Data Visualization with Microsoft Power BI

LAB RECORD

BY

Name of the Student:

Bearing Hall-Ticket No:

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Submitted in partial fulfillment for the award of MBA program of Osmania University towards the Paper Code: MB404 Practicals as part of the Course: Data Visualization in MBA IV-Semester for the Academic Year 2023-2024

AL-QURMOSHI Institute Of Business Management

(Approved by AICTE & Affiliated to OSMANIA UNIVERSITY)

HYDERABAD - 500005

AQIBM HYDERABAD AL-QURMOSHI INSTITUTE OF BUSINESS MANAGEMENT

Approved by : AICTE, Ministry of HRD Govt. of India, Affiliated to Osmania University

Date: 12-06-2024

CERTIFICATE

This is to certify that Mr./Ms. _____ bearing HALL-TICKET NO: 1401-____-672-_____ studying MBA IV-Semester for the academic year 2023-24 has completed Data Visualization with Microsoft Power BI Lab work as part of the MBA program for the course MB 404 Data Visualization in MBA IV-Semester for the Academic Year 2023-2024.

Signature of the Internal Examiner

Signature of the External examiner **Principal**

MBA- SEMESTER – IV

PAPER CODE – MB 404-S-IMarks: 20

DATA VISUALIZATION WITH MICROSOFT POWER BI-

PRACTICAL SYLLABUS

1. Getting Started with Power BI- Understanding the parts of Desktop Power BI.
2. Getting Access to Data Sources from Power BI.
3. Exploring Data Sets.
4. Creating simple visualizations- Creating Map Visualizations, Using Combinations.

   Charts, Using Table, Modify Colors in Charts, Adding Shapes, Images and Text box.
5. Creation, Sharing of Dashboards.
6. Creation, Styling and Sharing of Reports.
7. Using Excel Data (integrating excel data with Power BI).

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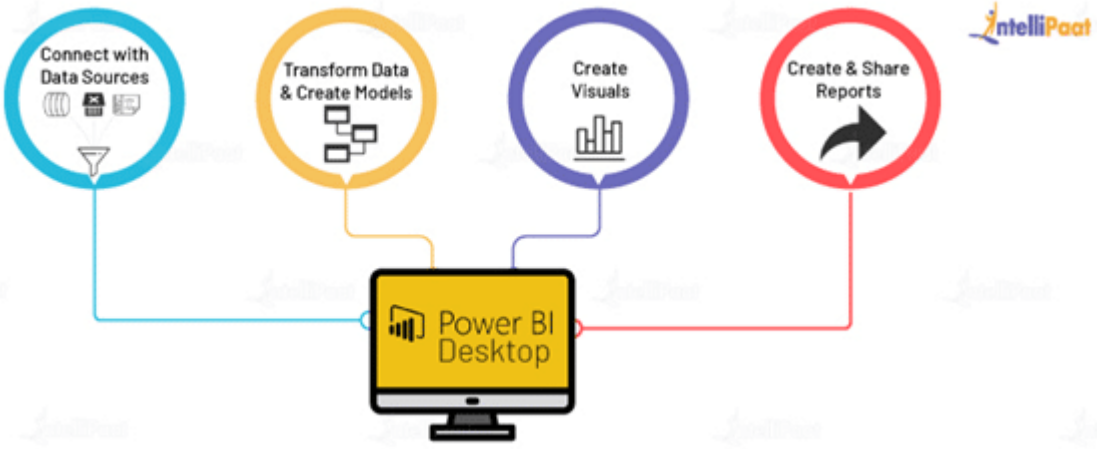
1. Getting started with power BI Desktop?

Power BI:

Microsoft Power BI is a collection of software services, tools, processes, and connectors that enables users to create custom reports and dashboards based on complex information, streaming in from multiple data sources.
On Power BI, users can visualize raw business data in the form of graphs and charts based on different constraints and attach them as tiles on live dashboards. A tile is a single visualization of any dataset embedded on the dashboard.
Power BI architecture bridges the gap between data and decision-making with the help of Power BI Components such as Power Query, Power View, and Power Map. These components provide accurate answers to business questions using AI algorithms and Natural Language Processing.

What is Power BI Desktop:

Microsoft Power BI Desktop is a data analysis and reporting application that a user can install on a computer to create dashboards and live reports. Integrated with Power BI Service, the user can also share these reports with decision-makers and stakeholders to help them understand the current state of the business.
It brings all the components and analytics features on a single platform. Power BI has a simple and easy-to-use interface that allows even a non-technical user to build compelling reports, data models, and custom dashboards.
The process of creating a report has four main steps or stages. Let's briefly discuss these steps in this section.



Transform Data & Create Models:

Using Power Query Editor, you can extract valuable information, remove anomalies, and add some conditions for a better understanding of the data. It is similar to sculpting a block of wood by cutting the edges, removing extra wood, shaving off the projections, and adding other ingredients to make it look as intended.
We can also change columns and data types and add default values into the columns with null values. If you do Business Analytics on Tableau, the transformation of data would be exhausting. However, Power BI components convert it into a drag-n-drop play for data modeling.

Create Visuals:

Visuals are the graphical representations of the data you stored in a model. Microsoft Power BI Desktop provides drag-n-drop features through which you can visualize the raw business data in the form of charts, graphs, maps, and KPIs.
After creating the visuals, they can be attached to the dashboards or live reports in the form of tiles. Custom visuals also help you identify the problems in various departments and the market behavior and make better decisions based on them.

Create & Share Reports:

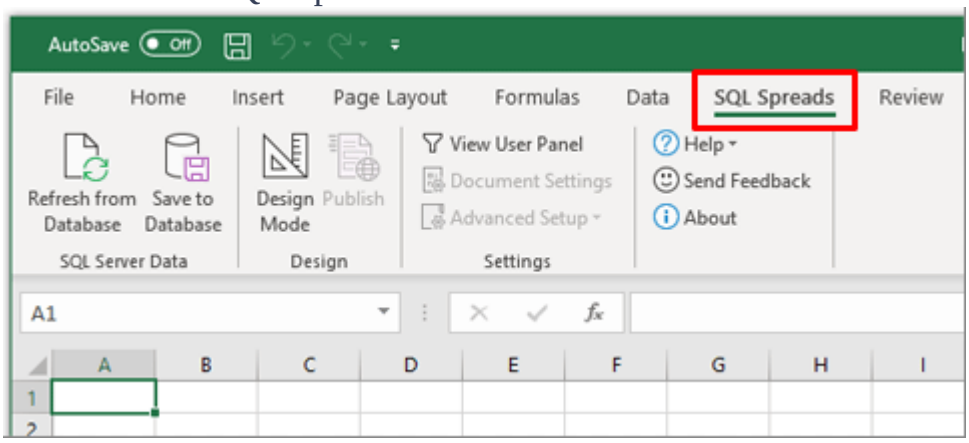
A report in a collection of visuals created from different data models. A report might consist of multiple dashboards with custom visualizations. Live reports, on the other hand, show real-time analysis of the data, streaming in from multiple sources.
These visually rich reports, analyzing complex data, can be shared with other people in your organization with the help of Power BI Desktop online.

2.Getting access to data source from Power BI

Step 1: Get all your data into SQL Server

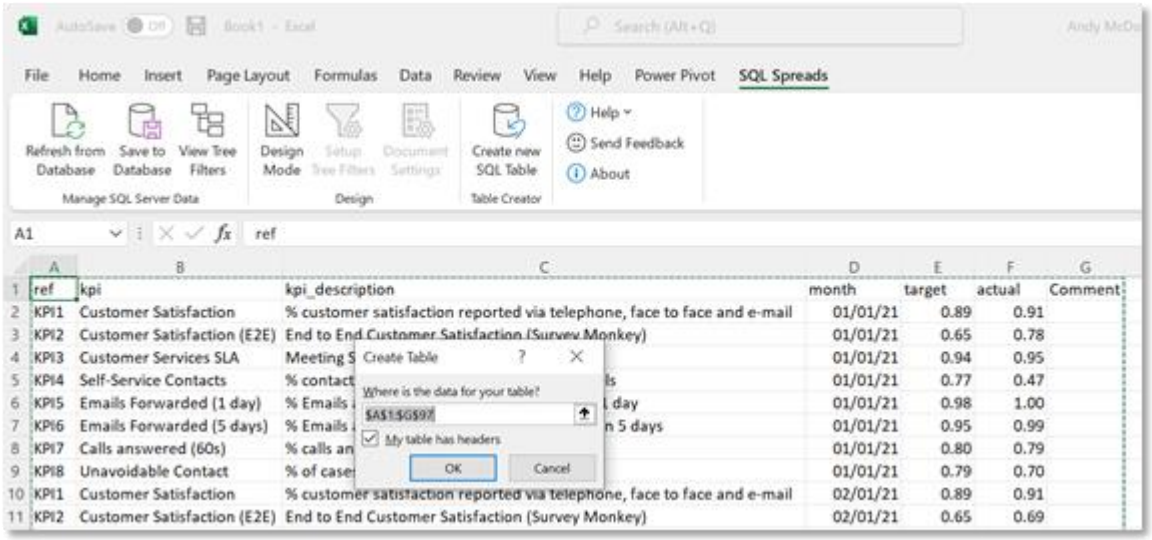
We're going to create the data in an Excel spreadsheet and then import it into a table in SQL Server using the **SQL Spreads Add-in for Excel**.

1. Run the SQLSpreadsSetup.exe file and follow the instructions.
2. Restart Excel and accept the Add-In confirmation.
3. You will find SQL Spreads in the tab menu in Excel:



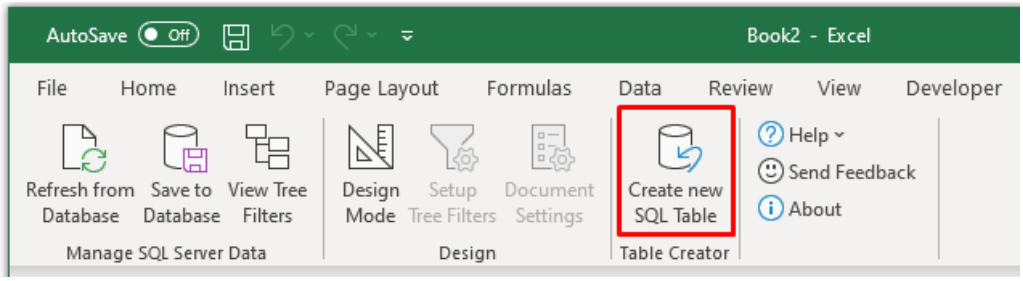
Once the data has been created in Excel, we can use the SQL Spreads 'Table Creator' feature to create the table in SQL Server.

1. Convert the data that you've added into an Excel table – just select one of the data cells and press CTRL + T (hold down the CTRL-key and press T)



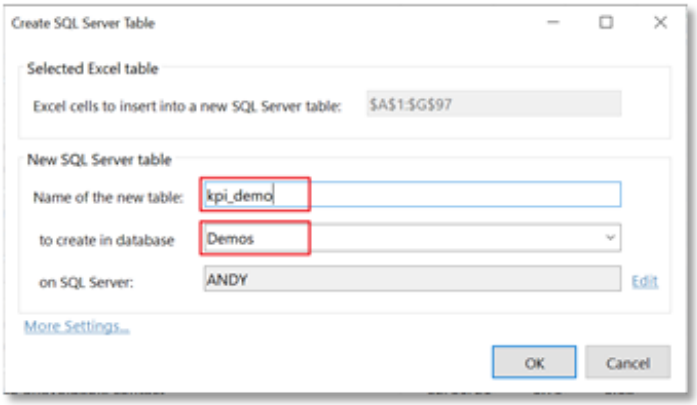
ref	kpi	kpi_description	month	target	actual	Comment
KPI1	Customer Satisfaction	% customer satisfaction reported via telephone, face to face and e-mail	01/01/21	0.89	0.91	
KPI2	Customer Satisfaction (E2E)	End to End Customer Satisfaction (Survey Monkey)	01/01/21	0.65	0.78	
KPI3	Customer Services SLA	Meeting S	01/01/21	0.94	0.95	
KPI4	Self-Service Contacts	% contact	01/01/21	0.77	0.47	
KPI5	Emails Forwarded (1 day)	% Emails	01/01/21	0.98	1.00	
KPI6	Emails Forwarded (5 days)	% Emails	01/01/21	0.95	0.99	
KPI7	Calls answered (60s)	% calls an	01/01/21	0.80	0.79	
KPI8	Unavoidable Contact	% of case	01/01/21	0.79	0.70	
KPI1	Customer Satisfaction	% customer satisfaction reported via telephone, face to face and e-mail	02/01/21	0.89	0.91	
KPI2	Customer Satisfaction (E2E)	End to End Customer Satisfaction (Survey Monkey)	02/01/21	0.65	0.69	

2. Click the **Create new SQL Table** button. If this is the first time you are using SQL Spreads or the Table Creator, you will see the dialog to connect to your SQL Server.

