Dashboard in a Day

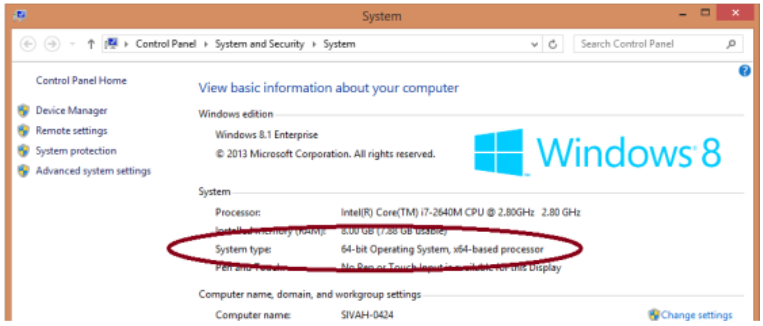
by Power BI Team, Microsoft

Contents

Lab Prerequisites

Following prerequisites and setup must be complete for successful completion of the exercise:

- You must be connected to the internet.
- **Signup for Power BI:** Go to http://aka.ms/pbidiadtraining and sign up for Power BI with a business email address. If you cannot sign up for Power BI, let the instructor know.
- If you have an existing account, please go to http://app.powerbi.com and **Sign in** using your **Power BI Account.**
- At minimum, a computer with 2-cores and 4GB RAM running one of the following version of Windows: Windows 10, Windows 7, Windows 8 (64-bit preferred), Windows 8.1, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2.
- Microsoft Power BI Desktop requires Internet Explorer 9 or greater.
- Verify if you have 32-bit or 64-bit operating system to decide if you need to install the 32-bit or 64-bit applications.
    - Search for computer on your PC, right click properties for your computer.
    - You will be able to identify if your operating system is 64 or 32 bit based on "system type" as shown below.



- **Download the Power BI Content:** Create a folder called **DIAD** on the C drive of your local machine. Copy all contents from the folder called **Dashboard in a Day Assets** on the flash drive to the **DIAD** folder you just created (C:\DIAD).
- **Download and install Power BI Desktop** using any one of the options listed below:
    - If you have Windows 10, use Microsoft App Store to download and install Power BI Desktop app.
    - Download and install Microsoft Power BI Desktop from http://www.microsoft.com/en-us/download/details.aspx?id=45331.

Document Structure

This document has two main sections:

- **Power BI Desktop**: This section highlights the features available in Power BI Desktop and walks the user through the process of bringing in data from the data source, modeling and creating visualizations.
- **Power BI Service**: This section highlights the features available in Power BI Service including the ability to publish the Power BI Desktop model to the web, creating and sharing dashboard and Power Q & A.

The document flow is in a table format. On the left panel are steps the user needs to follow and in the right panel are screenshots to provide a visual aid for the users. In the screenshots, sections are highlighted with red boxes to highlight the action/area user needs to focus on.

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.

Overview

Introduction

Today you will be learning various key features of the Power BI service. This is an introductory course intended to learn how to author reports using Power BI Desktop, create operational dashboards and share content via the Power BI Service.

Data Set

The dataset you will you 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 retail 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.

Workshop Outline

1. Power BI Desktop
2. Power BI Service
3. Bring your own data to build a dashboard
4. Q&A

Power BI Desktop

Power BI Desktop - Accessing Data

In this section, you will import VanArsdel and its competitors USA sales data. Then you import and merging sales data from other countries.

Power BI Desktop - Get Data

Let's start with looking at the data files. The dataset contains sales data of VanArsdel and other competitors. We have 7 years of transaction data by day, product and zip code for each manufacturer. We are going to analyze data from 7 countries.

USA sales data is in a csv file located in /Data/USSales folder.

Sales of all other countries is in /Data/InternationalSales folder. Each country's sales data is in a csv file in this folder.

Product, Geography and Manufacturer information is in an excel file in /Data/USSales/bi_dimensions.xlsx.

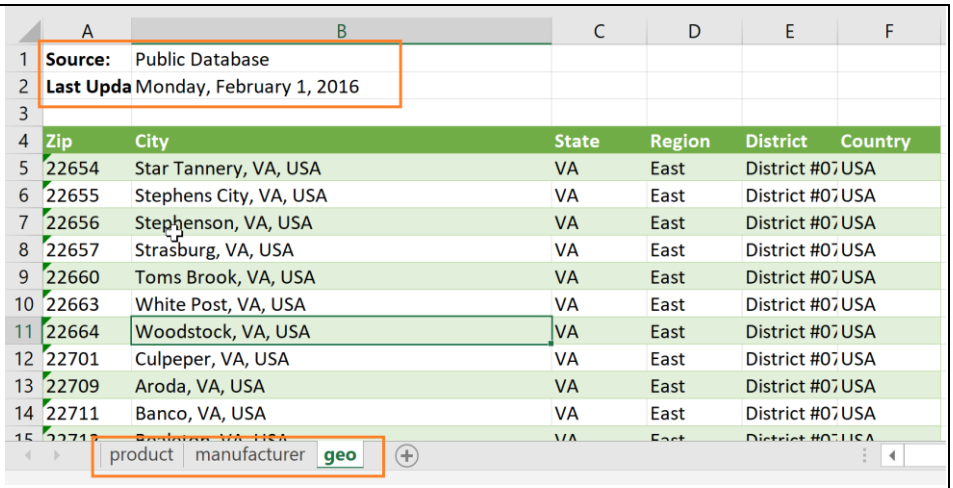
1. Open **/Data/USSales/bi_dimensions.xlsx.**

Notice the first sheet has **Product** information. The sheet has a header and product data is in a named table. Also notice Category column has a bunch of empty cells.

Manufacturer sheet has data laid out across the sheet and with no column headers and it has a couple of blank rows and a note in row 7.

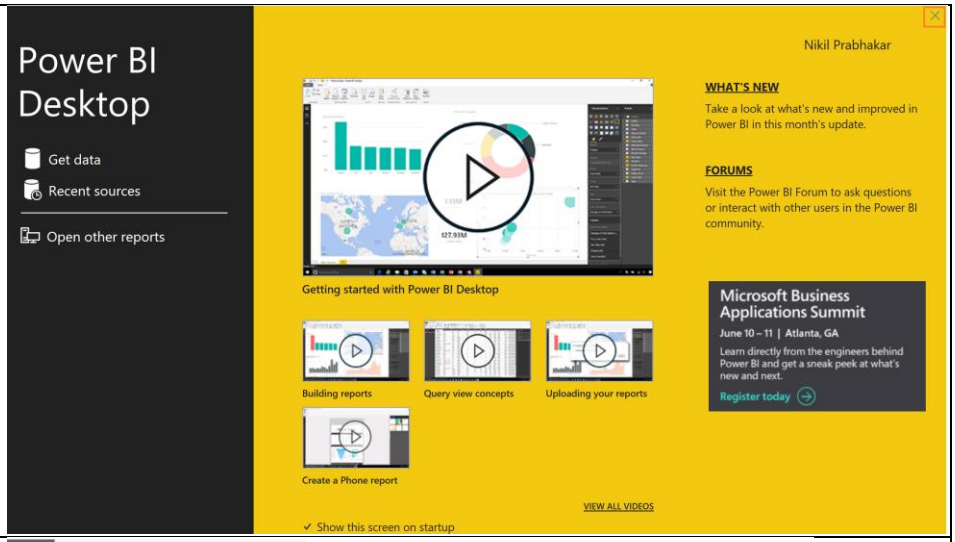
Geo sheet has geography information. The first couple of rows has data details. Actual data starts from row 4.

We will start by connecting to data from these different files and perform data cleaning and transformation operations.



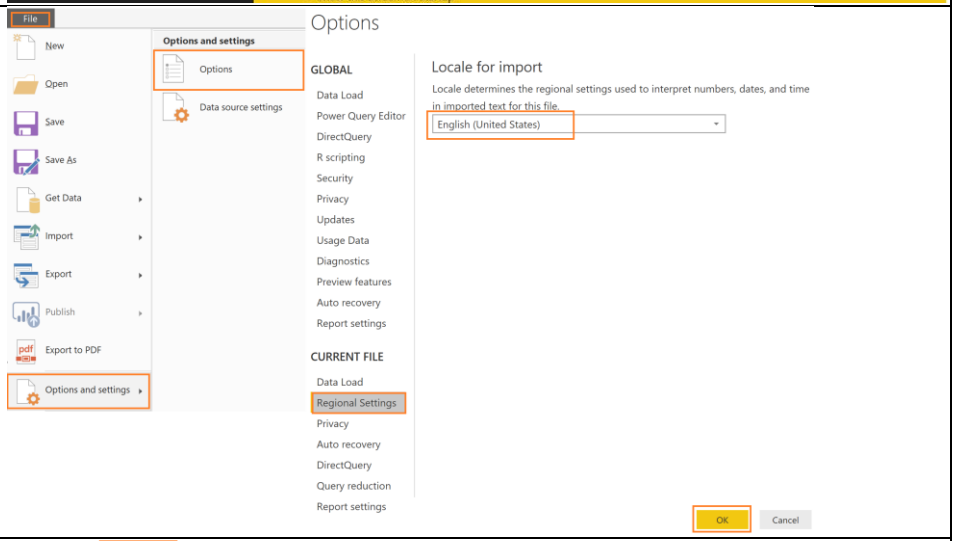
	A	B	C	D	E	F
1	**Source:**	Public Database				
2	**Last Upda**	Monday, February 1, 2016				
3						
4	**Zip**	**City**	**State**	**Region**	**District**	**Country**
5	22654	Star Tannery, VA, USA	VA	East	District #07	USA
6	22655	Stephens City, VA, USA	VA	East	District #07	USA
7	22656	Stephenson, VA, USA	VA	East	District #07	USA
8	22657	Strasburg, VA, USA	VA	East	District #07	USA
9	22660	Toms Brook, VA, USA	VA	East	District #07	USA
10	22663	White Post, VA, USA	VA	East	District #07	USA
11	22664	Woodstock, VA, USA	VA	East	District #07	USA
12	22701	Culpeper, VA, USA	VA	East	District #07	USA
13	22709	Aroda, VA, USA	VA	East	District #07	USA
14	22711	Banco, VA, USA	VA	East	District #07	USA

2. If you don't have the **Power BI Desktop** open, launch it now.
3. Select **Already have a Power BI Account? Sign in** option.
4. **Sign in** using your Power BI credentials.
5. Startup screen opens. Click on **X** on the top right corner of the dialog to close it.



Let's set up the locale to US English, to make it convenient to go through the rest of this lab.

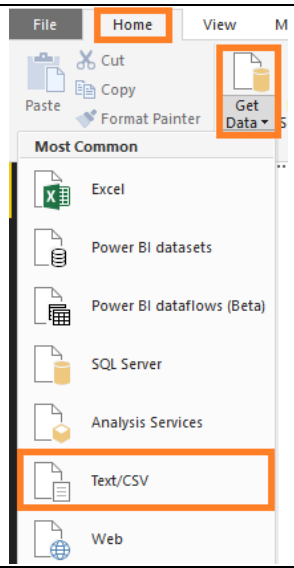
6. From the ribbon, select **File -> Options and settings -> Options**.
7. In the left panel of Options dialog, select **Regional Settings**.
8. From the **Locale** drop down select **English (United States).**
9. Select **OK** to close the dialog.



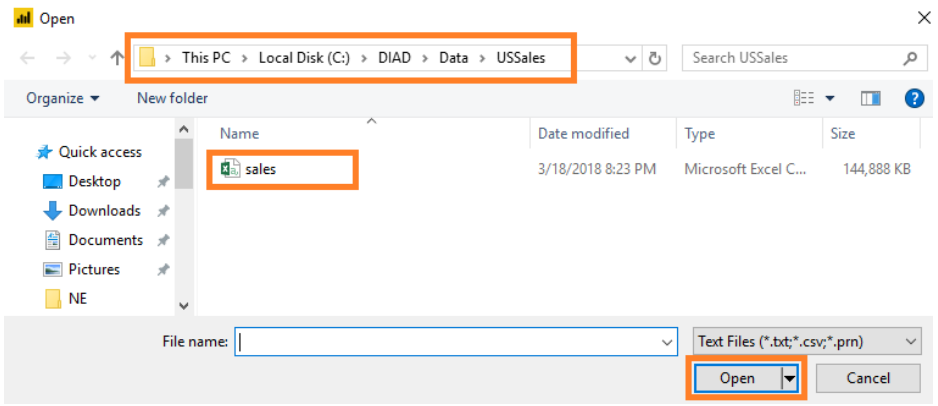
First step is to load data to Power BI Desktop. We will load USA Sales data which is in comma separated value (CSV) files.

10. From the ribbon, select **Home -> Get Data.**
11. Select **Text/CSV.**

Note: Power BI Desktop has the capability to connect to 70+ data sources. We are using csv and excel data files in this lab for simplicity.



12. Browse to **DIAD\Data\USSales** folder and select **sales.csv.**
13. Click **Open**.

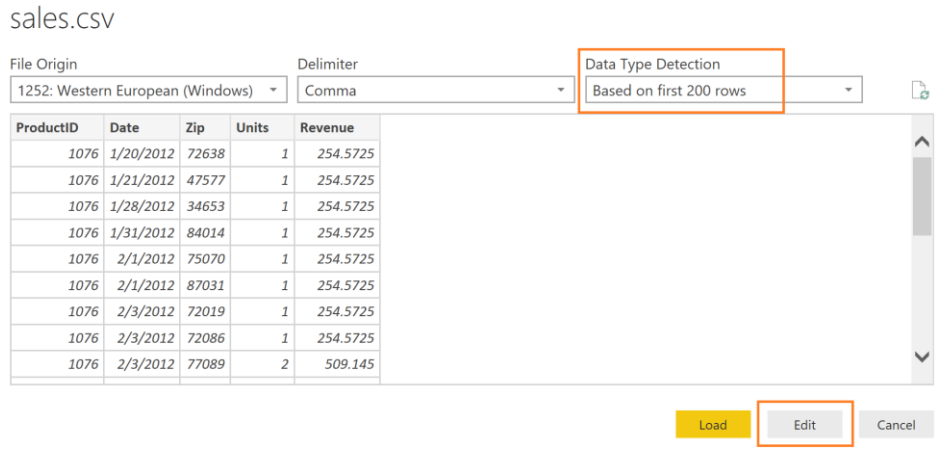


Power BI detects the data type of each column. There are options to detect the data type based on the first 200 rows or based on the entire dataset or not detect it. Since our dataset is large and it will take time and resources to scan the complete data set, let's leave the default option of selecting dataset based on the first 200 rows.

After completing your selection, you have three options – Load, Edit or Cancel.

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

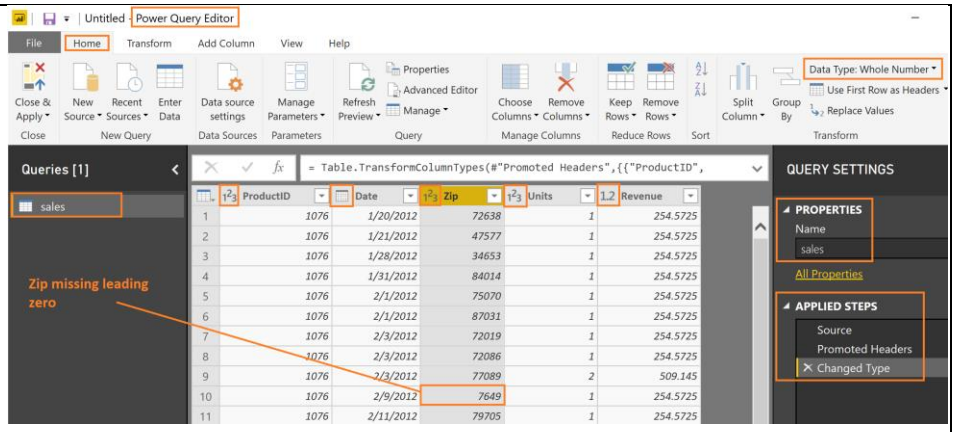
14. Click **Edit** as shown in the screenshot. A new window opens.

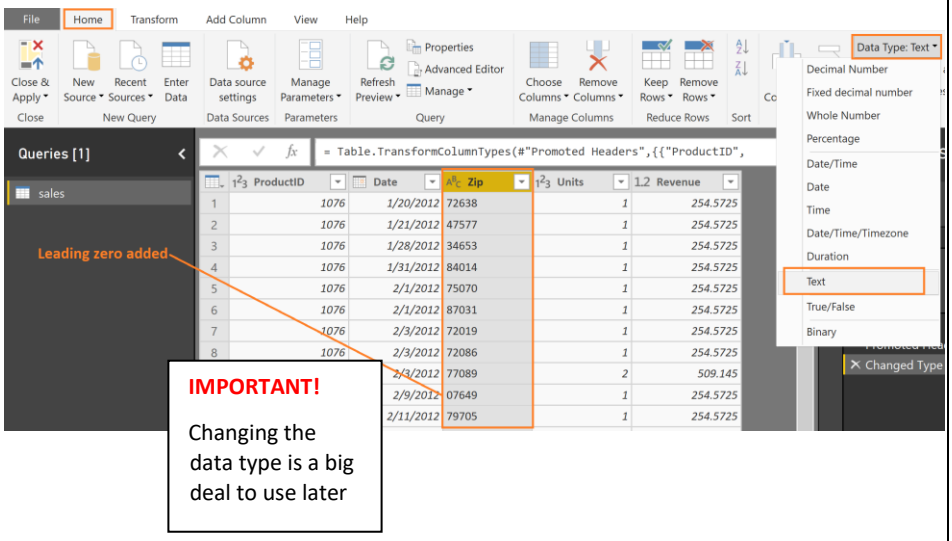


You should be in the Query Editor window as shown in the screenshot to the right. Query Editor is used to perform data shaping operations. Notice the sales file you connected to shows as a query in the left panel. You see a preview of the data in the center panel. Power BI predicts data type of each field (based on the first 200 rows) which is indicated next to the column header. In the right panel, steps that Query Editor performs are recorded.

Note: You will be bringing in sales data from other countries as well as performing certain data shaping operations.

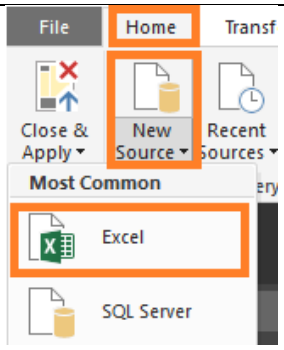
15. Notice Power BI has set Zip field to data type Whole Number. To ensure that Zip codes which start with zero don't lose the leading zero, we will format them as text. Highlight the **Zip column**. From the ribbon, select **Home -> Data Type** and update it to **Text**.
16. **Change Column Type** dialog opens. Select **Replace Current** button which overwrites Power BI's predicted datatype.





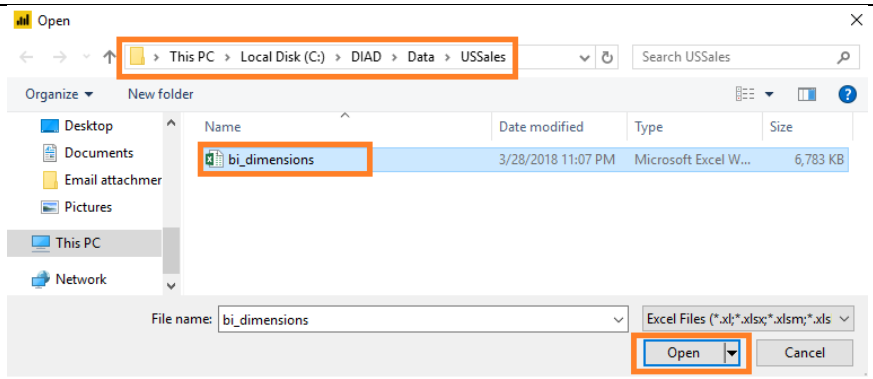
Now let's get the data that is in excel source file.

17. From the ribbon, select **Home -> New Source -> Excel.**



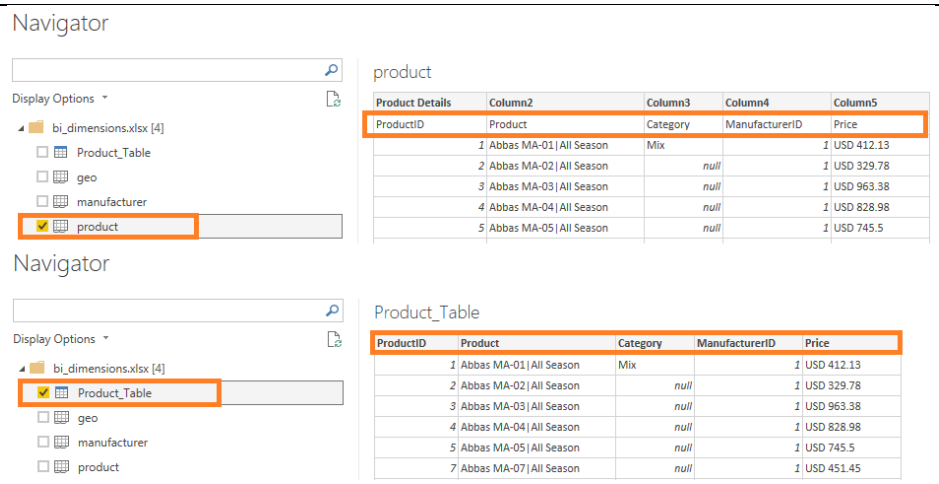
18. Browse to **DIAD\Data\USSales** folder and select **bi_dimensions.xlsx**.

Navigator dialog opens.



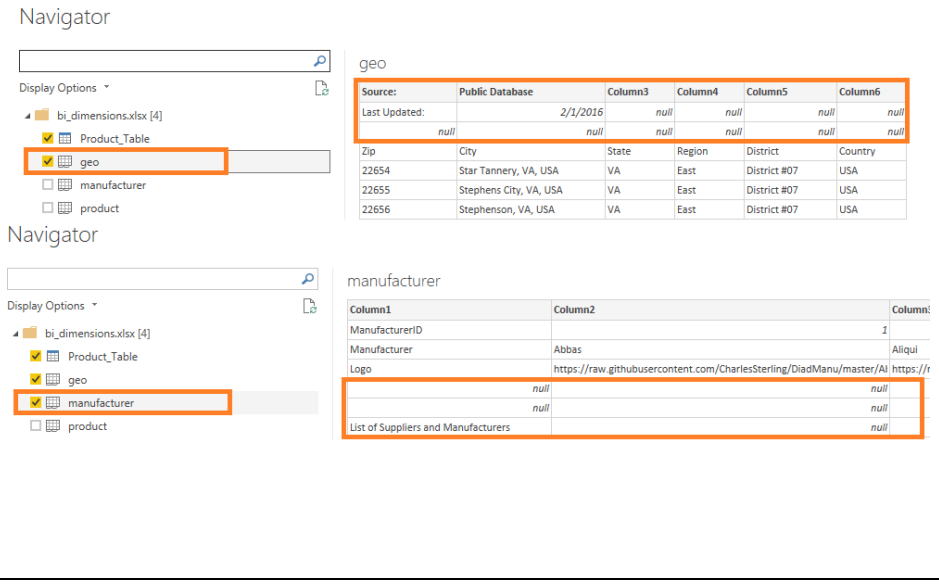
19. Navigator dialog lists 3 sheets that are in the excel workbook. It also lists the Product named table. **Select product** from the left panel and in preview panel notice the first row is the header. This is not part of the data.
20. **Unselect product** from the left panel. **Select Product_Table**. Notice this has only the contents of the named table. This is the data we need.

Note: Table names are differentiated from Worksheet names by using different icons.



21. From the left panel, **select geo**. In the preview panel notice the first couple of rows are headers that are not part of the data. We will remove them shortly.
22. From the left panel, **select manufacturer**. In the preview panel notice the last couple of rows are footers that are not part of the data. We will remove them shortly.
23. Select **OK**. (Make sure Product_Table, geo and manufacturer are selected in the left panel)

Notice all 3 sheets are added as queries in the Query Editor.



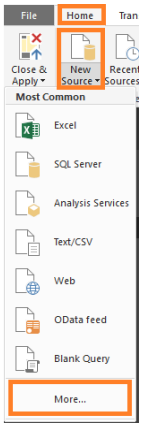
Power BI Desktop - Adding additional data

International subsidiaries have agreed to provide their sales data so that the company's sales can be analyzed together. You've created a folder where they will each put their data.

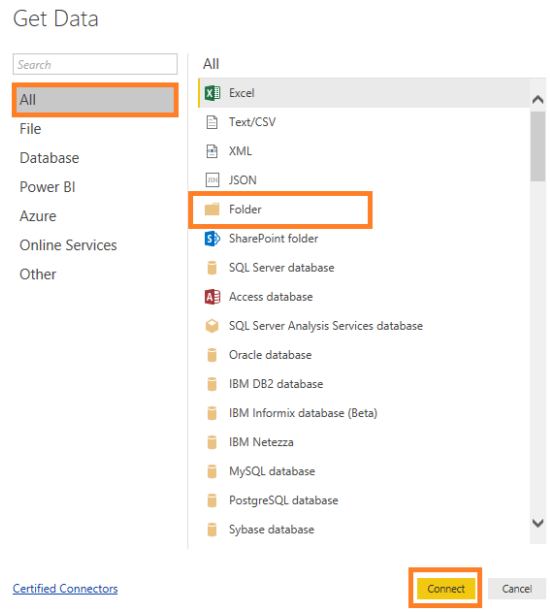
To analyze all the data together you will want to import the new data from each of the subsidiaries and combine it with the US Sales you loaded earlier.

