



Dashboard in a Day

Last Updated:

19/06/2016

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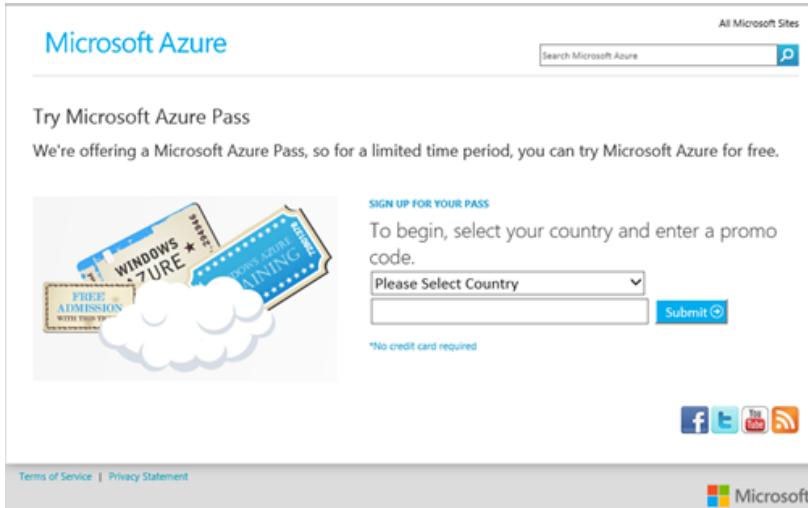
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Lab Prerequisites

Activating an Azure Subscription

To complete this lab from any device we are going to run the lab from a virtual machine in Azure which avoids the need to install any software on the device you have with you and allows you to use a tablet like an iPad as well as a laptop. The first thing we need to do is to activate our Azure trial subscriptions..

Steps	
<ol style="list-style-type: none">1. Go to http://microsoftazurepass.com.2. Select your country, type in the provided promo code and click Submit.	

3. Sign into a Microsoft account to continue. If you have an account password saved or you automatically sign into other Microsoft services that Microsoft account will be used to redeem the promo code.

4. Fill out the remaining information and click **Submit**

Microsoft Azure

All Microsoft Sites

Search Microsoft Azure

Fill out the remaining information, then click submit.

First Name* Ed

Last Name* Donahue

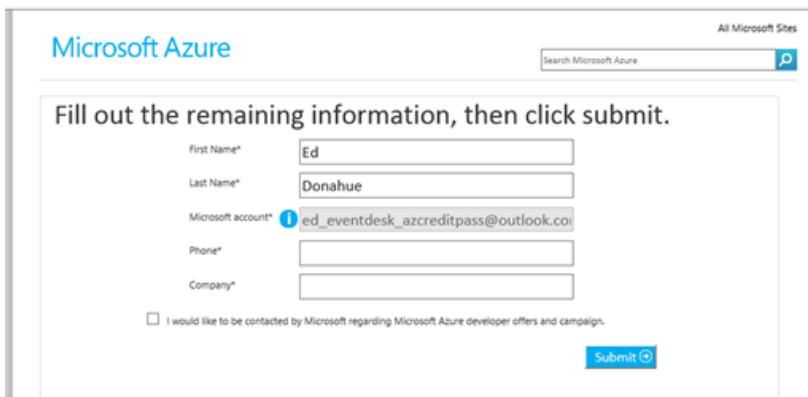
Microsoft account* [ed_eventdesk_azcreditpass@outlook.co](#)

Phone*

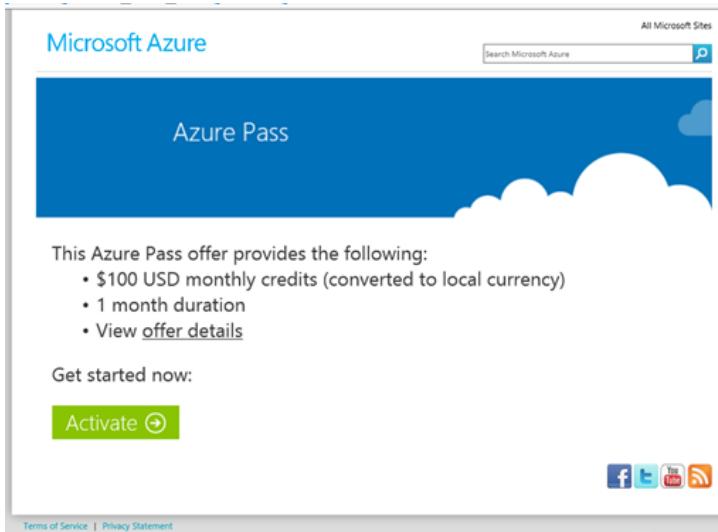
Company*

I would like to be contacted by Microsoft regarding Microsoft Azure developer offers and campaigns.

Submit



5. Review the Azure Pass offer and click **Activate**.

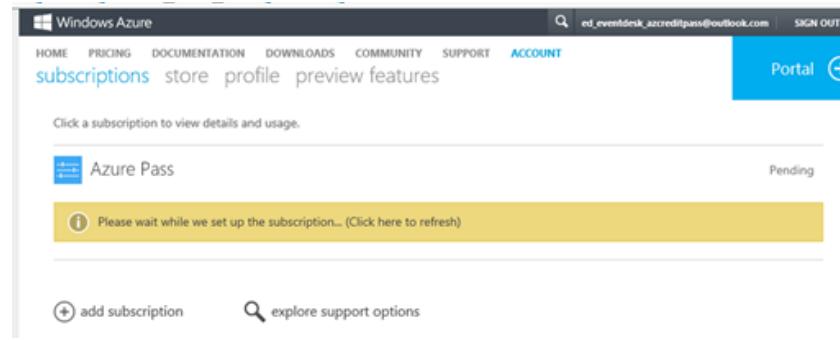


6. Fill out the rest of the required information and click **Sign up**.



The screenshot shows the Windows Azure sign-up process. On the left, there's a blue sidebar with the title "Sign up" and "Azure Pass". The main area is titled "About you" and contains fields for First Name (Ed), Last Name (Donahue), Country/Region (United States), Contact Email (ed_eventdesk_accreditpass@outlook.com), and Company Name (Optional). Below this is a section for "Contact phone number" with a dropdown set to "United States (+1)" and a text input showing "(425) 555-0100". At the bottom is an "Agreement" section with a checkbox for accepting the Windows Azure Agreement, Offer Details, and Privacy Statement, followed by a "Sign up" button.

7. The process will take a couple of minutes to complete..



8. And then you should get a screen like this..

The screenshot shows the Windows Azure portal interface. At the top, there's a navigation bar with links for HOME, PRICING, DOCUMENTATION, DOWNLOADS, COMMUNITY, SUPPORT, ACCOUNT, and a sign-in link for 'ed.eventdesk.accreditpass@outlook.com'. Below the navigation bar, the 'subscriptions' section is selected. A blue 'Portal' button with a right-pointing arrow is visible.

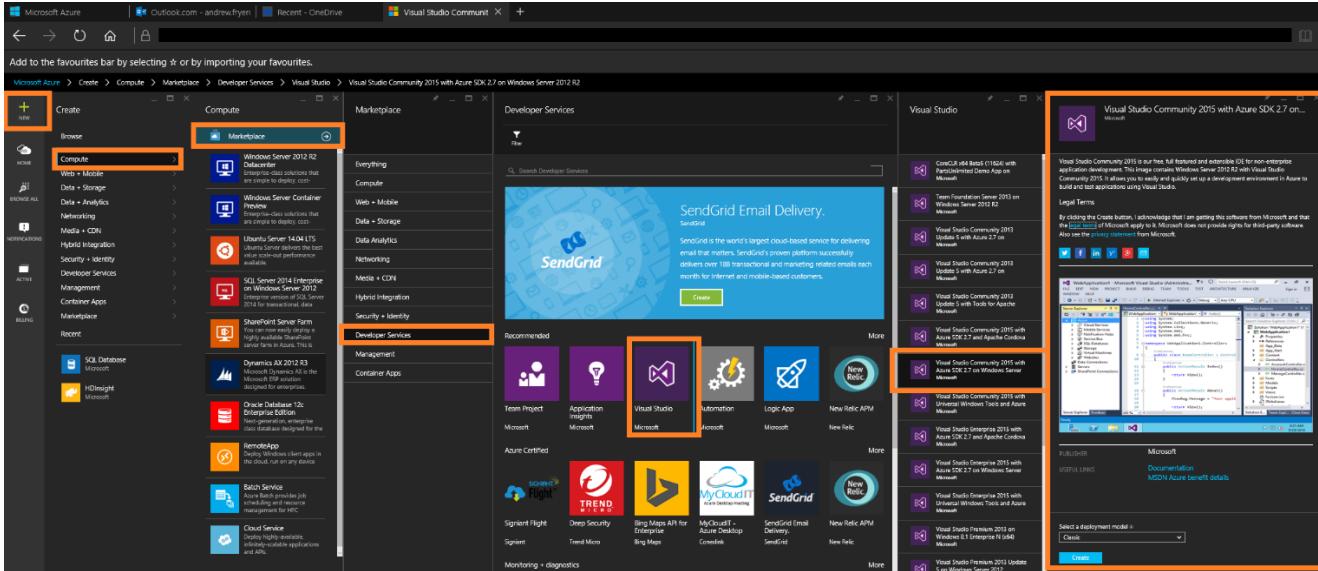
The main content area is titled 'Summary for Azure Pass'. It features two tabs: 'OVERVIEW' (selected) and 'BILLING HISTORY'. The 'OVERVIEW' tab displays a green progress bar indicating a spending limit of '\$100.00' across a range from '\$0.00' to '\$100.00'. A note states: 'Your monthly credit expires on 11/12/2014.' There's also a 'Pricing calculator' link. Below the bar, it says: 'You have not used any services recently with this subscription.'

To the right, a 'SUBSCRIPTION STATUS' box shows '30 days left' and '\$100 credits remaining*'. A green button labeled 'Remove spending limit' with a circular arrow icon is present. Below this, the 'NEXT BILL (ESTIMATED)' section shows '\$0.00'. At the bottom, it indicates the 'DATE PURCHASED' as '10/13/2014'.

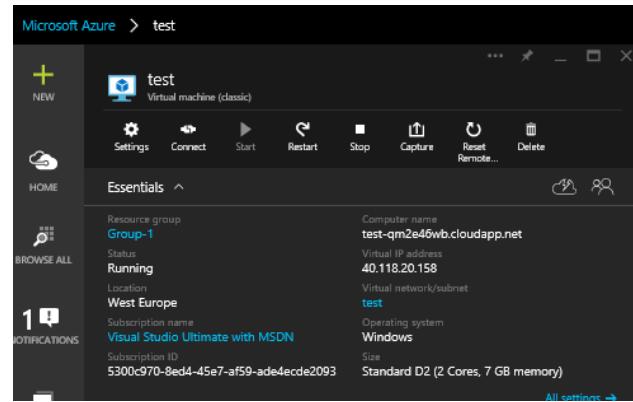
Creating an Azure Virtual Machine

One of the easiest things to do in Azure is to create a virtual machine (VM), there are many preconfigured images already which we can use to create a VM based on a version of Windows or linux on top of which are various applications and services. For our lab today we'll be using an image on the gallery based on Visual Studio 2013 running on Windows Server 2012 R2 to which we'll add the Power BI desktop application.

Azure is managed from one of two web portals the management portal and the preview portal and for the purposes of this lab we'll use the newer preview portal at <https://portal.azure.com>

Steps	
<ol style="list-style-type: none">From the new  icon select Compute -> Developer Services -> Visual Studio -> Visual Studio 2013 Community 2013 update 5 with Azure 2.7 on windows server 2012R2..Click create and complete the details in the VM blade, host name, user name password and which data centre you want the VM to be in (e.g. Northern Europe = Ireland).	

3. select connect from the toolbar and Azure will download an .rdp file we can use to connect to our VM. Note: it will have been saved to downloads and you could edit this in the normal way to share local drives and devices if required.



For the remainder of this lab we'll do everything from inside this VM

Sign up to Power BI

- **Signup:** Go to www.powerbi.com and sign up for a Power BI with a business email address.
- Download and install **Microsoft Power BI Desktop** and **Microsoft Personal Gateway** from <https://powerbi.microsoft.com/downloads>. Don't launch the Personal Gateway yet we'll cover that in a later module in this lab.

Sample Data and lab Guide

The data used in this lab is partly stored on Azure in a SQL Data Warehouse (SQLDW) and there are a few local files and the lab guide itself which can be found on One Drive at ..

NOTE: This lab is using real anonymized data and is provided by ObviEnce LLC. Visit their site to learn about their services: www.obvience.com .

This data is property of obviEnce llc and has been shared for the purpose of demonstrating PowerBI functionality with industry sample data. Any uses of this data must include this attribution to obviEnce, LLC.

Introduction

In this lab, we will explore the rich reporting and analytical capabilities of Power BI using the Power BI Designer.

At a basic level BI Designer allows a business user with a working knowledge of Excel to create and share rich reports from a variety of sources they have access to both inside their organisation and available publicly. However, it can go far beyond this to create complex business calculations across disparate sets of data and also allows access to certain data to be restricted.

It's also worth mentioning that currently Power BI is only available as a cloud service although it can access and render data from on premises servers via the Power BI Personal Gateway To sign up for a trial of Power BI service you'll need an organisation e-mail account (as to a personal one like google.com, outlook.com etc.)

Much of the functionality in the BI Designer has been available via the Power * (Power Pivot, Power Query, Power Map etc.) add-ins to Excel but there is no dependency on having Excel to use the Designer tool as we shall see.

Data Set

The dataset you will use today is a sales and market share analysis. This type of analysis is very common for the office of a Chief Marketing Officer (CMO). Unlike the office of the Chief Financial Officer (CFO), a CMO is focused not only on company's performance internally (how well do our products sell) but also externally (how well do we do against the competing products).

The company, VanArsdel, manufactures expensive electronic products that could be used for fun as well as work and it sells them directly to consumers nationwide as well as several other countries. VanArsdel and its competitors have retained a 3rd party marketing company to collect and anonymize industry sales so that all participants can benchmark themselves.

Course Outline

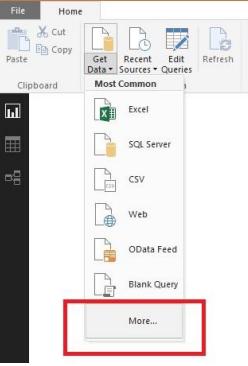
1. Power BI Desktop
2. Power BI Service – Part I
3. Power BI Service – Part II
4. Q&A
5. Create your own Dashboard

Power BI Desktop

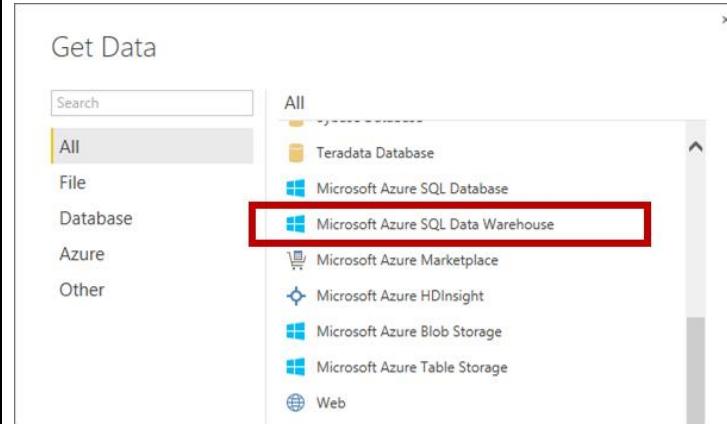
Importing Data

In this section you will be importing sales data of VanArsdel and competing companies within United States which are being maintained in an access database. In addition you also will be merging sales data from other countries.

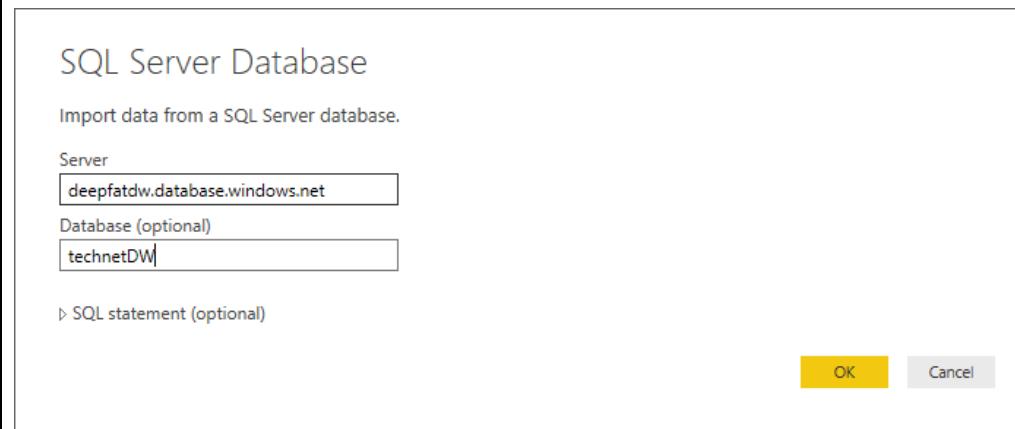
Launching Power BI Desktop and Loading Data

Steps	
<ol style="list-style-type: none">1. Launch Power BI Desktop.2. Click the play button to get an overview of Power BI Desktop3. Click the close icon.	
4. Select the Get Data item in the Home ribbon and click More...	

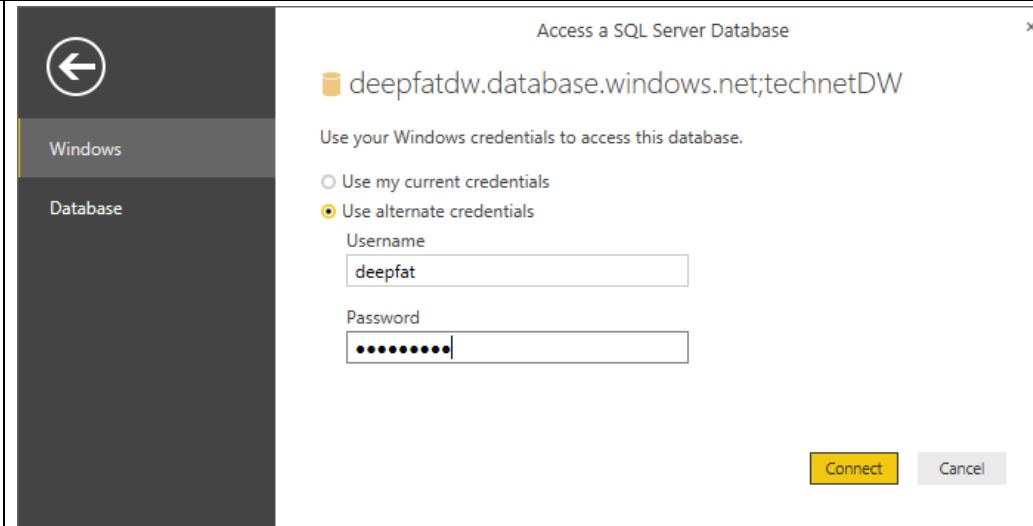
- 5 Scroll down to Microsoft Azure SQL Data Warehouse and click **Connect**



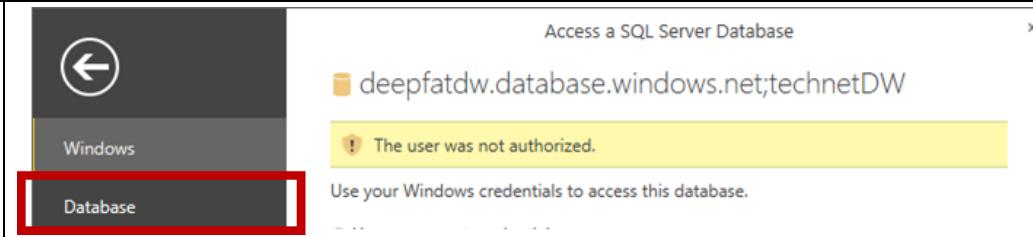
6. Enter **deepfatdw.database.windows.net** as the server and **TechNetDW** as the database and click **OK**



8. Select Use alternate credentials,
Username **deepfat**
Password **Passw0rd!**
And click Connect



9. If you get an error The user was not authorized
then click on Database on the left hand pane
and enter the same credentials and click
Connect again



10. In the Navigator window select all the tables but **not** the function at the end of the list .

After completing your selection you have three options.

- **Cancel** gets you back to the main canvas.
- **Load** , loads the data from the source into Power BI Desktop for you to start creating reports.
- **Edit** allows you perform data shaping operations such as merging columns, adding additional columns, changing data types of columns as well as bringing in additional data.

11. Click Edit as shown in the diagram.

The screenshot shows the Power BI Navigator window. On the left, under the 'deepfatdw.database.windows.net: technetDW [7]' connection, several tables are listed with checkboxes: bi_date, bi_geo, bi_manufacturer, bi_product, bi_salesFact, and bi_sentiment. All checkboxes are checked except for the last one. A red box highlights this list of tables. To the right, a table named 'bi_sentiment' is displayed with columns ID, DateID, StateID, ManufacturerID, Score, and Manufacturer. The data shows various manufacturer IDs and names like Fama, Aliqui, Pirum, Maximus, etc. At the bottom of the Navigator window, there are three buttons: 'Load' (yellow), 'Edit' (highlighted with a red box), and 'Cancel' (grey).

ID	DateID	StateID	ManufacturerID	Score	Manufacturer
9917	21	21		5	65 Fama
10407	23	12		2	20 Aliqui
10895	23	35		10	71 Pirum
11382	24	12		7	70 Maximus
11870	24	38		2	78 Aliqui
12359	15	38		13	77 Salvus
12849	15	33		5	61 Fama
13337	16	13		3	14 Barba
13826	16	5		2	16 Aliqui
14316	16	22		3	83 Barba
14803	17	41		4	70 Currus
15291	17	41		12	89 Quibus
15779	18	28		13	74 Salvus
16269	18	37		6	83 Leo
16758	18	45		3	85 Barba
17246	19	28		7	33 Maximus
17737	19	11		4	14 Currus
18227	20	13		8	87 Natura
18716	20	30		4	64 Currus
19203	20	5		4	29 Currus
9770	21	49		4	81 Currus
9918	21	28		6	66 Leo
10408	23	28		8	78 Natura

Transforming your Data

In most cases you might find that the table or column names are typically system generated and they might not be end user friendly names that are easy to understand. In addition, for you to present the data to your end users you might need additional data shaping operations such as merging columns such as "First Name" and "Last Name" of an employee to be called as Name. In this section you will be performing certain data shaping operations to transform the data you will be bringing into Power BI Desktop to make them end user friendly.

Renaming names of the table

1. You will land into the Query Editor window as shown in the diagram. Select the each query name as shown in the diagram and rename them in the Query Settings section with names shown in the table below. If you do not see Query Settings window click on "View" tab in Ribbon and select "Query Settings".

Initial name	Final name
bi_date	Date
bi_geo	Geography
bi_manufacturer	Manufacturer
bi_product	Product
bi_salesFact	Sales
bi_sentiment	Sentiment

The screenshot shows the Power BI Query Editor interface. On the left, there is a list of '6 Queries' with 'bi_date' selected. The main area displays a table with 23 rows and 7 columns, showing dates from 1999-01-01 to 1999-01-23. The columns are labeled: Date, MonthNo, MonthName, MonthID, Month, Quarter, and Year. On the right, the 'Query Settings' pane is open, showing the 'Properties' section where the 'Name' field is set to 'Date'. Below it, the 'Applied Steps' pane shows the steps 'Source' and 'Navigation' with checkmarks. A red box highlights the 'Name' field in the 'Properties' section of the Query Settings pane.

Changing data types of columns

1. Select the Date Query.
2. Select the column Date as shown in the diagram.
3. Change the data type of Date from Text to Date.

Note: If the data type is accurately specified in the source ,as in this case Power BI desktop automatically infers the right data types for the columns. If not, it is very important you specify the right data types for the columns for efficient data analysis. Power BI Desktop automatically infers the Date table that is typically needed for time intelligence calculations based on the data type Date for a column that's unique.

The screenshot shows the Power BI Desktop interface with the 'Date' query selected in the 'Queries' pane. The 'Transform' ribbon is open, and the 'Data Type' dropdown menu is highlighted, showing 'Text' and 'Date/Time'. The main area displays a table with columns: Date, MonthNo, MonthName, MonthID, Month, Quarter, and Year. The table contains 999+ rows of date information. The 'Query Settings' pane on the right shows the 'Name' is 'Date' under 'PROPERTIES'.

4. Select the Revenue column in the Sales table and change the data type to Decimal Number and the format to Currency.

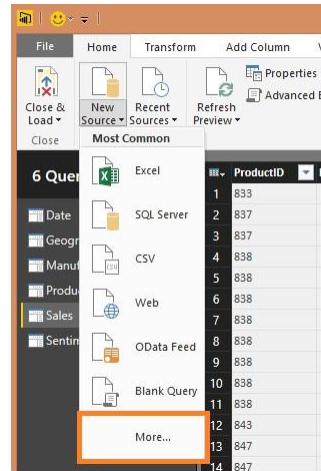
Note: On the right side under "APPLIED STEPS" you will see the list of transformations and steps that have been applied. You can delete a step to get back to the previous state or go through each step of the transformation. We encourage you to explore this.

The screenshot shows the Microsoft Power BI Query Editor interface. A context menu is open over the 'Revenue' column, specifically at the cell containing '813.6975'. The menu path 'Data Type: Decimal Number' is shown, with 'Currency' highlighted. The preview pane at the bottom indicates '5 COLUMNS, 999+ ROWS' and was 'PREVIEW DOWNLOADED AT 12:38 AM'.

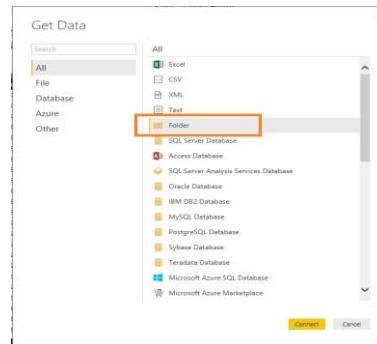
Adding additional data

You have the sales information for various products sold in the countries Canada, France and Mexico as comma separated files in a folder which you get daily from a different transactional system. Since these are additional sales data, you want to analyze the data along with the United States Sales data you imported from the access database. In this section you will perform operations to add international sales data to the Sales table.

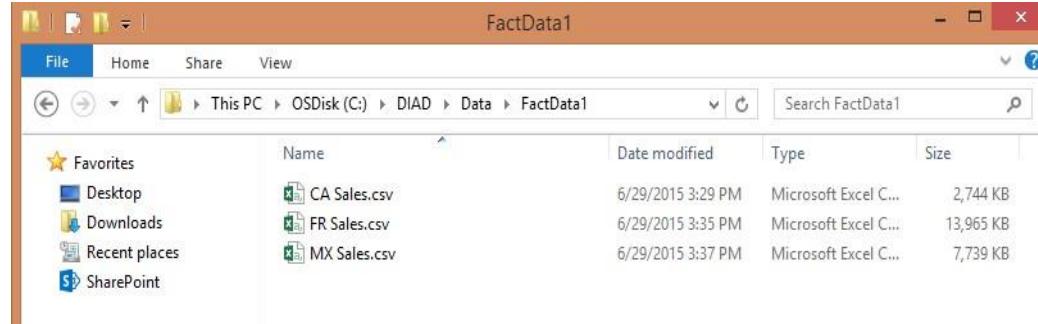
1. In the Home of the Query Editor click on New Source drop down and select “More...” as shown in the figure.



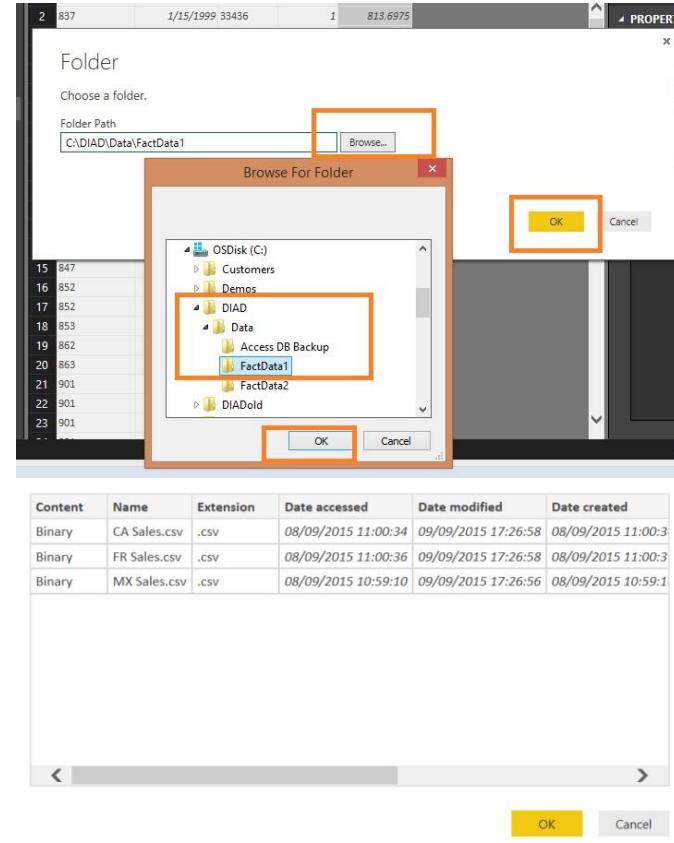
2. In the Get Data dialog select “Folder” as shown in the diagram and click Connect



3. Locate the FactData1 folder which you was part of the downloaded contents for the class. This folder contains the sales information for Canada, France and Mexico as separate CSV files.



