Excel Power Pivot

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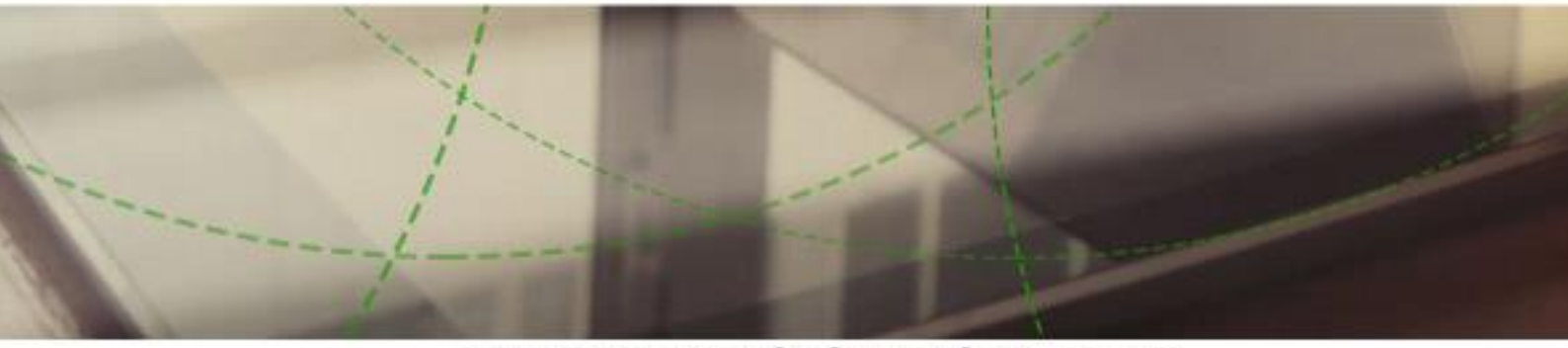

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About the Tutorial

Excel Power Pivot is an efficient, powerful tool that comes with Excel as an Add-in. With Power Pivot, you can load hundreds of millions of rows of data from external sources and manage the data effectively with its powerful xVelocity engine in a highly compressed form. This makes it possible to perform the calculations, analyze the data, and arrive at a report to draw conclusions and decisions.

Audience

This guide targets professionals with hands-on experience with Excel, to perform the high-end data analysis and decision making in a matter of few minutes.

Prerequisites

Before you proceed with this tutorial, we are assuming that you are already aware about the basics of Excel. If you are not well aware of these concepts, then we will suggest you to go through our short tutorials on Excel charts and MS Access.

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1. Power Pivot – Overview

Excel Power Pivot is an efficient, powerful tool that comes with Excel as an Add-in. With Power Pivot, you can load hundreds of millions of rows of data from external sources and manage the data effectively with its powerful xVelocity engine in a highly compressed form. This makes it possible to perform the calculations, analyze the data, and arrive at a report to draw conclusions and decisions. Thus, it would be possible for a person with hands-on experience with Excel, to perform the high-end data analysis and decision making in a matter of few minutes.

This tutorial will cover the following-

Power Pivot Features

What makes Power Pivot a strong tool is the set of its features. You will learn the various Power Pivot features in the chapter – Power Pivot Features.

Power Pivot Data from Various Sources

Power Pivot can collate data from various data sources to perform the required calculations. You will learn how to get data into Power Pivot, in the chapter – Loading Data into Power Pivot.

Power Pivot Data Model

The power of Power Pivot lies in its database- Data Model. The data is stored in the form of data tables in the Data Model. You can create relationships between the data tables to combine the data from different data tables for analysis and reporting. The chapter – Understanding Data Model (Power Pivot Database) gives you the details about the Data Model.

Managing Data Model and Relationships

You need to know how you can manage the data tables in the Data Model and the relationships between them. You will get the details of these in the chapter - Managing Power Pivot Data Model.

Creating Power Pivot Tables and Power Pivot Charts

Power PivotTables and Power Pivot Charts provide you a way to analyze the data for arriving at conclusions and/or decisions.

You will learn how to create Power PivotTables in the chapters – Creating a Power PivotTable and Flattened PivotTables.

You will learn how to create Power PivotCharts in the chapter – Power PivotCharts.

DAX Basics

DAX is the language used in Power Pivot to perform calculations. The formulas in DAX are similar to Excel formulas, with one difference – while the Excel formulas are based on individual cells, DAX formulas are based on columns (fields).

You will understand the basics of DAX in the chapter – Basics of DAX.

Exploring and Reporting Power Pivot Data

You can explore the Power Pivot Data that is in the Data Model with Power PivotTables and Power Pivot Charts. You will get to learn how you can explore and report data throughout this tutorial.

Hierarchies

You can define data hierarchies in a data table so that it would be easy to handle related data fields together in Power PivotTables. You will learn the details of the creation and usage of Hierarchies in the chapter – Hierarchies in Power Pivot.

Aesthetic Reports

You can create aesthetic reports of your data analysis with Power Pivot Charts and/or Power Pivot Charts. You have several formatting options available to highlight the significant data in the reports. The reports are interactive in nature, enabling the person looking at the compact report to view any of the required details quickly and easily.