24. Click on the **New Source** drop down in the Home menu tab of the Query Editor.
25. Select **More…** as shown in the figure.

Get Data dialog opens.



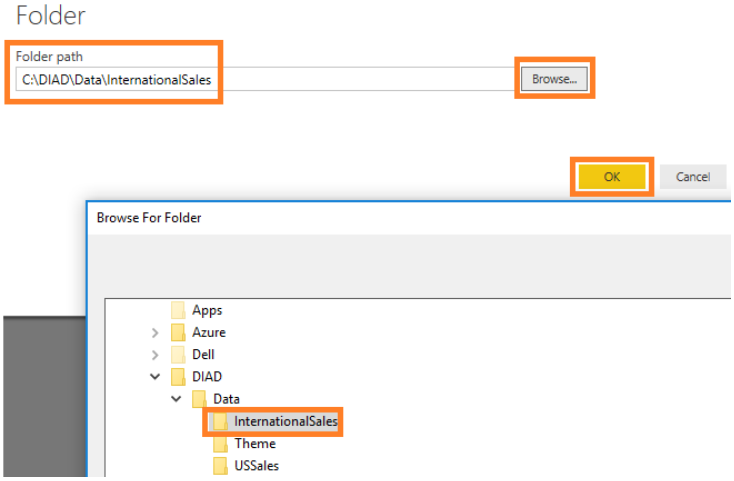
26. In the Get Data dialog select **Folder** as shown in the diagram.
27. Click **Connect**.

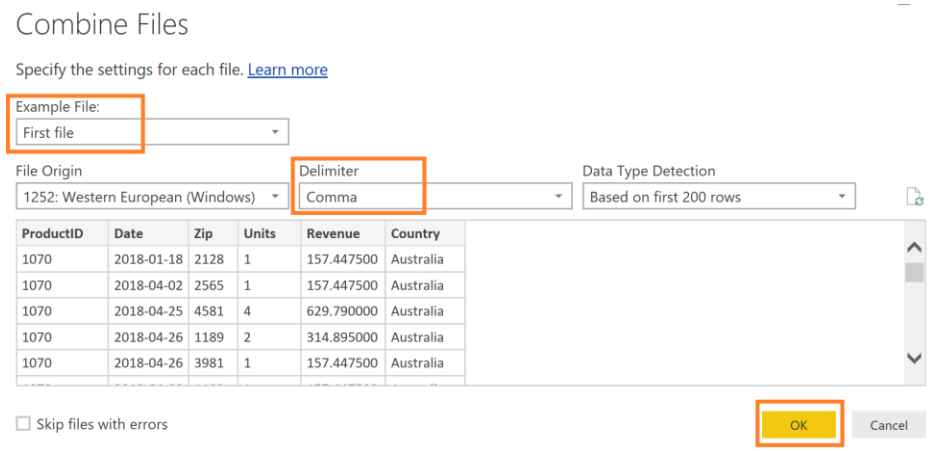
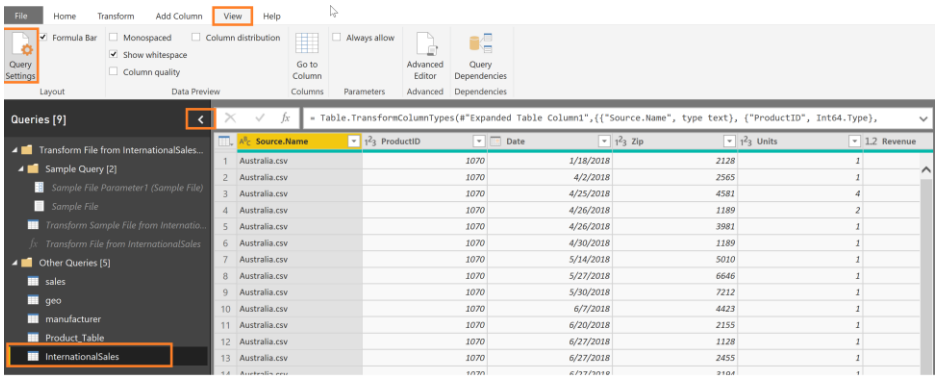


Folder dialog opens.

28. Click **Browse…** button.
29. In the **Browse for Folder** dialog navigate to the location where you unzipped the class files.
30. Open the **DIAD** folder.
31. Open the **Data** folder.
32. Select the **InternationalSales** folder.
33. Click **OK** (to close the Browse for Folder dialog box).
34. Click **OK** (to close the Folder dialog box).

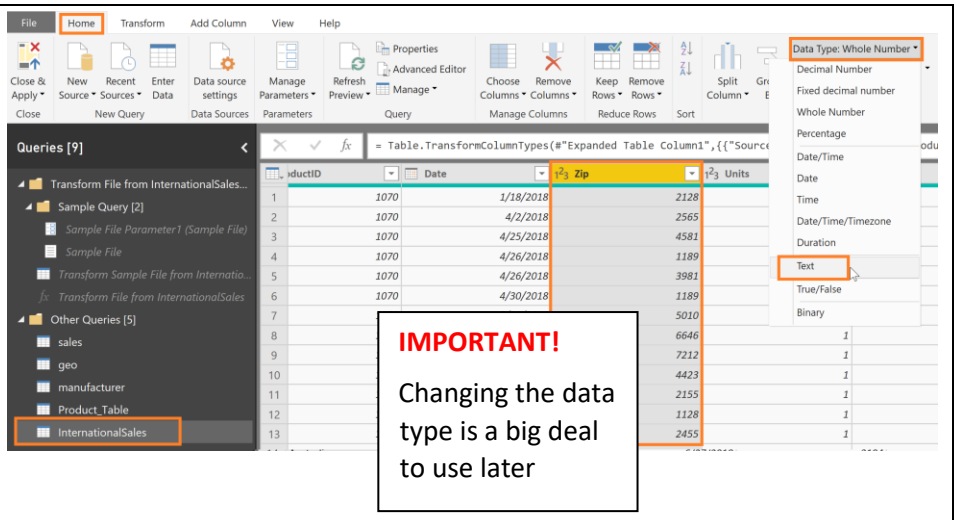
Note: This approach uses folders instead of individual files. This will load all files in the folder. This is useful when you have a group that puts files on an ftp site each



month and you are not always sure of the names of the files or the number of files. All the files must be of the same file type with columns in the same order.	
Dialog displays the list of files in the folder. 35. Since we want to combine data, click **Combine & Edit**. **Note**: Date accessed, Date modified and Date created might be different compared to the dates displayed in the screenshot.	C:\Users\cort\Dropbox\obviEnce\201902\Data\InternationalSales Content | Name | Extension | Date accessed | Date modified | Date created | Attributes | Folder Path Binary | Australia.csv | .csv | 2/6/2019 8:55:48 AM | 2/8/2019 8:57:28 AM | 2/6/2019 8:55:48 AM | Record | C:\Users\cort\Dropbox\obviEnce\2 Binary | Canada.csv | .csv | 2/6/2019 8:58:08 AM | 2/8/2019 8:57:29 AM | 2/6/2019 8:58:08 AM | Record | C:\Users\cort\Dropbox\obviEnce\2 Binary | Germany.csv | .csv | 2/6/2019 9:00:16 AM | 2/8/2019 8:57:30 AM | 2/6/2019 9:00:16 AM | Record | C:\Users\cort\Dropbox\obviEnce\2 Binary | Japan.csv | .csv | 2/6/2019 10:38:12 PM | 2/8/2019 8:57:31 AM | 2/6/2019 10:38:12 PM | Record | C:\Users\cort\Dropbox\obviEnce\2 Binary | Mexico.csv | .csv | 2/6/2019 10:40:30 PM | 2/8/2019 8:57:32 AM | 2/6/2019 10:40:30 PM | Record | C:\Users\cort\Dropbox\obviEnce\2 Binary | Nigeria.csv | .csv | 2/6/2019 10:42:48 PM | 2/8/2019 8:57:33 AM | 2/6/2019 10:42:48 PM | Record | C:\Users\cort\Dropbox\obviEnce\2
Combine Files dialog opens. By default, Power BI again detects the data type based on the first 200 rows. Notice there is an option to select various file Delimiters. The file we are working with is Comma delimited, so let's leave Delimiter option as Comma. There is also an option to select each individual file in the folder (using Example File dropdown) to validate the format of the files. 36. Select **OK**.	
You will be in the **Query Editor** window with a new query called **InternationalSales**. 37. If you do not see the **Queries** pane on left, click on the **>** icon to expand. 38. If you do not see the Query Settings pane on the right as shown in the figure, click on **View** in the ribbon and click **Query Settings** to see the pane. 39. Click on the Query **InternationalSales**.	

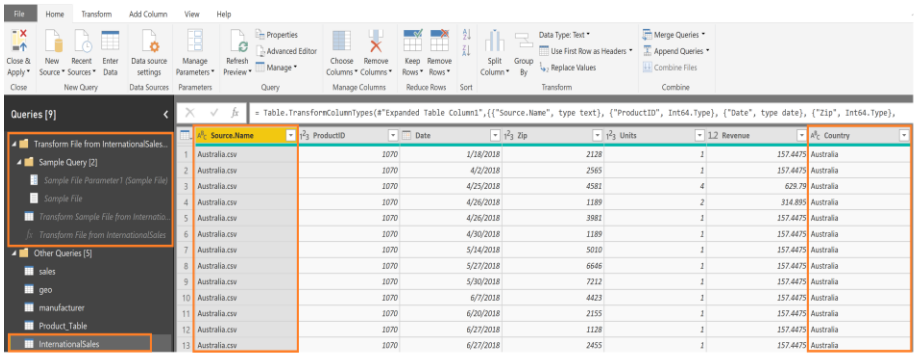
Notice that column Zip is of type Whole Number. Based on the first 200 rows Power BI thinks Zip is of type Whole Number. But zip code could be alpha numeric in some countries or leading zeros (similar to USA data). If we do not change the data type, we will see an error when we load the data shortly. So, let's change Zip to data type Text.

40. Highlight the **Zip column** and change the **Data Type** to **Text**.
41. **Change Column Type** dialog opens. Select **Replace Current** button.

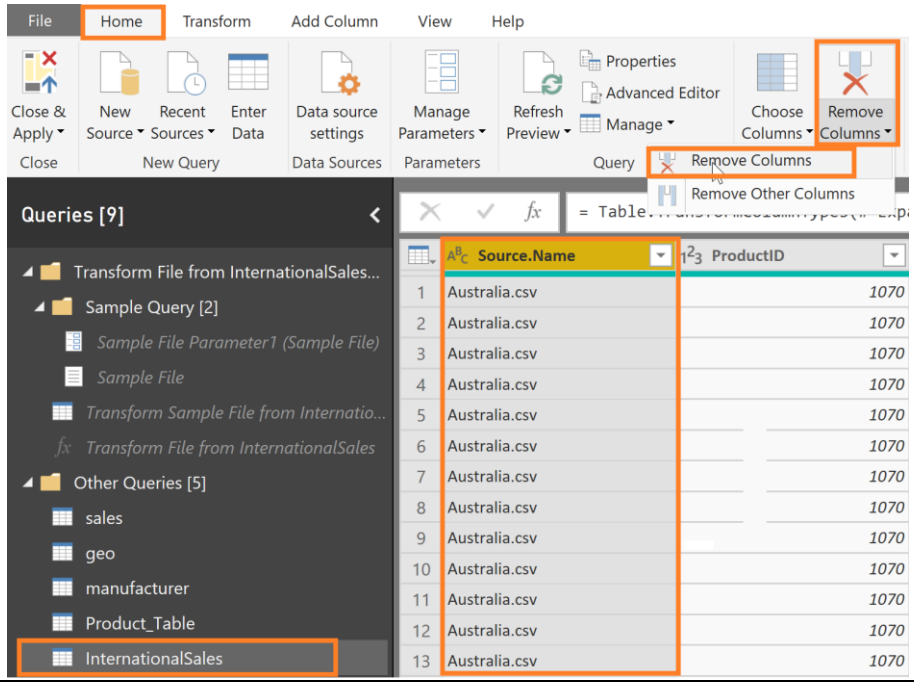


In Queries panel, notice Transform File from InternationalSales folder is created. This contains the function used to load each of the files in the folder.

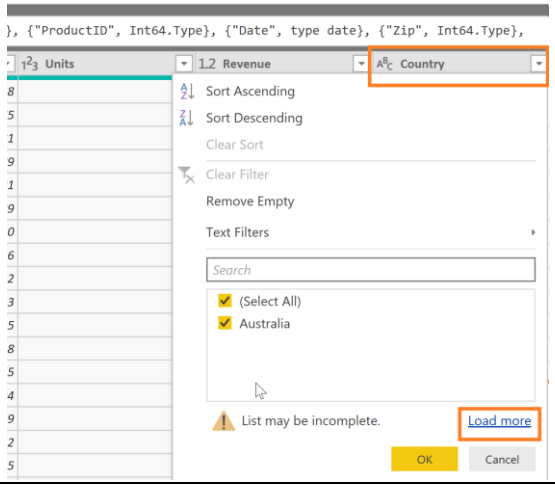
If you compare **InternationalSales** and **sales** table, you will see the **InternationalSales** table contains two new columns, **Source.Name** and **Country**.



42. We do not need Source.Name column. Select **Source.Name** column. From the ribbon, select **Home -> Remove Columns -> Remove Columns**.



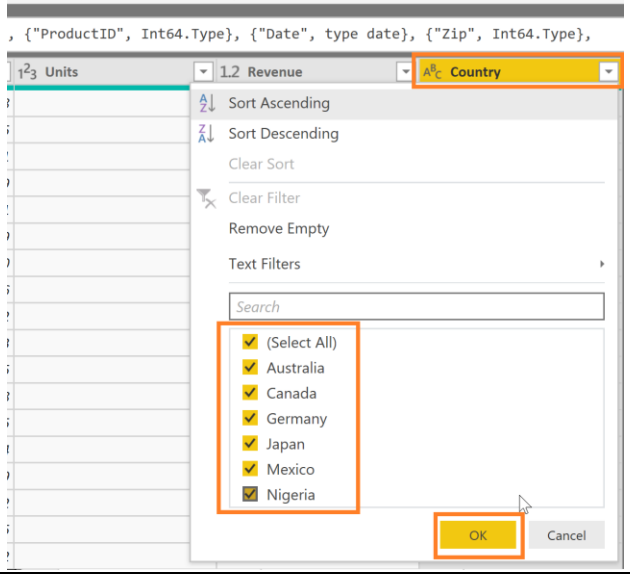
43. **Click on the drop down** next to **Country** column to see the unique values.
44. You will only see Australia as shown in the figure. Click on **Load more** to validate you have data from various countries included.



You will see the countries, Australia, Canada, Germany, Japan, Mexico and Nigeria.

45. Click **OK**.

Note: You can perform various types of filters, sorting operations using the drop down to verify the imported data.



Power BI Desktop – Data Preparation

In this section, we will explore methods to transform data in the data model. Transforming the data by renaming tables, updating data types, and appending tables together ensures that the data is ready to be used for reporting. In some instances, this means cleaning the data up so that similar sets of data are combined. In other instances, groups of data are renamed so that they are more recognizable by end users and simplifies report writing.

Power BI Desktop - Renaming tables

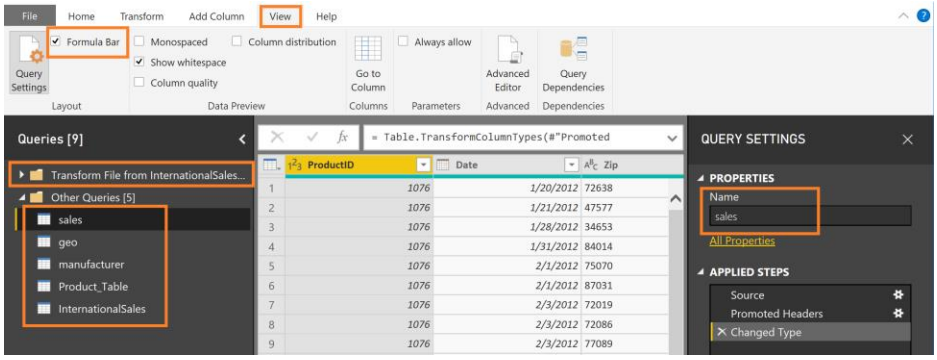
The Query Editor window should appear as shown in the diagram.

- If formula bar is disabled, you can turn on the formula bar from the View ribbon. This enables you to see the "M" code generated by each click on the ribbons.
- Select the options available on the ribbon – **Home, Transform, Add Column and View** to notice the various features available.

1. Under **Queries** panel**, minimize** Transform Files from InternationalSales folder.
2. Select each query name in the **Other Queries** section**.**
3. **Rename** them in the Query Settings -> Properties section as shown below:

Initial Name	Final Name
sales	Sales
geo	Geography
manufacturer	Manufacturer
Product_Table	Product
InternationalSales	International Sales

Note: It is best practice to give descriptive query names and column names. These names are used in visuals and in Q&A section, which is covered later in the lab.

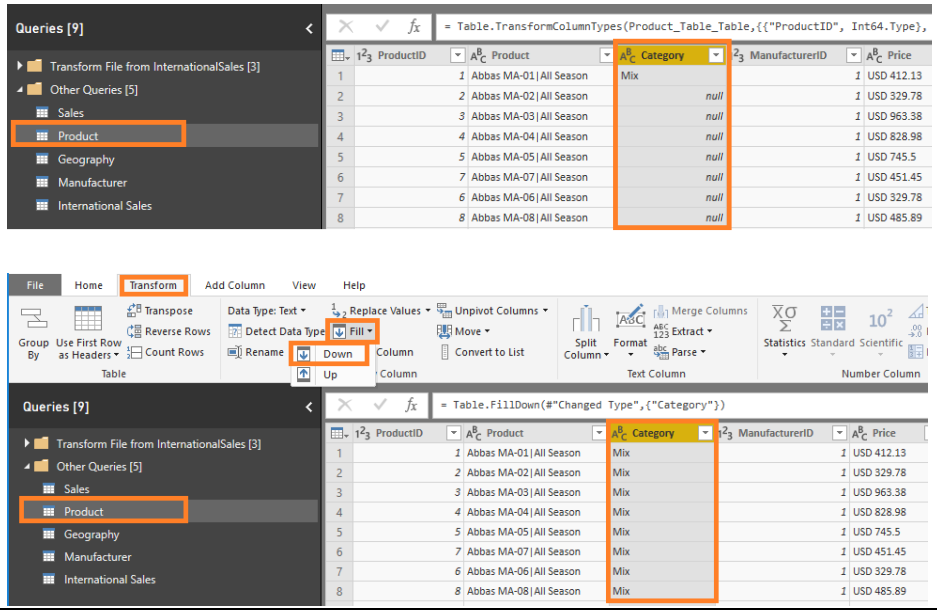


Power BI Desktop – Using Fill feature

Some of the data provided is not in the right format. Power BI provides extensive transformation capabilities to clean and prepare the data to meet our needs. Let's start with Product query. Notice that Category column has a lot of null values. Looks like there are values in Category column only when the value changes. We need to fill it down to have values in each row.

4. From the left panel, select **Product** Query.
5. Select **Category** column.
6. From the ribbon select **Transform -> Fill -> Down**.

Notice now all the null values are filled with the appropriate Category values.



Power BI Desktop – Using Split feature

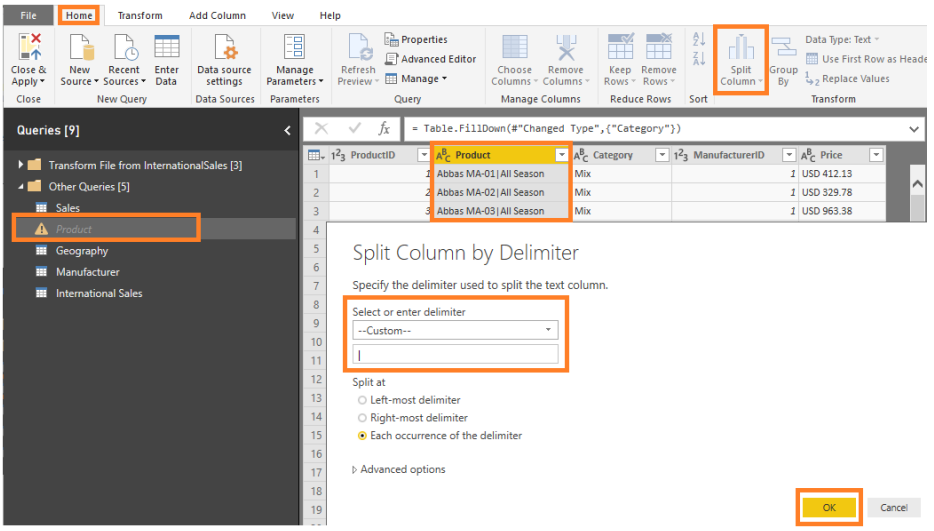
In Product query, notice Product column. Looks like two fields are concatenated into one field with a pipe (|) separator. Let's split them into two columns. This will be useful when we build visuals, so we can analyze based on both fields.

7. From the left panel, select **Product** Query.
8. Select **Product** column.
9. From the ribbon select **Home -> Split Column -> By Delimiter**. Split Column by Delimiter dialog opens.
10. In the dialog, make sure **Custom** is selected in the **Select or enter delimiter** dropdown.

Note: Select or enter delimiter dropdown has some of the standard delimiters like comma, colon, etc.

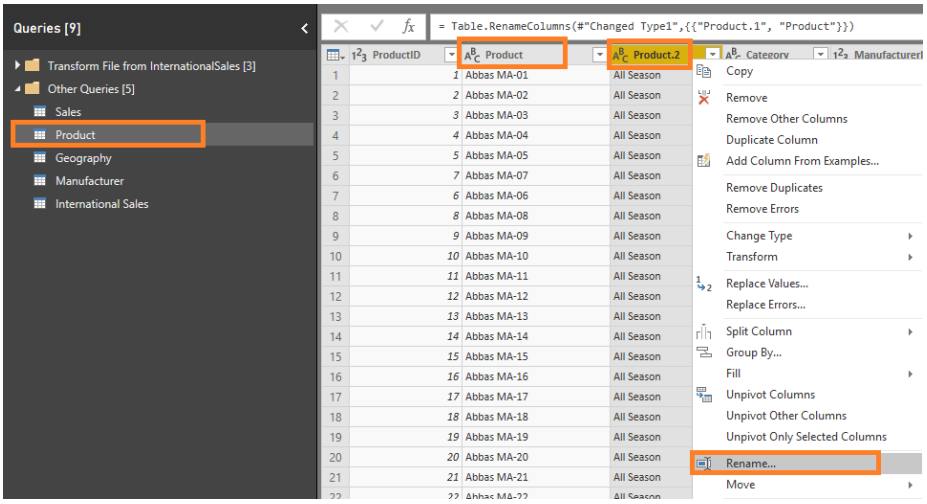
11. Notice in the text area, there is a hyphen (-). Power BI assumes we want to split by hypen. **Remove hyphen** symbol and **enter pipe symbol** (**|**) as shown in the screenshot.
12. Select **OK**.

Note: If the delimiter occurs multiple times, **Split at** section provides option to



split only once (either left most or right most) or the column can be split on each occurrence of the delimiter. In this scenario delimiter occurs only once, hence Product column is split into 2 columns.	

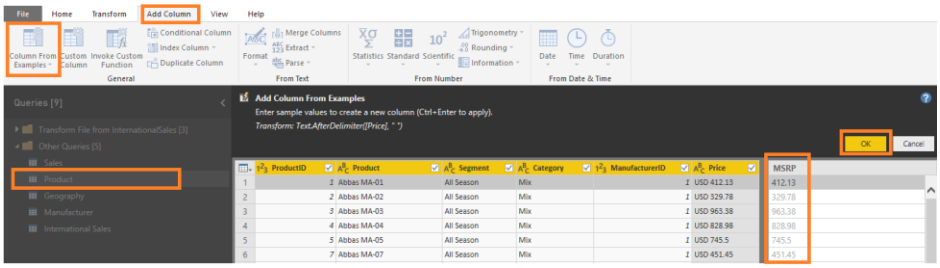
Power BI Desktop – Using Rename Column feature

Let's rename the columns. 13. Select **Product.1** column. **Right click** next to the column name. 14. Select **Rename** from the selection dialog. 15. **Rename** the field to **Product**. 16. Similarly rename **Product.2** to **Segment**.	