4. You will see the Folder dialog.
5. Click the Browse... button
6. In the “Browse For Folder” select the folder FactData1 which was obtained from the contents of the class and click Ok. The FactData1 folder contains the sales information for Canada, France and Mexico
7. In the Folder dialog click OK as shown in diagram.



8. You will be in the Query Editor window with a new query called "Query1".
9. If you do not see the Queries pane on left click on the > icon to expand
10. If you do not see the Query Settings pane on the right shown in the figure click on "View" in the ribbon and click "Query Settings" to see the pane.
11. Change the name of the query to International Sales as shown in the diagram.
12. You will see the metadata information of each and every file in the folder.

The screenshot shows the Power BI Query Editor interface. On the left, the 'Queries' pane lists seven items: Date, Geography, Manufacturer, Product, Sales, Sentiment, and Query1. The 'Query1' item is highlighted with an orange box. In the center, there is a table view showing three rows of data with columns: Content, Name, Extension, Date accessed, Date modified, Date created, and Attribute. The first row is highlighted with an orange box. On the right, the 'Query Settings' pane is open, showing the 'Properties' section where the 'Name' field is set to 'International Sales'. There is also a 'All Properties' link and an 'Applied Steps' section.

Content	Name	Extensi...	Date accessed	Date modified	Date created	Attribute
Binary	A Sales.csv	.csv	7/10/2015 8:16:31 PM	6/29/2015 3:29:32 PM	7/10/2015 8:16:31 PM	Record
Binary	R Sales.csv	.csv	7/10/2015 8:16:31 PM	6/29/2015 3:35:32 PM	7/10/2015 8:16:31 PM	Record
Binary	MX Sales.csv	.csv	7/10/2015 8:16:32 PM	6/29/2015 3:37:00 PM	7/10/2015 8:16:32 PM	Record

13. You need the actual sales data from the files and are not interested in the metadata.
14. The actual data from the files is contained within the "Content" column shown in the figure. We are not interested in the metadata of other columns in this exercise. Right click on the column "Content" and select "Remove Other Columns".

Note: If you are interested in information from other columns such as date modified (the date / time when you receive the CSV files from your international subs), you are welcome to include those. Power BI Desktop provides the functionality and flexibility to shape your contents as needed for your business.

The screenshot shows the Power BI Desktop interface with the title bar 'International Sales - Query'. The ribbon has tabs like File, Home, Transform, Add Column, View, etc. On the left, there's a sidebar with '7 Queries' and a list of tables: Date, Geography, Manufacturer, Product, Sales, Sentiment, and International Sales (which is selected). In the main area, there's a table with columns: Content, Row#, Remove, and Date modified. The 'Content' column contains three rows labeled 1, 2, and 3, each with the value 'Binary'. A context menu is open over the 'Content' column header, listing options: Remove Other Columns (highlighted and circled in orange), Duplicate Column, Remove Duplicates, Remove Errors, Change Type, Transform, Replace Errors..., and Group By... .

15. Click the icon next to Content shown in the figure to expand the data in this column.

Note: In this example, you have data that's shown as "Binary" by Power BI Desktop since it has not analyzed the data. You can potentially have nested tables as in JSON format within a table and in those examples Power BI Desktop will show tables which you can then expand in a similar manner.

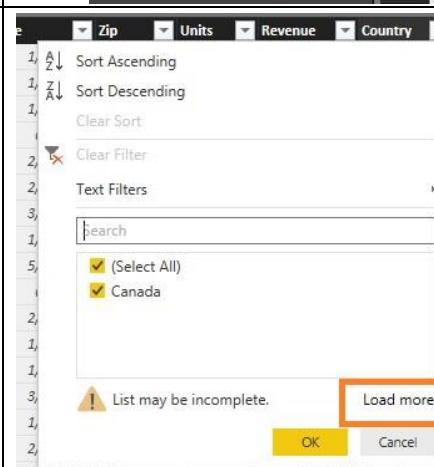
This screenshot shows the same Power BI Desktop interface as the previous one, but the focus is on the 'Content' column header. A small icon (a square with a dot) is visible next to the 'Content' column header, and it is circled in orange to indicate where to click to expand the data.

16. You will now see the Content column expanded to the Sales information.
17. If you compare the Sales table you already imported, you will see the "International Sales" now contains a new column called Country.

The screenshot shows the Power BI Data Editor interface. On the left, there's a sidebar titled "7 Queries" containing items like Date, Geography, Manufacturer, Product, Sales, Sentiment, and International Sales. The main area displays a table with 13 rows and columns for ProductID, Date, Zip, Units, Revenue, and Country. All entries in the Country column are "Canada".

	ProductID	Date	Zip	Units	Revenue	Country
1	725	1/15/1999 H1B		1	115.4475	Canada
2	2235	1/15/1999 H1B		2	131.145	Canada
3	713	1/15/1999 H1B		1	160.0725	Canada
4	574	6/5/2002 H1B		1	869.1375	Canada
5	94	2/15/1999 H1B		1	866.25	Canada
6	609	2/15/1999 H1B		1	778.8375	Canada
7	2064	3/15/1999 H1B		2	976.395	Canada
8	714	1/15/1999 H1B		1	160.0725	Canada
9	826	5/31/2002 H1B		1	944.9475	Canada
10	2149	6/6/2002 H1B		2	871.395	Canada
11	992	2/15/1999 H1B		1	288.6975	Canada
12	726	1/15/1999 M4X		1	115.4475	Canada
13	725	1/15/1999 M4X		1	115.4475	Canada

18. Click on the drop down next to Country column to see the unique values.
19. You will only see Canada as shown in the figure.
20. Click on Load more to validate you have data from various countries included.



21. You will see the countries, Canada, France, Mexico. In addition you see Country. The reason why you see Country here is due to the fact the CSV files for France and Mexico contain header row where you have the value Country. We do not want to include the header rows.
22. Click on the check box next to Country to deselect it as shown in the Figure and click OK.

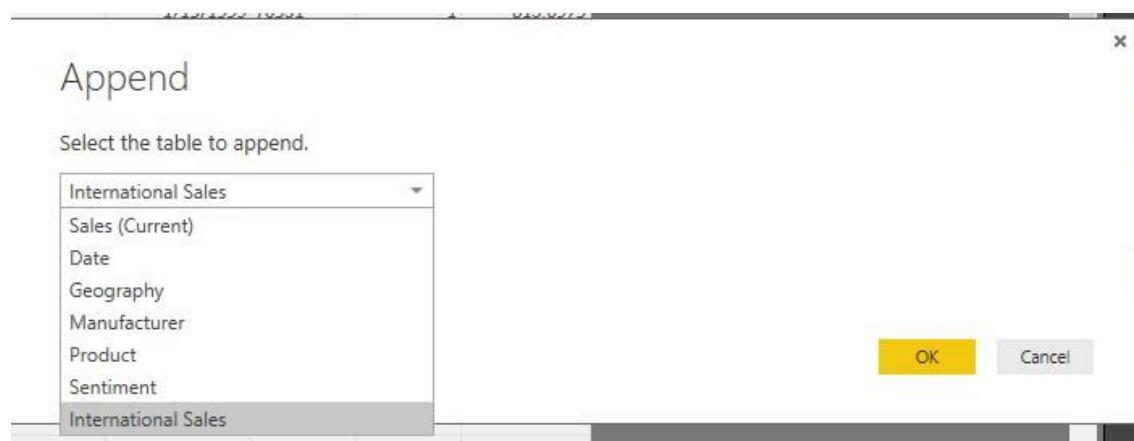
Note: You can do various types of Filters, sorting ascending/descending operations using this drop down to verify your data import and shaping operations.

The screenshot shows a data grid with columns: ProductID, Date, Zip, Units, Revenue, and Country. A context menu is open over the 'Country' column, specifically at the row for 'Country'. The menu includes options like 'Sort Ascending', 'Sort Descending', 'Clear Sort', 'Clear Filter', and a 'Text Filters' section. In the 'Text Filters' section, there is a dropdown menu with the following items: '(Select All)', 'Canada' (selected), 'Country' (highlighted with a red box), 'France', and 'Mexico'. At the bottom right of the menu are 'OK' and 'Cancel' buttons.

23. In order to analyze the Sales in all countries, it is convenient to have a single Sales table. Hence you want to append all the rows from InternationalSales to Sales.
24. Select Sales in the Queries window as shown in the figure.
25. Click on the Append Queries in the Home ribbon on the top right corner as shown in the figure.

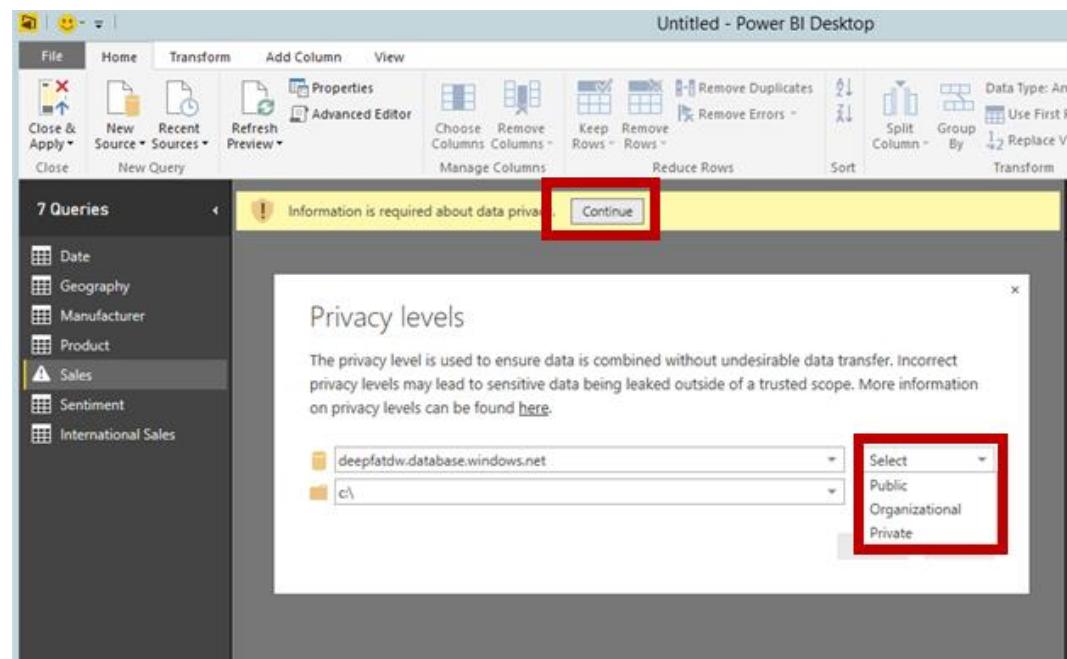
The screenshot shows the Power BI Query Editor interface. The ribbon has a 'Home' tab selected. On the far right of the ribbon, there is a 'Transform' tab with several icons. One of these icons, 'Append Queries', is highlighted with a red box. The main area of the editor shows a table with 12 rows and columns for ProductID, Date, Zip, Units, Revenue, and others. To the left, a 'Queries' pane lists seven queries: Date, Geography, Manufacturer, Product, Sales (highlighted with a red box), Sentiment, and International Sales. On the right side, there are sections for 'PROPERTIES' (Name: Sales) and 'APPLIED STEPS' (Source, Navigation, Changed Type).

26. In the Append window select "International Sales" as shown in the figure and click OK.

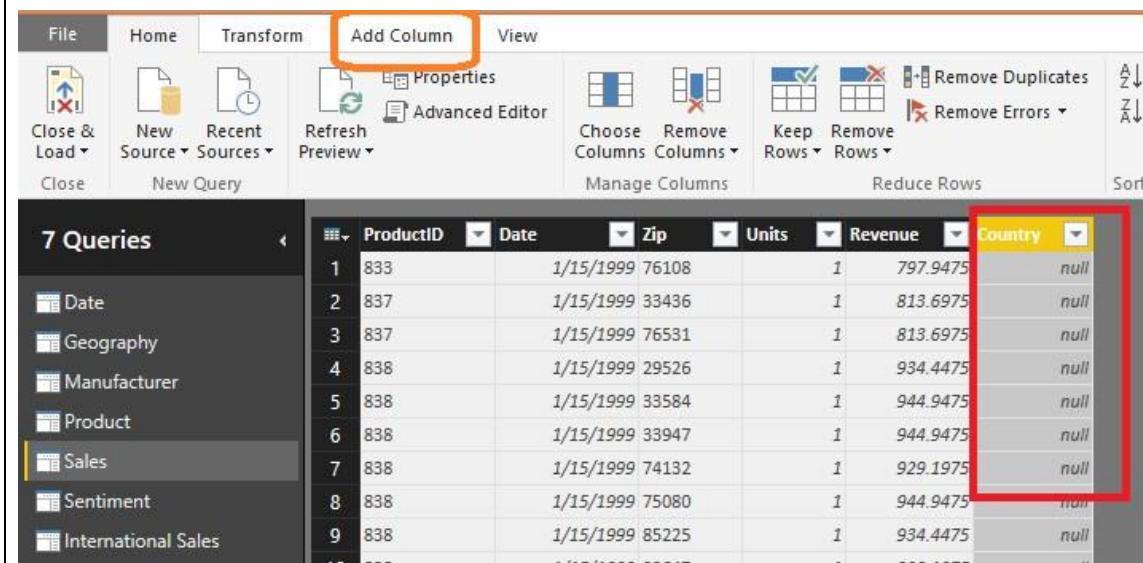


Notice that we now get a warning **Information is required about data privacy**. This is because we are joining data from the cloud (Azure DW) with another source that is on premises (the csv files).

27. Click On Continue
28. In the row for the Azure DW click on Select and select **Organizational**
29. On the second row select the location of the csv files we just loaded and select Organizational again.
30. Click Save



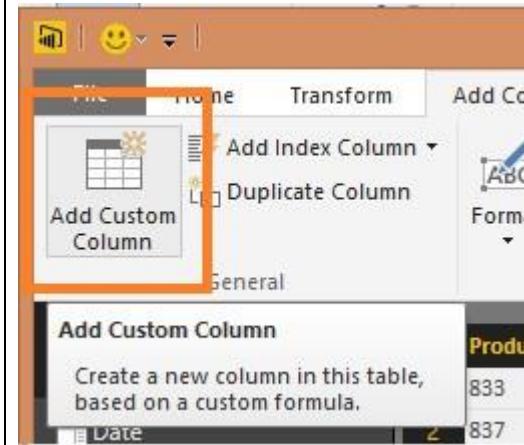
27. You will now see a new column in Sales table called Country since Power BI Desktop added the rows from International Sales to the Sales.
28. You see null values since by default the Sales table did not have a Country column. We will add the value USA as a data shaping operation.
29. Click on the AddColumn as shown in the figure.



The screenshot shows the Power BI Desktop ribbon with the 'Add Column' tab highlighted. Below the ribbon is a table view showing 10 rows of data. The columns are ProductID, Date, Zip, Units, Revenue, and Country. The 'Country' column contains several 'null' values. A red box highlights the 'Country' column header and the first few rows of the data.

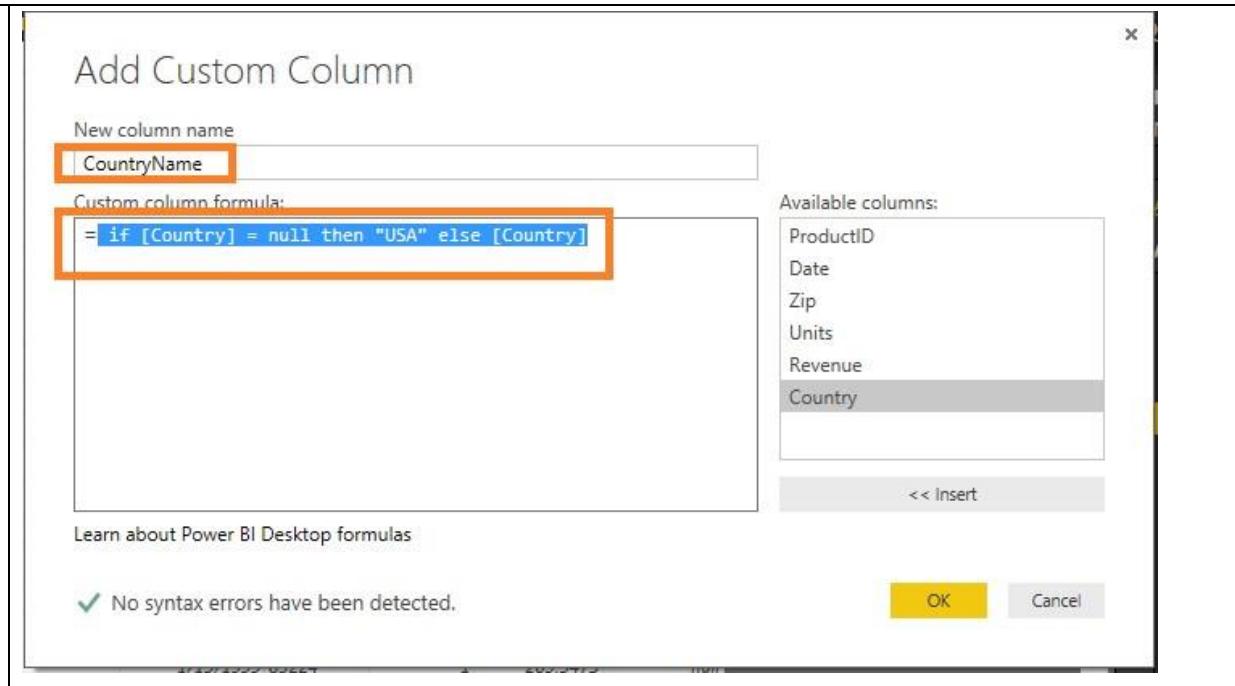
	ProductID	Date	Zip	Units	Revenue	Country
1	833	1/15/1999	76108	1	797.9475	null
2	837	1/15/1999	33436	1	813.6975	null
3	837	1/15/1999	76531	1	813.6975	null
4	838	1/15/1999	29526	1	934.4475	null
5	838	1/15/1999	33584	1	944.9475	null
6	838	1/15/1999	33947	1	944.9475	null
7	838	1/15/1999	74132	1	929.1975	null
8	838	1/15/1999	75080	1	944.9475	null
9	838	1/15/1999	85225	1	934.4475	null

30. Click on Add Custom Column in the Add Column tab in the Ribbon



31. In the Add Custom Column dialog, enter name of the column as "CountryName".
32. In the Custom column formula editor enter following formula after the "=" sign
- ```
if [Country] = null then "USA" else
[Country]
```

Note: You can double click on the column names "Country" from the "Available columns" in the dialog. Please also note that "if then else" statement and null are case sensitive. Power BI Desktop does syntax checking as you type the formula.



33. You will see the CountryName column in the Query editor window.

The Country column is only required as a temporary column. It is not required in the final table for analysis and can be removed.

|    | ProductID | Date      | Zip   | Units | Revenue  | Country | CountryName |
|----|-----------|-----------|-------|-------|----------|---------|-------------|
| 1  | 833       | 1/15/1999 | 76108 | 1     | 797.9475 | null    | USA         |
| 2  | 837       | 1/15/1999 | 33436 | 1     | 813.6975 | null    | USA         |
| 3  | 837       | 1/15/1999 | 76531 | 1     | 813.6975 | null    | USA         |
| 4  | 838       | 1/15/1999 | 29526 | 1     | 934.4475 | null    | USA         |
| 5  | 838       | 1/15/1999 | 33584 | 1     | 944.9475 | null    | USA         |
| 6  | 838       | 1/15/1999 | 33947 | 1     | 944.9475 | null    | USA         |
| 7  | 838       | 1/15/1999 | 74132 | 1     | 929.1975 | null    | USA         |
| 8  | 838       | 1/15/1999 | 75080 | 1     | 944.9475 | null    | USA         |
| 9  | 838       | 1/15/1999 | 85225 | 1     | 934.4475 | null    | USA         |
| 10 | 838       | 1/15/1999 | 92647 | 1     | 929.1975 | null    | USA         |
| 11 | 838       | 1/15/1999 | 92833 | 1     | 934.4475 | null    | USA         |

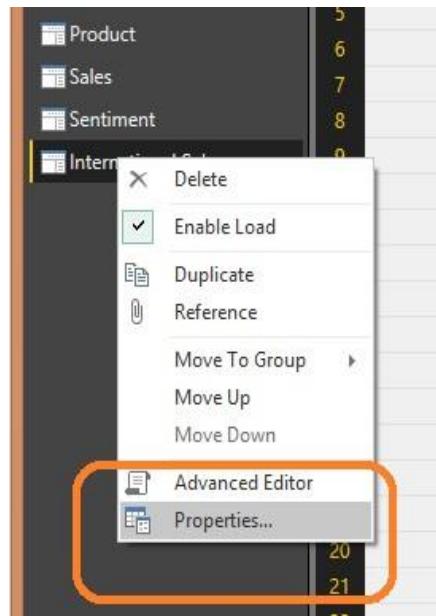
34. Right click on the Country column and select Remove as shown in the figure.

|    | ProductID | Date      | Zip   | Units | Revenue  | Country | CountryName |
|----|-----------|-----------|-------|-------|----------|---------|-------------|
| 1  | 833       | 1/15/1999 | 76108 | 1     | 797.9475 |         |             |
| 2  | 837       | 1/15/1999 | 33436 | 1     | 813.6975 |         |             |
| 3  | 837       | 1/15/1999 | 76531 | 1     | 813.6975 |         |             |
| 4  | 838       | 1/15/1999 | 29526 | 1     | 934.4475 |         |             |
| 5  | 838       | 1/15/1999 | 33584 | 1     | 944.9475 |         |             |
| 6  | 838       | 1/15/1999 | 33947 | 1     | 944.9475 |         |             |
| 7  | 838       | 1/15/1999 | 74132 | 1     | 929.1975 |         |             |
| 8  | 838       | 1/15/1999 | 75080 | 1     | 944.9475 |         |             |
| 9  | 838       | 1/15/1999 | 85225 | 1     | 934.4475 |         |             |
| 10 | 838       | 1/15/1999 | 92647 | 1     | 929.1975 |         |             |

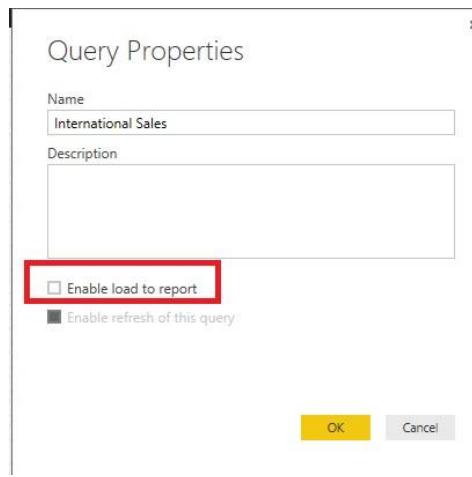
Context menu options for the Country column:

- Remove
- Remove Other Columns
- Duplicate Column
- Remove Duplicates
- Remove Errors
- Change Type
- Transform
- Replace Values...
- Replace Errors...

35. Since you have appended the rows from the **International Sales** table to **Sales** table, you don't need to load data into **International Sales** table. We will avoid the additional load using the Properties for "International Sales"..  
36. Select **International Sales**, right click and select Properties.



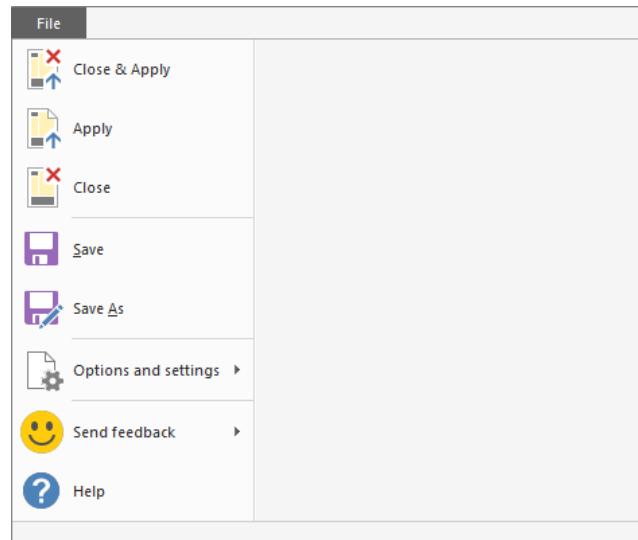
37. In the Query Properties window, click on the checkbox next to "Enable load to report" to deselect the load as shown in the figure.



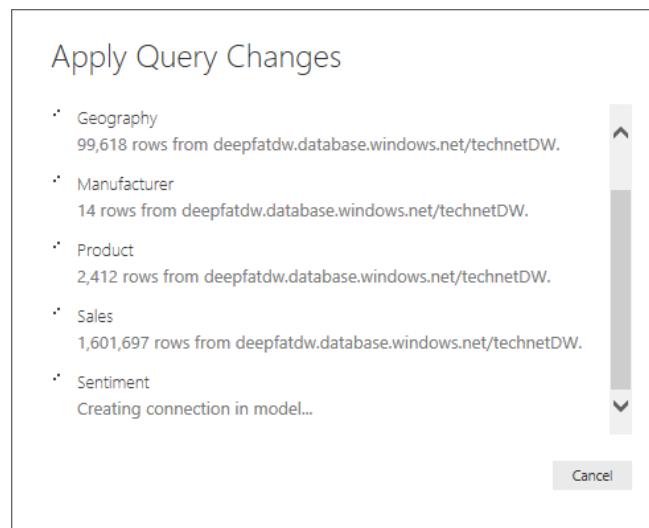
38. You have successfully completed import and data shaping operations and ready to load the data into Power BI Desktop for visualizing the data.

39. Click on File → Close & Apply.

Note: You can also close the window by clicking on the X on the top right corner.