You will learn these details in the chapter - Aesthetic Reports with Power Pivot Data.

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2. Power Pivot – Installing

Power Pivot in Excel provides a Data Model connecting various different data sources based on which the data can be analyzed, visualized, and explored. The easy-to-use interface provided by Power Pivot enables a person with hands-on experience in Excel to effortlessly load data, manage the data as data tables, create relationships among the data tables, and perform the required calculations to arrive at a report.

In this chapter, you will learn, what makes Power Pivot a strong and sought after tool for analysts and decision makers.

Power Pivot on the Ribbon

The first step to proceed with Power Pivot is to ensure that the POWERPIVOT tab is available on the Ribbon. If you have Excel 2013 or later versions, the POWERPIVOT tab appears on the Ribbon.

If you have Excel 2010, **POWERPIVOT** tab might not appear on the Ribbon if you have not already enabled the Power Pivot add-in.

Power Pivot Add-in

Power Pivot Add-in is a COM Add-in that needs to be enabled to get the complete features of Power Pivot in Excel. Even when POWERPIVOT tab appears on the ribbon, you need to ensure that the add-in is enabled to access all the features of Power Pivot.

Step 1: Click the FILE tab on the Ribbon.

Step 2: Click Options in the dropdown list. The Excel Options dialog box appears.

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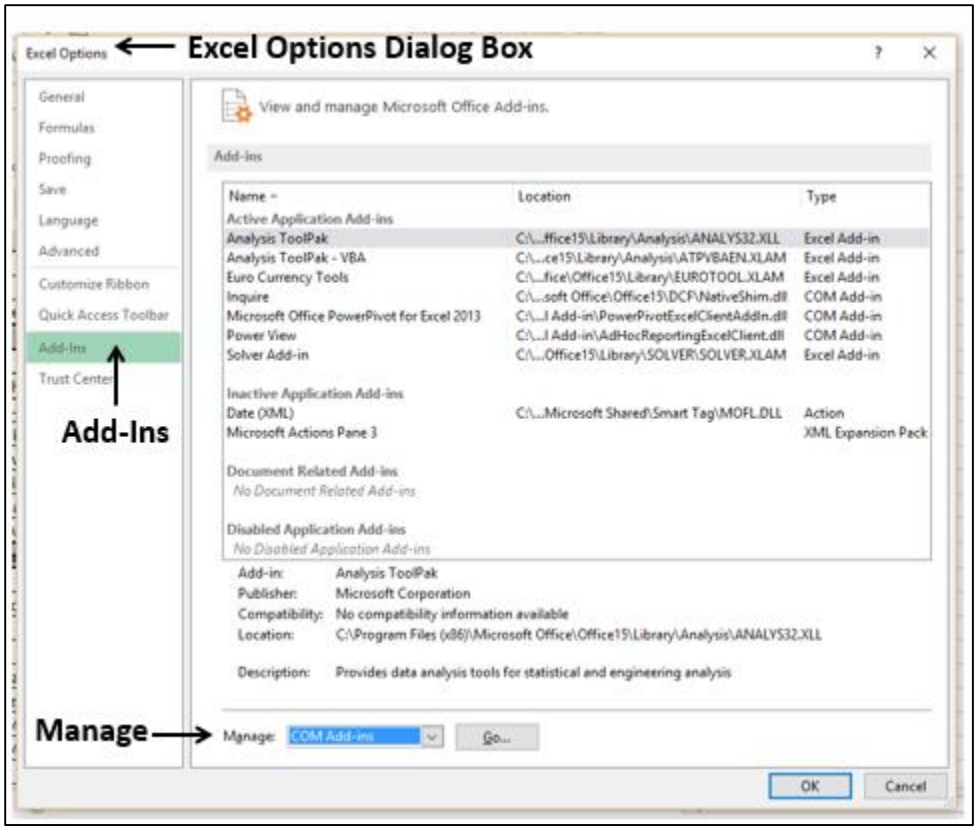

Step 3: Follow the instructions as follows-

- Click Add-Ins.
- In the Manage box, select COM Add-ins from the dropdown list.
- Click the Go button. The COM Add-Ins dialog box appears.
- Check Power Pivot and click OK.

What is Power Pivot?

Excel Power Pivot is a tool for integrating and manipulating large volumes of data. With Power Pivot, you can easily load, sort and filter data sets that contain millions of rows and perform the required calculations. You can utilize Power Pivot as an ad hoc reporting and analytics solution.

The Power Pivot Ribbon as shown below has various commands, ranging from managing Data Model to creating reports.

