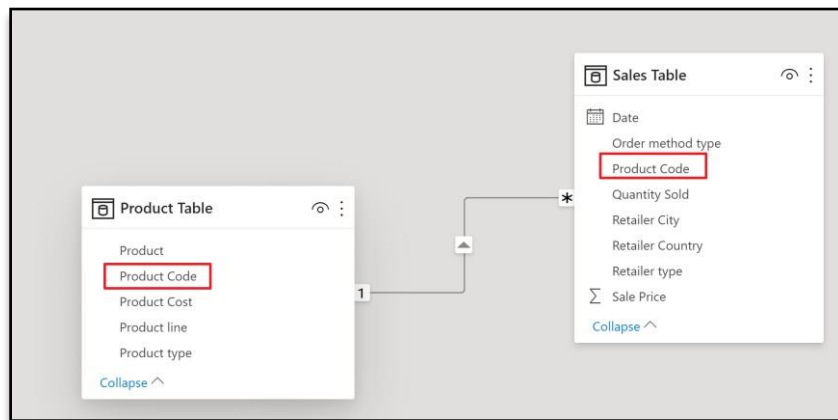
Data Modeling is the process of creating relationships between multiple datasets. These **Relationships** are established by relating the **Primary Key** and **Foreign Key**. Once relationships are in place, these datasets act as a single data model which can be used for the purpose of visualization and reporting.

Primary Keys (or a Unique Identifier)

The **Primary Key** is the field that uniquely identifies each row in the table. In our case, **Product Code** in the **Product Table** will act as a **Primary Key**.

Foreign Keys

A **Foreign Key** is the field that refers to the **Primary Key** in another table. Foreign keys can have duplicates. In our case, **Product Code** in the **Sales Table** will act as a **Foreign Key** for the **Product Code** in the **Product Table**.



Tables having Primary keys are referred to as **Dimension Tables** or **Lookup Tables**. Tables having foreign keys are referred to as **Fact Tables** or **Data Tables**. Usually, in a data model, there is a single **Fact Table** surrounded by multiple **Dimension Tables**.

Cardinality and Cross Filter Direction

There are two important aspects in establishing the relationship between two data sets. These are Cardinality and Cross Filter Direction. Let's discuss them in detail.

Cardinality

Cardinality is the type of connection established between two tables. There are four types of Cardinalities in Power BI. The relation between tables is denoted by two symbols, the asterisk (*) and 1, where the asterisk (*) represents many sides and 1 denotes a single side.

1. **Many to One (*:1)** – This means the column in a given table can have more than one instance of a value, and the other related table has only one instance of a value.
2. **One to One (1:1)** – This means one primary key from the dimension table will be linked to just one foreign key in the fact table.
3. **One to Many (1:*)** – This means the column in one table has only one instance of a particular value, and the other related table can have more than one instance of a value.
4. **Many to Many (*:*)** – A many-to-many relationship between tables removes requirements for unique values in tables. This setting indicates that there are multiple records for the single value in both tables.

Cross Filter Direction

The arrow in the center of the line represents the direction of filtering being applied to two tables and is called Cross Filter Direction. There are two types:

1. **Single** – This is the default type. It means that filtering flows from the dimension table towards the fact table.
2. **Both** – This means filtering flows from the dimension table towards the fact table and vice versa.

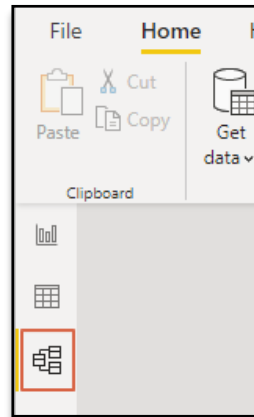
Cardinality: The *One-to-many* and *Many-to-one* cardinality options are essentially the same and the most common type of cardinality.

Cross filtering Direction: The *“Both”* Cross Filter Direction type is used in rather complex data models and should be used with caution as it may lead to unexpected results.