40. All the data will be loaded in memory within Power BI Desktop. You will see the progress dialog with the number of rows being loaded in each table as shown in the Figure. It will take a few minutes to load all the tables



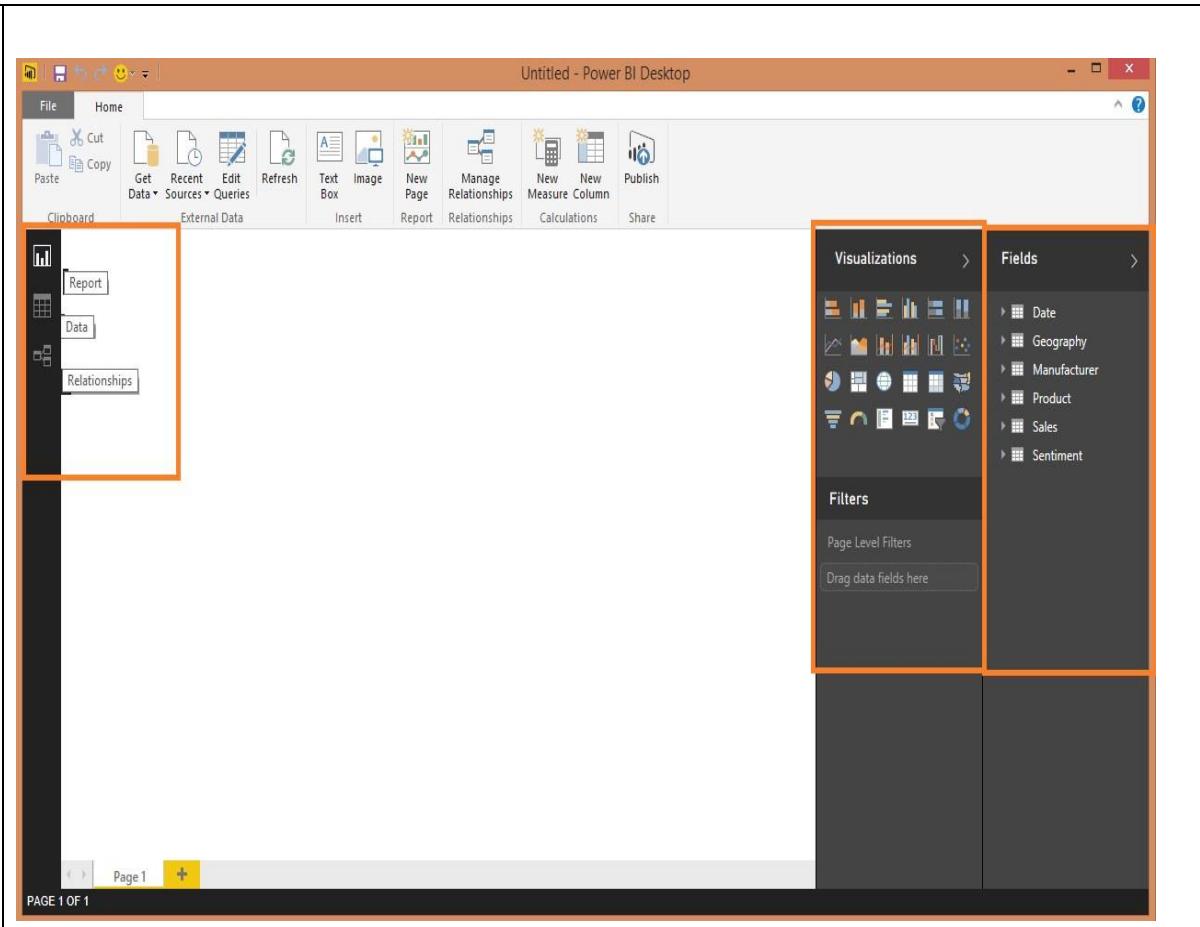
# Interactive Data Exploration

In this section we will learn the key parts of the Power BI desktop, do ad-hoc exploration of the data.

## Understanding the Power BI Desktop

1. You will now be returned to the main Power BI Desktop window. There are distinct sections in the Power BI Window to understand.
2. On the top you see the Home tab where the most common operations you perform are available.
3. **Fields** window on the right side as shown in the figure where you will see the list of tables. If you expand a table clicking on the  icon.
4. **Visualizations** window on the right allows you to select various visualizations, add the right columns to the axis or values of the visual and also allows you to add the columns to the filter.
5. The center white space is the canvas where you will be adding the visuals

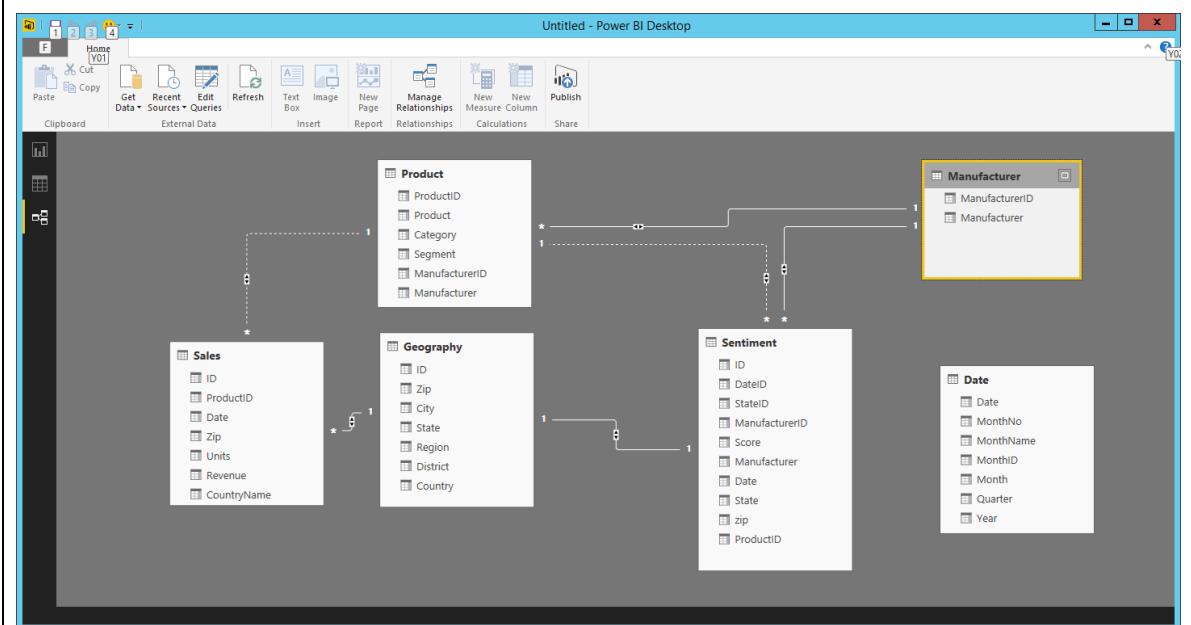
On the left side you have three icons, Report, Data and Relationships. Switching between these allows you to see the data and the relationships between the tables.



7. Click on the Data icon. You should notice a new tab Modeling can be seen as seen in the figure. We call all the tables you have imported as a data model. The key reason you are in this tab is to guide you through performing data model enhancements as you explore the data.
8. Click on the Sales Table in the **Fields** as shown in the figure.
9. You will see the data values for each of the columns. You can see the total number of rows in the Sales table to be ~11 Million rows.
10. Move the slider from top to bottom and you can see the various rows of this table. You should observe how fast you are able to navigate through ~ 11 Million rows.

The screenshot shows the Power BI Desktop interface with the 'Modeling' tab selected in the ribbon. The main area displays a table titled 'Sales' with columns: ProductID, Date, Zip, Units, Revenue, and CountryName. The 'Fields' pane on the right lists various tables: Date, Geography, Manufacturer, Product, Sales, and Sentiment. The 'Sales' table is expanded, showing its columns: ProductID, Date, Zip, Units, Revenue, and CountryName. A red box highlights the 'Sales' table in the Fields pane, and another red box highlights the table preview area.

11. Click on the **Relationships** icon. You will see the tables you have imported along with some relationships as well. The Power BI Desktop automatically infers relationships between the tables. However this process is not perfect:
12. For example there is no link between Sales and Data and although it's not apparent on the diagram the link between Sales to Geography is not correct.



13. Click on the line connecting **Sales** and **Geography** to see details of the join. The **Sales.SalesID** is the primary key of the **Sales** table in Azure DW, not a foreign key linking sales to primary key of the **Geography** table, **Geography.ID**. However we can't easily create the right realtionship from here as we need to use a combination of zip and country in each table to make the join so for now click **Cancel**.

Edit Relationship

Select tables and columns that relate to one another.

**Sales**

| ID      | ProductID | Date                       | Zip   | Units | Revenue   | CountryName |
|---------|-----------|----------------------------|-------|-------|-----------|-------------|
| 5496883 | 792       | Wednesday, August 31, 2005 | 08085 | 1     | \$65.5725 | USA         |
| 5496884 | 792       | Wednesday, August 31, 2005 | 11786 | 1     | \$65.5725 | USA         |
| 5496885 | 792       | Wednesday, August 31, 2005 | 13403 | 1     | \$65.5725 | USA         |
| 5496886 | 792       | Wednesday, August 31, 2005 | 18064 | 1     | \$65.5725 | USA         |
| 5496888 | 792       | Wednesday, August 31, 2005 | 20902 | 1     | \$65.5725 | USA         |

**Geography**

| ID    | Zip   | City   | State | Region               | District | Country |
|-------|-------|--------|-------|----------------------|----------|---------|
| 80692 | 68944 | Oaxaca | null  | San Juan Lalana      | Mexico   |         |
| 80693 | 68950 | Oaxaca | null  | San Juan Lalana      | Mexico   |         |
| 80694 | 68957 | Oaxaca | null  | San Juan Lalana      | Mexico   |         |
| 80695 | 68585 | Oaxaca | null  | San Juan de los Cues | Mexico   |         |
| 80696 | 70230 | Oaxaca | null  | San Juan Mazatlan    | Mexico   |         |

▲ Advanced options

Cardinality

Many to One (\*:1)

Cross filter direction

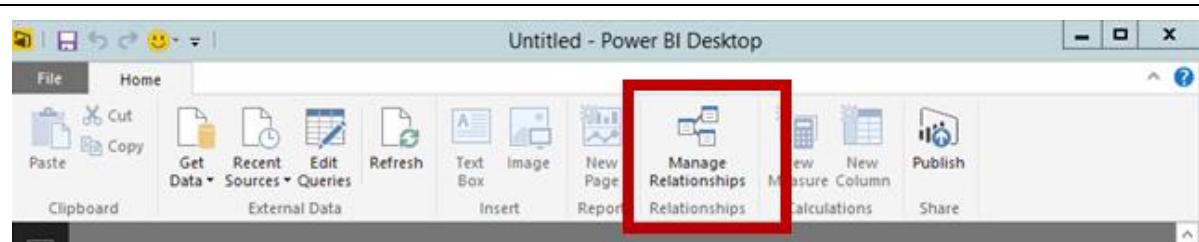
Both

Make this relationship active

**OK** **Cancel**

What we can do right now is to delete this relationship and create the relationship between the **Date** and **Sales** tables.

11. Click on the **Manage Relationships** in the ribbon



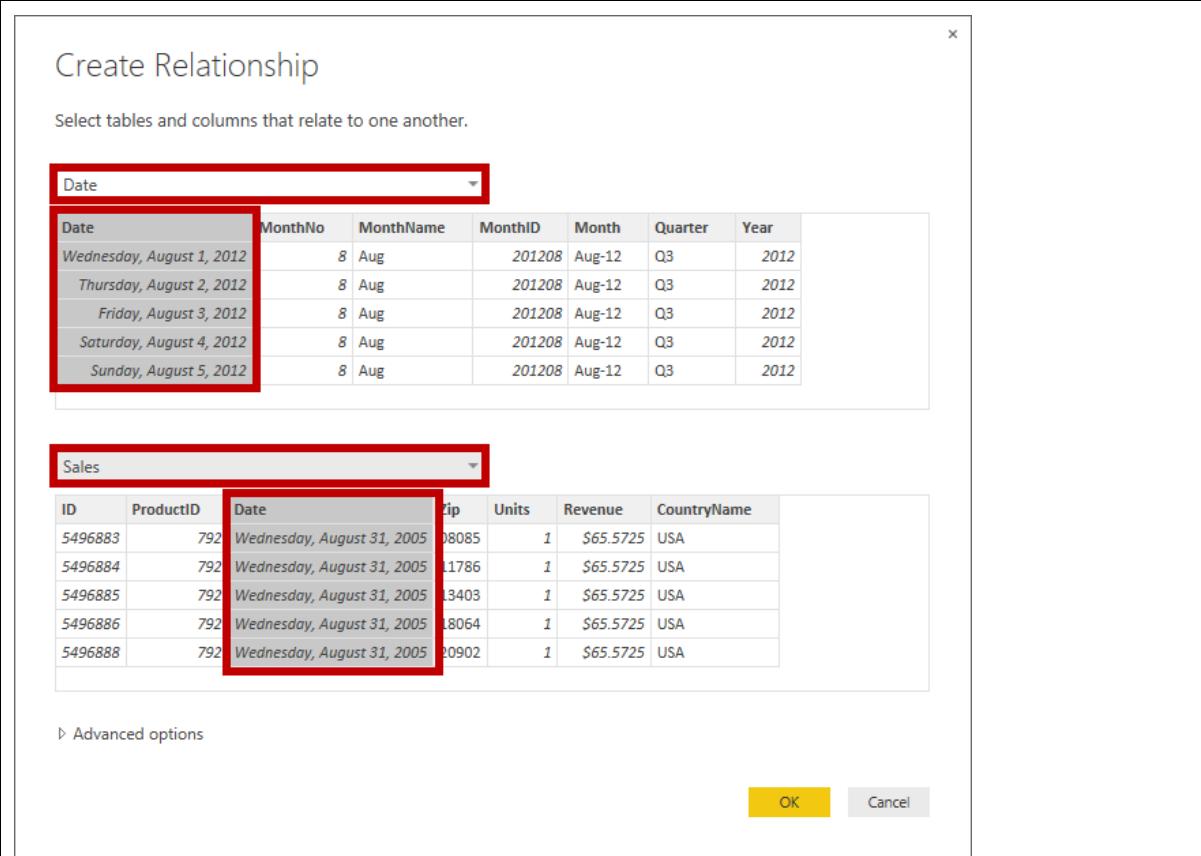
12. Select the row From **Sales** to **Geography** and click on **Delete** to remove this relationship for now.
13. Select the row From **Sentiment** to **Geography** and click on **Delete** to remove this relationship as it also incorrect.
14. Mark the row from **Sales** to **Product** as Active. Currently this relationship is not active because Power Bi has made connection to these tables via the **Geography** and **Sentiment** tables

A screenshot of the "Manage Relationships" dialog box. It contains a table with two columns: "From: Table (Column)" and "To: Table (Column)".

| Active                              | From: Table (Column)       | To: Table (Column)            |
|-------------------------------------|----------------------------|-------------------------------|
| <input checked="" type="checkbox"/> | Product (ManufacturerID)   | Manufacturer (ManufacturerID) |
| <input checked="" type="checkbox"/> | Sales (ID)                 | Geography (ID)                |
| <input type="checkbox"/>            | Sales (ProductID)          | Product (ProductID)           |
| <input checked="" type="checkbox"/> | Sentiment (ID)             | Geography (ID)                |
| <input checked="" type="checkbox"/> | Sentiment (ManufacturerID) | Manufacturer (ManufacturerID) |
| <input type="checkbox"/>            | Sentiment (ProductID)      | Product (ProductID)           |

At the bottom of the dialog box are buttons for "New...", "Autodetect...", "Edit...", "Delete", and "Close".

15. To connect the **Sales** and **Date** table click on **New** to bring up the **Create Relationship** dialog.
16. Click **Date** for the first table and **Sales** for the second table. Select the **Date** columns in each table as shown and click **OK** to create the relationship
17. Task: If there is a difference in the type/format of the data being joined from the Data and Sales Table this can cause issues when creating visuals – can you fix it ?



14. Please verify you see all the relationships with check boxes as shown in the figure. If you do not see some relationships enabled please click on the check boxes.

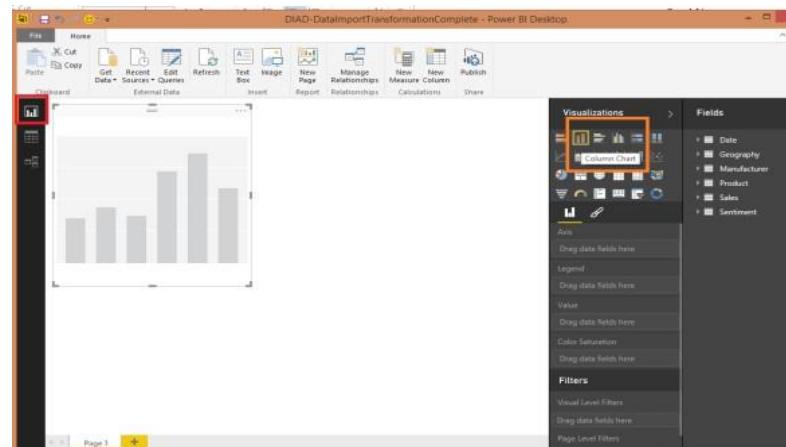
Note The order of these relationships down'st matter and also the relationship between Sentiment and Product table should **not be marked as active..**

| Manage Relationships                                 |                            |                                                |                       |
|------------------------------------------------------|----------------------------|------------------------------------------------|-----------------------|
| Active                                               | From: Table (Column)       | To: Table (Column)                             | x                     |
| <input checked="" type="checkbox"/>                  | Product (ManufacturerID)   | Manufacturer (ManufacturerID)                  |                       |
| <input checked="" type="checkbox"/>                  | Sentiment (ManufacturerID) | Manufacturer (ManufacturerID)                  |                       |
| <input type="checkbox"/>                             | Sentiment (ProductID)      | Product (ProductID)                            |                       |
| <input checked="" type="checkbox"/>                  | Sales (ProductID)          | Product (ProductID)                            |                       |
| <input checked="" type="checkbox"/>                  | Date (Date)                | Sales (Date)                                   |                       |
| <a href="#">New...</a> <a href="#">Autodetect...</a> |                            | <a href="#">Edit...</a> <a href="#">Delete</a> | <a href="#">Close</a> |

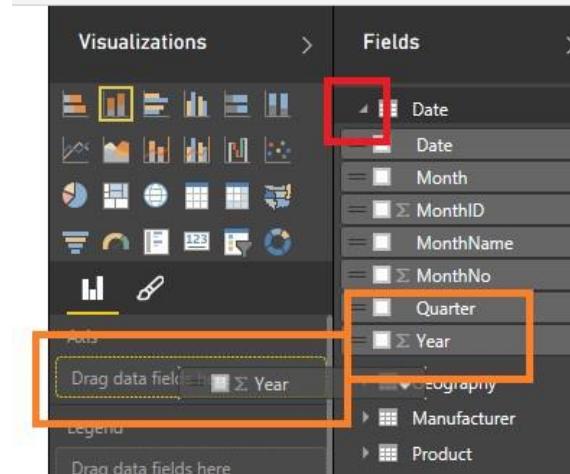
## Enhancing your model and Data exploration

In this section you will do initial data exploration along with model enhancements to create calculated column, setting up relationships and creating a measure using DAX (Data Analysis Expression).

1. Assume you want to analyze the sales by various years.
2. Click on the Report icon on the left pane to get to Report view.
3. Click on the column chart visual in Visualizations as shown in the figure

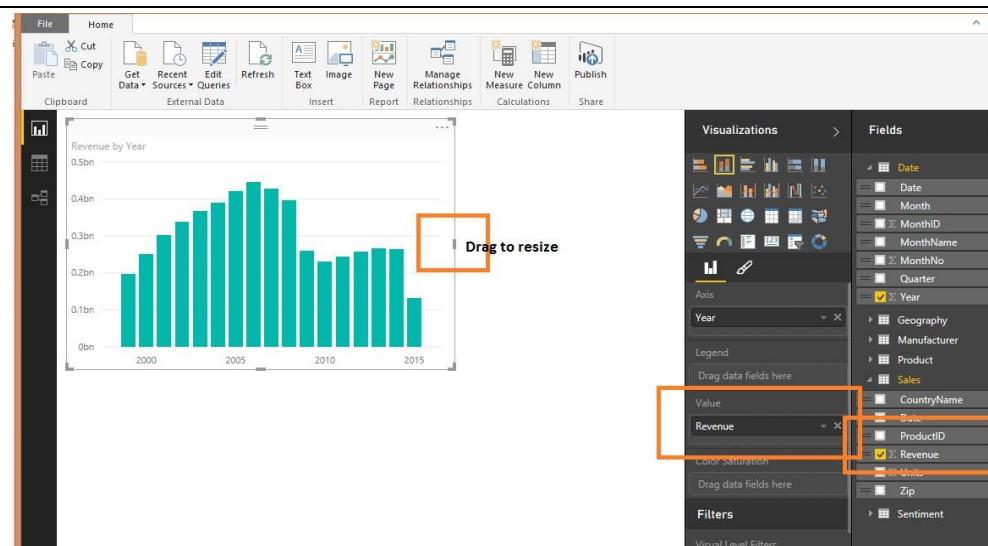


4. Click on the icon next to **Date** to expand the table
5. Drag and drop **Year** into the **Axis**.



6. Expand the **Sales** table by clicking on the icon next to the Sales table in **Fields** pane.
7. Drag and drop **Revenue** to **Values** as shown in the figure.
8. You can now see the total revenue of all manufacturers by years.
9. Drag the edge of the visual to resize the visual

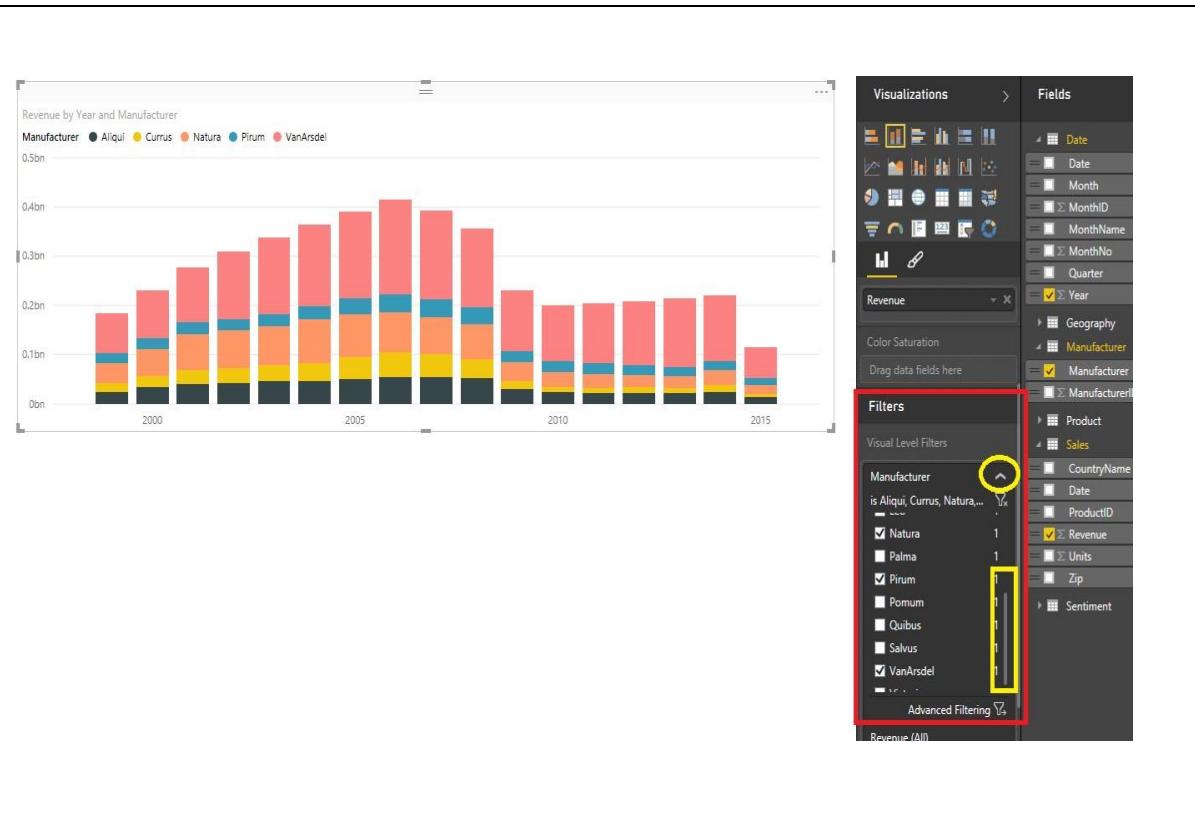
HINT: If the visual does not look like this, it might be because of how the data has been joined go back to step X and check the format/type of the Date columns in Date and Sales Table



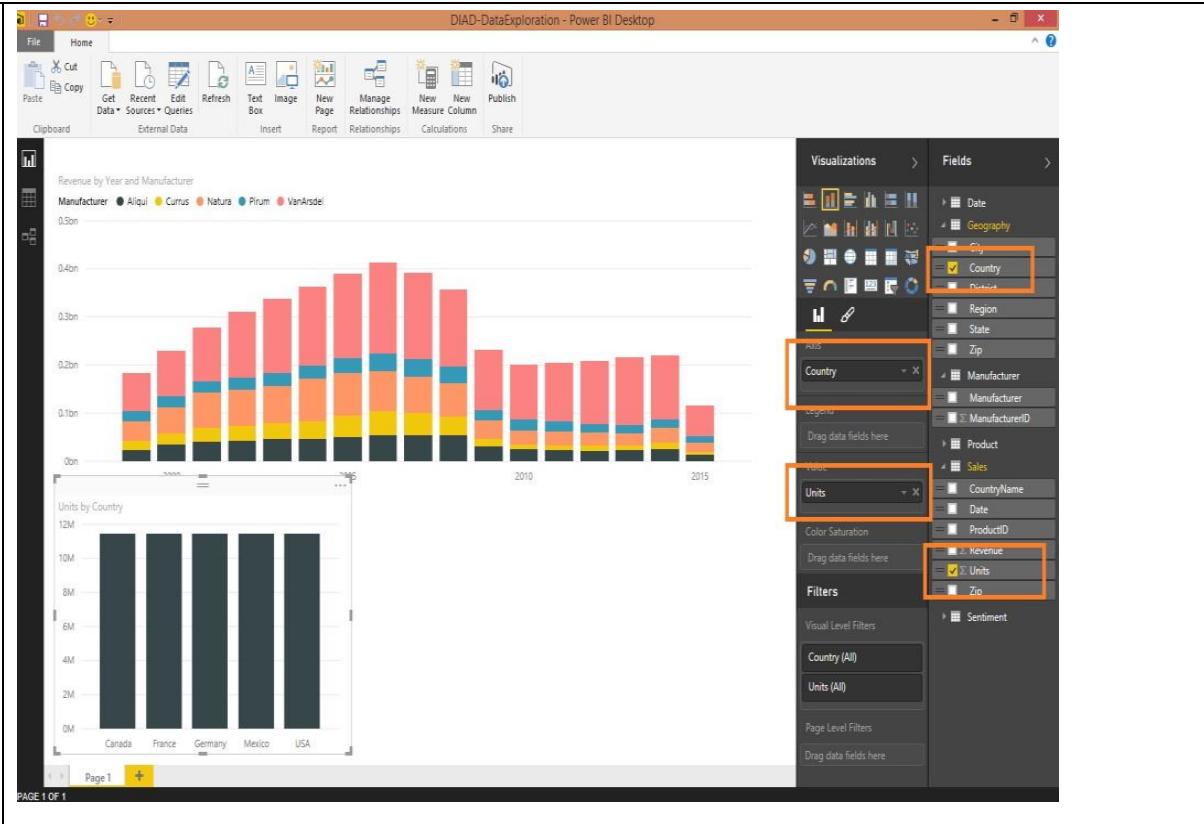
10. In order to analyze how my company (VanArsDel), is doing as compared to other manufacturers, drag and drop Manufacturer column in Manufacturer table to the Legend as shown in Figure.
11. You will see the stacked column chart of sales by various companies and the legend on the top as shown in the figure.



12. You are primarily interested in the key major competitors for VanArsdel and not all companies. I can filter just to the core competitors in the visual
13. Select the column chart visual.
14. The Filters section in Visualizations tab is now scoped to the filter for the visual.
15. Select the Manufacturer drop down arrow (shown in yellow circle in the figure) in the Filters area and select the companies Aliqui, Currus , Natura, Pirum and VanArsdel. This gives me a quick view of how my company is performing. You might need to scroll down and select the companies. Please see the scroll bar shown in the diagram.

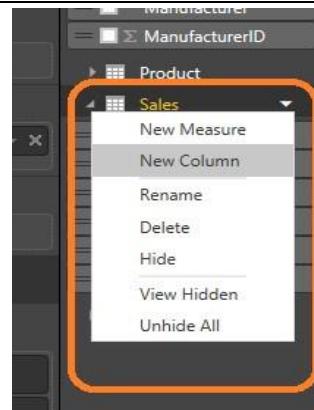


16. Assume you want to be able to analyze the sales of units by various countries along with the sales by years.
17. Click on the white canvas in Power BI Desktop.
18. Click on another column chart. You will see the column chart appear below your existing column chart.
19. Drag and drop Country column from Geography table to Axis
20. Drag and drop the Units from the Sales table to the Values.
21. You will see all the countries having about 11.4 Million units. The reason why you see the same value is due to the fact there is no relationship between Geography table and Sales table.



We now need to setup the correct relationship between these tables. The columns Zip and Country will help us establish the relationship since we can uniquely identify each row in the Geography table with Zip and Country.

22. Select the drop down next to Sales tables and select "New Column" shown in the figure.



You will see an editor as shown in the figure.