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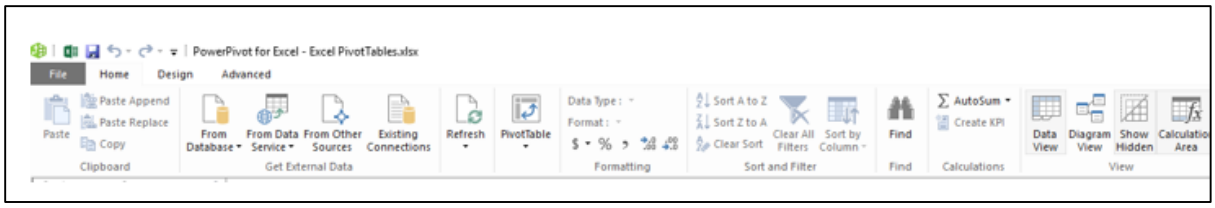
The Power Pivot window will have the Ribbon as shown below-



Why is Power Pivot a Strong Tool?

When you invoke Power Pivot, Power Pivot creates data definitions and connections that get stored with your Excel file in a compressed form. When the data at the source is updated, it is refreshed automatically in your Excel file. This facilitates the usage of the data maintained elsewhere but is required for study time-to-time study and arriving at decisions. The source data can be in any form – ranging from a text file or a web page to the different relational databases.

The user-friendly interface of Power Pivot in the PowerPivot window enables you to perform data operations without the knowledge of any database query language. You can then create a report of your analysis within few seconds. The reports are versatile, dynamic and interactive and enable you to further probe into the data to get the insights and arrive at the conclusions / decisions.

The data that you work on in Excel and in the Power Pivot window is stored in an analytical database inside the Excel workbook, and a powerful local engine loads, queries, and updates the data in that database. Since the data is in Excel, it is immediately available to PivotTables, PivotCharts, Power View, and other features in Excel that you use to aggregate and interact with the data. The data presentation and interactivity is provided by Excel and the data and Excel presentation objects are contained within the same workbook file. Power Pivot supports files up to 2GB in size and enables you to work with up to 4GB of data in memory.

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Power Features to Excel with Power Pivot

Power Pivot features are free with Excel. Power Pivot has enhanced the Excel performance with power features that include the following -

- Ability to handle large data volumes, compressed into small files, with amazing speed.
-
- Filter data and rename columns and tables while importing.
-
- Organize tables into individual tabbed pages in the Power Pivot window as against the Excel tables distributed all over the workbook or multiple tables in the same worksheet.
-
- Create relationships among the tables, so as to analyze the data in the tables collectively. Before Power Pivot, one had to rely on heavy usage of VLOOKUP function to combine the data into a single table before such analysis. This used to be laborious and error-prone.
-
- Add power to the simple PivotTable with many added features.
- Provide Data Analysis Expressions (DAX) language to write advanced formulas.
- Add calculated fields and calculated columns to the data tables.
- Create KPIs to use in PivotTables and Power View reports.

You will understand the Power Pivot features in detail in the next chapter.

Uses of Power Pivot

You can use Power Pivot for the following –

- To perform powerful data analysis and create sophisticated Data Models.
- To mash-up large volumes of data from several different sources quickly.
- To perform information analysis and share the insights interactively.
- To write advanced formulas with the Data Analysis Expressions (DAX) language.
- To create Key Performance Indicators (KPIs).

Data Modelling with Power Pivot

Power Pivot provides advanced data modeling features in Excel. The data in the Power Pivot is managed in the Data Model that is also referenced as Power Pivot database. You can use Power Pivot to help you gain new insights into your data.

You can create relationships between data tables so that you can perform data analysis on the tables collectively. With DAX, you can write advanced formulas. You can create calculated fields and calculated columns in the data tables in the Data Model.

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You can define Hierarchies in the data to use everywhere in the workbook, including Power View. You can create KPIs to use in PivotTables and Power View reports to show at a glance whether performance is on or off target for one or more metrics.

Business Intelligence with Power Pivot

Business intelligence (BI) is essentially the set of tools and processes that people use to gather data, turn it into meaningful information, and then make better decisions. The BI capabilities of Power Pivot in Excel enable you to gather data, visualize data, and share information with people in your organization across multiple devices.

You can share your workbook to a SharePoint environment that has Excel Services enabled. On the SharePoint server, Excel Services processes and renders the data in a browser window where others can analyze the data.

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3. Power Pivot – Features

The most important and powerful feature of Power Pivot is its database – Data Model. The next significant feature is the xVelocity in-memory analytics engine that makes it possible to work on large multiple databases in a matter of few minutes. There are some more important features that come with the PowerPivot Add-in.

In this chapter, you will get a brief overview of the features of Power Pivot, which are illustrated in detail later.

Loading Data from External Sources

You can load data into Data Model from external sources in two ways –

- Load data into Excel and then create a Power Pivot Data Model.
-
- Load data directly into Power Pivot Data Model.

The second way is more efficient because of the efficient way Power Pivot handles the data in memory.

For more details, refer to chapter – Loading Data into Power Pivot.

Excel Window and Power Pivot Window

When you start working with Power Pivot, two windows will open simultaneously – Excel window and Power Pivot window. It is through PowerPivot window that you can load data into Data Model directly, view the data in Data View and Diagram View, Create relationships between tables, manage the relationships, and create the Power PivotTable and/or PowerPivot Chart reports.