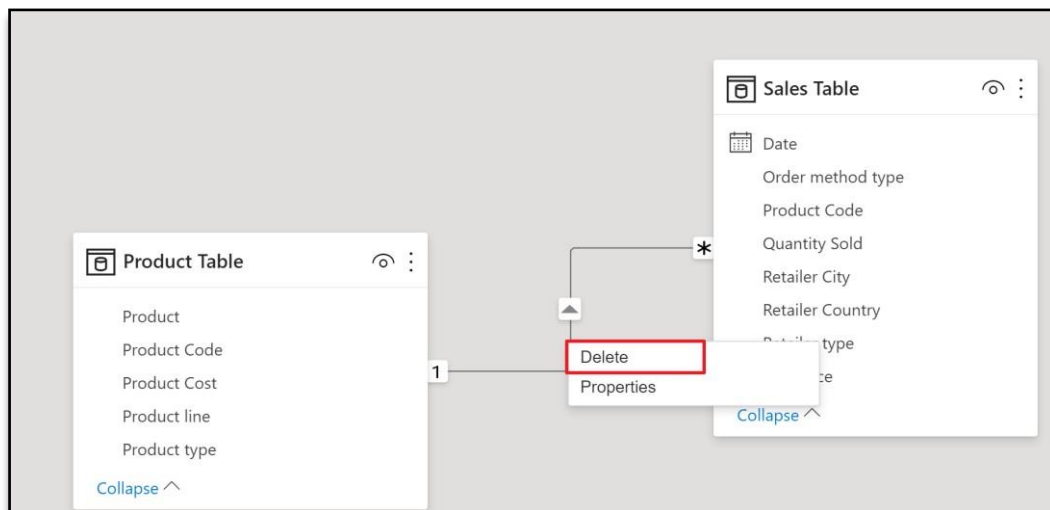
Deleting Relationships

Relationships between data sets are auto-detected by Power BI based on columns/field names and values. However, sometimes this guesswork by Power BI can be incorrect. Let us discuss how you can delete and re-establish the relationship to rectify the error.

1. Switch over to the **Relationships** tab from the left pane by clicking on the Relationships icon shown in the screenshot.



2. Click on the connecting line between the two tables.
3. Right-click using the mouse and select **Delete**, or press the delete key on the keyboard



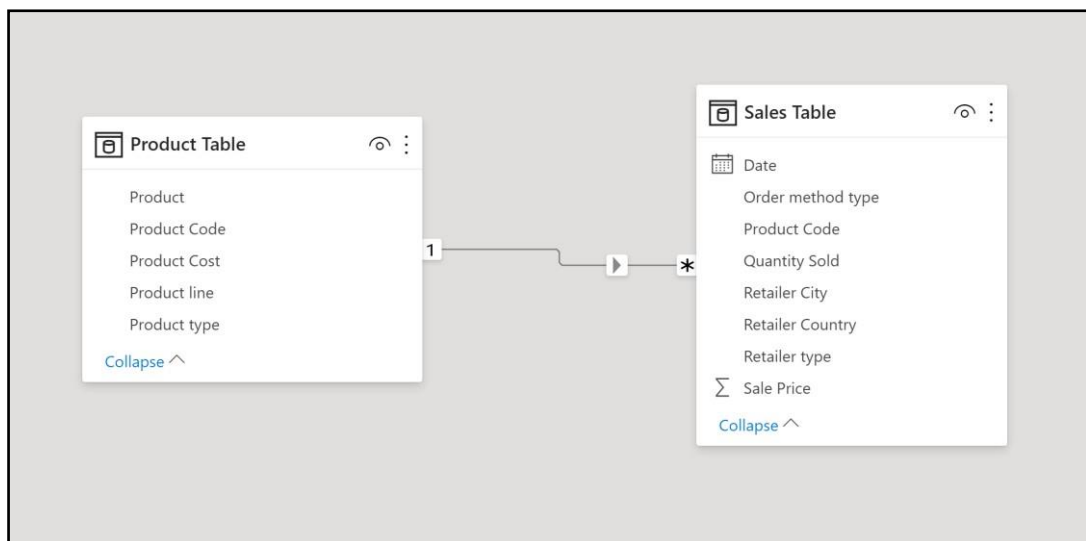
The line connecting the tables disappears.

