



Power BI

Dashboard in a Day

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13/06/2017

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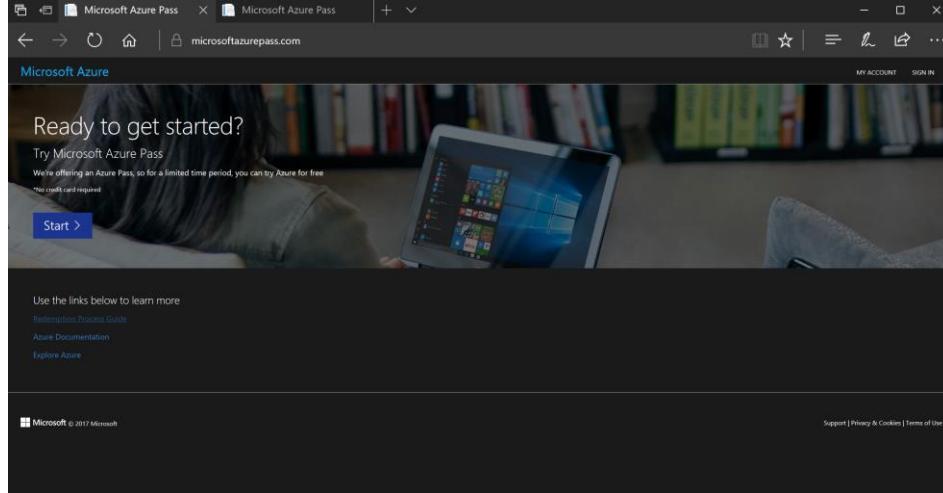
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Lab Prerequisites

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. Note there is a redemption guide on the site to guide you through the sign-up process	

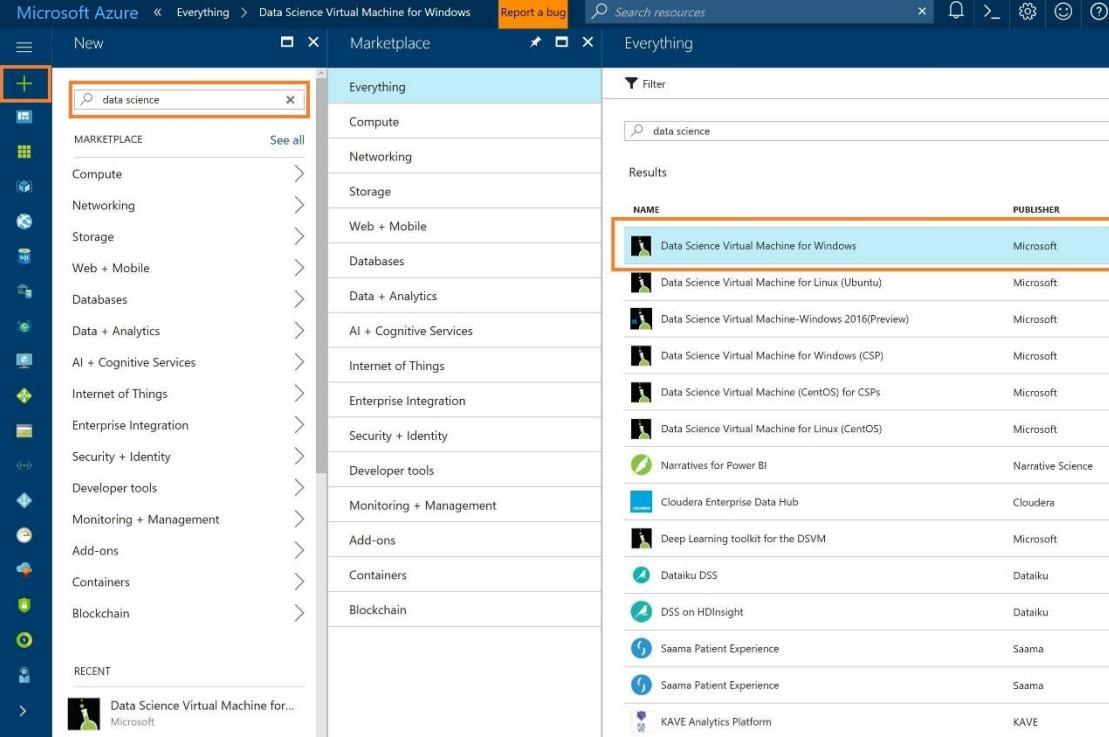
3. Sign into a Microsoft account to continue. If you have an account password saved or you automatically sign into other Microsoft services that Microsoft account will be used to redeem the promo code.
4. Fill out the remaining information and click **Submit**

The image is a composite of two parts. On the left, there is a stylized illustration of a city skyline with various buildings in different colors like blue, green, purple, and orange. A large lightbulb is positioned above the buildings, symbolizing ideas or innovation. Two small figures, one in a blue suit and one in a red shirt, are standing near the base of the buildings, looking at a laptop screen. The background is a bright blue sky with a few white clouds. On the right side of the image, there is a screenshot of a Microsoft login page titled "Azure Pass". The page has fields for "Email address or phone number" and "Password", a "Keep me signed in" checkbox, and a "Sign in" button. Below the sign-in area, there is a link for users who "Can't access your account?". At the bottom of the page, there is copyright information ("© 2017 Microsoft Terms of Use Privacy & Cookies") and the Microsoft logo.

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 the Data Science Virtual Machine for Windows with Power BI already installed.

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 search for 'Data Science' and select the 'Data Science Virtual Machine for Windows'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. North Europe = Ireland).	

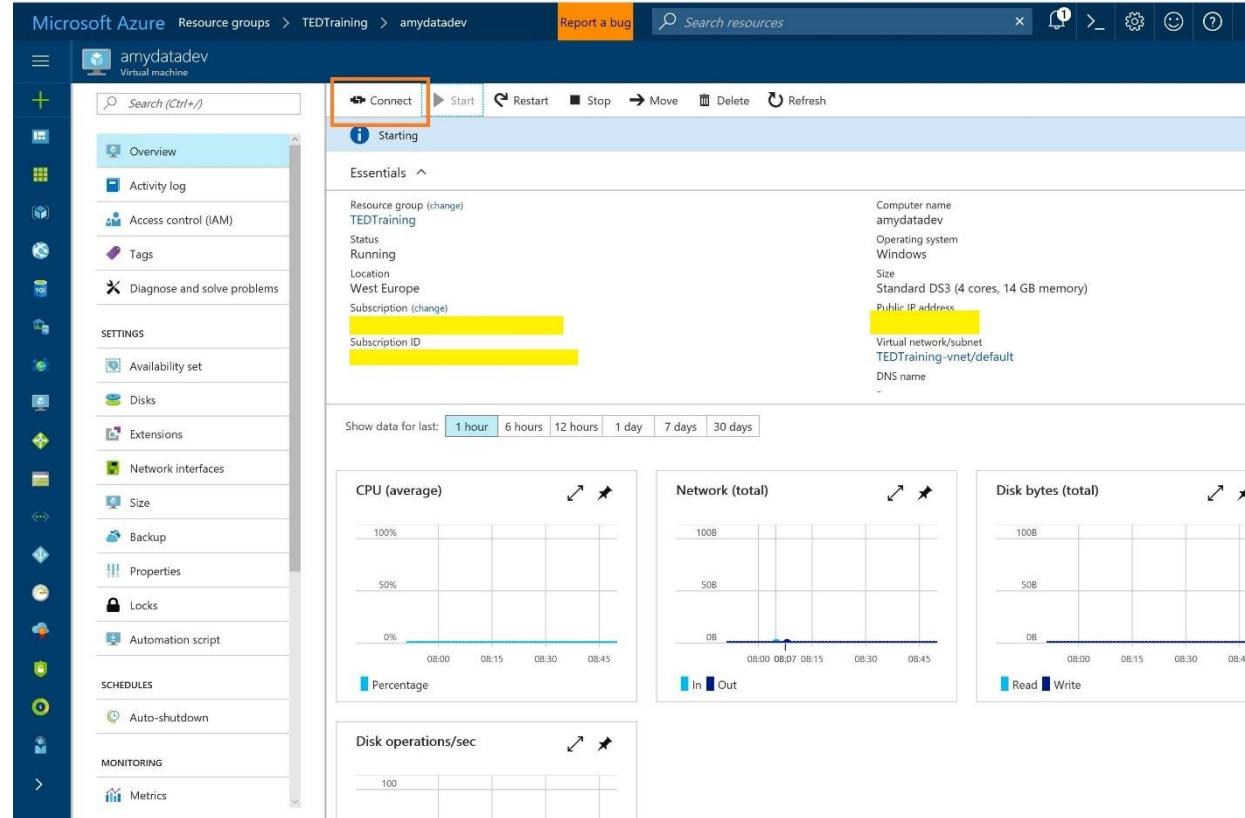
3. select **connect** from the toolbar and Azure will download an .rdp file we can use to connect to our VM.

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.

Also if you aren't using a PC for this and you haven't tried connecting to a remote Windows machine before then follow this guide for iOS (<https://docs.microsoft.com/en-us/windows-server/remote/remote-desktop-services/clients/remote-desktop-ios>)

And this for Android

<https://docs.microsoft.com/en-us/windows-server/remote/remote-desktop-services/clients/remote-desktop-android>



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 few local files. The lab guide itself and the local files can be found on GitHub:

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

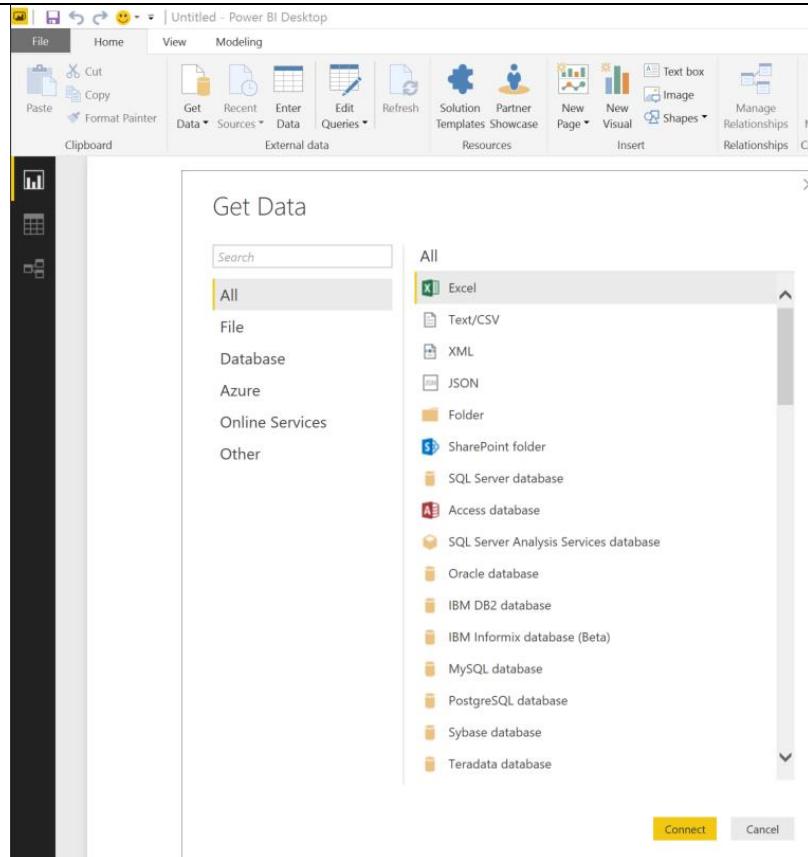
1. Power BI Desktop
2. Power BI Service – Part I
3. Power BI Service – Part II
4. Q&A
5. Create your own Dashboard

Power BI Desktop

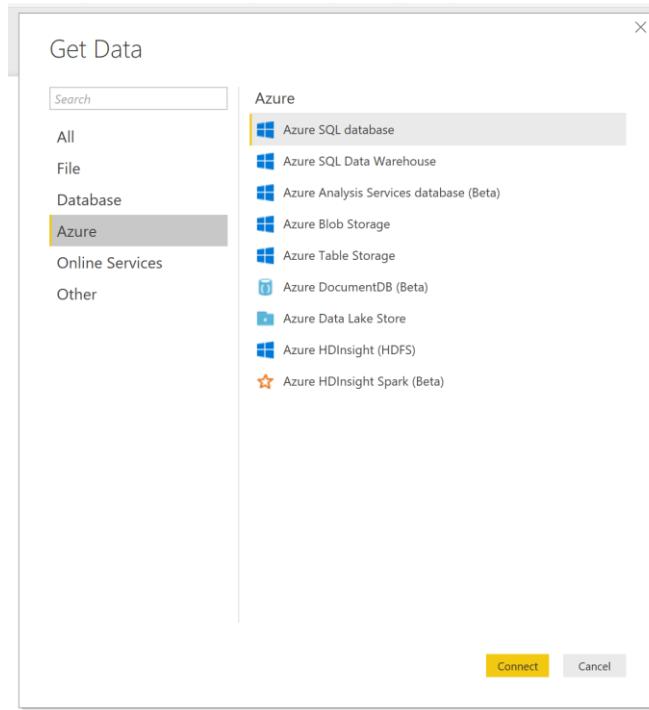
Importing Data

In this section, you will be importing sales data of VanArsdel and competing companies within the United States which are being maintained in a SQL Data Warehouse. In addition, you also will be merging sales data from other countries.

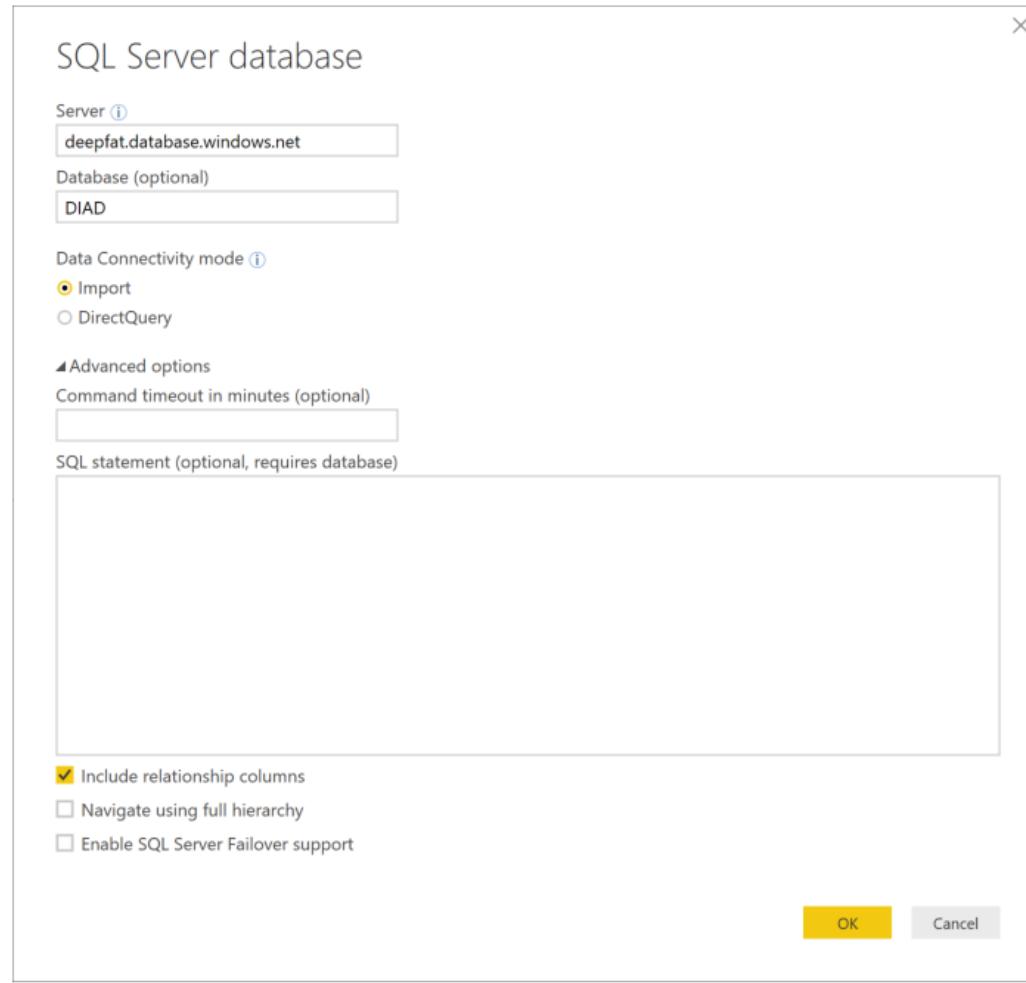
Launching Power BI Desktop and Loading Data

Steps	
1. Launch Power BI Desktop.	
2. Select the Get Data item in the Home ribbon and click Azure..	

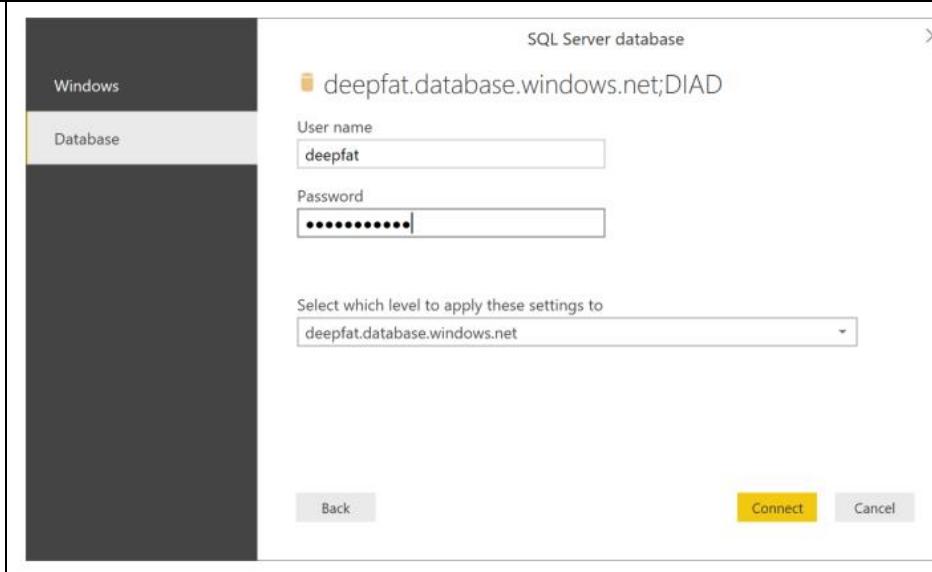
3. Scroll down to Microsoft Azure SQL Database and click **Connect**



4. Enter **deepfat.database.windows.net** as the server and **DIAD** as the database, leave the option set as Import, note the other advanced options and click OK



5. Select Database on the left as we'll be using SQL Authentication for this lab
Username **deepfat**,
Password **sqlsatMCR17**
And click **Connect**



6. In the Navigator window select all the tables but NOT the sys_database_firewall_rules_table or Bi_User which will be used later.

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.

1.

7. Click Edit NOT Load as we'll want to make some changes before we can use the data.

The screenshot shows the Power BI Navigator window. On the left, a tree view lists tables from a database named 'deepfat.database.windows.net: DIAD [11]'. Several tables are selected, indicated by checked checkboxes: bi_date, bi_geo, bi_manufacturer, bi_product, bi_salesFact, bi_sentiment, and bi_User. The 'bi_product' table is highlighted with a yellow rectangular selection box. On the right, a preview grid titled 'bi_product' displays 23 rows of data. The columns are ProductID, Product, Category, Segment, ManufacturerID, and a partially visible Ma column. All products listed are 'Abbas MA' models, categorized as 'Mix', and belong to the 'All Season' segment. At the bottom of the Navigator window, there are three buttons: 'Select Related Tables' (disabled), 'Load' (highlighted in yellow), 'Edit' (disabled), and 'Cancel'.

ProductID	Product	Category	Segment	ManufacturerID	Ma
1	Abbas MA-01	Mix	All Season	1	
2	Abbas MA-02	Mix	All Season	1	
3	Abbas MA-03	Mix	All Season	1	
4	Abbas MA-04	Mix	All Season	1	
5	Abbas MA-05	Mix	All Season	1	
6	Abbas MA-06	Mix	All Season	1	
7	Abbas MA-07	Mix	All Season	1	
8	Abbas MA-08	Mix	All Season	1	
9	Abbas MA-09	Mix	All Season	1	
10	Abbas MA-10	Mix	All Season	1	
11	Abbas MA-11	Mix	All Season	1	
12	Abbas MA-12	Mix	All Season	1	
13	Abbas MA-13	Mix	All Season	1	
14	Abbas MA-14	Mix	All Season	1	
15	Abbas MA-15	Mix	All Season	1	
16	Abbas MA-16	Mix	All Season	1	
17	Abbas MA-17	Mix	All Season	1	
18	Abbas MA-18	Mix	All Season	1	
19	Abbas MA-19	Mix	All Season	1	
20	Abbas MA-20	Mix	All Season	1	
21	Abbas MA-21	Mix	All Season	1	
22	Abbas MA-22	Mix	All Season	1	
23	Abbas MA-23	Mix	All Season	1	

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 user friendly and relevant for your business audience.

Renaming names of the table

1. You should now see the Query Editor window as shown on the right. Select 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 sidebar titled '6 Queries' with a list of six queries: bi_date, bi_geo, bi_manufacturer, bi_product, bi_salesFact, and bi_sentiment. The 'bi_date' query is highlighted with a red box. On the right, the main area displays the 'bi_date' query results, which consist of a single column of dates from January 1, 1999, to January 23, 1999. Below the table, it says '7 COLUMNS, 999+ ROWS'. To the right of the table is the 'Query Settings' pane, which is also highlighted with a red box. In the 'Properties' section of the 'Query Settings' pane, the 'Name' field is set to 'Date', also highlighted with a red box. The 'APPLIED STEPS' section shows a single step named 'Navigation'. At the bottom right of the editor, it says 'PREVIEW DOWNLOADED AT 12:38 AM'.

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.

Having done this what else should you change?

The screenshot shows the Power BI Query Editor interface. On the left, there is a list of queries: bi_date, bi_geo, bi_manufacturer, bi_product, bi_salesFact, and bi_sentiment. The 'bi_date' query is selected. In the main area, there is a table with columns: Date, MonthNo, MonthName, MonthID, Month, and Quarter. The 'Date' column contains dates from 1/1/1999 to 1/26/1999. A context menu is open over the 'Date' column header, with 'Data Type' selected. A dropdown menu shows options: Date, Decimal Number, Fixed decimal number, Whole Number, Percentage, Date/Time, Date/Time/Timezone, Duration, Text, True/False, and Binary. The 'Date' option is highlighted with a red box. On the right side of the editor, there is a 'Query Settings' pane with sections for 'PROPERTIES' (Name: bi_date) and 'APPLIED STEPS' (Source, Navigation).

Notes:

2. On the right side under "APPLIED STEPS" you will see the list of transformations and steps that have been applied. In this case the bi_date.date column has been changed to datetime. 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.
3. You can also see the code behind your actions in M, Power BI's data transformation language. To do this open the advanced editor as shown and you may want check this again as we do through the rest of the lab. a reference guide and introduction on M is available on [MSDN](#)

The screenshot shows the Power BI Advanced Editor window. On the left, the 'Queries [6]' pane is visible, with 'Date' selected. The main area displays the M code for the 'Date' query:

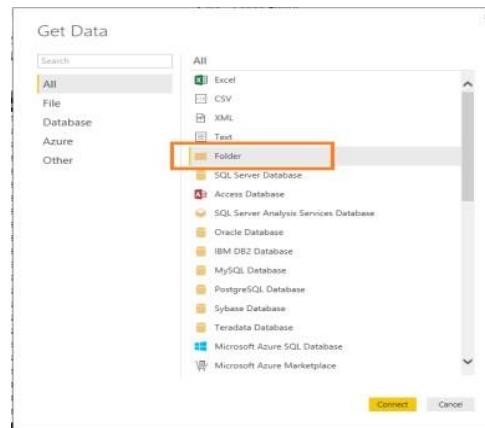
```
let
    Source = Sql.Database("deepfat.database.windows.net", "DIAD"),
    dbo.bi_date = Source[[Schema="dbo",Item="bi_date"]][Data],
    #"Changed Type" = Table.TransformColumnTypes(dbo.bi_date,{{"Date", type datetime}})
in
    #"Changed Type"
```

A red arrow points from the 'Advanced Editor' button in the Power BI ribbon to the 'Advanced Editor' window. Another red arrow points from the 'Date' query in the Queries pane to the same query in the editor window. A green checkmark icon in the bottom right corner of the editor window indicates 'No syntax errors have been detected.'

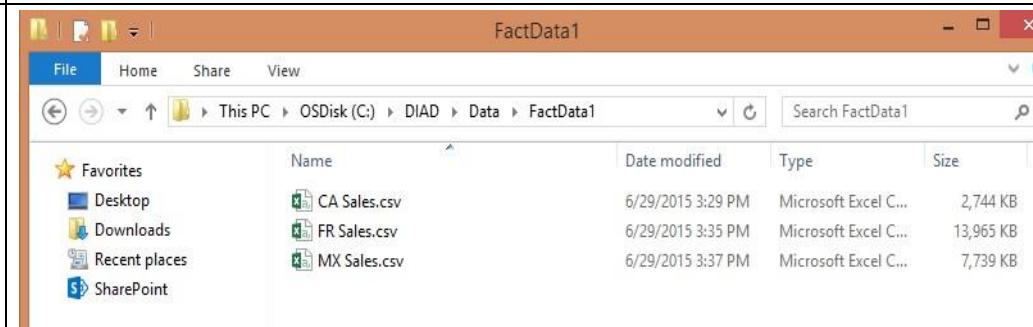
Adding additional data

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 analyse the data along with the United States Sales data you imported from the Azure SQL Database. In this section, you will perform operations to add international sales data to the Sales table.

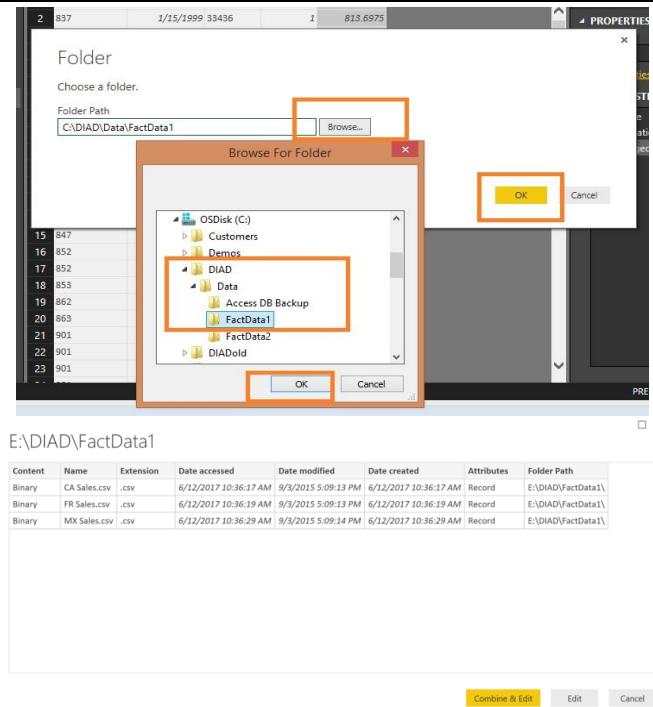
1. In the Home section of the Query Editor toolbar click on New Source, click more to see more options.
2. select "Folder" as shown and click Connect



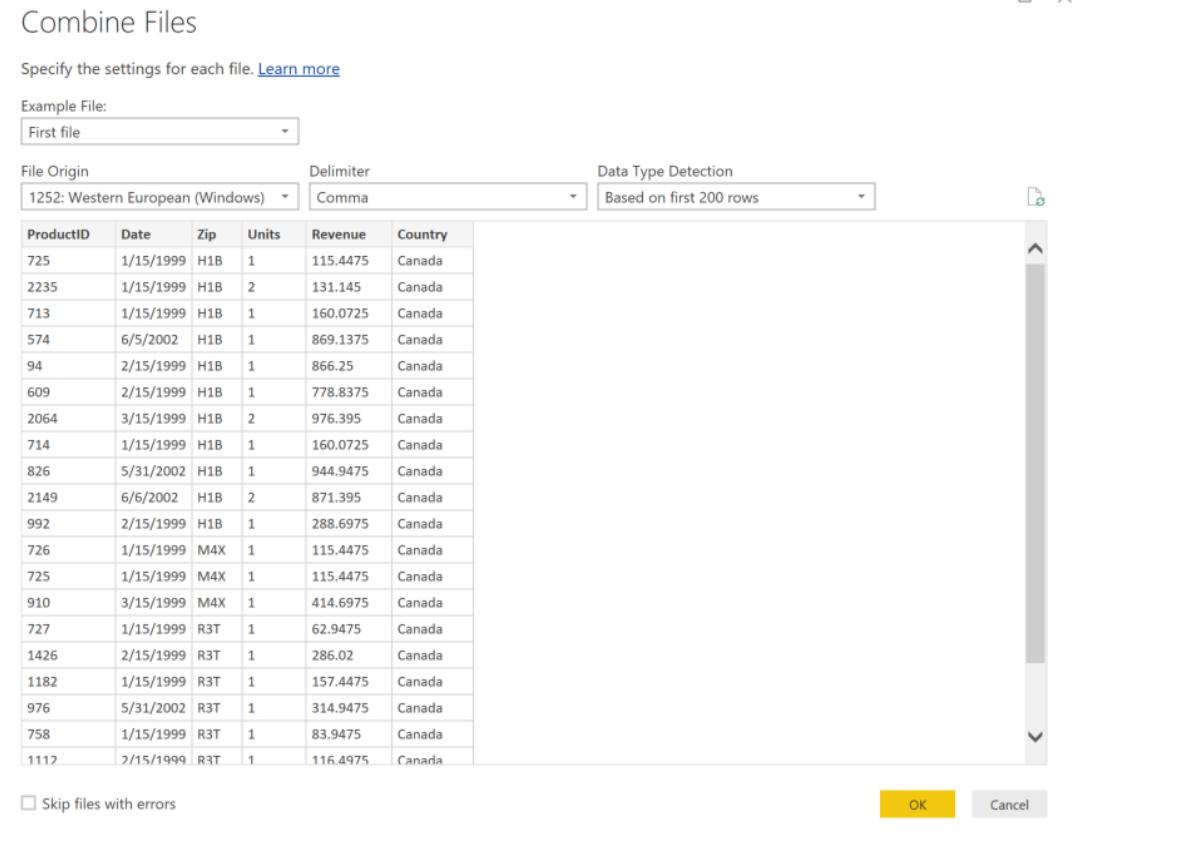
4. Locate the FactData1 folder in the downloaded contents for the class. This folder contains the sales information for Canada, France and Mexico as separate CSV files.