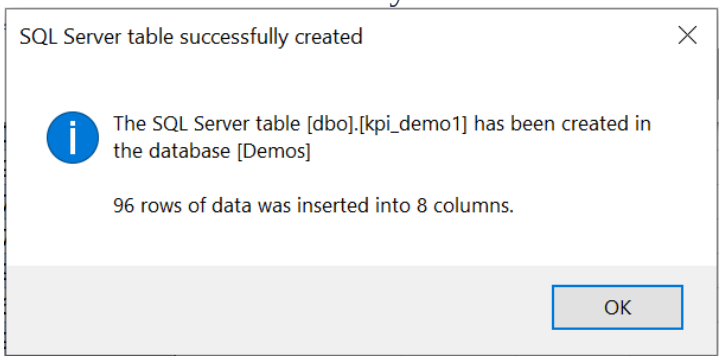


Fill out your server details and click OK.

3. Once you are connected to SQL Server, you will see the Create SQL Server Table dialog. Enter a table name and choose which SQL Server database to create the table in. SQL Spreads will always remember the last used table. If you need to change to another SQL Server click the Edit button next to the server name.

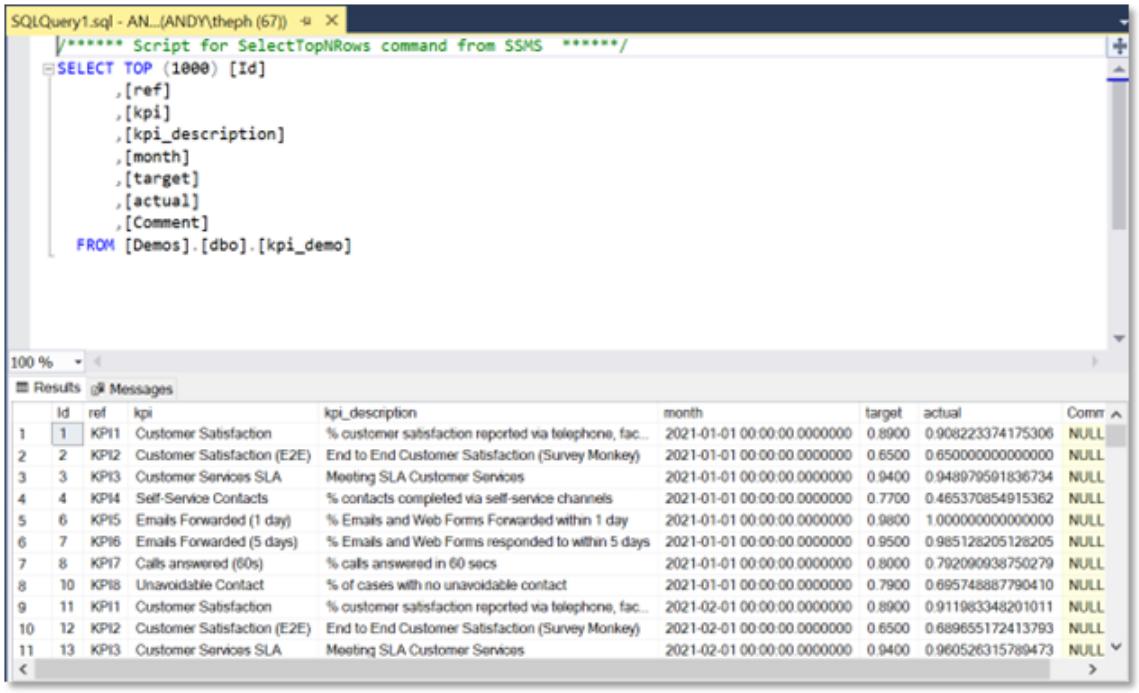


4. Click OK. A confirmation message will appear confirming the table was created and how many rows of data were inserted into the table.



We can check that the new table has been created and that our data is

there by running a query in SQL Server Management Studio.



	Id	ref	kpi	kpi_description	month	target	actual	Comm
1	1	KPI1	Customer Satisfaction	% customer satisfaction reported via telephone, fac...	2021-01-01 00:00:00.0000000	0.8900	0.908223374175306	NULL
2	2	KPI2	Customer Satisfaction (E2E)	End to End Customer Satisfaction (Survey Monkey)	2021-01-01 00:00:00.0000000	0.6500	0.650000000000000	NULL
3	3	KPI3	Customer Services SLA	Meeting SLA Customer Services	2021-01-01 00:00:00.0000000	0.9400	0.948979591836734	NULL
4	4	KPI4	Self-Service Contacts	% contacts completed via self-service channels	2021-01-01 00:00:00.0000000	0.7700	0.465370854915362	NULL
5	6	KPI5	Emails Forwarded (1 day)	% Emails and Web Forms Forwarded within 1 day	2021-01-01 00:00:00.0000000	0.9800	1.000000000000000	NULL
6	7	KPI6	Emails Forwarded (5 days)	% Emails and Web Forms responded to within 5 days	2021-01-01 00:00:00.0000000	0.9500	0.985128205128205	NULL
7	8	KPI7	Calls answered (60s)	% calls answered in 60 secs	2021-01-01 00:00:00.0000000	0.8000	0.792090938750279	NULL
8	10	KPI8	Unavoidable Contact	% of cases with no unavoidable contact	2021-01-01 00:00:00.0000000	0.7900	0.695748887790410	NULL
9	11	KPI1	Customer Satisfaction	% customer satisfaction reported via telephone, fac...	2021-02-01 00:00:00.0000000	0.8900	0.911983348201011	NULL
10	12	KPI2	Customer Satisfaction (E2E)	End to End Customer Satisfaction (Survey Monkey)	2021-02-01 00:00:00.0000000	0.6500	0.689655172413793	NULL
11	13	KPI3	Customer Services SLA	Meeting SLA Customer Services	2021-02-01 00:00:00.0000000	0.9400	0.960526315789473	NULL

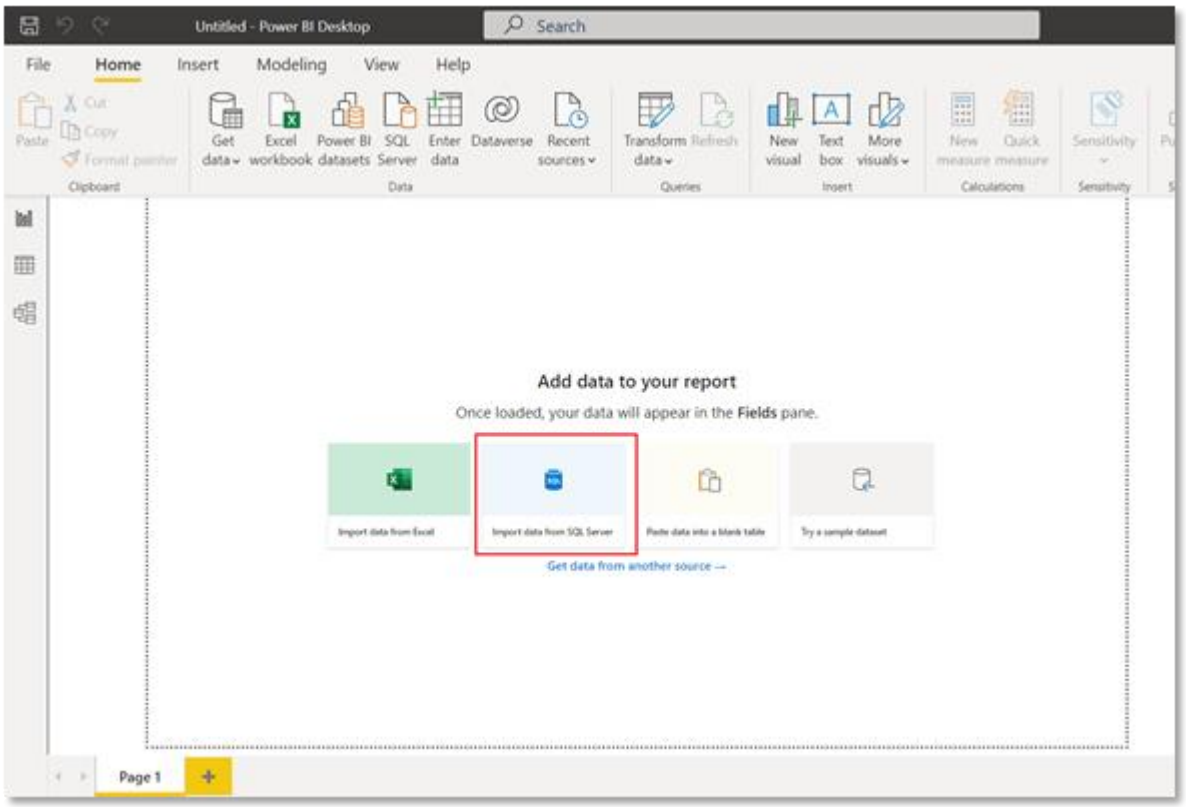
5. You can now close Excel. In Step 3 later on, we'll explain how to use SQL Spreads to connect to the table in SQL Server that we just created and perform updates in Excel that we can save back to SQL Server.

The next step is to connect Power BI to SQL Server and create a Power BI report.

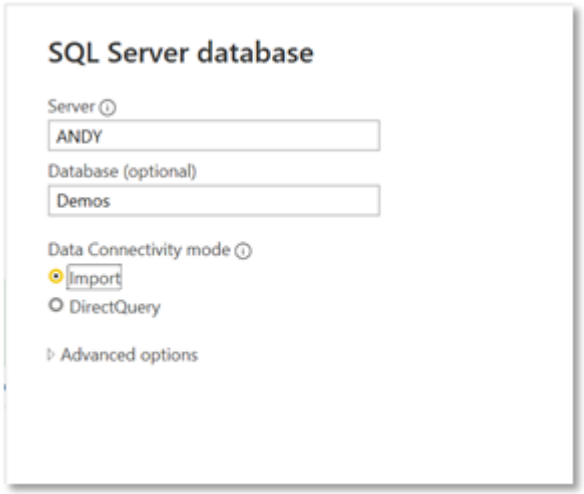
Step 2: Connect Power BI to SQL Server

Create a new report in Power BI Desktop

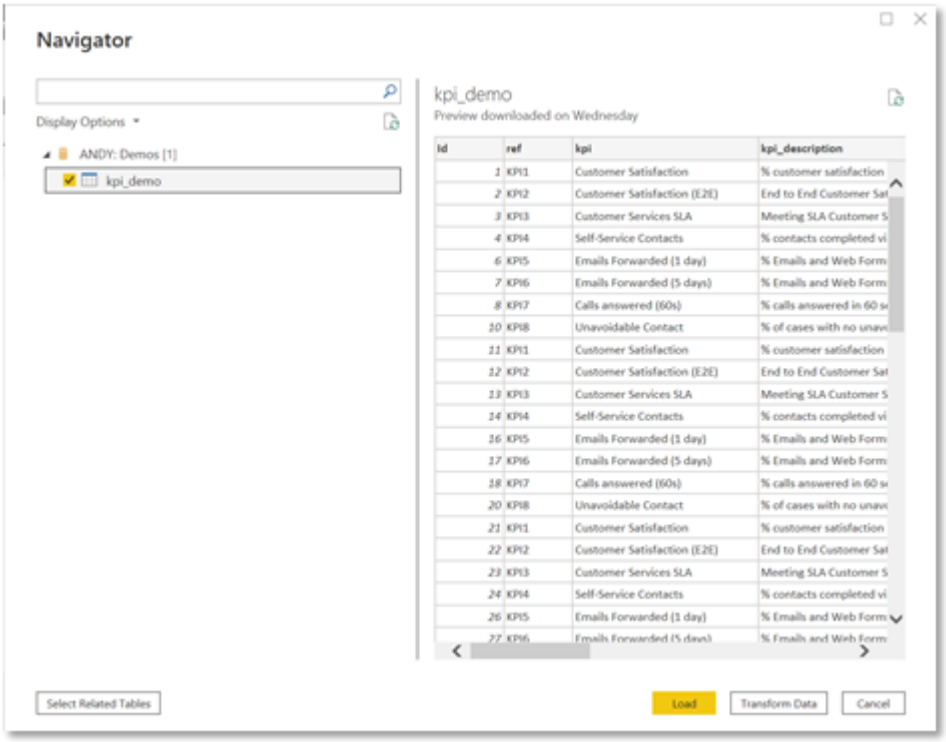
Open Power BI Desktop, click on 'Get Data' and then 'Import Data from SQL Server'.