You need not have the data in Excel tables when you are importing data from external sources. If you have data as Excel tables in the workbook, you can add them to Data Model, creating data tables in Data Model that are linked to the Excel tables.

When you create a PivotTable or PivotChart from Power Pivot window, they are created in the Excel window. However, the data is still managed from Data Model.

You can always switch between the Excel window and Power Pivot window anytime, easily.

Data Model

The Data Model is the most powerful feature of Power Pivot. The data that is obtained from various data sources is maintained in Data Model as data tables. You can create relationships

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between the data tables so that you can combine the data in the tables for analysis and reporting.

You will learn in detail about the Data Model in the chapter – Understanding Data Model (Power Pivot Database).

Memory Optimization

Power Pivot Data Model uses xVelocity storage, which is highly compressed when data is loaded into memory that makes it possible to store hundreds of millions of rows in memory.

Thus, if you load data directly into Data Model, you will be doing it in the efficient highly compressed form.

Compact File Size

If the data is loaded directly into Data Model, when you save the Excel file, it occupies very less space on the hard disk. You can compare the Excel file sizes, the first one with loading data into Excel and then creating the Data Model and the second with loading data directly into the Data Model skipping the first step. The second one will be up to 10 times smaller than the first one.

Power PivotTables

You can create the Power PivotTables from Power Pivot window. The PivotTables so created are based on the data tables in the Data Model, making it possible to combine data from the related tables for analysis and reporting.

Power PivotCharts

You can create the Power PivotCharts from Power Pivot window. The PivotCharts so created are based on the data tables in the Data Model, making it possible to combine data from the related tables for analysis and reporting. The Power PivotCharts have all the features of Excel PivotCharts and many more such as field buttons.

You can also have combinations of Power PivotTable and Power PivotChart.

DAX Language

The strength of Power Pivot comes from the DAX Language that can be used effectively on the Data Model to perform calculations on the data in the data tables. You can have Calculated Columns and Calculated Fields defined by DAX that can be used in the Power PivotTables and Power PivotCharts.

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4. Power Pivot – Loading Data

In this chapter, we will learn to load data into Power Pivot.

You can load data into Power Pivot in two ways –

- Load data into Excel and add it to the Data Model
-
- Load data into PowerPivot directly, populating the Data Model, which is the PowerPivot database.

If you want the data for Power Pivot, do it the second way, without Excel even knowing about it. This is because you will be loading the data only once, in highly compressed format. To understand the magnitude of difference, suppose you load data into Excel by first adding it to the Data Model, the file size is say 10 MB.

If you load data into PowerPivot, and hence into Data Model skipping the extra step of Excel, your file size could be as less as 1 MB only.

Data Sources Supported by Power Pivot

You can either import data into the Power Pivot Data Model from various data sources or establish connections and/or use the existing connections. Power Pivot supports the following data sources –

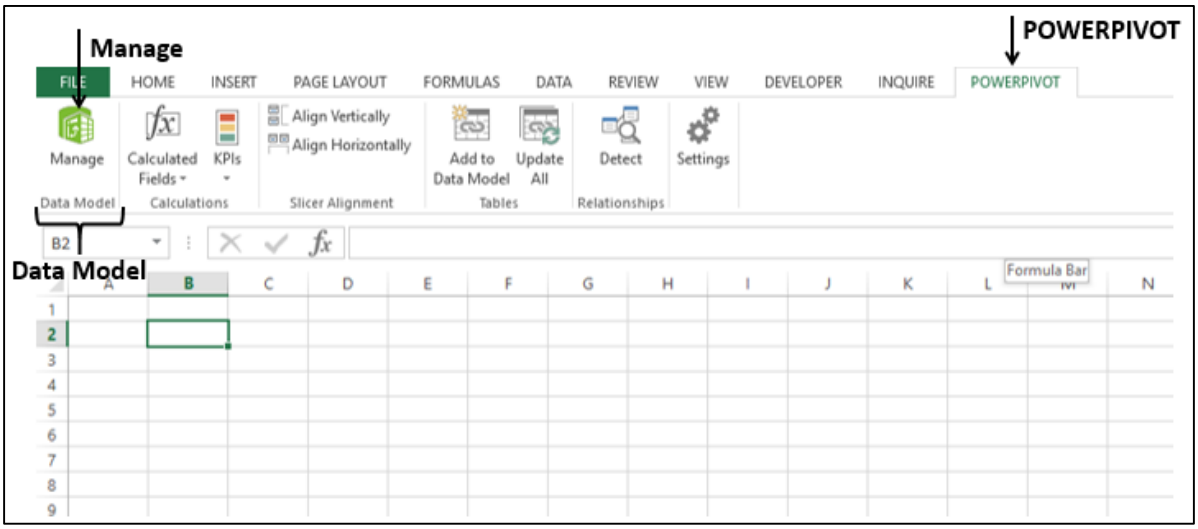
- SQL Server relational database
- Microsoft Access database
- SQL Server Analysis Services
- SQL Server Reporting Services (SQL 2008 R2)
- ATOM data feeds
- Text files
- Microsoft SQL Azure
- Oracle
- Teradata
- Sybase
- Informix
- IBM DB2
- Object Linking and Embedding Database/Open Database Connectivity
- (OLEDB/ODBC) sources