Power BI Desktop – Using Column From Examples feature

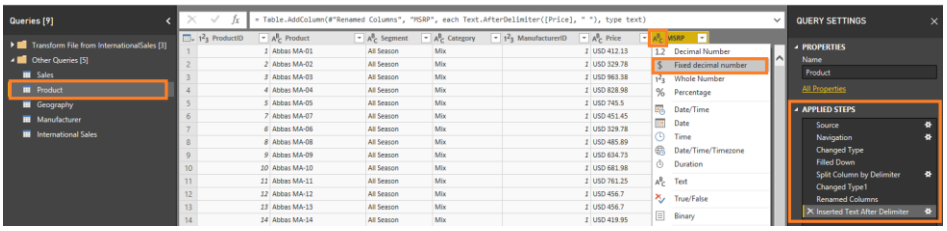
In Product query, notice that the Price column. You will see price and currency concatenated into one field. To do any calculations we just need the numeric value. It will be good to split this field into two columns. We can use the split feature like earlier or we can use Column From Examples. Column From Examples is handy in scenarios where the pattern is more complex than a delimiter.

17. From the left panel, select **Product** Query.
18. From the ribbon, select **Add Column -> Column From Examples -> From All Columns**.
19. In the **first row of Column1** enter the first Price value which is **412.13** and click enter.
Notice as you enter, Power BI knows that you want to split Price column. The formula it uses is displayed as well.
20. **Double click** column header **Text After Delimiter** to rename it.
21. **Rename** the column to **MSRP**.
22. Click **OK** to apply the changes.

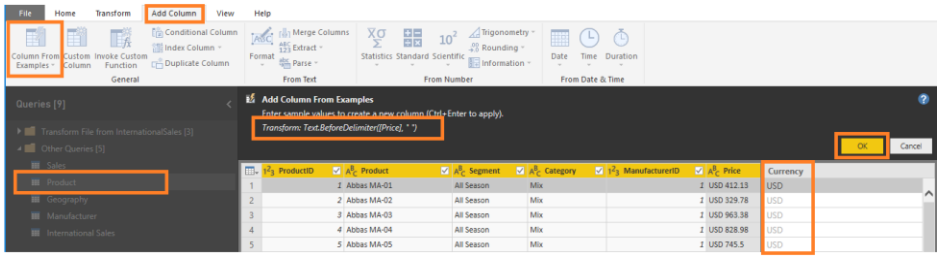


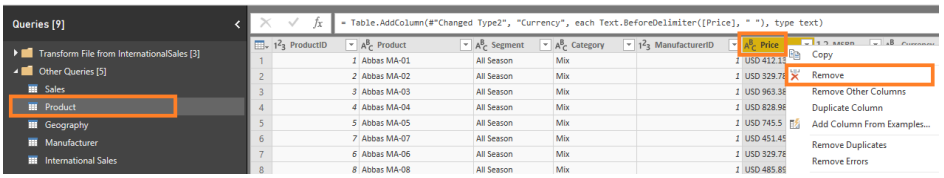
Notice MSRP field is of data type text. It must be a decimal. Let's change it.
23. Select **ABC** in **MSRP** column.
24. From the selection dialog, select **Fixed Decimal Number**.

Notice all the steps we performed on the Product query are being recorded under **APPLIED STEPS** in the right panel.



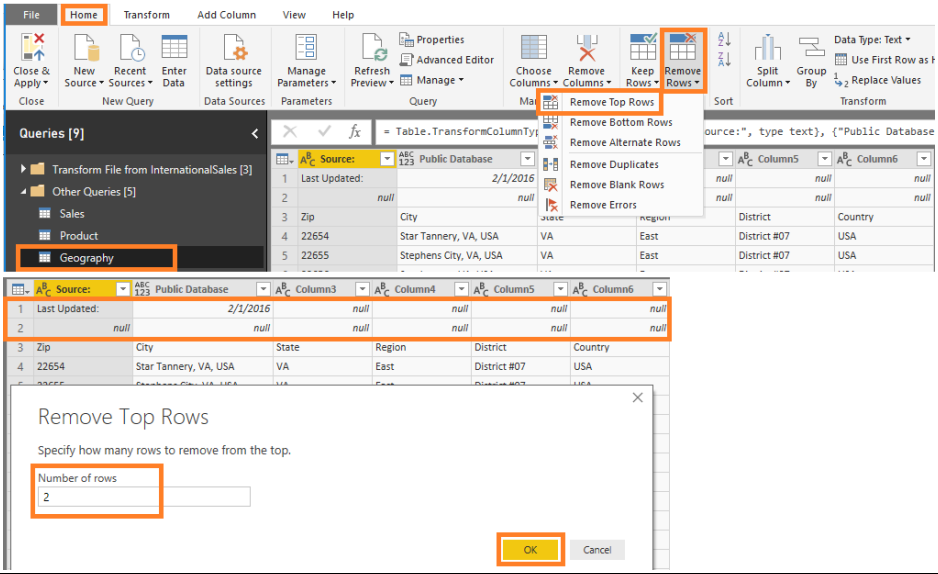
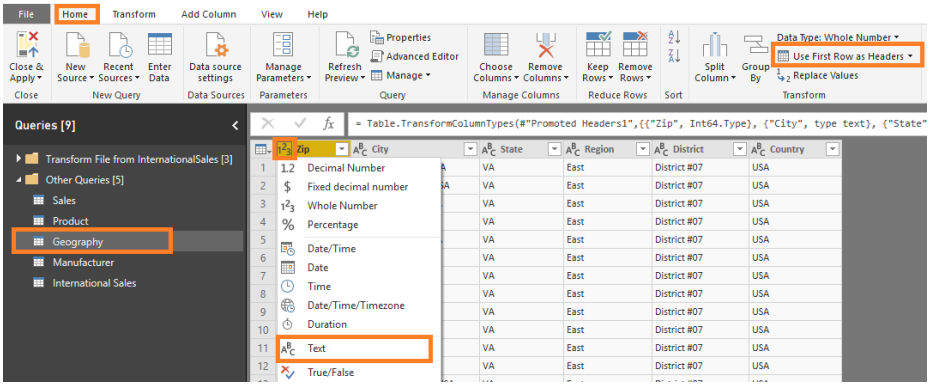
Similarly, let's create a currency column.
25. From the left panel, select **Product** Query.
26. From the ribbon, select **Add Column -> Column From Examples -> From All Columns**.
27. In the **first row of Column1** enter the first Currency value as **USD** and click enter
Notice as you enter, Power BI knows that you want to split Price column. The formula it uses is displayed as well.
28. **Double click** column header **Text Before Delimiter** to rename it.
29. **Rename** the column to **Currency**.
30. Click **OK** to apply the changes.



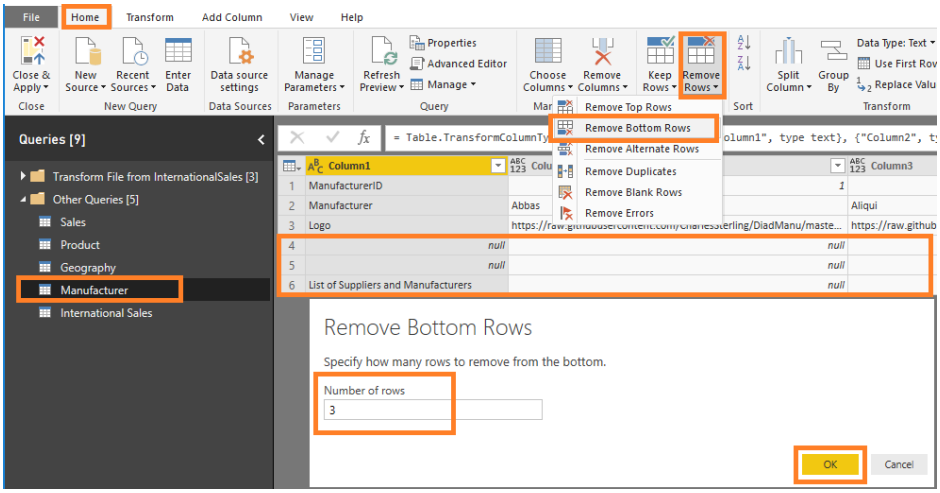
Now that we have split Price into MSRP and Currency columns, we don't need Price column. Let's remove it. 31. From the left panel, select **Product** Query. 32. **Right click** next to **Price** column. 33. Select **Remove**.	

Power BI Desktop – Using Add/Remove Rows feature

In Geography query, notice that first two rows are informational. It is not part of the data. Similarly, in Manufacturer query the last couple of rows are not part of the data. Let's remove them so we have a clean dataset.

34. In the left panel, select **Geography** query. 35. From the ribbon, select **Home -> Remove Rows -> Remove Top Rows**. 36. Remove Top Rows dialog opens. Enter **2** in the text box, since we want to remove the top informational data row and the blank 2nd row. 37. Select **OK**.	
Notice the first row in Geography query now is the column header. So let's make it a header. 38. With **Geography** query selected in the left panel, from the ribbon select **Home -> Use First Row as Headers.** Notice column Zip is of data type number. Let's change it to text as we did earlier. If we don't we will see errors when we load the data. 39. Select **123** next to Zip Column. From the dialog, select **Text**. 40. Select **Replace Current** in the **Change Column Type** dialog.	

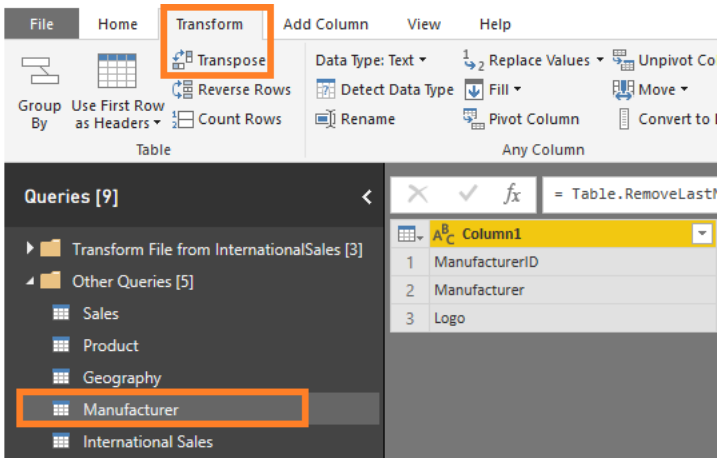
41. From the left panel, select **Manufacturer** query. Notice the bottom 3 rows are not part of the data. Let's remove it.
42. From the ribbon, select **Home -> Remove Rows -> Remove Bottom Rows**
43. Remove Bottom Rows dialog opens. Enter **3** in **Number of rows text box**.
44. Select **OK**.



Power BI Desktop – Using Transpose feature

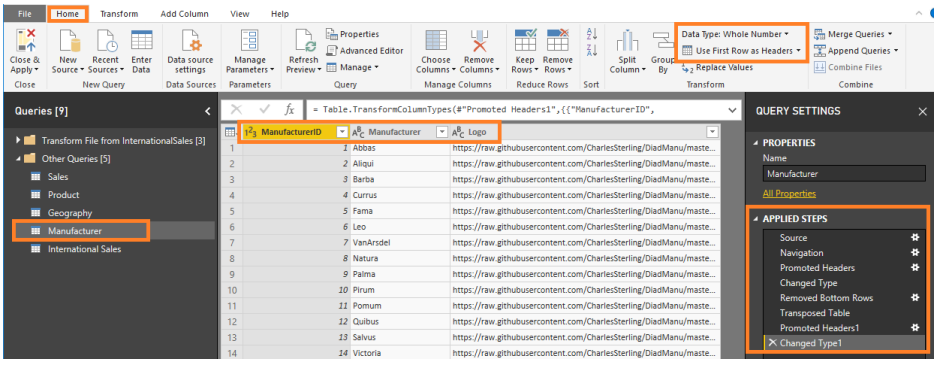
45. From the left panel, select **Manufacturer** Query. Notice ManufacturerID, Manufacturer and Logo data is laid across in rows. And the header is not useful. We need to transpose the table to meet our needs.
46. From the ribbon select **Transform -> Transpose**.

Notice this transposes the data into columns. Now we need the first row to be the header.



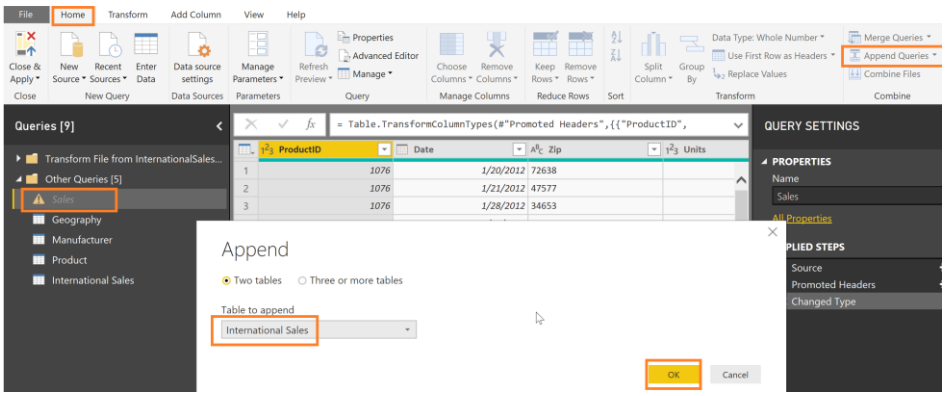
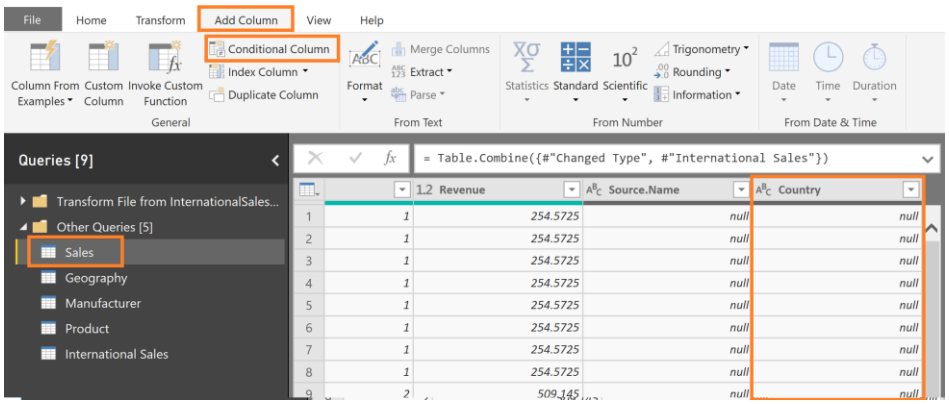
47. From the ribbon select **Home -> Use First Row As Headers**.

Notice now Manufacturer table is laid out the way we need it with a header and values along columns.
Notice on the right panel under **APPLIED STEPS** you will see the list of transformations and steps that have been applied.
You can navigate through each change made to the data by clicking on the step. Steps can also be deleted by clicking on the **X** that appears to the left of the step.

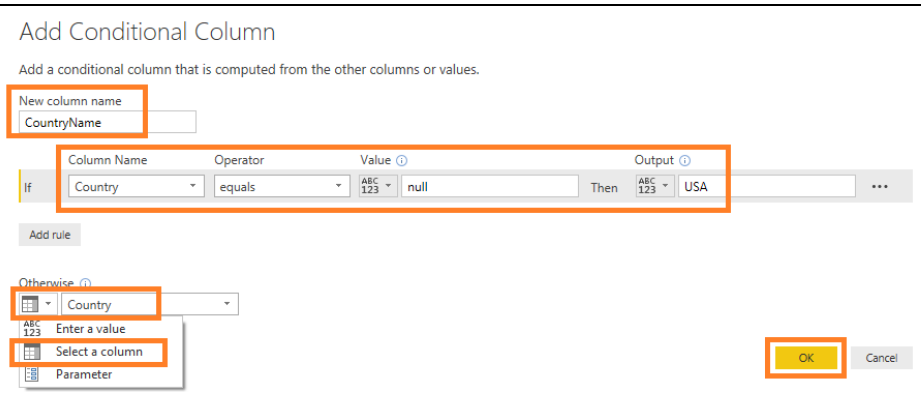


The properties of each step can be reviewed by clicking on the **gear** to the right of the step.	

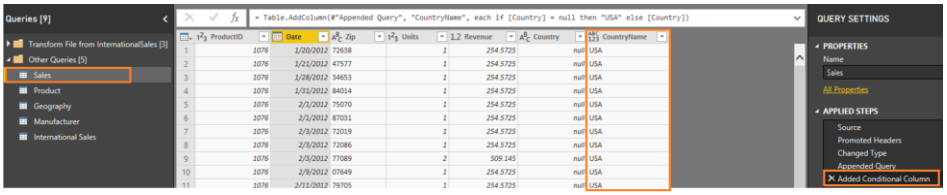
Power BI Desktop – Using Append and Conditional Column feature

To analyze the Sales of all countries, it is convenient to have a single Sales table. Hence you want to append all the rows from **International Sales** to **Sales**. 48. Select **Sales** in the Queries window in the left panel as shown in the figure. 49. From the ribbon select **Home -> Append Queries**. Append dialog opens. There is an option to append **Two tables** or **Three or more tables**. Leave Two tables selected since we are appending just two tables. 50. Select **International Sales** from the drop down and click **OK**.	
You will now see a new column in the **Sales** table called **Country**. Since International Sales had the additional column for Country, Power BI Desktop added the column to the Sales table when it loaded the values from International Sales. You see **null values** in the **Country** column by default for the Sales table rows because the column did not exist for the table with USA data. We will add the value "**USA**" as a data shaping operation. 51. From the ribbon select **Add Column -> Conditional Column**.	

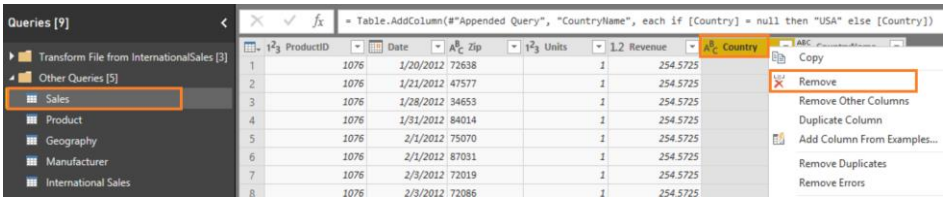
52. In the **Add Conditional Column** dialog, enter name of the column as "**CountryName**".
53. Select **Country** from the **Column Name** dropdown.
54. Select **equals** from the **Operator** dropdown.
55. Enter **null** in the **Values** text.
56. Enter **USA** in the **Output** text.
57. Select the dropdown under **Otherwise** and pick **Select a column** option.
58. Select **Country** from the column dropdown.
59. Click **OK**.
This reads, if Country equals null then the value is USA else value is that of Country.

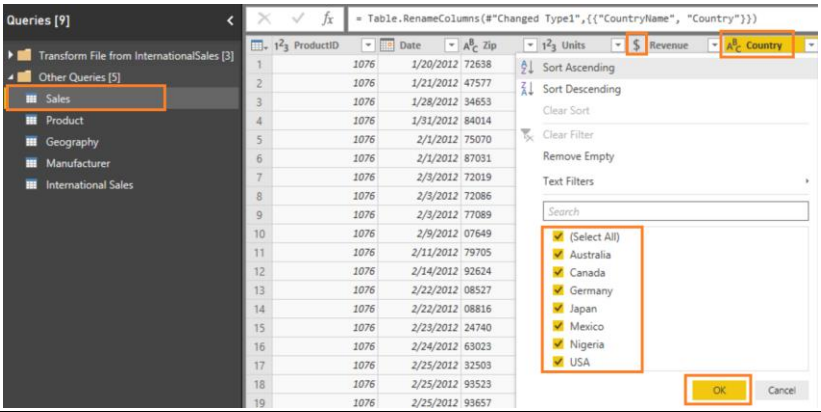
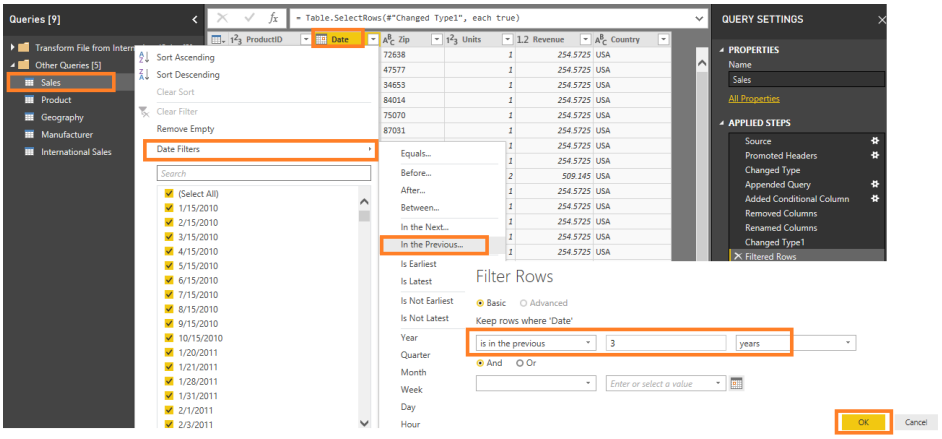


60. You will see the **CountryName** column in the Query editor window.



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.
61. Right click on the **Country** column and select **Remove** as shown in the figure.
We can now rename **CountryName** column to Country.
62. Right click on the **CountryName** column and rename to **Country**.
63. Using **Home -> Data Type**, change the **data type** of the **Country** column to type **Text**.
64. Using **Home -> Data Type**, change the **data type** of the **Revenue** column to type **Fixed Decimal Number** since it is a currency field.
When the data is refreshed, it will process through all the "Applied Steps" that you have created.

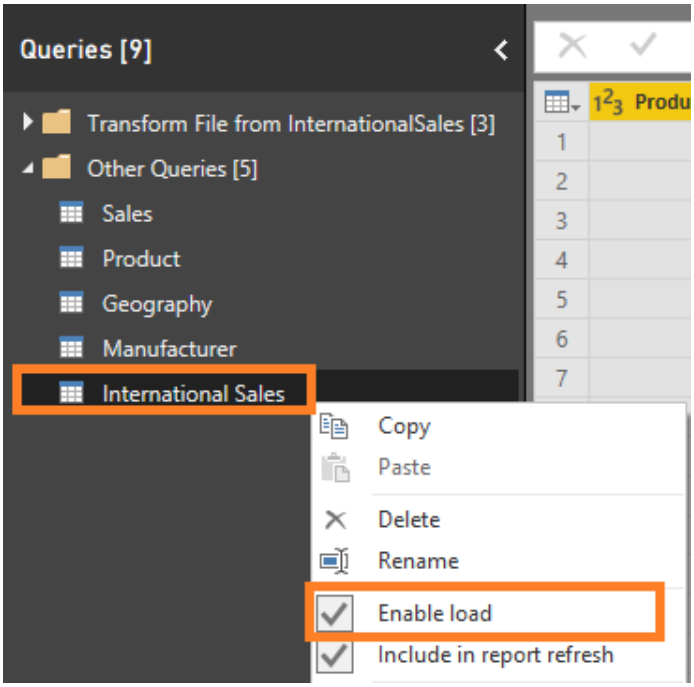


The newly named **Country** column will have names for all countries, including the USA. You can validate this by clicking on the drop down next to **Country** column to see the unique values. 65. At first, you will only see USA data. Click on **Load more** to validate you have data from all 7 countries. 66. Click **OK** to close this filter.	
Typically, when exploring data, we load a subset of data. There are multiple ways to do this. From the ribbon, select **Home -> Keep Rows -> Keep Top Rows** OR **Home -> Keep Rows -> Keep Bottom Rows** OR **Home -> Keep Rows -> Keep Range of Rows.** You can use any of these options to filter down to a subset of data. Our dataset has data from 2012 to 2018. For our analysis we want to start with the last 3 years of data (2016-2018). We don't know how many rows. We can filter by year to get the subset. 67. Select the **arrow** next to **Date** in **Sales** Query. 68. Select **Date Filters -> In the Previous…** 69. Filter Rows dialog opens. Enter **3** in the text box next to **is in the previous**. 70. Select **years** from the dropdown. 71. Select **OK**.	

Now that International Sales data is appended to Sales, we don't need the International Sales table to load to the data model. Let's prevent International Sales table from loading to the data model.

72. From the Queries panel on the left, select **International Sales** query.
73. Right click and select **Enable Load**. This will disable loading International Sales.

Note: The appropriate data from the International Sales table will load into the Sales table each time the model is refreshed. By removing the International Sales table, we are preventing duplicate data from loading into the model and increasing its file size. In some instances, storing very large amounts of data affects the data model performance.