5. You will see the Folder dialog. 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.
7. The FactData1 folder contains the sales information for Canada, France and Mexico
3. In the Folder dialog click Combine & Edit as shown



4. The Combine Files dialog will appear shown which allows us to preview the data for each file (via the example file drop down). Review the data and click OK



5. The Query Editor will now open with a new query, FactData1 (from the folder name used) and in addition to the data in each file there is a Source.Name column showing which of the files each row came from.

6. If you try and filter on this new column note that it is only showing a preview of the data and you'll need to load more data to see the full set of data with the relevant source file name

The screenshot shows the DIAD Transform data - Query Editor interface. The main area displays a preview of data from multiple CSV files, specifically CA Sales.csv. The preview includes columns: ProductID, Date, Zip, Units, Revenue, and Country. A 'Source.Name' column is present, showing the file name for each row. The 'APPLIED STEPS' pane on the right lists the transformation steps: Source, Invoke Custom Function1, Renamed Columns1, Removed Other Columns1, Expanded Table Column1, and Changed Type. The 'Filtered Rows' step is highlighted. The status bar at the bottom right indicates 'PREVIEW DOWNLOADED AT 11:02 AM'.

8. Click on the drop down next to Country column to see the unique values.
9. You will only see Canada again because only a preview is shown so Click on Load more to validate you have data from various countries included.
- 10.

The screenshot shows a dropdown menu for the Country column in the Query Editor. The menu includes options: Sort Ascending, Sort Descending, Clear Sort, Clear Filter, and Text Filters. The Text Filters section shows a search field with '(Select All)' and 'Canada' checked. A message 'List may be incomplete.' is displayed above the 'Load more' button. The 'Load more' button is highlighted with a red box.

11. To complete this query rename it from FactData1 to International Sales

The screenshot shows the Power BI Query Editor interface. The ribbon at the top has 'Transform' selected. The left sidebar lists 'Queries [11]' including 'International Sales'. The main area displays a table with 999+ rows and 7 columns: ProductID, Date, Zip, Units, Revenue, and Country. The preview pane on the right shows the same table with data for Canada. The 'APPLIED STEPS' pane on the right lists steps like 'Renamed Columns1' and 'Changed Type'.

7. In order to analyse 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.
8. Select Sales in the Queries window as shown in the figure.
9. Click on the Append Queries in the Home ribbon on the top right corner as shown in the figure.

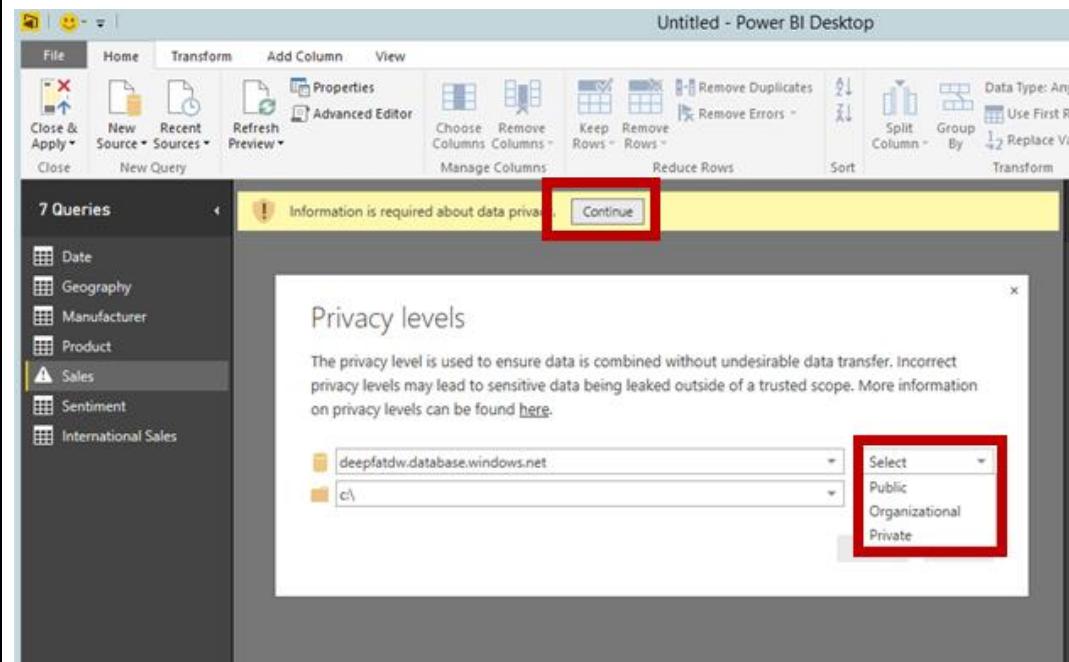
The screenshot shows the Power BI Query Editor interface. The ribbon has 'Transform' selected. The left sidebar lists '7 Queries' including 'Sales'. The main area displays a table with 12 rows and 6 columns: ProductID, Date, Zip, Units, Revenue, and Country. The preview pane on the right shows the same table. The 'APPLIED STEPS' pane on the right shows 'Navigation' and 'Changed Type'. A context menu is open over the 'Append Queries' button in the ribbon, with the 'Append Queries' option highlighted.

10. 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).

11. Click On Continue
12. In the row for the Azure DW click on Select and select Organizational
13. On the second row select the location of the csv files we just loaded and select Organizational again.
14. Click Save



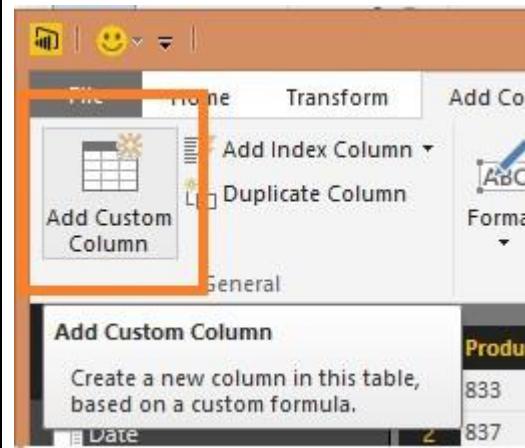
15. You will now see a new column in the Sales table called Country since Power BI Desktop added the rows from International Sales to the Sales.

16. 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.

17. Click on the AddColumn as shown in the figure.

	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

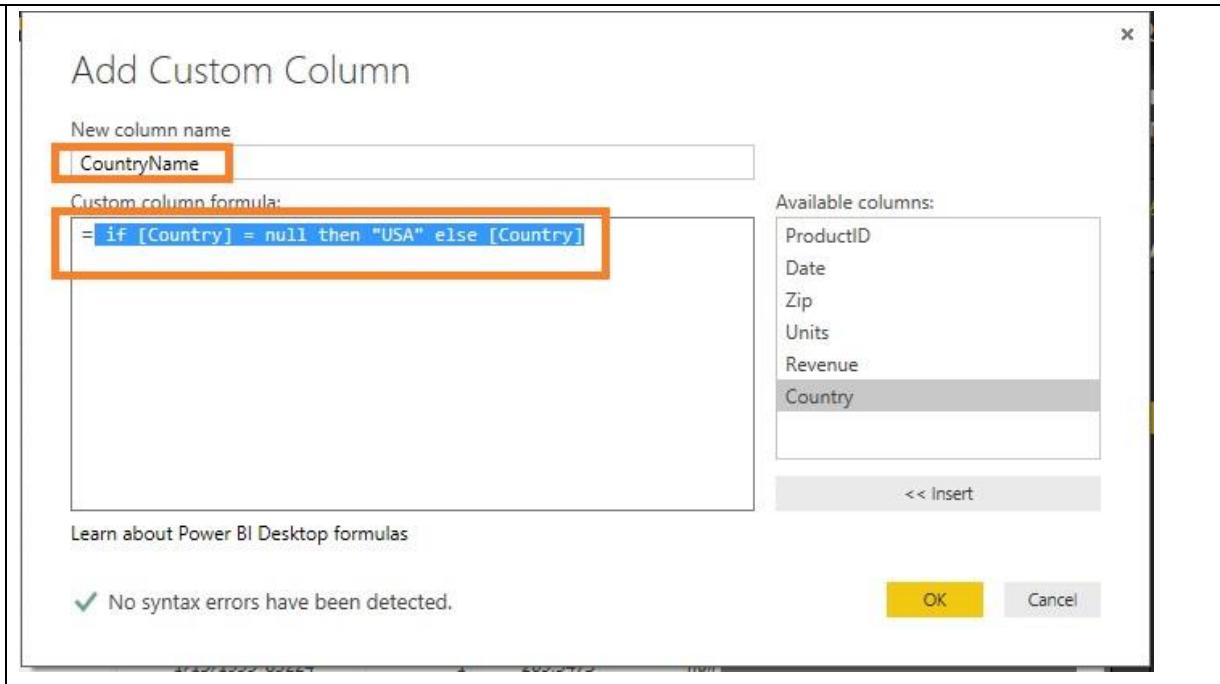
18. Click on Add Custom Column in the Add Column tab in the Ribbon



19. In the Add Custom Column dialog, enter name of the column as "CountryName".
20. 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. If you get an error from cutting and pasting from this document change the quotes to double quotes on your keyboard.

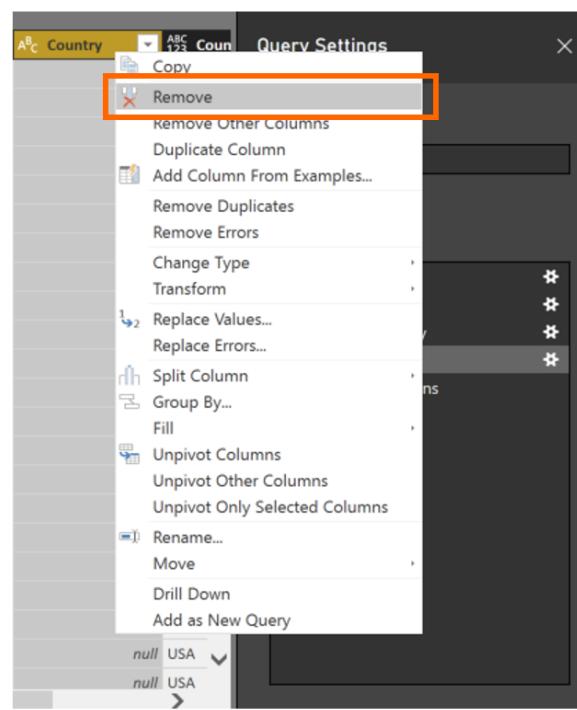


21. You will now see the CountryName column in the Query editor window.

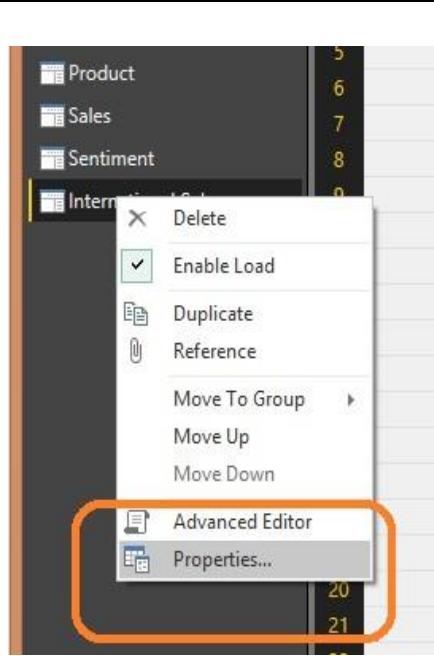
22. The original Country column is only required as a temporary column. It is not required in the final table for analysis and can be removed.

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

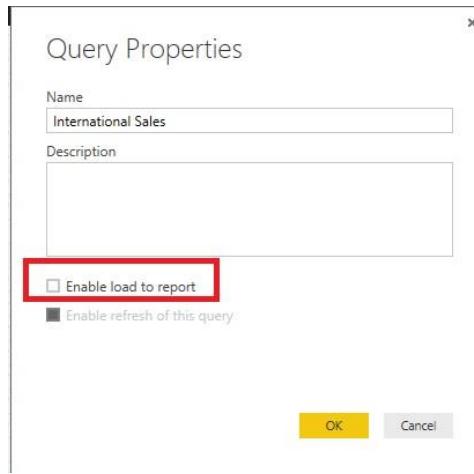
24. Do the same for the Source.Name column as well.



25. 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".
26. Select International Sales, right click and select Properties.



27. In the Query Properties window, uncheck the checkbox next to "Enable load to report" to deselect the load as shown in the figure.



28. To improve your understanding of M have a look at the Sales and International Sales queries in the advanced editor (on the home toolbar). Note that every step is included in the one script as shown here. Things to note are:

- We can simply type this query in as shown rather than doing all the manual steps
- We can keep these scripts away from Power BI for future use.
- We can change the variable names to improve legibility
- Note how each function in the international sales script allows M to iterate over the files in the FactData1 folder

```
Sales
let
    Source = Sql.Database("deepfat.database.windows.net", "DIAD"),
    dbo_bi_salesFact = Source{[Schema="dbo", Item="bi_salesFact"]}[Data],
    #"Appended Query" = Table.Combine({dbo_bi_salesFact, #"International Sales"}),
    #"Added Custom" = Table.AddColumn(#"Appended Query", "CountryName", each if [Country] = null then "USA" else [Country]),
    #"Removed Columns" = Table.RemoveColumns(#"Added Custom", {"Country", "Source.Name"})
in
International Sales
let
    Source = Folder.Files("E:\DIAD\FactData1"),
    #"Invoke Custom Function1" = Table.AddColumn(Source, "Transform File from FactData1", each #"Transform File from FactData1"([Content])),
    #"Renamed Columns1" = Table.RenameColumns(#"Invoke Custom Function1", {"Name", "Source.Name"}),
    #"Removed Other Columns1" = Table.SelectColumns(#"Renamed Columns1", {"Source.Name", "Transform File from FactData1"}),
    #"Expanded Table Column1" = Table.ExpandTableColumn(#"Removed Other Columns1", "Transform File from FactData1", Table.ColumnNames(#"Transform File from FactData1"("#"Sample File"))),
    #"Changed Type" = Table.TransformColumnTypes(#"Expanded Table Column1",{{"Source.Name", type text}, {"ProductID", Int64.Type}, {"Date", type date}, {"Zip", type text}, {"Units", Int64.Type}, {"Revenue", type number}, {"Country", type text}}),
    #"Filtered Rows" = Table.SelectRows(#"Changed Type", each true)
in
#"Filtered Rows"
```

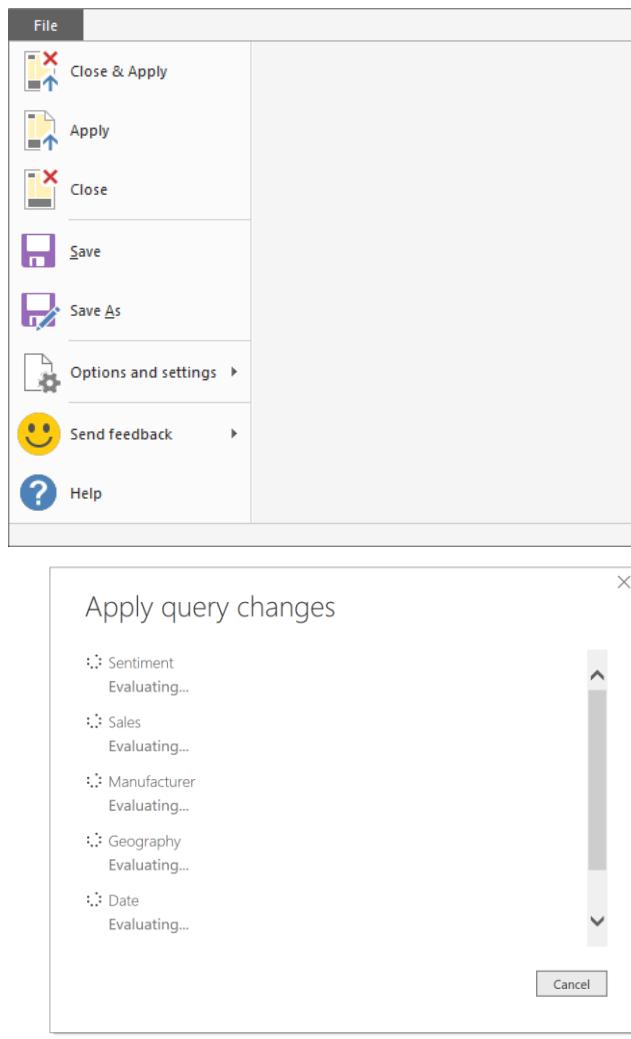
29. You have successfully completed import and data shaping operations and ready to load the data into Power BI Desktop for visualizing the data.

30. Click on. **File → Close & Apply**

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

31. 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.

Note: that all this data is now compressed in memory in Power BI using technology like columnstore in SQL Server which is why it is so fast and memory efficient.

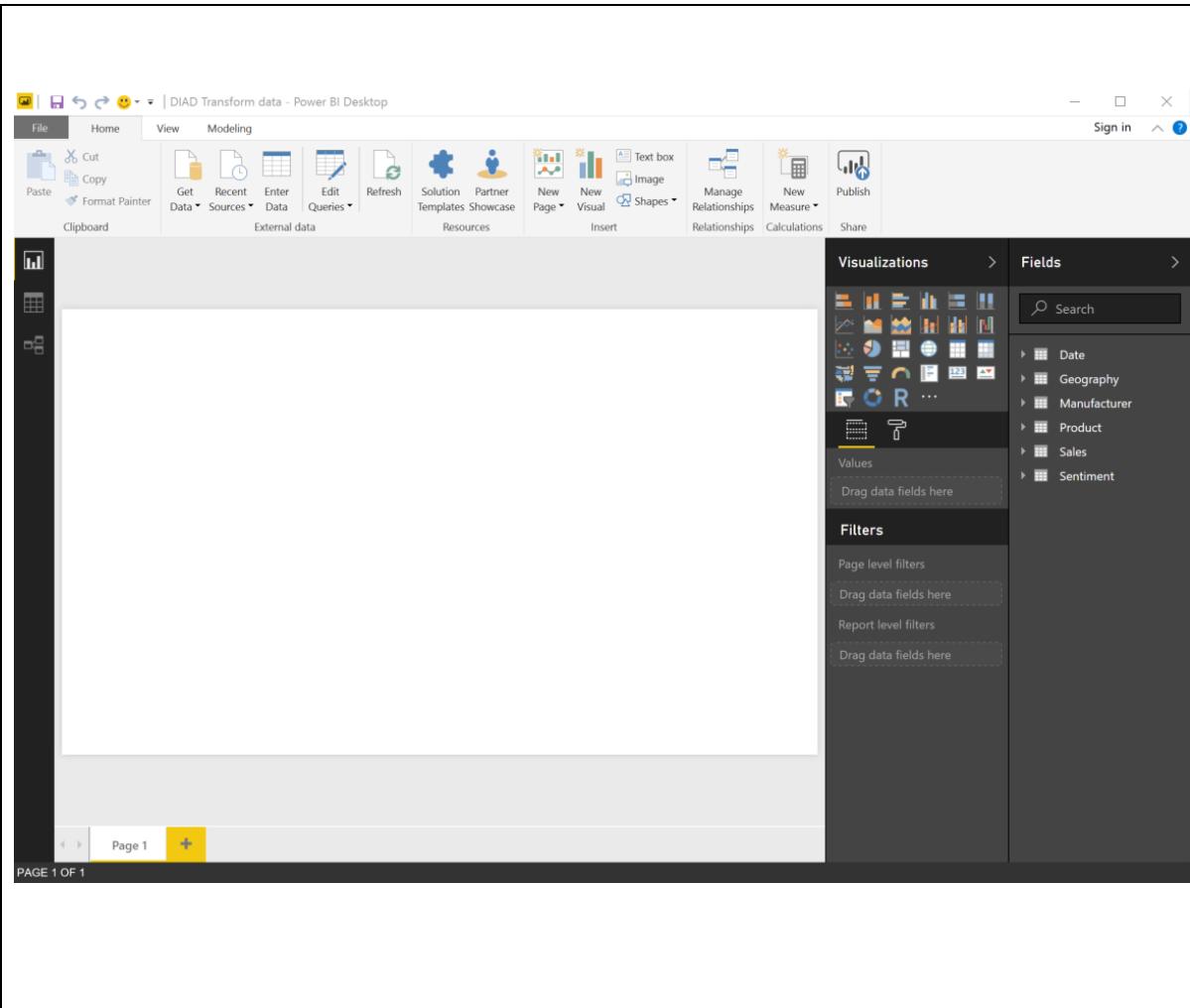


Interactive Data Exploration

In this section, we will learn the key parts of the Power BI desktop, to 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 allows you to add the columns to the filter.
5. The centre white space is the canvas where you will be adding the visuals.
6. On the left side you have three icons for Report, Data and Relationships. Switching between these allows you to see the data and the relationships between the tables



12. Click on the Data icon. You should notice a new tab Modelling. All the tables you have imported comprise a data model. However, we need to explore and enhance the model before we can use it for visualisations.

13. Choose the Sales table and the Revenue column. Currently it is a Decimal Data Type. But under Format choose Currency (\$ United States)

7. Click on the Sales Table in the Fields as shown in the figure.

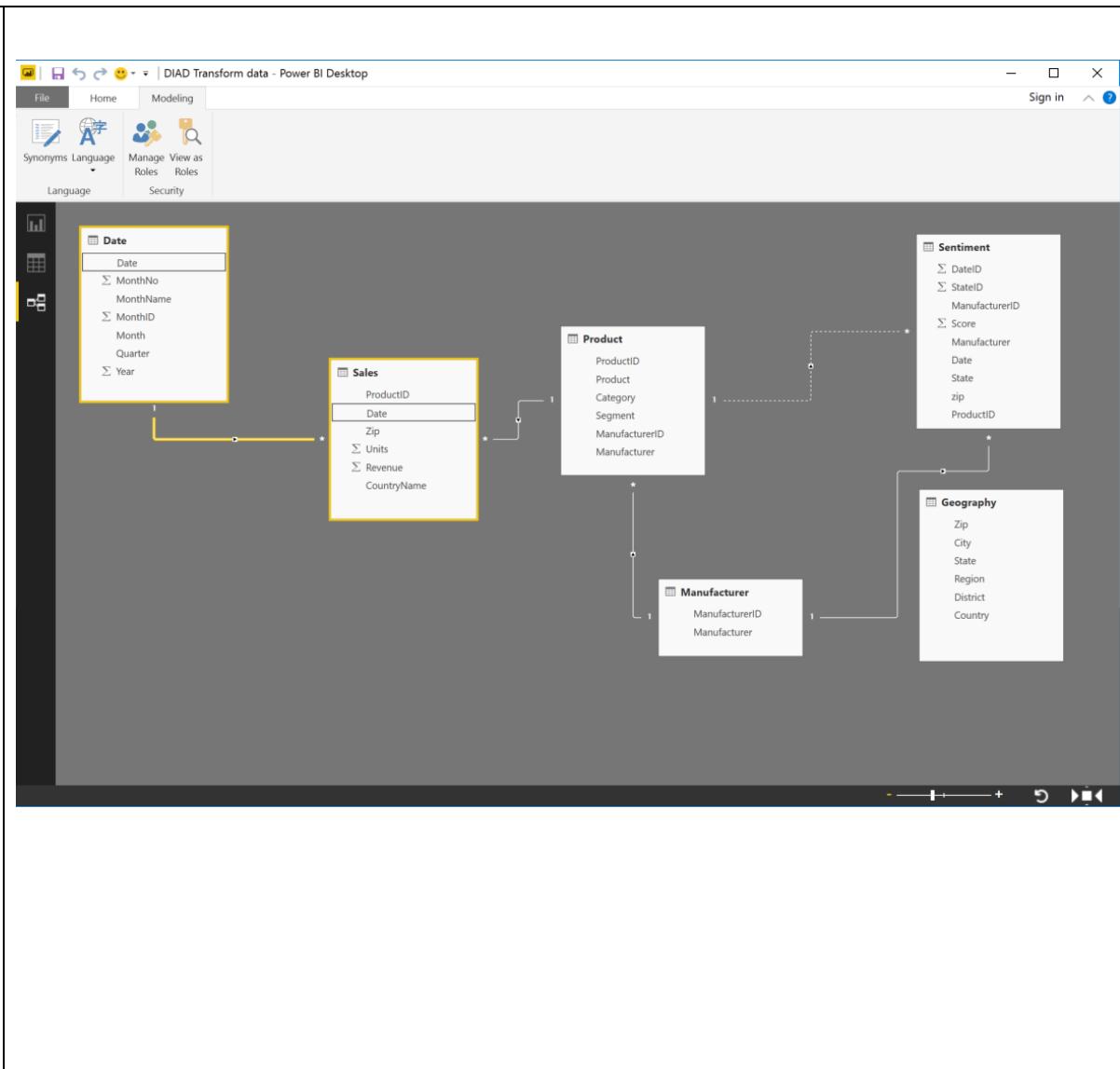
8. You will see the data values for each of the columns. You can see the total number of rows in the Sales table to be ~11 Million rows.

9. 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 the rows.

You may wish to make changes to the date format for the UK so try that if you have time

The screenshot shows the Power BI Desktop interface with the 'Modelling' tab selected. In the center, a table named 'Sales' is displayed with columns: ProductID, Date, Zip, Units, Revenue, and CountryName. The 'Revenue' column is currently set to a 'Decimal Number' type. A tooltip indicates the format is '\$ English (United States)'. On the right, the 'Fields' pane shows the structure of the Sales table, with 'Revenue' highlighted. The status bar at the bottom indicates there are 1,655,650 rows and 5,539 distinct values in the Revenue column.

10. 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: - For example there is no link between Sales and Geography and If we were to use the data without fixing these problems then the results will be incorrect in some way



11. We can show this by quickly creating a grid on a report.
 1. Click on the graph icon on the left
 2. Drag a grid onto the report page
 3. Expand the Geography query and check Country
 4. Expand Sales and check Revenue

12. Notice that the total for each country is the same and is the same as the total. This is because the relationships are not properly defined

13. Let's go back to the relationships (the bottom icon on the left of Power BI) and see if we can fix that

The screenshot shows the Power BI Desktop interface with the following highlights:

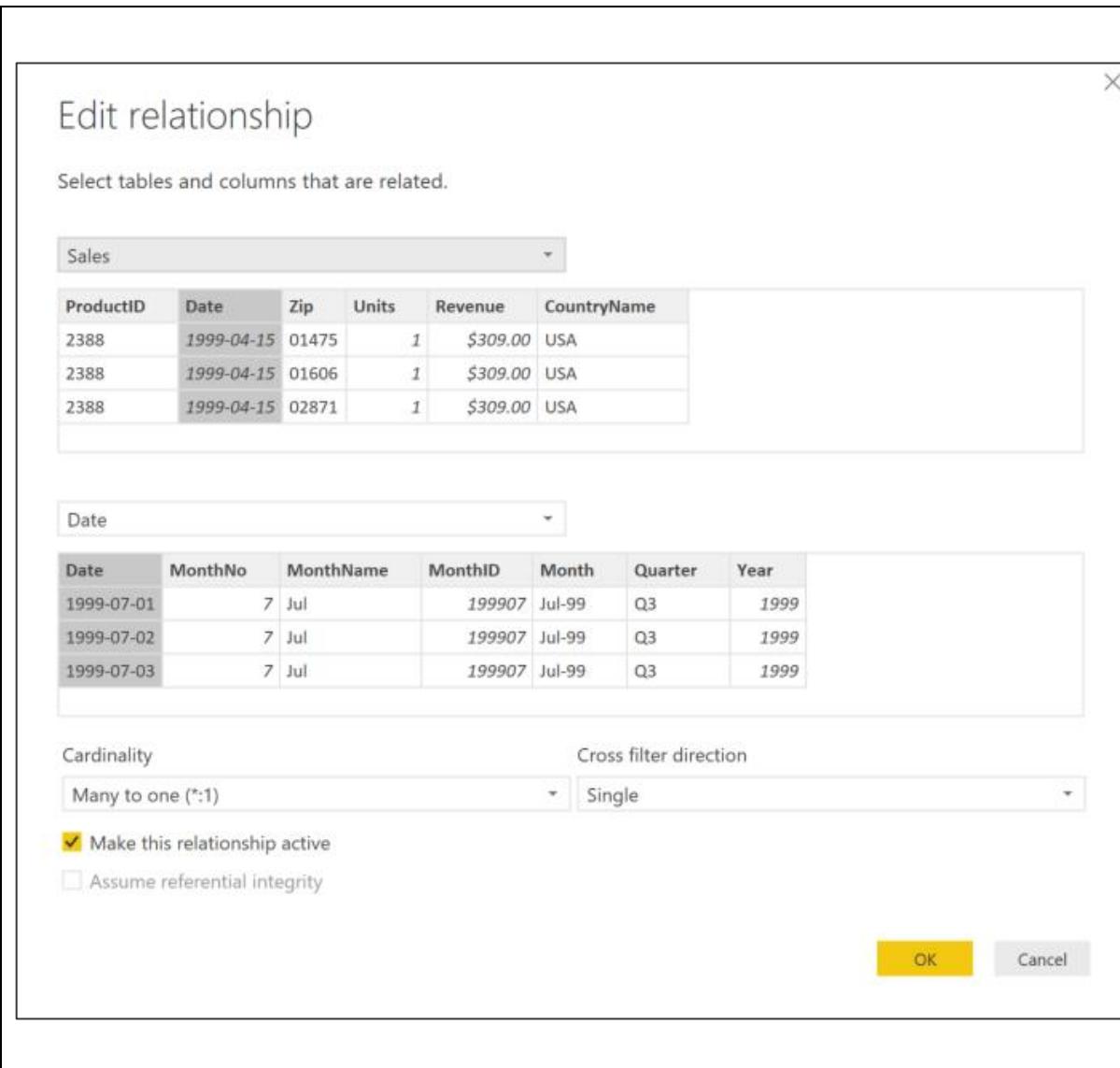
- Step 1:** A red box highlights the "Layout" icon in the ribbon, which is used to switch to the "Grid" view.
- Step 2:** A red box highlights the "Grid" icon in the Visual tools ribbon tab.
- Step 3:** A red box highlights the "Country" field under the "Geography" node in the Fields pane.
- Step 4:** A red box highlights the "Revenue" field under the "Sales" node in the Fields pane.