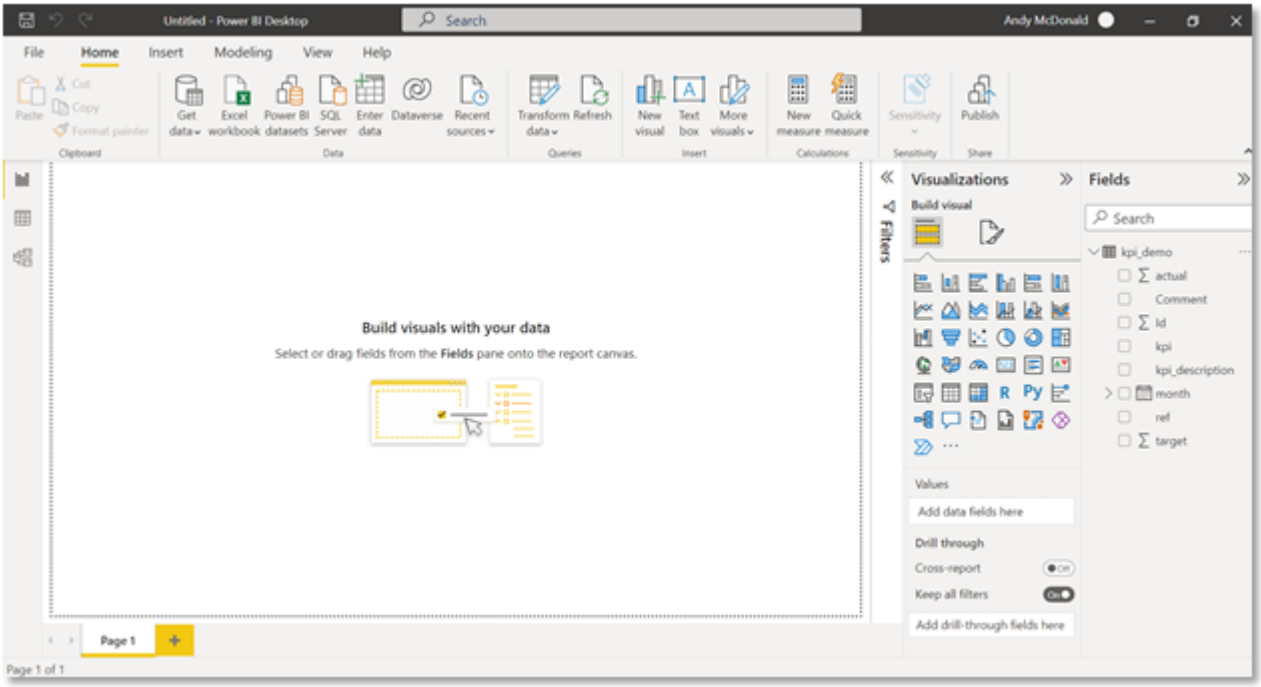
In the dialog, select the Server and Database (optional). The Data Connectivity mode defaults to 'Import' – leave it on this option. (The import option actually loads the data into the Power BI file, making it quicker to work on, but is not suitable for very large datasets. The alternative Direct Query option doesn't load the data into Power BI, but instead runs queries against the source data each and every time a visualization is refreshed or a filter changed).



now select the SQL table that we just created. We won't do any transformations in this example, so you can click 'Load'.

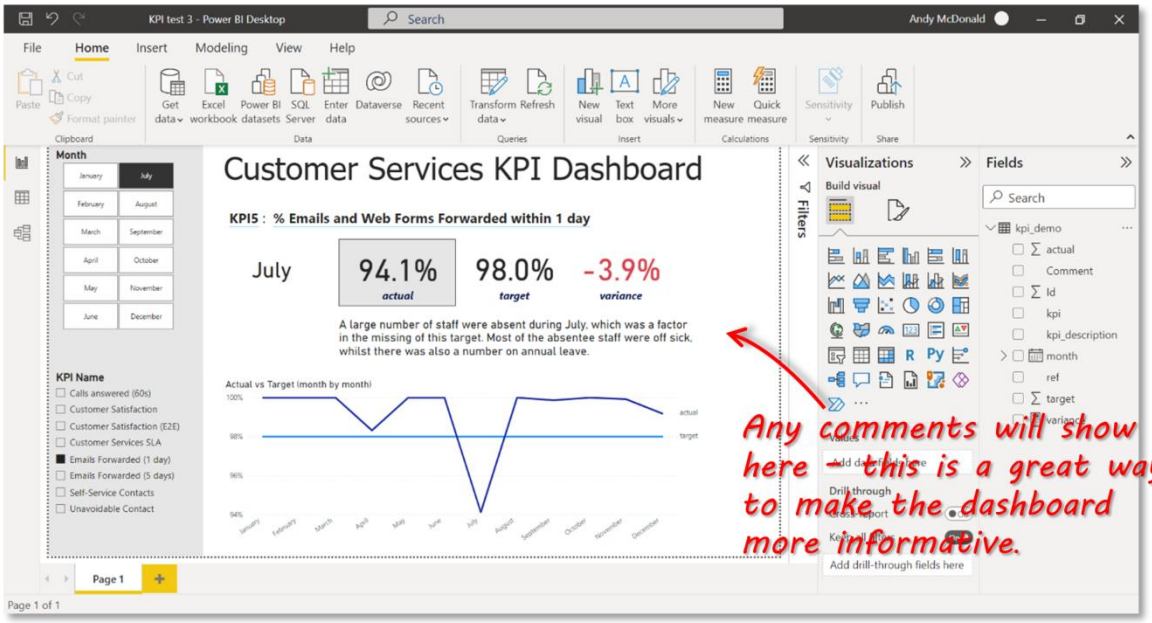


Once the data has been loaded, you'll see the tables in the **Fields** pane on the right-hand side. We also have a blank canvas to work with and the **Visualizations** pane to select our charts and other visualization types from.



We can now go ahead and create the visualizations that we need for our report. Check out our earlier article for more information on how to add the most common visualization types.

Here's a simple dashboard based on the sample customer service KPI data:

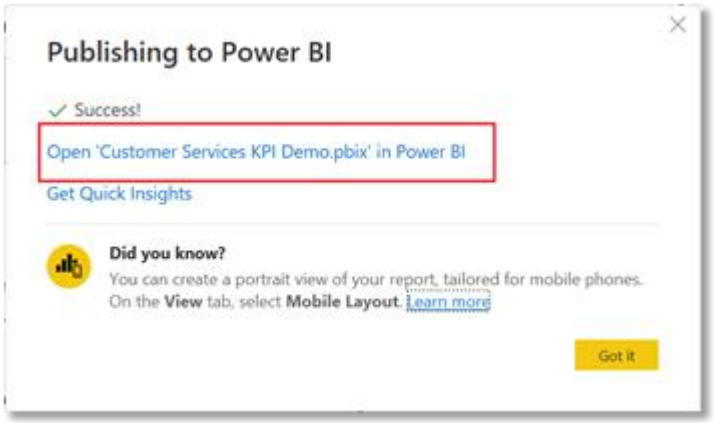


We now need to publish the report to the web-based Power BI Service so that our business users can access the report.

Publish the Report to the Power BI Service

Make sure you have saved your report and then from the Home tab, click on Publish > My Workspace > Select. Sign in to the Power BI service if you're asked to do so.

Once the report has been published you can click on the link in the dialog box.

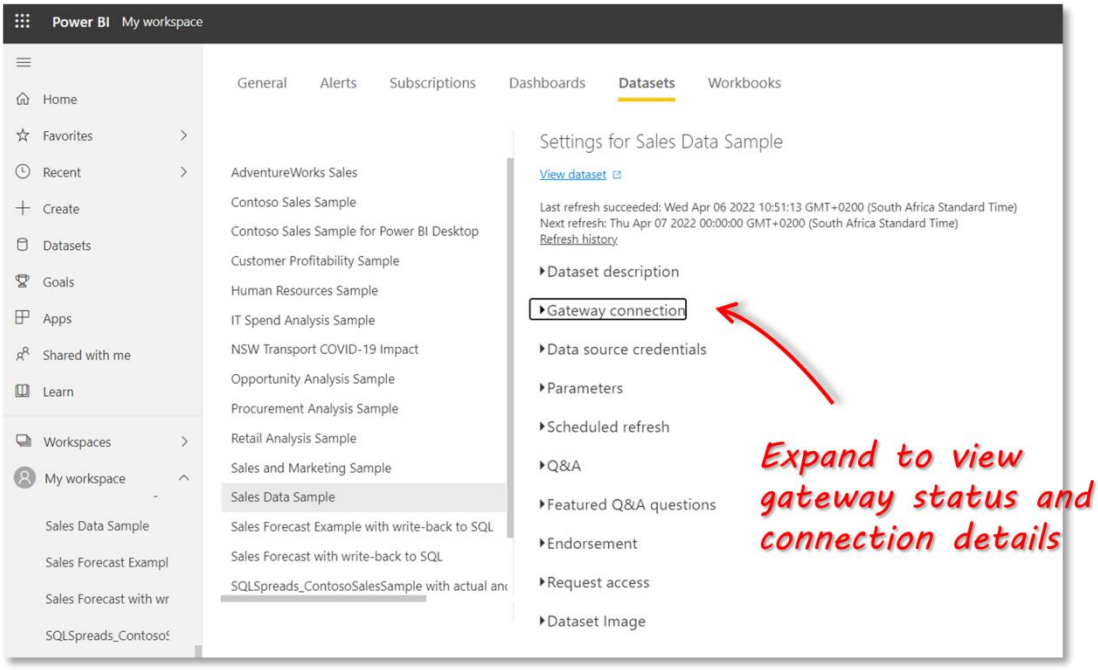


Configure the dataset settings

In Power BI Desktop, we connected directly to our on-premises SQL Server database. However, because the Power BI service is a cloud-based app, it needs a data gateway to act as a bridge between the cloud and our on-premises network. We therefore need to create a gateway on a local machine, add our SQL Server database as a data source, and then connect our Power BI dataset to this gateway.

To install a gateway on your local machine, follow the instructions here – for testing purposes you can install the 'On-premises data gateway (personal mode)' option.