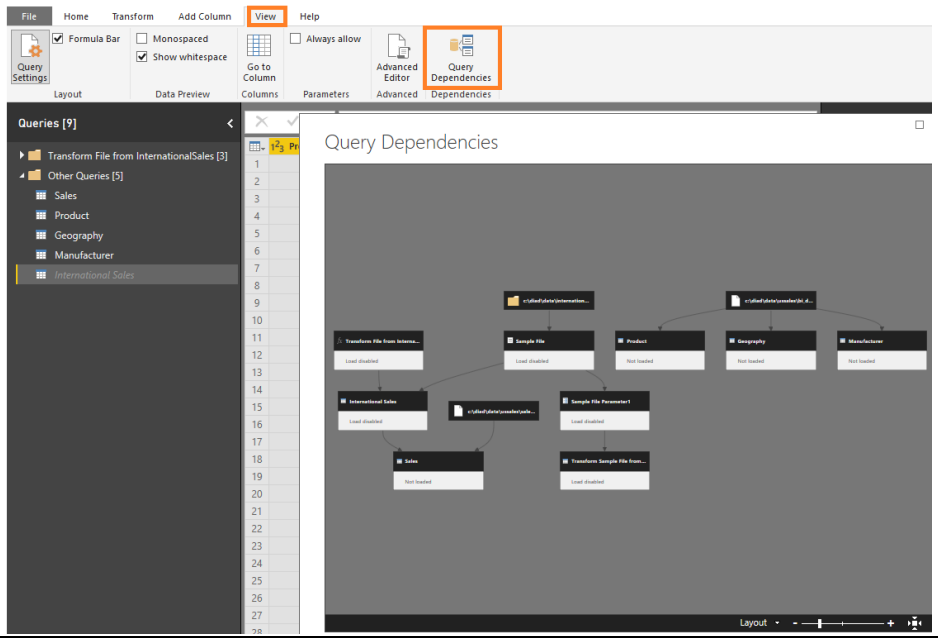


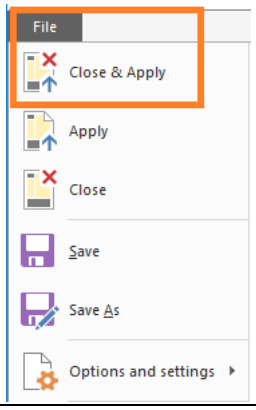
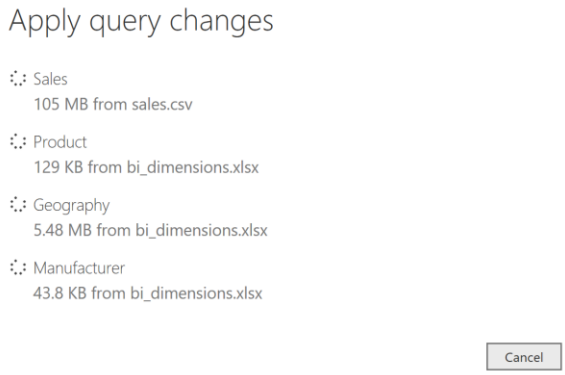
74. From the ribbon select **View -> Query Dependencies**.

This opens Query Dependencies dialog. The dialog shows the source of each of the queries and dependencies. E.g. We see that Sales query has a csv file source and it has a dependency on International Sales query. This is a useful self-document that can be used to share knowledge with your team members.

75. Select **Close** in the dialog.

Query Dependencies view can be zoomed in and out as needed.

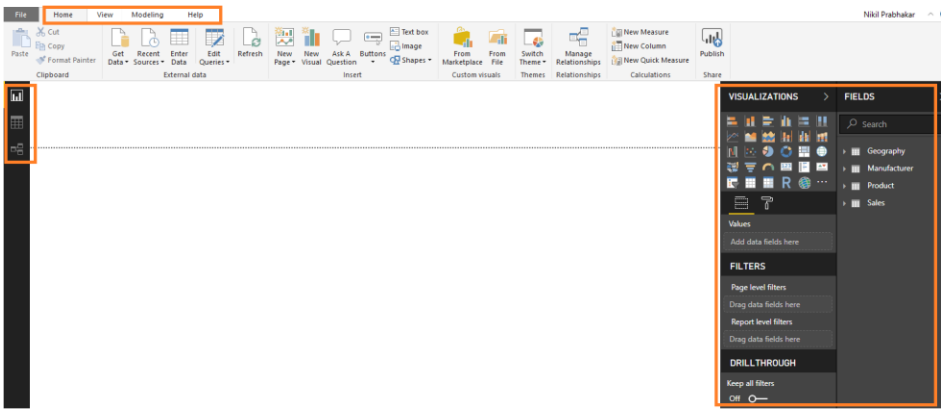


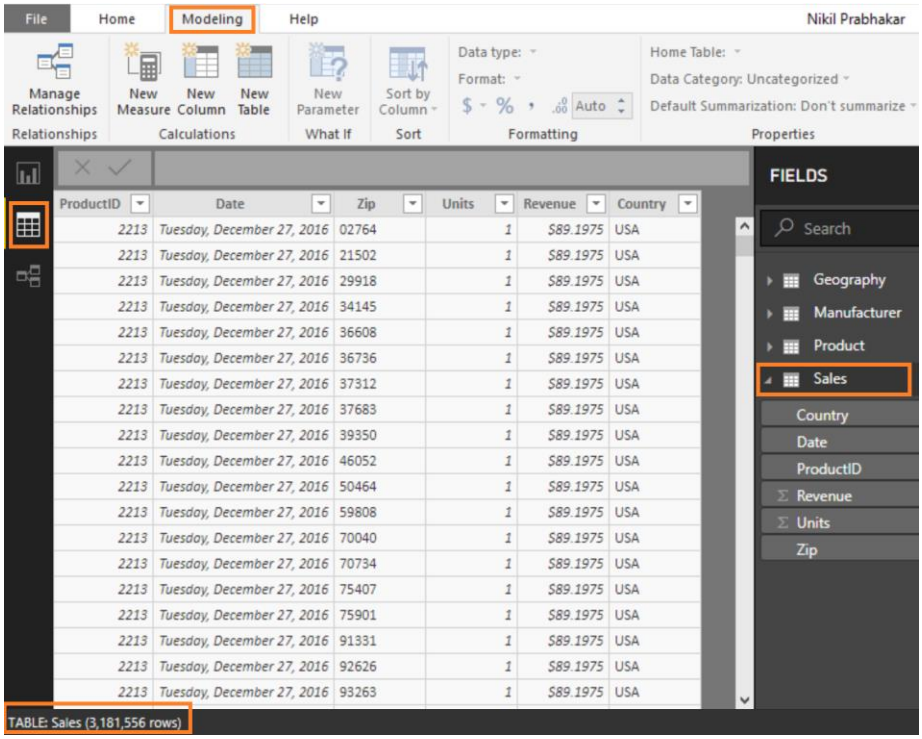
You have successfully completed import and data shaping operations and are ready to load the data into the Power BI Desktop data model which allows you to visualize the data. 76. Click on **File -> Close & Apply**.	
All the data will be loaded in memory within Power BI Desktop. You will see the progress dialog with the number of rows being loaded in each table as shown in the Figure. **Note:** It may take several minutes to load all the tables. 77. Select **File -> Save** to save the file after the data loading is complete. Name the file as "**MyFirstPowerBIModel**". Save the file in **\DIAD\Reports** folder.	

Power BI Desktop – Data Modeling and Exploration

In this section, we will learn the key parts of the Power BI desktop, to model and explore the data and build visuals.

Power BI Desktop - Layout

You will land on the main **Power BI Desktop** window. Let's get familiar with the distinct sections available in the Power BI Window. 1. On the top, you see the **Home** tab where the most common operations you perform are available. 2. **View** tab has options to format the page layout. 3. **Modeling** tab in the ribbon enables additional data modeling capabilities like adding custom columns and calculated measures.	

4. **Help** tab provides self-help options like guided learning, training videos and links to online communities, partner showcase, solution templates.	
5. The **Fields** window on the right panel, is where you will see the list of tables which were generated from the queries. Click the ▶ icon next to a table name to expand to the field list for that table. 6. **Visualizations** panel on the right allows you to select visualizations, add values to the visuals and add columns to the axes or filters. 7. The center **white space** is the canvas where you will be creating visuals. 8. On the left side, you have three icons, **Report, Data and Relationships**. If you hover over the icons, you can see the tool tips. Switching between these allows you to see the data and the relationships between the tables. 9. Click on the Data icon. Expand **Sales** table in the **Fields** as shown in the figure Scroll up and down to notice how fast you can navigate **through ~ 3 Million rows**.	

10. Click on the **Relationships** icon on the left panel of Power BI Desktop.

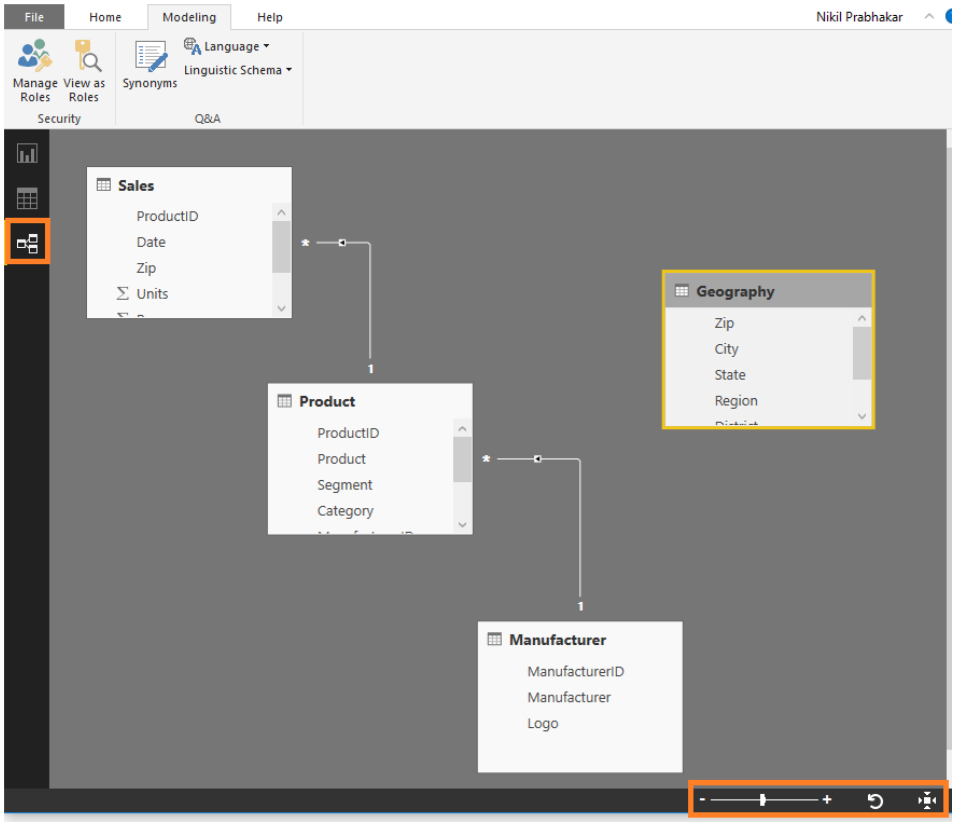
You will see the tables you have imported along with some Relationships. The Power BI Desktop automatically infers relationships between the tables.

- Relationship is created between Sales and Product tables using ProductID column.
- Relationship is created between Product and Manufacturer tables using ManufacturerID column.

Power BI Desktop supports 1 to many or 1 to 1 relationships between the tables. This means one of the tables involved in the relationship should have a unique set of values.

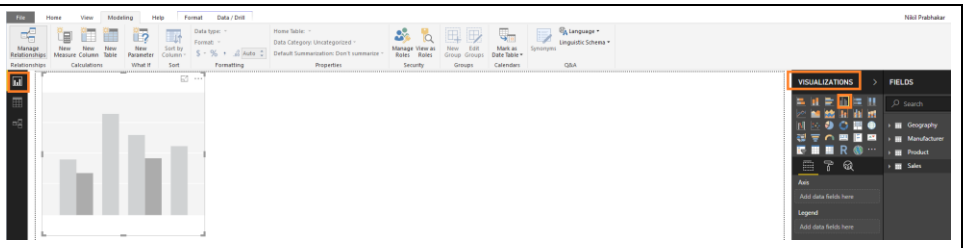
Notice there is no relationship between the Geography and Sales tables. If you want to explore sales data across state or city or country, you will need to setup the relationship between the Geography and Sales tables. You will create the relationship shortly.

Note: Tables may not appear as shown in the figure. You can zoom in and out of the Relationships page by dragging the zoom slider in the bottom right corner of the window. Also, if want to ensure you are seeing all the tables, use the fit to page icon:  . Drag and move the tables to appear as shown in the figure.



We loaded data from different countries. So, let's start with analyzing sales by country.

1. Click on the **Report** icon on the left panel to navigate to the Report view.
2. Select the **Clustered column chart** visual in **Visualizations** as shown in the screenshot.

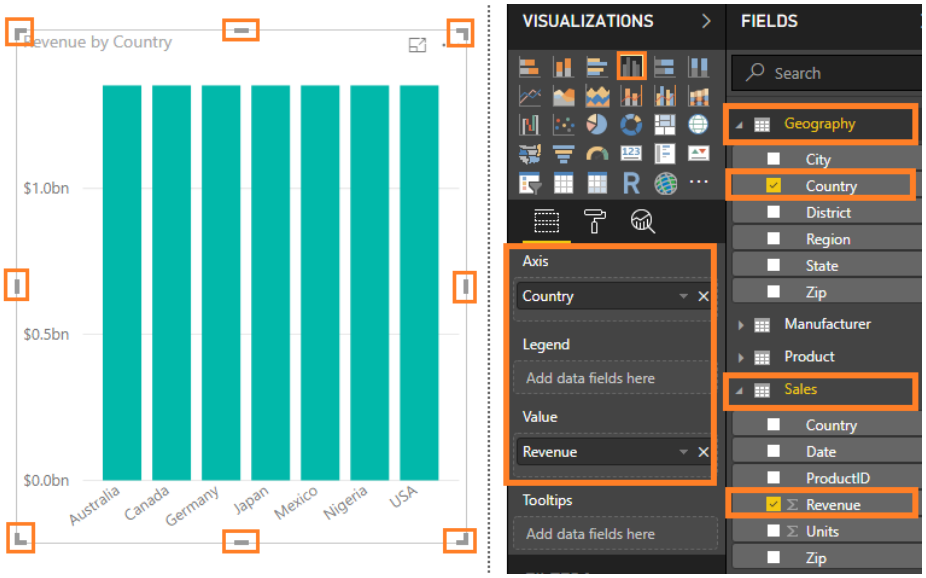


3. From the **FIELDS** section, expand **Geography** table and click the checkbox next to the **Country** field.
4. From the **FIELDS** section, expand **Sales** table and click the checkbox next to the **Revenue** field.
5. **Resize** the visual as needed by dragging the edges.

Notice revenue of each country is the same. This is because there is no relationship between Sales and Geography tables. Let's create one.

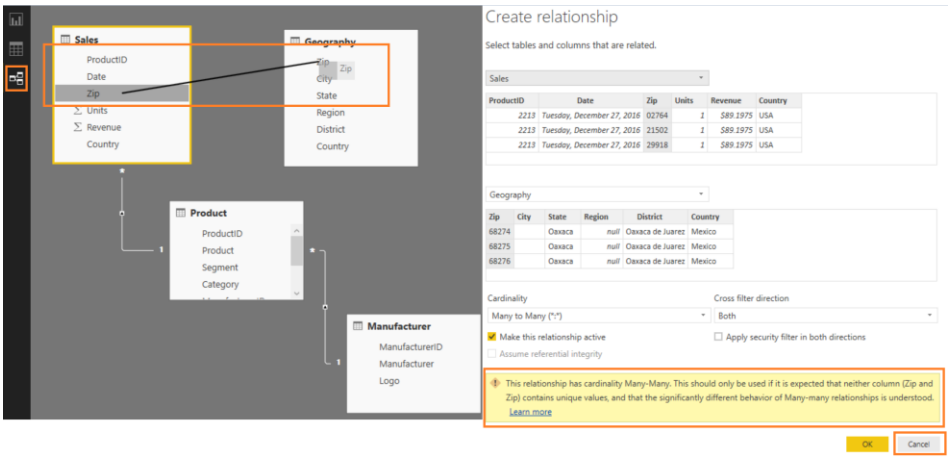
Note: You now need to set up the correct relationship between these tables.

To create a relationship between the two tables we need a "joining" or "relating" column.



6. Click on the **Relationships** icon on the left panel to navigate to the Relationship view.
7. Sales data is by Zip code. Hence, we need to connect Zip column from Sales table with Zip column in Geography table. You can do this by dragging the **Zip** field in **Sales** table and connecting the line with **Zip** field in **Geography** table.

You will notice Create relationship dialog opens with a warning message at the bottom stating the relationship has a many-many cardinality. The reason for the warning is that we don't



have unique Zip values in Geography. This is because multiple countries could have the same Zip code. Let's concatenate Zip and Country columns to create a unique value field.

8. Select **Cancel** in Create relationship dialog.

We need to create a new column in both the Geography table and the Sales table that combines "Zip" and "Country". Let us start by creating a new column in the Sales table.

9. Click on the **Report** icon on the left panel to navigate to the Report view.

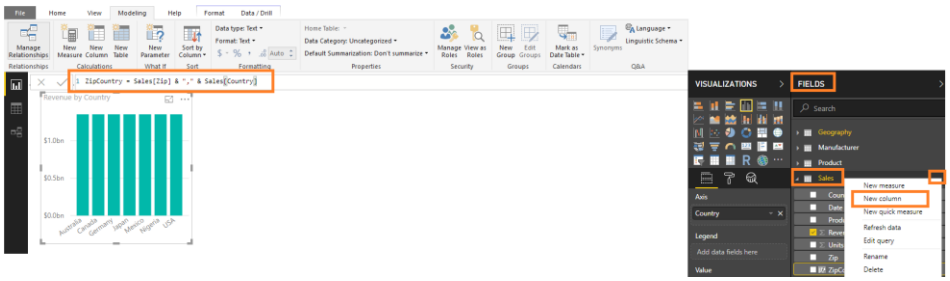
10. In the **Fields** section, click on the ellipsis next to **Sales** table. Select "**New Column**" as shown in the figure.

You will see a formula bar appear as shown in the screenshot to help create this new column.

11. We can combine or concatenate the Zip and Country columns into a new column called ZipCountry separated by a comma. Let us create this column called **ZipCountry** using the following calculation in the editor.

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

12. Once you are done entering the formula click in the check mark on the left side of the formula bar.

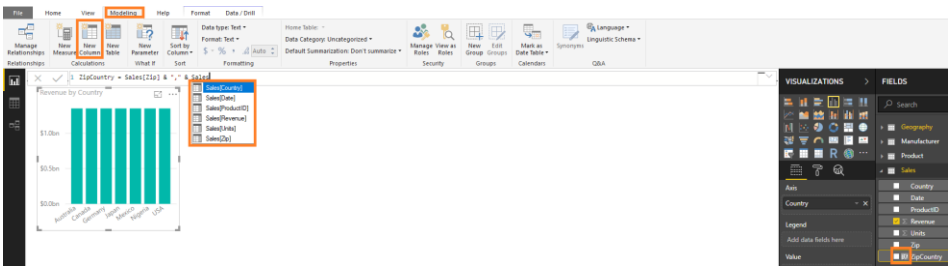


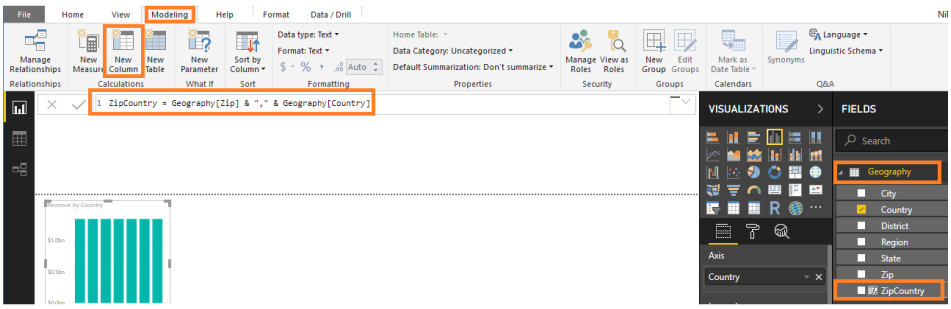
IMPORTANT!

If you get an error creating a new column here, make sure your Zip column is the Text Data Type.

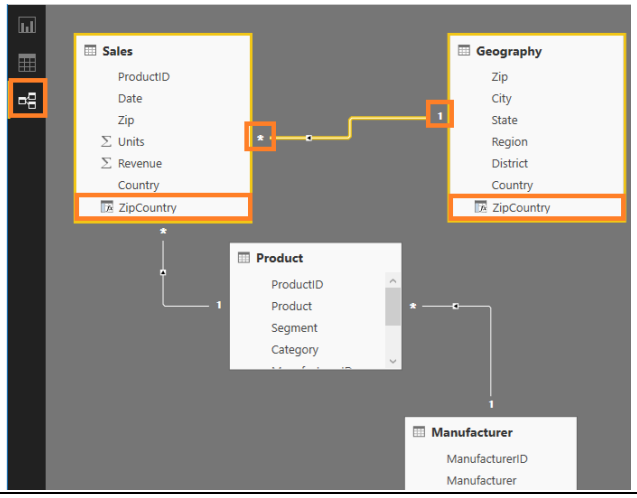
You will notice that as you type the expression the Power BI desktop guides you to choose the right columns using a Technology called Intellisense. As you type half way through you can select the right column by double clicking on it using your mouse or by continuing to hit tab until you see the correct name.

The language you used to create this new column is called DAX (Data



Analysis Expression) which is very similar to writing expressions in Excel where you are concatenating the two columns (Zip and Country) in each row by using the “&” symbol. You will see a new column ZipCountry in Sales table. The icon with a (fx) indicates you have a column that contains an expression, also referred to as calculated column. You can also create a new column by selecting the table and then clicking on **Modeling -> New Column** from the ribbon. Let us use this method to create a “ZipCountry” column in the Geography table.	
13. From **Fields** section, select **Geography** table and from the ribbon select **Modeling -> New Column** as shown in the figure. 14. Formula bar appears. Enter the following DAX expression in the formula bar: **ZipCountry = Geography[Zip] & "," & Geography[Country]** You will see a new column ZipCountry in Geography table. The final step is to setup the relationship between the two tables using the newly created “ZipCountry” columns in each of these tables.	

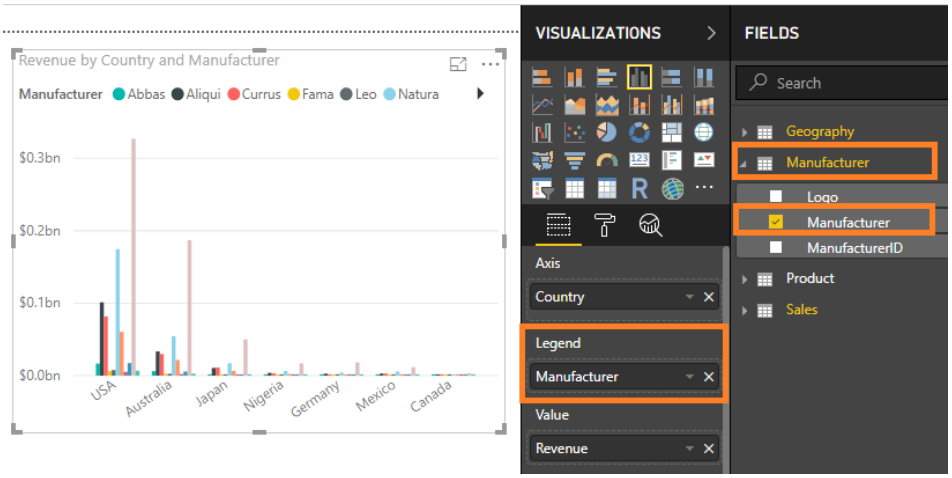
15. Click on the **Relationships** icon on the left panel to navigate to the Relationship view.
16. Drag **ZipCountry** field from **Sales** table and connect it to **ZipCountry** field in **Geography** table.
Now we have successfully created a relationship. The number 1 next to Geography indicates it is on the one side of the relationship and * next to Sales indicates it is on the many side of the relationship.



17. Click on the **Report** icon on the left panel to navigate to the Report view.
Notice the clustered column chart we created earlier. It shows different sales for each country. USA has the most sales followed by Australia and Japan. By default, it is sorted by Revenue.
18. Click on the **ellipsis** on the top right corner of the visual.
Notice there is option to Sort by Country as well.

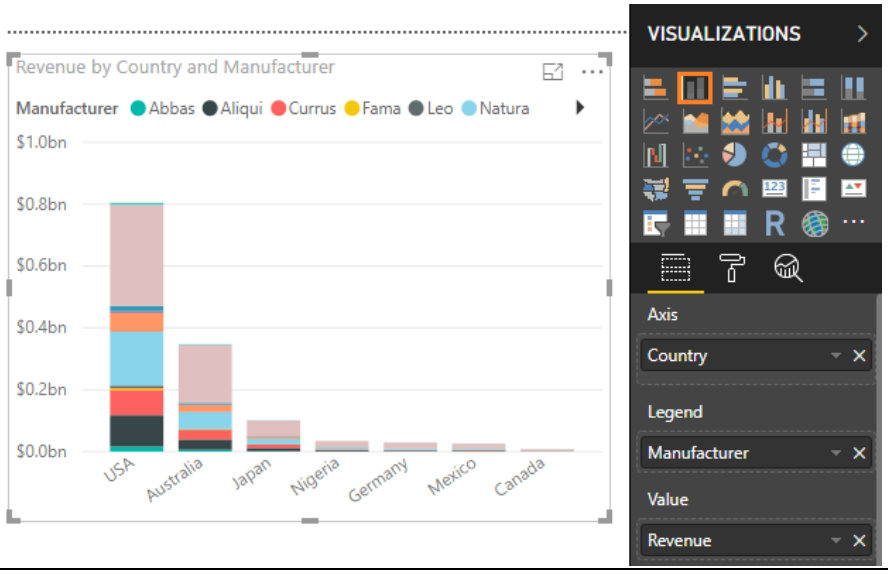
Now let's analyze Sales by Country by Manufacturer and see if we get more insights.
19. With the Clustered column chart selected, from the **Fields** section expand **Manufacturer** table.
20. **Drag and drop Manufacturer** field to **Legend** section.