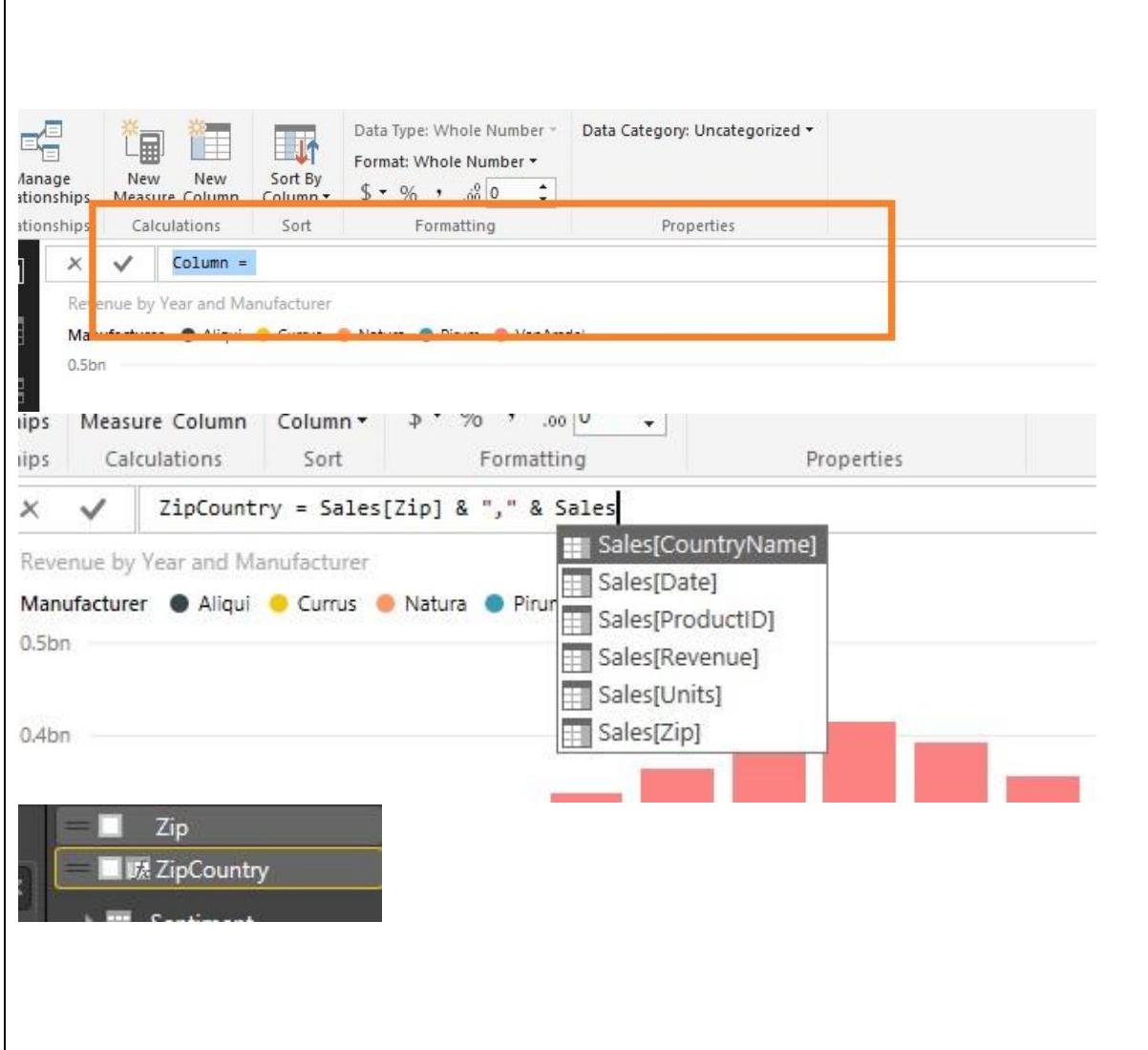
23. To concatenate the Zip and Country separate by a comma enter the following calculation in the editor

`ZipCountry = Sales[Zip] & "," & Sales[CountryName]`

You will notice that as you type the expression the Power BI desktop guides you to choose the right columns. You can just hit tab as you see the correct value.

You created a column using an expression called DAX (Data Analysis Expression) which is very similar to writing expressions in Excel where you are concatenating the value of each row. The "&" symbol is used for concatenation.

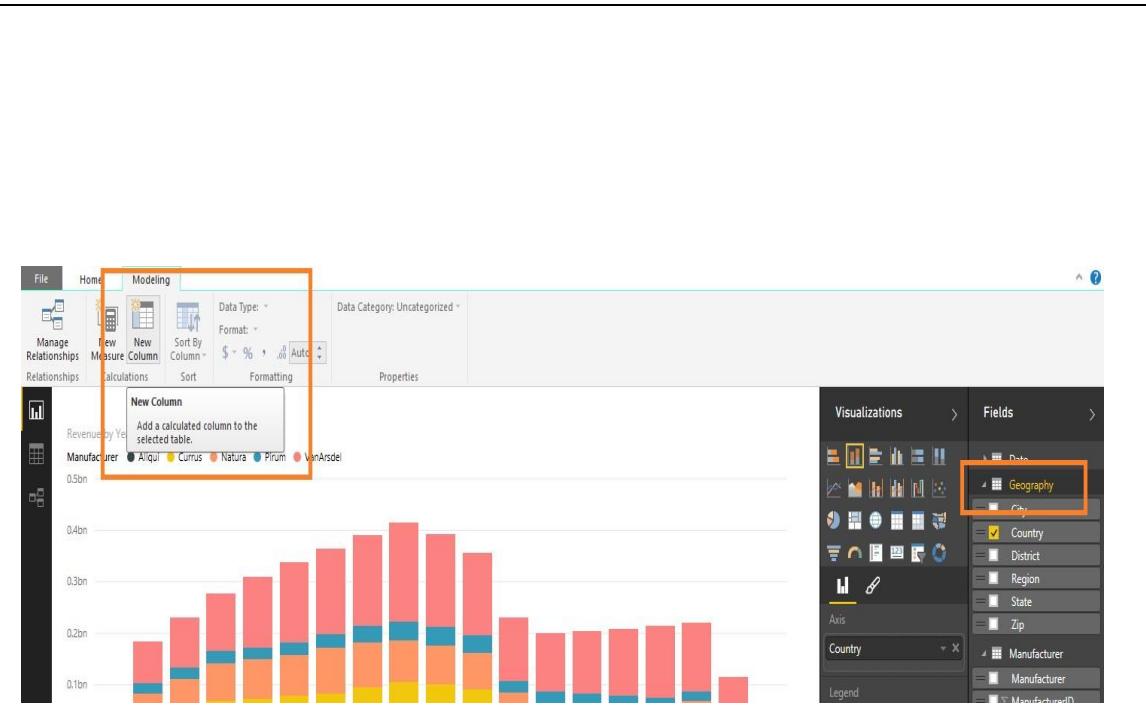
You will see a new column ZipCountry in Sales table. The icon indicates you have a columns that contains an expression, also referred to as Calculated column.



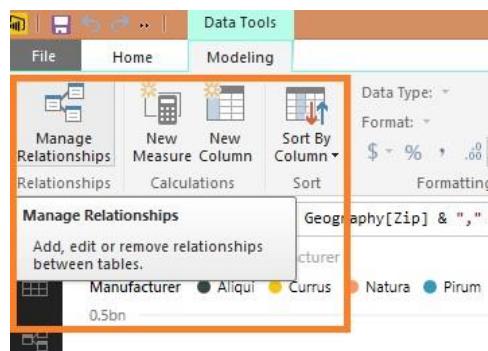
27. You can also create a new column by selecting the table and then clicking on New Column from the ribbon.
28. Select the Geography table in the Fields and click on New Column in the Modeling ribbon as shown in the figure and enter the following DAX expression:

`ZipCountry = Geography[Zip] & "," & Geography[Country]`

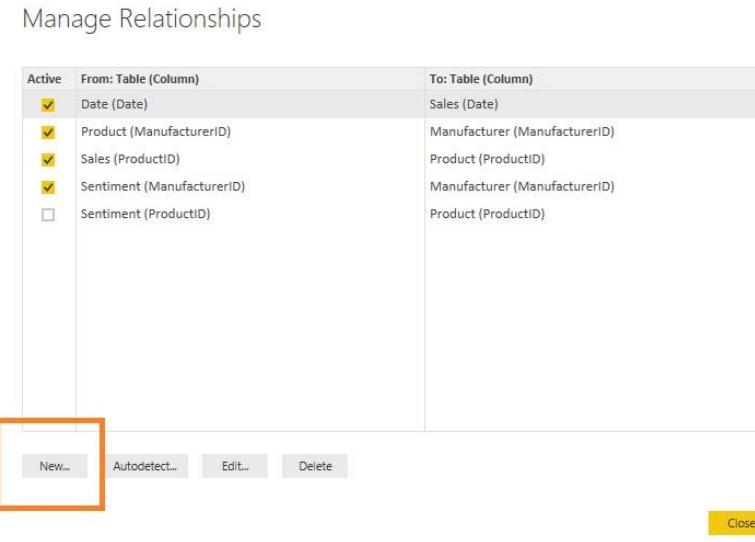
You will see a new column ZipCountry in Geography table. The final step is to setup the relationship.



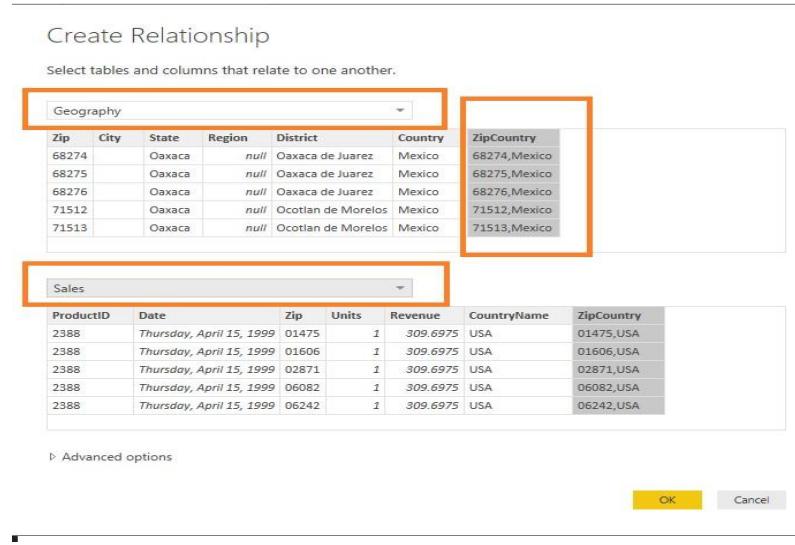
29. Click on the Manage relationship icon in the Modeling tab.



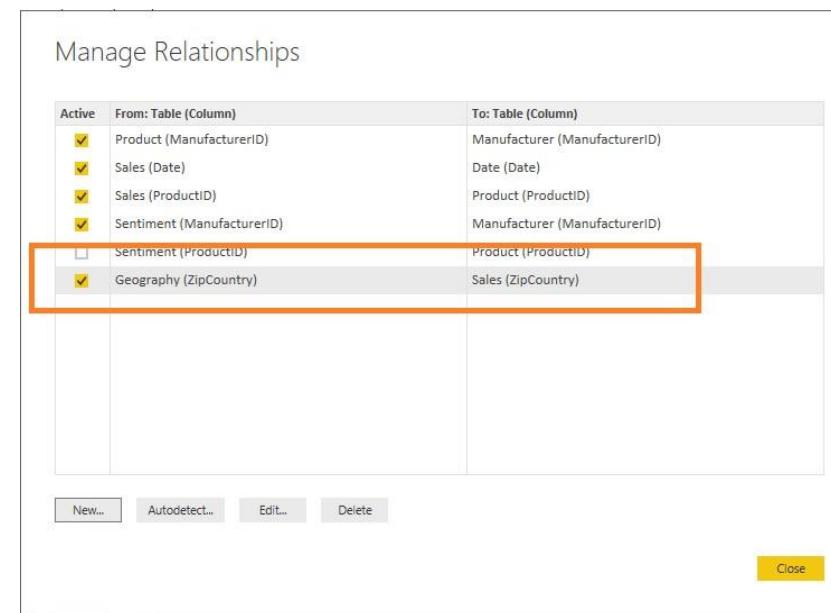
30. In the Manage Relationships dialog you will see all the relationships between the tables.
31. Click on the New tab to create the new relationship



32. In the Create Relationship dialog first select Geography from the top drop down as shown in the figure
33. Select the column ZipCountry
34. Select Sales table from the second drop down as shown in the figure
35. Click OK in the Create Relationship dialog.



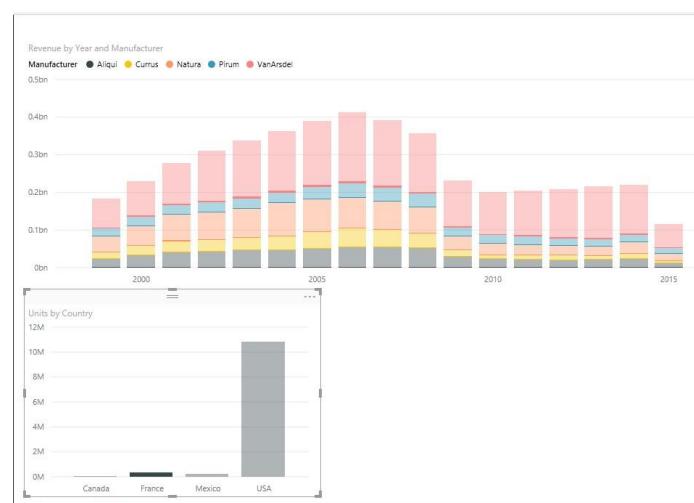
36. You will see the new relationship created as shown in the figure.
37. Click Close in the Manage Relationships dialog.



38. In the canvas you will immediately see the relationship take effect and the total units sold in each country. You can hover over USA to see the actual value.

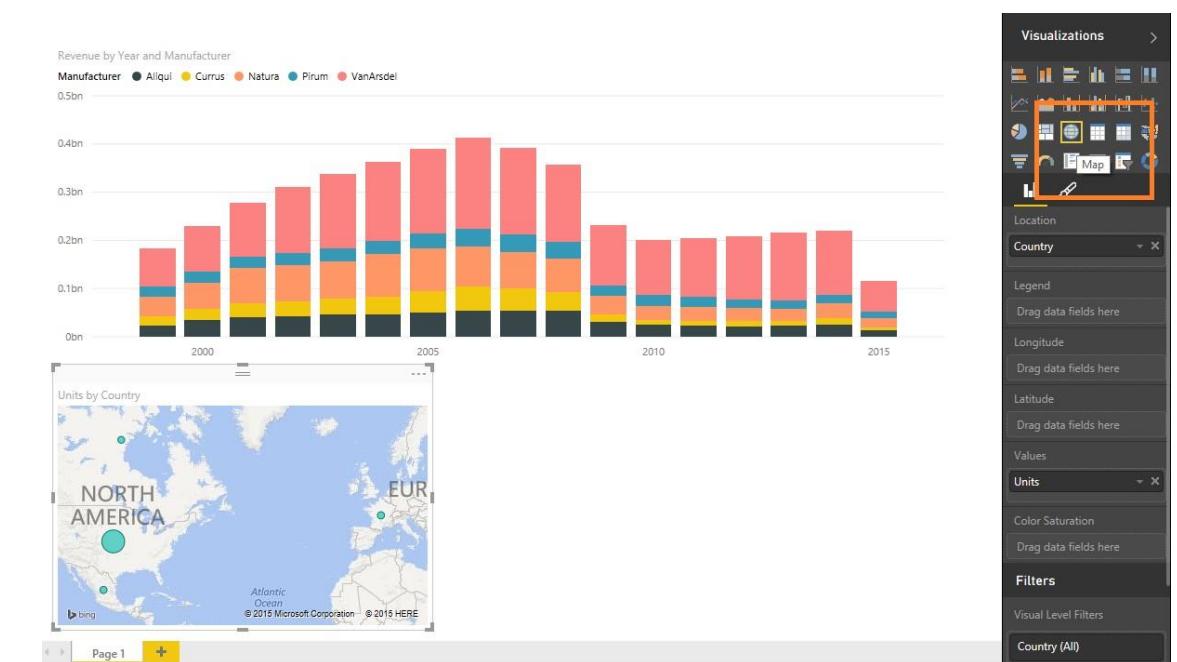


39. Click on France in the bottom graph to analyze what portion of the units sold in France contributes towards overall Sales.  
 Note: You have now created a visual filter on the top graph while the bottom graph on units sold includes all manufacturer.



40. Since the units sold are by countries, visualizing the total units by a map would be an efficient way.  
 41. Select the bottom column chart and click on the map visual in Visualizations. You will see the bottom visual change to a map visualization and the size of the bubble in each country shows the total number of units sold.

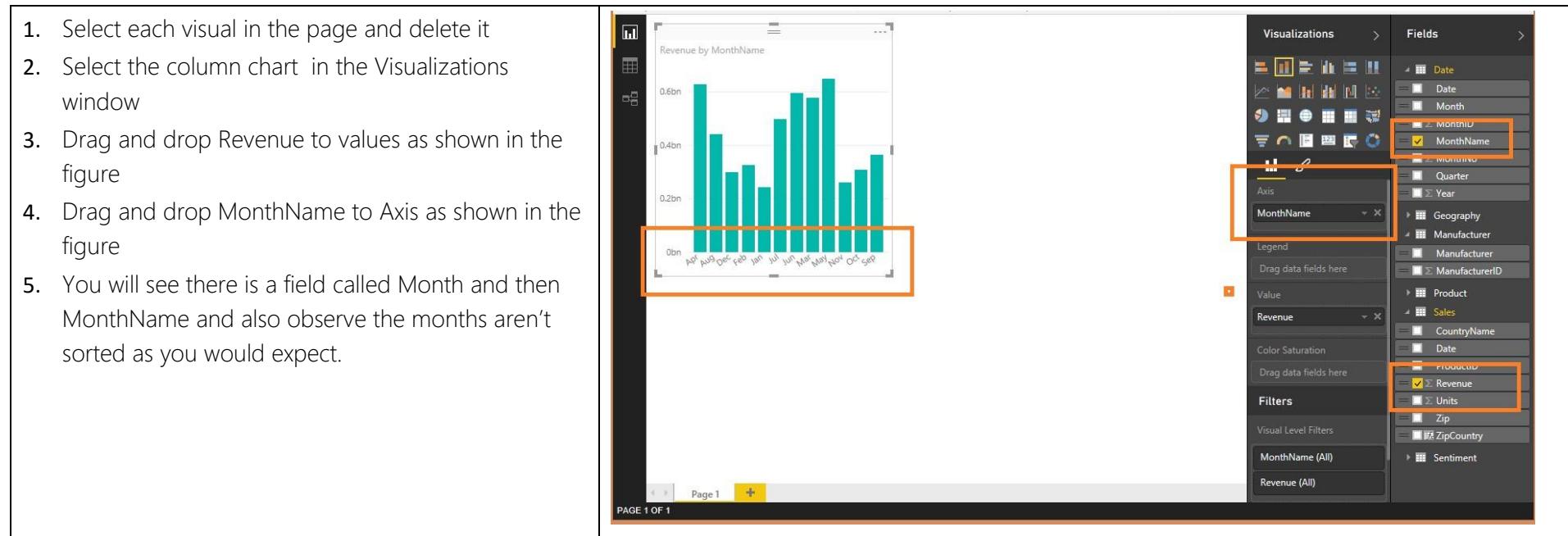
Note: You didn't have to do any complex operations, Power BI desktop automatically understood the Country column and add it to the location and the units to the values.



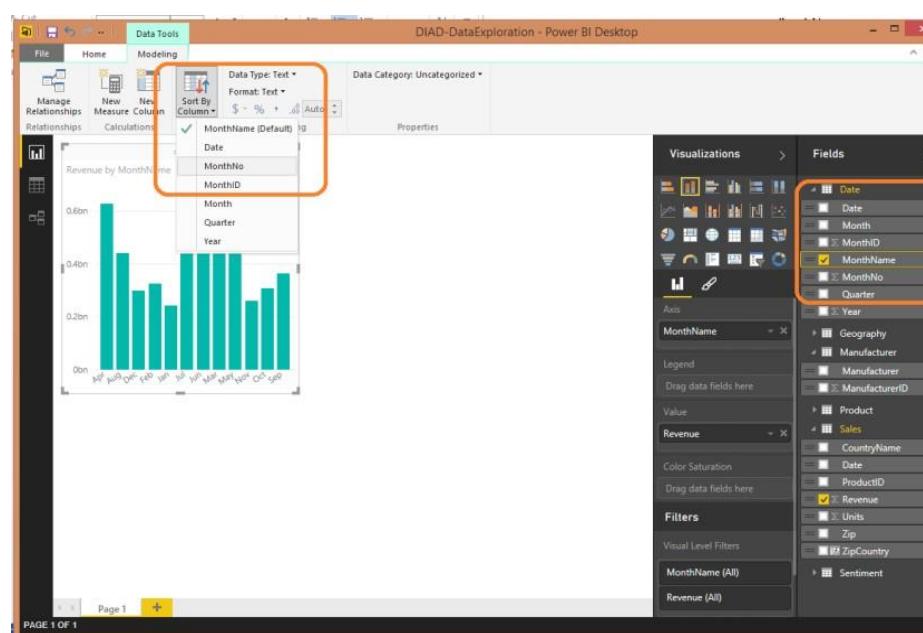
## Report Authoring

Having done some initial data exploration and visualization you are now finding good insights to share to your team. In this section you will create a professional report that you and your entire team can benefit on a daily basis. You will be creating a report that can give quick insights into comparing sales of various months this year and easily being able to compare it to previous years in this report.

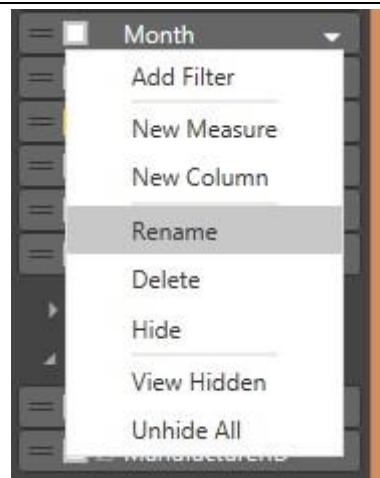
1. Select each visual in the page and delete it
2. Select the column chart in the Visualizations window
3. Drag and drop Revenue to values as shown in the figure
4. Drag and drop MonthName to Axis as shown in the figure
5. You will see there is a field called Month and then MonthName and also observe the months aren't sorted as you would expect.



6. You need to make the report easily understandable by your team.
7. To ensure the Months are shown in the correct order, select the MonthName column in Date table as shown in the figure.
8. In the Modeling table, select the drop down "Sort By Column" and select MonthNo.
9. By default the Months are ordered alphabetically. Once you specific the ordering, you will see the right ordering of the months.



10. The Month column actually includes month and year.
11. Rename this column by selecting the drop down and Rename and provide the name MonthYear
12. Now Rename the MonthName column to Month

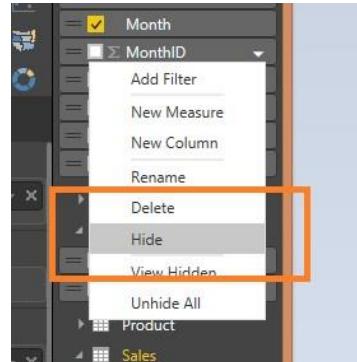


Several of the ID columns in the tables are not useful to the end-users.

13. Select the dropdown of column MonthID and select Hide. This hides the column from the report.

Note: You can still see this column in the data view and relationship view.

14. Similarly hide the MonthNo and MonthYear columns from the Date table



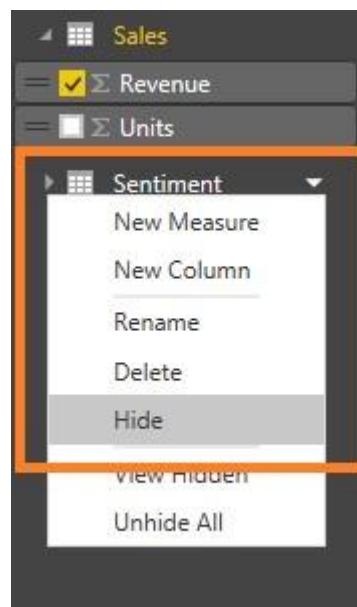
15. In the Manufacturer table hide ManufacturerID column

16. In the Product table Hide the columns ManufacturerID and ProductID

17. In the Sales table hide the columns CountryName, Date, ProductID, Zip and ZipCountry

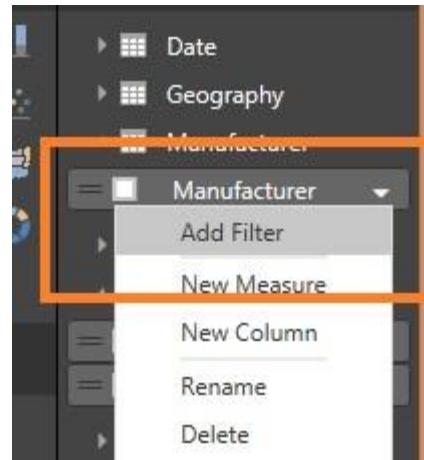
18. Select Geography table and hide the column ZipCountry. 18. Select the entire table Sentiment and Hide the table as shown in the figure.

Note: You can hide columns or tables from the report view so that your end users of the report only see the columns they need to interact with.

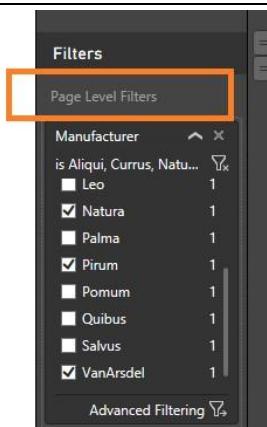


Similar to you analyzing top competitors your team is also only interested in comparing top competitors.

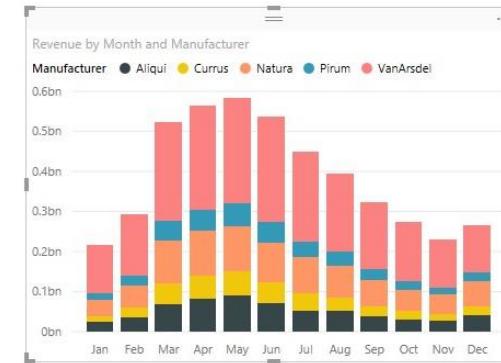
19. In order to apply a global filter for the entire page, click on the canvas outside the column chart.
20. Select the drop down next to Manufacturer column in the Manufacturer table and click Add Filter. This will add the Manufacturer column to Page filter.
21. OR ... Drag the field into the Page Level Filters section under Filters



22. Select the manufacturers Aliqui, Currus , Natura, Pirum and VanArsdel in the filter



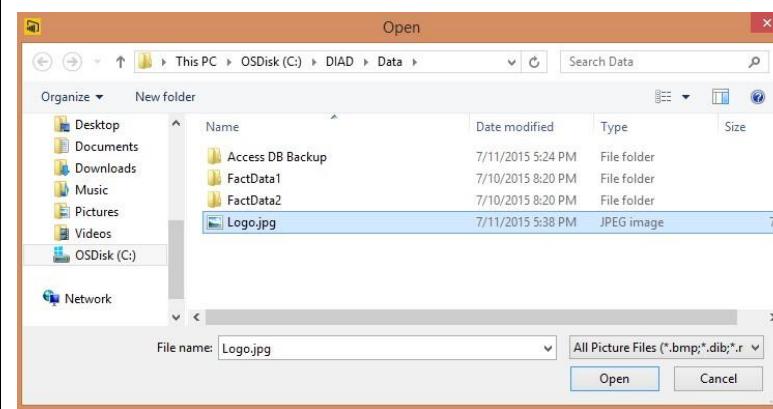
23. Move the column chart visual to the right of the canvas.
24. Add the Manufacturer to the Legend of the visual.



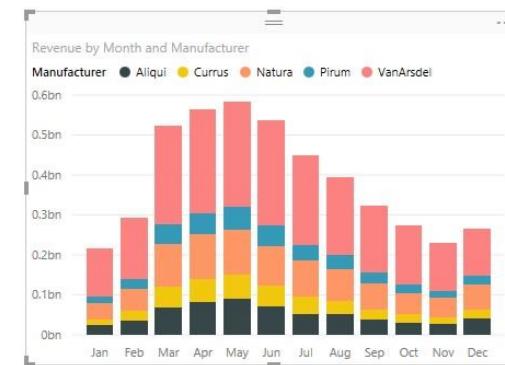
25. You need the company logo in any of your report.
26. Click on the Image in the Home tab



27. Select the Logo provided as part of the contents downloaded and click Open.
28. The logo will be appear on the report.