Creating New Relationships: Drag and Drop

To create a relationship between two tables a simple drag and drop method can be used. We will discuss the **Drag and Drop** method here.

To create relationships using this method:

1. Click on the **Product Code** field in the **Product Table** and keep the mouse button clicked.
2. Drag the mouse to the **Product Code** field in the **Sales Table** still holding the mouse button.
3. Release the mouse click while on the **Product Code** field in the **Sales Table**.



A relationship line will appear connecting the Product Table and the Sales Table.

Chapter 7

Introduction to DAX

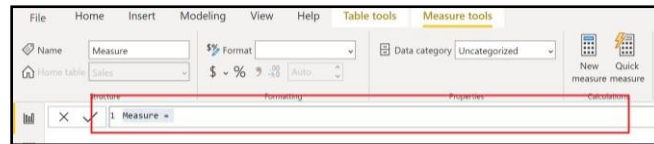
- ✓ What is DAX?
- ✓ Defining Calculated Columns
- ✓ Defining a Calculated Measure

What is DAX?

DAX is used and applied in many Microsoft tools and platforms such as:

- ✓ Power BI
- ✓ Microsoft Power Pivot for Excel
- ✓ SSAS Tabular

DAX is a formula language which means there is one formula call with many parameters. This function call can also contain other function calls as parameters. All the DAX code is typed in the formula bar shown below. The measure/column tool additionally provides all the information related to the measure or column respectively.



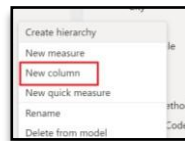
A DAX expression consists of a formula followed by a measure or a column reference.

Defining Calculated Columns

We can also calculate additional columns from existing columns so that these can then be used to create various visuals. This enriches your data set and enables you to perform in-depth analysis.

To create Calculated Columns:

1. Right click on the **Sales Table**.
2. Click on **New Column**.



Let's get **Product Cost** in the **Sales Table** from the **Product Table**.

3. Type in the following **DAX formula** in Formula Bar.

- Product Cost (CC) = RELATED('Product Table'[Product Cost])

```
Product Cost (CC) = RELATED('Product Table'[Product Cost])
```

Now, Let's Create a **Revenue** column by multiplying **Quantity Sold** by **Sale Price**.

4. Right click on the **Sales Table**.
5. Click on **New Column**.
6. Type in the following DAX formula in **Formula Bar**.

- Revenue (CC) = 'Sales Table'[Quantity Sold]*'Sales Table'[Sale Price]

```
Revenue (CC) = 'Sales Table'[Quantity Sold]*'Sales Table'[Sale Price]
```

Now let's create a **Total Cost** column by multiplying **Quantity Sold** by **Product Cost**.

7. Right click on the **Sales Table**.
8. Click on **New Column**.
9. Type in the following **DAX formula** in **Formula Bar**.

- Total Cost (CC) = 'Sales Table'[Quantity Sold]*'Sales Table'[Product Cost (CC)]

```
Total Cost (CC) = 'Sales Table'[Quantity Sold]*'Sales Table'[Product Cost (CC)]
```

CHAPTER 7: INTRODUCTION TO DAX

All the three columns i.e., **Total Cost (CC)** column, **Revenue (CC)** column and the **Product Cost (CC)** column have been created, giving values for which row of the table.