- Microsoft Excel File
- Text File

Loading Data Directly into PowerPivot

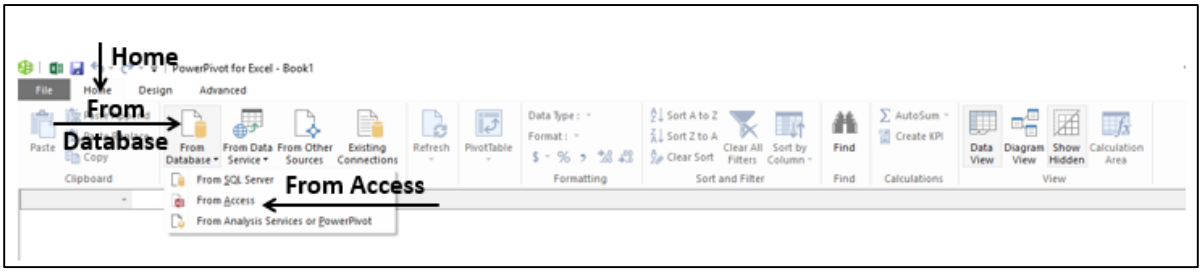
To load data directly into Power Pivot, perform the following-

- Open a new workbook.
- Click on the POWERPIVOT tab on the ribbon.
- Click on Manage in the Data Model group.



The PowerPivot window opens. Now you have two windows – the Excel workbook window and the PowerPivot for Excel window that is connected to your workbook.

- Click the **Home** tab in the PowerPivot window.
- Click **From Database** in the Get External Data group.
- Select **From Access**.



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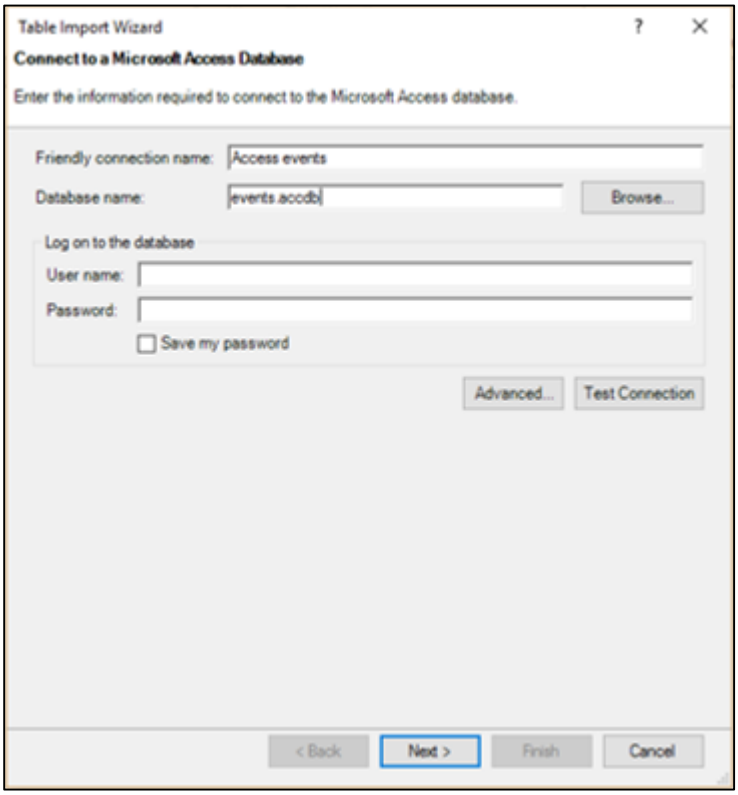
The Table Import Wizard appears.

- Browse to the Access database file.
- Provide Friendly connection name.
- If the database is password protected, fill in those details also.



Click the **Next >** button. The Table Import Wizard displays the options for choosing how to import data.