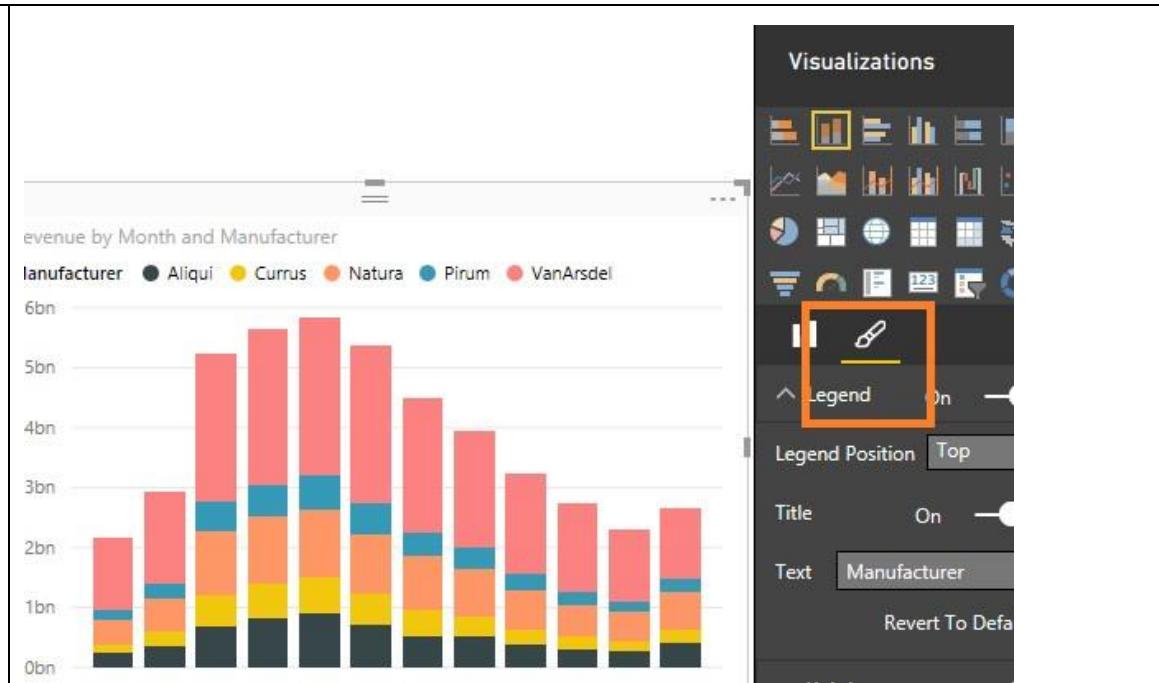


29. Resize and Move the logo to the top left of the report

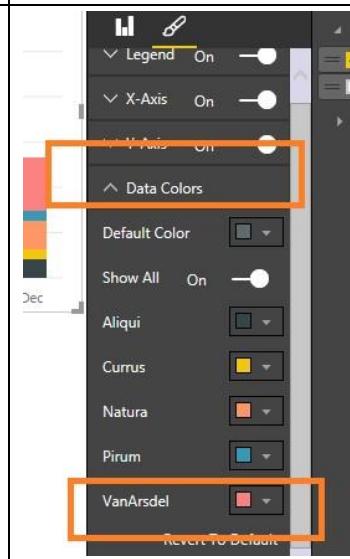


30. You can see VanArsdel logo is GREEN. You want to be able to match the sales of VanArsdel to right in your report.

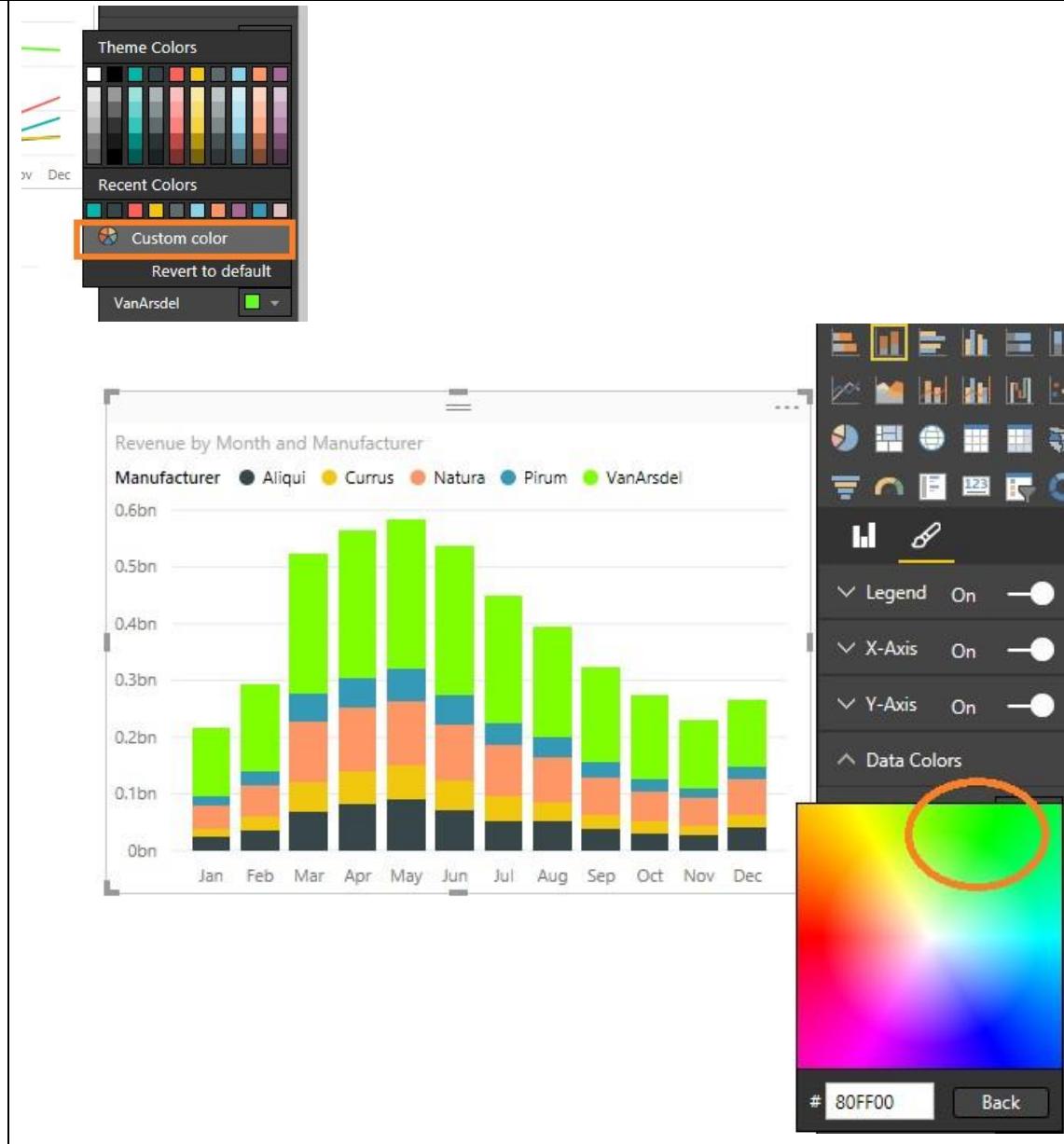
31. Click on the column chart visual and select the format icon as shown in the figure.



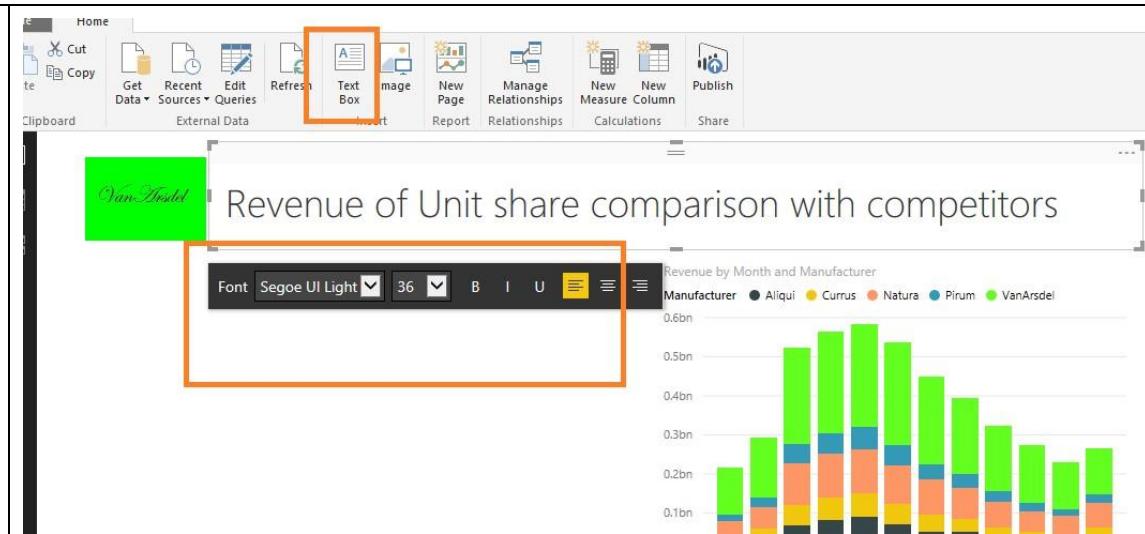
32. Select the drop down icon next to Data Colors and then the color next to VanArsdel



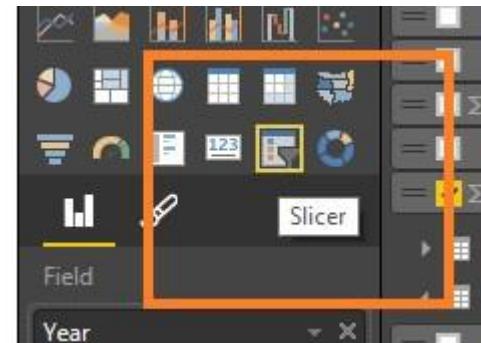
33. Select the Custom color as shown in the first figure.
34. Click on the light GREEN color to match VanArsdel logo color.
35. Click on the white canvas next to the visual to continue to the next step. You can also select back button.



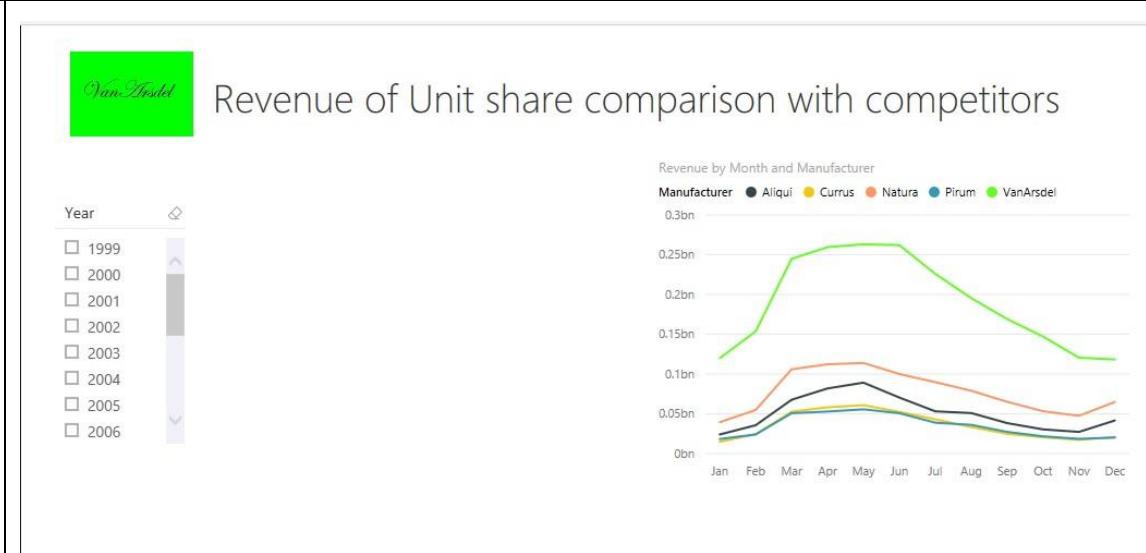
36. Click on the white canvas.
37. Click on the Text box, enter the title "Revenue and Unit share comparison with competitors".
38. Highlight and select the entire text.
39. Change the font to size 36 and move the text box to the top of the page as shown in the figure.



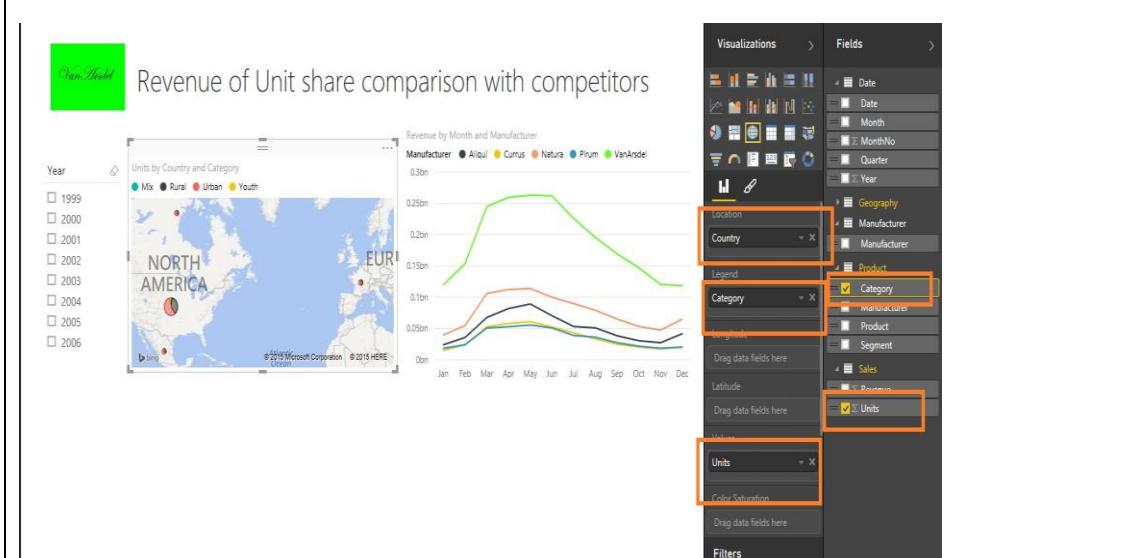
40. Click on the canvas
41. Click on the slicer icon in Visualizations pane.
42. Drag and drop the Year column from the Date table into the Field of the slicer.
43. Move the slicer below the logo.
44. A slicer provides the ability for end users to visually see the key filters applied to the entire page and also the flexibility to select values easily.



45. In order to compare the revenue by competitors over time easily line charts are more helpful.
46. Select the column chart visual and change it to line chart visual in the Visualizations.
47. Your report should look like the one on the right.



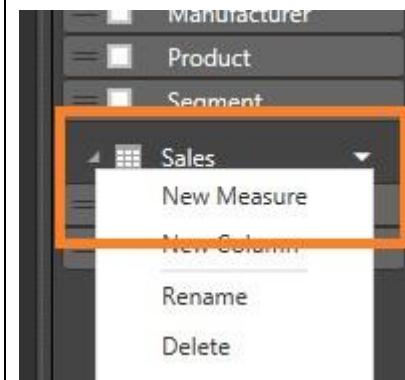
48. Select the map visual from Visualizations
49. Drag and drop Country column from Geography table to Location of the map visual as shown in figure.
50. Drag and drop Units column from Sales table to the Values of the visual
51. Drag and drop Category column from Product table to Legend.
52. Resize and move the map as shown in the figure



53. Select the slicer visual and drag and drop Segment column from Product
54. Move the slicer below the Year slicer as shown in the figure.



55. You want the ability to compare current year to date sales as compared to previous year and see if you are doing better or worse. In order to achieve such calculations Power BI desktop provides you the ability to create Measure, aggregatable quantity with the help of DAX functions that understand time calculations. Click on the drop down next to Sales and select New Measure



56. Enter the following DAX Expression as shown in the figure

YTD Revenue =  
TOTALYTD(Sum(Sales[Revenue]),'Date'[Date])

You will see the YTD Revenue under Sales table with a special icon which indicates it is a measure.

This DAX calculation aggregates the value of revenue and based on the date selection is able to calculate the year to date revenue.

57. For calculating last year's YTD revenue, create a new Measure in the Sale table and enter the following DAX expression.

LY YTD Revenue =  
CALCULATE([YTD Revenue],  
SAMEPERIODLASTYEAR('Date'[Date]))

This DAX expression evaluates the YTD Revenue in the context of current date and calculates the same YTD revenue for the previous year so that it's easier to compare the revenue.

The screenshot shows the Power BI Data view. At the top, there is a DAX formula: `YTD Revenue = TOTALYTD(Sum(Sales[Revenue]),'Date'[Date])`. Below the formula, the Sales table structure is visible. The YTD Revenue column is highlighted with a yellow border, indicating it is a measure. The table also contains columns for Revenue (summarized) and Units (summarized).

The screenshot shows the Power BI Data view. At the top, there is a DAX formula: `LY YTD Revenue = CALCULATE([YTD Revenue],SAMEPERIODLASTYEAR('Date'[Date]))`. Below the formula, the Sales table structure is visible. The LY YTD Revenue column is highlighted with a yellow border, indicating it is a measure. The table also contains columns for Revenue (summarized with a checkmark) and Units (summarized).

To compare the percentage different in Revenue between the years, you need two additional DAX expressions.

58. Create the two additional DAX measures in the Sales table

YTD Sales Var = [YTD Revenue]-[LY YTD Revenue]

YTD Sales Var % =

DIVIDE([YTD Sales Var],[LY YTD Revenue])

These above DAX expressions calculate the YTD revenue difference between a specific year and it's previous year and then the percentage Variance.

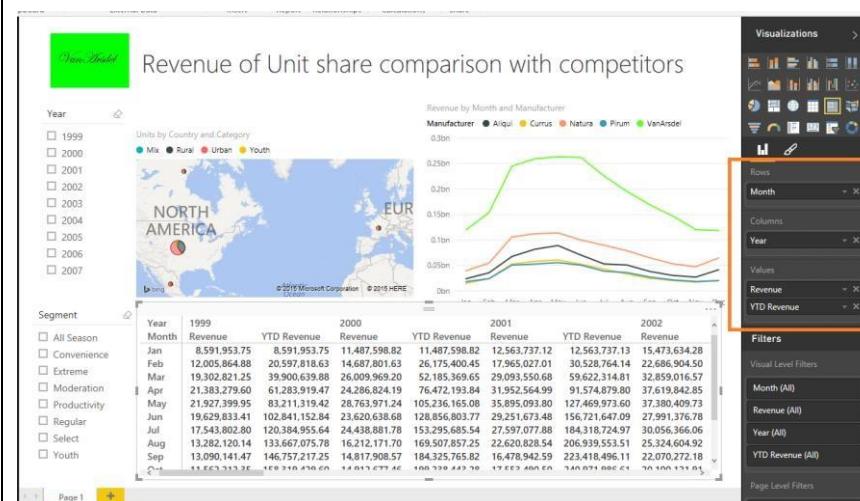


59. Now let's include the Revenue and YTD Revenue by each month in tabular view for your users. Click on the Matrix icon in Visualizations.

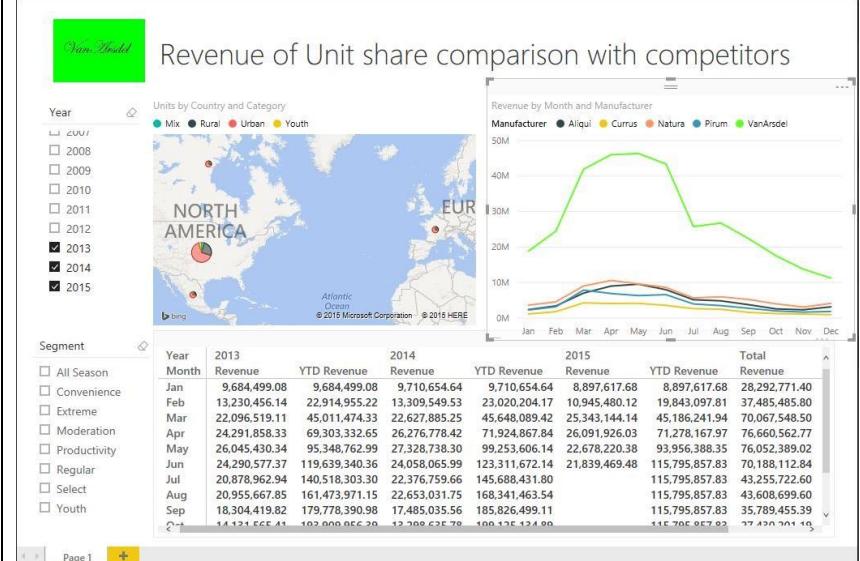


60. Drag and drop Month column from Date table to Rows.
61. Drag and drop Year column from Date table to Columns.
62. Drag and drop Revenue and YTD Revenue to Values.

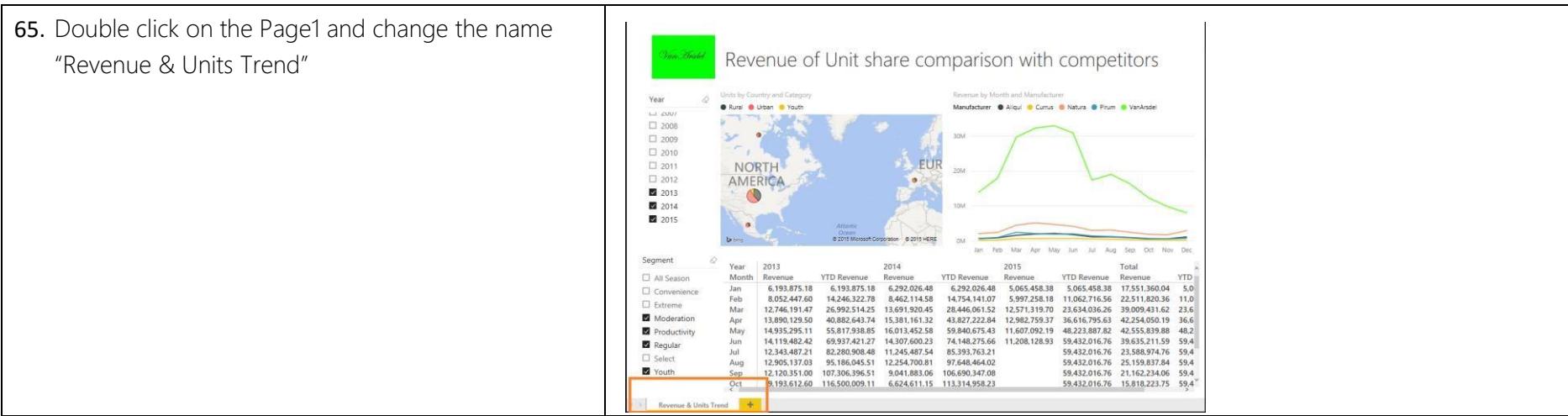
You should see the matrix with the values as shown on the left



63. Your team will most likely be most interested only in the recent years.
64. In the Year slicer scroll down and select the years 2013, 2014 and 2015 in the Slicer.



65. Double click on the Page1 and change the name "Revenue & Units Trend"



66. Select the map where you have Units by Country and

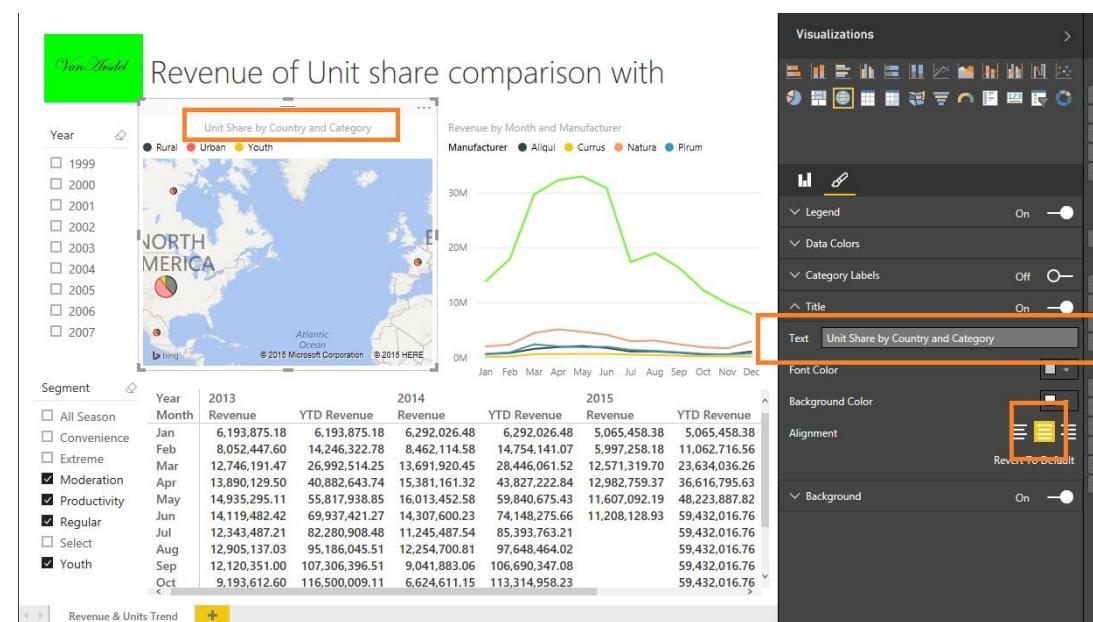
let's change this to Unit share by Country and Category.

67. Click on the brush in the Visualizations pane for formatting.

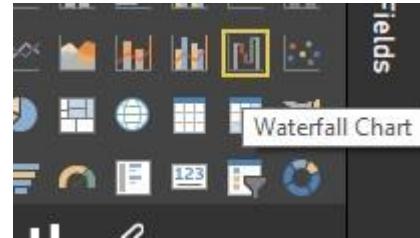
68. Click on the icon to expand Title. The title has been highlighted in the figure to select the right visual.

69. Click on the center alignment shown in the figure.

Explore selecting the various slicers, specific manufacturer from the legend in the line char and see how the various values change interactively.

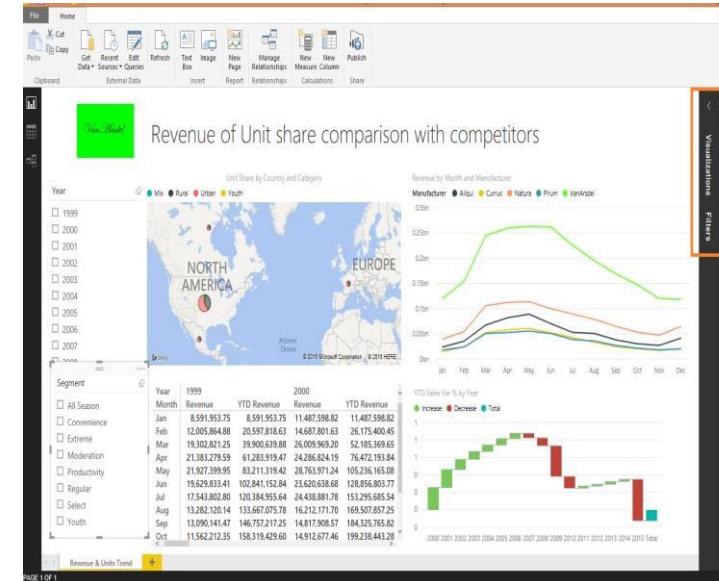


70. Resize the matrix so that it's half the width so that the matrix is just below the map visual.
71. Clear all the slicer selections from both slicers by selecting the "Clear selections" icon in the slicer
72. Select the waterfall visual from the Visualizations pane.



73. Resize and move the waterfall visual below the line chart visual.
74. Drag and drop Year column from Date table to Category as shown in the figure.
75. Drag and drop the YTD Sales Var % to Y axis
76. You will see the percentage variance YoY increase or decrease.
77. Collapse the Visualizations and Filters pane and save the file with your name.

Explore changing the slicers/selections in the visuals to get interesting insights.



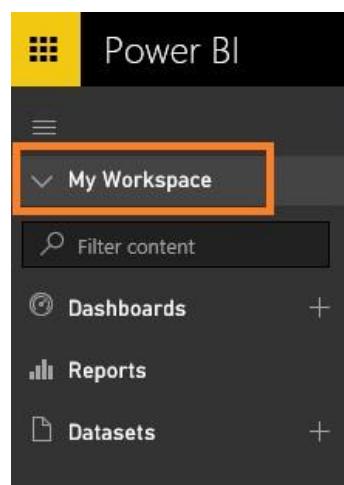
You have successfully completed the hands on lab in creating a report to share to your team. The next section covers creating a dashboard from this report so that you can easily share it to your team. You have learned a quick overview of various functionality in Power BI Desktop to get accelerated. There are a lot more features for you to build upon this on your own data.