Transaction Date	Retailer City	Retailer type	Product Code	Sale Price	Quantity Sold	Product Cost (CC)	Revenue (CC)	Total Cost (CC)
01/01/2016 12:00:00 am	Brisbane	Outdoors Shop	S48	5	340	\$1.79	\$1,700.00	\$608.60
09/01/2016 12:00:00 am	Montreal	Outdoors Shop	S48	5	322	\$1.79	\$1,610.00	\$576.38
14/01/2016 12:00:00 am	London	Outdoors Shop	S48	5	372	\$1.79	\$1,860.00	\$665.88
19/01/2016 12:00:00 am	Liverpool	Outdoors Shop	S48	5	435	\$1.79	\$2,175.00	\$778.65
22/01/2016 12:00:00 am	London	Outdoors Shop	S47	5	206	\$1.95	\$1,030.00	\$401.70
01/02/2016 12:00:00 am	Glasgow	Outdoors Shop	S47	5	193	\$1.95	\$965.00	\$376.35
08/02/2016 12:00:00 am	Geneva	Outdoors Shop	S49	5	435	\$1.86	\$2,175.00	\$809.10
19/02/2016 12:00:00 am	Basel	Outdoors Shop	S47	5	141	\$1.95	\$705.00	\$274.95
20/02/2016 12:00:00 am	Canberra	Outdoors Shop	S50	5	327	\$1.96	\$1,635.00	\$640.92
21/02/2016 12:00:00 am	Liverpool	Outdoors Shop	S50	5	256	\$1.96	\$1,280.00	\$501.76
07/03/2016 12:00:00 am	London	Outdoors Shop	S49	5	707	\$1.86	\$3,535.00	\$1,315.02
25/03/2016 12:00:00 am	Houston	Outdoors Shop	S47	5	268	\$1.95	\$1,340.00	\$522.60
01/04/2016 12:00:00 am	Shenzhen	Outdoors Shop	S50	5	657	\$1.96	\$3,285.00	\$1,287.72

Calculated Columns have a distinct icon, as seen in the screenshot, to differentiate them from other data entities.



Notice that each of the column has been formatted using Column Tools.

Defining a Calculated Measure

Measures are lightweight alternatives to Calculated Columns. Reason being, they do not appear in the data set, hence do not occupy any physical memory. Measures are only calculated when used within a visual and this property takes the efficiency of your data model to a next level.

Let's Calculate **Profit** by subtracting **Product Cost** from **Revenue**

1. While in the **Data tab** on the left pane, click on the Table Tools ribbon on the top navigation and select **Sales Table** from the Fields pane on the right.
2. Select **New Measure**.



3. Type in below mentioned **DAX formula** in Formula Bar.

- Profit (CM) = SUM('Sales Table'[Revenue (CC)]) - SUM('Sales Table'[Total Cost (CC)])

Profit (CM) = SUM('Sales Table'[Revenue (CC)]) - SUM('Sales Table'[Total Cost (CC)])

Calculated Measures have a distinct icon as seen in the screenshot to differentiate them from other data entities.



Chapter 8

Data Visualization

- ✓ Data Visualization in Power BI
 - Canvas
 - Visualization Panel
 - Filters Panel
- ✓ Creating a Card Visual
- ✓ Creating an Area Chart
- ✓ Creating a Bubble Map Visual
- ✓ Creating a Donut Chart
- ✓ Creating a Stacked Bar Chart
- ✓ Creating a Slicer

Data Visualization in Power BI

Visualizations reside in the **Report** section of **Power BI**. Report section consists of three main components: **Canvas**, **Visualization Panel**, and **Filters Panel**. Let us briefly discuss them one by one.

Canvas:

It is the blank page where data is placed in compelling visual forms.

Visualization Panel:

This panel consists of a set of default and custom visuals. In addition to visuals, this panel contains the Fields area, Formatting area, and Analytics tab. Please note, this pane is context-sensitive, i.e., it will change its properties based on the selected visual type. The Fields area contains the actual data listed as field names, which can be dragged and placed on Visualization pane against appropriate visuals.

Filters Panel:

In the Filters pane, you configure which filters to include and update existing filters.

Creating a Card Visual

As we have got ourselves familiar with different panels in the report section. It is time to discuss some of the visual types and their usage.

Card visuals are used /to display key metrics of your data.

To create a Card Visual:

1. Click on **Card** visualization.
2. Drag **Total Cost (CC)** value from **Sales Table** to the **Field** area.
3. Click on **Total Cost (CC)** in the Sales Table.