The main area displays a grid visualization with the following data:

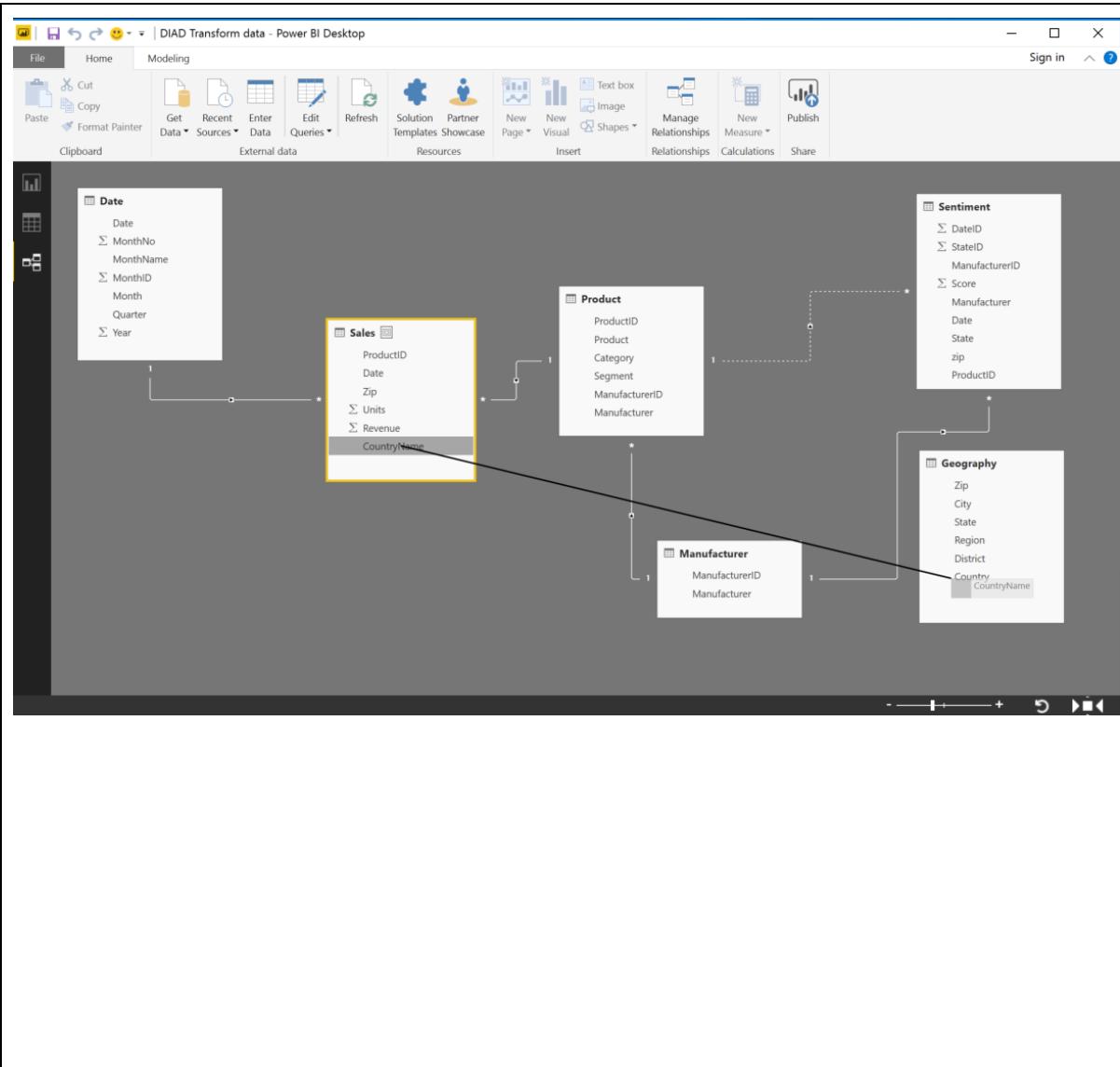
Revenue	Country
\$711,912,466.20	Canada
\$711,912,466.20	France
\$711,912,466.20	Germany
\$711,912,466.20	Mexico
\$711,912,466.20	USA

14. Before we do that let's look at a relationship that is correct – click on the line between Sales and Date to see its properties. We have a many to one relationship from Sales.Date to Date.Date.

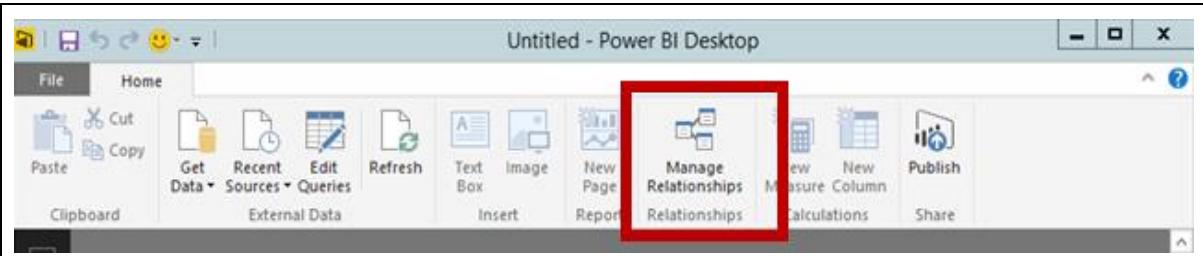
This has been inherited either because we got the data from a database, the names of the columns are the same and the data type are the same. However, this is not always the case and so we'll ALWAYS want to check what Power BI has done to infer relationships and possibly make changes.



15. Drag Country Name on the Sales table to the Geography Country column and let go. You'll get an error saying that either Country or CountryName has to be unique and Power BI won't allow the join – which is a good thing as you'll end up with a cartesian product and very large sales numbers which are very wrong!
16. You might think we could use the Zip column instead, but we get the same error! Why is that?
17. We won't fix this yet but remember that as we go through this lab that without a proper model with good clean data we can't create accurate reports



14. What we can do right now is clean up the existing relationships. Click on the Manage relationships icon to get a list of them



15. Notice that there is a non-active relationship which we can see on the diagram a dotted line

A screenshot of the "Manage relationships" dialog box. The dialog has two main sections: "From: Table (Column)" on the left and "To: Table (Column)" on the right. A legend at the top indicates that checked boxes represent active relationships. The list shows five entries:

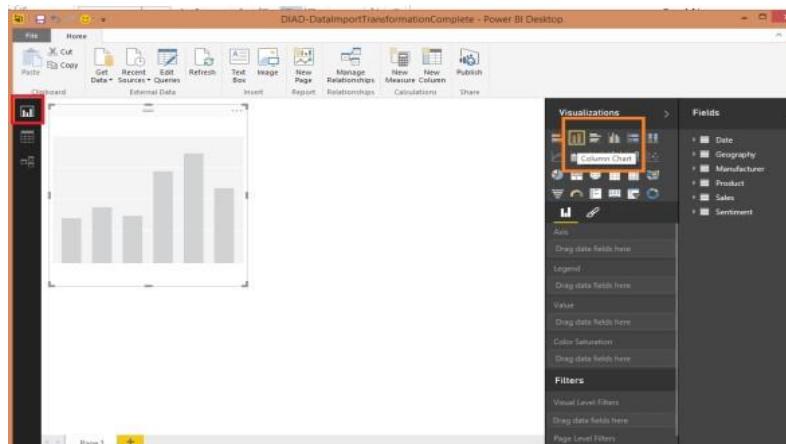
Active	From: Table (Column)	To: Table (Column)
<input checked="" type="checkbox"/>	Product (ManufacturerID)	Manufacturer (ManufacturerID)
<input checked="" type="checkbox"/>	Sales (Date)	Date (Date)
<input checked="" type="checkbox"/>	Sales (ProductID)	Product (ProductID)
<input checked="" type="checkbox"/>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

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

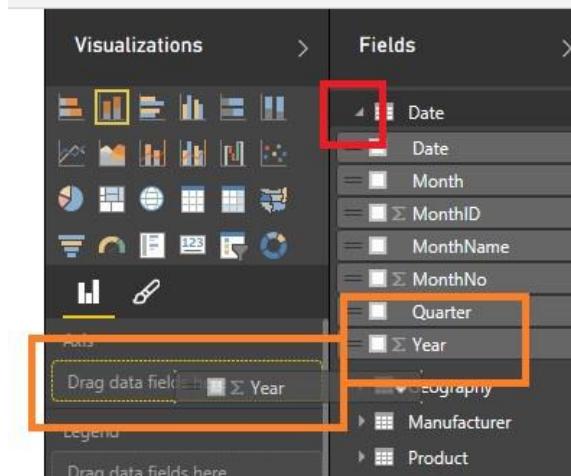
Enhancing your model and Data exploration

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 analyse 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

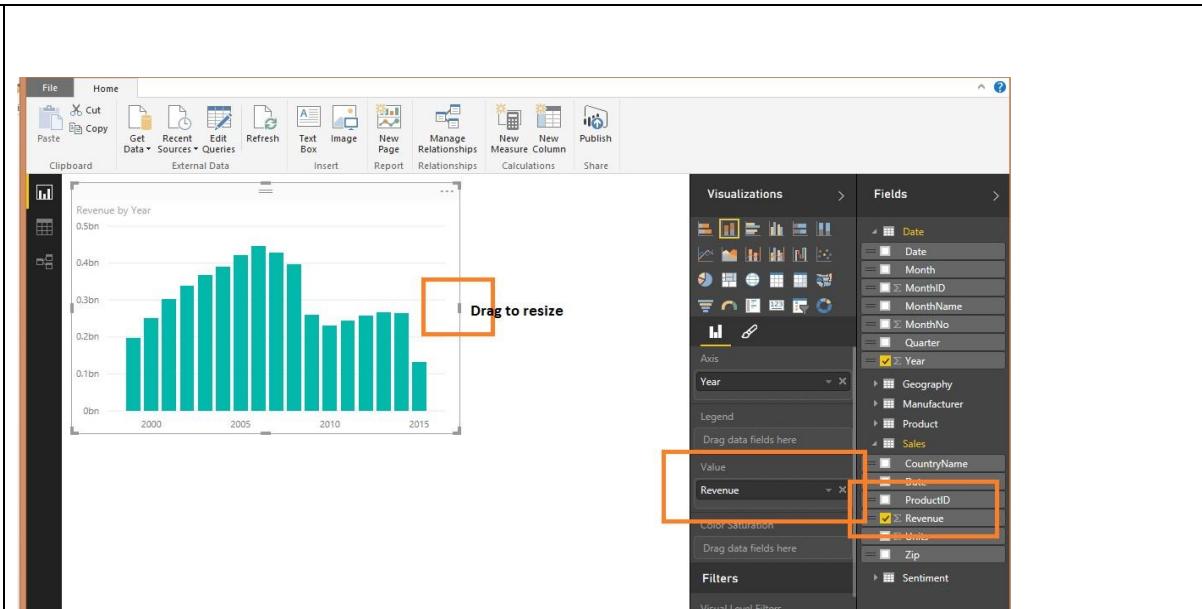


4. Click on the icon next to Date to expand the table
5. Drag and drop Year into the Axis.

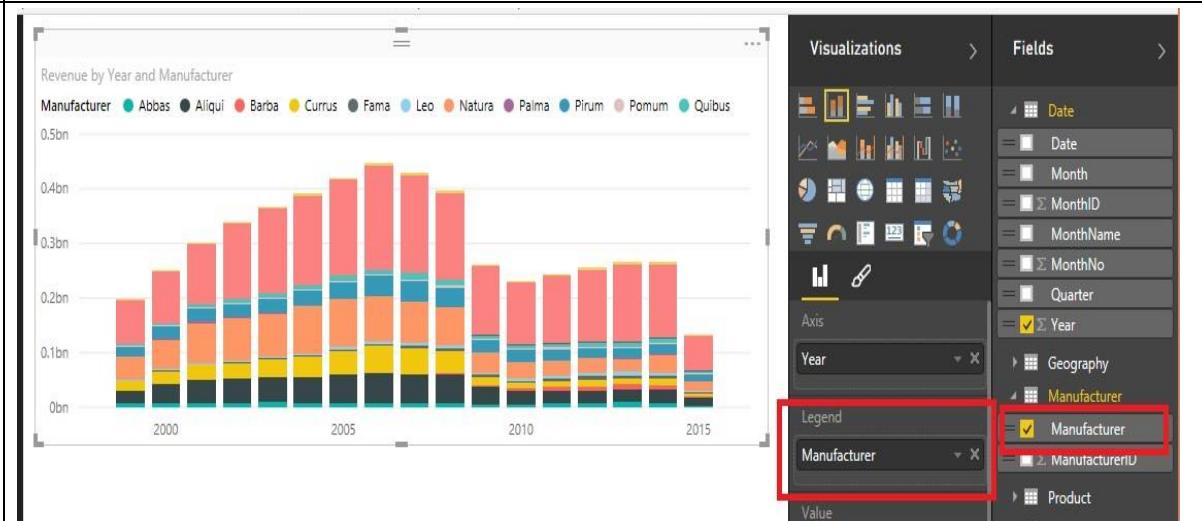


6. Expand the Sales table by clicking on the icon next to the Sales table in Fields pane.
7. Drag and drop Revenue to Values as shown in the figure.
8. You can now see the total revenue of all manufacturers by years.
9. Drag the edge of the visual to resize the visual

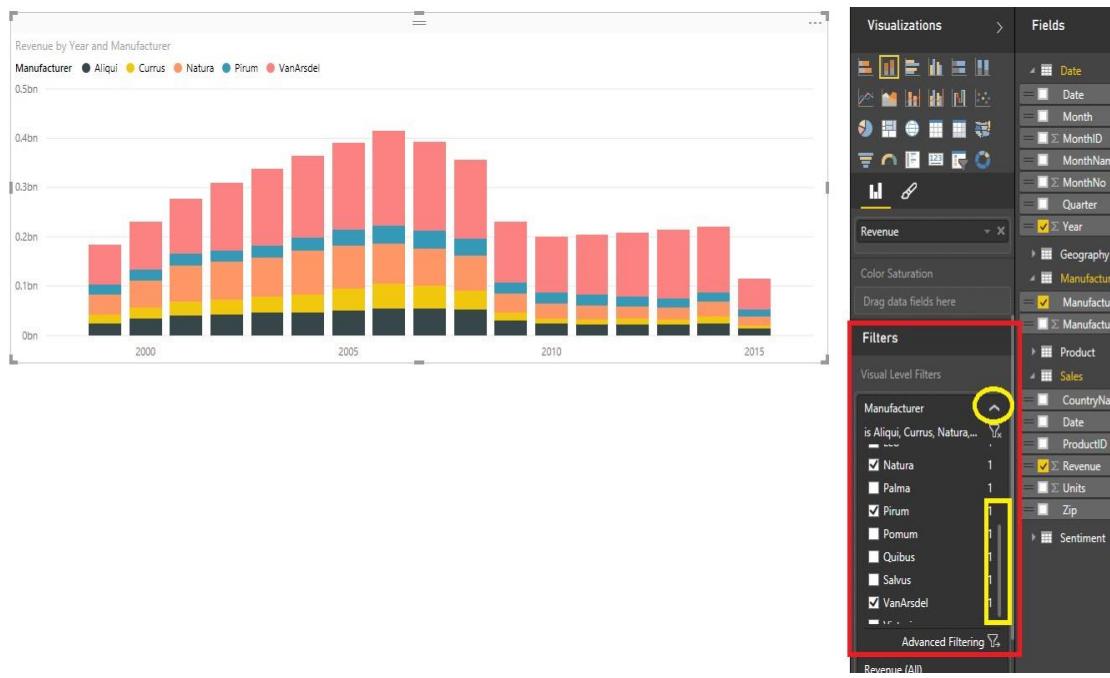
HINT: If the visual does not look like this, it might be because of how the data has been joined go back to step X and check the format/type of the Date columns in Date and Sales Table.



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

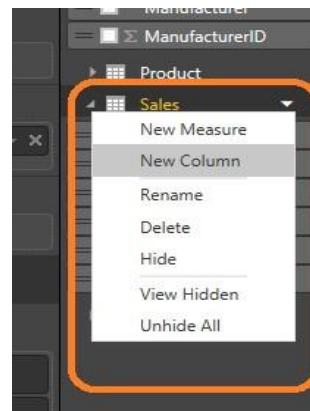


14. You are primarily interested in the key major competitors for
15. VanArsdel and not all companies. I can filter just to the core competitors in the visual
16. Select the column chart visual.
17. The Filters section in
18. Visualizations tab is now scoped to the filter for the visual.
19. Select the Manufacturer drop down arrow (shown in yellow)
20. 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.



We now need to setup the correct relationship between these tables and as we saw earlier we need a unique column in the Geography query based on the Zip code AND country as the same zip code could refer to different places in different countries which was the problem we saw earlier. We'll also need to create the same foreign key in the Sales query so we'll create two new columns ZipCountry in each query and then use those to form the relationship. As Power BI can't use concatenated keys made up of multiple columns for relationships like we can in databases like SQL Server

16. Right click the Sales query and select new column.
17. Select the drop down next to Sales tables and select "New Column" as shown.



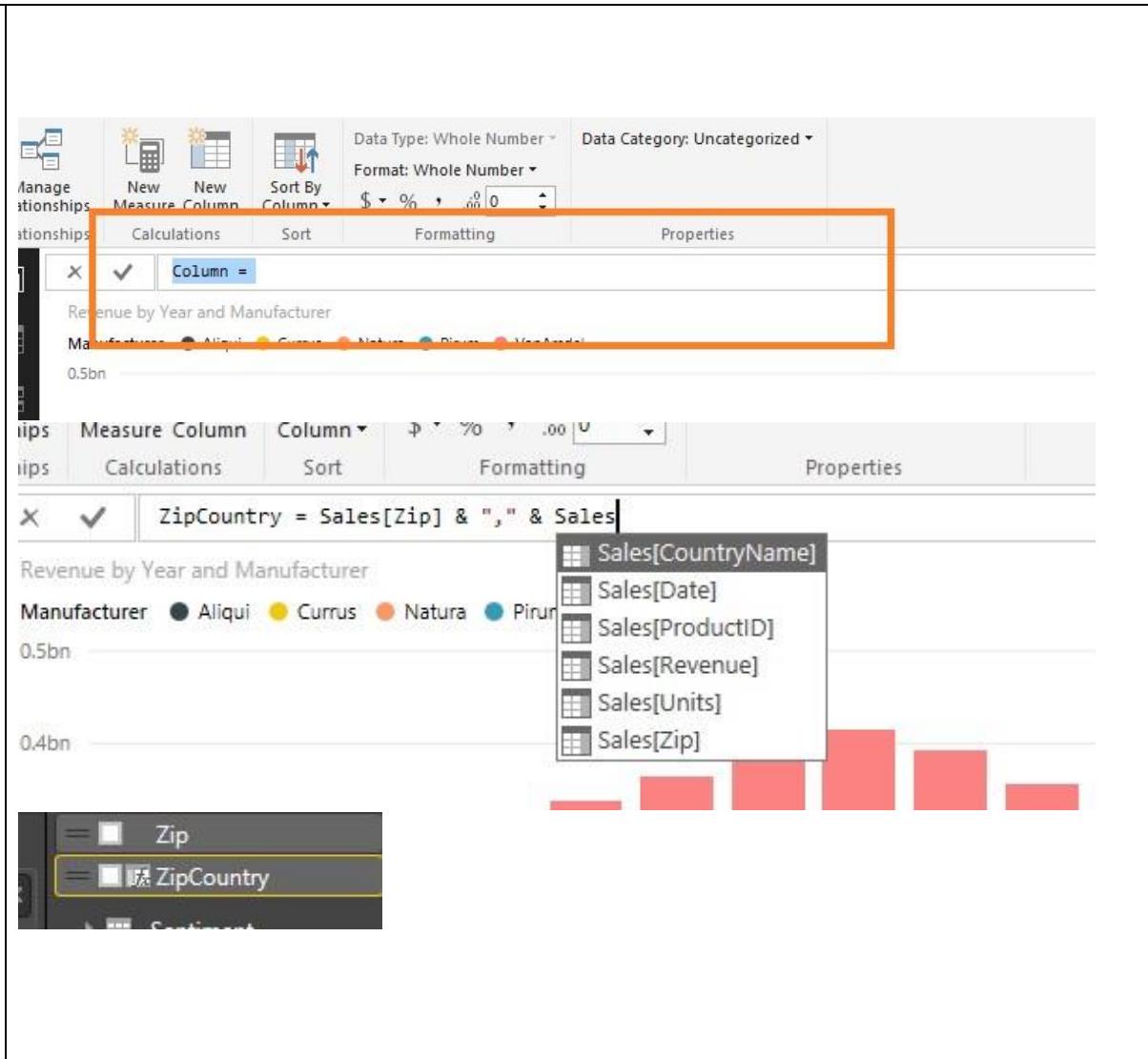
You will see an editor as shown.

21. 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 have just created a column using an expression called DAX (Data Analysis Expression) which is very similar to writing expressions in Excel and much easier than the MDX language used in the olap version of Analysis Services where you are concatenating the value of each row. The "&" symbol is used for concatenation.



We could have also done this at the query editing stage If you have time you might try this and if you do the resulting M looks like this for the sales table:

```
let
    Source = Sql.Database("deepfat.database.windows.net", "DIAD"),
    dbo_bi_salesFact = Source{[Schema="dbo", Item="bi_salesFact"]}[Data],
    #"Appended Query" = Table.Combine({dbo_bi_salesFact, {"International Sales"}},
    #"Added Custom" = Table.AddColumn(#"Appended Query", "CountryName", each if
    [Country] = null then "USA" else
    [Country]),
    #"Removed Columns" = Table.RemoveColumns(#"Added Custom", {"Country",
    "Source.Name"}),
    #"Added Custom1" = Table.AddColumn(#"Removed Columns", "ZipCountry", each
    [CountryName]& ","&[zip])
in
    #"Added Custom1"
```

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

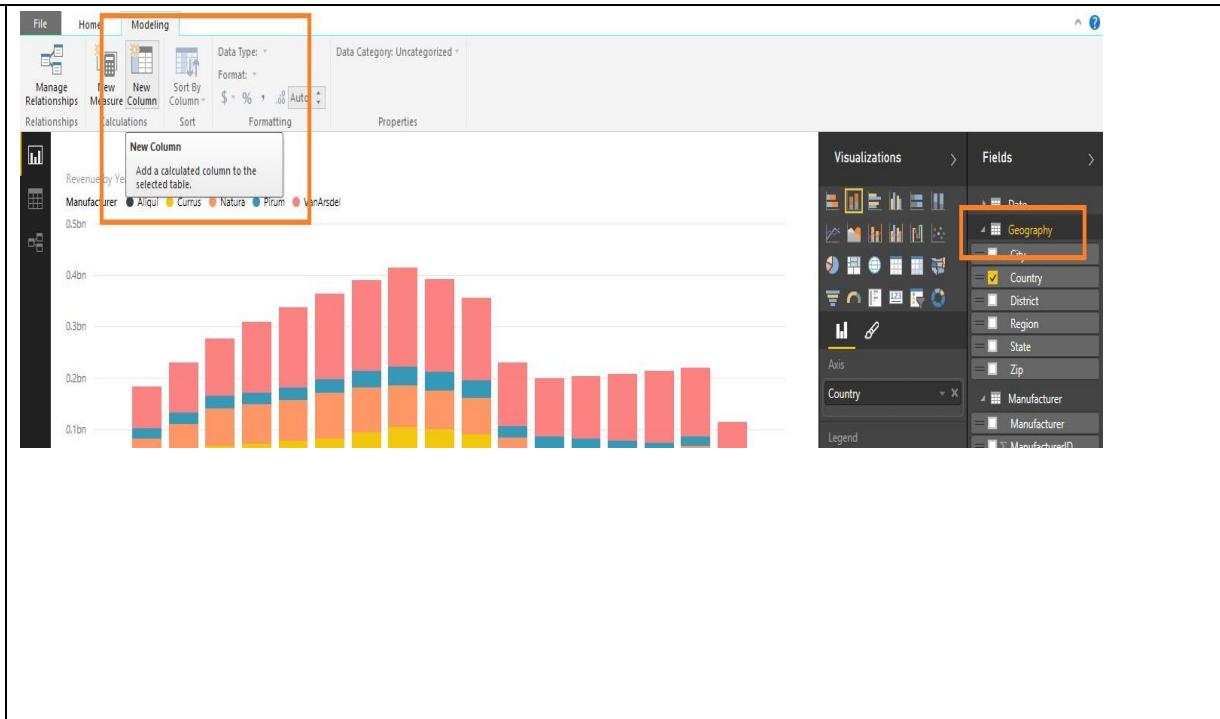


22. You can also create a new column by selecting the table and then clicking on New Column from the ribbon.

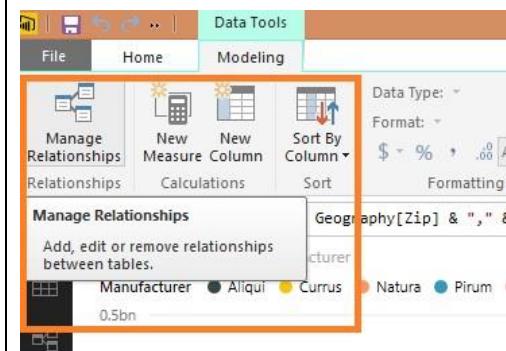
23. Select the Geography table in the Fields and click on New Column in the Modelling ribbon as shown in the figure and enter the following DAX expression:

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

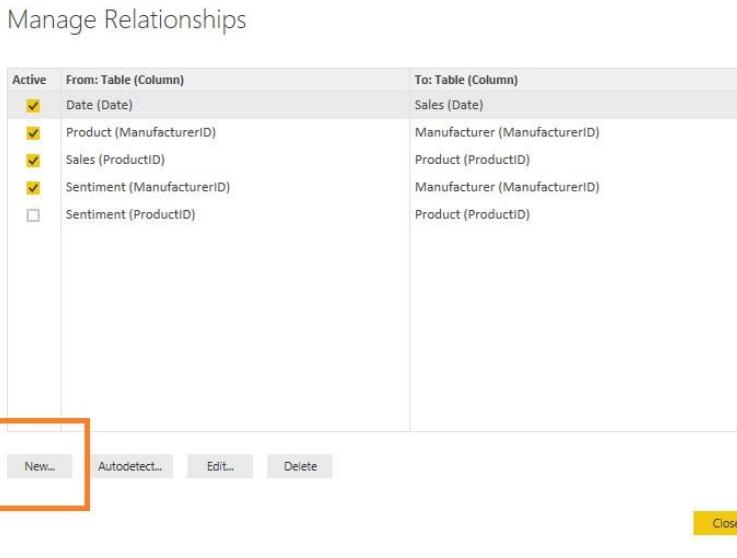
You will see a new column ZipCountry in Geography table. The final step is to setup the relationship.



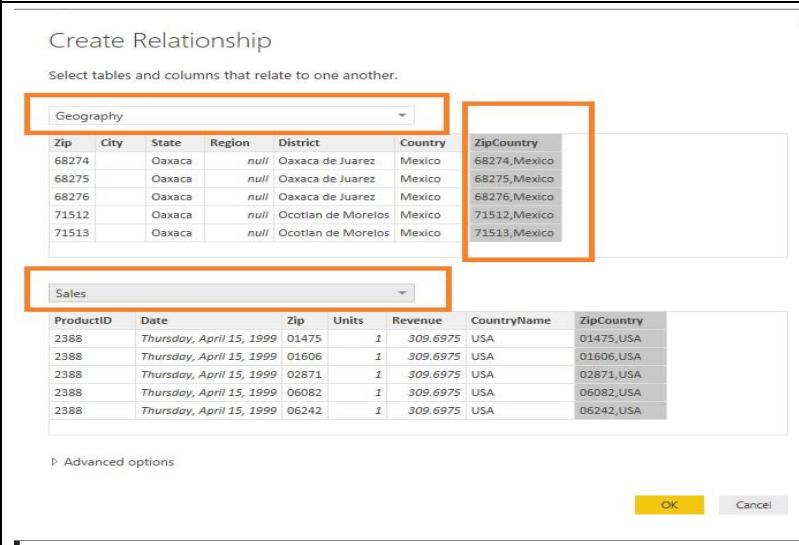
24. Click on the Manage relationship icon in the Modelling tab.



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

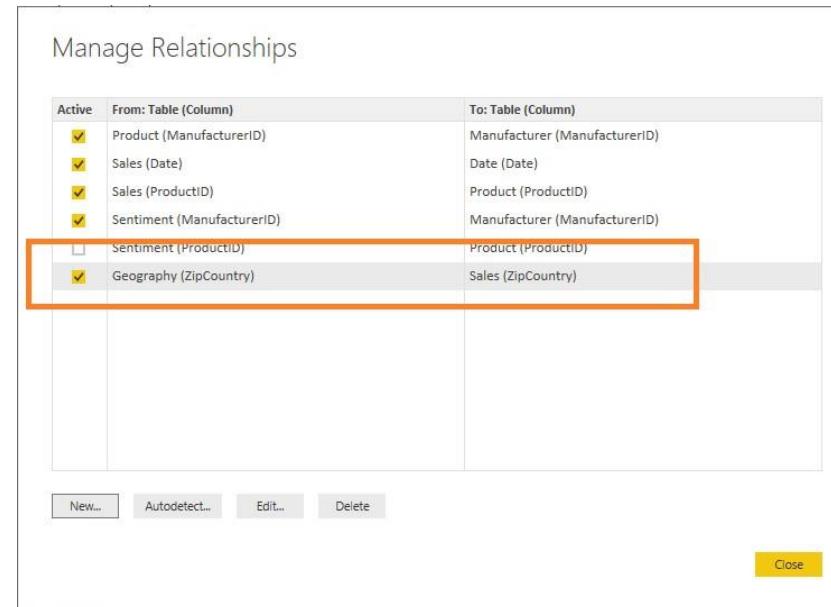


27. In the Create Relationship dialog first select Geography from the top drop down as shown in the figure
28. Select the column ZipCountry
29. Select Sales table from the second drop down as shown in the figure
30. Click OK in the Create Relationship dialog.



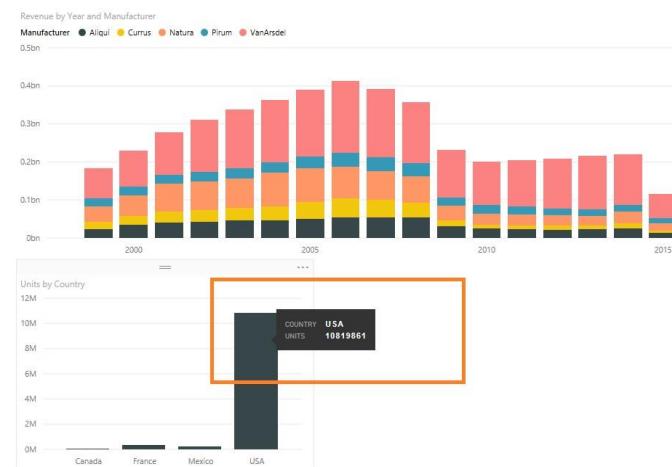
31. You will see the new relationship created as shown in the figure.