## Power BI Service – Part I

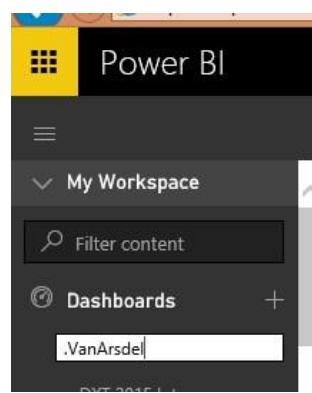
You will now leverage the report authored using Power BI Desktop and create a dashboard for VanArsdel data analysis team and finally share it to the CMO. We have been given a Power BI Desktop file with additional reports / views of Sales information. Please use this for the next two sections of the lab.

### Creating Dashboard and uploading your Report

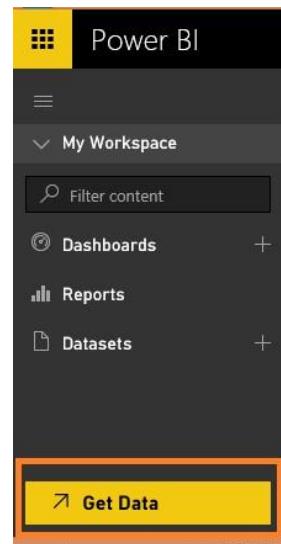
1. Login to <http://app.powerbi.com> using your organizational credential which you used to sign up for Power BI.
2. Once you login into the Power BI Service you will see "My Workspace" selected by default and below that you will see Dashboards, Reports and Datasets as shown in the figure.



4. Create a dashboard called ".VanArsdel" as shown in the figure.



5. Click on the “Get Data” to import your Power BI Desktop file.



6. In the Get Data page, Click Get icon below the Files section as shown in the Figure.

The screenshot shows the "Get Data" page. At the top right, it says "Get Data" and "Need more guidance? [Try this tutorial](#)". Below that, there are two main sections: "Content Pack Library" and "Import or Connect to Data". The "Import or Connect to Data" section contains two options: "Files" and "Databases". The "Files" option is highlighted with an orange rectangular box. Both options have a description and a "Get" button with an arrow icon.

**Get Data**  
Need more guidance? [Try this tutorial](#)

**Content Pack Library**

**My Organization**  
Browse content packs that other people in your organization have published.  
[Get ↗](#)

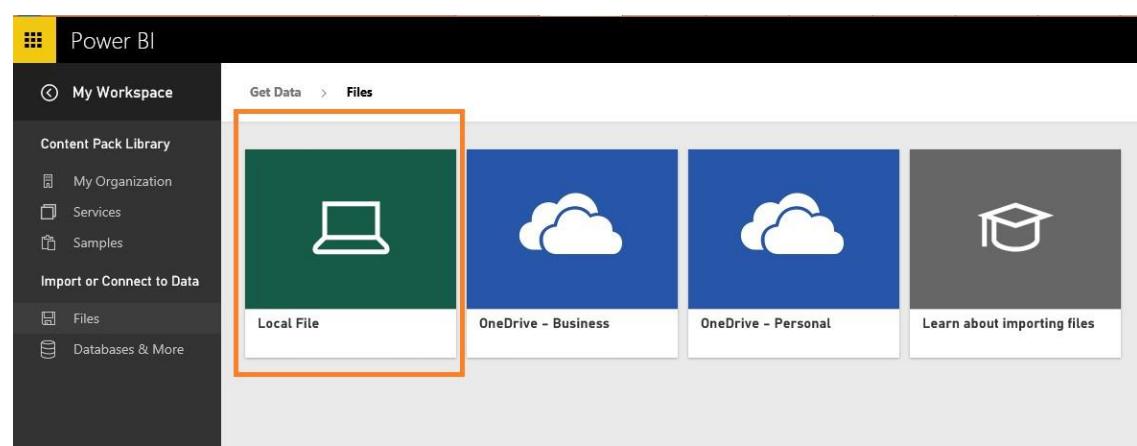
**Services**  
Choose content packs from online services that you use.  
[Get ↗](#)

**Import or Connect to Data**

**Files**  
Bring in your reports, workbooks, or data from Excel, Power BI Desktop or CSV files.  
[Get ↗](#)

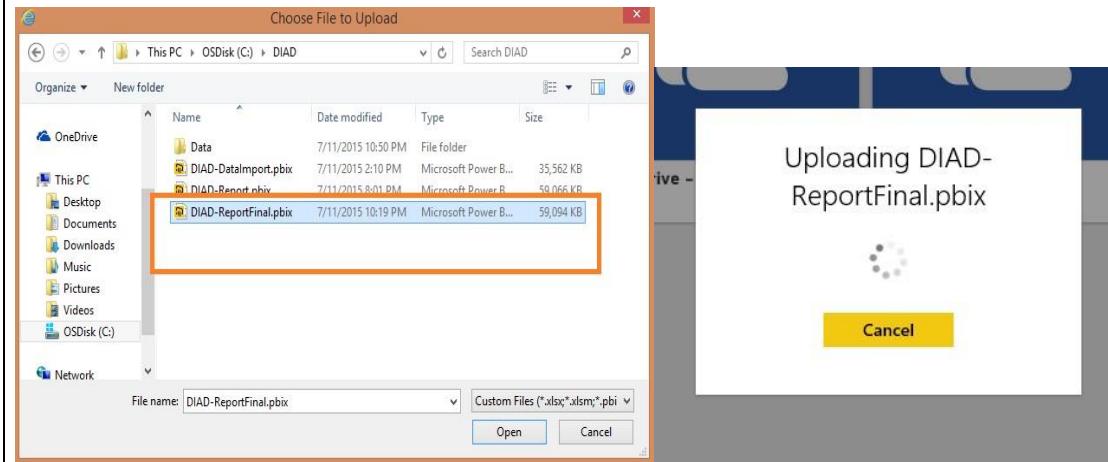
**Databases**  
Connect to live data in Azure SQL Database and more.  
[Get ↗](#)

7. Click on Local File as shown in the Figure



8. Select the Power BI Desktop file DIADReportFinal.pbix which was provided along with the Dashboard in a Day content and click Open.  
9. You will see the upload status as shown in the figure.

Upload might take a few minutes based on bandwidth and network connectivity.

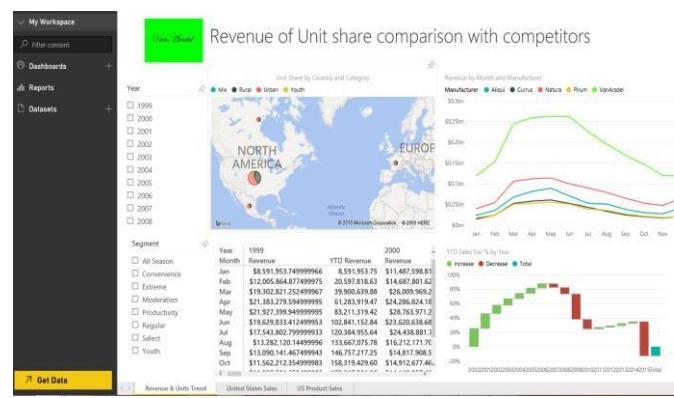


## Operational Dashboard and Sharing

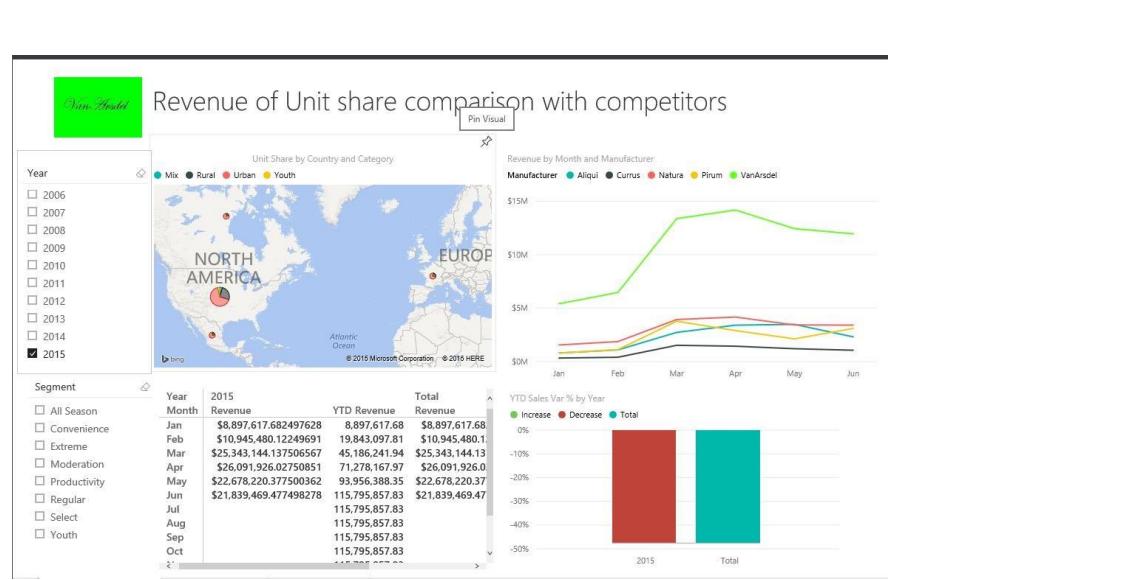
1. You will see an icon indicating the file that has been uploaded.
2. The service extracted the data model and reports that were part of the Power BI Desktop file and added separate entries under Reports and Datasets as shown in the Figure.

The screenshot shows the 'My Workspace' interface in the Power BI service. On the left, there's a sidebar with a search bar and a 'Dashboards' section. Below it are sections for 'Reports' and 'Datasets', each containing two entries: 'DIAD-ReportFinal' and 'DIAD-ReportFinal \*'. The 'Get Data' button is located at the bottom of the sidebar. On the right, there's a dashboard titled '.VanArsdel' with a share button and a text input field. A preview of a report is shown, featuring a line chart with an upward trend.

3. To create an operational dashboard you need to open the report and select visuals that provide metrics to the organization.
4. Click on the icon of the report you uploaded.
5. You will see the entire report open and you will see the three report pages



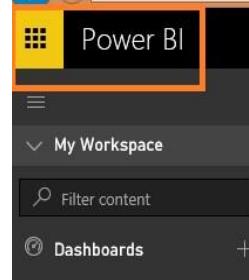
- Select the year 2015 in the slicer.
- Select the map visual or Hover over the map visual and you will see a pin icon as shown in the Figure. The pin icon will appear for each visual you would like to pin to the dashboard.
- Click on the Pin icon of the map. This pins the visual to the dashboard from which you launched the report. For you this will be the .VanArsdel dashboard.
- Hover over the logo of VanArsdel and click on the Pin icon.
- Hover over the Linechart visual and click on the Pin icon.



- Clear the 2015 selection, select the waterfall visual and click pin.
- Switch to the United States report page (as circled in the figure), select the year 2015 in the slicer and pin the visuals tree map, the card showing the United States revenue, the combo chart of revenue and units and finally the donut chart as show in the figure.

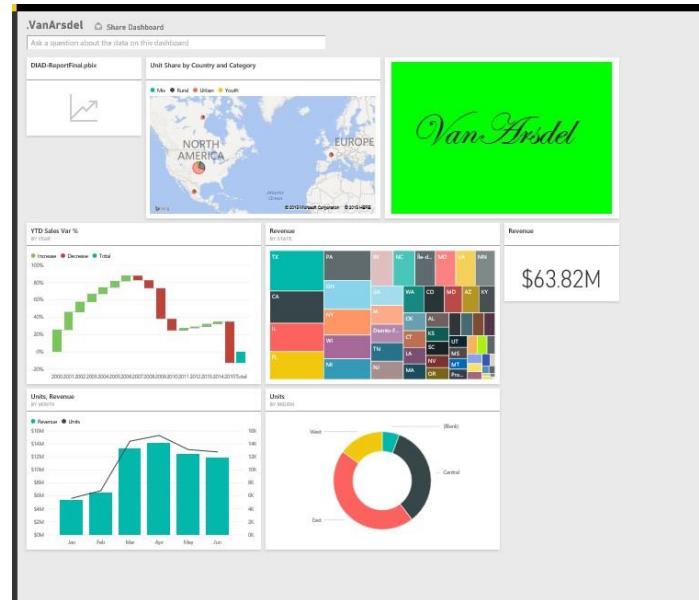


13. Click on the Power BI or on the .VanArsdel dashboard to get to the dashboard.

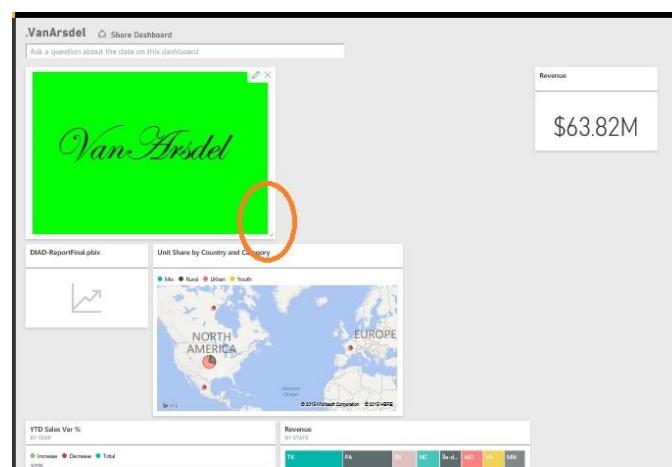


14. You will see the visuals on the dashboard as shown in the Figure. Each visual on the dashboard is called as a tile. The tiles represent the data chosen and will be kept up to date as the data of the data model changed.

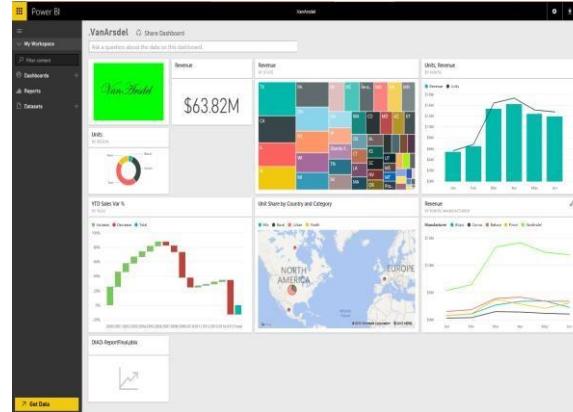
15. We will organize the dashboard for the team now.



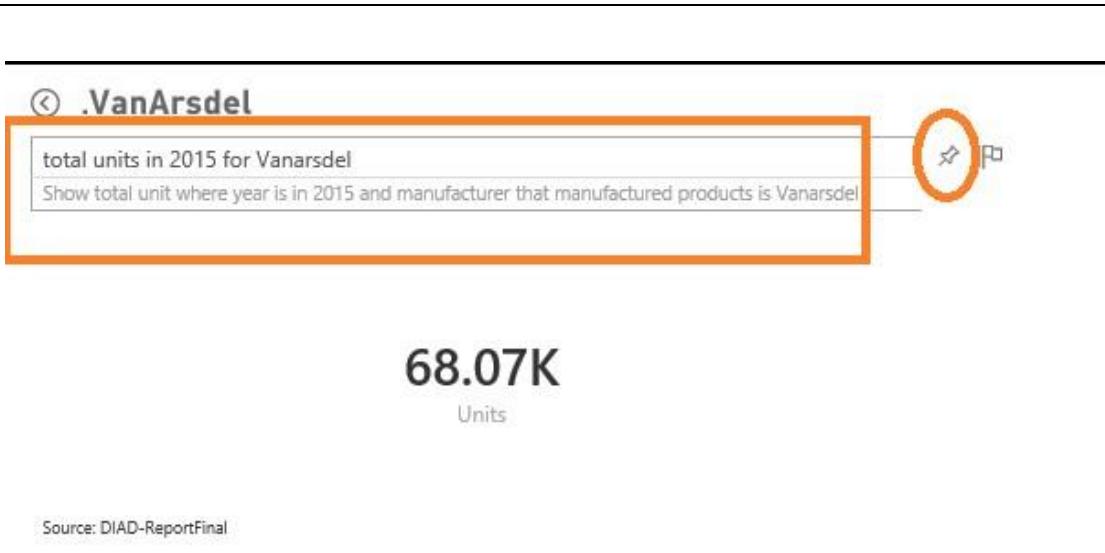
16. Select and move the image visual to the top left corner.
17. Select the bottom right corner of the visual and move it diagonally to change the image to a small



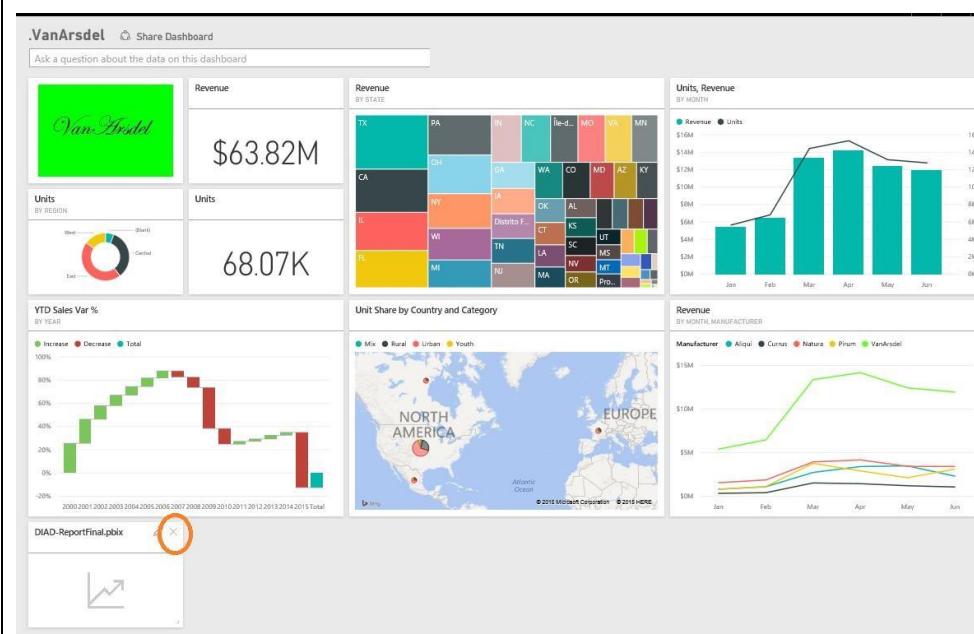
18. Change the tile size and organize the dashboard as shown in the Figure.  
The top row contains data about VanArsDel for the 2015 year while the bottom row contains the industry trend and competitors revenue.



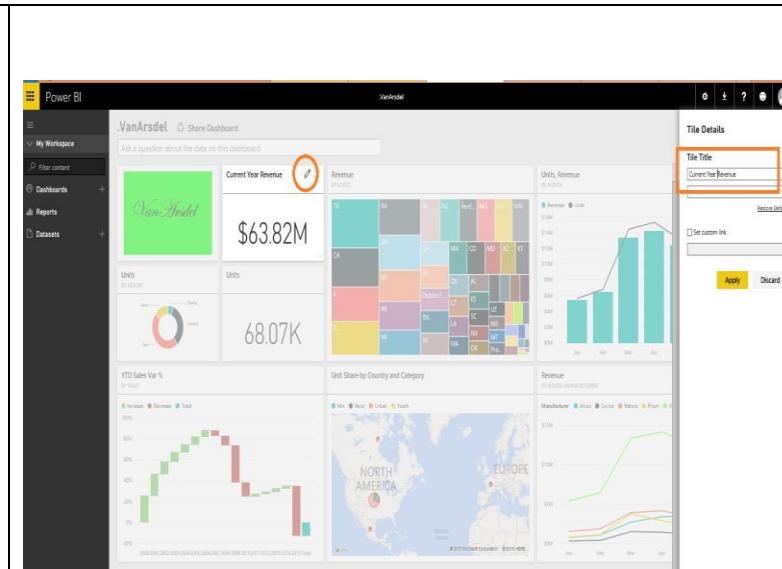
19. Power BI supports asking questions against your data. Type "Total units in 2015 for VanArsdel" in the box below the dashboard name as shown in the figure.
20. You will see the total units sold shown as a card. Power BI also shows how it translated your request.
21. Click on the pin icon on the right corner next to the box to pin the value to your dashboard.
22. Click on the < arrow or Power BI or the dashboard name to get to the dashboard



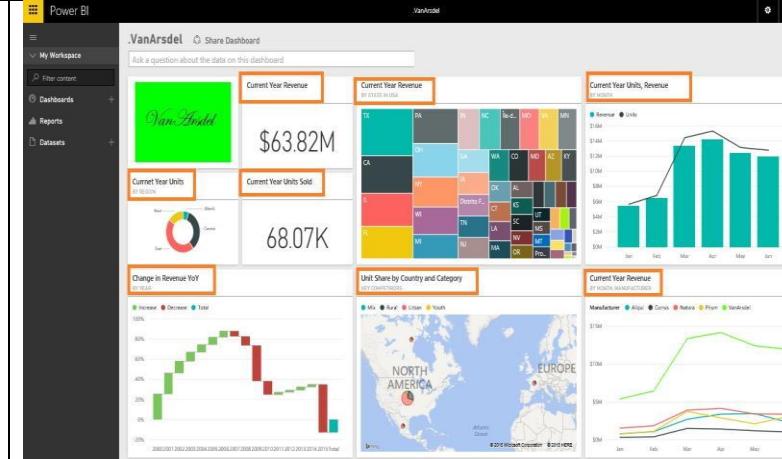
23. The units sold in 2015 will be pinned to the dashboard. Move the tile to the open space on the dashboard so that your dashboard looks like the figure.



24. You can hover over a tile to delete it from the dashboard or edit it.
25. Hover over the icon of the report and select "x" to delete it from the dashboard
26. Hover over the Revenue tile and select the pen icon to edit it.
27. Change the title to Current Year Revenue as shown in the figure and click apply.
28. If you click on a tile it takes you directly to the underlying report. If you accidentally click, you can get back to the dashboard by clicking on the dashboard name on the navigation pane or by clicking on "Power BI" on the top left.



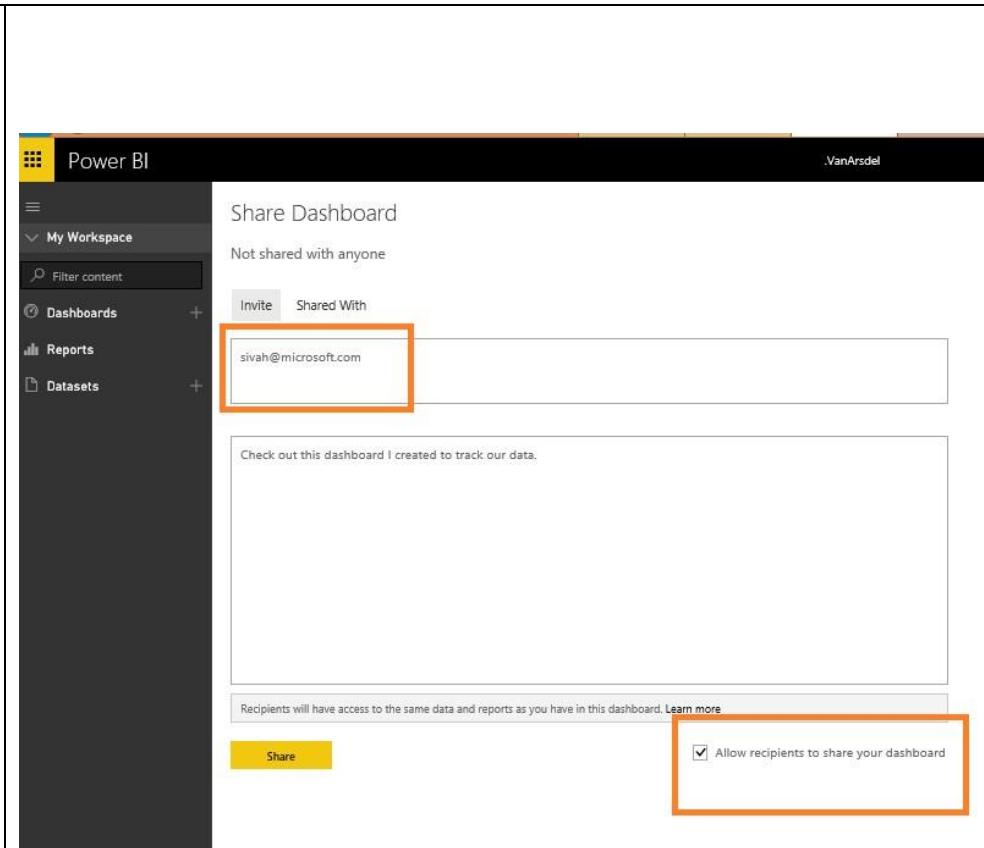
29. Make changes to the titles of the tile as shown in the figure.
30. You have now successfully created a dashboard to share it to your team.



31. You can now share your dashboard to your team using their email address. Click on the "Share dashboard" next to the dashboard name.
32. Enter the email address of the members of your team separate by  
",".
33. Enter appropriate message in the text box below the email addresses
34. You can allow recipients to share this dashboards with other team members. If you do not want the users to re-share, please deselect the checkbox and then Share the dashboard.

Note: The Power BI service sends an email on your behalf. Once the recipient accepts the invite the user will get a read only copy of the dashboard and will see any changes to the dashboard you make periodically.

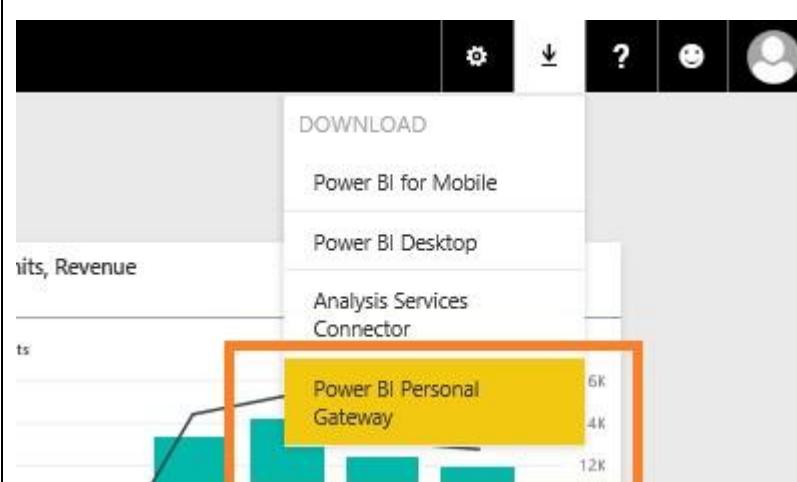
If the dashboard is backed by tiles from on premises SSAS then the recipients' credential are flown through to SSAS and the Power BI service retrieves the data that can be accessed by the recipient.



## Refreshing data on the Dashboard

Once the dashboard has been shared to the members of the team, one of the key benefits of Power BI is the ability to setup automated data refresh. This enables the dashboard to be live and operational for the organization. If your data is being retrieved from a cloud data source such as SQL Azure then you can click on the Dataset ... and schedule the refresh as per your organization needs. In this section you will learn to setup Personal Gateway that allows the author of the report and dashboard to refresh the content in the data model from an on premises data source.

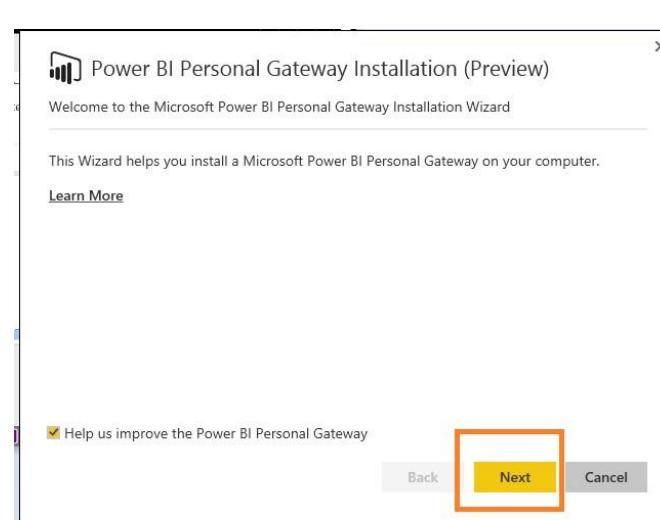
1. Go to <http://app.powerbi.com> and download and install the Personal Gateway as shown in the Figure



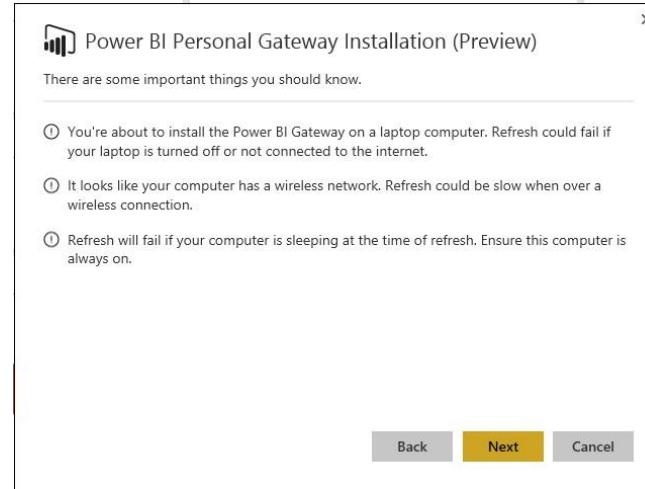
2. Click on Run once the download is complete.