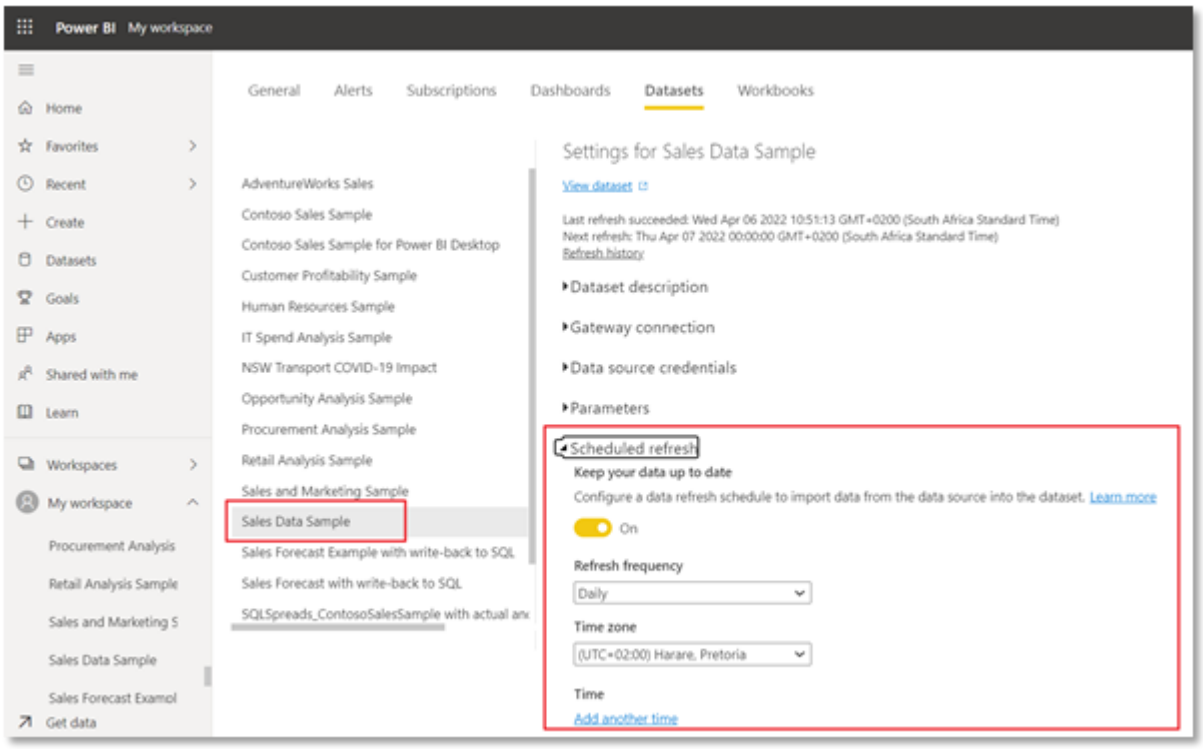
Once you've completed the process of installing and configuring the gateway you can review details and troubleshoot issues by clicking on the ellipsis to the right of a dataset name and selecting 'Settings', or by viewing from the My Workspace > Datasets page.



Configure the refresh interval

Now that we have our Power BI dataset connected to our on-premises SQL Server database via the gateway, we need to create a refresh schedule. The refresh schedule means that our report will remain up to date as the source data changes.

Go to My Workspace > Datasets. Select the ellipsis (. . .) for your dataset, then select Schedule refresh.

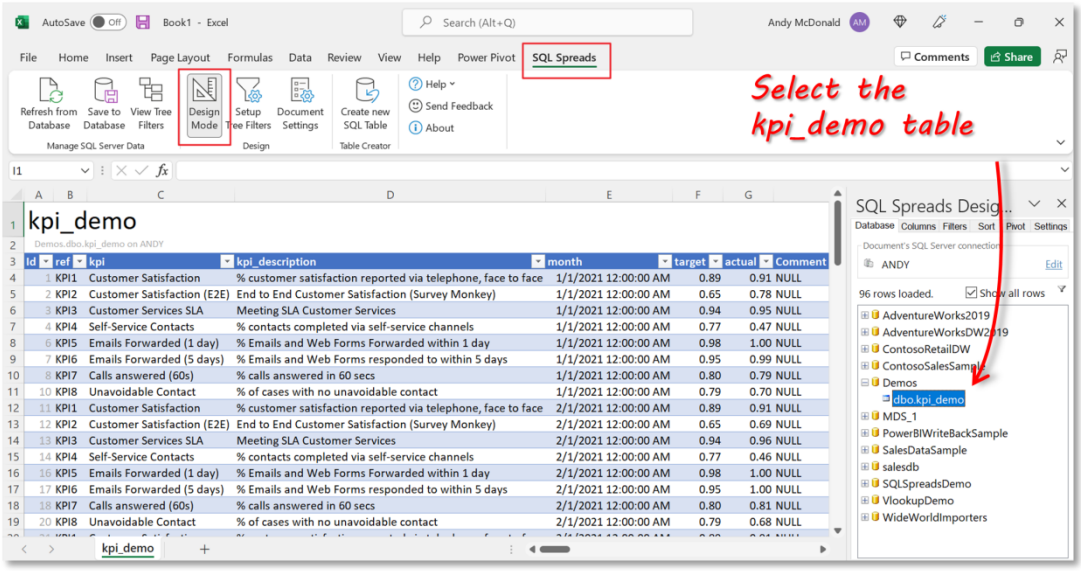


Enabling the scheduled refresh feature also allows you to perform a manual refresh on-demand (note that doing this will contribute to the count of daily refreshes you are allowed). To perform a manual refresh, select the dataset in the navigation pane, click the ellipses menu and select 'Refresh Now'.

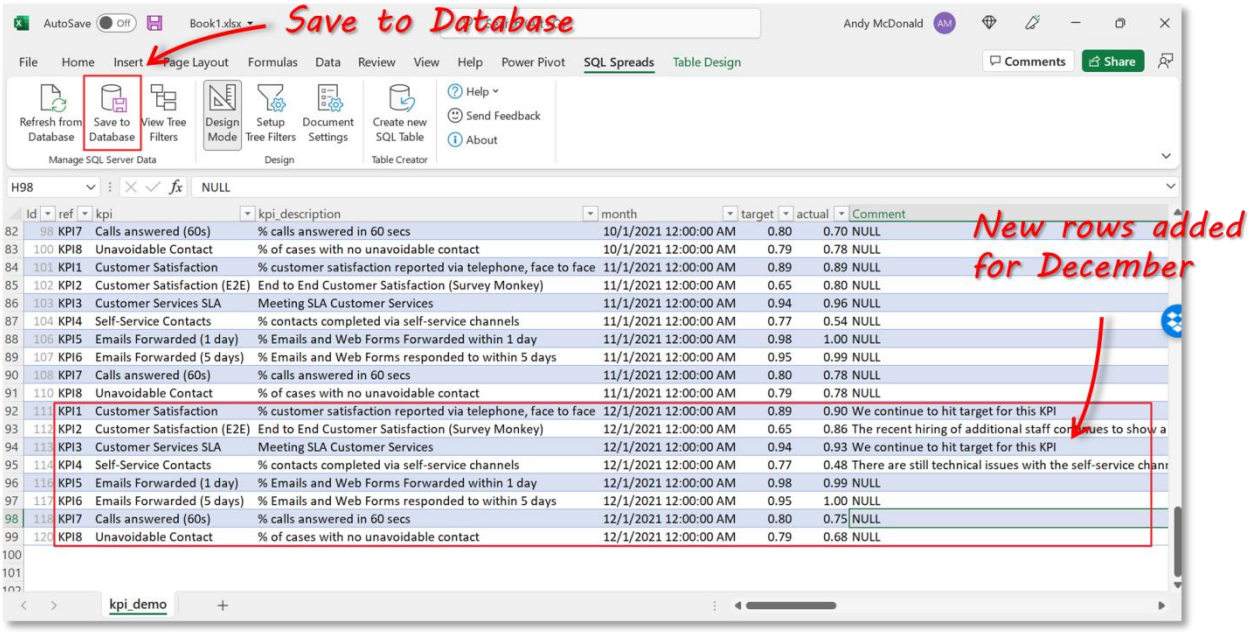
Step 3: Ensure the data is up to date

In the previous steps, we loaded our data into a SQL table and created a report in Power BI. We're now going to look at the process for ensuring that the data for our Power BI report is up to date.

Open Excel and click on the **Design Mode** button in the SQL Spreads menu. A list of databases will be displayed, and you can select the Demos database and then the kpi_demo table. When you select the table, SQL Spreads will connect to SQL Server and import the data from the table into Excel.



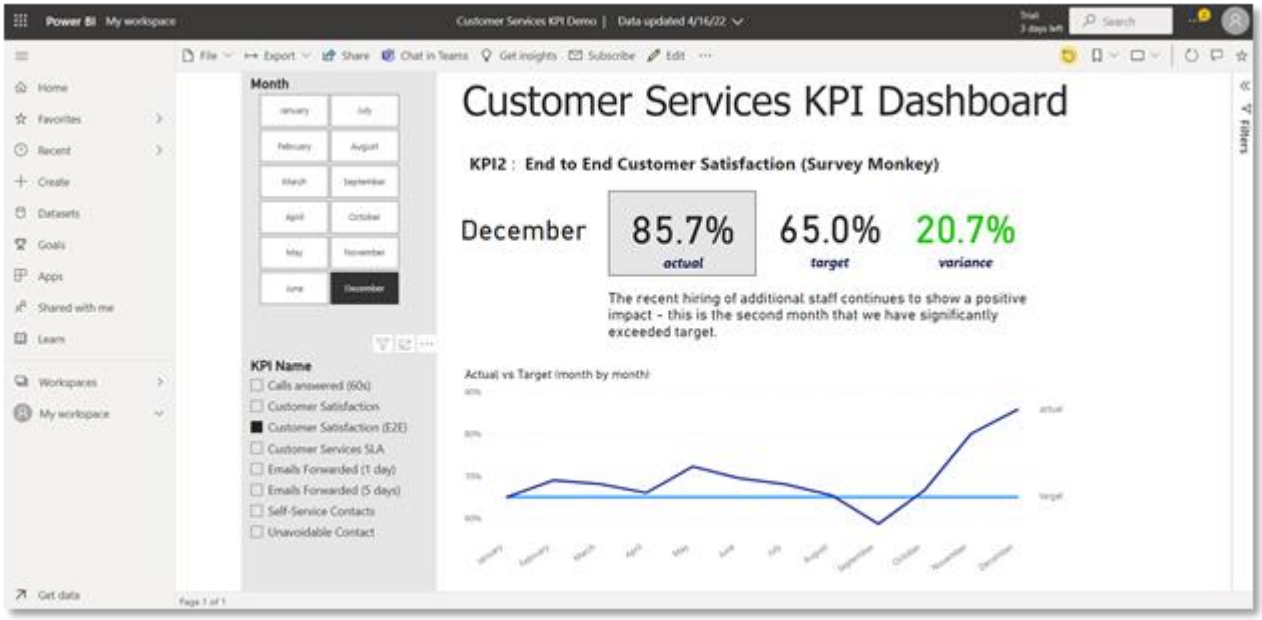
With the data loaded in Excel, we can now make changes to any of the existing records or add new rows. In our example, we're going to assume that we're submitting the report for the month of December. We therefore need to copy the rows for each of the KPIs from November and paste them as new rows at the bottom of the table. We can then change the month for each of the new rows to be December, and also add in the new actual KPI values and comments.



Once you've made all the changes, click 'Save to Database' – all of the updates will be written to SQL Server.

We can now go to our dataset in the Power BI service and perform a manual refresh. The KPIs for December, including the actual values and

any comments that were added can now be viewed.



3. Exploring Data Sets using Power BI.

The data we have is in a CSV file so, we can use “Import data from Excel” to view it in Power BI (remember to select All Files from the file explorer). Just navigate to the file and click on open. A new screen will open which will preview the data you selected. First, we need to do some transformations on this data, for that click on Transform data at the bottom right of this screen.