32. Click Close in the Manage Relationships dialog.



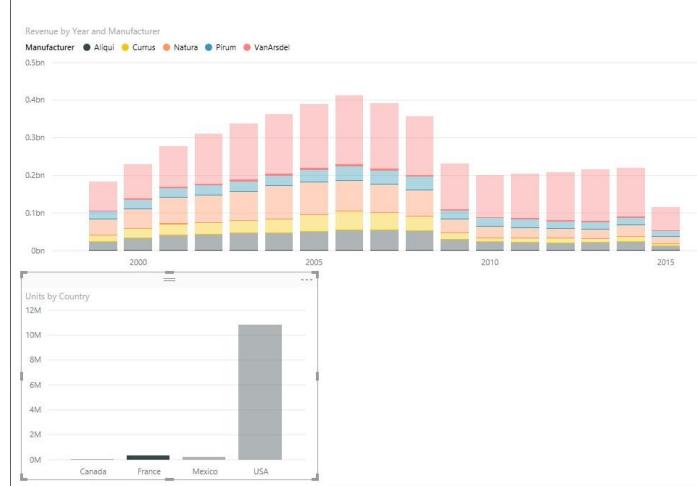
33. Click away from the chart and click on the column chart onto the canvas and this time select Units and CountryName.

34. 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



35. Click on France in the bottom graph to analyze what portion of the units sold in France contributes towards overall Sales.

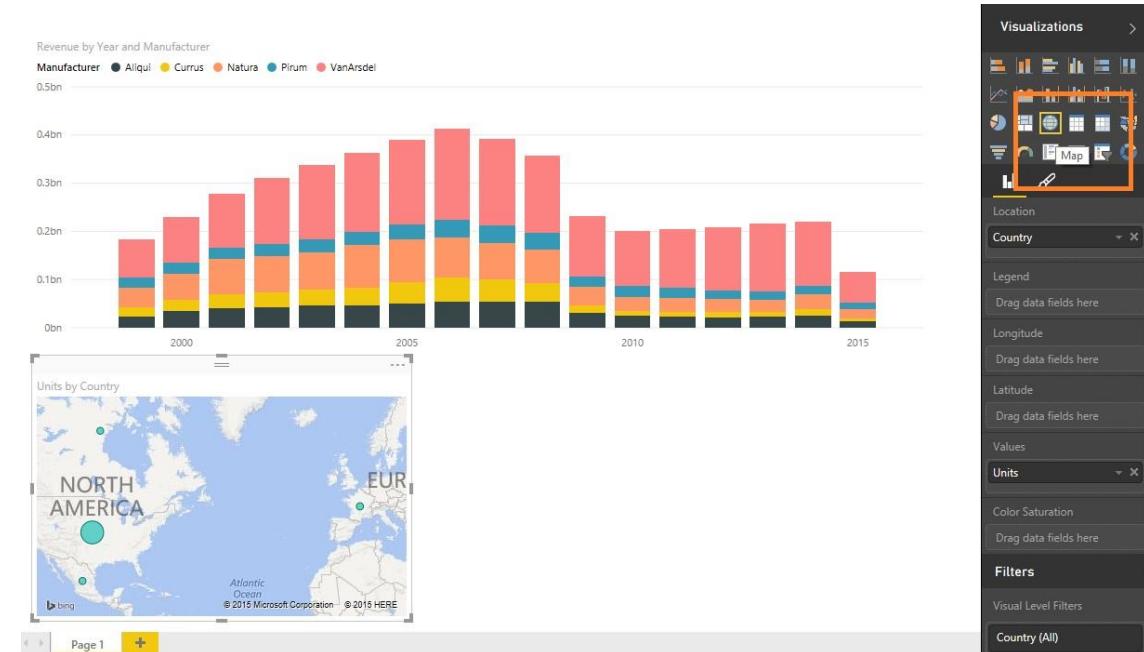
Note: You have now created a visual filter on the top graph while the bottom graph on units sold includes all manufacturer.



36. Since the units sold are by countries, visualizing the total units by a map would be an efficient way.

18. 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.

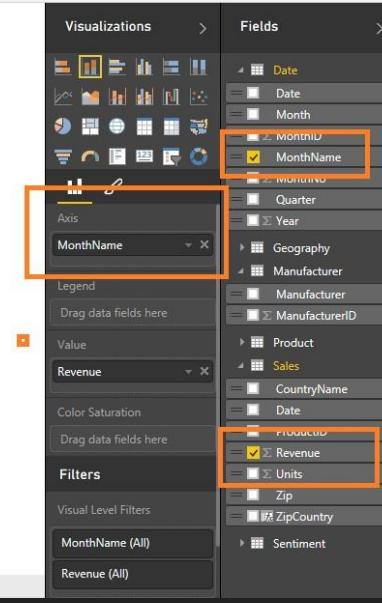
Note: You didn't have to do any complex operations, Power BI desktop automatically understood the Country column and add it to the location and the units to the values.



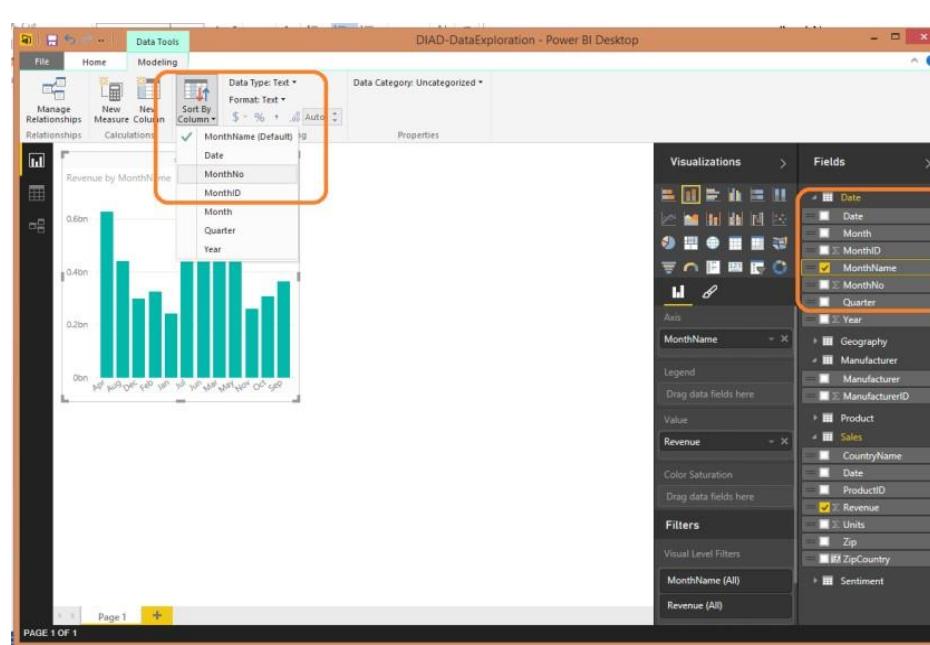
Report Authoring

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.

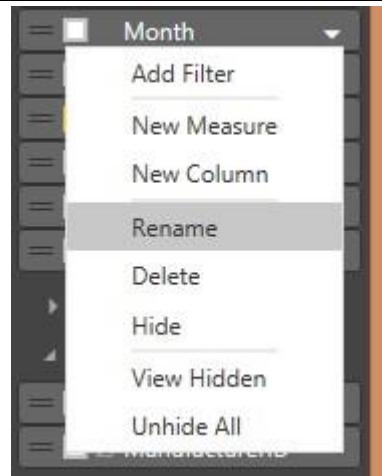
1. Select each visual in the page and delete it
2. Select the column chart in the Visualizations window
3. Drag and drop Revenue to values as shown in the figure
4. Drag and drop MonthName to Axis as shown in the figure
5. You will see there is a field called Month and then MonthName and also observe 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.

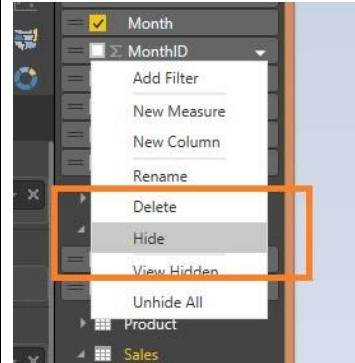


10. The Month column actually includes month and year.
11. Rename this column by selecting the drop down and Rename and provide the name MonthYear
12. Now Rename the MonthName column to Month



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

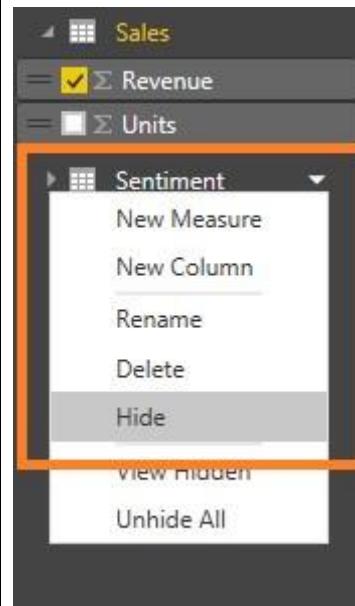
13. Select the dropdown of column MonthID and select Hide. This hides the column from the report.
14. Note: You can still see this column in the data view and relationship view.
15. Similarly hide the MonthNo and MonthYear columns from the Date table



16. In the Manufacturer table hide ManufacturerID column
17. In the Product table Hide the columns ManufacturerID and ProductID
18. Select Geography table and hide the column ZipCountry. 18. Select the entire table Sentiment and Hide the table as shown in the figure.

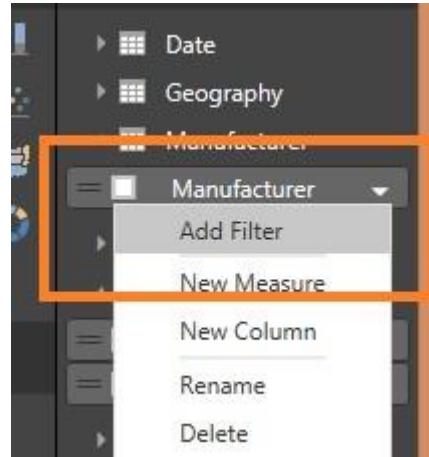
What columns should be hidden in the Sales table? All the keys – all we need here are the measures

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.

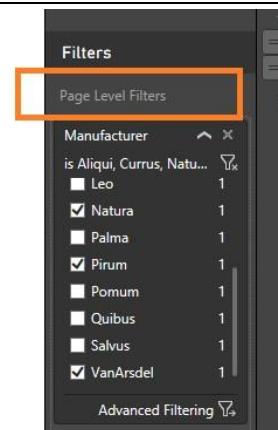


Similar to you analyzing top competitors your team is also only interested in comparing top competitors.

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

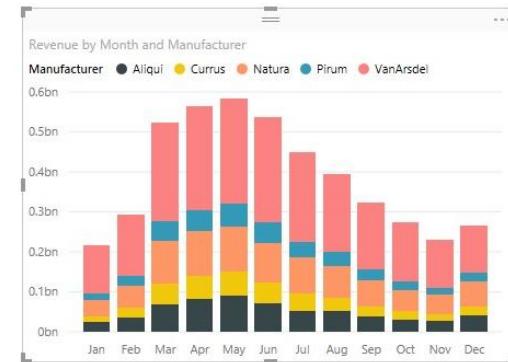


22. Select the manufacturers Aliqui, Currus , Natura, Pirum and VanArsdel in the filter



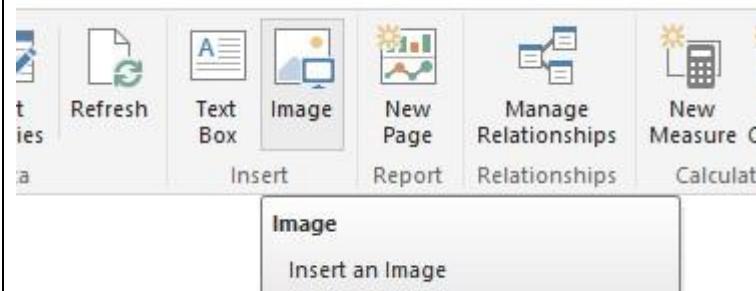
23. Move the column chart visual to the right of the canvas.

24. Add the Manufacturer to the Legend of the visual.



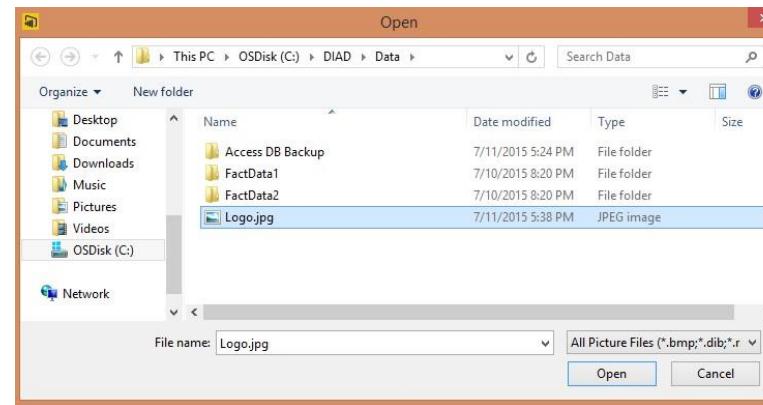
25. You need the company logo in any of your report.

26. Click on the Image in the Home tab

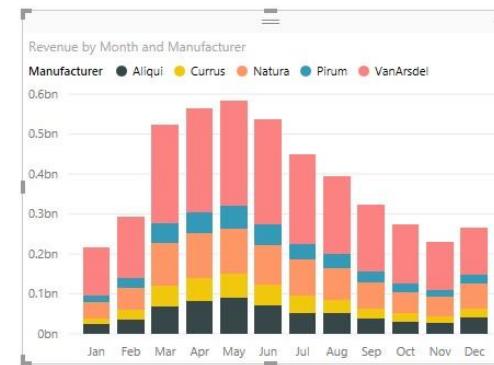


27. Select the Logo provided as part of the contents downloaded and click Open.

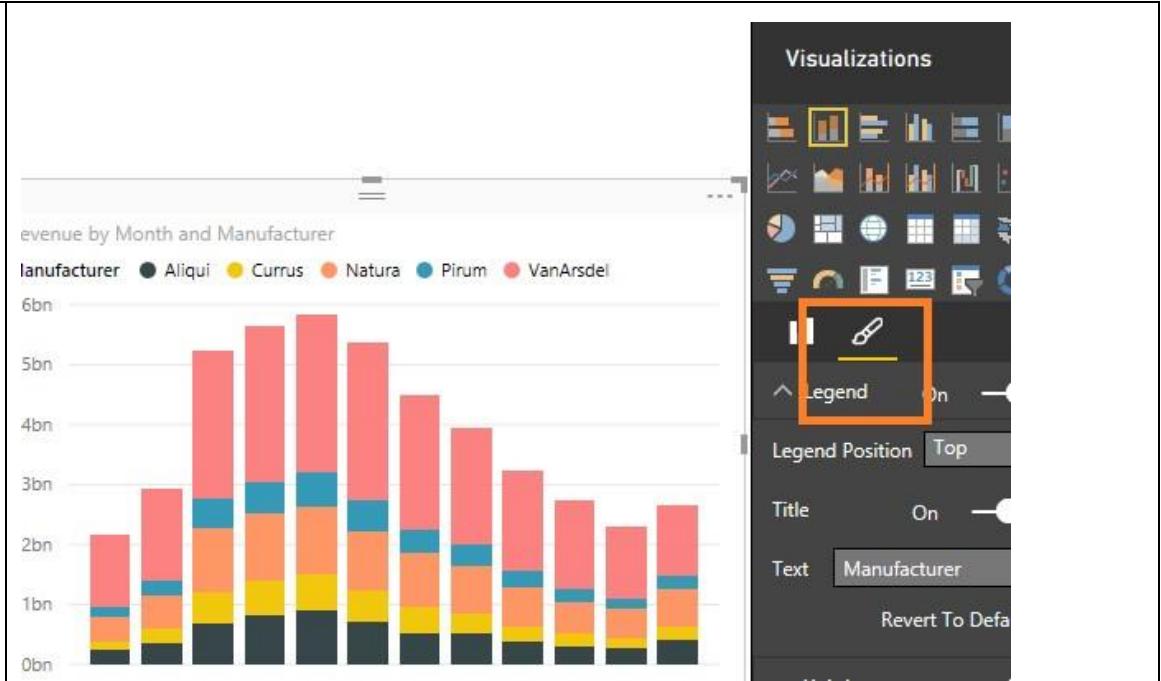
28. The logo will appear on the report.



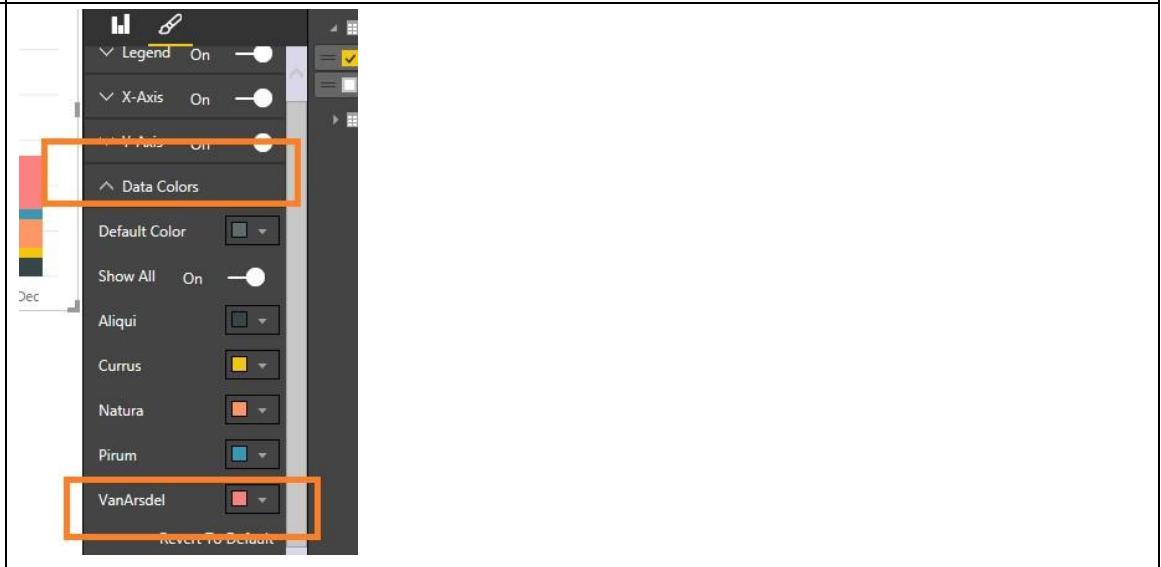
29. Resize and Move the logo to the top left of the report



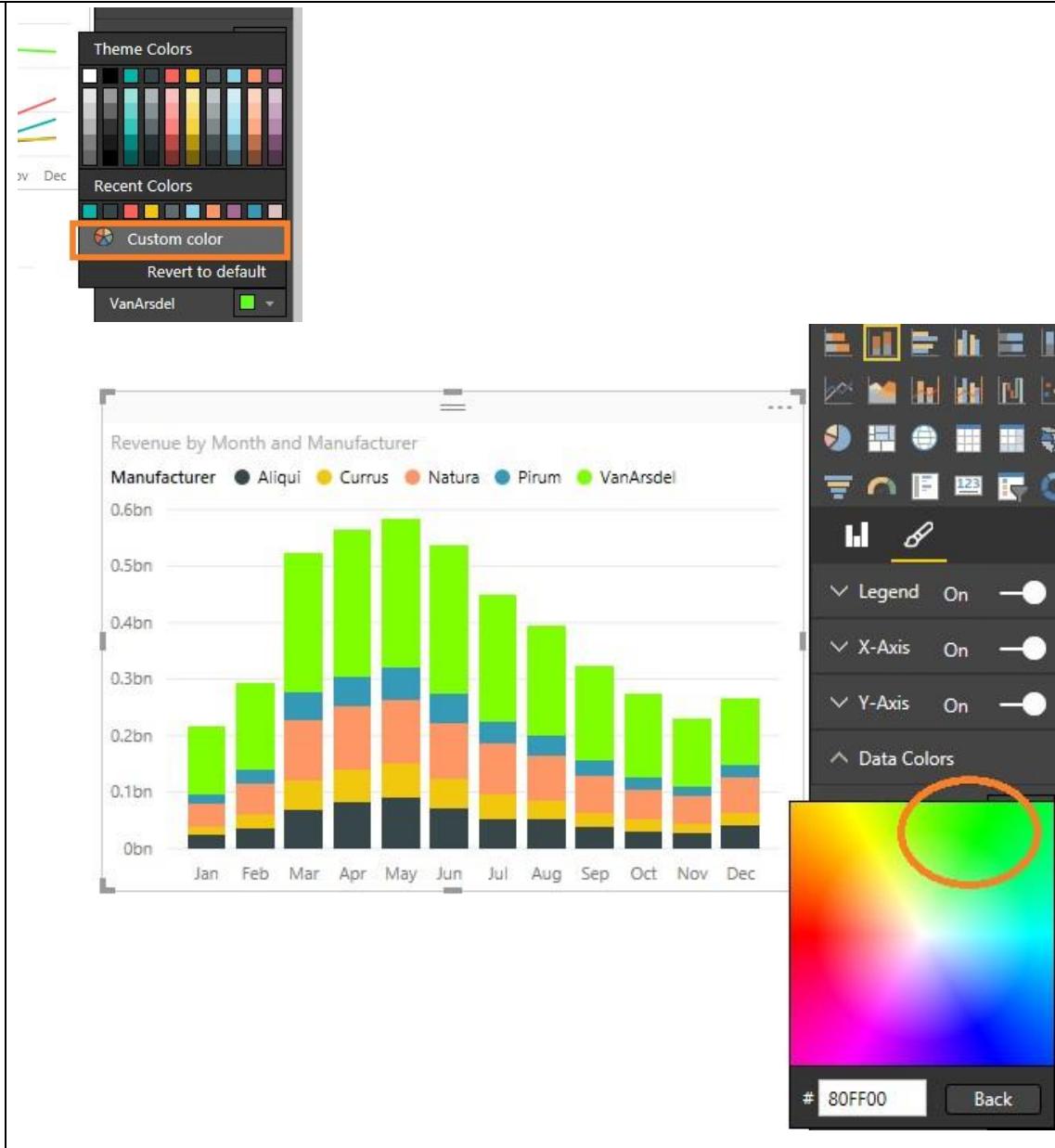
30. You can see VanArsdel logo is GREEN. You want to be able to match the sales of VanArsdel to right in your report.
31. Click on the column chart visual and select the format icon as shown in the figure.



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.

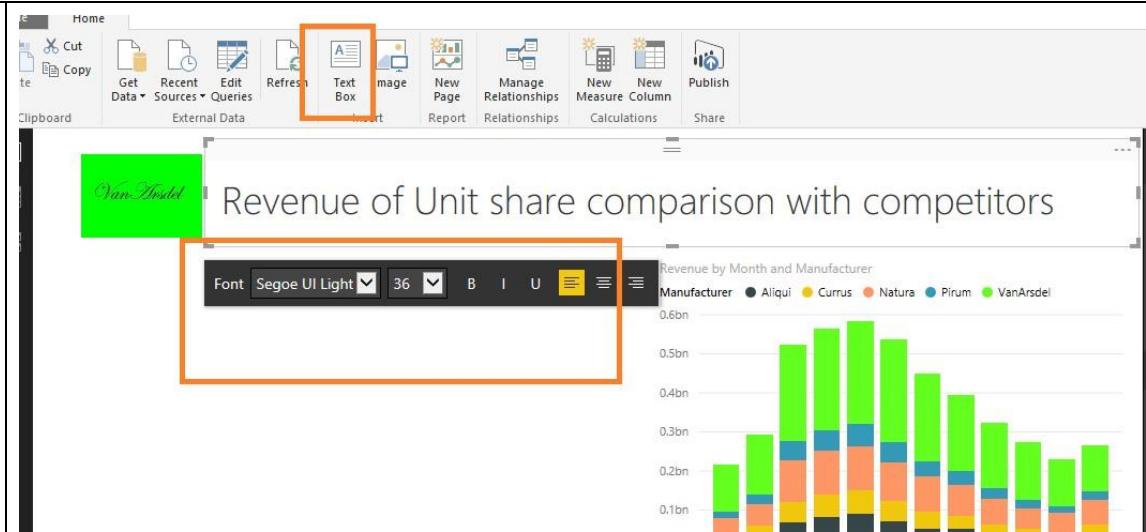


36. Click on the white canvas.

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.



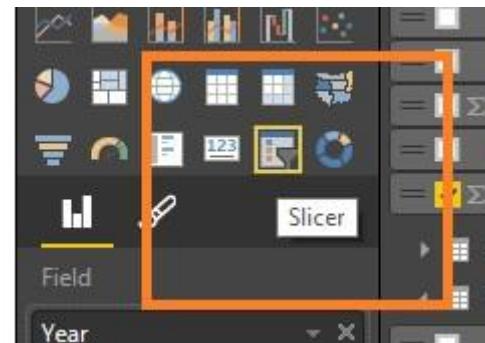
40. Click on the canvas

41. Click on the slicer icon in Visualizations pane.

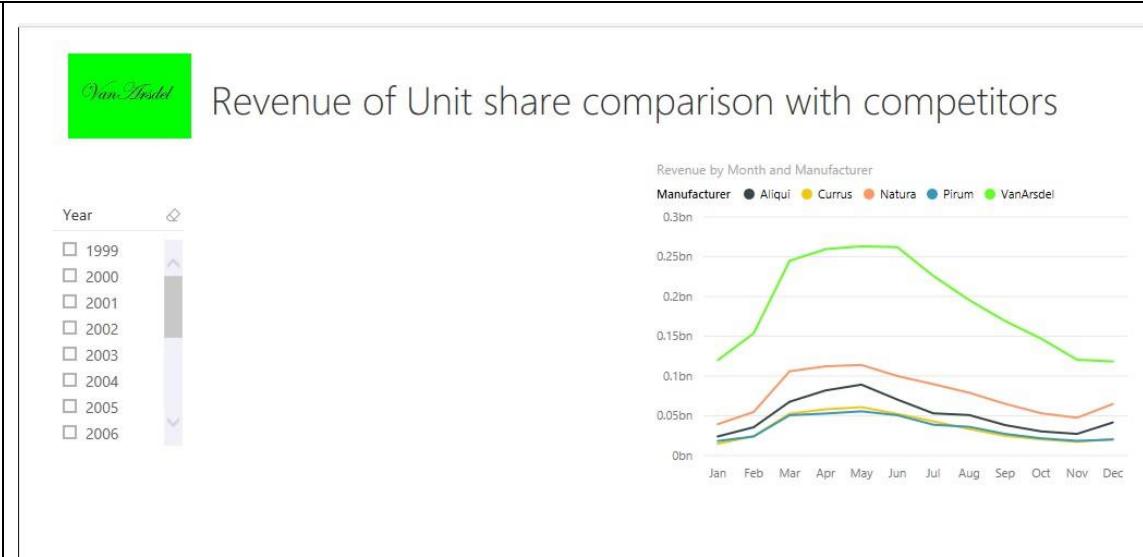
42. Drag and drop the Year column from the Date table into the Field of the slicer.

43. Move the slicer below the logo.

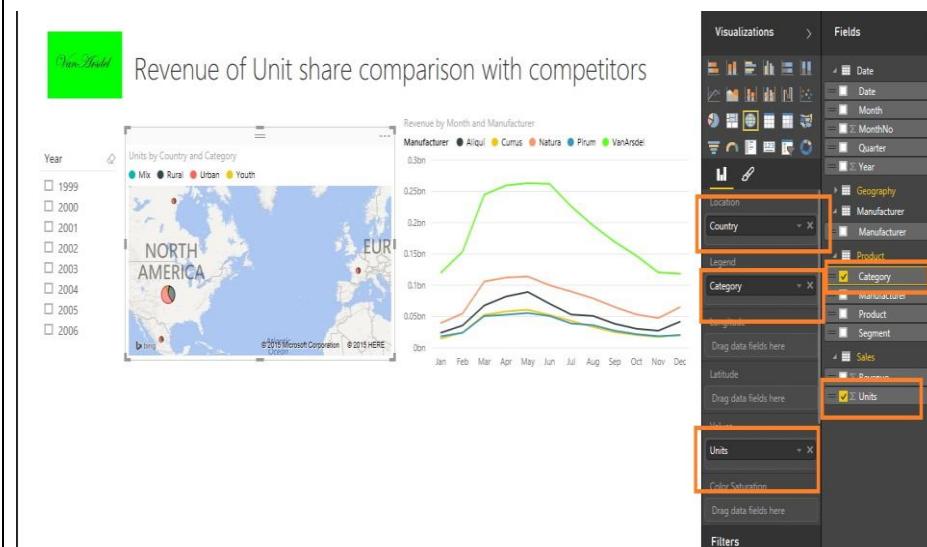
44. A slicer provides the ability for end users to visually see the key filters applied to the entire page and also the flexibility to select values easily.