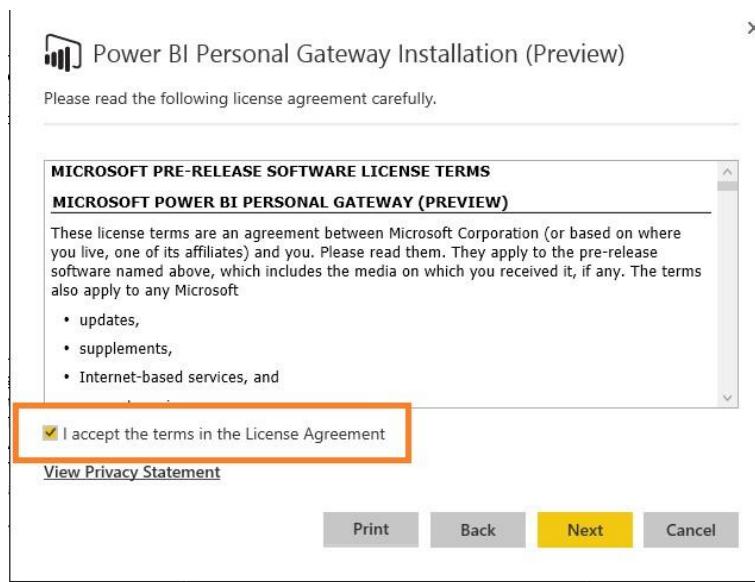
3. Once the Personal Gateway preparation steps are completed click on Next as shown in the figure.



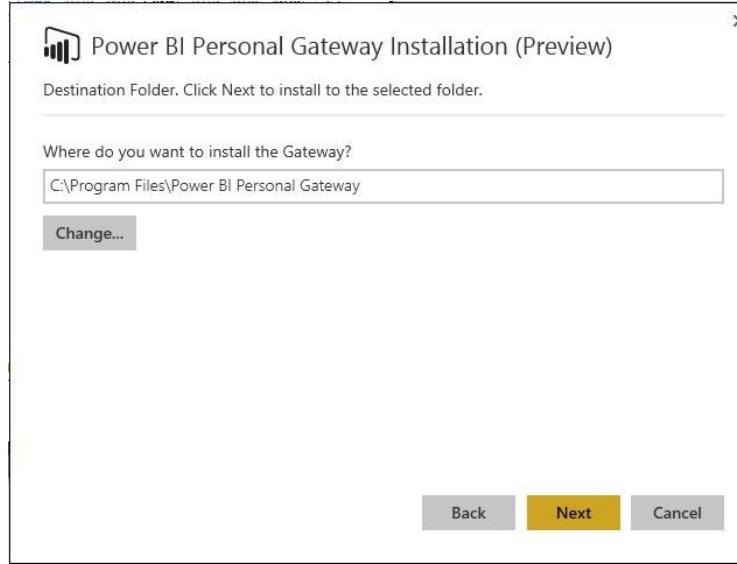
4. The Personal gateway detects information on your machine and shares these. The machine where personal gateway is being setup needs to be online and connected for the service to get data from your on premises data source.  
5. Click Next in this dialog.



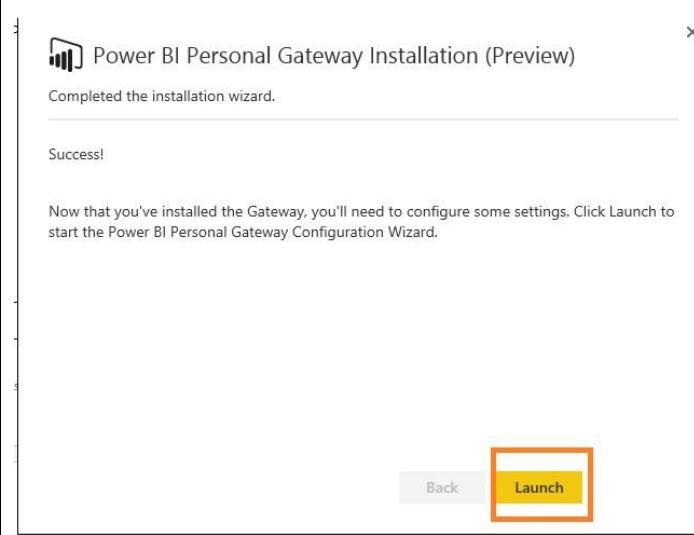
6. Read the privacy statement and accept the terms in the License Agreement as shown in the figure and click Next.



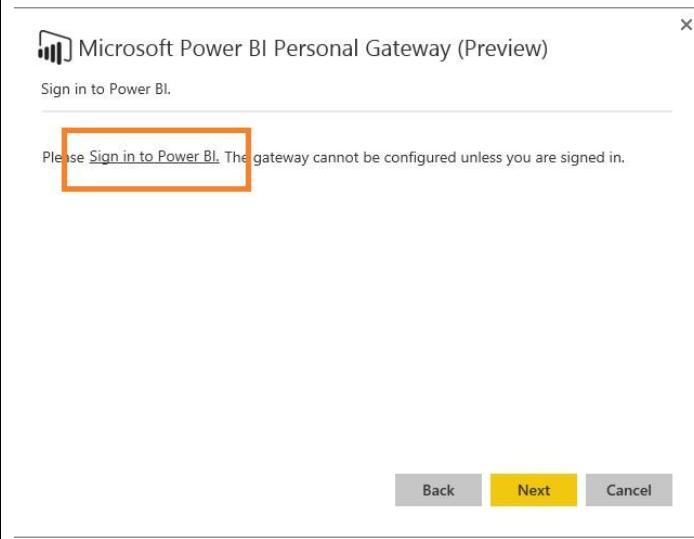
7. Select the default install path for the gateway and click Next.



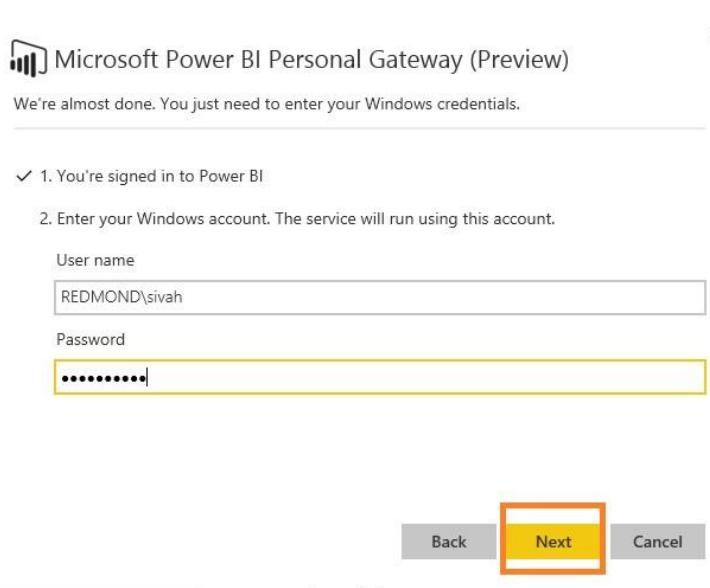
8. After the installation is complete click on Launch as shown in the figure.



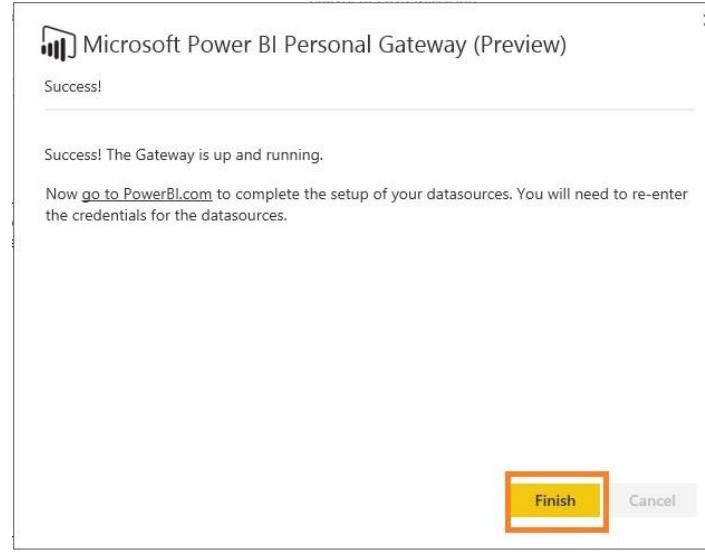
9. Click on sign in to Power BI.  
10. If you are prompted with Microsoft Azure dialog enter your Power BI credentials and click OK. If not, you are likely signed in automatically using your credentials.



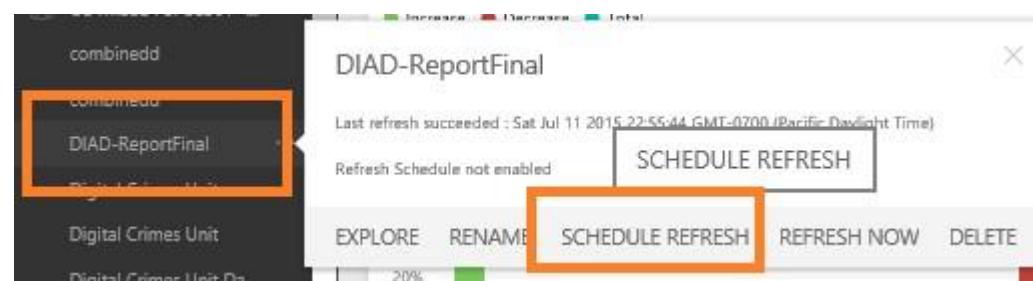
11. Enter your windows credentials for the Personal gateway service to run and click Next.



12. Once you see a successful install of the Personal gateway click Finish.  
13. At this time the Personal Gateway has been setup for you to refresh your on premises source data.



14. Go to <http://app.powerbi.com> or the service URL provided by the instructor.
15. Under the DataSet section locate the data set called DIAD-ReportFinal, click on the ellipses ... and click on Schedule Refresh as shown in the Figure.



16. In the Settings page, you will see the dataset is selected.
17. The Power BI service has detected that you have setup a Personal Gateway. If you expand the Gateway you will see the machine were Gateway is running.
18. The service has detected there are two data sources → File and Folder used in this data mode.
19. Click on Edit Credentials for File and in the Configure DIAD-ReportFinal dialog click Sign-in.
20. Click on the Edit Credentials for the Folder and in the Configure DIAD-ReportFinal dialog again click Sign-in.

You have now setup credentials to access the on premises data via the Power BI service.

Settings

General Dashboards Datasets Workbooks

04082015Roster  
AdventureWorksDW  
AdventureWorksDW  
AZCUBIPBIPOC05 - Adventure Works DW - Model  
AZCUBIPBIPOC05 - EnterpriseAnalytics - Enterprise Analytics  
BabyNames-06182015  
BabyNamesBugswhenNameisaddedtoLegend  
BabyNamesExcel  
BD1Test  
combineddd  
combineddd  
DIAD-ReportFinal  
Digital Crimes Unit  
Digital Crimes Unit Dashboard  
DNA-geospatial1 - Win10TabularModel - Model  
FinanceWithTable  
HR Dashboard Power Pivot

Settings for DIAD-ReportFinal

Gateway  
The Personal Gateway on SIVAH-0424 is online.

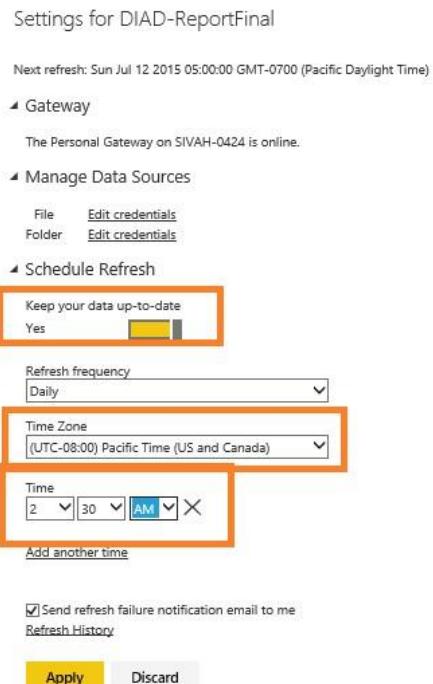
Manage Data Sources  
File Edit credentials  
Folder Edit credentials

Schedule Refresh  
Keep your data up-to-date: No  
Refresh frequency: Daily  
Time Zone: (UTC) Coordinated Universal Time  
Time: 12:00 PM  
Add another time  
Send refresh failure notification email to me  
Refresh History  
Apply Discard

Configure DIAD-ReportFinal  
Path: C:\DIAD\DATA\Access DB Backup\PowerBI.accdb  
Authentication Method: Windows  
Sign In Cancel

21. After setting up the credentials, enable data refresh by moving the slider below "Keep your data up-to-date".
22. Change the time zone to your time zone under "Time Zone" drop down.
23. Data refresh can be scheduled on the hour or 30min. Change the time to the next available 30 min time slot but give 5 min to complete the next few steps.
24. Click Apply.

You have now setup automated refresh.



25. The company has acquired another company selling the product in Germany and just received the sales details from Germany. The CSV file is provided under the folder FactData2
26. Copy and paste this file to
27. DIAD\Data\FactData1 folder where you have all the remaining CSV files.



Now you have configured on premises data refresh. Wait for the refresh operation to complete and the data to change on the dashboard. Continue to next section to learn more functionality.

## Power BI Service -- Part II

The dashboards and report you have shared with your team have been become really useful for entire team to get insights. You have heard the following requests from your team. You are unable to support them individually and you cannot meet their needs even if you work 24 hour/day.

1. Several users have requested you to create a dashboard for them that they can customize.
2. Some users have complained to you that the dashboards you have shared are dynamically changing sometimes and they are not clear what's happening. This is due to the fact you are updating the dashboards based on some users requests.
3. You want the ability to manage the list of users to whom you want to share the dashboards and you have existing security groups in your organization.
4. Certain Excel power users in your team reports in Excel with Excel data model where they have pivot tables and power view sheets. They really like Power BI and want to be able to see all their reports in Power BI. In addition they really like the functionality of automatic refresh in Power BI.
5. Additional people on your team have started creating reports that are useful for your team and organization. You want to be able to leverage them as a group and maintain content efficiently.

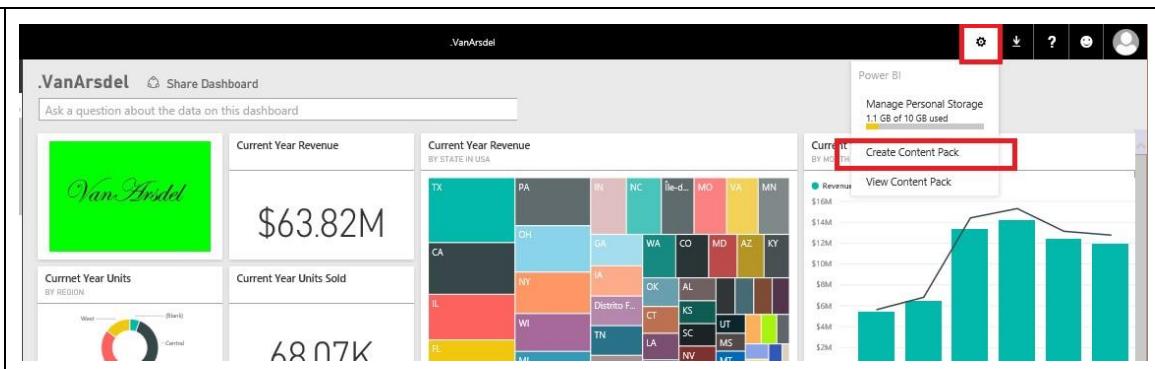
You only have 24 hours in a day and you are unable to meet the demands from all your users for the requests above. You want to make them be successful. In order to tackle this business problem in this section you will learn how to leverage the features in Power BI.

### Distributing content to larger audiences for them to customize

Power BI offers a feature content pack which helps you to package dashboards, reports and datasets and share it to a broad set of audiences – entire company or a group of people.

### Sharing content to your organization

1. Go to .VanArsdel dashboard.
2. Click on the settings icon on the top right and select "Create content pack" as shown in the figure



3. In the create content pack dialog enter the "VanArsdel Sales Report" under Title as shown in the figure
4. Enter "This report contains VanArsdel revenue and unit shares over the year along with competitor information"
5. Select the Upload text below Image and choose VanArsdel logo which you used earlier that's available as part of the contents for this class.
6. You can select the set of Dashboards, reports and datasets to be shared. In this example, we will just be using the .VanArsdel dashboard, report and dataset as shown in the Figure.
7. Finally you will be choosing if you want to share this to a group of users or to entire organization which is your entire company. Follow the instructions from the instructor on what group to share your content pack.
8. Click on Publish.

**Create Content Pack**

Choose who will have access to this content pack:

Specific Groups    My Entire Organization

Enter email addresses separated by ; or,

**Title**

**Description**

This report contains VanArsdel revenue and unit shares over the years along with competitor information

**Image:**  
  ⓘ

**Select items to publish**

**Dashboards**

- Project Portfolio
- Sales Manager Dashboard
- Sales Performance
- Sales Impact
- Sales Manager
- AdventureWorks
- .VanArsdel

**Reports**

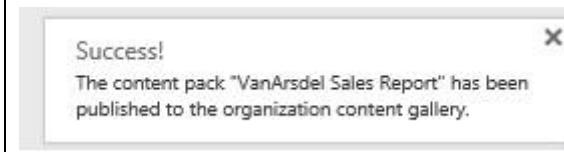
- Salesforce Sales Manager
- AdventureWorksDW
- Sales Impact
- Title
- Title
- VanArsdel Revenue
- DIAD-ReportFinal

**Datasets**

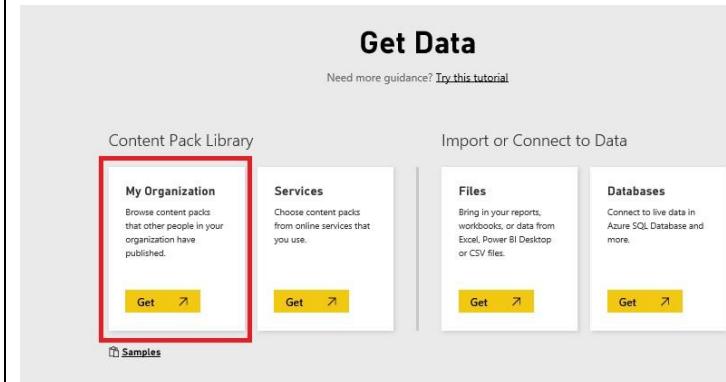
- Customer Work
- Town Data
- Title
- Title
- Sales Impact
- Sales Manager
- AdventureWorksDW
- DIAD-ReportFinal

The content pack will be available in your organization's content gallery. Learn more

9. You should see a notification that content pack creation was successful as shown in the figure.

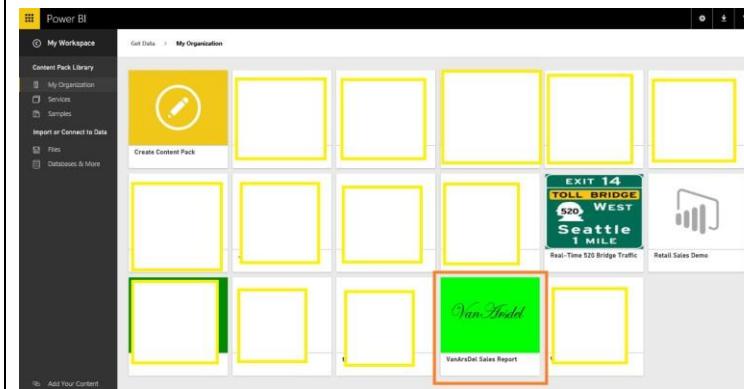


10. Identify a user part of your company to whom you shared the content pack. This user can be you as well.  
11. Click on Get Data on the Power BI Service.  
12. In the Get Data page click on Get under My Organization as shown in the figure.

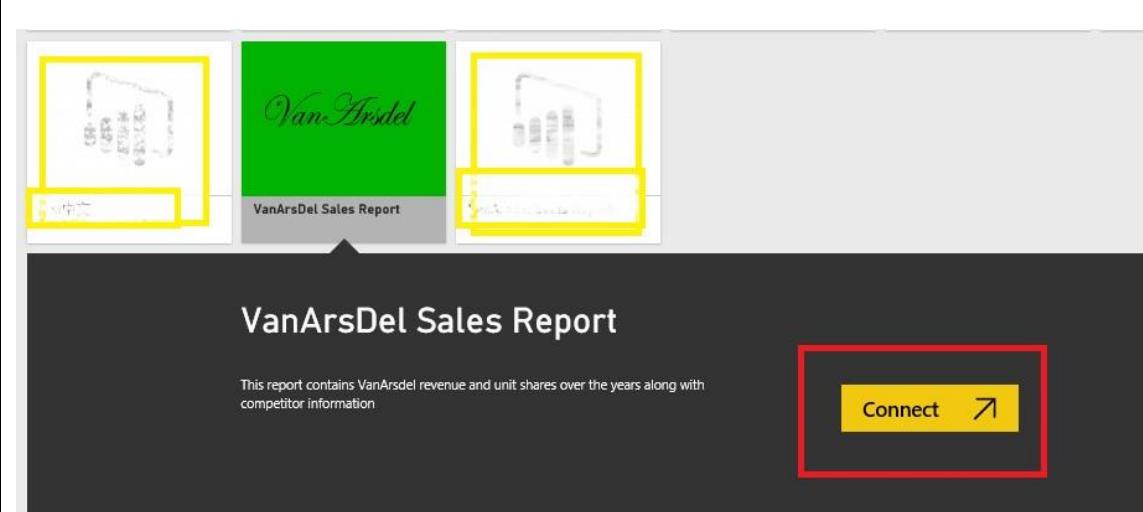


13. In the Organization page you will see the VanArsdel content package as shown in the figure.

In the figure several content packs are shaded with yellow border due to the confidentiality of the content packs.

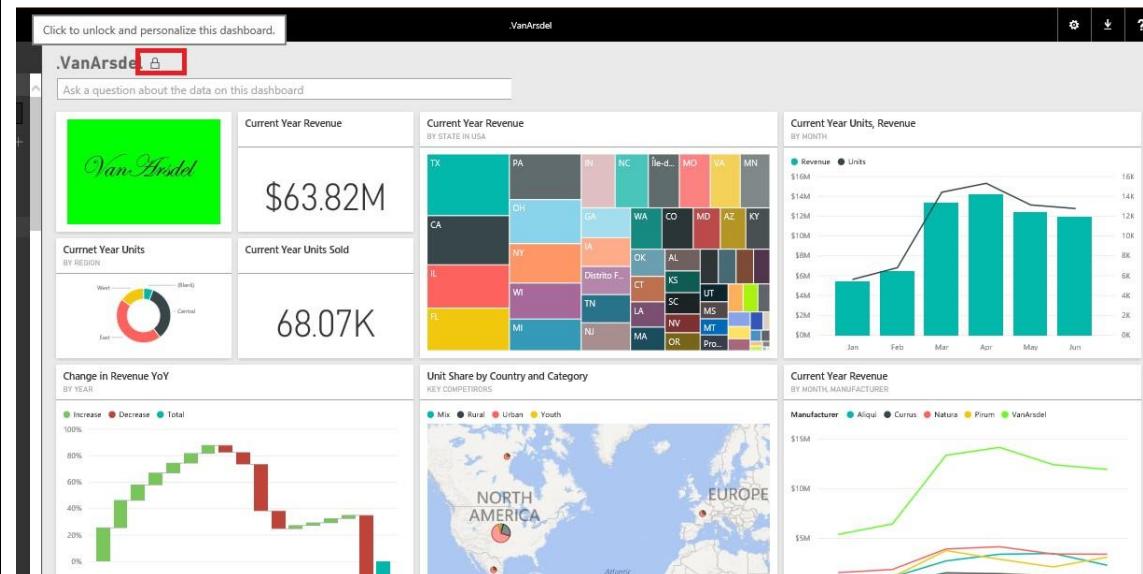


14. Request the end user to click on VanArsdel content pack. The user will see the description you entered while creating the content pack. Request the user to hit Connect.



15. A new dashboard is created for the end user as shown in the figure. By default the dashboard is a read only dashboard for the end user and any updates made to the content packs will be seen by the end user. You will learn how to make updates to the content pack shortly.

16. If the user wants to personalize (rearrange the tiles, add additional tiles from his/her reports) then the user needs to click on the lock icon to unlock the dashboard. Request your co-worker to click on lock to unlock the dashboard and personalize their dashboard.



## Updating a content pack

After publishing your content pack you have requests from key members of your team to organize and add additional content (tiles to the dashboard, new reports using the same data as well as additional data. In this section you will learn how to update a content pack. In this example you will just re-organize the tiles and adding a new QnA tile to update the content pack.

1. Go to your .VanArsdel dashboard which was published as a content pack.
2. Re-organize the tiles as shown in the figure.

The dashboard contains the following tiles:

- Current Year Revenue**: Shows a large value of \$63.82M.
- Current Year Units Sold**: Shows a value of 68.07K.
- Change in Revenue YoY**: A line chart showing revenue growth from 2000 to 2015.
- Current Year Revenue BY STATE IN USA**: A stacked bar chart showing revenue distribution across US states.
- Unit Share by Country and Category**: A map showing unit share by country and category.
- Current Year Revenue BY MONTH, MANUFACTURER**: A line chart showing revenue by month for different manufacturers, highlighted with a red box.
- Current Year Units, Revenue BY MONTH**: A dual-axis chart showing units and revenue by month.

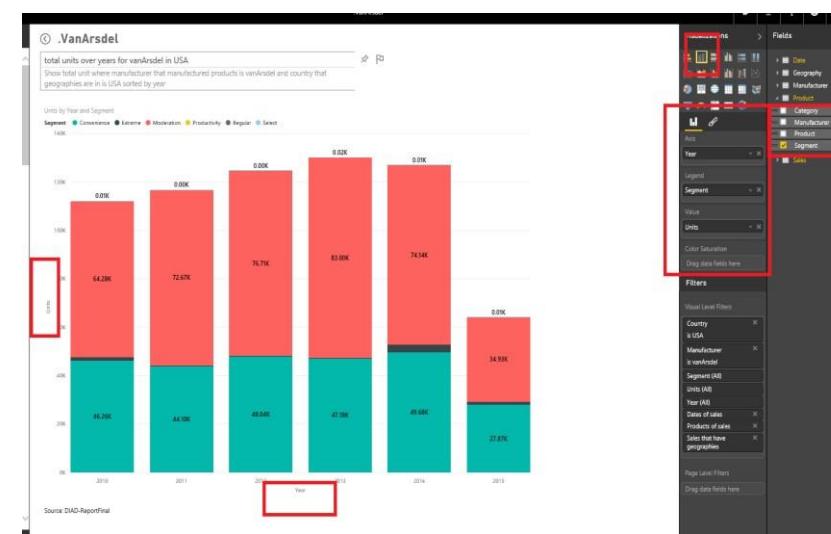
  

The visualization pane shows the following filters applied to the line chart:

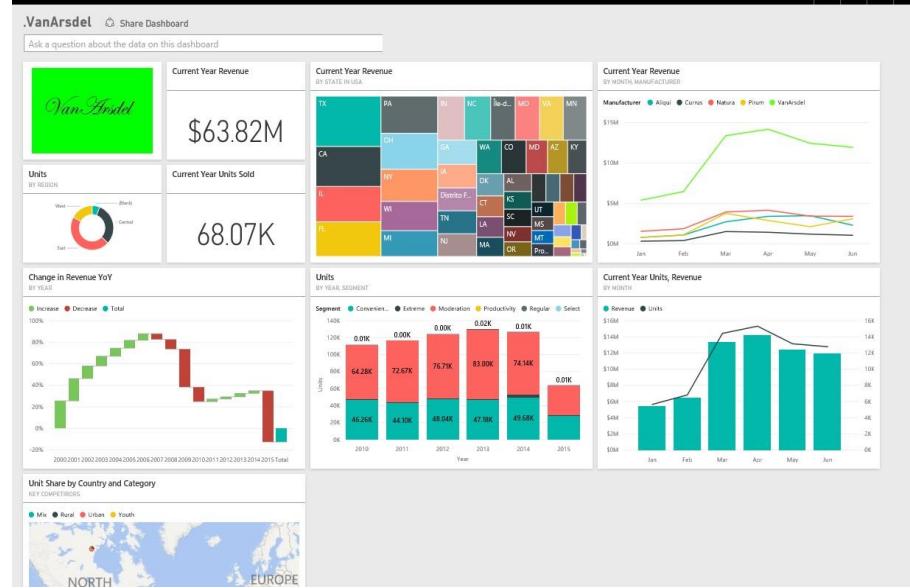
- Country: USA
- Manufacturers: VanArsdel
- Date of sale: Jan 2015 - Jun 2015
- Product type: All products
- Region: North America

3. Your organization has requested you to add the total units sold since 2010 for United States as top level metric.
4. Enter the text "Total units over years for VanArsdel in USA". You will see the line chart formed by QnA.
5. Click on the > icons next to Visualizations and Fields so that you can see the list of filters that have been applied in the filter pane.