Transformation:

There are some columns which have null values, so we can remove them. We can do this by clicking on individual columns and then selecting Remove Columns from the upper tab. Do the same for other columns

OTHER_EXPENDITURE

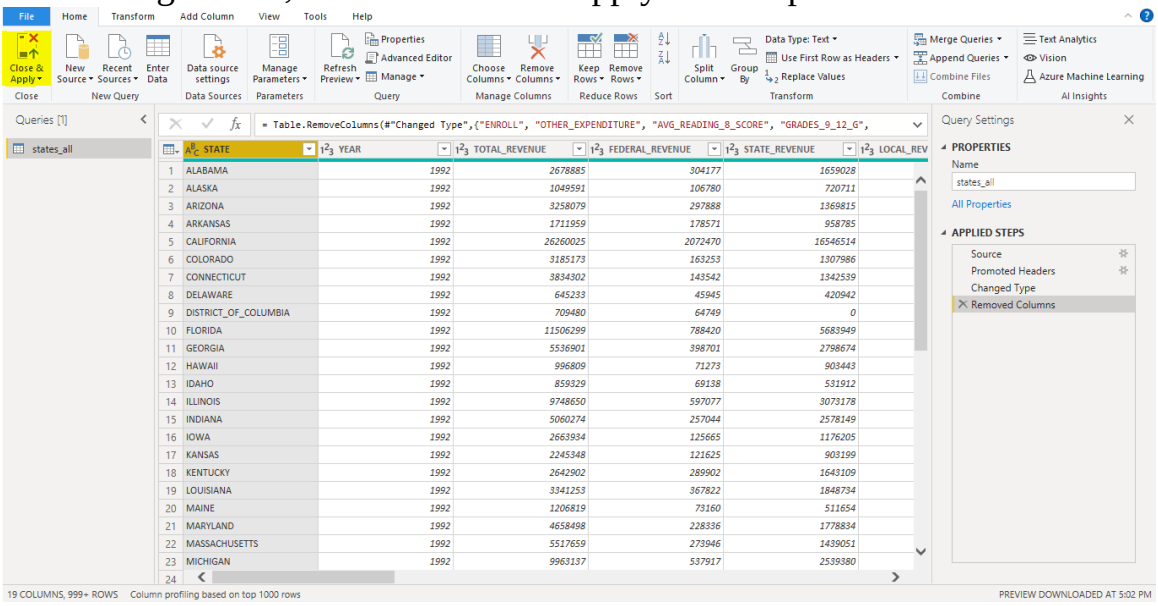
GRADES_1_8_G

GRADES_9_12_G

AVG_READING_8_SCORE

We can also remove the PRIMARY_KEY column as it is of no importance to us in the later steps.

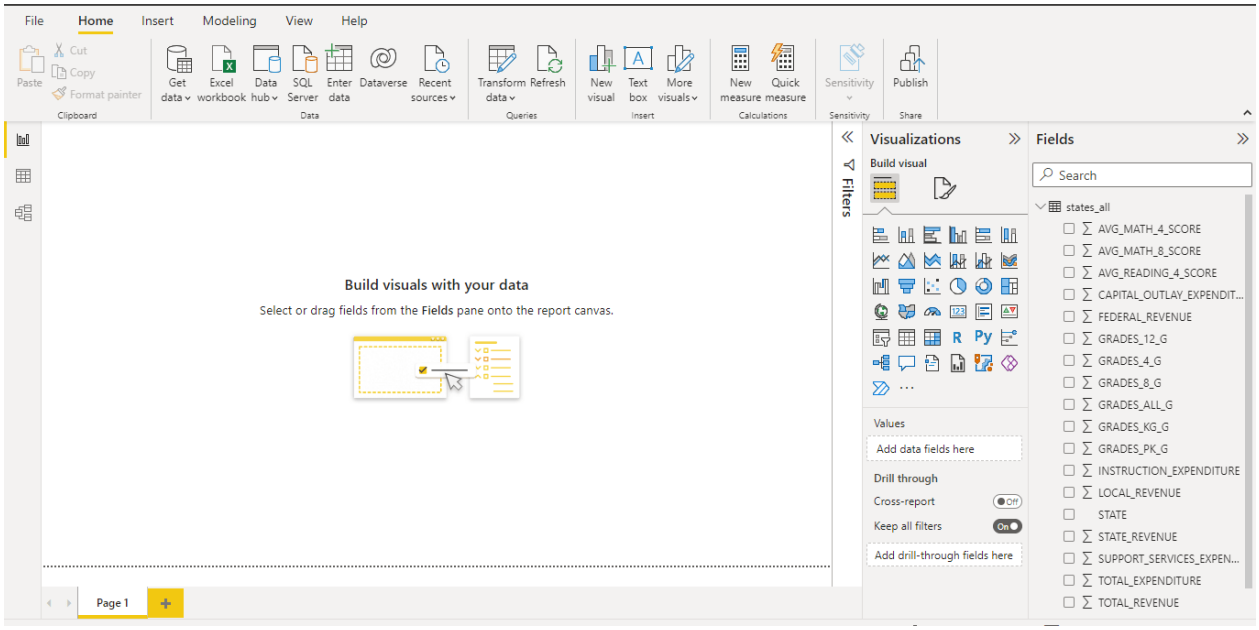
After doing all this, click on Close & Apply at the top left.



Column – Power BI

Data visualization:

Now we are ready to visualize the data. On the right, you can see all the imported columns from the CSV file.

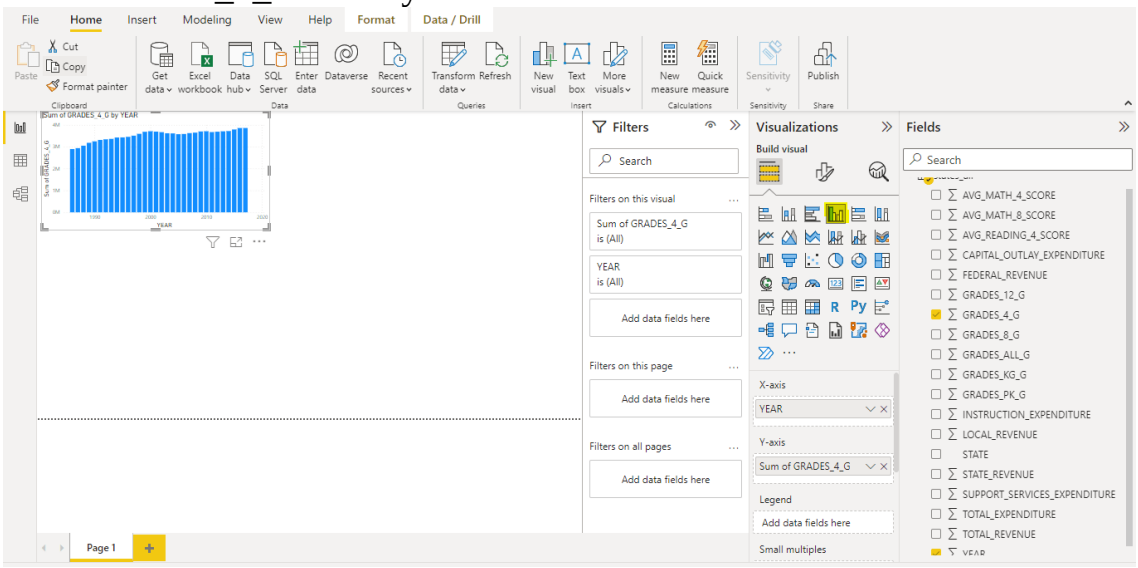


Data visuals – Power BI

4. Creating Simple Visualizations

1. Clustered column chart:

Let us create a clustered column chart to visualize 4th grade scores per year. To do this first select clustered column chart from the Visualizations pane. After that, drag down the Year column to the X-axis and GRADES_4_G to the y-axis.

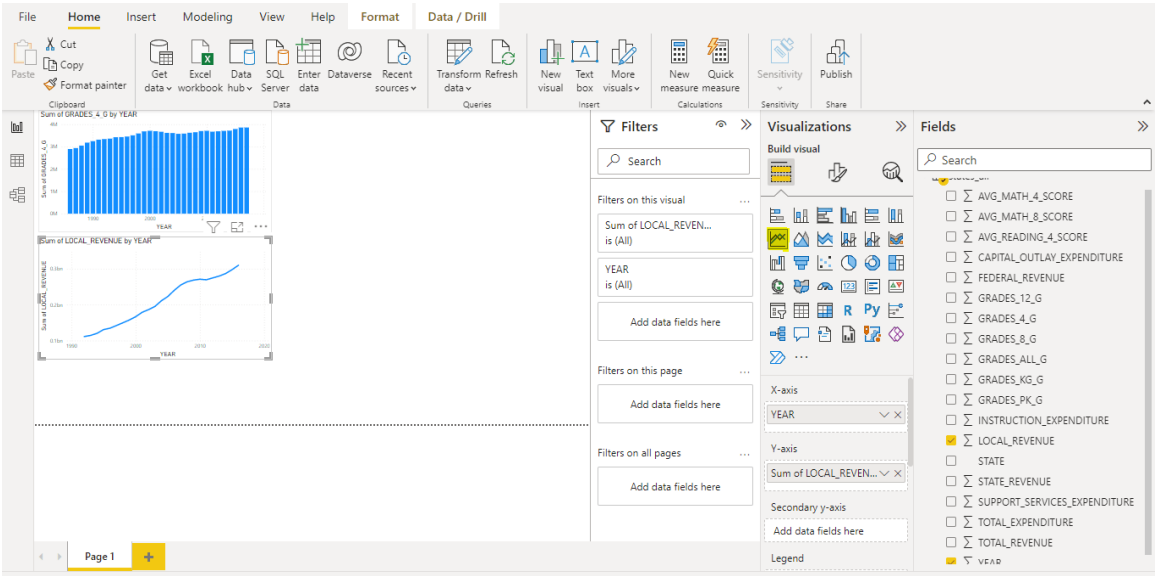


Graph – Power BI

As we can see from the graph above, the sum of all the grades lies in the same range every year

2. Line chart:

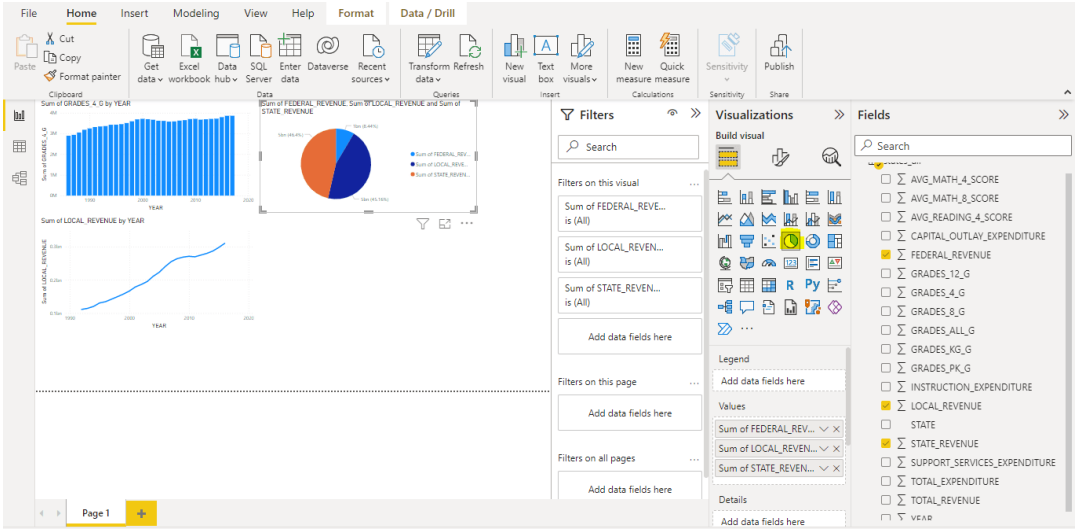
Now Let us make a line chart showing local revenue affected every year. For that, we can select a line chart from the Visualizations pane. Select Year as the x-axis and LOCAL_REVENUE as the y-axis.