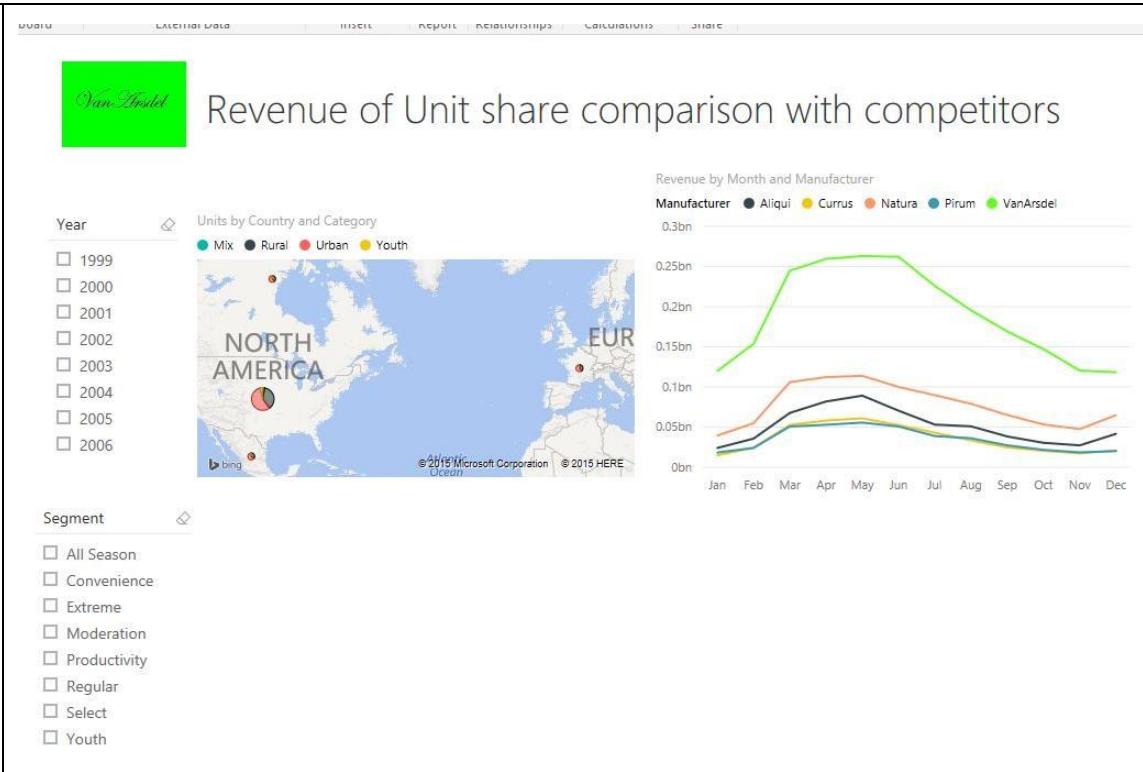
45. In order to compare the revenue by competitors over time easily line charts are more helpful.
46. Select the column chart visual and change it to line chart visual in the Visualizations.
47. Your report should look like the one on the right.



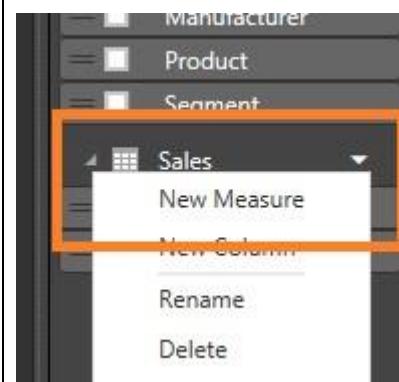
48. Select the map visual from Visualizations
49. Drag and drop Country column from Geography table to Location of the map visual as shown in figure.
50. Drag and drop Units column from Sales table to the Values of the visual
51. Drag and drop Category column from Product table to Legend.
52. Resize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

The screenshot shows the Power BI Data view. At the top, the DAX expression is displayed: `YTD Revenue = TOTALYTD(Sum(Sales[Revenue]),'Date'[Date])`. Below the expression is a tree view of the table structure. The `Sales` table is expanded, showing three columns: `Revenue`, `Units`, and `YTD Revenue`. The `YTD Revenue` column is highlighted with a yellow border, indicating it is a calculated measure.

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, the DAX expression is displayed: `LY YTD Revenue = CALCULATE([YTD Revenue],SAMEPERIODLASTYEAR('Date'[Date]))`. Below the expression is a tree view of the table structure. The `Sales` table is expanded, showing four columns: `LY YTD Revenue`, `Revenue`, `Units`, and `YTD Revenue`. The `LY YTD Revenue` and `YTD Revenue` columns are highlighted with yellow borders, indicating they are calculated measures. Additionally, the `Revenue` and `Units` columns have checkmarks next to their names, indicating they are also measures.

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.

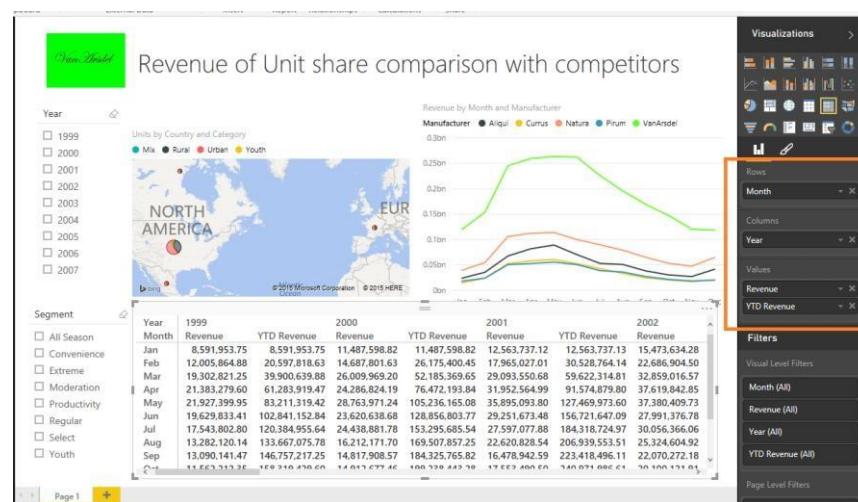


60. Drag and drop Month column from Date table to Rows.

61. Drag and drop Year column from Date table to Columns.

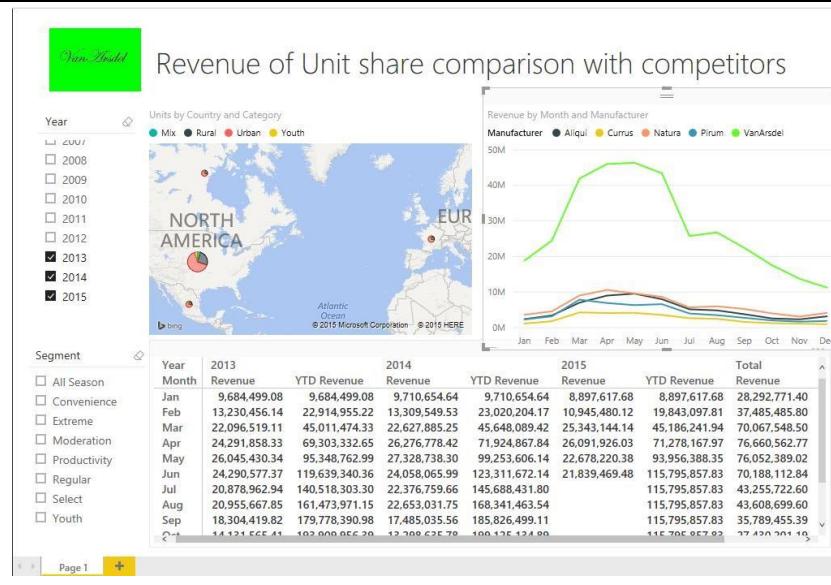
62. Drag and drop Revenue and YTD Revenue to Values.

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

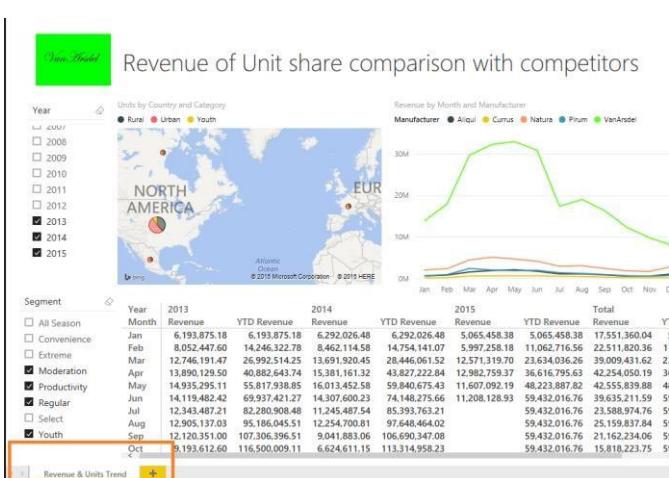


63. Your team will most likely be most interested only in the recent years.

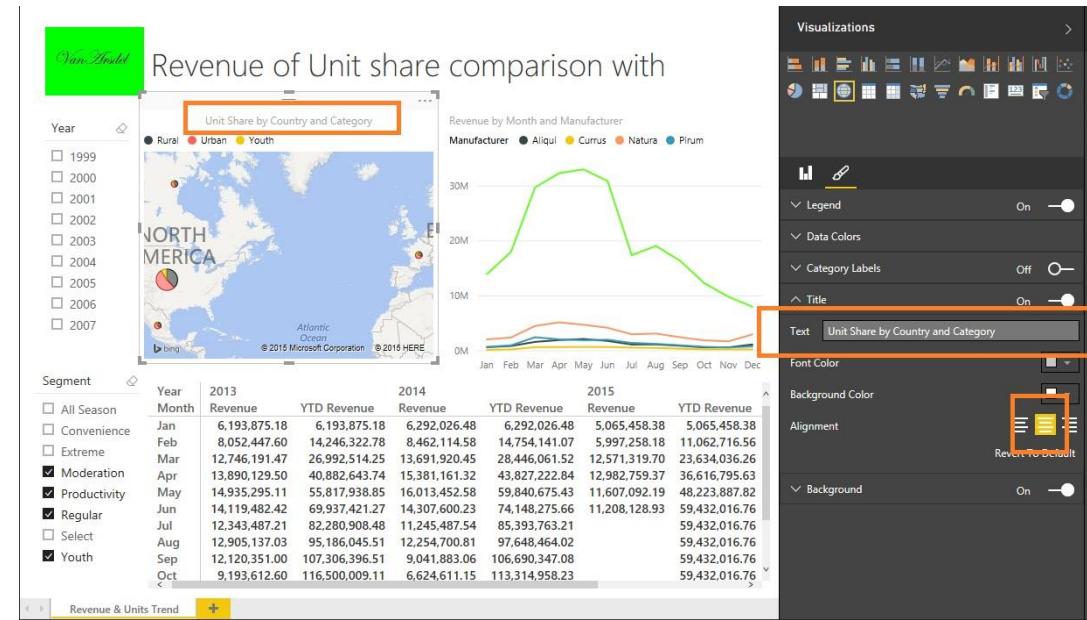
64. In the Year slicer scroll down and select the years 2013, 2014 and 2015 in the Slicer.



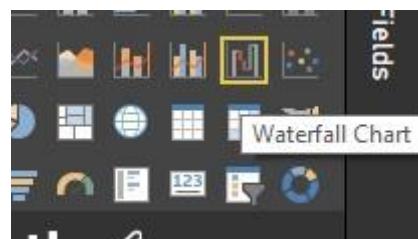
65. Double click on the Page1 and change the name "Revenue & Units Trend"



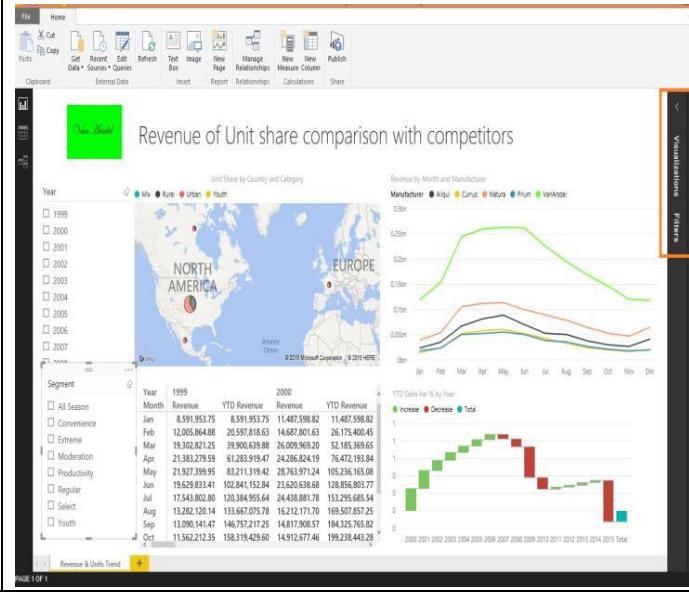
66. Select the map where you have Units by Country and change this to Unit share by Country and Category.
67. Click on the brush in the Visualizations pane for formatting.
68. Click on the icon to expand Title. The title has been highlighted in the figure to select the right visual.
69. Click on the centre alignment shown in the figure.
70. Explore selecting the various slicers, specific manufacturer from the legend in the line chart and see how the various values change interactively.



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



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



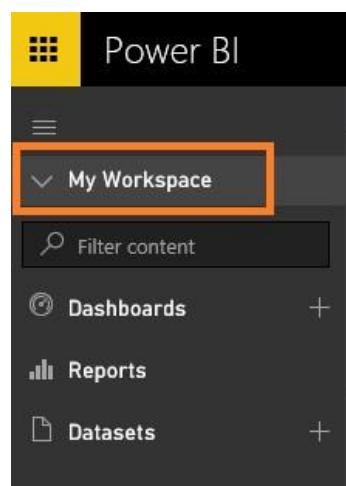
You have successfully completed the hands on lab in creating a report to share to your team. The next section covers creating a dashboard from this report so that you can easily share it to your team. You have learned a quick overview of various functionality in Power BI Desktop to get accelerated. There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

Power BI Service – Part I

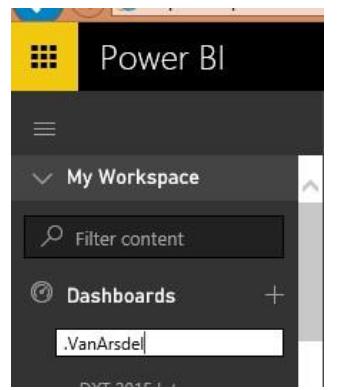
You will now leverage the report authored using Power BI Desktop and create a dashboard for VanArsdel data analysis team and finally share it to the CMO. We have been given a Power BI Desktop file with additional reports / views of Sales information. Please use this for the next two sections of the lab.

Creating Dashboard and uploading your Report

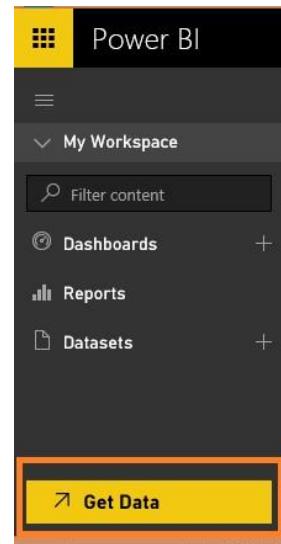
1. Login to <http://app.powerbi.com> using your organizational credential which you used to sign up for Power BI.
2. Once you login into the Power BI Service you will see "My Workspace" selected by default and below that you will see Dashboards, Reports and Datasets as shown in the figure.



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



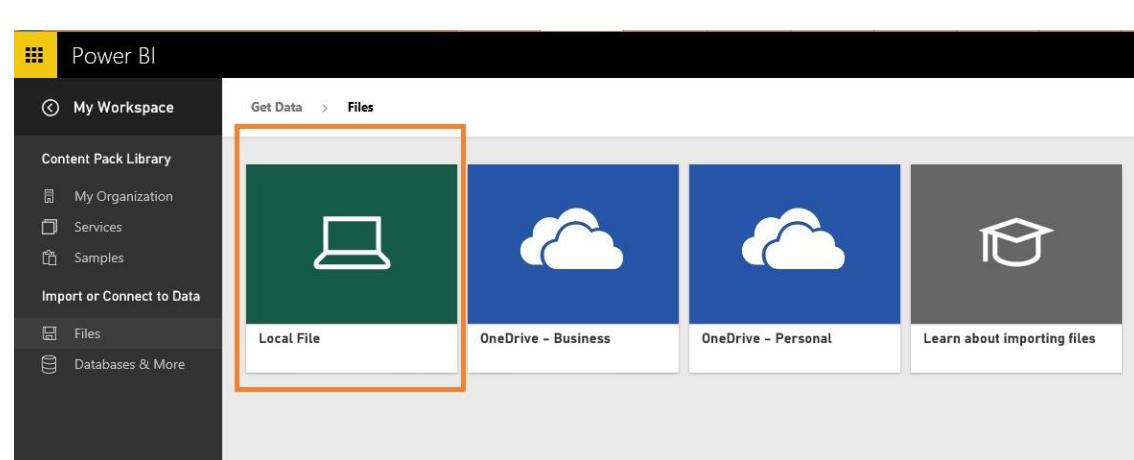
4. Click on the "Get Data" to import your Power BI Desktop file.



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

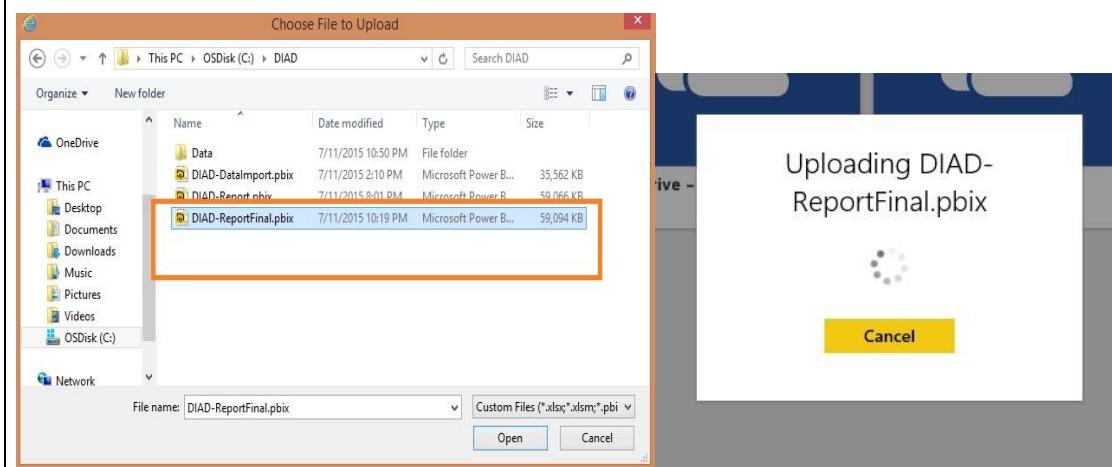
A screenshot of the 'Get Data' page in the Power BI service. The page has a header 'Get Data' and a sub-header 'Import or Connect to Data'. It features two main sections: 'Content Pack Library' on the left and 'Import or Connect to Data' on the right. The 'Import or Connect to Data' section contains four boxes: 'My Organization', 'Services', 'Files', and 'Databases'. The 'Files' box is highlighted with an orange border. Within the 'Files' box, there is a description: 'Bring in your reports, workbooks, or data from Excel, Power BI Desktop or CSV files.' and a yellow 'Get' button with an arrow icon, which is also highlighted with an orange border.

6. Click on Local File as shown in the Figure



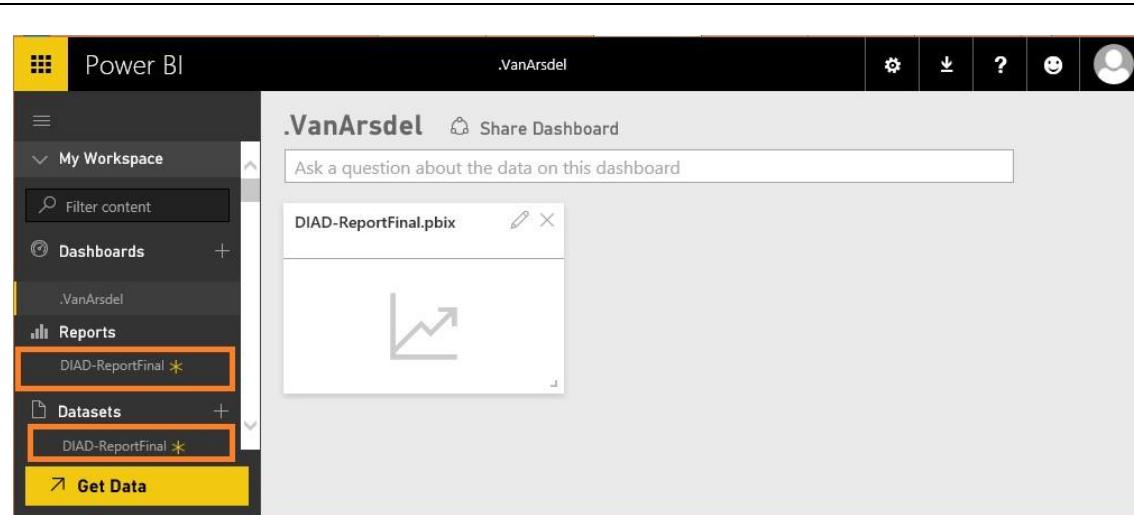
7. Select the Power BI Desktop file
DIADReportFinal.pbix which was provided along
with the Dashboard in a Day content and click
Open.
8. You will see the upload status as shown in the
figure.

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

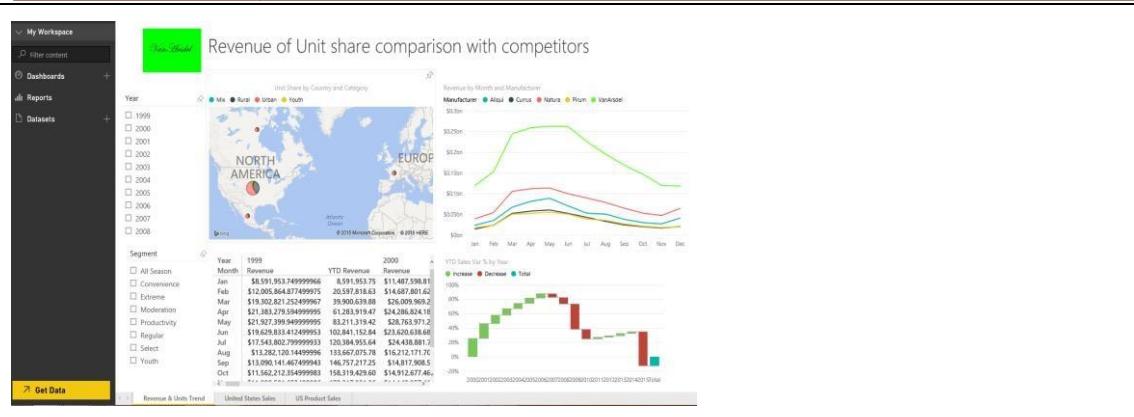


Operational Dashboard and Sharing

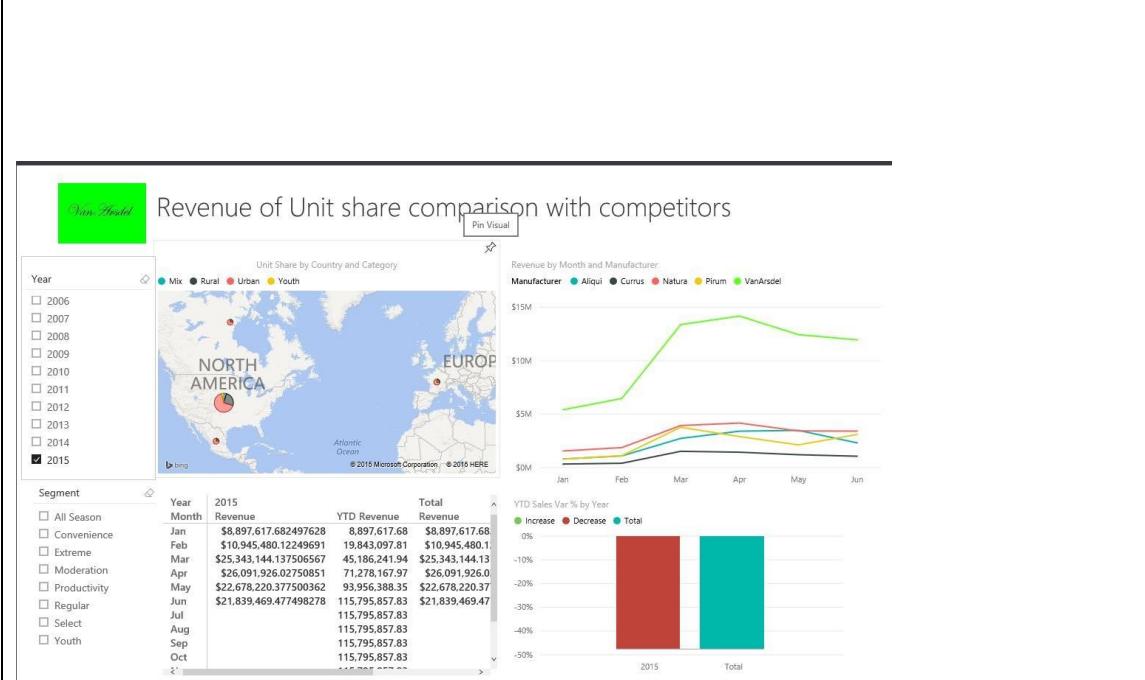
1. You will see an icon indicating the file that has been uploaded.
2. The service extracted the data model and reports that were part of the Power BI Desktop file and added separate entries under Reports and Datasets as shown in the Figure.



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



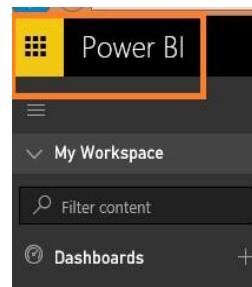
- Select the year 2015 in the slicer.
- Select the map visual or Hover over the map visual and you will see a pin icon as shown in the Figure. The pin icon will appear for each visual you would like to pin to the dashboard.
- Click on the Pin icon of the map. This pins the visual to the dashboard from 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.

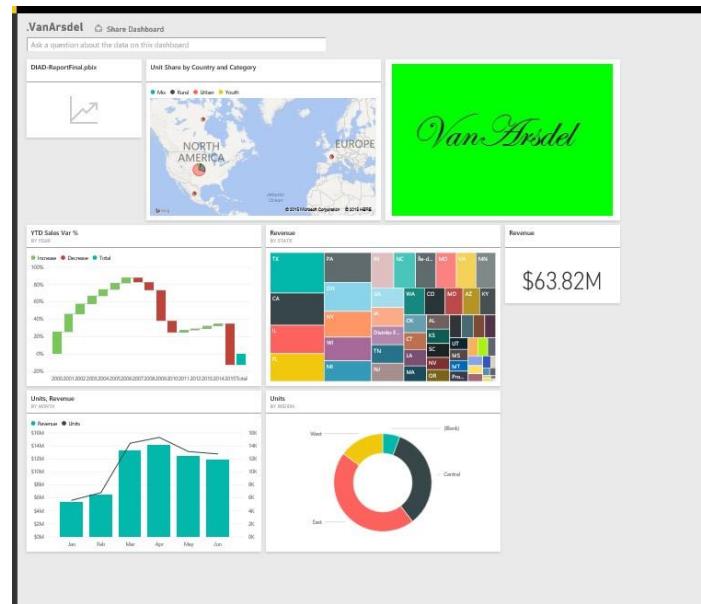


13. Click on the Power BI or on the .VanArsdel dashboard to get to the dashboard.

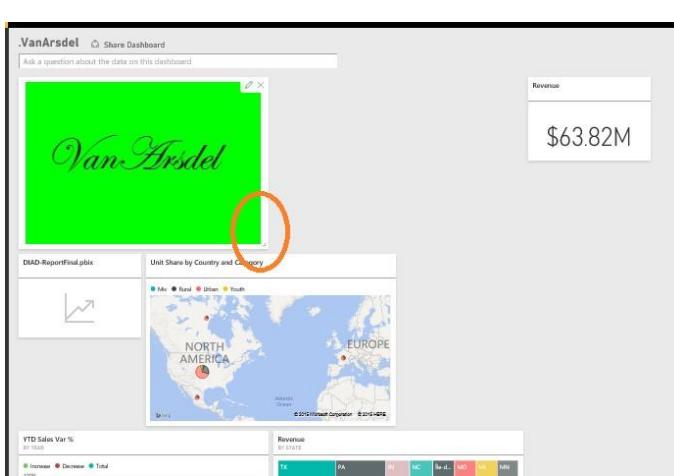


14. You will see the visuals on the dashboard as shown in the Figure. Each visual on the dashboard is called as a tile. The tiles represent the data chosen and will be kept up to date as the data of the data model changed.

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

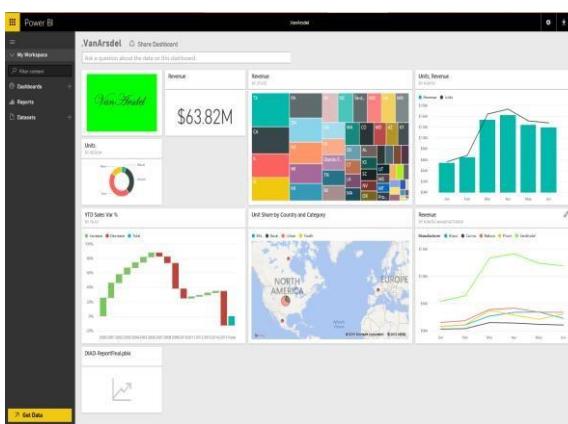


16. Select and move the image visual to the top left corner.
17. Select the bottom right corner of the visual and move it diagonally to change the image to a small

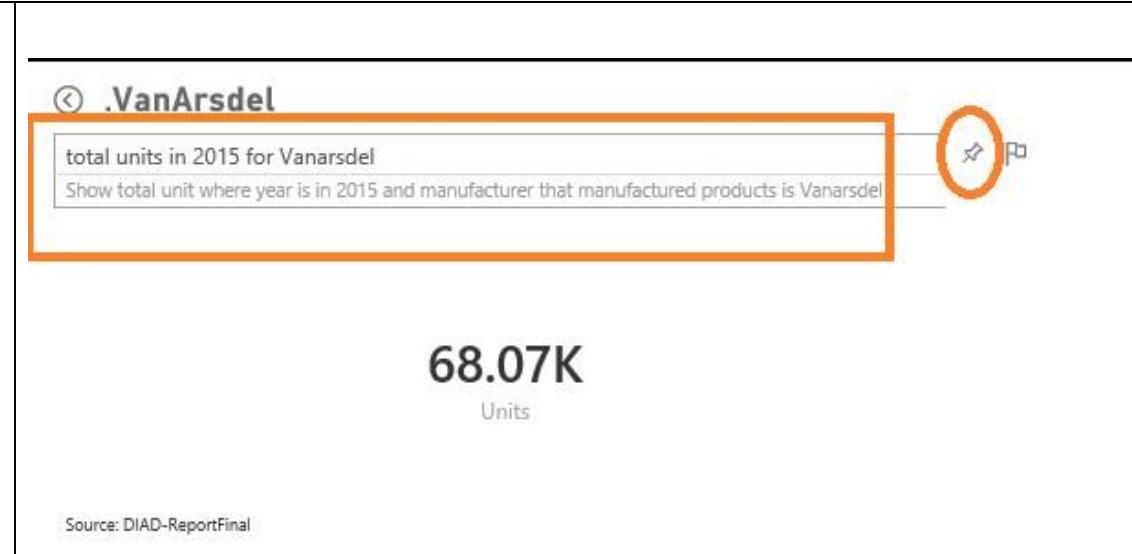


18. Change the tile size and organize the dashboard as shown in the Figure.

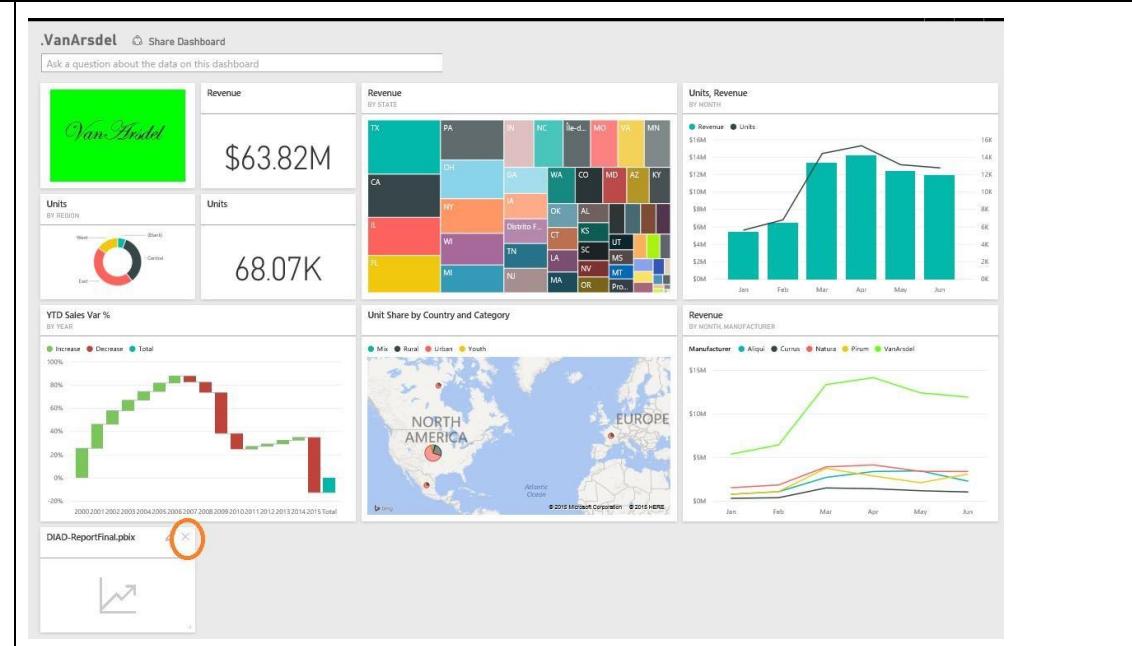
The top row contains data about VanArsDel for the 2015 year while the bottom row contains the industry trend and competitors revenue.