Column tools open.

4. Click on “\$” and type 2 in the text area.



5. Click on **Paint Roller** Icon to access Format options.
6. Set the **Category Label > Off**, **Border > On**, **Title > On**, **Title Text> “Total Cost”**, **Title Text Size > 15**, **Title Alignment > Centre**, **Title Background Color > Black** and **Title Font Color > White**.

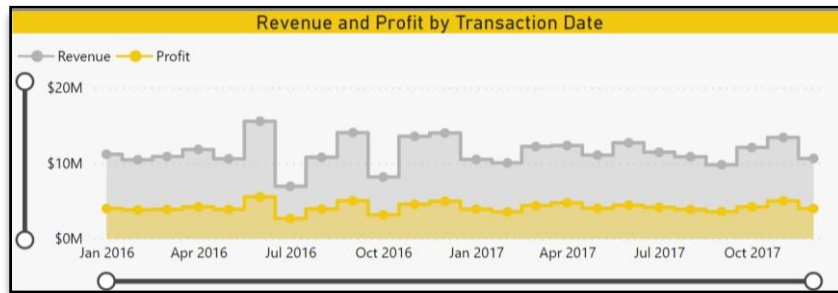


Creating an Area Chart

Area charts emphasize the magnitude of change over time, and can be used to draw attention to the total value across a trend. For example, data that represents profit over time can be plotted in an area chart to emphasize the total profit.

To create an Area chart:

1. Click on the **Area Chart** visualization.
2. Drag **Transaction Date** from **Sales Table** to the **Axis** field.
3. Drag **Revenue (CC)** and **Profit (CM)** from **Sales Table** to the **Values** field.
4. Click on the **Paint Roller** icon to access the **Format** options.
5. Set the **Title Text** > **Revenue and Profit by Transaction Date**, **Zoom slicer** > **On**.



Creating a Bubble Map Visual

A bubble map is used to display geographical data with different sized bubbles. The size of the Bubble is directly proportional to the numerical value it indicates.

To create a Bubble Map:

1. Click on the **Map** visualization.
2. Drag **Retailer City** from **Sales Table** to the **Location** field.
3. Drag **Total Cost (CC)** from **Sales Table** to the **Size** field.
4. Click on **Paint Roller** icon to access the **Format** options.
5. Set the **Bubbles > Size > 15**, **Title > On**, **Title Text > Total Cost by Retailer City**, **Title Text Size > 15**, **Title Alignment > Centre**, **Title Background Color > #F2C811**, **Data Colors > #F2C811**, **Map Styles > Dark**, **Background > On**, **Background Color > #F2C811** and **Border > On**.

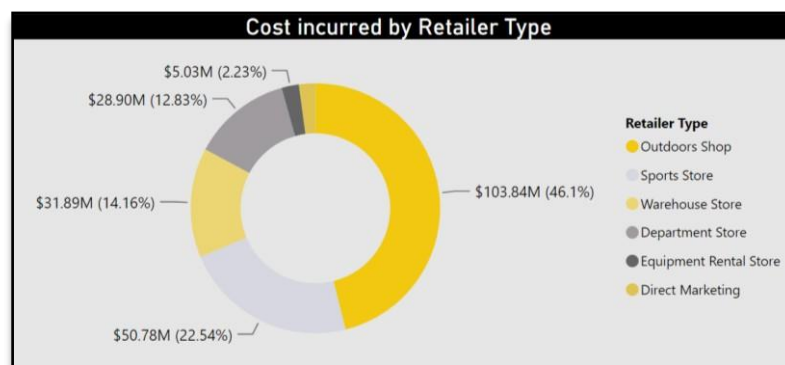


Creating a Donut Chart

A donut chart is a variation of the pie chart and is generally used to show the proportions of categorical data, with the size of each segment representing the proportion of each category.

To create a Donut Chart:

1. Select **Donut Chart**.
2. Drag **Retailer Type** from Sales Table to Legend field.
3. Drag **Total Cost (CC)** from Sales Table to Value field.
4. Click on Paint Roller Icon to access Format options.
5. Set the **Title > Cost incurred by Retailer Type**.