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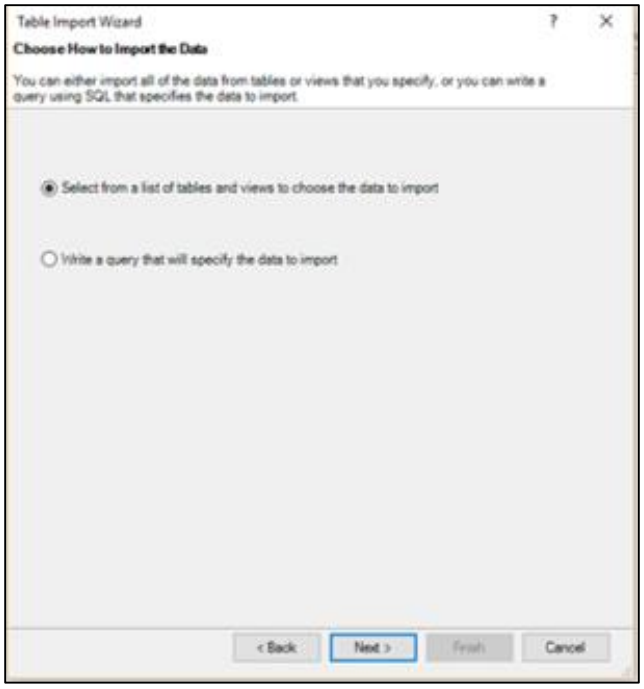
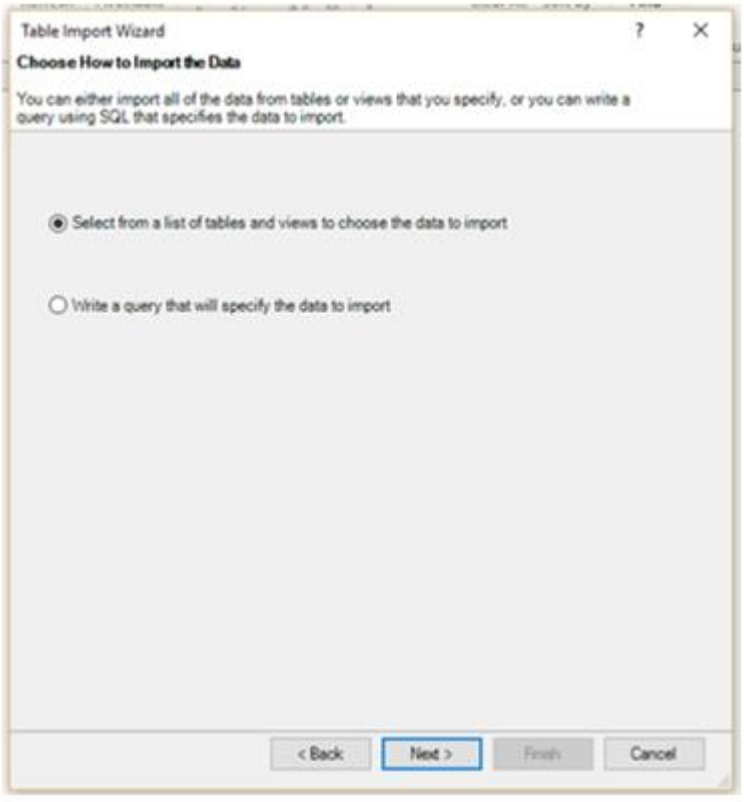


Click Select from a list of tables and views to choose the data to import.



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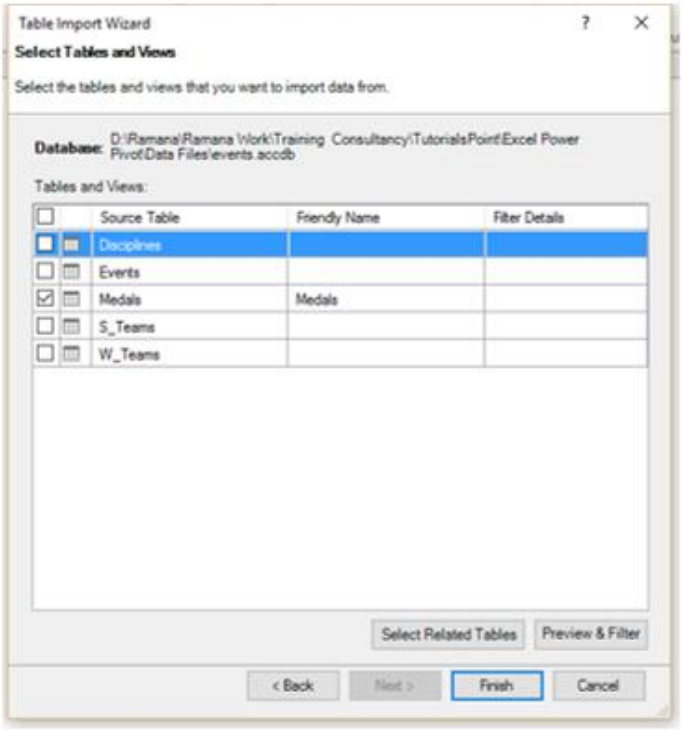
Click the **Next >** button. The Table Import Wizard displays the tables and views in the Access database that you have selected.

Check the box Medals.



As you can observe, you can select the tables by checking the boxes, preview and filter the tables before adding to Pivot Table and/or select the related tables.

Click the **Preview & Filter** button.