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.



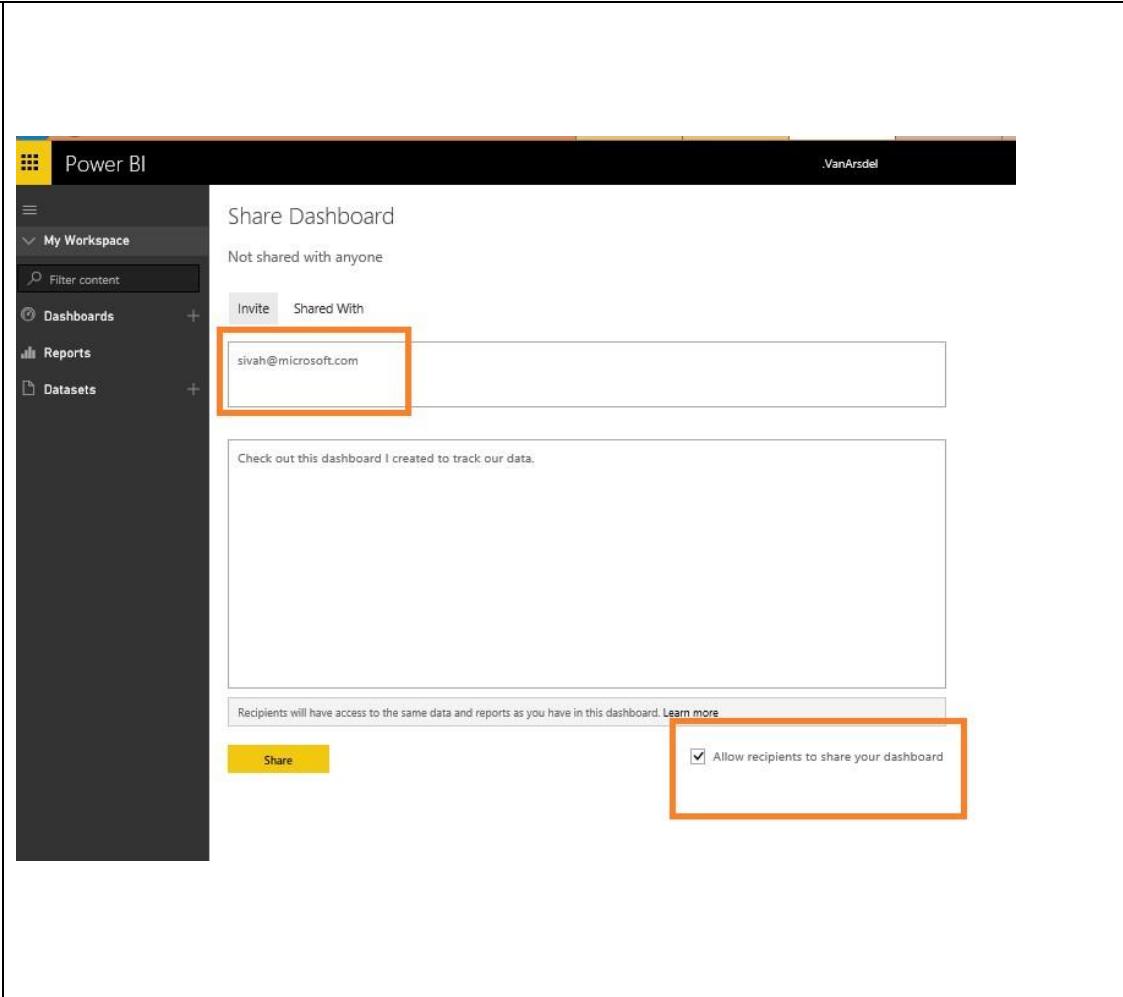
24. You can hover over a tile to delete it from the dashboard or edit it.
25. Hover over the icon of the report and select "x" to delete it from the dashboard
26. Hover over the Revenue tile and select the pen icon to edit it.
27. Change the title to Current Year Revenue as shown in the figure and click 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.

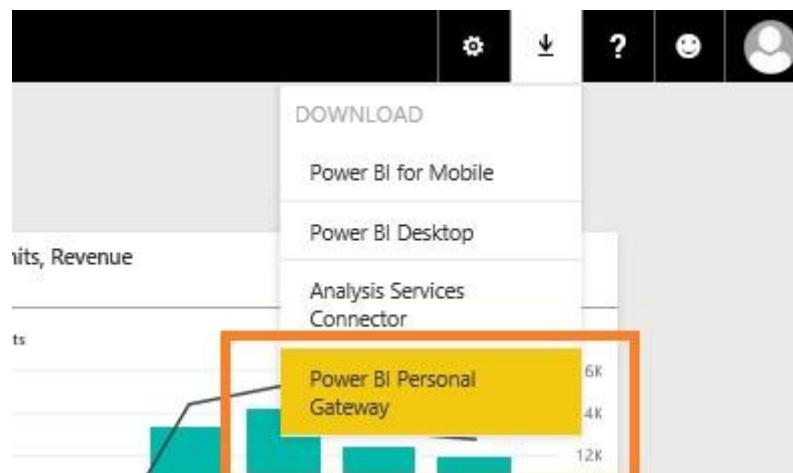


Refreshing data on the Dashboard

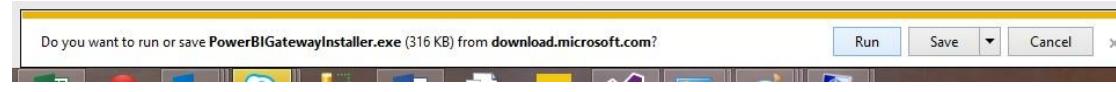
Once the dashboard has been shared to the members of the team, one of the key benefits of Power BI is the ability to setup automated data refresh. This enables the dashboard to be live and operational for the organization. If your data is being retrieved from a cloud data source such as SQL Azure then 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.

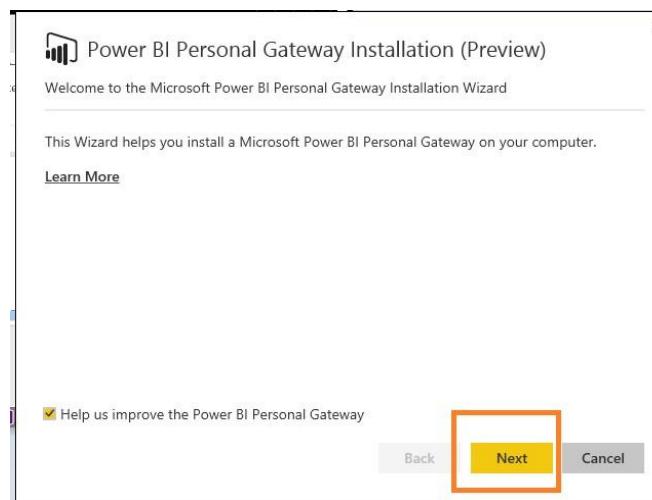
1. Go to <http://app.powerbi.com> and download and install the Personal Gateway as shown in the Figure



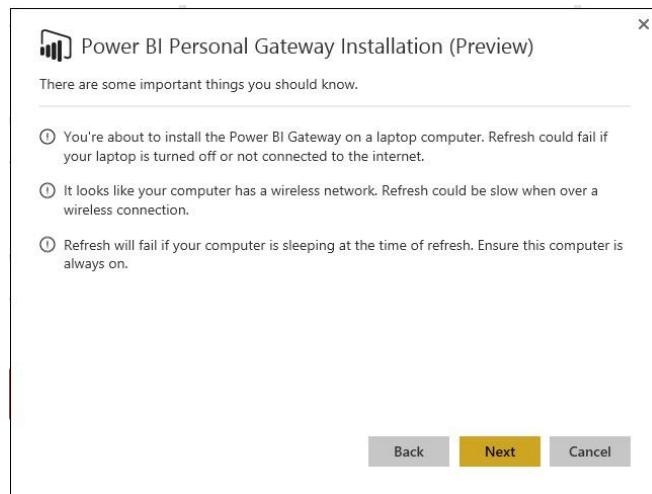
2. Click on Run once the download is complete.



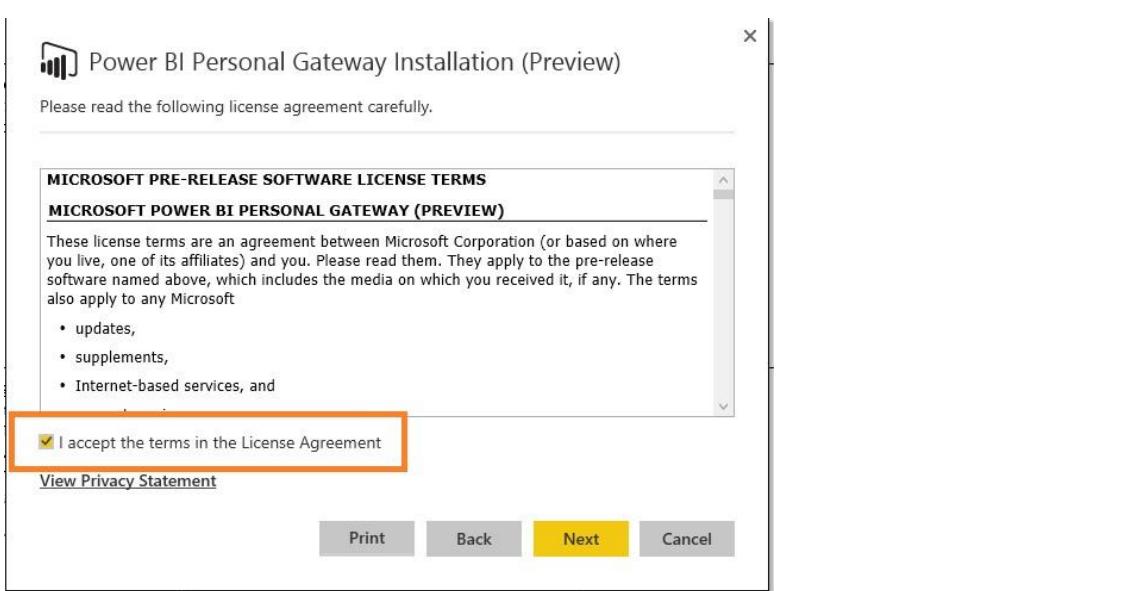
3. Once the Personal Gateway preparation steps are completed click on Next as shown in the figure.



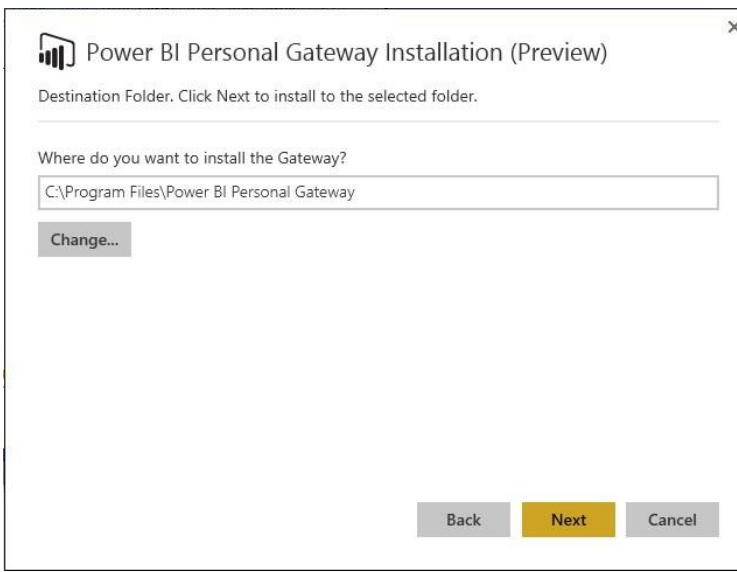
4. The Personal gateway detects information on your machine and shares these. The machine where personal gateway is being setup needs to be online and connected for the service to get data from your on premises data source.
5. Click Next in this dialog.



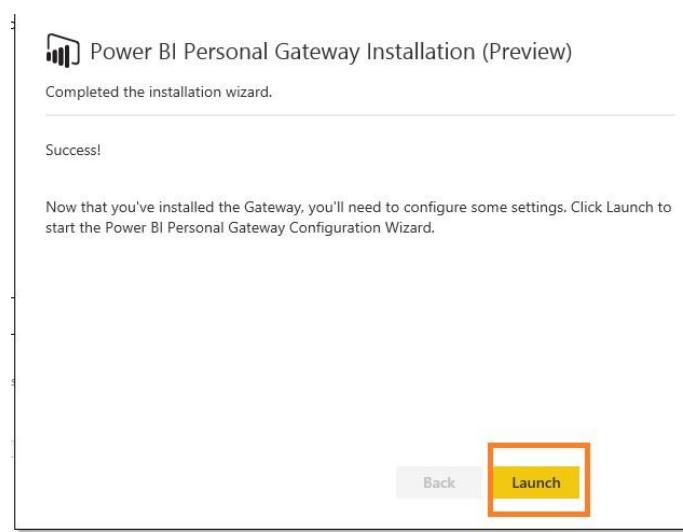
6. Read the privacy statement and accept the terms in the License Agreement as shown in the figure and click Next.



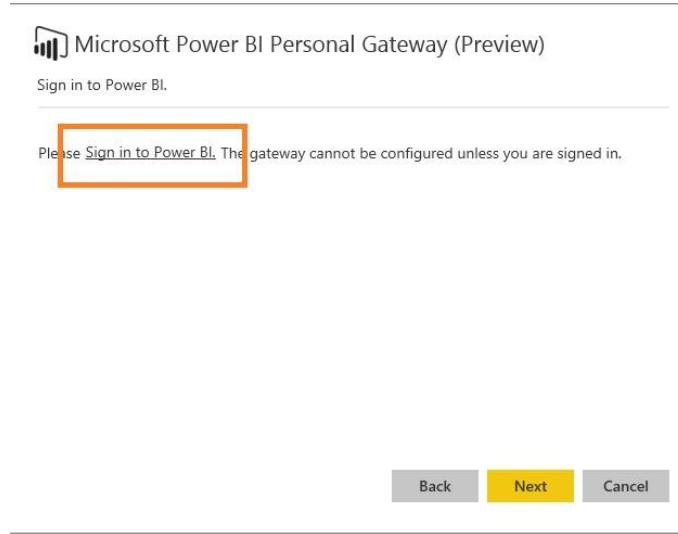
7. Select the default install path for the gateway and click Next.



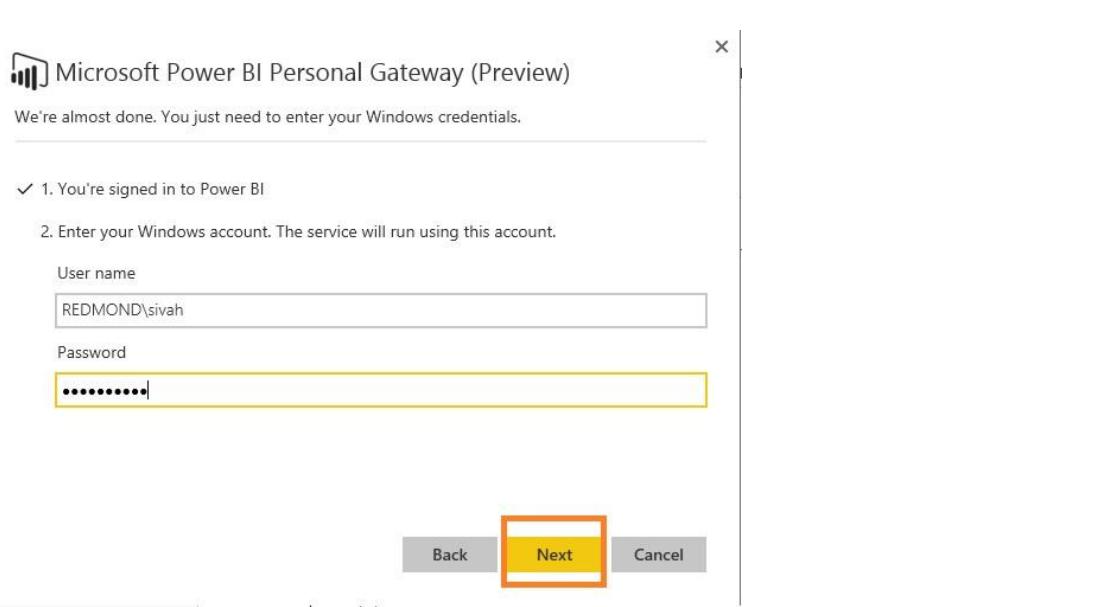
8. After the installation is complete click on Launch as shown in the figure.



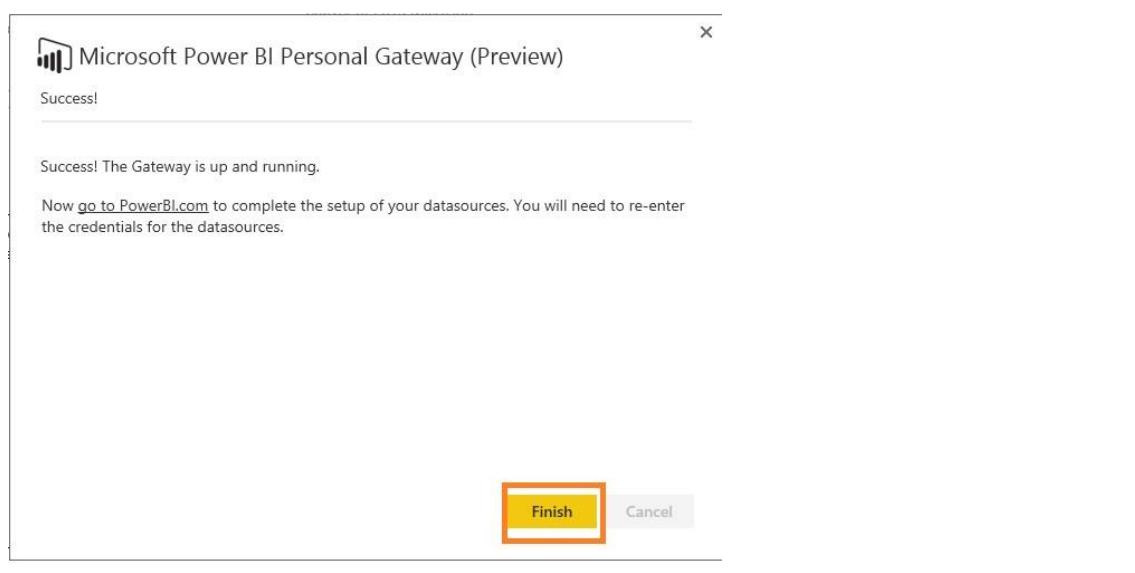
9. Click on sign in to Power BI.
10. If you are prompted with Microsoft Azure dialog enter your Power BI credentials and click OK. If not, you are likely signed in automatically using your credentials.



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

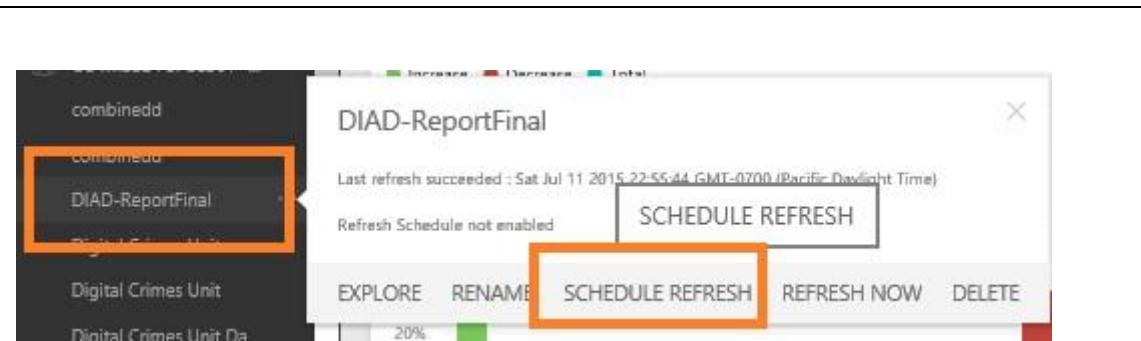


12. Once you see a successful install of the Personal gateway click Finish.
13. At this time the Personal Gateway has been setup for you to refresh your on premises source data.



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.

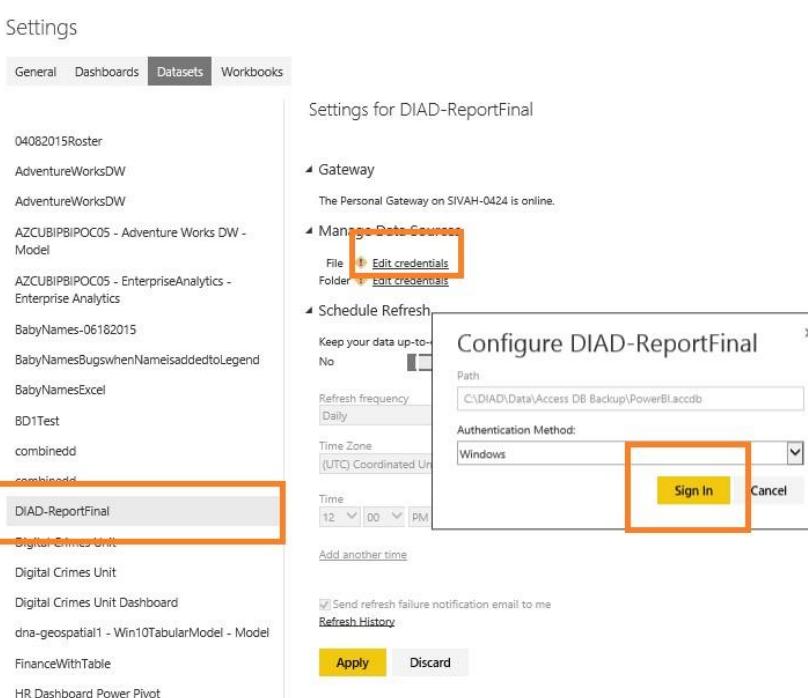
18. The service has detected there are two data sources → File and Folder used in this data mode.

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-

21. ReportFinal dialog again click Sign-in.

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



22. After setting up the credentials, enable data refresh by moving the slider below "Keep your data up-to-date".
23. Change the time zone to your time zone under "Time Zone" drop down.
24. 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.
25. Click Apply.

You have now setup automated refresh.

Settings for DIAD-ReportFinal

Next refresh: Sun Jul 12 2015 05:00:00 GMT-0700 (Pacific Daylight Time)

▪ 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
Yes

Refresh frequency Daily

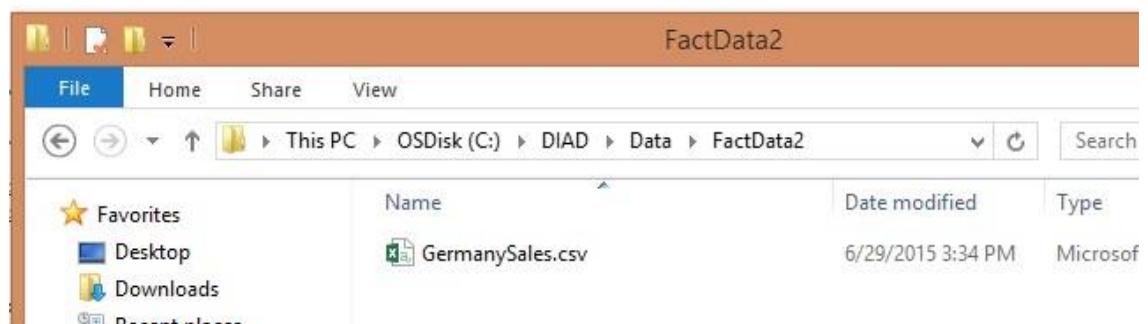
Time Zone (UTC-08:00) Pacific Time (US and Canada)

Time 2 30 AM X Add another time

Send refresh failure notification email to me
[Refresh History](#)

Apply **Discard**

26. 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
27. Copy and paste this file to
28. 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.

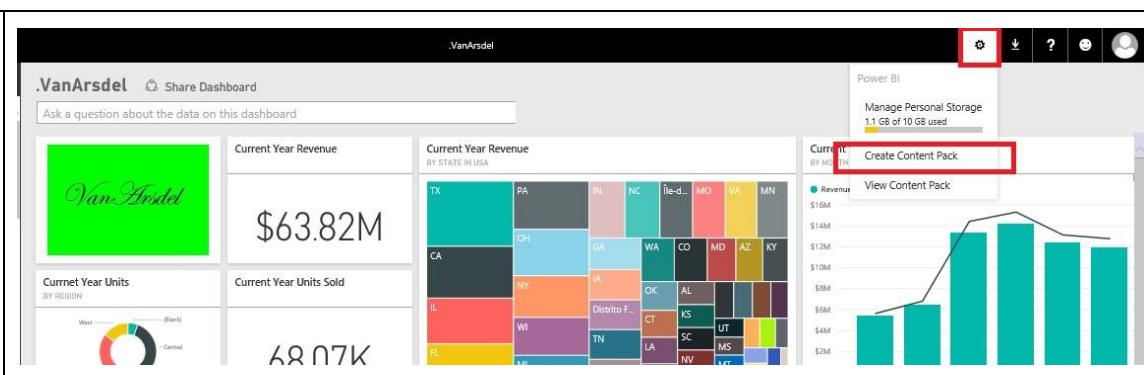
You only have 24 hours in a day and you are unable to meet the demands from all your users for the requests above. You want to make them be successful. In order to tackle this business problem in this section you will learn how to leverage the features in Power BI.

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:
 [Upload an image or company logo](#) (i)
[Use Default](#)

Select items to publish

Dashboards

Project Plan
 Sales Analysis Dashboard
 Sales Forecast
 Sales Report
 Sales Manager
 Sales Data
 VanArsdel

Reports

SalesForce Sales Manager
 AdventureWorksDW
 Sales Report
 Title
 Title
 Sales Manager
 DIAD-ReportFinal

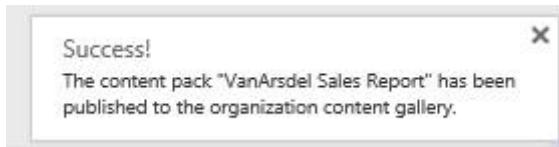
Datasets

Adventure Works DW
 Town Data
 Title
 Title
 Sales Data
 Sales Manager
 DIAD-ReportFinal

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

Publish **Cancel**

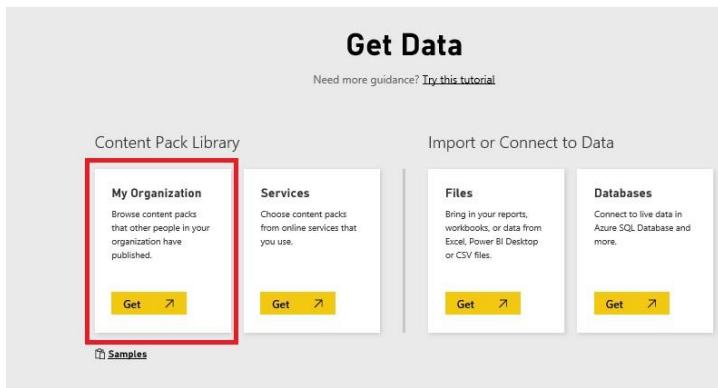
9. You should see a notification that content pack creation was successful as shown in the figure.



9. Identify a user part of your company to whom you shared the content pack. This user can be you as well.

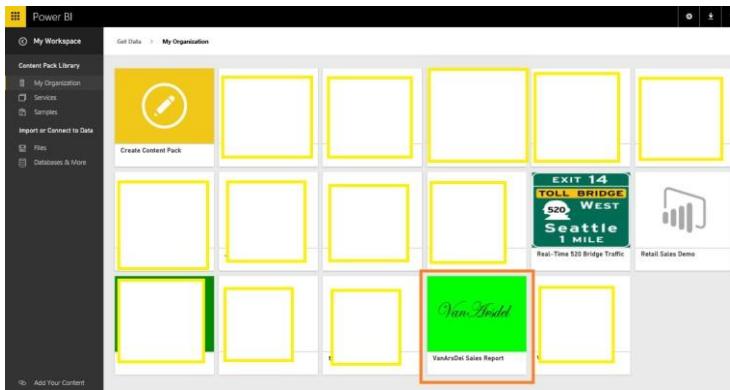
10. Click on Get Data on the Power BI Service.