Hovering with the mouse over the Donut Chart will display a tooltip with more information including the percentage.

Creating a Stacked Bar Chart

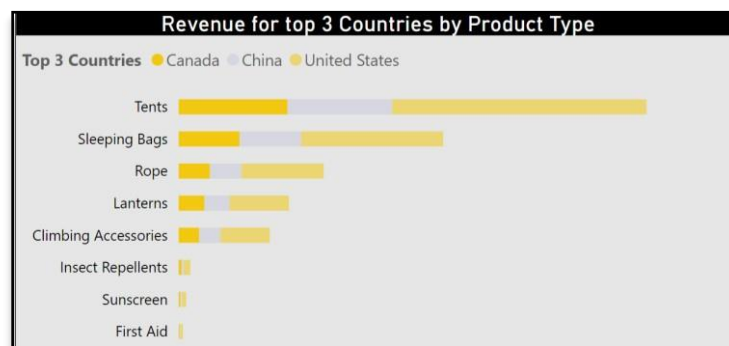
A stacked bar chart is used to break down and compare statistics between different categories.

To create a Stacked Bar Chart:

1. Select **Stacked Bar Chart**.
2. Drag **Product Type** from **Product Table** to Axis field.
3. Drag **Country** from **Country Table** to Legend field.
4. Drag **Revenue (CC)** from **Sales Table** to Values field.
5. Expand **Country** in Visual level filters.

Top N filter is a type of visual level filter which when applied displays N number of top items in a visual based on the given value.

6. Select **Top N** from Filter Type dropdown.
7. Type “3” in Show Items > Top.
8. Drag **Revenue (CC)** from Sales Table to **By Value** Field.
9. Click on **Apply Filter**.
10. Click on **Paint Roller** Icon to access Format options.
11. Set the **Title > Revenue for top 3 Countries by Product Type**.



Creating a Slicer

Slicer is an alternate way of filtering, that narrows the other visualizations in a report. Unlike filters, the slicers are present as a visual on the report.

To create a Slicer:

1. Click on **Slicer**.
2. Drag **Product Line** from **Product Table** to the **Field** area.
3. Click on **Paint Roller** Icon to access Format options.
4. Set the **Slicer Header** > **On** and **Slicer Title** > **Off**.
5. To filter the whole report for **Camping Equipment**, click on its checkbox.



Filters Pane on the right side configures visual, page and report level filters.