Graph, Line chart – Power BI
From the above graph we can see the local revenue increasing every year

3. Pie chart:

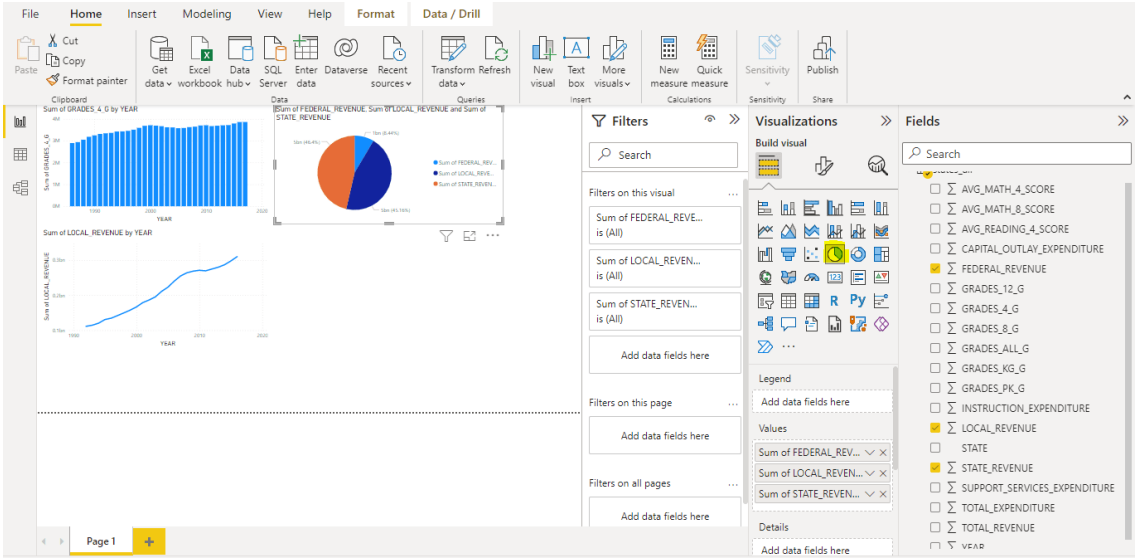
If we want to see the Revenue generated by each; Local, Federal, and State. We can use a Pie Chart for that. We can select Pie Chart from the pane and drag LOCAL_REVENUE, FEDERAL_REVENUE and STATE_REVENUE to the values tab.



Pie chart – Power BI
The pie chart shows the sum of different amounts of revenue

4. Area chart:

At last, we can compare any two grades to see their revenue changes during the past years. For this purpose, we can use Area Chart from the visualizations pane and use GRADES_4_G as the y-axis and GRADES_12_G as the secondary y-axis. Drag YEAR to the x-axis.



Pie chart – Power BI
The Area chart shows the difference in grades of class 4 and 12 on top of each other.
Finally, we have this report to showcase to our colleagues or friends.

Creation and sharing data in dashboard using Power BI

Power BI dashboard:

In Power BI, a dashboard, also known as a canvas, is a single page that presents the key metrics and data with high-impact visualizations (Figure A). Designing dashboards efficiently is critical as they are one of the main sources for data-driven decision-making.
Figure A

Power BI dashboards are used by executives, managers, team leaders, analytics and business leaders to track key performance indicators, drive decisions, communicate and present data, and work to meet business targets. As Power BI users advance, they can leverage more powerful features, for example using data analysis expressions.

How to create a dashboard from a report:

import your data set as an Excel file.

Import Excel data to Power BI

- Open the Power BI service in your browser.
- From the navigation pane, select My Workspace, and then, click Get Data at the bottom of the menu.
- Under Files, select Get.
- Find your Excel file and click Connect.
- Select Import, and Power BI will automatically import the data.

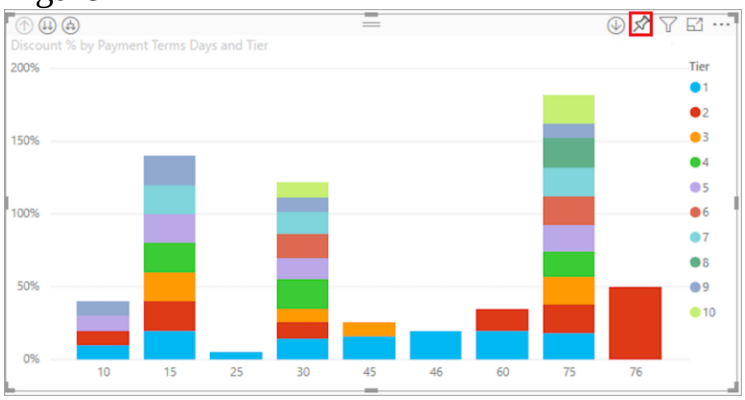
Now that you have your report on Power BI, you can start building your dashboard.

Build a dashboard in Power BI

Dashboards are created by pinning tiles from a report to a new dashboard. It's possible to pin an entire report to a dashboard or pin individual tiles from one or several reports. To do so:

- Select and open the Excel file report that will be part of the new dashboard.
- Select More options (…), then Edit to open the report in the Editing view.
- Hover over a visualization. This will reveal the hidden options. Select the Pin icon to add the tile to the dashboard (Figure B).

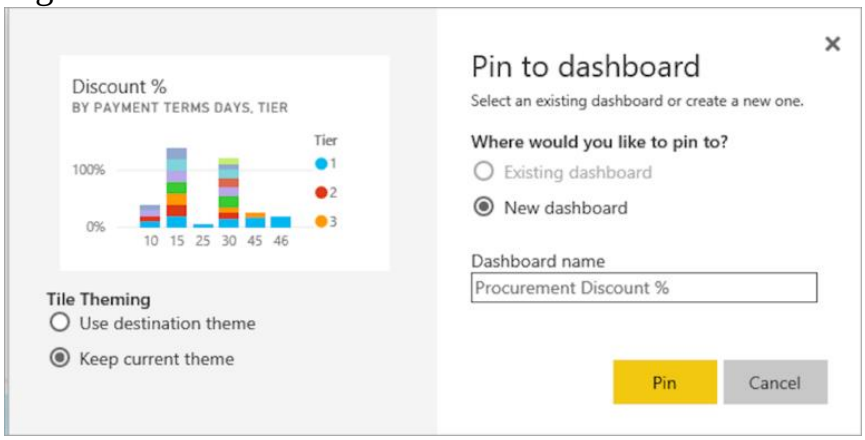
Figure B



To add a tile to the dashboard, click on the Pin icon. Image: Ray Fernandez/TechRepublic

- Select New Dashboard, then name it (Figure C).

Figure C



- Click on Go To Dashboard.

The tile you pinned should now be the only visualization in your new dashboard. To pin more tiles, return to a report and repeat the process. Remember, when adding more tiles, click on Existing Dashboard and select the name of your new dashboard from the dropdown menu.

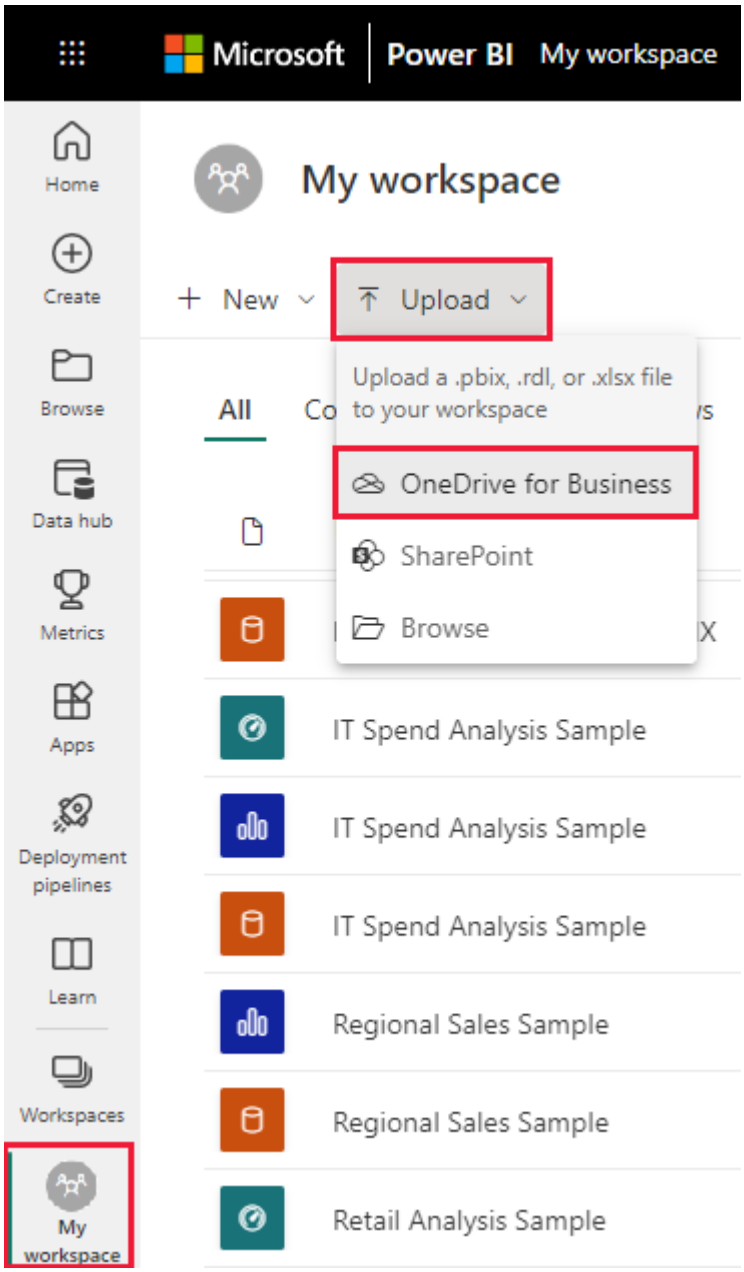
How to pin a tile from Excel to a Power BI dashboard

Alternatively, if you already have a dashboard set up in Power BI, you can borrow from Excel workbooks to emphasize key data points in your dashboard. To do that, you must first connect the Excel workbook you want to pin to your Power BI service. When a workbook is connected, a read-only version is saved, allowing you to pin ranges and entire worksheets to dashboards.

Connect an Excel workbook from OneDrive to Power BI

- Upload the workbook to your OneDrive.
- Open Power BI and go to My Workspace, then Upload >OneDrive for Business (Figure D).

Figure D



- Next, search for your saved Excel file, select it and choose Upload.

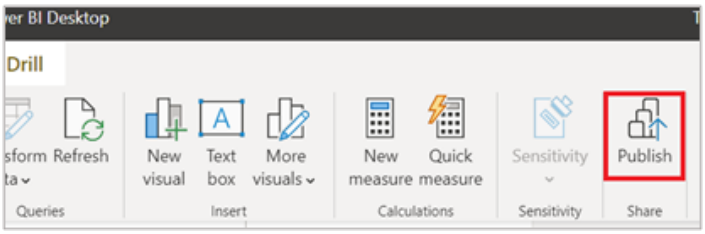
- Now you should see the workbook added to Power BI in your workspace.
- Finally, open the workbook in Power BI by selecting the workbook you uploaded.

6. Creating styling and sharing report in power bi

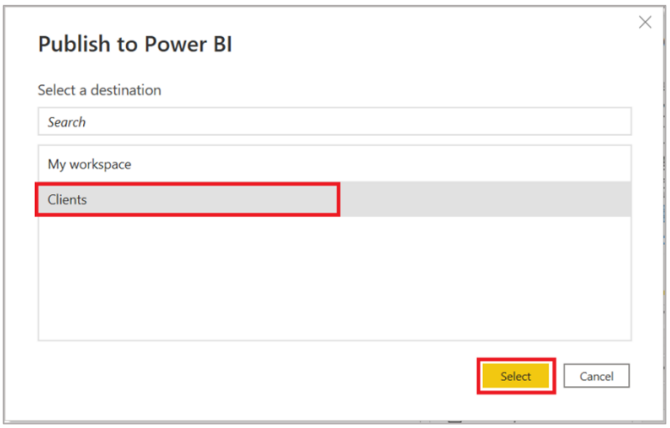
Publishing Power BI Reports

Within your Power BI Desktop or Power BI Report Builder application, to publish the current report follow these instructions:

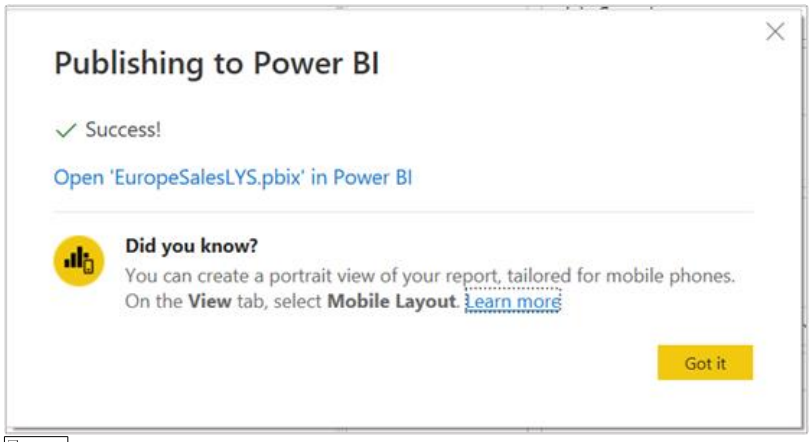
Click on the Publish button from the Home Ribbon.