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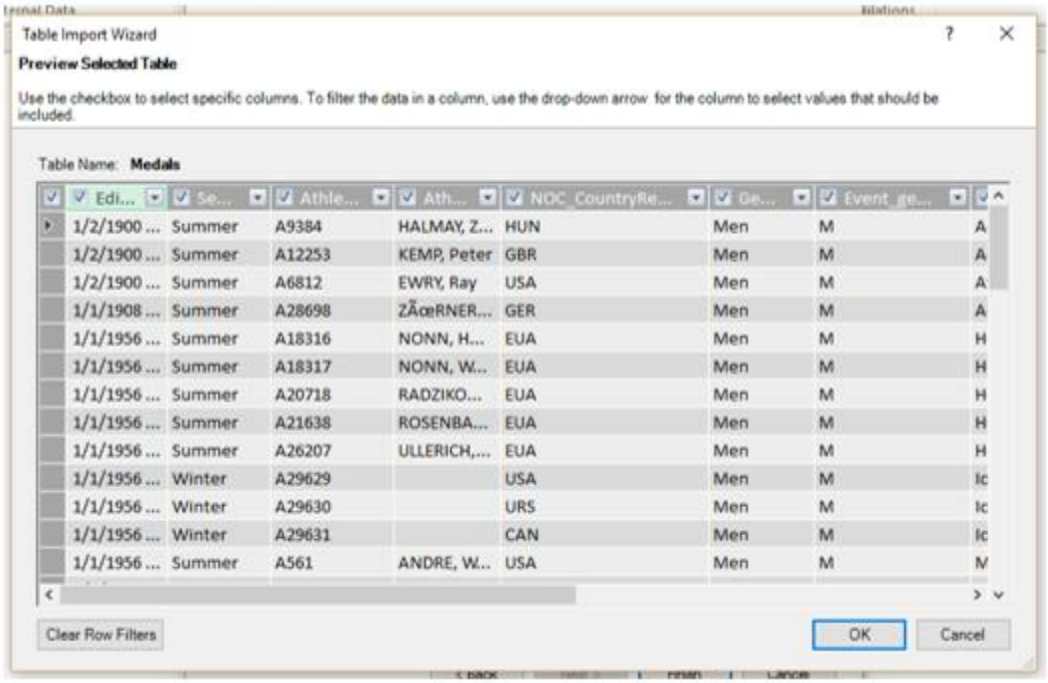

As you can see, you can select specific columns by checking the boxes in the column labels, filter the columns by clicking the dropdown arrow in the column label to select the values to be included.

- Click OK.
-
- Click the **Select Related Tables** button.
-
- Power Pivot checks what other tables are related to the selected Medals table, if a relation exists.

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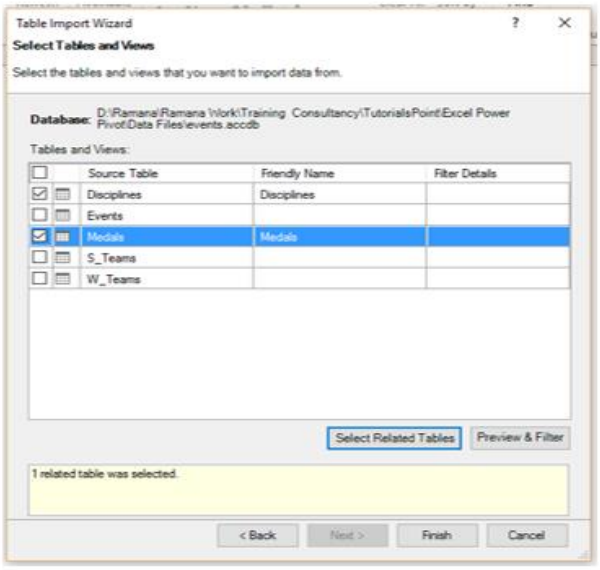
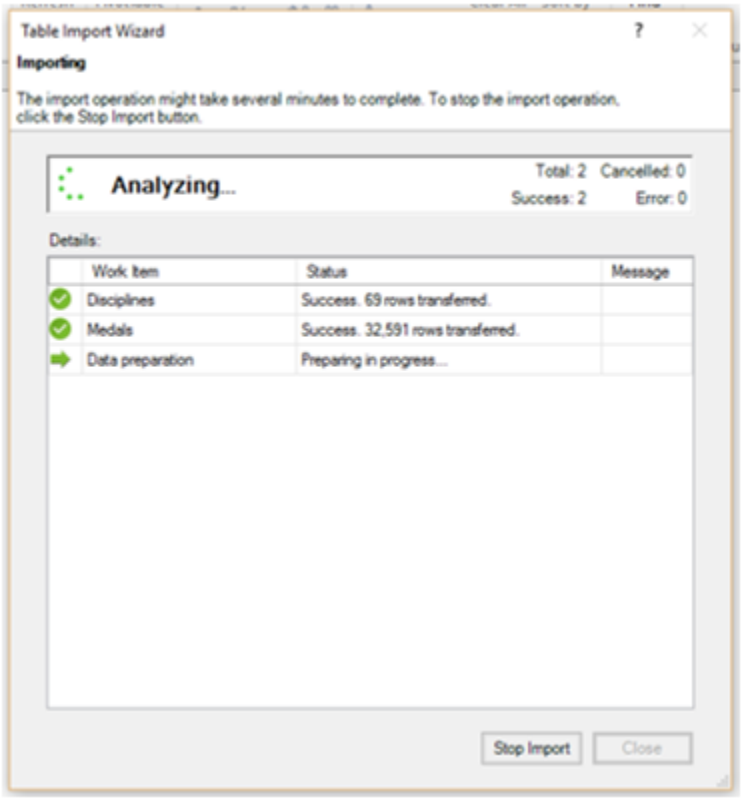


You can see that Power Pivot found that the table Disciplines are related to the table Medals and selected it. Click Finish.