Chapter 9

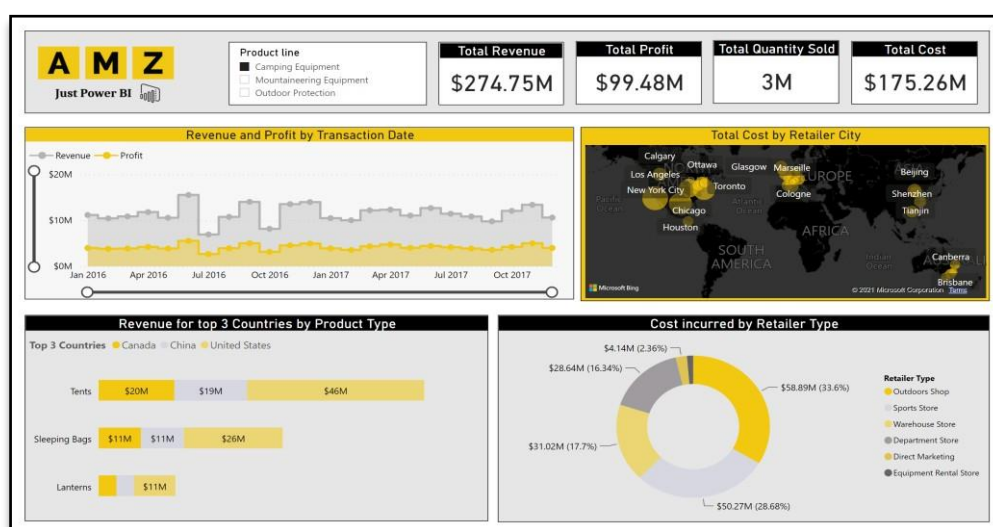
Publish and Share

- ✓ Save and Publish to My Workspace
- ✓ Sharing the Report

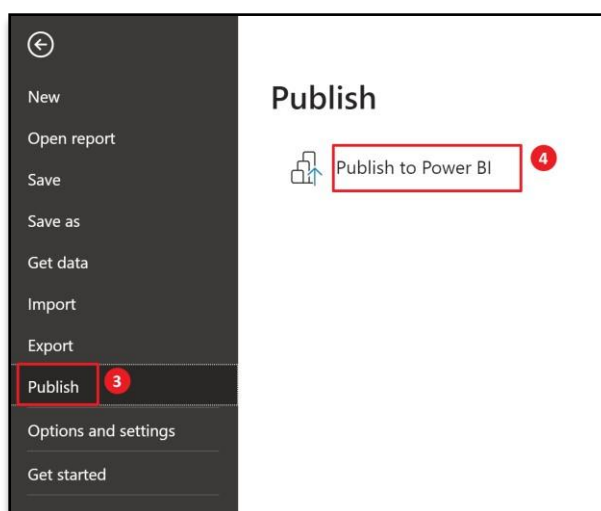
Save and Publish to My Workspace

Now that you have created your report. It is time to publish your report to the web so we can create dashboards and share them with other stakeholders.

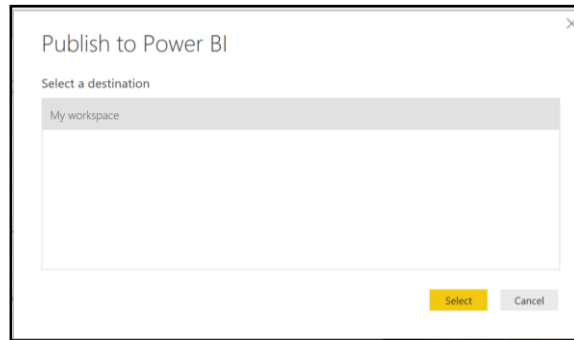
1. Click on the **File > Save**.
2. Rearrange your visuals as shown below or in any other way that you may like.



3. Click on **File** menu again and click **Publish**.
4. Click on **Publish to Power BI**.



5. Select the appropriate **Workspace** and click **Select**.



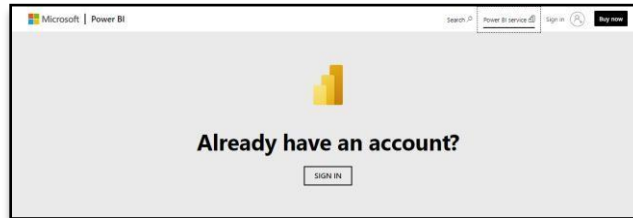
Confirmation dialogue box will appear once your report has been published on web.

You can now share the link to your report by visiting Power BI app on the web.

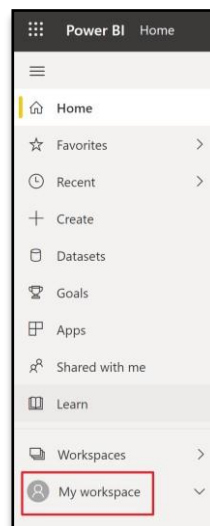
Sharing the Report

Reports published to Power BI Service can then be shared with other stakeholders via shareable link or as a dashboard.

1. Open app.powerbi.com and sign in using your login credentials.



2. Click on **My Workspaces** on the Navigation pane on the left to access your workspace components.



*In the Report tab, list of all the **Published Reports** can be seen.*

3. Go to **Report** section > **Sales Report** in **Power BI service**.
4. Click on **Share** in upper right corner of the menu ribbon.
5. In the given field enter Email address of person you want to share the Report with.
6. You can include a message as well for the recipient.