Select which Workspace you wish to publish the report to.



You will see a message confirming the publication.



Power BI Dashboards

Often called "Canvas", a Power BI Dashboard is a single-page interface filled with the most important and critical data from various related reports, immediately available in a single glance.

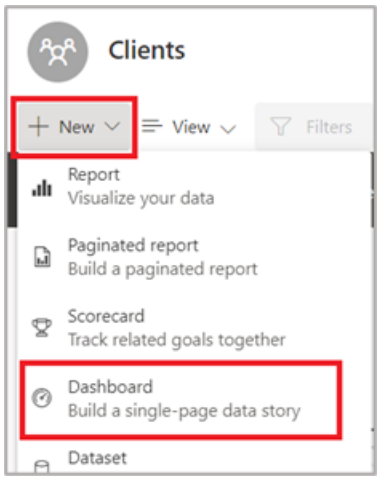
The visualisation of data on the dashboard is called Tiles. These are organised to represent different datasets, to give you an overview of the story you are trying to create from the detailed Power BI Reports.

Creating A Dashboard

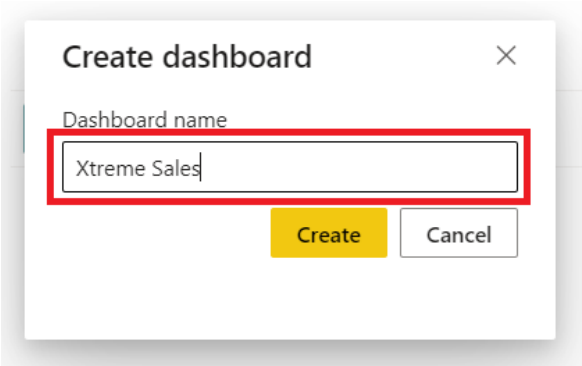
Dashboards are created on the Power BI Service page. Login to your Microsoft 365 Account and load the Power BI app.

Within your navigation panel, **select the Workspace** you wish to add the dashboard to.

Select the New button and click on Dashboard



Enter the name for your Dashboard and click Create.



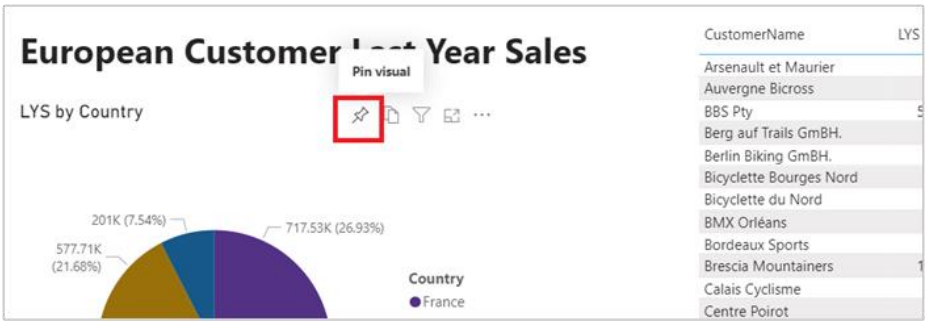
The Dashboard is created and ready for you to start adding information from your reports to the canvas.

Adding Tiles To A Dashboard

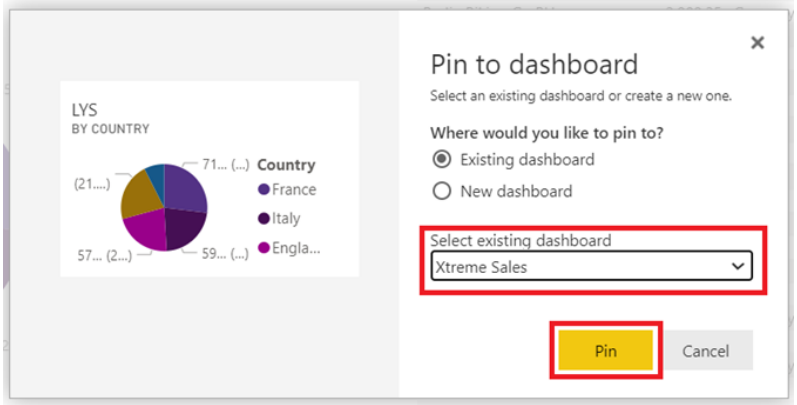
Each Dashboard is made up of Tiles – these can be either visualisations from a Power BI Report, text items, web content, videos or images. You will select items that will give you an overview of the content, which a user can then select to link through to the entire Report.

To add a Power BI Report visualisation, select the following:

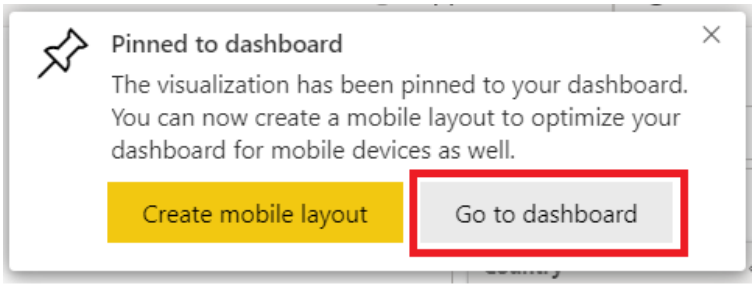
Open the report in the tool of choice and **locate the visualisation** to be added. **Click the Pin button**.



Select the Dashboard you want to add it to – you can even create a new Dashboard at this point if necessary – **click the Pin button** to add.

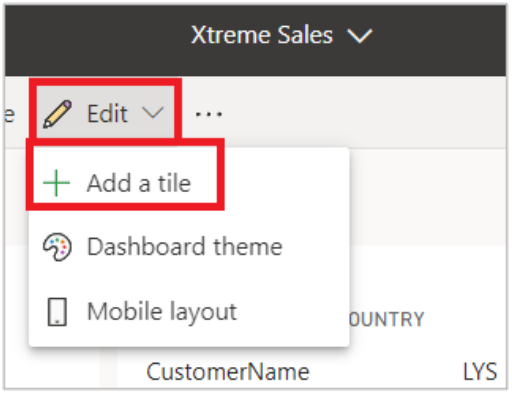


A message will confirm that the visualisation has been added. Either close the dialogue box and continue to pin items or select Go To Dashboard to view the result and re-organise the tiles if necessary.



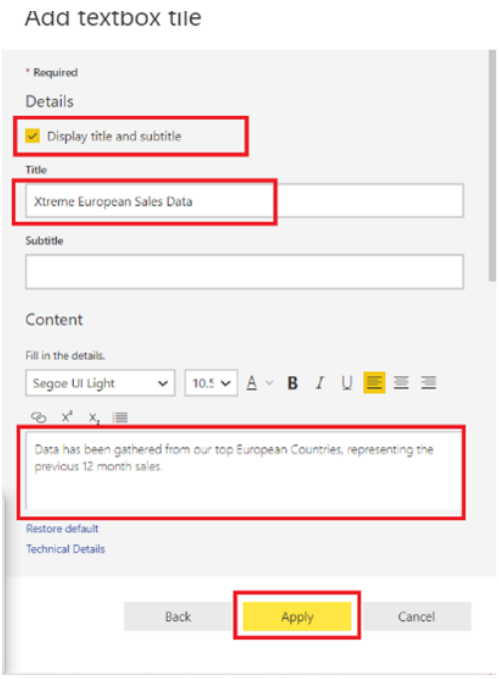
To Add non-report Tiles to your Dashboard, first view the Dashboard within the Power BI Service environment.

Select the Edit button at the top of the Dashboard and **click + Add a Tile**.



Choose the style of Tile – in this example we are going to use Text, click Next to continue

Add the detail required. We are using a Title and Content below. The formatting can be applied to the content details – **click Apply** to add the tile

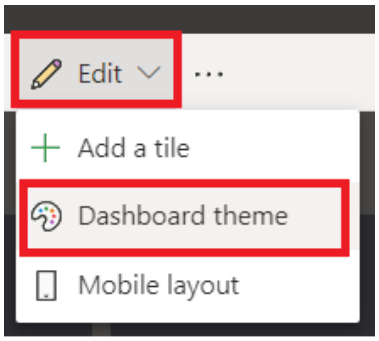


Organising Tile Data

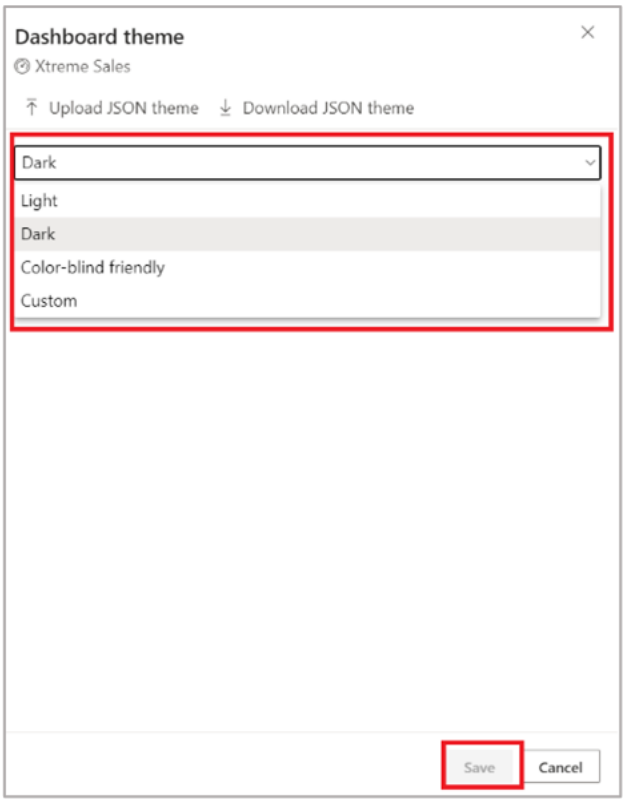
Once you have added all the required Tiles of information to your Dashboard, you are able to re-organise the information by dragging and dropping each tile to the necessary position on the Dashboard.

The appearance of the Dashboard can be changed by applying a new Theme. There are limited themes available by default, but you are able to customise a theme in Power BI or upload a pre-designed theme.

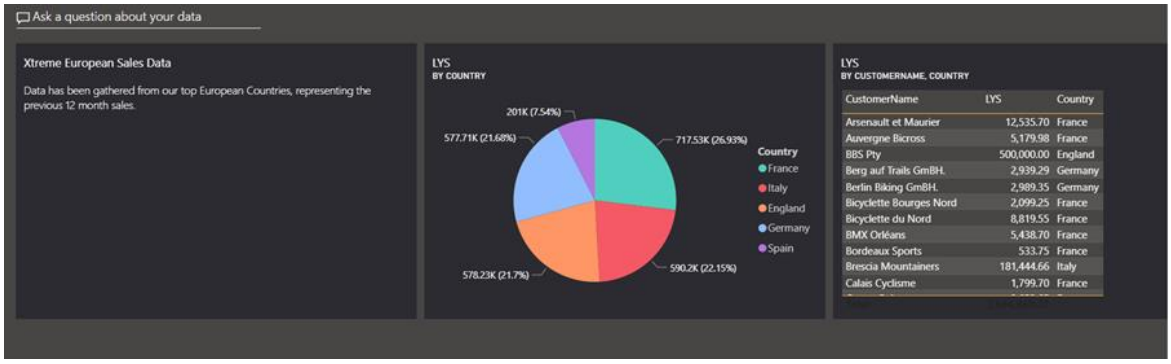
While viewing the Dashboard, **select Edit and click Dashboard Theme**.



Select the required Theme and click Save.