Table Import Wizard displays – **Importing** and shows the status of the import. This will take a few minutes and you can stop the import by clicking the **Stop Import** button.



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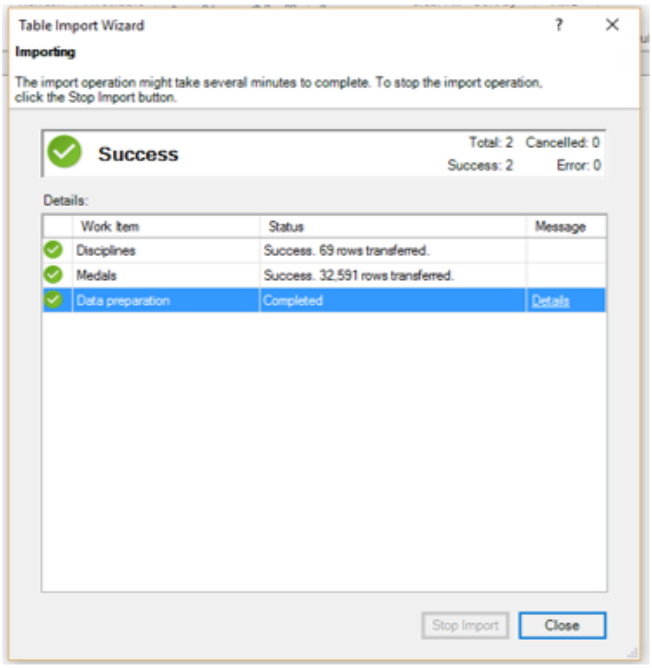
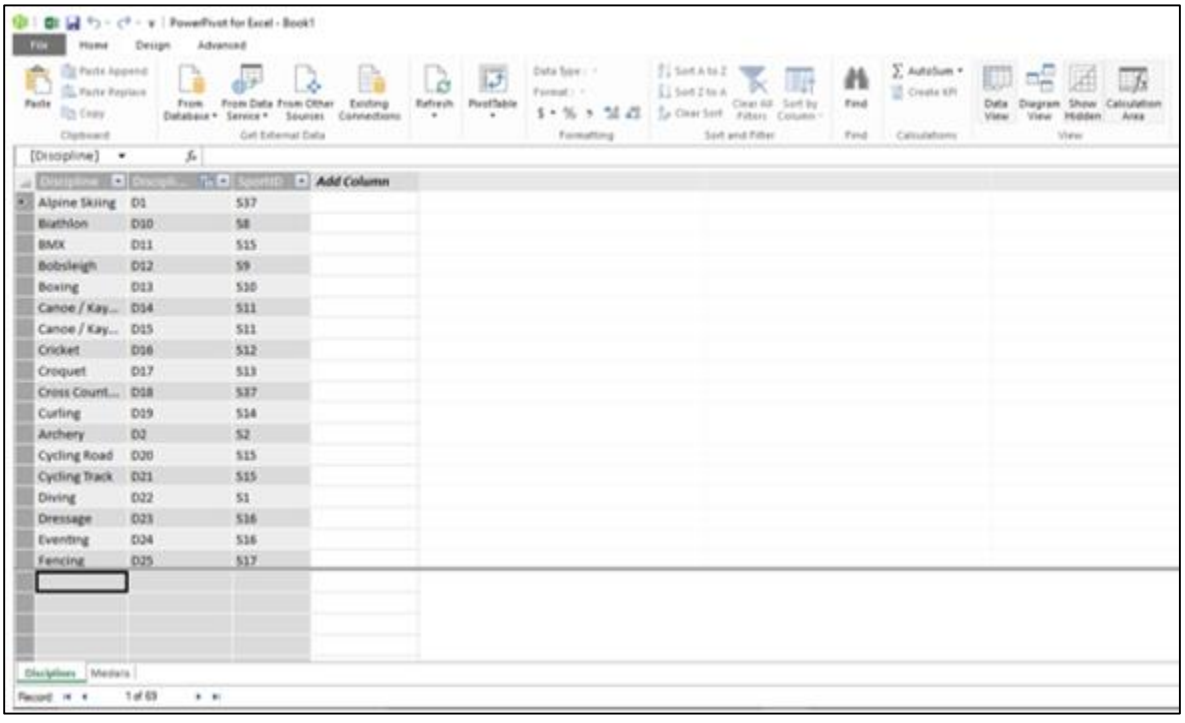
Once the data is imported, the Table Import Wizard displays – **Success** and shows the results of the import as shown in the screenshot below. Click Close.



Power Pivot displays the two imported tables in two tabs.



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You can scroll through the records (rows of the table) using the **Record** arrows below the tabs.

Table Import Wizard

In the previous section, you have learnt how to import data from Access through the Table Import Wizard.

Note that the Table Import Wizard options change as per the data source that is selected to connect to. You might want to know what data sources you can choose from.

Click **From Other Sources** in the Power Pivot window.

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