11. In the Get Data page click on Get under My Organization as shown in the figure.

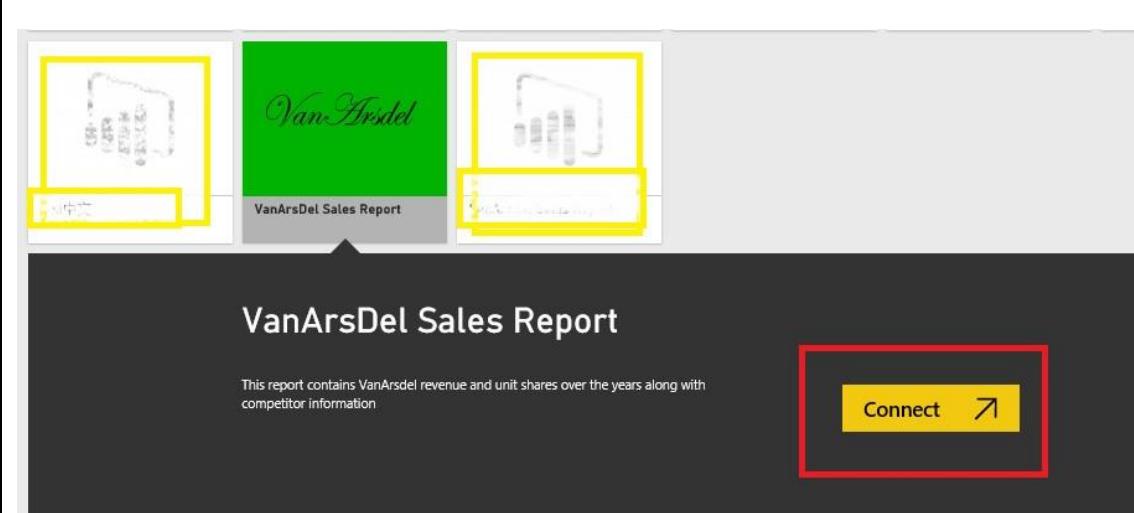


12. In the Organization page you will see the VanArsdel content package as shown in the figure.

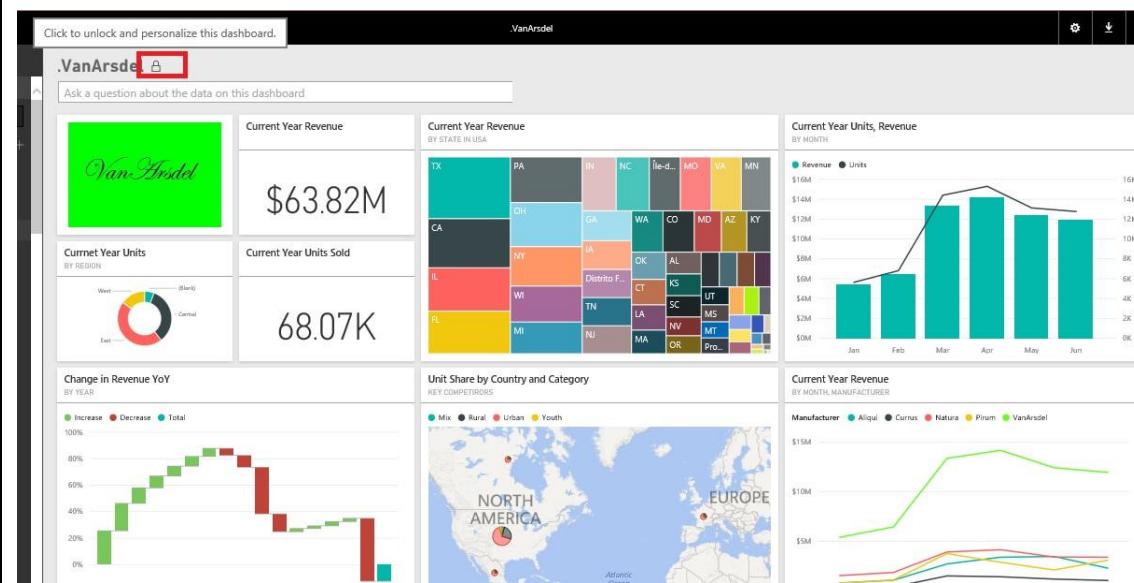
In the figure several content packs are shaded with yellow border due to the confidentiality of the content packs.



13. 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.



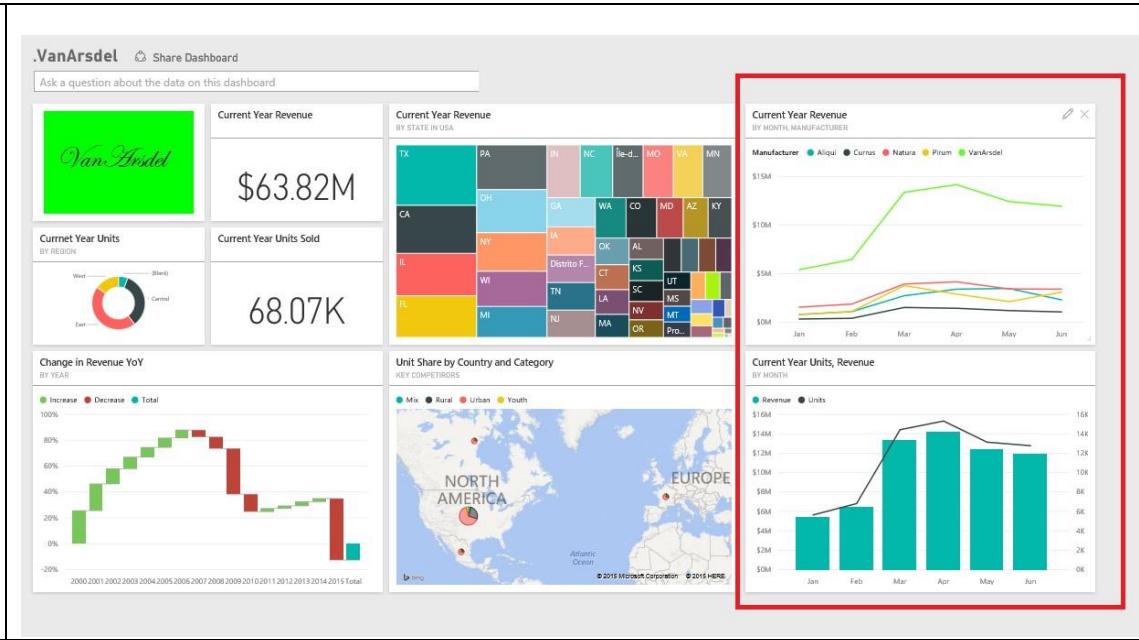
14. A new dashboard is created for the end user as shown in the figure. By default the dashboard is a read only dashboard for the end user and any updates made to the content packs will be seen by the end user. You will learn how to make updates to the content pack shortly.
15. If the user wants to personalize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



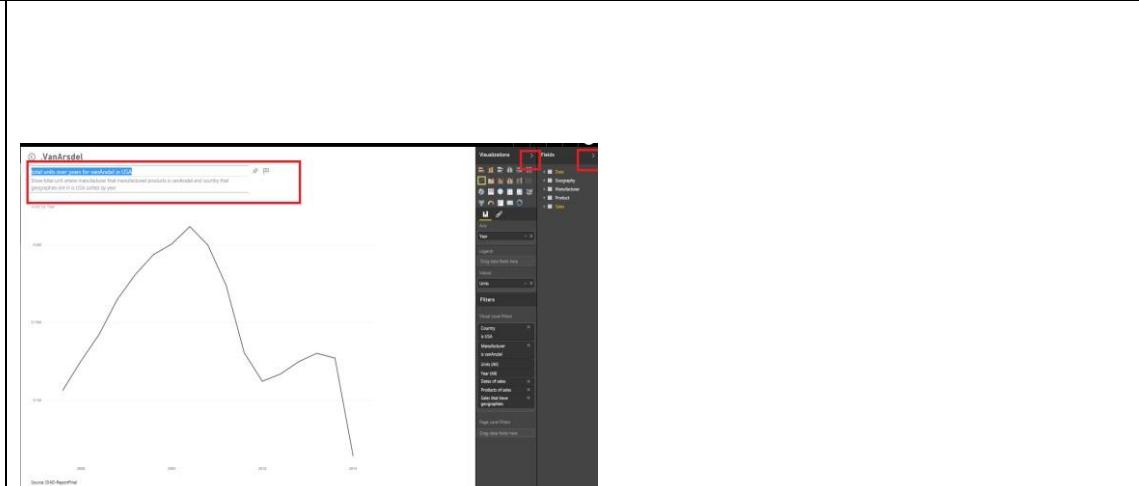
Updating a content pack

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.

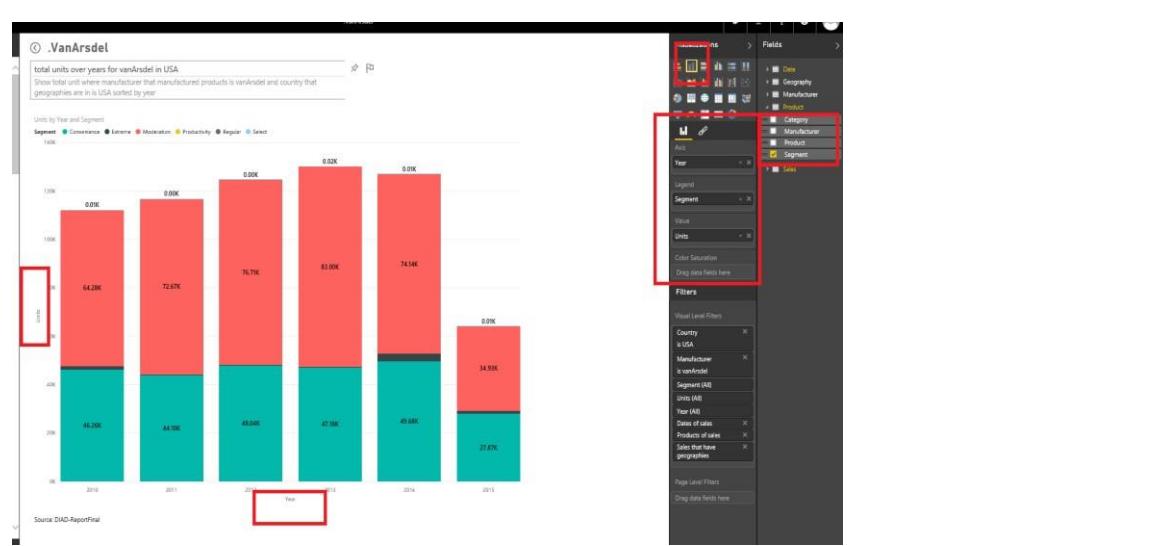
1. Go to your .VanArsdel dashboard which was published as a content pack.
2. Re-organize the tiles as shown in the figure.



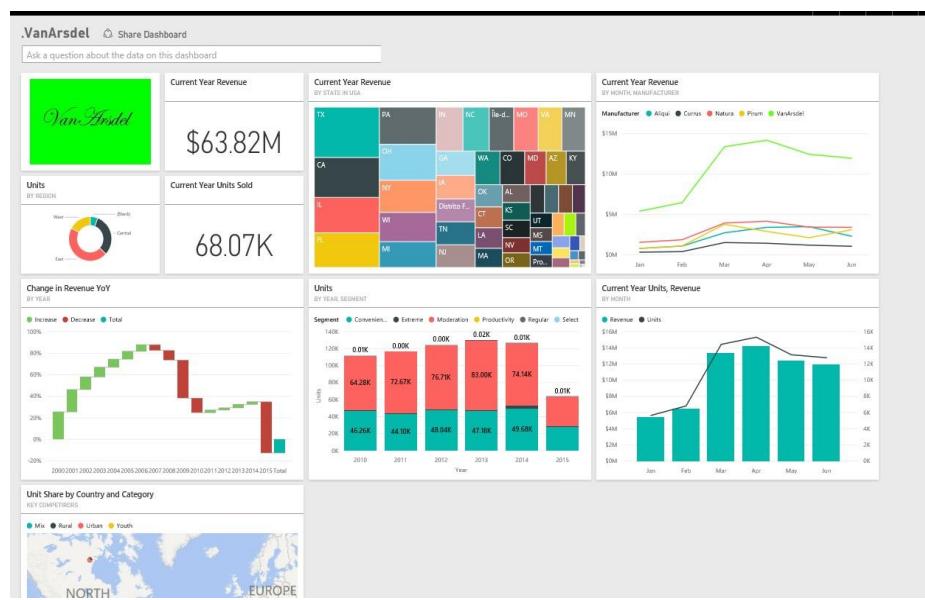
3. Your organization has requested you to add the total units sold since 2010 for United States as top level metric.
4. Enter the text "Total units over years for VanArsdel in USA". You will see the line chart formed by QnA.
5. Click on the > icons next to
6. Visualizations and Fields so that you can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



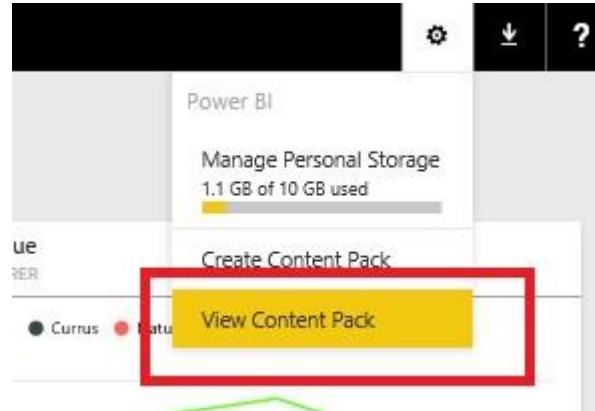
7. Change the visual to column chart
8. Drag and drop Segment column to the Legend of the column chart 8. Click on the formatting brush.
9. Enable X-axis and Y-axis titles
10. Enable Data Labels
11. Expand X-axis and enter the start year as 2010.
12. Pin the tile to your dashboard.



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.

View Content Packs			
Name	Published To	Date Published	Actions
VanArsDel Sales Report	My Organization	Jul 12, 2015	Edit Delete

18. 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](#)

Select items to publish

Dashboards

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

Reports

- People View
- Digital Crimes Unit Dashbo...
- Windows&WinPhoneUserV...
- New Technology Adoption...
- TLI_V2.5
- MPSIT Travel
- poc

Datasets

- People View
- Digital Crimes Unit Dashbo...
- Windows&WinPhoneUserV...
- New Technology Adoption...
- TLI_V2.5
- MPSIT Travel
- poc

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

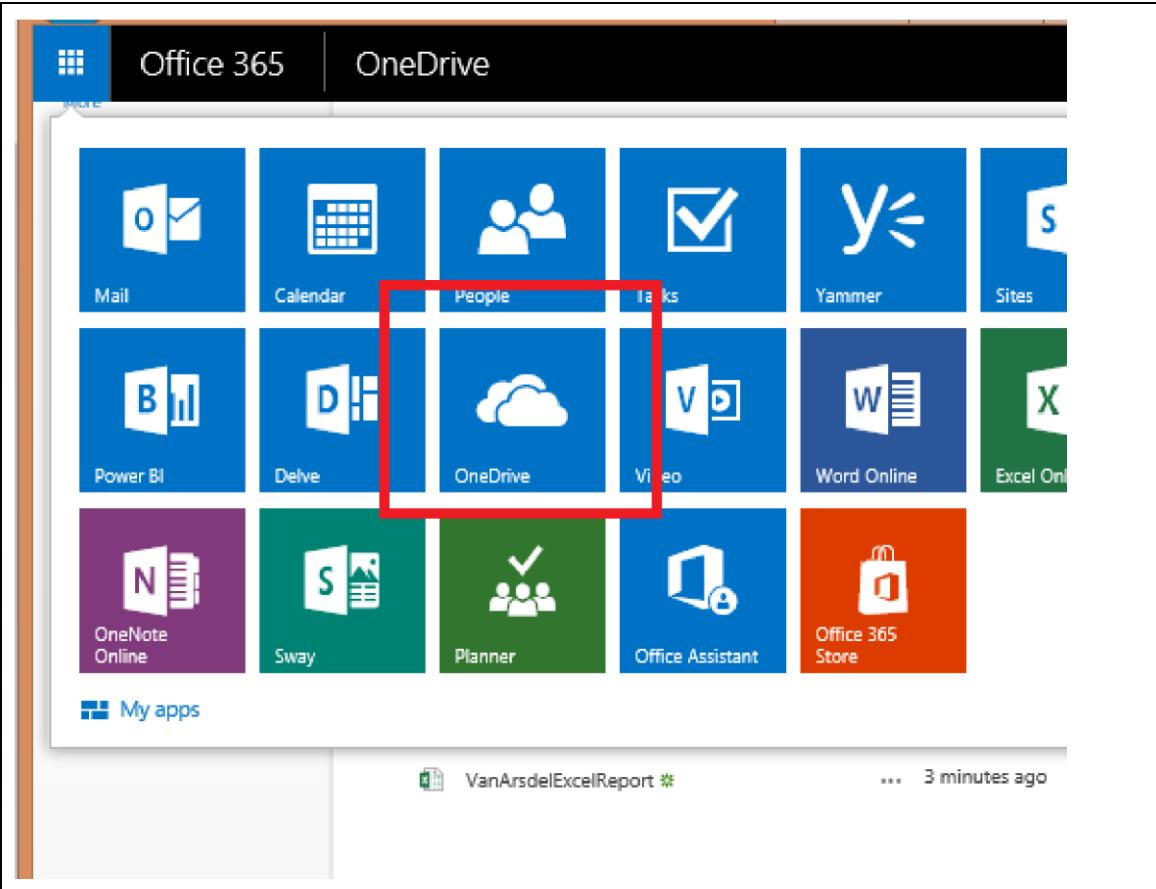
Update

Cancel

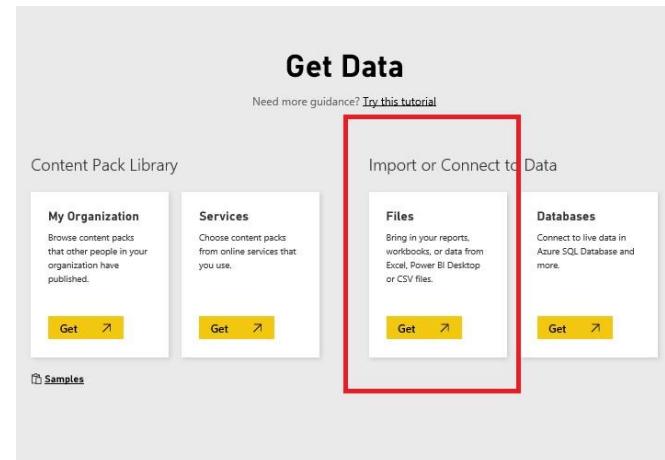
View and manage your Excel reports in Power BI

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.

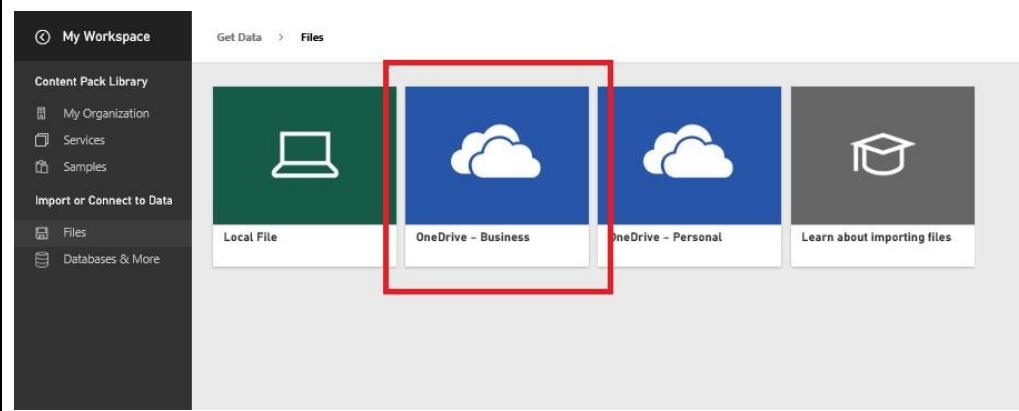
1. Login to your Office 365 account
2. Click on the top left corner and select OneDrive
3. Go to the documents and upload the file VanArsdelExcelReport provided to you.



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 page click on Data → Files
→ 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 navigation bar 'Get Data > Files > OneDrive - Business'. 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
VanArsdelExcelReport.xlsx	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.

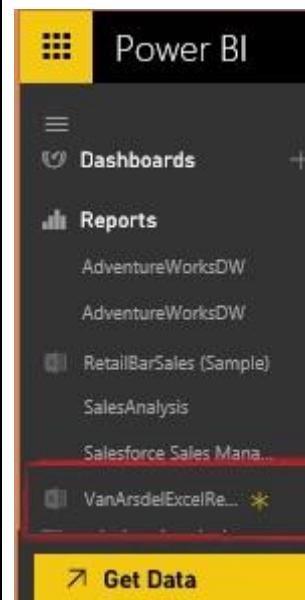
The screenshot shows the 'OneDrive for Business' connection options. It offers two choices:

- 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 description and a 'Import' button.
- 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. It includes a description and a 'Connect' button.

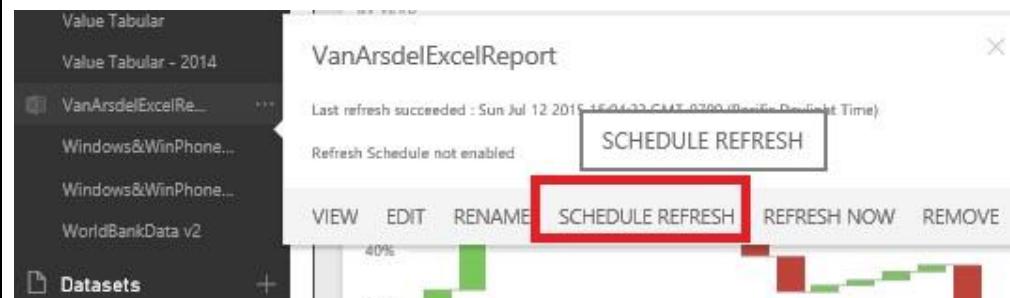
10. Once the Excel workbook has been successfully connected to Power BI you will see the information shown in the figure on top right corner of your browser.



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 'Workbooks' tab is selected. On the left, there is a list of workbooks: 'Olympics (Sample)', 'RetailBarSales (Sample)', and 'VanArsdelExcelReport'. The 'VanArsdelExcelReport' item is highlighted with a red box. The right pane displays settings for the selected workbook, titled 'Settings for VanArsdelExcelReport'. It includes a checkbox for managing a personal gateway, a note about the gateway being online, and links for 'Manage Data Sources' and 'Schedule Refresh'.

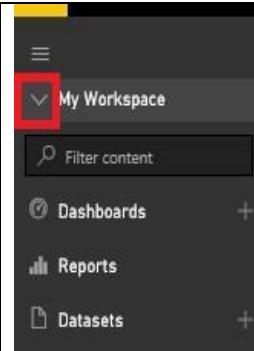
You have learned how to view and manage your Excel reports within Power BI. You can now communicate to your power users of Excel to leverage this functionality for your workbooks. This helps address the fourth business problem we reviewed earlier.

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



- 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.
- Enter a name for your group
- Select if you want the group to be private or public. We recommend using private.
- Enter the email addresses of users of your organization who need to be part of this group as shown in the figure.
- Click Add to add the members.
- Finally you will see "Create" enabled at the top. Click on Create.
- You will now have a group created.

The screenshot illustrates the steps to create a new group in a Power BI workspace. On the left, the workspace sidebar shows 'GROUP WORKSPACES' with a '+'. The main area displays a dashboard with current year revenue (\$63.82M) and units sold (68.07K). On the right, a 'Create a Group' dialog box is open, prompting for a group name ('DADJuly'), group ID ('dadjuly'), and privacy settings ('Private - Only approved members can see what's inside'). The 'Add group members' field contains the email address 'svan@microsoft.com', which is highlighted with a red box. The 'Add' button at the bottom right is also highlighted with a red box.

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.

The screenshot shows the Power BI service interface. On the left, there's a sidebar with navigation options like 'My Workspaces' and 'Power BI Training'. A red box highlights the 'DIADJuly' workspace under 'GROUP WORKSPACES'. The main content area is titled 'Welcome to the DIADJuly group' with a sub-instruction 'Let's start by getting some data.' Below this, there are sections for 'Content Pack Library' (with 'My Organization', 'Services', 'Files', and 'Databases' options), 'Import or Connect to Data', and a 'Samples' section. At the bottom left is a 'Get Data' button.

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.

The screenshot shows the Office 365 Groups interface. On the left, there's a sidebar with 'Groups' selected, showing 'Power BI Training' and 'Power BI Customer S...' under 'Create Group'. A red box highlights 'Power BI Training'. The main content area shows the 'DIADJuly' group workspace with options like 'Members', 'Calendar', 'Conversations', 'Files', 'Edit Group', and 'Leave Group'. A red box highlights the three dots menu icon next to the group name.

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 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
Purpose	Adhoc sharing	Collaboration	Broader content delivery
Discovery	Invitation email	Group space	Content Gallery in Get Data
Target Audience	Individuals (Typically people that you work with and needs this content)	O365 Groups (Typically teams/collaborators that you work with closely for a common purpose/project)	All/Groups/Individuals (Anyone who might be interested in this content)
Permission	Primarily read	Primarily edit	Primarily edit their own copy
License	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.

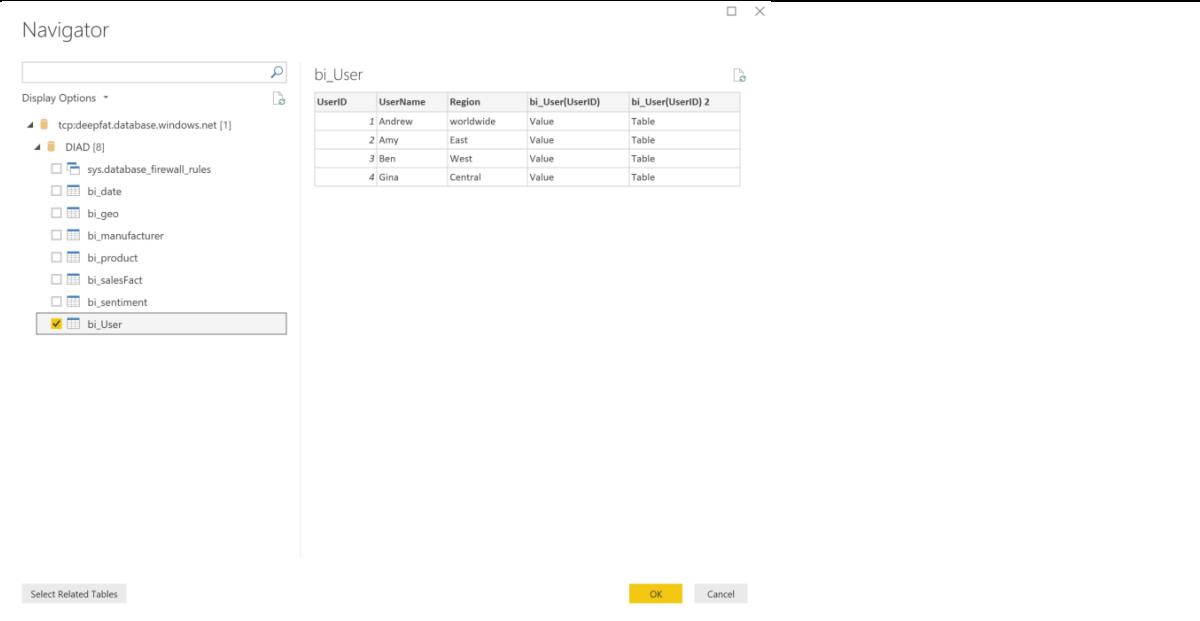
You installed the Power BI mobile app in the pre-requisite section. We recommend you to try out the Power BI mobile application after the features get to <http://msit.powerbi.com>

User Roles in Power BI

Van Arsdel organises its sales team by territory and there is a table in Azure SQL bi_user that has the data describing who is responsible for each territory. We need to load this in and then configure Power BI to only allow a territory manger to see their own territory.

Go to edit queries and load in the bi_user table

1. Go to Recent Sources and select the database again. If the database isn't listed go to Edit queries and right click on the . Other queries folder and select new query. Connect to the SQL Database again (tcp:deepfat.database.windows.net)
2. Expand the DIAD database and check on bi_User.
3. Click OK to load the data.
4. Rename the query to be User.
5. Click Close & Apply to return to Power BI



6. Check the relationship between Geography and User and make sure it is as shown

Edit relationship

Select tables and columns that are related.