There are many manufacturers and clustered column chart does not represent the information well. Let's change the visual.



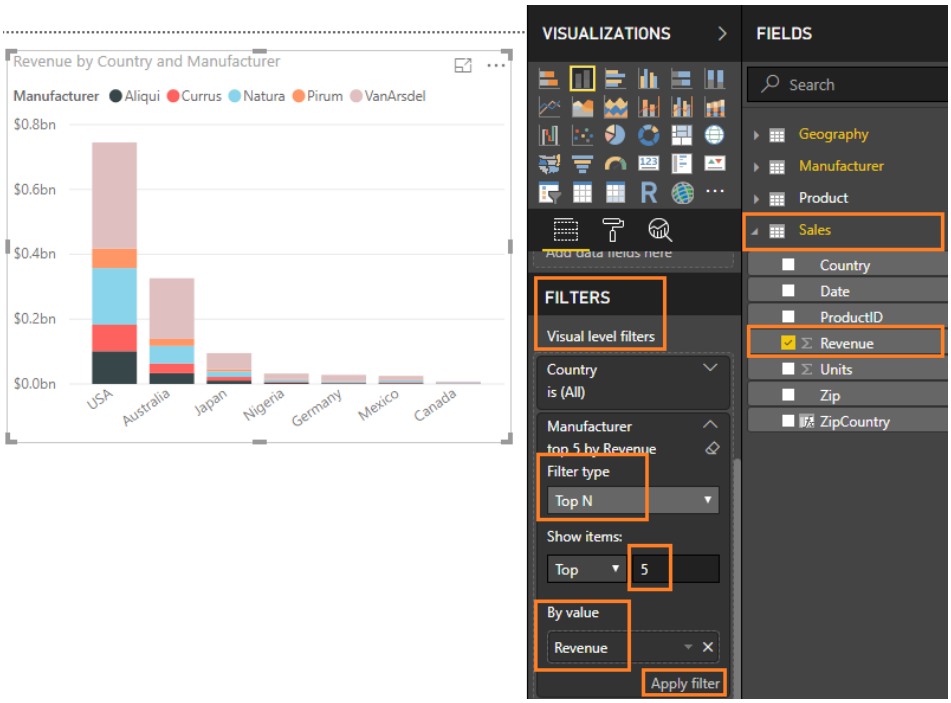
21. With the Clustered column chart selected, from the **VISUALIZATIONS** section select **Stacked column chart** visual.
22. **Resize** the visual as needed.

Now we can figure out the top manufacturers by country. It will be nice to narrow down to the top 5 competitors to better analyze the data.



23. With Clustered column chart selected, scroll down to the **Visual level filters** section under **VISUALIZATIONS** panel.
24. Expand **Manufacturer** under Visual level filters.
25. From the **Filter Type** drop down select **Top N**.
26. Enter **5** in the text box next to Top.
27. From the **FIELDS** section expand **Sales** table.
28. Drag and drop **Revenue** field to **By value** section.
29. Select **Apply filter**.

Notice now the visual is filtered to display the Top 5 manufacturers by Revenue. We see that VanArsdel has higher percentage of sales in Australia compared to other countries.



Let's see if there is another way to build this visual.

30. Click on the white space in the canvas and from the ribbon select **Home -> Ask A Question**.

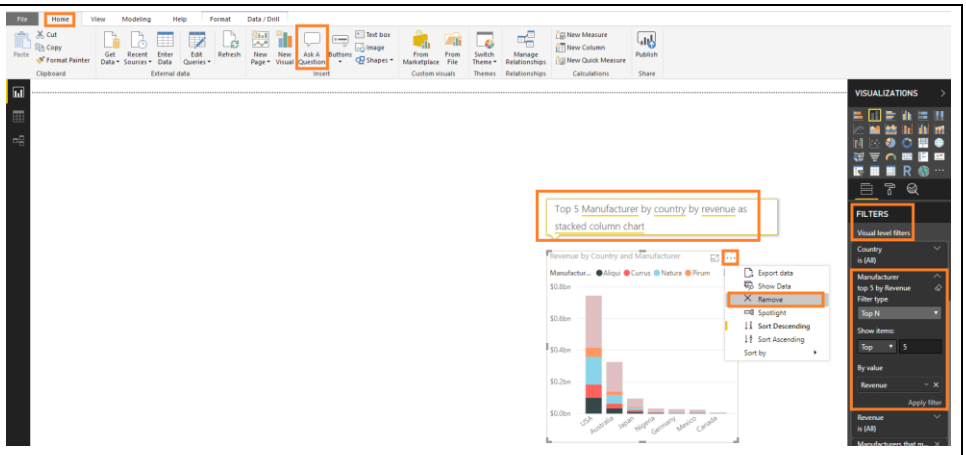
31. In the dialog start typing **Top 5 Manufacturer**. Notice a table with the top 5 manufacturers is displayed.

32. Continue typing **Top 5 Manufacturer by country by revenue**. Notice a bar chart is created.

33. Continue typing **Top 5 Manufacturer by country by revenue as stacked column chart**. Notice we can create the same visual we did earlier by typing the question.

34. With the visual selected, under VISUALIZATIONS section, **scroll** down to **Visual level filters**. Expand **Manufacturer**. Notice the Top N filter is applied.

35. We have two of the same visuals, so let's delete this one. Hover over the visual and select the **ellipsis** on the top right corner. Select **Remove**.



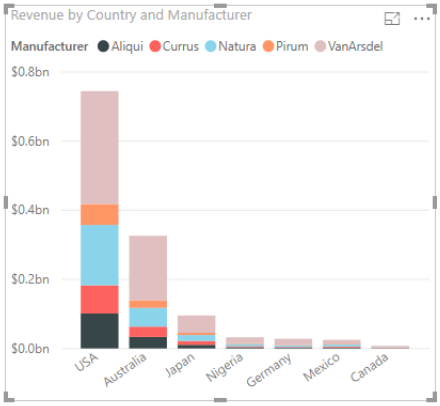
We are interested in the top 5 competitors by revenue. Let's group them so we don't have to add a filter in every visual.

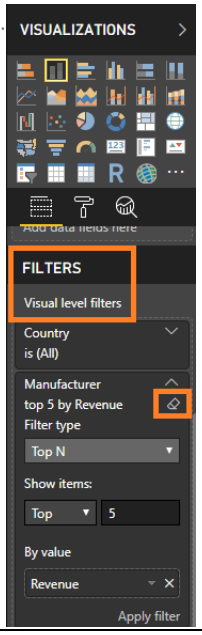
Before we do that let's remove the Top 5 visual level filter.

36. With Clustered column chart selected, scroll down to the **Visual level filters** section in **VISUALIZATIONS** panel.

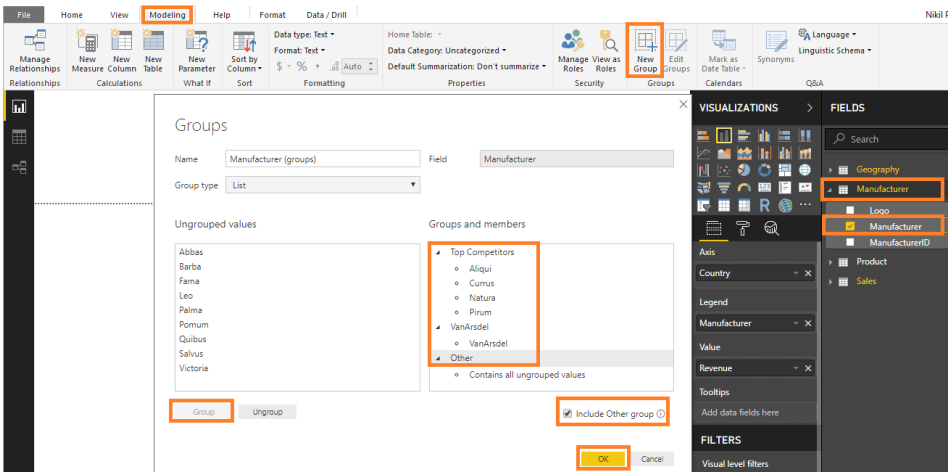
37. Expand **Manufacturer** under Visual level filters.

38. Hover over and select the **Clear filter** icon (erase) next to Manufacturer field.



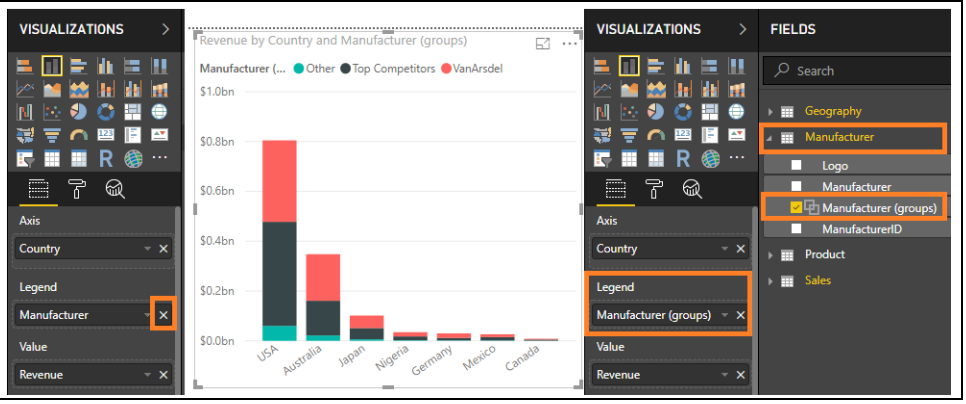


39. From the **FIELDS** section expand **Manufacturer** table.
40. Click on the **Manufacturer** field name (note: do not check the checkbox).
41. From the ribbon select **Modeling -> New Group**. Groups dialog opens.
42. In the Ungrouped values section, using Ctrl key, select **Aliqui, Currus, Natura and Pirum**.
43. Select **Group** button. Notice a new group is added in the Groups and members section.
44. Double click the newly created group and **rename** it to **Top Competitors**.
45. Select **VanArsdel** from the Ungrouped values section and select **Group** button to create **VanArsdel Group**.
46. Select the check box **Include Other group**. This will create an Other group which will include all the other manufacturers.
47. Select **OK** to close Groups dialog.



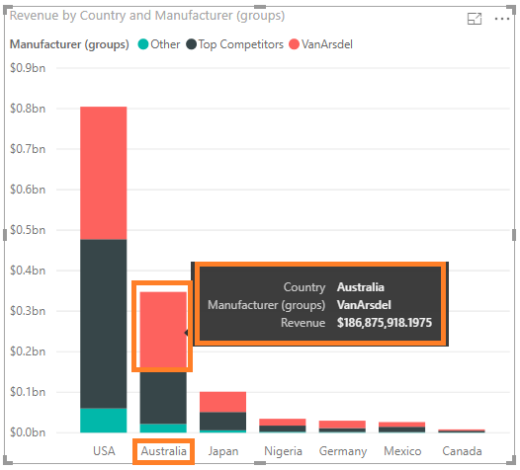
48. With the Stacked column chart selected, click on the **X** next to **Manufacturer** in the **Legend** section. This will remove Manufacturer.
49. From the **FIELDS** section, drag the newly created **Manufacturer (groups)** to the Legend section.

Now we can clearly see that VanArsdel has nearly 50% share in Australia.

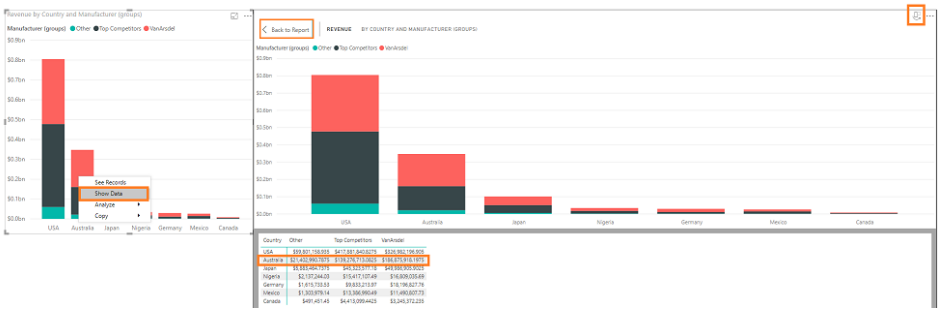


50. **Hover** over **VanArsdel section** of the **Australia** column. You will see a tooltip with the Revenue.
51. **Hover** over **Top Competitors section** of **Australia** column to get the Revenue value.

Let's find a better way to view the data without creating a new visual.

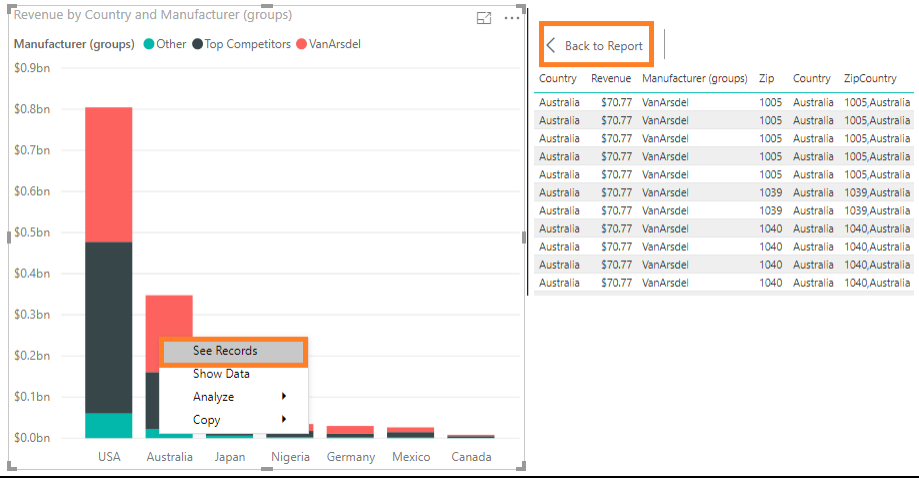


52. Hover over one of the columns and **right click**.
53. Select **Show Data**.
You will be in Focus mode with the chart displayed on top and the data displayed below. It is easy to see that VanArsdel has a big percent of the Australian market.
54. You can use the icon on the top right corner to switch to **vertical layout**. In this layout you will view the chart on the left and data on the right panel.
55. Select **Back to Report** to go back to Report canvas.



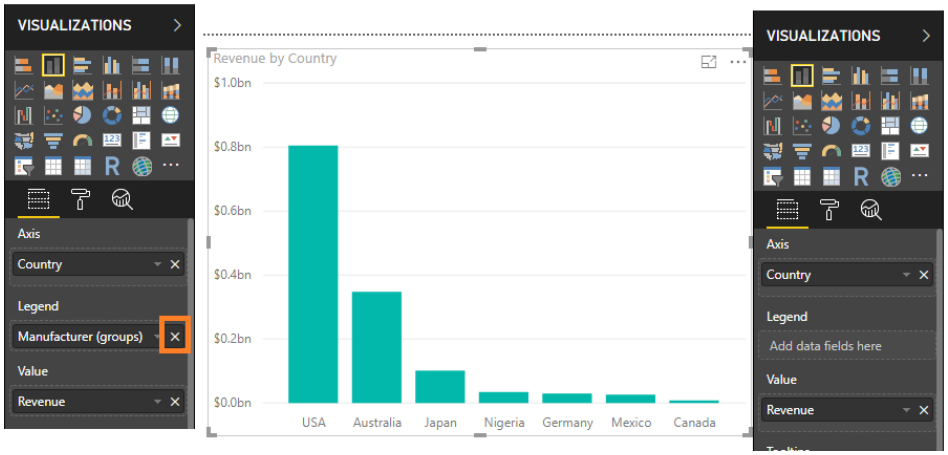
56. There is also an option to see the records. Hover over one of the columns and **right click.**
57. This time select **See Records**.
You will see the detailed records.
58. Select **Back to Report** to go back to Report canvas.

Note: See Records and Show Data options are also available in the ribbon under **Data/Drill** menu option.



Let's remove Manufacturer from the Legend and create a visual which represents Revenue by Manufacturer and check if it will help with any new insights.

59. With the Stacked column chart selected, click on the **X** next to **Manufacturer (groups)** in the **Legend** section. This will remove Manufacturer.



Let's use Ask a Question feature to create Revenue by Manufacturer visual.

60. Click on the white space in the canvas. From the **ribbon,** select **Ask A Question**.

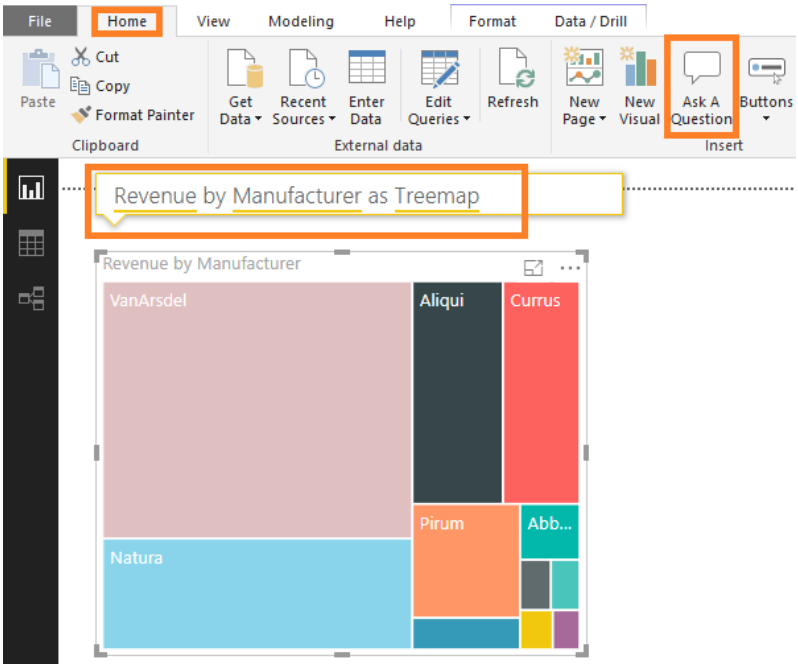
61. In the dialog, **type** **Revenue**. Notice a card visual is created with Total Revenue.

62. **Continue typing**... **Revenue by Manufacturer**. Notice a bar chart is created.

63. **Continue typing**... **Revenue by Manufacturer as Treemap**.

64. **Resize** the visual as needed.

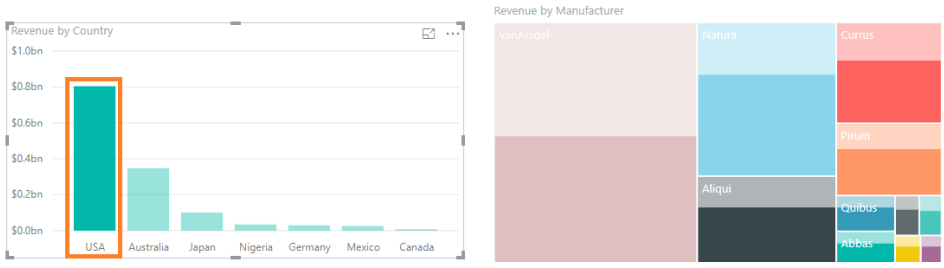
We have Revenue by Manufacturer. Let's figure out the interaction between the Stacked column chart and the Treemap visuals.

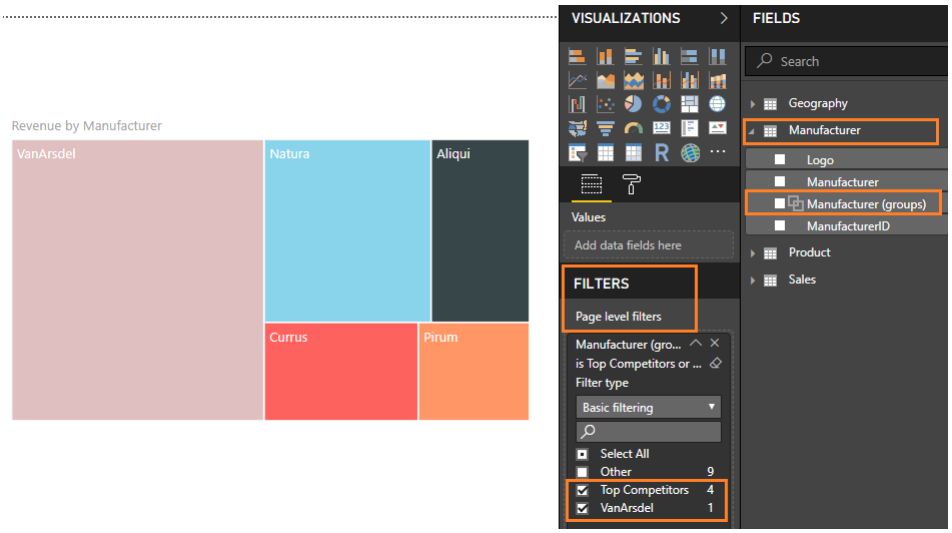
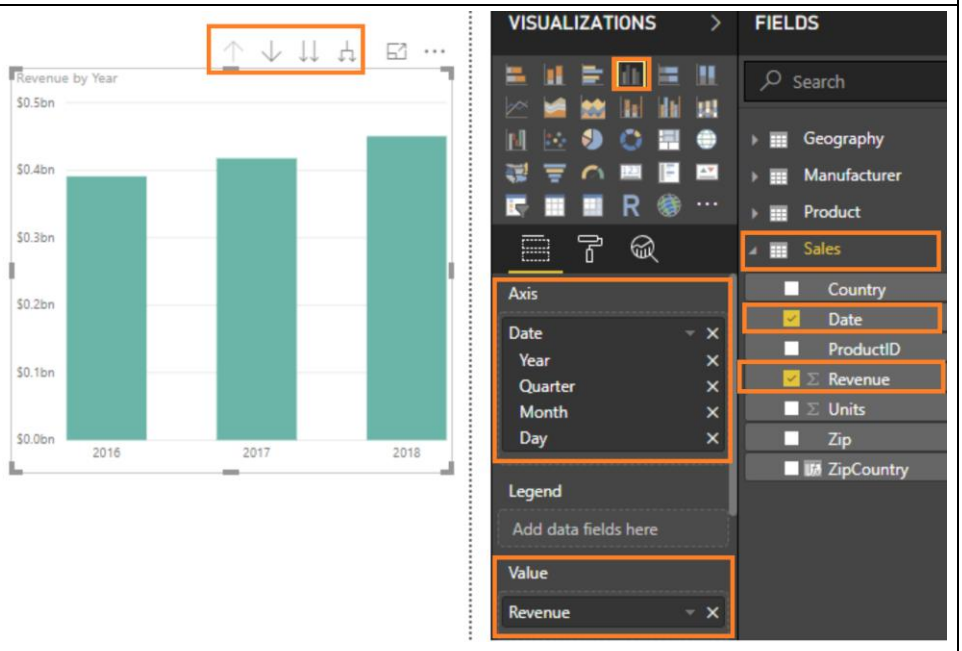


65. Click on **USA** column in the Stacked column chart and notice the Highlighted section of Treemap updates.

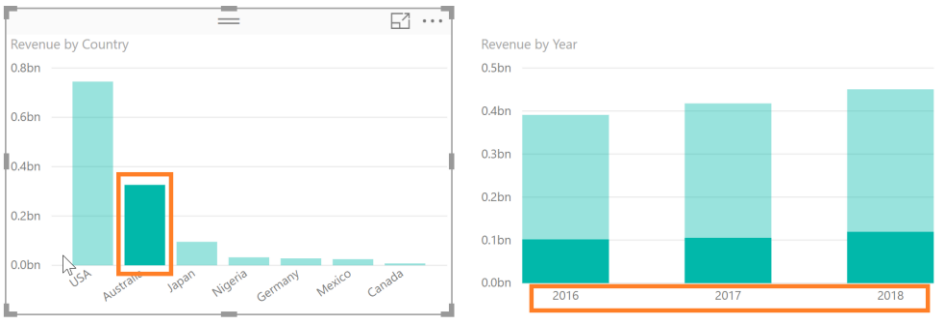
66. Click on **Australia** column in the Stacked Column chart and notice the Highlighted section of Treemap updates.

67. Similarly, select **VanArsdel** in the **Treemap** and notice Stacked column chart is filtered. This confirms that VanArsdel has a big percent of the Australian market.