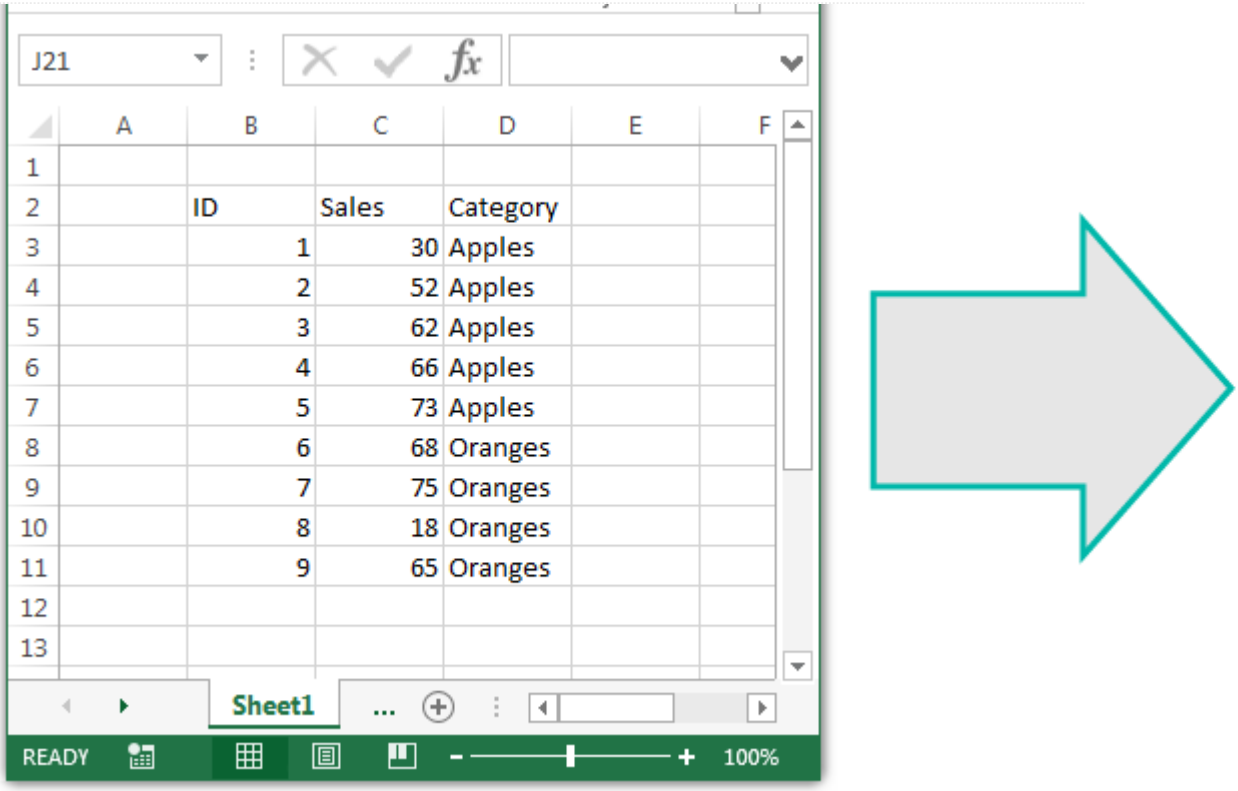
The Dashboard will be updated on screen.



7. **<u>Using Execl Data(how to embed excel file in power BI)</u>**

Import an Excel file into PowerBI

2016-03-29 Mike Carlo Data Sources 7



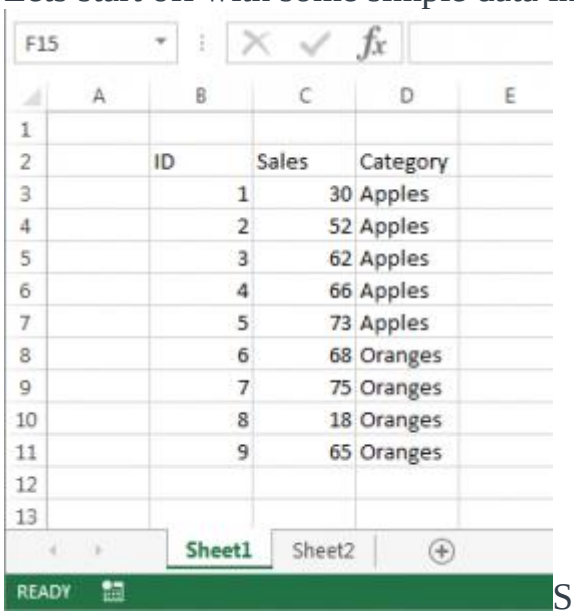
Import Excel Data into Power BI

We are going to kick this blog off with a simple example of how to load data from excel into Power BI Desktop.

Note: I'm a firm believer of always understanding your data. If you are receiving data files or extracts from an automated system or from an individual, trust me it will make a difference. So, make sure you

understand the source of the data and how the structure of your data may change over time. For example, you have have a column that has both text values and number values; or the data may add additional columns in the future. Thus, the data load into Power BI Desktop (PBID) will need to be flexible.

Lets start off with some simple data in excel:

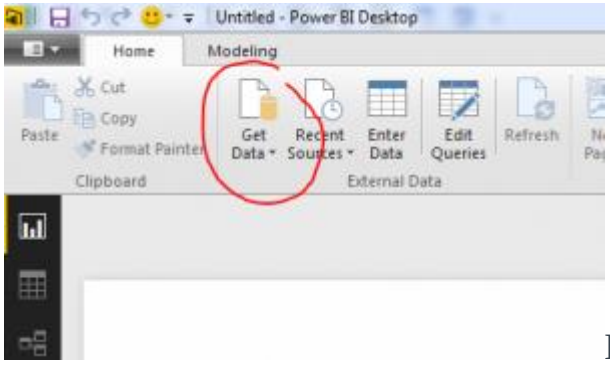


	A	B	C	D	E
1					
2		ID	Sales	Category	
3		1	30	Apples	
4		2	52	Apples	
5		3	62	Apples	
6		4	66	Apples	
7		5	73	Apples	
8		6	68	Oranges	
9		7	75	Oranges	
10		8	18	Oranges	
11		9	65	Oranges	
12					
13					

Sample of Data in Excel

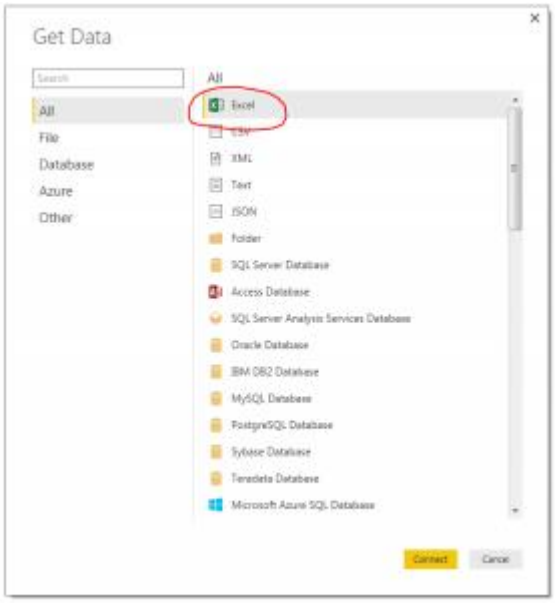
We have three columns of data, two have number in it and one has text values.

For now we will close out of excel and jump over to Power BI Desktop. Once the program loads we will click the **Home** ribbon then select the **Get Data** button.



Button for Get Data

After pressing the button a new menu will pop up showing us all the sources where data can be ingested from. The very first item in the list is Excel. Click the **Excel** then click the **Connect** button in the lower right hand corner.

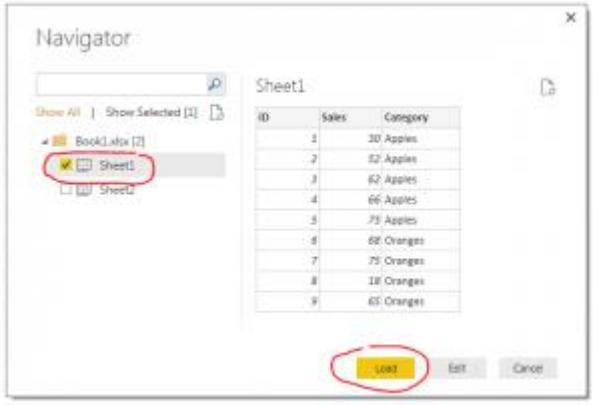


Select Excel as Data Source

After clicking **Connect** a new window will pop up asking for the location of the Excel file. Navigate to our sample data called Book1.xlsx you can down load the actual file I used here: **Book1** I saved my Book1.xlsx file on the desktop of my computer. Select **Book1** and then Click **Open**.

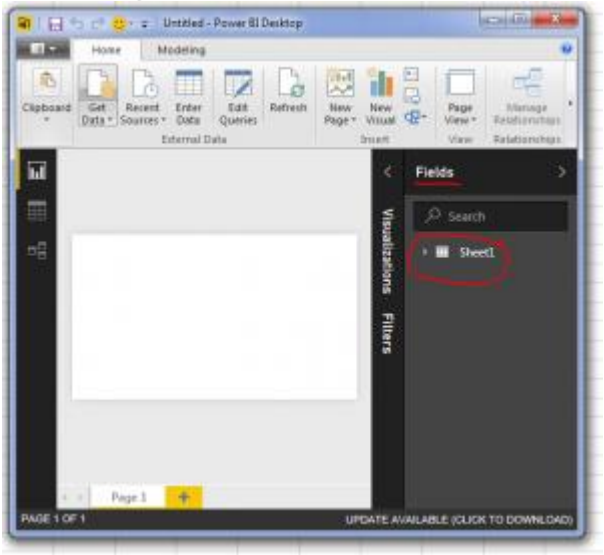
Open Excel File Dialog Box

Next we are presented with the Navigator screen that reveals what is inside the workbook. There are two sheets. For now we are only interested in the data on Sheet1. Select **Sheet1** and then click **Load**. This will load our data from Sheet1 into the Power BI Desktop data model.



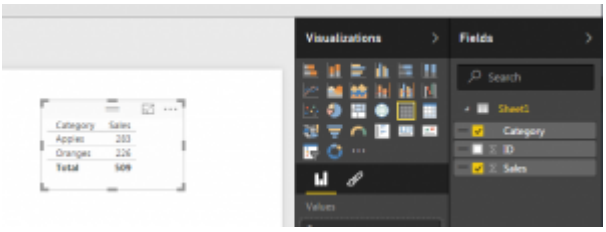
Navigator Selection Screen

Now our data has been added to the Power BI Desktop data model. The data and the various columns we loaded can be found in the tool bar at the far right of PBI called Fields.



Location of Loaded Excel Data

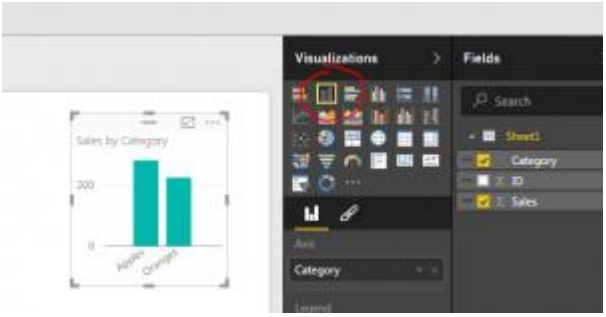
Tech Tip: Power BI Desktop (PBI) opening the file and loading the relevant data into the memory of the computer. This has an approximate 4 to 1 compression ratio. In practical terms this means that a 100MB file will only consume 25MB of file size in PBI when it is saved. This is extremely useful as the data model can be quite large when loading multiple data files but the PBI file will compress down to a manageable size.



Make a Data from Column Sales and Category

Finally, the Sheet1 data table can be expanded into is respective columns by clicking the triangle next to the table icon. Finally you can drag and drop the column names into the visualization page to begin making visualizations. For this demo I used the Category Column and the Sales column to make a table.

By selecting a different visualization in the visualizations bar you can change your data table into a Bar Chart.



Data Transformed into a Bar Chart

Well that is it for the first tutorial. Share your thoughts and comments below. Let me know if you have any suggestions on what you would like to see next.