Geography

Zip	City	State	Region	District	Country	ZipCountry
71276	null	Oaxaca	worldwide	San Pablo Cuatro Venados	Mexico	71276,Mexico
68258	null	Oaxaca	worldwide	San Pablo Etla	Mexico	68258,Mexico
68259	null	Oaxaca	worldwide	San Pablo Etla	Mexico	68259,Mexico

User

UserID	UserName	Region
1	Andrew	worldwide
2	Amy	East
3	Ben	West

Cardinality

Many to one (*:1)

Cross filter direction

Single

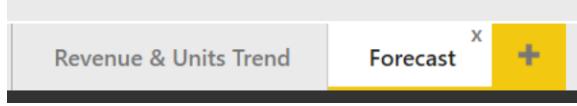
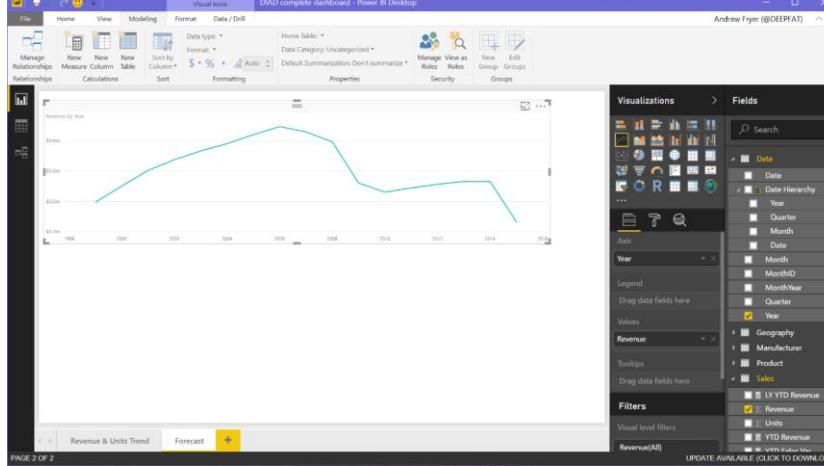
Make this relationship active

Assume referential integrity

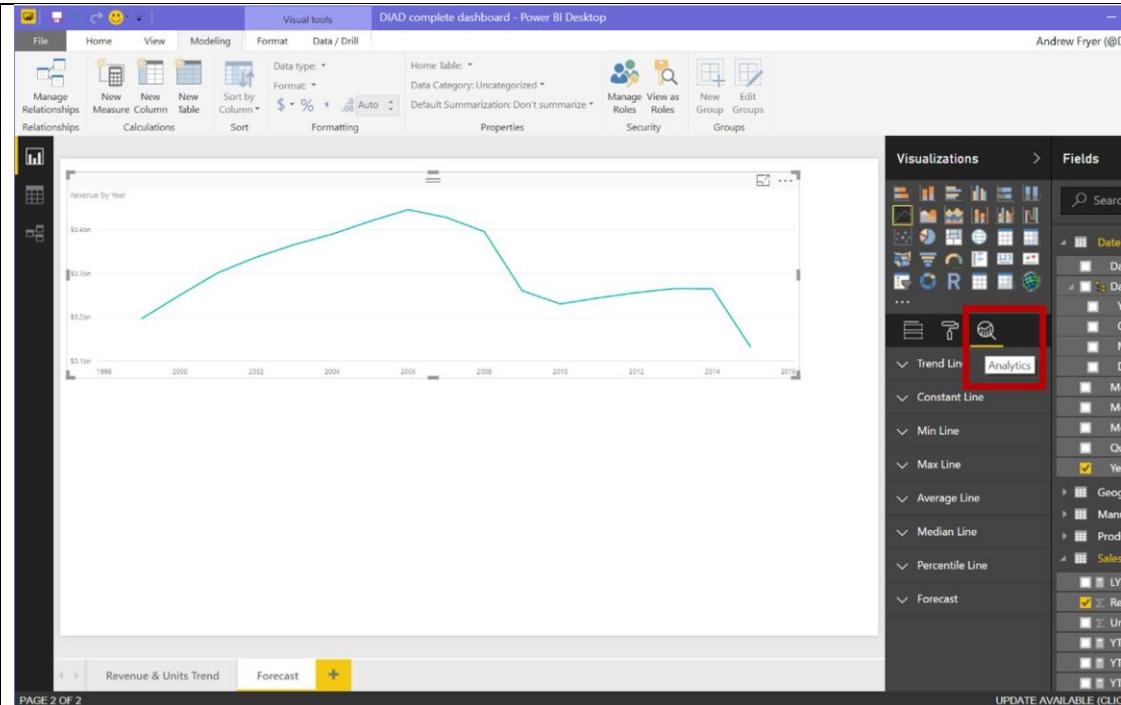
OK Cancel

Advanced Analytics in Power BI

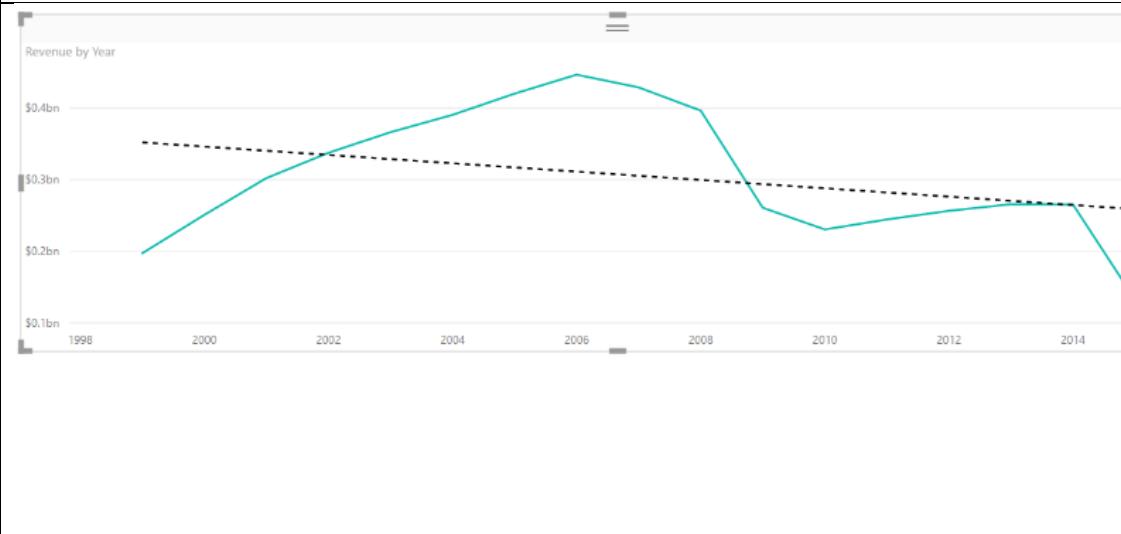
Power BI has a set of overlays that can be added to charts which can add further information to our visuals to make them more useful. These advanced analytics vary by chart type and in this exercise, we'll look at forecasting which is only available for the **line chart**. It is also possible to add any chart using the R language which is an open source language specifically designed for data science.

<ol style="list-style-type: none">1. Create a new page by clicking on the + tab at the bottom of the tab. Rename the page to Forecasting	
<ol style="list-style-type: none">2. Drag a line chart on to the screen.3. Use Revenue as the measure and Years as the Axis.4. Resize the chart across the top of the page	

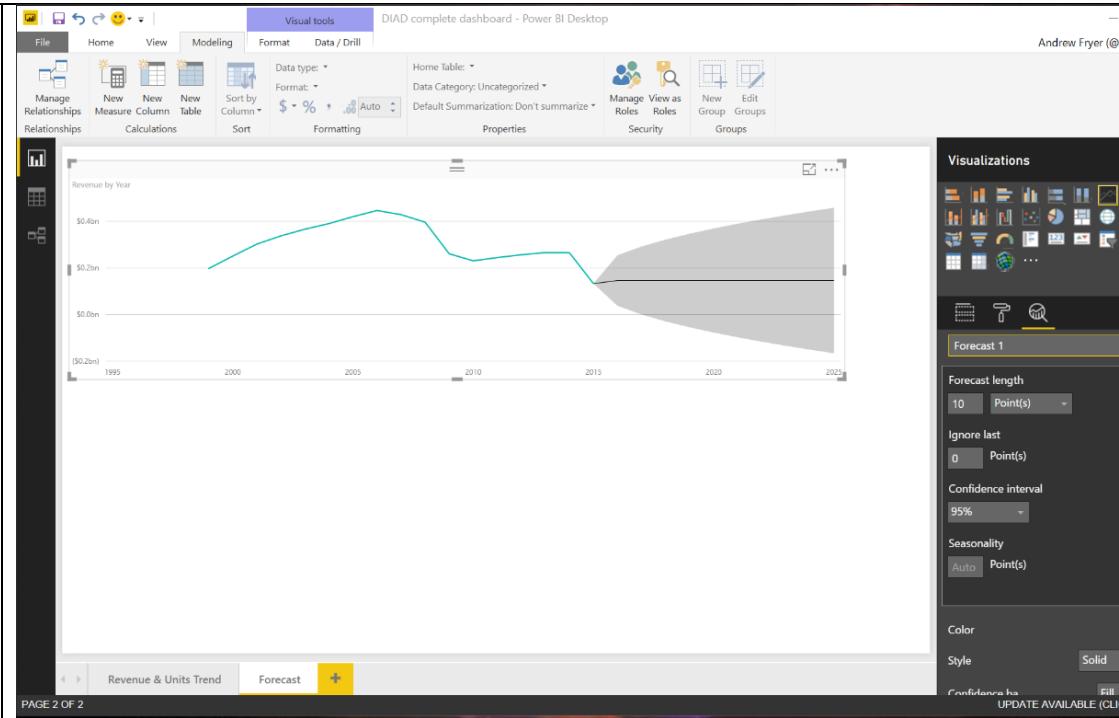
5. Notice that the advanced analytics icon appears underneath visualisation in the Visualisations toolbar when we have focus on the line chart.



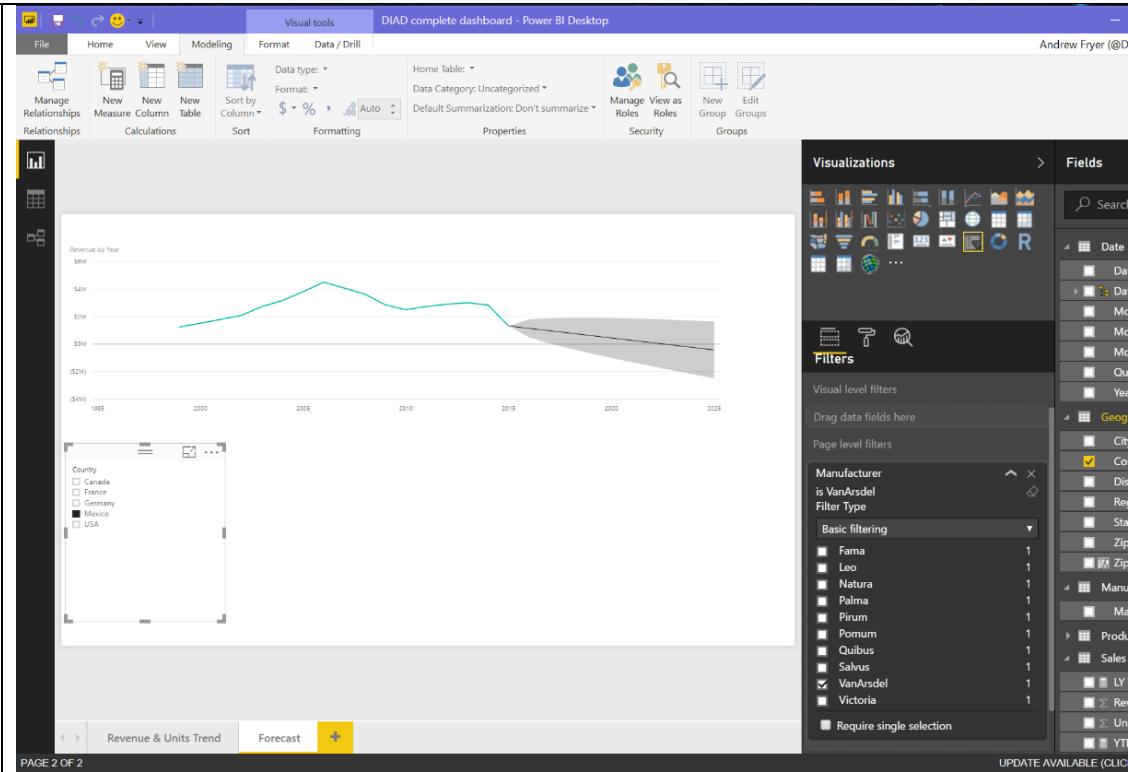
6. Click on this icon to see what is available. Expand the trend line, and click Add. This Looks at all the values and just shows a best fit straight line of the existing points (aka linear regression)



7. This is not really a forecast but there is also an option for this. Delete the Trend Line by clicking on the X to the right of it. Collapse the Trend Line options (click on the up arrow) and expand Forecast.
 8. Create a new Forecast with the defaults as set. Notice the grey shaded area which shows how the forecast might vary given the confidence level specified – in this case 95%.
 9. We can also change the length of the forecast and ignore the last few points. Also there is a seasonality option which is greyed out



10. If you have time set the page level filter to Van Arsdel and a add a slicer for countries. Now we can see the forecast just for Mexico

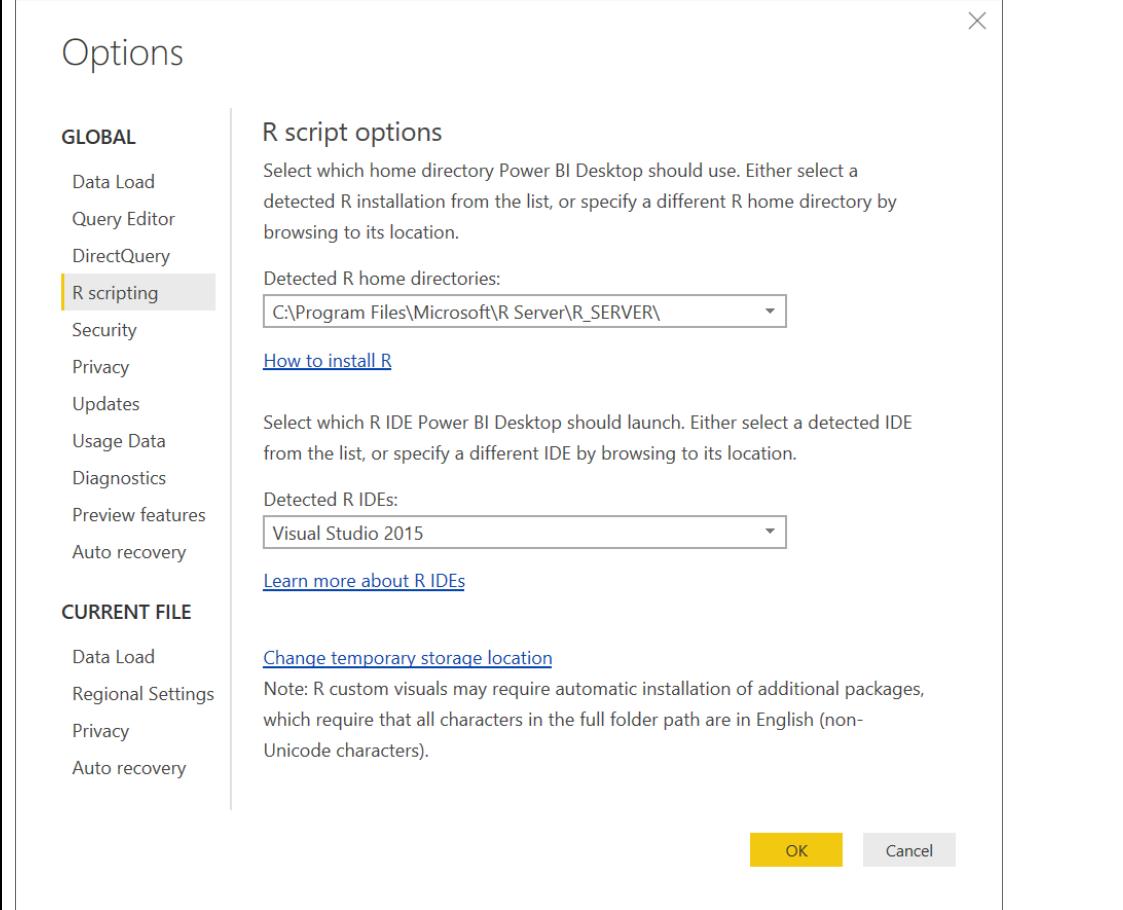


Using R in Power BI

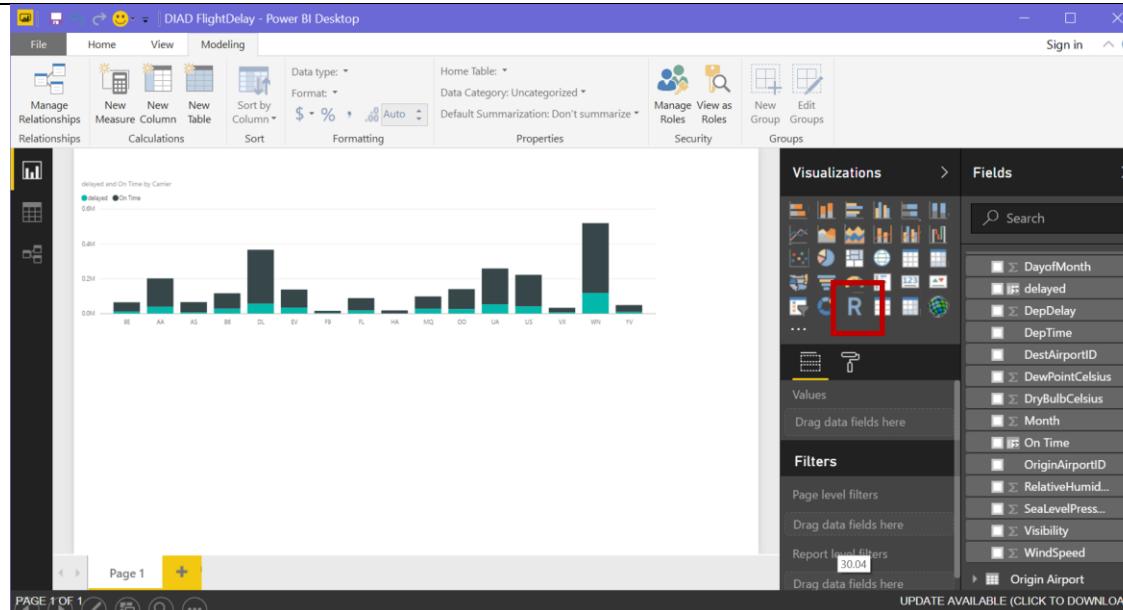
R is a powerful opensource language specifically designed for data science. As well as having advanced statistical and modelling functions, R is also widely used for visualising data. R Visualisations are built into Power BI and in his short lab we'll explore how to do a simple plot in R and show that in Power BI alongside other visuals.

First we need to see how R is setup in Power BI.

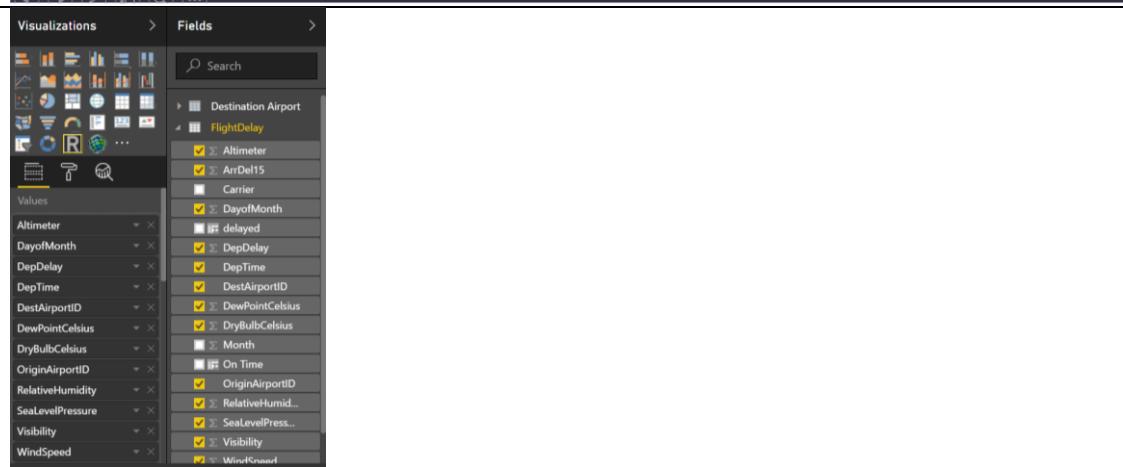
1. From the ribbon in Power BI go to File -> Options and Settings -> Options.
2. Select the R scripting option.
3. Here we can choose where to store the various packages R uses and set our preferred R development environment to use alongside Power BI. Make sure this is set to Visual Studio 2015 and that the R home directory is set as shown.



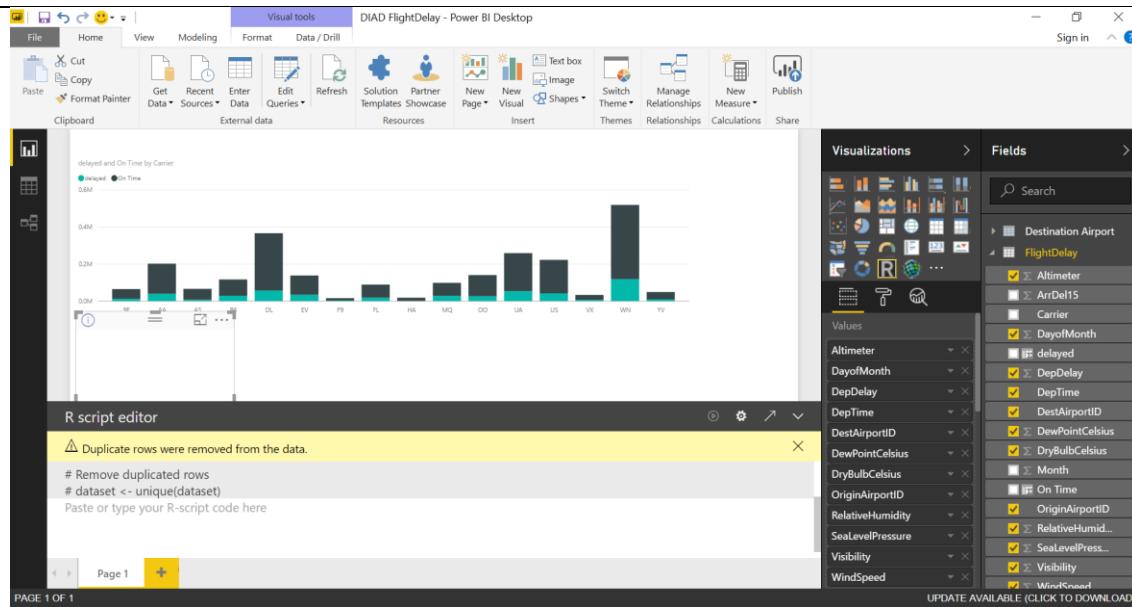
4. Open the DIAD Flight Delay Power Pivot from the reports folder in the Git repo you have downloaded.
5. Review the data model and fields
6. Create a new R visual on the report page by selecting the R visualisation.
7. You'll get a warning dialog asking you to enable scripting visuals. Click Enable to close this



8. You will now see a scripting pane fill the bottom half of the design surface asking to drag fields on to the values area in the visualisations pane to start scripting. Drag the following fields from the flight delay table on to the R visual.



9. Notice how the scripting window has changed Power BI has created an R dataframe (the R equivalent of a table) for us to work with and that this code is not editable.



10. We are going to look at how the data in the fields relates to each other using a correlation plot. However this visualisation is not built into R it is in its own package corrplot. We can check that the library is present and then produce the plot with the code on the right.

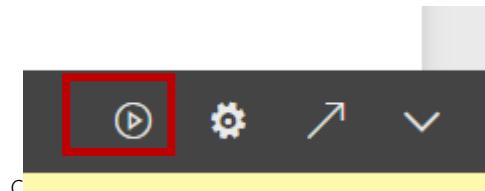
Note the use of <- to assign values to variables and the parameters in the corrplot function to set sizes and colours.

11. Click on the run icon on the R toolbar to run the script

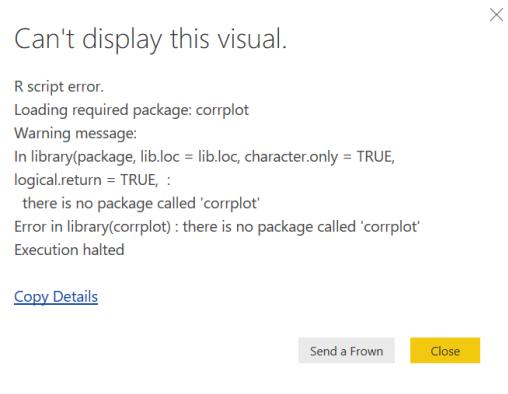
```

require("corrplot")
library(corrplot)
M <- cor(dataset)
corrplot(M, method = "color", tl.cex=0.6, tl.srt = 45, tl.col = "black")

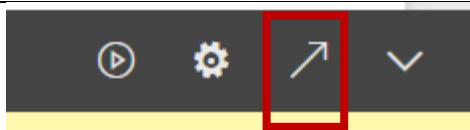
```



However this code won't work and we'll see an error on the visual and if we click on this we can see this is because we have not installed the Corrplot from CRAN, the open repository of R functions) in our R environment. Also this cannot be done in Power BI but we can launch Visual Studio (our selected designer for R) and do this from there.



11. Launch Visual studio rom Power BI by clicking on the arrow icon on the toolbar. This will take a few minutes and you'll need to sign into Visual Studio Community edition with the microsoft account you used to start your Azure trial.



Notice that our code and a snapshot of our data appears so we can actually test our script works from here. However before we can do that we need to install the corrplot packages

12. Type this into the interactive window at the bottom of Visual Studio

Install.packages("corrplot")

You should then see this successfully run as shown.

```
REditorWrapper.R - Microsoft Visual Studio (Administrator)
File Edit View Project Debug Team Tools Test R Tools Analyze Window Help
REditorWrapper.R <--> Tabular Model Explorer
REditorWrapper.R <--> R Interactive - Microsoft R Server (3.3.3.0)

# Input load. Please do not change #
`dataset` = read.csv('C:/Users/deepfat/AppData/Local/Radio/REditorWrapper_af4f2315-1985-43b6-8525...
# Original Script. Please update your script content here and once completed copy below section to clipboard
require("corrplot")
library(corrplot)
M <- cor(dataset)
corrplot(M, method = "color", tl.cex=0.6, tl.srt = 45, tl.col = "black")

R Interactive - Microsoft R Server (3.3.3.0)
> install.packages("corrplot")
trying URL 'https://mran.microsoft.com/snapshot/2017-03-15/bin/windows/contrib/3.3/corrplot_0.77.zip'
Content type 'application/zip'
length 3019847 bytes (2.9 MB)
downloaded 2.9 MB
package 'corrplot' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
  C:\Users\deepfat\AppData\Local\Temp\2\Rtmpm4lRlp\downloaded_packages
>
```

13. We can now test our code by highlighting it and selecting run in interactive.

The screenshot shows the Microsoft Visual Studio interface with the R EditorWrapper.R file open. The R Interactive window below shows the R code used to generate the correlation matrix:

```

# Input load. Please do not change #
`dataset` = read.csv('C:/Users/deepfat/AppData/Local/Radio/REditorWrapper_af4f2315-1'
# Original Script. Please update your script content here and once completed copy below
require("corrplot")
library(corrplot)
M <- cor(dataset)
corrplot(M, method = "color", tl.cex=0.6, tl.srt = 45, tl.col = "black")

```

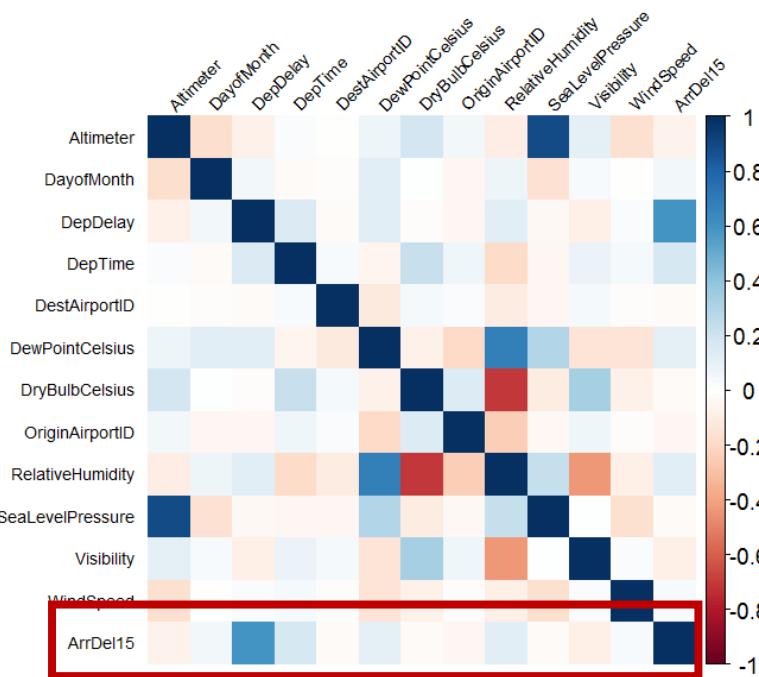
The R Plot window displays a correlation matrix heatmap. The variables listed on the axes are: Altimeter, DayofMonth, DepDelay, DepTime, DestAirportID, DewPointCelsius, DryBulbCelsius, OriginAirportID, RelativeHumidity, SeaLevelPressure, Visibility, and WindSpeed. A color scale bar on the right indicates correlation values from -1 (dark blue) to 1 (dark red).

Having tested our code we can now switch back to Power BI and rerun the code.

14. Click on the R run button again and you should now get the same visual in Power BI.

Note your visual might look a bit different depending on which order you dragged the files on to the R visual.

What this plot shows is how each variable relates to each other variable. If we are looking for what affects delayed flights (ArrDel15) we can see the most significant factor is DepDelay – how much the flight was delayed on departure.



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. Also if the score is a percentage we'll want to create measures that respect this.

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? For extra credit how would the M scripts you have so far need to be modified?

Competitive Analysis

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

Manufacturer Competitive Analysis.csv	<table border="1"><thead><tr><th>CompetitiveAnalysisID</th><th>CompetitiveAnalysis</th><th>SortOrderID</th></tr></thead><tbody><tr><td>1</td><td>Acquisition Target</td><td>1</td></tr><tr><td>2</td><td>Merger Target</td><td>2</td></tr><tr><td>3</td><td>PLC</td><td>4</td></tr><tr><td>4</td><td>LLP</td><td>5</td></tr><tr><td>5</td><td>Privately Owned</td><td>6</td></tr><tr><td>6</td><td>Takover Threat</td><td>3</td></tr><tr><td>7</td><td>Market Leader</td><td>7</td></tr><tr><td>8</td><td>Challenger</td><td>8</td></tr><tr><td>9</td><td>In Decline</td><td>9</td></tr></tbody></table>	CompetitiveAnalysisID	CompetitiveAnalysis	SortOrderID	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
CompetitiveAnalysisID	CompetitiveAnalysis	SortOrderID																													
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	<table border="1"><thead><tr><th>ManufacturerID</th><th>CompetitiveAnalysisID</th></tr></thead><tbody><tr><td>1</td><td>8</td></tr><tr><td>2</td><td>7</td></tr><tr><td>3</td><td>8</td></tr><tr><td>4</td><td>7</td></tr><tr><td>5</td><td>9</td></tr><tr><td>6</td><td>8</td></tr><tr><td>8</td><td>7</td></tr><tr><td>9</td><td>8</td></tr><tr><td>10</td><td>7</td></tr></tbody></table>	ManufacturerID	CompetitiveAnalysisID	1	8	2	7	3	8	4	7	5	9	6	8	8	7	9	8	10	7										
ManufacturerID	CompetitiveAnalysisID																														
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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?