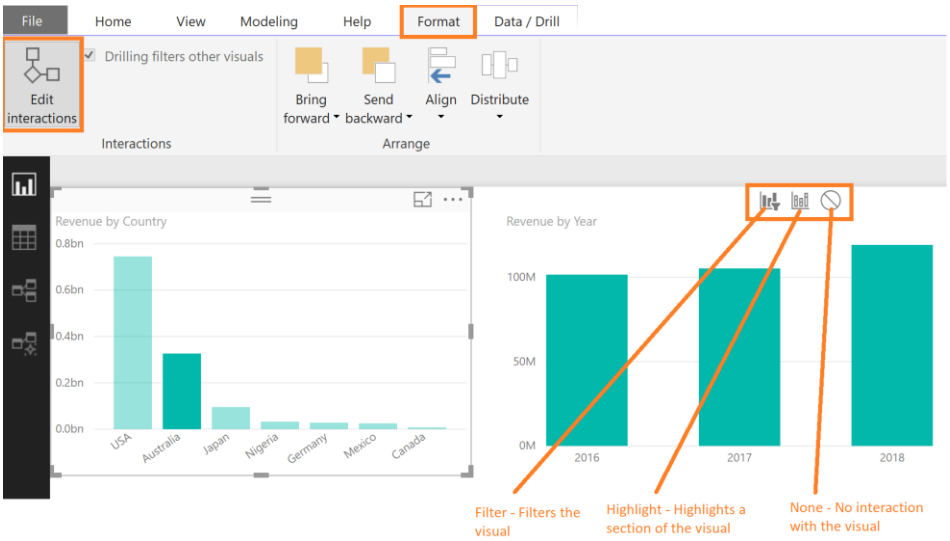


68. To **remove the filter** select VanArsdel again. The interaction between visuals is called **cross filtering**.	
Previously we added Top 5 Visual level filter. Let's add a filter to the Page level, so we are working with the Top Competitors and VanArsdel and filter out the other manufacturers. Page level filters apply to all the visuals on the page whereas Visual level filter applies to a visual. 69. From the **FIELDS** section expand **Manufacturer** table. 70. Drag **Manufacturer (groups)** field to **Page level filters** section under **VISUALIZATIONS** panel. 71. Select **Top Competitors** and **VanArsdel**.	
Let's add a visual that will provide sales information over time. 72. Click on the white space in the canvas. From the **FIELDS** section, expand **Sales** table. 73. Click the checkbox next to the **Date** field. Notice a Date Hierarchy is created. If Date hierarchy is not created, select the arrow next to Date field in the Axis well and select Date Hierarchy. 74. Click the checkbox next to the **Revenue** field. Notice a Clustered column chart is created. Also notice in the **Axis** section, a date hierarchy is created. There are arrows on the top bar of the chart. This is used to navigate through the hierarchy.	

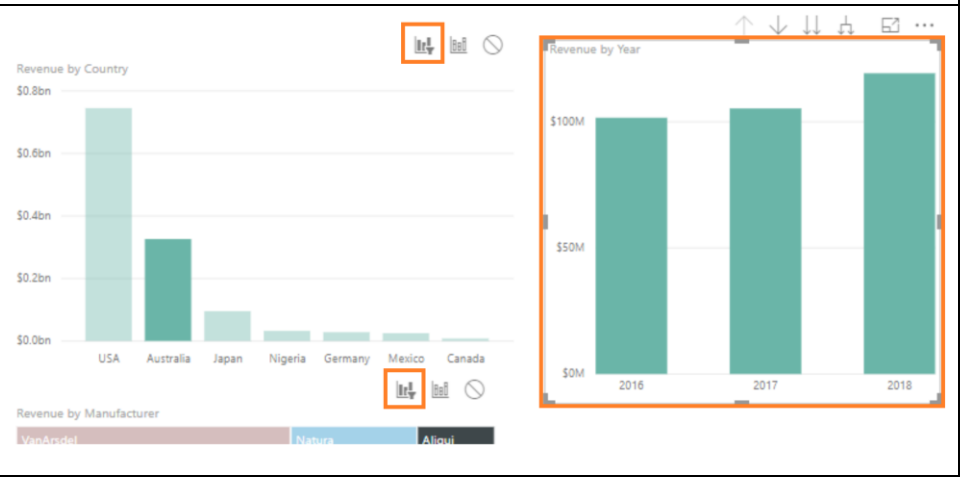
75. Click on **USA** column in the **Revenue by Country** visual. Notice sales is on the upward trend over time.
76. Click on **Australia** column in the **Revenue by Country** visual. Again, the trend is upwards.
77. We see a similar scenario with **Japan** as well.
With the current interaction the visuals are slicing the data. It will be nice to filter data across visuals. This might give us a better perspective. Let's try that.



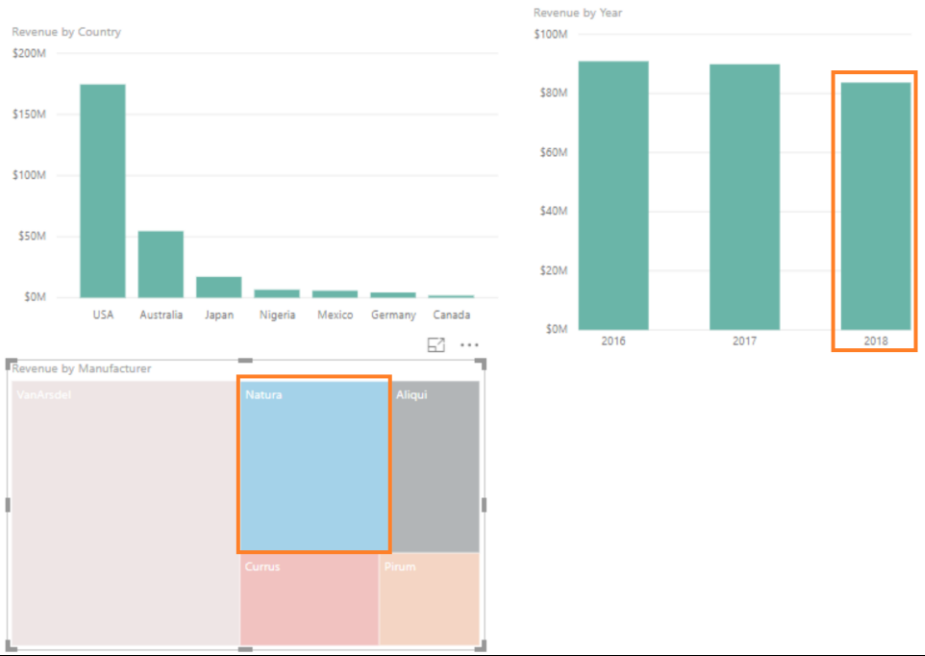
78. Click on **Australia** column in the **Revenue by Country** visual.
79. With the Revenue by Country visual selected, from the ribbon select **Format -> Edit Interactions**.
Notice on the top right of the other two visuals we see new icons with the highlight icon selected.
80. Select **filter icon** for **both visuals**.
Notice now in both Revenue by Year and Revenue by Manufacturer data is filtered for Australia.



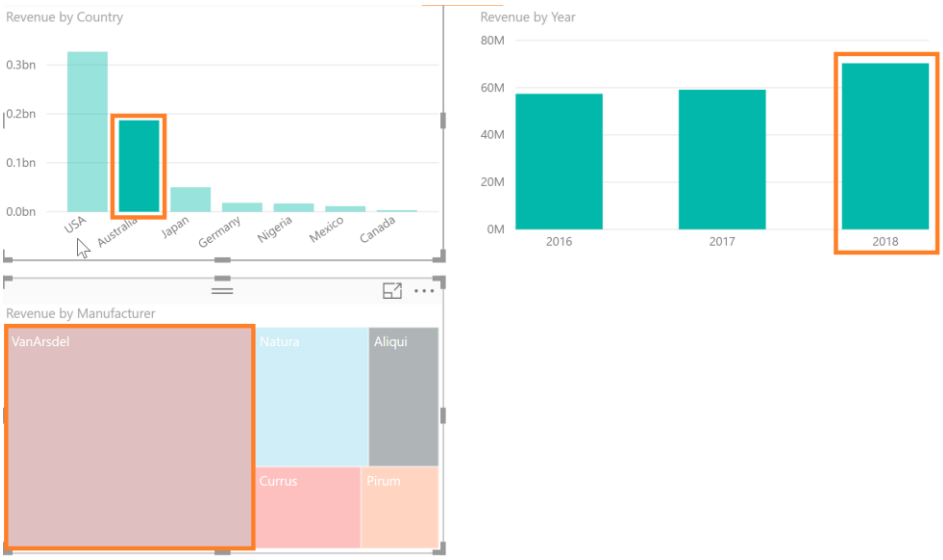
81. Now select **Revenue by Year** visual.
82. Select **filter icon** on the other **two visuals**.
83. Similarly, select **Revenue by Manufacturer** visual and select **filter icon** on the other **two visuals**.
Once you are done, all the visuals should be in filter mode.
84. With the **Revenue by Manufacturer** visual selected, from the ribbon select **Format -> Edit Interactions** to remove the icons.

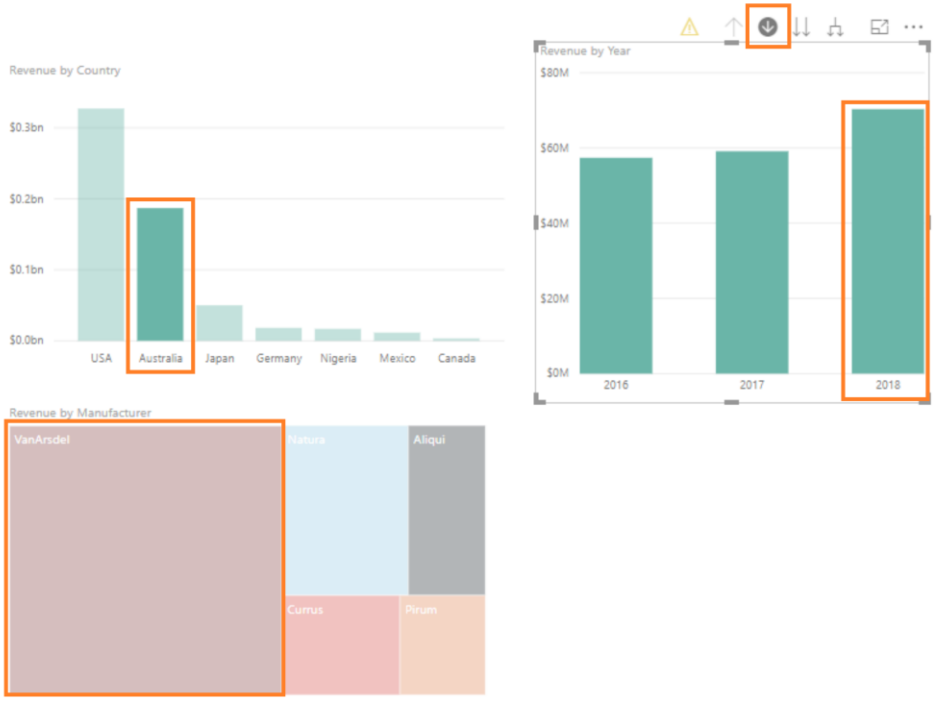
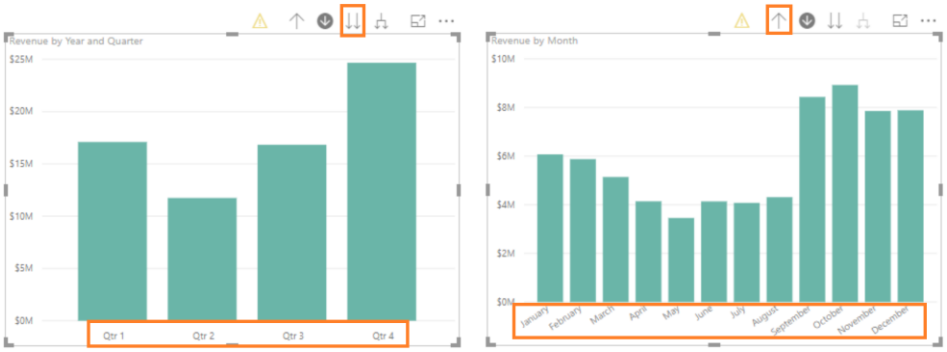


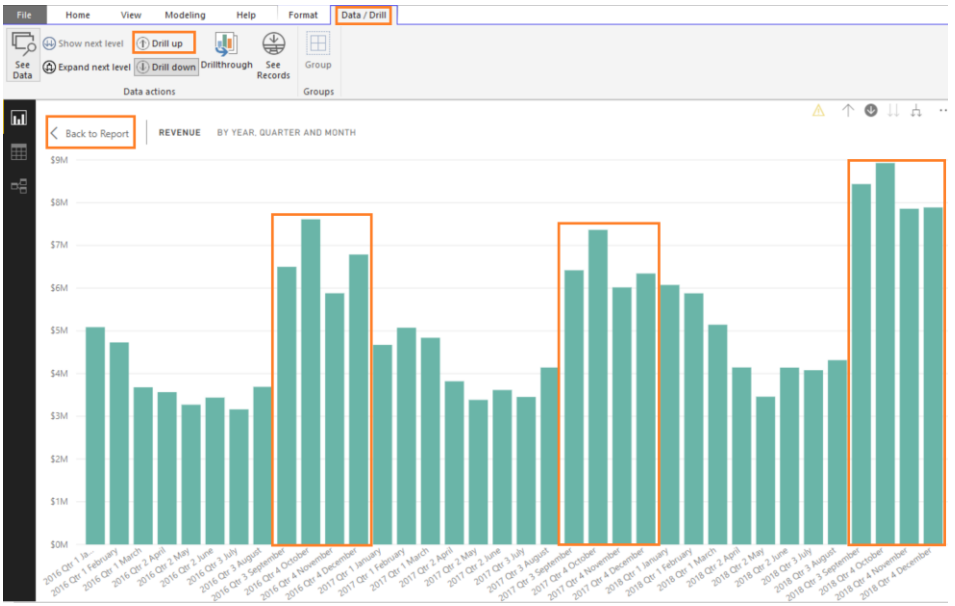
85. Click on **VanArsdel** in the **Revenue by Manufacturer** visual. Notice sales is on an upward trend over time.
86. Click on **Natura** column in the **Revenue by Manufacturer** visual. Notice sales in 2018 for Natura was on a downward trend.
Similarly, you can analyze other manufacturer's performance.



We had already noticed that VanArsdel has a big share of the market in Australia. Let's check how VanArsdel has done over time in Australia.
87. Click on **VanArsdel** in the **Revenue by Manufacturer** visual.
88. **Ctrl+Click Australia column in Revenue by Country** visual. Now we have filtered the charts by both VanArsdel and Australia. We see a spike in 2018 sales for VanArsdel in Australia.
89. Let's see what's happening in USA. **Click USA column in Revenue by Country** visual.
90. **Ctrl+Click** on **VanArsdel** in the **Revenue by Manufacturer** visual. Now we have filtered the charts by both VanArsdel and USA. We see a steady growth.
Similarly, we can analyze data for different countries, manufactures and time frame.



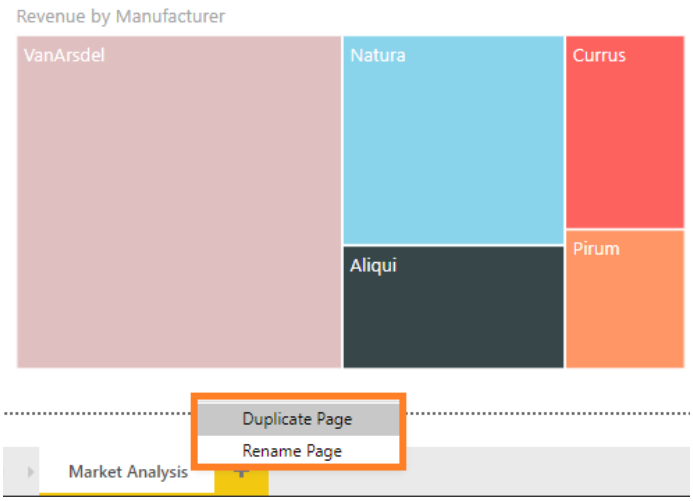
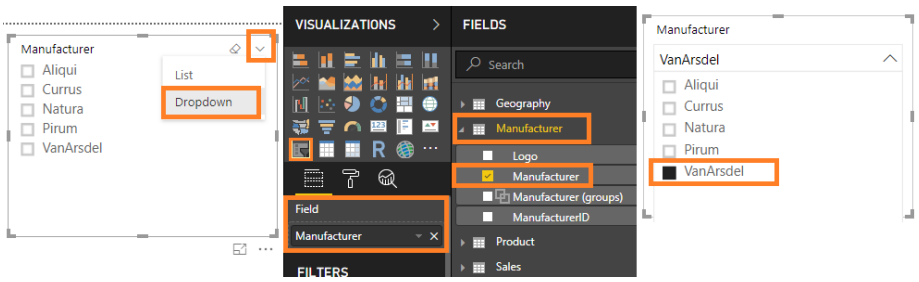
We are intrigued by the spike in 2018 for VanArsdel in Australia. Let's investigate further. 91. Click on **VanArsdel** in the **Revenue by Manufacturer** visual. 92. **Ctrl+Click Australia column in Revenue by Country** visual 93. Select the **down arrow** on the **top right** corner of the **Revenue by Year** visual. This enables drill down capability. 94. Select **2018 column in Revenue by Year** visual. Notice you have drilled down to quarter level of 2018. There is a big spike in the 4th quarter. Interesting let's dig further…	
95. Click on the **double arrow icon** on the **top right** of **Revenue by Year** visual. This drills down to the **next level of the hierarchy** which is month. Looks like sales picked up in September and October and is holding steady since then. Ok this is interesting. Now is this a yearly trend. Let's check? 96. Click on the **up arrow icon** on the **top right** of **Revenue by Year** visual to drill up to **Quarter level**. 97. Click on the **drill up icon** again to go up to **Year level**.	
98. Click on the **split arrow icon** on the **top right** of **Revenue by Year** visual. This expands down to the **next level of the hierarchy** which is quarter for all the years. Notice 4th quarter sales have always been high but in 2018 there is a bigger spike in the 4th quarter. 99. Let's expand down to the month level. Click on the **split arrow icon** on the **top right** of **Revenue by Year** visual. This expands down to the **next**	

level of the hierarchy which is month for all the years. There is a lot of information on the visual and we must scroll left and right to compare. 100. Click on **focus mode icon** on the top right of **Revenue by Year** visual.	
Now Revenue by Year takes over the complete canvas. Notice that sales have typically been high that last 4 months of the year. It confirms the spike in 2018. Drill up/down functionality is available in the ribbon as well. 101. From the **ribbon**, select **Data/Drill -> Drill up** to move to Quarter level. 102. From the **ribbon**, select **Data/Drill -> Drill up** to move to Year level. 103. Click on **Back to Report** on the top left corner of the visual to go back to report canvas. 104. Click on **VanArsdel** in the **Revenue by Manufacturer** visual to remove filters.	

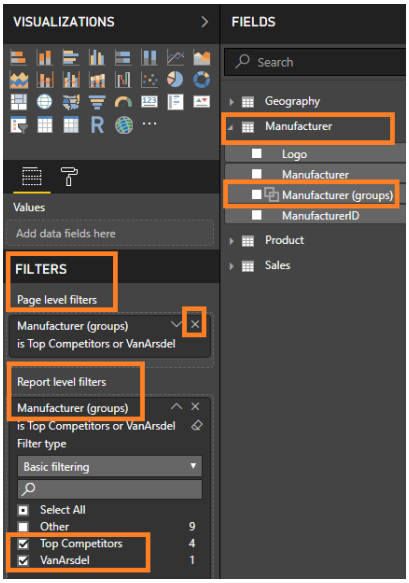
Power BI Desktop – Data Exploration Continued

In this section, you will continue to explore the data. You will investigate to see if a product segment has an impact on sales. At the end of the section, you will find that one of the reasons for the spike in sales in Australia for the year 2018 is 158% growth of product Maximus UE-04.	

Category	Revenue	%GT Revenue	PY Sales	% Growth
Urban	**27,736,358.90**	**100.00%**	**$17,127,448.59**	**61.94%**
Extreme	**27,736,358.90**	**100.00%**	**$17,127,448.59**	**61.94%**
Maximus UE-04	1,853,290.06	6.68%	$719,544.32	157.56%
Maximus UE-11	1,391,341.14	5.02%	$655,603.83	112.22%
Maximus UE-01	1,223,866.67	4.41%	$625,136.19	95.78%
Maximus UE-09	1,219,720.64	4.40%	$625,385.57	95.03%
Maximus UE-06	1,224,085.85	4.41%	$628,843.48	94.66%
Maximus UE-08	1,212,186.36	4.37%	$625,065.32	93.93%
Maximus UE-10	1,206,183.41	4.35%	$625,327.82	92.89%
Maximus UE-02	1,201,455.05	4.33%	$625,726.55	92.01%
Maximus UE-07	1,193,947.34	4.30%	$625,212.32	90.97%
Maximus UE-05	1,193,716.49	4.30%	$625,204.44	90.93%
Maximus UE-21	1,595,389.64	5.75%	$847,570.82	88.23%
Maximus UE-03	1,208,295.95	4.36%	$672,473.87	79.68%
Maximus UE-17	1,234,409.66	4.45%	$867,544.76	42.29%
Maximus UE-13	1,125,044.29	4.06%	$830,943.17	35.39%
Maximus UE-12	1,099,153.49	3.96%	$823,227.09	33.52%
Maximus UE-15	1,071,530.51	3.86%	$804,958.14	33.12%
Maximus UE-14	1,090,740.37	3.93%	$823,227.09	32.50%
Maximus UE-20	1,065,344.28	3.84%	$823,494.84	29.37%
Maximus UE-23	1,063,916.07	3.84%	$823,822.70	29.14%
Maximus UE-19	1,051,973.74	3.79%	$823,531.59	27.74%
Maximus UE-22	1,085,905.59	3.92%	$857,815.93	26.59%
Maximus UE-18	1,039,214.14	3.75%	$823,494.84	26.20%
Maximus UE-16	1,085,648.18	3.91%	$924,293.95	17.46%
Total	**27,736,358.90**	**100.00%**	**$17,127,448.59**	**61.94%**

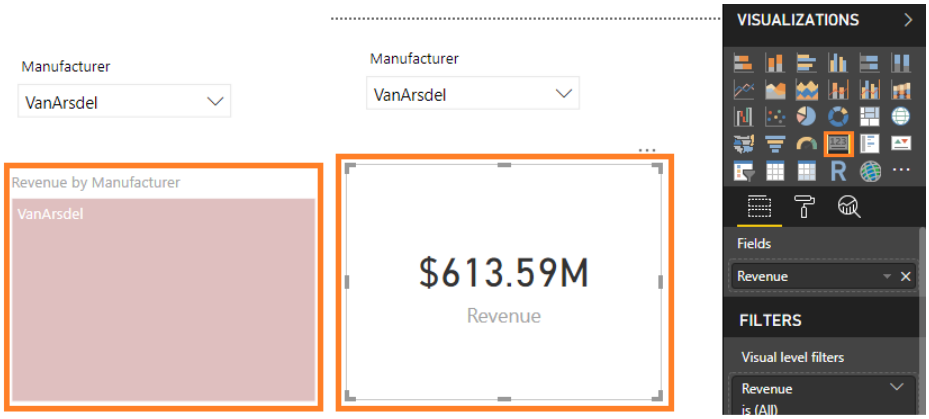
Let's continue to investigate our findings of VanArsdel's sales spike in 2018 in Australia. We will start by adding a new page. 1. Right click on **Page 1** (bottom left). 2. Select **Rename Page**. Rename the page to **Market Analysis**. 3. Right click on Market Analysis page. This time pick **Duplicate Page**. We are duplicating the page since we can reuse some of the visuals. A new page is created, and you will be navigated to this new page.	
Let's add a slicer so we can filter manufacturers. 4. Click on the white space in the canvas. From the **FIELDS** section, expand **Manufacturer table** and click the checkbox next to **Manufacturer** field**.** 5. From the **VISUALIZATIONS** section select **Slicer** visual. 6. You will see a list of Manufacturers. **Select VanArsdel** and notice all the visuals are filtered based on your selection. 7. **Hover** over the top right corner of the visual and click on the **down arrow**. Notice you have the option to change the slicer from a list to a drop down. 8. Select **Dropdown**. 9. Select **VanArsdel** from the dropdown.	

10. In the **VISUALIZATIONS** panel, scroll down to **FILTERS** section.
Notice the Page level filters for Manufacturers. Since we have two pages and we want Manufacturer filter to apply to both pages it makes sense to move it to Report level filters.
11. In the **FIELDS** section, expand **Manufacturer** table.
12. Drag **Manufacturer (groups)** field to **Report level filters**.
13. Select **Top Competitors** and **VanArsdel**.
14. Click on "**X**" next to **Manufacturers** in **Page level filters**.