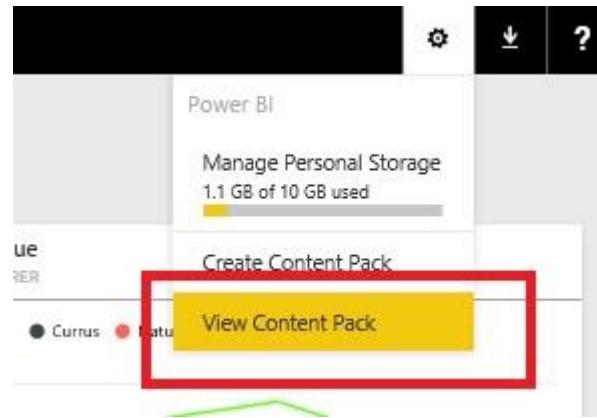
6. Change the visual to column chart
7. Drag and drop Segment column to the Legend of the column chart 8. Click on the formatting brush.
9. Enable X-axis and Y-axis titles
10. Enable Data Labels
11. Expand X-axis and enter the start year as 2010.
12. Pin the tile to your dashboard.



13. Organize your dashboard as shown in the Figure.
14. You will see a warning on the top right stating that the dashboard that was published as content pack has changed. You do need to republish for your end users to see the changes.



15. Now that you have made all the changes, you do need to update the content pack. Click on the settings and click on View Content pack



16. In the View Content Packs page you get to see all the content packs you have published, to whom you have published as well as date it was published
17. You can edit or delete content pack to make changes. Click Edit.
- 18.

| View Content Packs     |                 |                |                                               |
|------------------------|-----------------|----------------|-----------------------------------------------|
| Name                   | Published To    | Date Published | Actions                                       |
| VanArsDel Sales Report | My Organization | Jul 12, 2015   | <a href="#">Edit</a>   <a href="#">Delete</a> |

19. Make any changes to description you want to inform your users and click Update to republish your content pack.

If your end-users did not personalize the content pack they see the changes to the dashboard. No user action required.

If end-users have personalized the content pack they will see a warning that a new version of the content pack has been published. They can choose to get the updated content pack.

*Delivering the dashboards as content pack helps you in formatting the right content on the dashboard before your end-users can see the changes.*

*The users will not see new data at random time. You can establish a rhythm in your organization that changes will get published on a regular cadence that the users can expect. In addition you can also manage this efficiently for large user group via security group.*

Using the content pack you will achieve the first three business requirements in the beginning of this section.

## Update Content Pack

Choose who will have access to this content pack:

Specific Groups  My Entire Organization

### Title

VanArsDel Sales Report

### Description

This report contains VanArsdel revenue and unit shares over the years along with competitor information



### Image:

[Upload](#) an image or company logo (1)

### Select items to publish

#### Dashboards

- People View
- Windows & WinPhone Use...
- Cloud Refresh
- New Technology Adoption
- TU
- People View
- Windows & WinPhone Use...
- TU

#### Reports

- People View
- Digital Crimes Unit Dashbo...
- Windows&WinPhoneUserV...
- New Technology Adoption...
- TU\_V2.5
- MPSIT Travel
- poc
- TU\_V2.5
- MPSIT Travel
- poc

#### Datasets

- People View
- Digital Crimes Unit Dashbo...
- Windows&WinPhoneUserV...
- New Technology Adoption...
- TU\_V2.5
- MPSIT Travel
- poc
- People View
- Digital Crimes Unit Dashbo...
- Windows&WinPhoneUserV...
- New Technology Adoption...
- TU\_V2.5
- MPSIT Travel
- poc

The content pack will be available in your organization's content gallery. [Learn more](#)

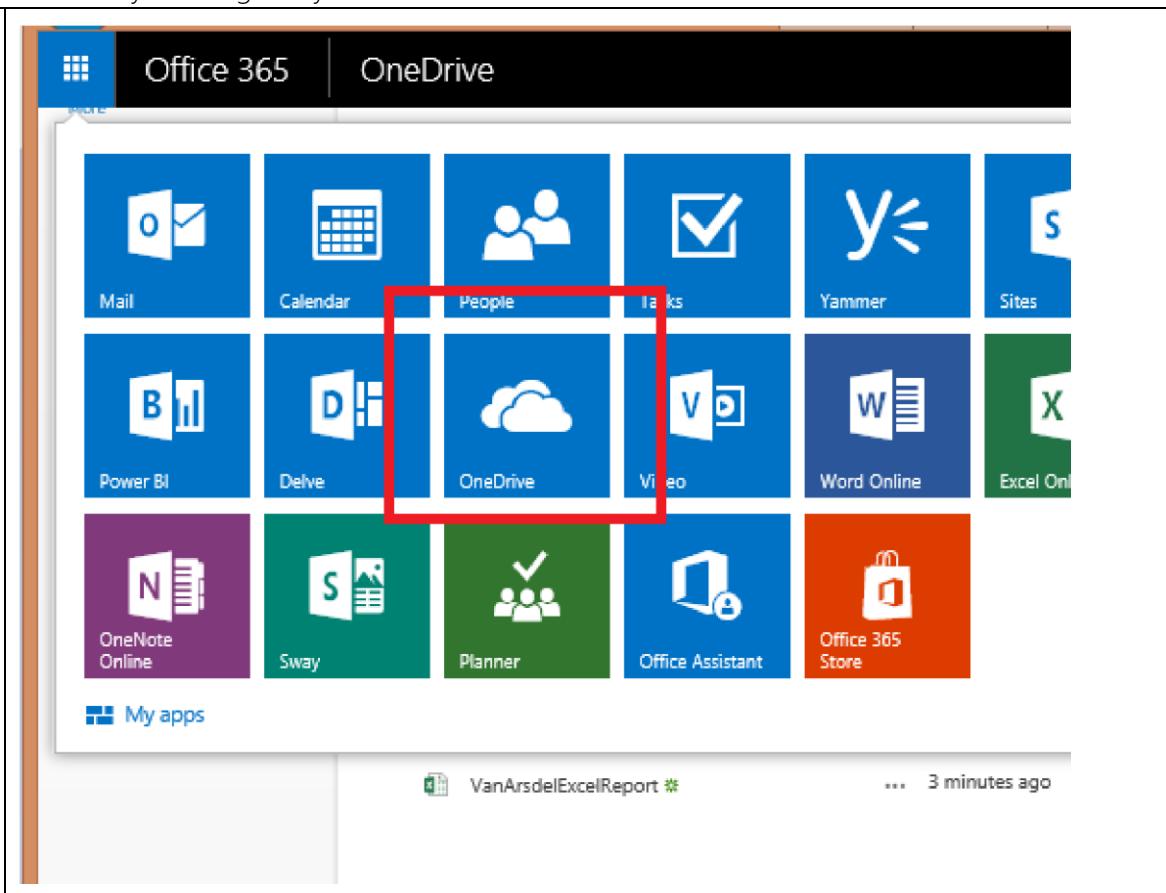
**Update**

Cancel

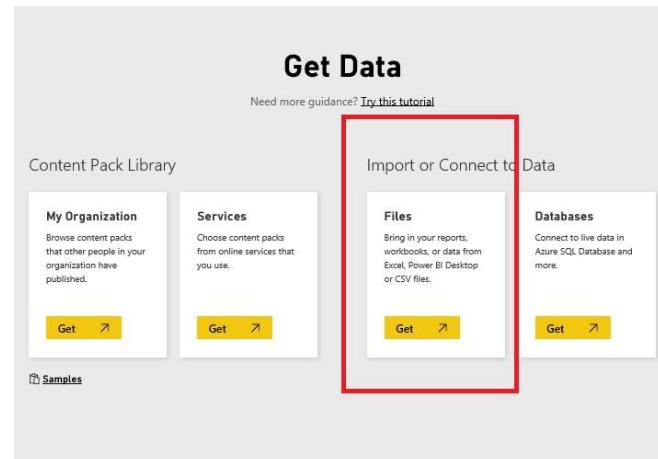
## View and manage your Excel reports in Power BI

The next business problem is to share information to your end-users on how they can bring in their Excel content and setup data refresh. In this section you will learn how to bring your Excel content and setup refresh so that you can guide your end-users who want to view all their content from Power BI.

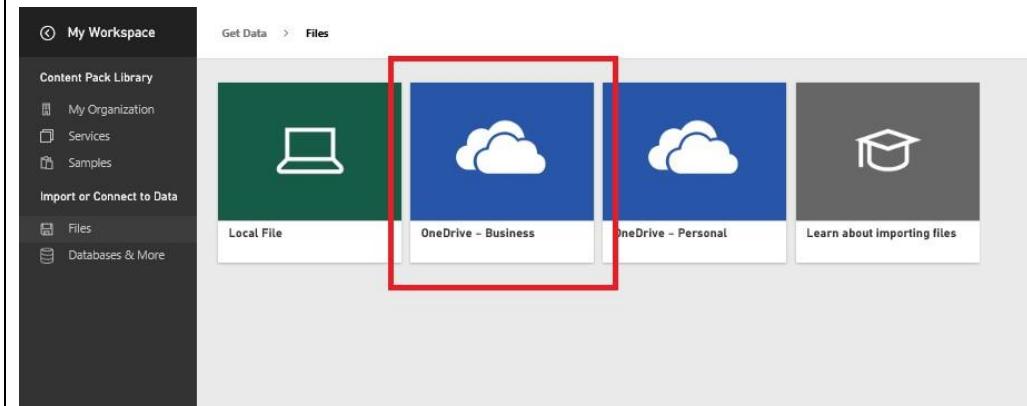
1. Login to your Office 365 account
2. Click on the top left corner and select OneDrive
3. Go to the documents and upload the file VanArsdelExcelReport provided to you.



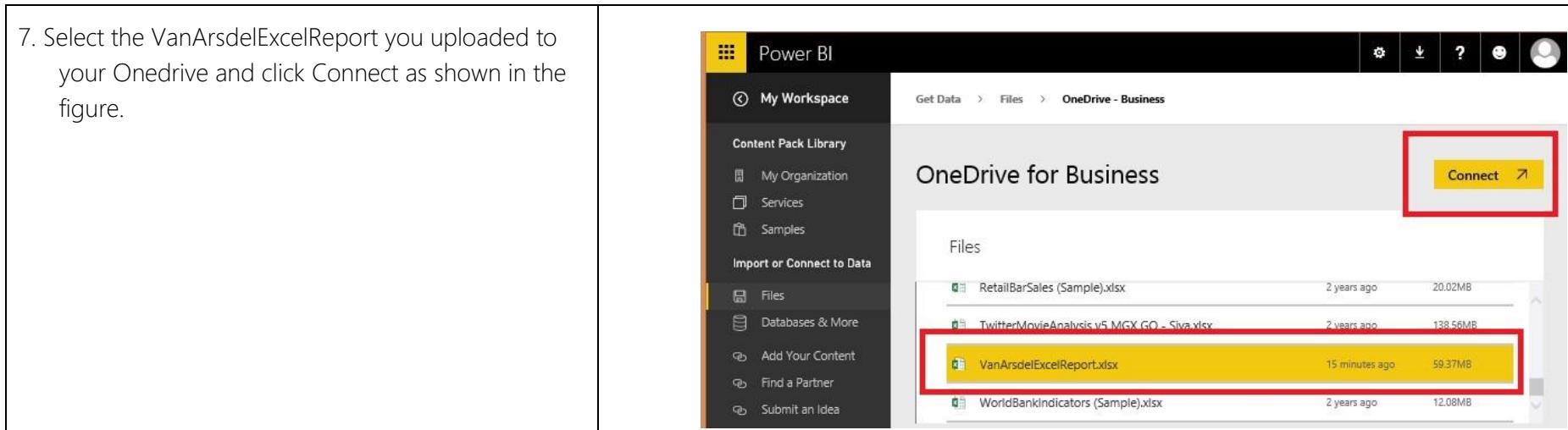
4. Login to <http://app.powerbi.com> (or URL provided by the instructor) using your organizational credential and click on Get Data.
5. Click on Get under Files as shown in the Figure



6. In the Get Data → Files page click on OneDrive – Business as shown in the figure.



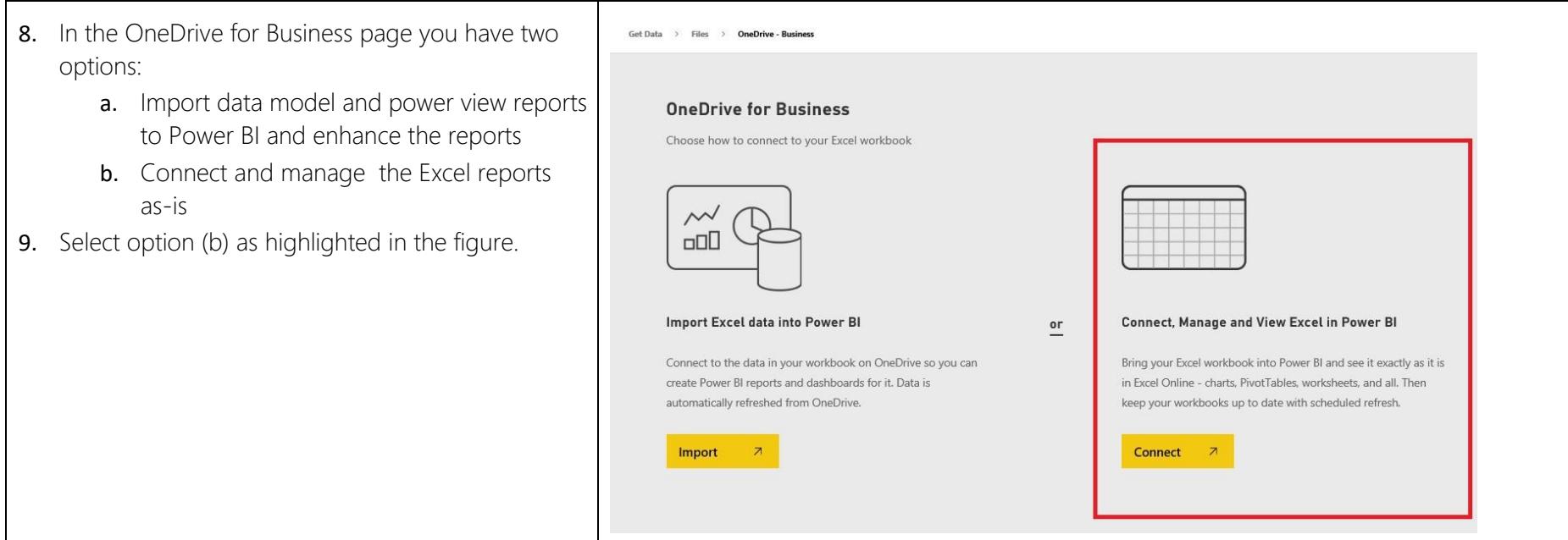
7. Select the VanArsdelExcelReport you uploaded to your Onedrive and click Connect as shown in the figure.



The screenshot shows the Power BI interface with the sidebar menu open. Under 'Import or Connect to Data', the 'Files' option is selected. The main area displays a list of files from OneDrive for Business. A red box highlights the 'Connect' button next to the file 'VanArsdelExcelReport.xlsx'. The file details are as follows:

| File                                       | Last Modified  | Size     |
|--------------------------------------------|----------------|----------|
| RetailBarSales (Sample).xlsx               | 2 years ago    | 20.02MB  |
| TwitterMovieAnalysis v5 MGX GO - Siva.xlsx | 2 years ago    | 138.56MB |
| <b>VanArsdelExcelReport.xlsx</b>           | 15 minutes ago | 59.37MB  |
| WorldBankIndicators (Sample).xlsx          | 2 years ago    | 12.08MB  |

8. In the OneDrive for Business page you have two options:
- Import data model and power view reports to Power BI and enhance the reports
  - Connect and manage the Excel reports as-is
9. Select option (b) as highlighted in the figure.

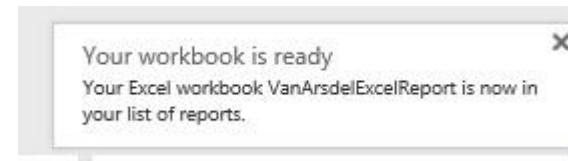


The screenshot shows the 'OneDrive for Business' connection options. It offers two choices:

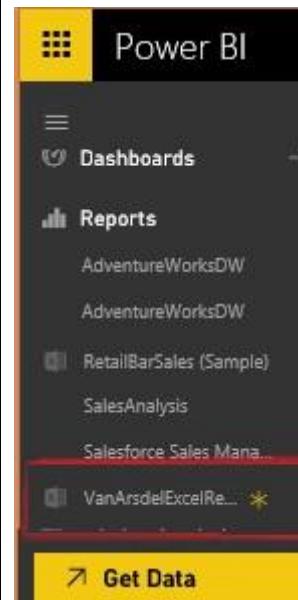
- Import Excel data into Power BI**: This option allows users to connect to their OneDrive data to create Power BI reports and dashboards. It includes a 'Import' button and a description: "Connect to the data in your workbook on OneDrive so you can create Power BI reports and dashboards for it. Data is automatically refreshed from OneDrive."
- Connect, Manage and View Excel in Power BI**: This option allows users to bring their Excel workbooks into Power BI exactly as they are in Excel Online, including charts, PivotTables, and worksheets. It includes a 'Connect' button and a description: "Bring your Excel workbook into Power BI and see it exactly as it is in Excel Online - charts, PivotTables, worksheets, and all. Then keep your workbooks up to date with scheduled refresh."

A red box highlights the 'Connect' button under the second option.

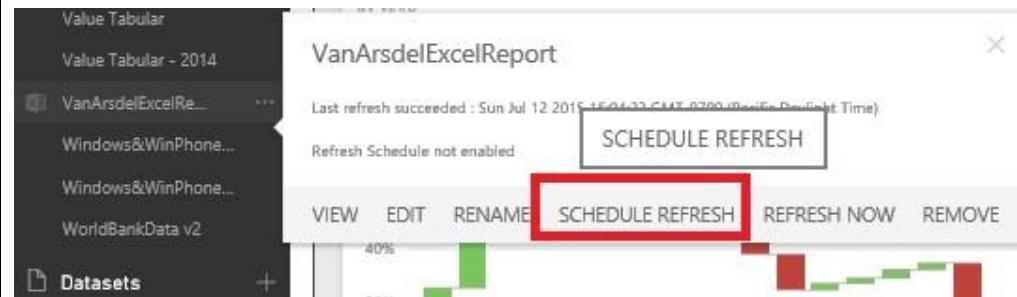
10. Once the Excel workbook has been successfully connected to Power BI you will see the information shown in the figure on top right corner of your browser.



11. You will now see the Excel report under the Reports. You will notice an Excel icon next to the report to indicate it's a high fidelity Excel report, meaning the excel content with pivot tables and charts can be viewed in Power BI.
12. If you click on the Excel report Power BI will launch a new browser and opens the workbook using Excel online.



13. To schedule a refresh for your Excel workbook click on the ellipses ... next to your Excel report and click Schedule Refresh



14. You will be in the Settings page. Depending on your source data (cloud or on premises) you can setup data refresh. If the source data is on premises you need a personal gateway. We will not be setting up data refresh again in this section. You can setup the data refresh very similar to what you did in earlier section for your Excel workbooks.

The screenshot shows the 'Settings' page in Power BI. The top navigation bar has tabs for General, Dashboards, Datasets, and Workbooks, with 'Workbooks' being the active tab. On the left, there is a list of workbooks: 'Olympics (Sample)', 'RetailBarSales (Sample)', and 'VanArdelExcelReport'. The 'VanArdelExcelReport' item is highlighted with a red box. The main content area is titled 'Settings for VanArdelExcelReport'. It contains the following sections: 'My organization manages my on-premises Gateway. I'd like to schedule refresh.' (with an unchecked checkbox), 'Gateway' (with a note: 'The Personal Gateway on SIVAH-0424 is online.'), 'Manage Data Sources', and 'Schedule Refresh'.

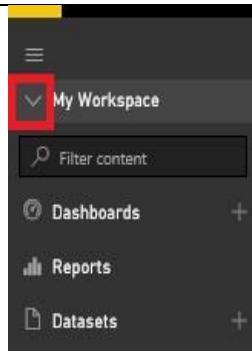
You have learned how to view and manage your Excel reports within Power BI. You can now communicate to your power users of Excel to leverage this functionality for your workbooks. This helps address the fourth business problem we reviewed earlier.

## Collaboration via Office 365 Groups

In order to address the last business problem of leveraging your co-workers preparing reports and collaboratively creating content for your organization you can leverage the group functionality in Power BI. In this section you will learn how to create groups and create content. You will learn this section more efficiently if you can pair up with a co-worker from your organization.

### Creating a Group

1. Login to you <http://app.powerbi.com> or the URL provided by your instructor using your organizational credential.
2. Select the drop down next to My Workspace



3. Click the + sign next to group workspaces. If you are part of other groups those groups will be show here as you can see from the figure.
4. Enter a name for your group
5. Select if you want the group to be private or public. We recommend using private.
6. Enter the email addresses of users of your organizational who need to be part of this group as shown in the figure.
7. Click Add to add the members.
8. Finally you will see "Create" enabled at the top. Click on Create.
9. You will now have a group created.

The screenshot shows the Microsoft Power BI service interface. On the left, there's a sidebar with 'My Workspace' selected, showing a list of group workspaces including 'My Workspace', 'Power BI Customer Success Team', and 'Power BI Training'. A red box highlights the '+' button next to 'GROUP WORKSPACES'. The main area displays a dashboard titled 'VanArsdel' with various visualizations: a large green square, a map of the US showing state revenue, a large text '\$63.82M', a bar chart for 'Current Year Revenue BY STATE', a donut chart for 'Units BY REGION', and a line chart for 'Change in Revenue YoY BY YEAR'. To the right, a modal window titled 'Create a Group' is open. It has fields for 'Name your group' (containing 'DADJuly'), 'Group ID' (containing 'dadijuly'), and a dropdown for 'Privacy' set to 'Private - Only approved members can see what's inside'. Under 'Add group members', the email 'sivah@microsoft.com|jenunder@microsoft.com' is listed, with a red box highlighting the input field. At the bottom of the modal, a yellow 'Add' button is visible.

10. Under Group workspaces you can now switch to the group you created. In this example we have shown a group called DIADJuly.

11. You have separate set of Dashboards, Reports and Datasets that are part of the group. You and your co-workers can bring content into the group, create dashboards together and package the set of dashboards, reports and datasets and share them as content pack.

Note: All members of the group have read-write permissions.

Welcome to the DIADJuly group

You're on your way to exploring your data and monitoring what matters with all your group members. Let's start by getting some data.

Need more guidance? [Try this tutorial](#)

Content Pack Library

My Organization

Services

Files

Databases

Samples

Import or Connect to Data

12. When you create a group, there is a separate OneDrive account created for the group. You can have all your assets of Excel and Power BI Desktop files stored in the groups OneDrive.

13. You can get to the groups OneDrive account by selecting the group and files or logging into Office 365 and selecting the appropriate group.

Please wait for automated email about creation of groups to see all the functionality about groups.

Office 365

Power BI

Documents

Recent

Shared with me

Followed

Site folders

Recycle bin

Groups

Browse Groups

Create Group

Power BI Training

Power BI Customer S...

...  
Members  
Calendar  
Conversations  
Files  
Edit Group  
Leave Group

We encourage you and your co-worker(s) part of the group to leverage the functionality and share content packs for your organization. Please note, dashboards created via groups can only be delivered as content pack to the end-users. You can cannot share dashboards to end-users using the Sharing mechanism.

Enclosed below is an overview of the three key Power BI features of Sharing, Groups and Organizational content packages by which you can share content to the users.

| Share/Groups/Content Packs |                                                                                            |                                                                                                                       |                                                                                           |
|----------------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
|                            | Share                                                                                      | Group                                                                                                                 | Org Content Pack                                                                          |
| <b>Purpose</b>             | Adhoc sharing                                                                              | Collaboration                                                                                                         | Broader content delivery                                                                  |
| <b>Discovery</b>           | Invitation email                                                                           | Group space                                                                                                           | Content Gallery in Get Data                                                               |
| <b>Target Audience</b>     | Individuals<br><small>(Typically people that you work with and needs this content)</small> | O365 Groups<br><small>(Typically teams/collaborators that you work with closely for a common purpose/project)</small> | All/Groups/Individuals<br><small>(Anyone who might be interested in this content)</small> |
| <b>Permission</b>          | Primarily read                                                                             | Primarily edit                                                                                                        | Primarily edit their own copy                                                             |
| <b>License</b>             | Power BI Free                                                                              | Power BI Pro                                                                                                          | Power BI Pro                                                                              |

Some organizations restrict the data using role based permissions using SQL Server Analysis Services. If you have data in your dashboards backed from on premises SQL Server Analysis Services end users will see the data based on the credentials of the end-user. By this you can add additional way of securing your organizational data. This lab does not cover how to create reports using Power BI Desktop against your SQL Server Analysis Services tabular models. Please request your instructor to give an overview and demo of creating reports against your on premises SQL Server Analysis Services and setting up Analysis Services connector and key factors to consider while architecting this solution for your organization.

You installed the Power BI mobile app in the pre-requisite section. We recommend you to try out the Power BI mobile application after the features get to <http://msit.powerbi.com>

## Optional Activities

There are a couple of extra pieces of data that you can explore to check your understanding of Power BI..

### Sentiment Analysis

We have not made use of the sentiment table, so try to figure out what needs to be done to correctly join it to what we have. Hint You might need to create extra columns and you might want to think carefully about how to join this so Power BI will not allow us to create circular references

### New Subsidiary

VanArsdel have opened a new subsidiary in Germany and in the Data\FactData2 folder there is a corresponding GermanySales.csv file. How should this file be included in the loading process?

### Competitive Analysis

The VanArsdel strategy team have classified its competitors in a couple of files in the Data\Data2 folder

| Manufacturer Competitive Analysis.csv                                                                                                                                                    | CompetitiveAnalysisID | CompetitiveAnalysis   | SortOrderID |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|-------------|
| is a way of classifying VanArsdel's competitors in a number of ways, what type of company they are, their position in the market and the possibility of a merger acquisition or takeover | 1                     | Acquisition Target    | 1           |
|                                                                                                                                                                                          | 2                     | Merger Target         | 2           |
|                                                                                                                                                                                          | 3                     | PLC                   | 4           |
|                                                                                                                                                                                          | 4                     | LLP                   | 5           |
|                                                                                                                                                                                          | 5                     | Privately Owned       | 6           |
|                                                                                                                                                                                          | 6                     | Takover Threat        | 3           |
|                                                                                                                                                                                          | 7                     | Market Leader         | 7           |
|                                                                                                                                                                                          | 8                     | Challenger            | 8           |
|                                                                                                                                                                                          | 9                     | In Decline            | 9           |
| Manufacturer Competitive Analysis.csv                                                                                                                                                    | ManufacturerID        | CompetitiveAnalysisID |             |
| joins the manufacturers to the analysis categories in the table above.                                                                                                                   | 1                     | 8                     |             |
|                                                                                                                                                                                          | 2                     | 7                     |             |
|                                                                                                                                                                                          | 3                     | 8                     |             |
|                                                                                                                                                                                          | 4                     | 7                     |             |
|                                                                                                                                                                                          | 5                     | 9                     |             |
|                                                                                                                                                                                          | 6                     | 8                     |             |
|                                                                                                                                                                                          | 8                     | 7                     |             |
|                                                                                                                                                                                          | 9                     | 8                     |             |
|                                                                                                                                                                                          | 10                    | 7                     |             |

So how should this many to many relationship be exposed in Power BI, to ensure that totals of revenue by these categories are correct?