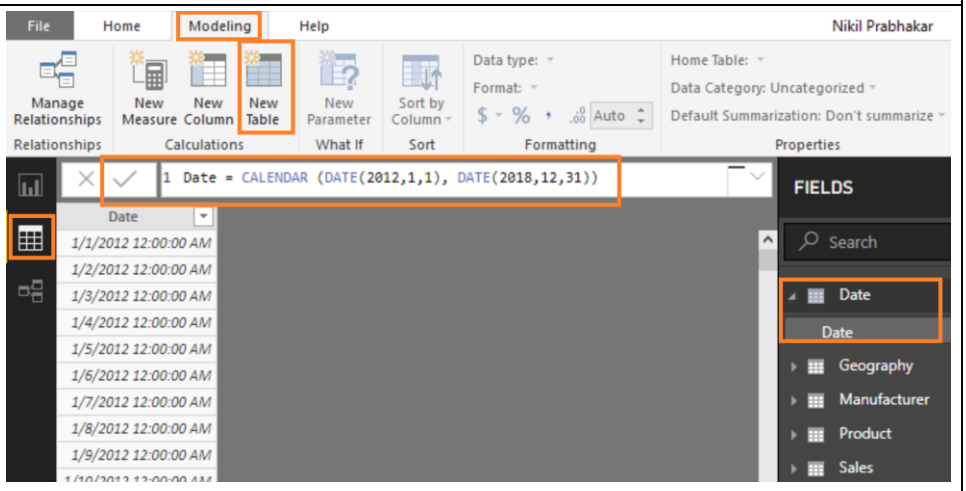
We use the Manufacturer slicer to analyze one manufacturer at a time. Notice when we do this, Revenue by Manufacturer Treemap visual is not the best representation of the data. Let's change it.
15. Select **Revenue by Manufacturer Treemap** visual.
16. From the **VISUALIZATIONS** section, select **Card** visual.

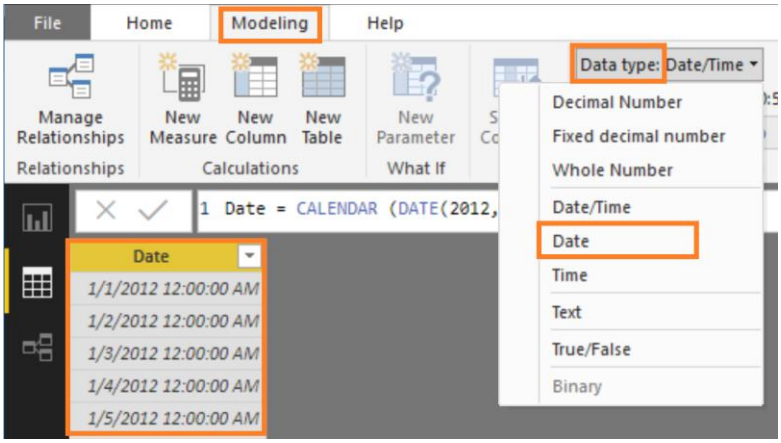
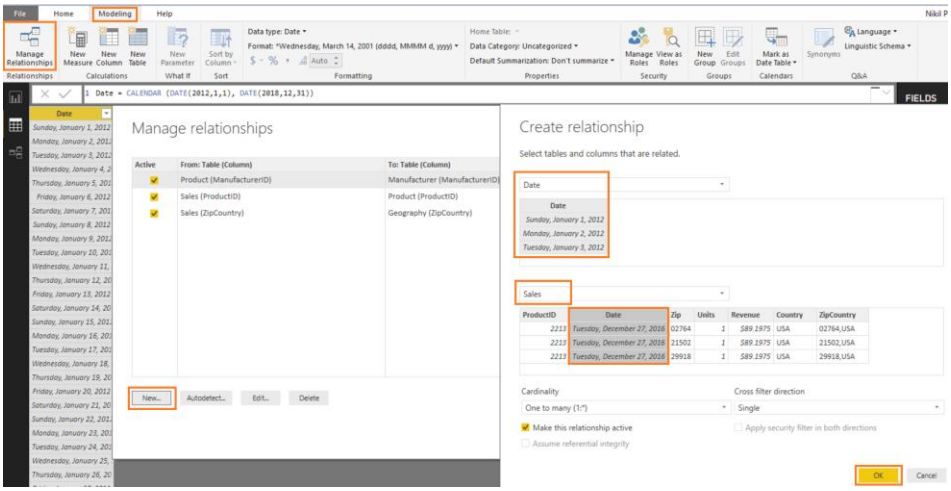
The card visual will give us the Revenue as we filter and cross filter the visuals.

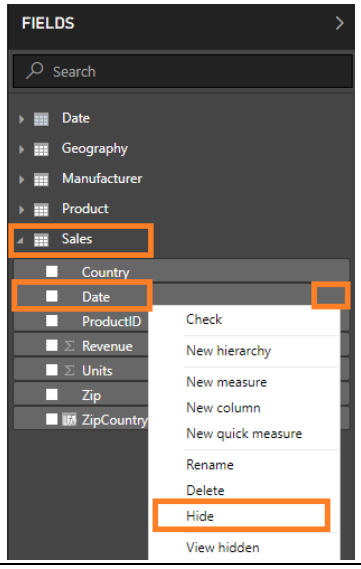


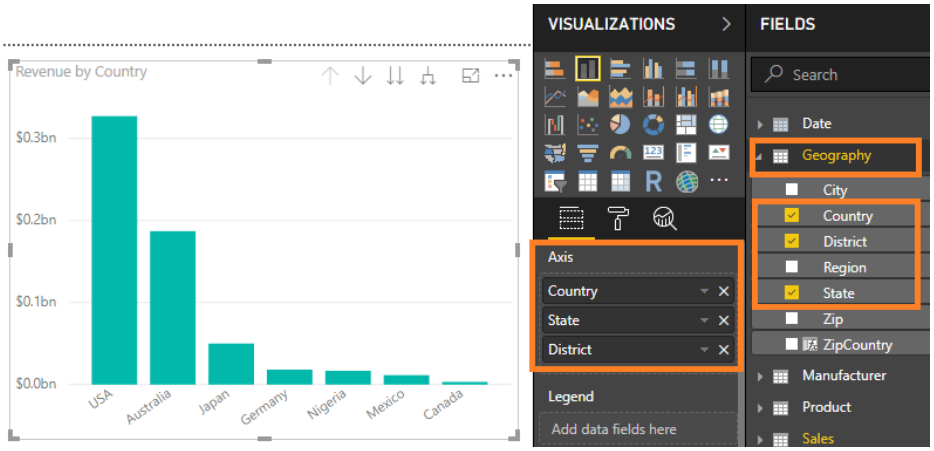
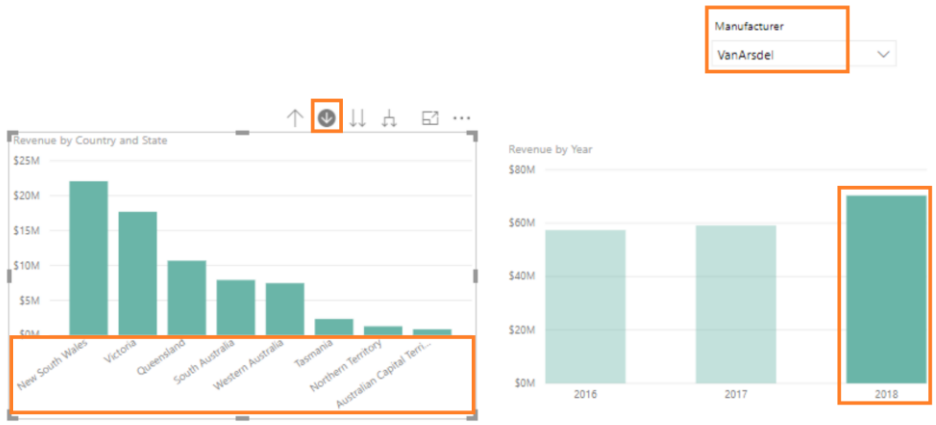
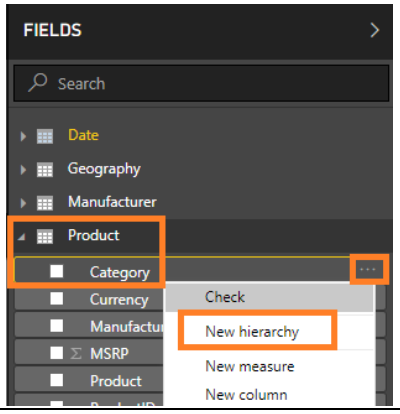
Notice all key dimensions/characteristics is in its own table with the related attributes **except date**. E.g. Product attributes are in Product table and we created a relationship between Product and Sales.
It is good practice to have dimensions in different tables. In the future if we need to add date attributes like Week number, Day of Week, Holiday, etc, we need to have a Date table. Let's create Date table.

17. Navigate to Data view by clicking on the **Data** icon on the left panel.
18. From the ribbon select **Modeling -> New Table**.



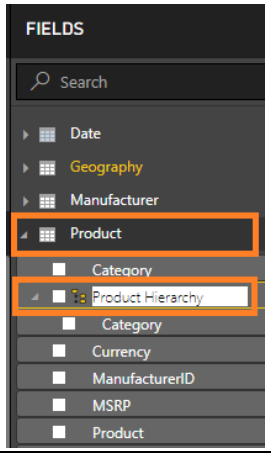
Notice a new table is created in the FIELDS section on the right and formula bar opens. 19. Enter **Date =CALENDAR (DATE(2012,1,1), DATE(2018,12,31))** in the formula bar and click on the **check mark**. A Date table with a Date column is created. We are using 2 DAX functions: **CALENDAR** function which takes the start and end data. **DATE** function which takes year, month and date fields. We are creating Date from 2012 to 2018 since our dataset has data for those years. We can add more fields to this table like Year, Month, Week etc. by using DAX functions.	
Notice Date field is of type Date/Time. Let's change it to data type Date. 20. Select the **Date** field in the **Date** table. 21. From the ribbon, select **Modeling -> Data type -> Date**.	
Next, we need to create a relationship between the newly created Date table and Sales table. Previously we used the visual drag and drop feature to create a relationship. This time around let's use a different option. 22. From the ribbon, select **Modeling -> Manage Relationships**. 23. Manage Relationships dialog opens. Select **New** button. 24. Create relationship dialog opens. Select **Date** from the top dropdown. 25. Select **Sales** from the second dropdown.	

26. Highlight **Date** fields from both the tables. 27. Select **OK** to close Create relationship dialog. 28. Select **Close** to close Manage relationships dialog.	
29. Navigate to Report view by clicking on the **Report** icon on the left panel. Notice Revenue by Date chart looks different. Let's fix it. 30. Select **Revenue by Date** visual. 31. From the **Axis** click on "**X**" to remove the **Date** field. 32. From the **FIELDS** section expand **Date** table. 33. Drag **Date** field to **Axis** section. Notice with the new Date field behavior is like earlier.	
There are two Date fields, it might get confusing to figure out which to use. Let's hide the Date field in Sales table. 34. From the **FIELDS** section, expand **Sales** table. 35. Click on the **ellipsis** next to **Date** field. 36. Select **Hide**. This hides Date field in the reports view. We have the option to view hidden fields and unhide fields as needed. **Note**: It is best practice to hide fields that are not used in reports like ZipCountry, ProductID, ManufacturerID.	

Let's get back to our data story, Australia, VanArsdel and 2018 – remember 😊. Let's check if the spike occurred in a specific region in Australia. 37. Select **Revenue by Country** visual. 38. In the **FIELDS** section, expand **Geography** table. 39. Drag **State** field below **Country** in the **Axis** section. 40. Drag **District** field below **State** in the **Axis** section. We just created a hierarchy.	
41. Make sure **VanArsdel** is selected in the Manufacturer **slicer**. 42. **Enable Drill mode** by selecting down arrow on the top right corner of Revenue by Country visual. 43. Select **Australia** to drill down to **State level**. 44. From **Revenue by Year** visual select **2018** and notice Revenue by Country and State visual. 45. From Revenue by Year visual select **2018** and notice Revenue by Country and State visual. 46. Similarly, select **2016**. We don't see a spike in a specific state. 47. Select **2016** again to remove year filter. 48. **Drill up** to **country** level.	
Let's analyze by Product to figure out what's happening there. Before we start with that let's create a Product Hierarchy. This way we don't have to drag multiple fields to the visual. 49. From the **FIELDS** section, expand **Product** table. 50. Click on the **ellipsis** next to **Category**. 51. Select **New Hierarchy**.	

Notice a new field called Category Hierarchy is created in the Product table.

52. **Double click** on **Category Hierarchy** and **rename** it to **Product Hierarchy**.



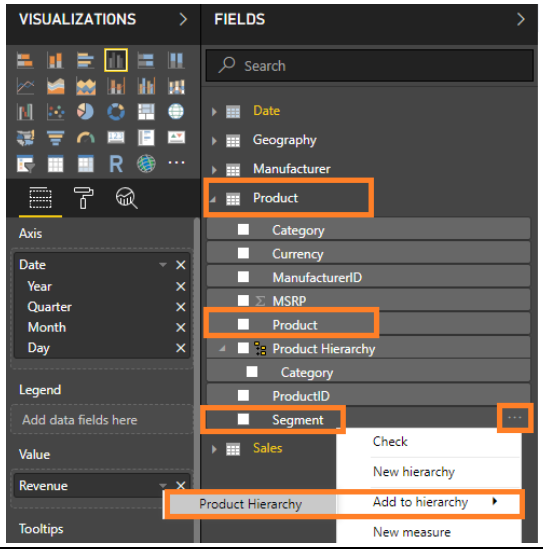
53. Click on the **ellipsis** next to **Segment**.

54. Select **Add to Hierarchy -> Product Hierarchy**.

55. Click on the **ellipsis** next to **Product**.

56. Select **Add to Hierarchy -> Product Hierarchy**.

We have created a Product Hierarchy which is Category -> Segment -> Product.



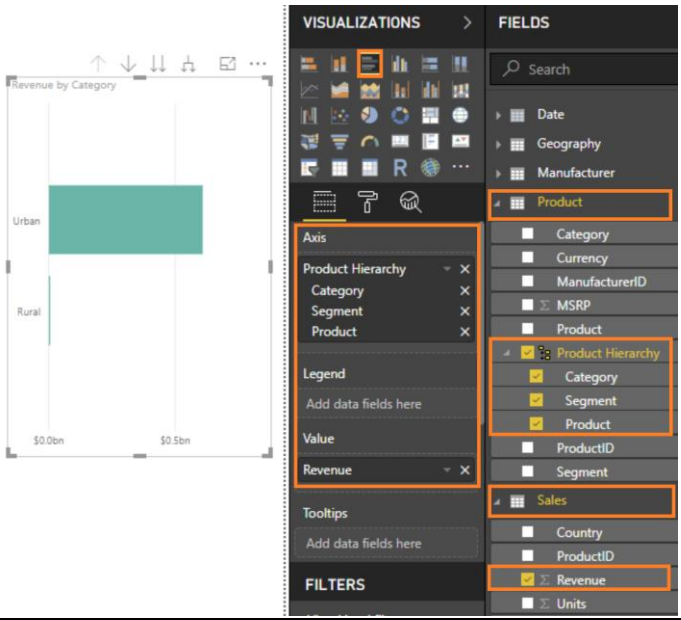
57. Click on the white space in the canvas. From the **VISUALIZATIONS** section select **Clustered bar chart**.

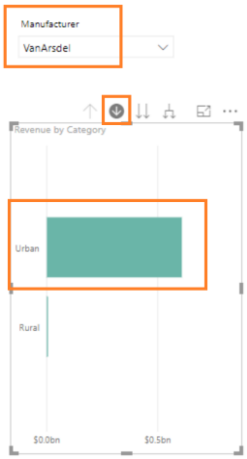
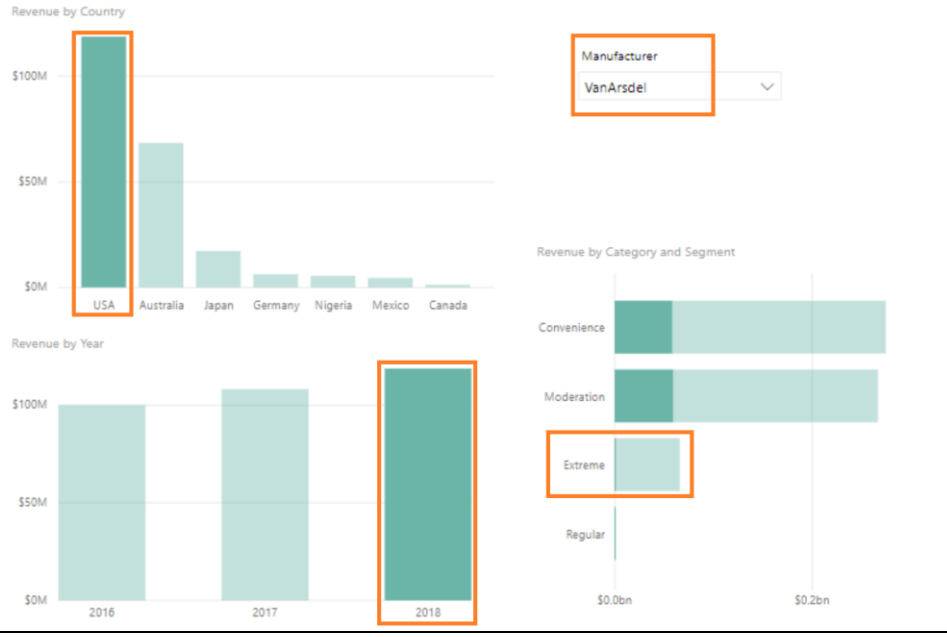
58. From the **FIELDS** section, expand **Product** table.

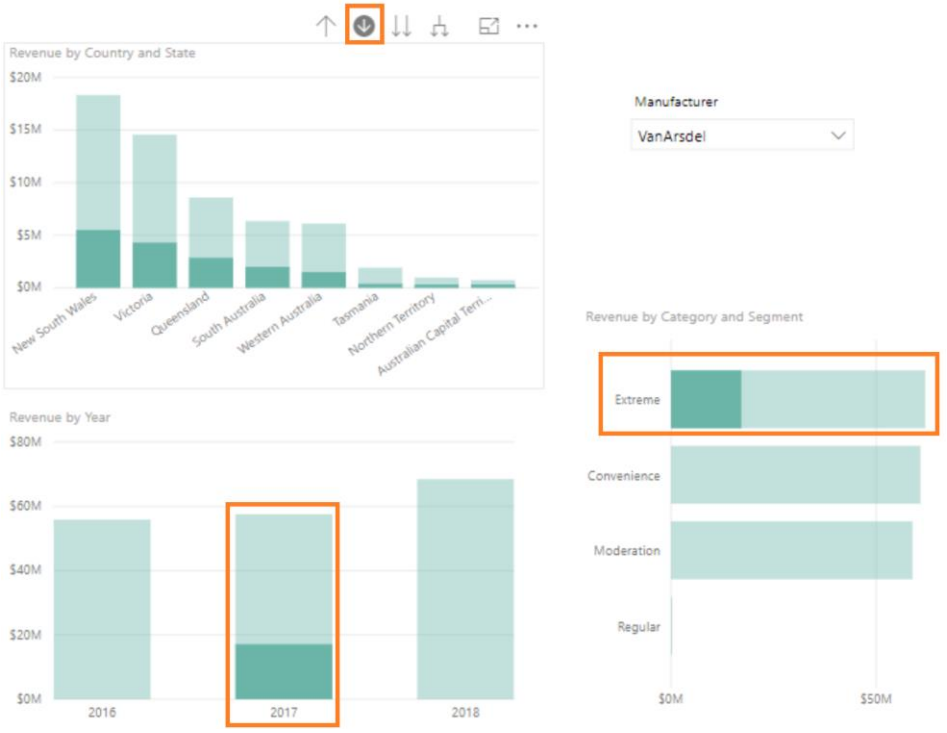
59. Click the checkbox next to **Product Hierarchy**. Notice complete hierarchy is selected.

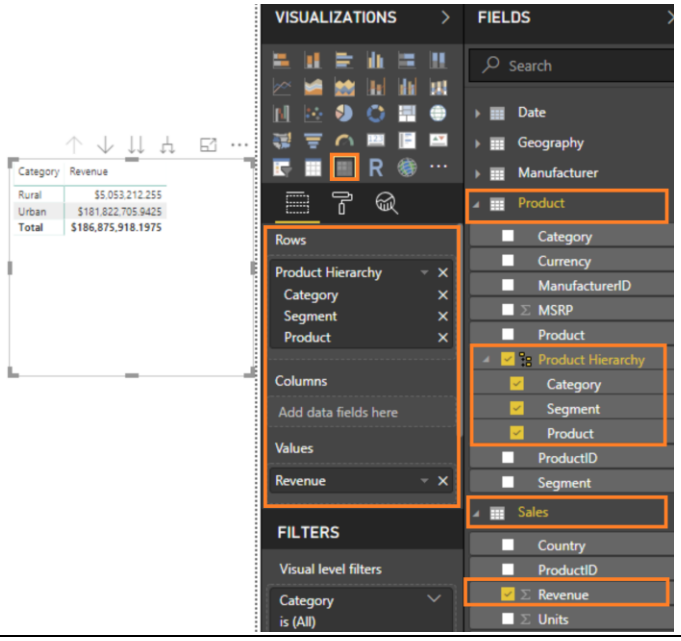
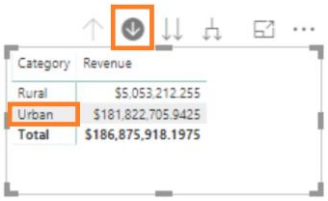
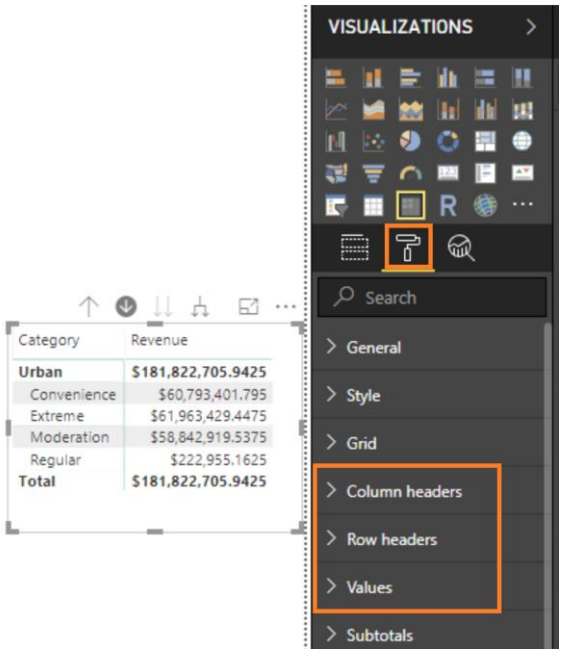
60. From the **FIELDS** section, expand **Sales** table.

61. Click the checkbox next to **Revenue** field.



Note: Make sure you have VanArsdel selected in the slicer. We see that VanArsdel has a presence in the Urban category and a small presence in the Rural category. 62. **Drill down Urban category** (yes you are an expert drilling up and down hierarchy 😊). If not, select the **down arrow** on the top right corner of the visual. 63. Select the **Urban** row to drill down to Urban segments.	
64. In **Revenue by Country** visual make sure **drill down mode is disabled**. 65. Select **USA**. Notice that Convenience and Moderation are the segments with most sales. 66. In **Revenue by Country** visual select **Japan**. Notice that again Convenience and Moderation are the segments with most sales. 67. In **Revenue by Country** visual select **Australia**. Notice that sales in Extreme segment is comparable to Convenience and Moderation. Let's dive into Extreme segment and investigate further.	
68. In **Revenue by Country** visual select **USA.** 69. **Ctrl+Select 2018** from Revenue by Year visual. Notice Convenience and Moderation are the key segments in USA.	

70. In **Revenue by Country** visual select **Australia.** 71. **Ctrl+Select 2018** from Revenue by Year visual. Notice sales in Extreme category is higher than Convenience and Moderation segments. We need to investigate further…	
72. Select the **down arrow** on the top right corner of **Revenue by Country** visual to enable drill model. 73. Select **Australia** to **drill down** to **State** level. 74. Select **2018** in Revenue by Year visual. 75. **Remove drill mode** from Revenue by Category visual. 76. **Ctrl+Select Extreme** Segment in Revenue by Category and Segment visual. 77. Select **2017** in Revenue by Year visual. 78. **Ctrl+Select Extrem**e Segment in Revenue by Category and Segment visual. There is no significant spike by State. 79. Select **Extreme** again to remove cross filtering between visuals. 80. **Drill up to Category level** in Revenue by Category visual.	

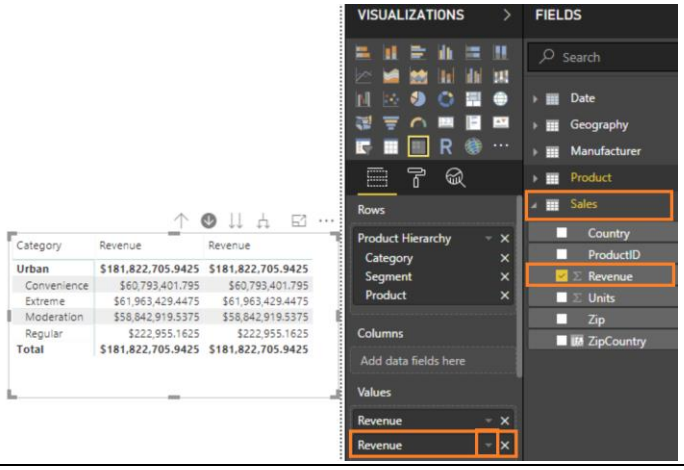
Let's add a matrix visual so we can view data in rows and columns. We can apply conditional formatting to the matrix visual to highlight outliers. 81. Click on the white space in the canvas. From the **VISUALIZATIONS** section, select **Matrix** visual. 82. From **FIELDS** section expand **Product** table. 83. Drag and drop **Product Hierarchy** field to **Rows** section. 84. From **FIELDS** section expand **Sales** table. 85. Drag and drop **Revenue** to **Values** section.	
86. **Enable drill mode** in the **matrix** by selecting the down arrow on the top right corner of the visual. 87. Select **Urban** row to drill down.	
Well the text is too small, let's format the matrix and make it more readable. 88. In the **VISUALIZATIONS** panel, select the **paint roller** icon to format the visual. 89. **Scroll down** and expand **Values** section. 90. **Scroll down** and increase the **Text size** to **10**. Notice there are a lot of formatting options. Feel free to explore them. 91. **Scroll up** and expand **Column headers** section**.** 92. **Scroll to** Text size and increase it to **10**. 93. **Scroll up** and expand **Row headers** section**.** 94. **Scroll to** Text size and increase it to **10**.	

Let's add percent of total field. This will give us a better perspective.

95. From **FIELDS** section expand Sales table.

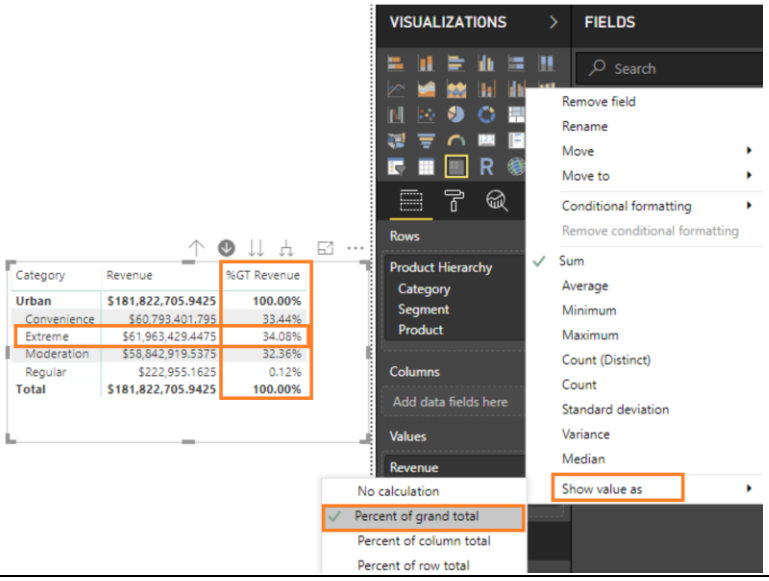
96. Drag **Revenue** field below the existing Revenue field in **Values** section.

97. Select the **arrow** next to the newly added **Revenue** field.



98. From the dialog select **Show value as -> Percent of grand total**.

We see that in Australia, Extreme segment has highest market share. Let's check across time if this is true.



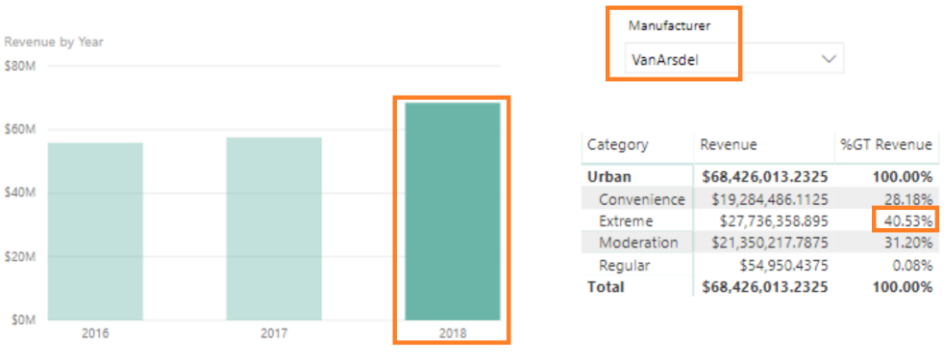
99. In the **Revenue by Year** visual select **2016** column. Notice Extreme segment has around **30%** of the grand total.

100. In the **Revenue by Year** visual select **2017** column. Notice Extreme segment has around **30%** of the grand total.

101. In the **Revenue by Year** visual select **2018** column. Notice Extreme segment has around **40%** of the grand total.

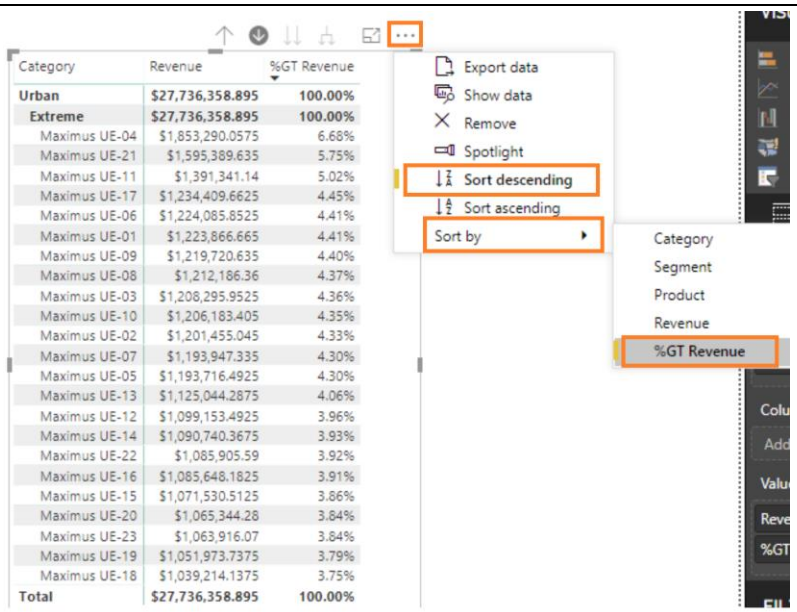
102. In the **Revenue by Year** visual select **2018** column to remove the filter.

Let's drill down Extreme Segment and figure out if a Product stands out.



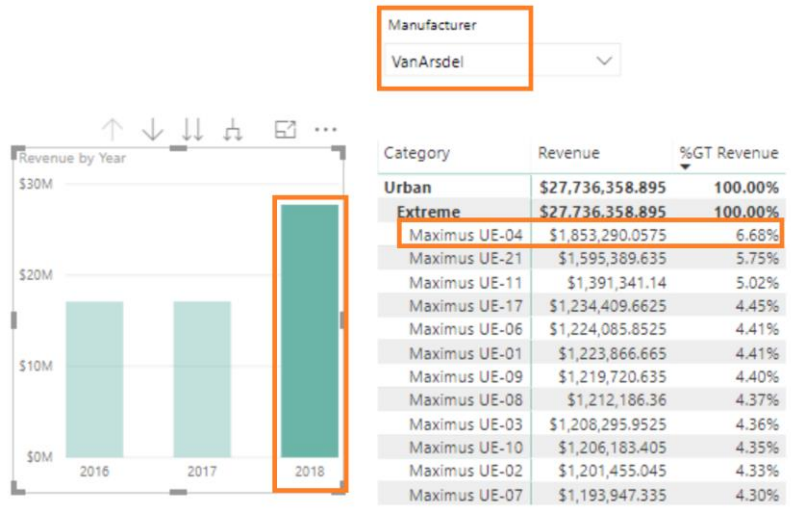
103. In the **matrix** visual select **Extreme** row to **drill down** to Product level.
104. **Resize** the visual as needed.
105. **Hover** over matrix visual and select the **ellipsis** on the top right corner.
106. Select **Sort By % GT Revenue** and **Sort Descending**.

We see the top Products. Let's analyze top Products over time.



Category	Revenue	%GT Revenue
Urban	$27,736,358.895	100.00%
Extreme	$27,736,358.895	100.00%
Maximus UE-04	$1,853,290.0575	6.68%
Maximus UE-21	$1,595,389.635	5.75%
Maximus UE-11	$1,391,341.14	5.02%
Maximus UE-17	$1,234,409.6625	4.45%
Maximus UE-06	$1,224,085.8525	4.41%
Maximus UE-01	$1,223,866.665	4.41%
Maximus UE-09	$1,219,720.635	4.40%
Maximus UE-08	$1,212,186.36	4.37%
Maximus UE-03	$1,208,295.9525	4.36%
Maximus UE-10	$1,206,183.405	4.35%
Maximus UE-02	$1,201,455.045	4.33%
Maximus UE-07	$1,193,947.335	4.30%
Maximus UE-05	$1,193,716.4925	4.30%
Maximus UE-13	$1,125,044.2875	4.06%
Maximus UE-12	$1,099,153.4925	3.96%
Maximus UE-14	$1,090,740.3675	3.93%
Maximus UE-22	$1,085,905.59	3.92%
Maximus UE-16	$1,085,648.1825	3.91%
Maximus UE-15	$1,071,530.5125	3.86%
Maximus UE-20	$1,065,344.28	3.84%
Maximus UE-23	$1,063,916.07	3.84%
Maximus UE-19	$1,051,973.7375	3.79%
Maximus UE-18	$1,039,214.1375	3.75%
Total	$27,736,358.895	100.00%

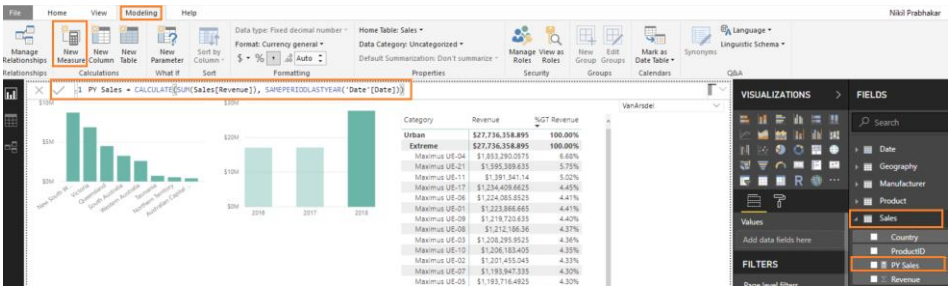
107. In the **Revenue by Year** visual select **2016** column. Notice Maximus UE-04 and 11 are the top products.
108. In the **Revenue by Year** visual select **2017** column. Notice Maximus UE-16 and 17 are the top products.
109. In the **Revenue by Year** visual select **2018** column. Notice Maximus UE-04 and 21 are the top products. And Product 04 has nearly 7% of the grand total. Product 04 has a big spike.
110. In the **Revenue by Year** visual select **2018** column to remove the filter.



Category	Revenue	%GT Revenue
Urban	$27,736,358.895	100.00%
Extreme	$27,736,358.895	100.00%
Maximus UE-04	$1,853,290.0575	6.68%
Maximus UE-21	$1,595,389.635	5.75%
Maximus UE-11	$1,391,341.14	5.02%
Maximus UE-17	$1,234,409.6625	4.45%
Maximus UE-06	$1,224,085.8525	4.41%
Maximus UE-01	$1,223,866.665	4.41%
Maximus UE-09	$1,219,720.635	4.40%
Maximus UE-08	$1,212,186.36	4.37%
Maximus UE-03	$1,208,295.9525	4.36%
Maximus UE-10	$1,206,183.405	4.35%
Maximus UE-02	$1,201,455.045	4.33%
Maximus UE-07	$1,193,947.335	4.30%

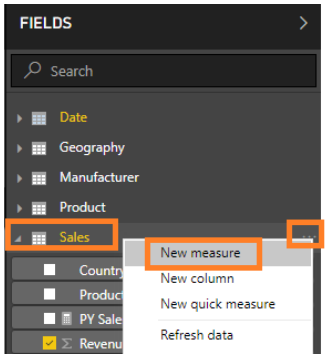
Earlier we created a calculated column (ZipCountry). Let's create % Growth measure so we can compare sales over time. We are going to do this in two steps.

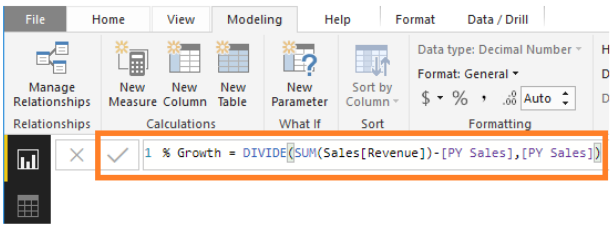
But first, what's the difference between measure and calculated column.
Calculated column is evaluated row by row. We extend a table by adding calculated columns.
Measure is used when we want to aggregate values from many rows in a table.



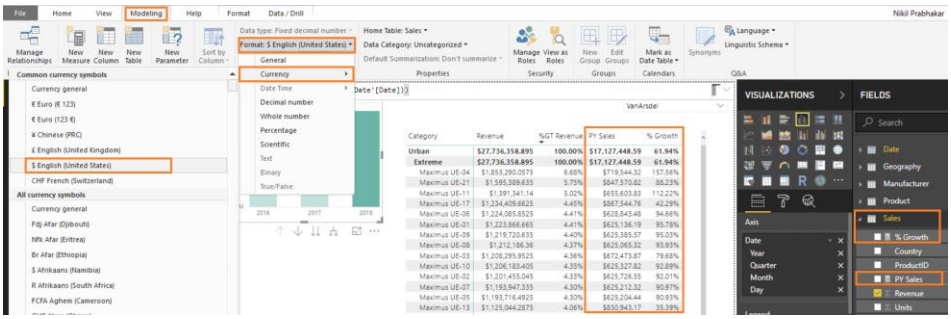
111. In the **FIELDS** section, select **Sales** table.
112. From the ribbon, select **Modeling -> New Measure**. Formula bar opens.
113. Enter **PY Sales = CALCULATE(SUM(Sales[Revenue]), SAMEPERIODLASTYEAR('Date'[Date])**
114. Select the **check mark** next to the formula bar. You will see PY Sales measure in Sales table.

Let's create another measure.
115. In the **FIELDS** section, hover over **Sales** table.
116. Click on the **ellipsis** on the right corner.
117. Select **New Measure** from the dialog. Formula bar opens.
118. Enter **% Growth = DIVIDE(SUM(Sales[Revenue])-[PY Sales],[PY Sales])**
119. Select the **check mark** next to the formula bar. You will see % Growth measure in Sales table.

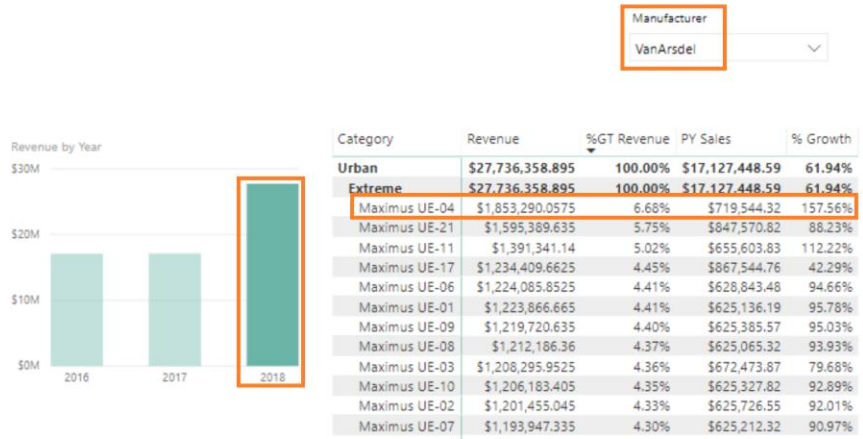




120. Select the **matrix** visual.
121. In the **FIELDS** section, expand **Sales** table.
122. Click the checkbox next to the newly created **PY Sales and % Growth** measures.
Notice these fields need to be formatted.
123. From the **FIELDS** section, click the checkbox next to **% Growth** field.
124. From the ribbon select **Modeling -> Format -> Percentage**
125. Similarly, from the **FIELDS** section, click the checkbox next to **PY Sales** field.
126. From the ribbon select **Modeling -> Format -> Currency -> $ English (United States)**



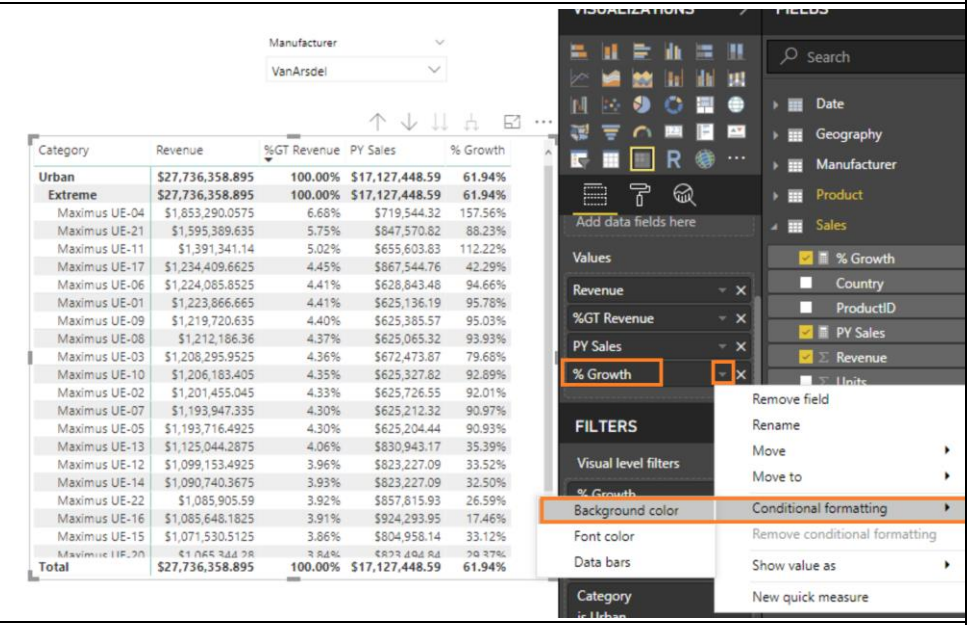
127. In the **Revenue by Year** visual select **2018** column. Notice Maximus UE-04 has nearly 158% growth compared to last year.



Category	Revenue	%GT Revenue	PY Sales	% Growth
Urban	**$27,736,358.895**	**100.00%**	**$17,127,448.59**	**61.94%**
Extreme	**$27,736,358.895**	**100.00%**	**$17,127,448.59**	**61.94%**
Maximus UE-04	$1,853,290.0575	6.68%	$719,544.32	157.56%
Maximus UE-21	$1,595,389.635	5.75%	$847,570.82	88.23%
Maximus UE-11	$1,391,341.14	5.02%	$655,603.83	112.22%
Maximus UE-17	$1,234,409.6625	4.45%	$867,544.76	42.29%
Maximus UE-06	$1,224,085.8525	4.41%	$628,843.48	94.66%
Maximus UE-01	$1,223,866.665	4.41%	$625,136.19	95.78%
Maximus UE-09	$1,219,720.635	4.40%	$625,385.57	95.03%
Maximus UE-08	$1,212,186.36	4.37%	$625,065.32	93.93%
Maximus UE-03	$1,208,295.9525	4.36%	$672,473.87	79.68%
Maximus UE-10	$1,206,183.405	4.35%	$625,327.82	92.89%
Maximus UE-02	$1,201,455.045	4.33%	$625,726.55	92.01%
Maximus UE-07	$1,193,947.335	4.30%	$625,212.32	90.97%

128. Select **matrix** visual.
129. From the **Values** section, select the arrow next to **% Growth**.
130. Select **Conditional Formatting -> Background color scales.**

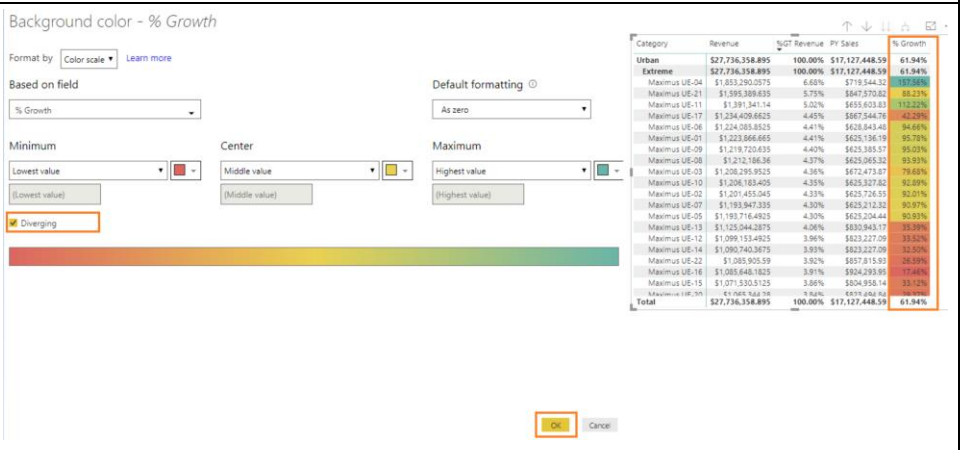
Note: Conditional formatting can be applied using font color or data bars as well.



Background color scales dialog opens. This dialog provides options to format background color either using rules or diverging colors.

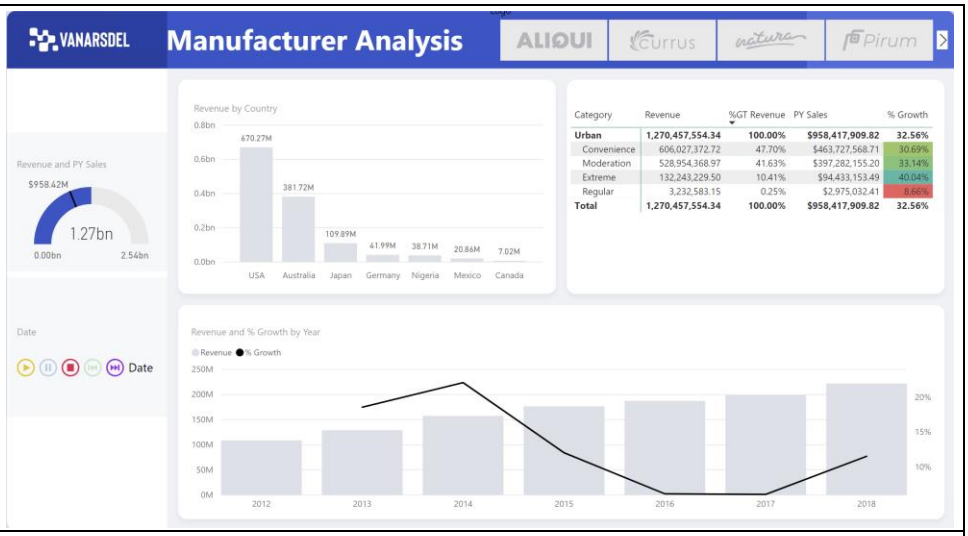
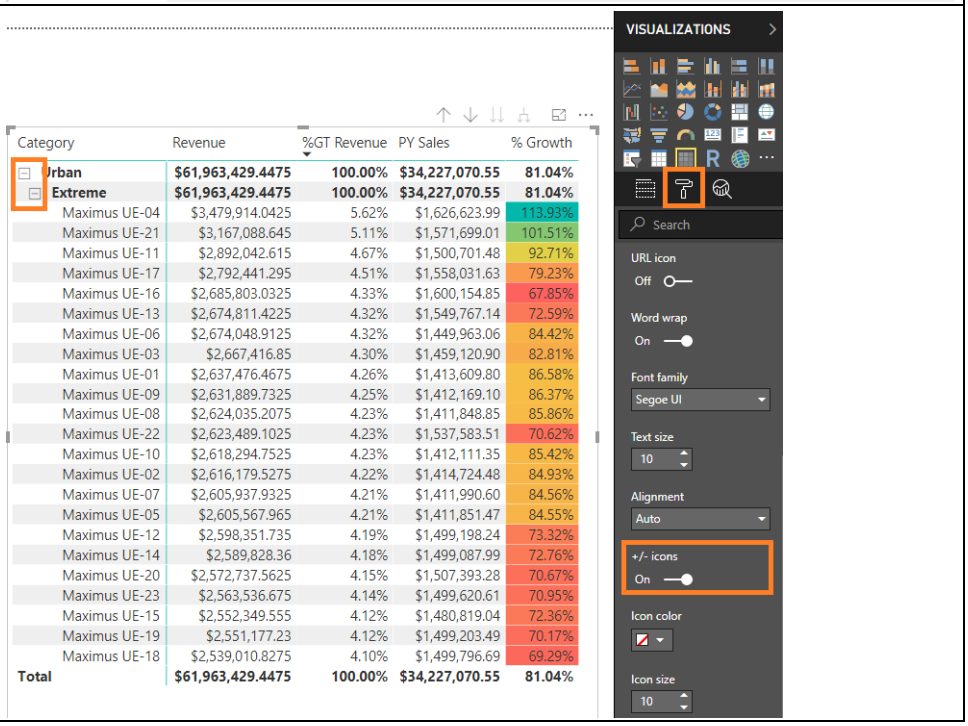
131. Select the **Diverging** checkbox.
132. Select **OK**.

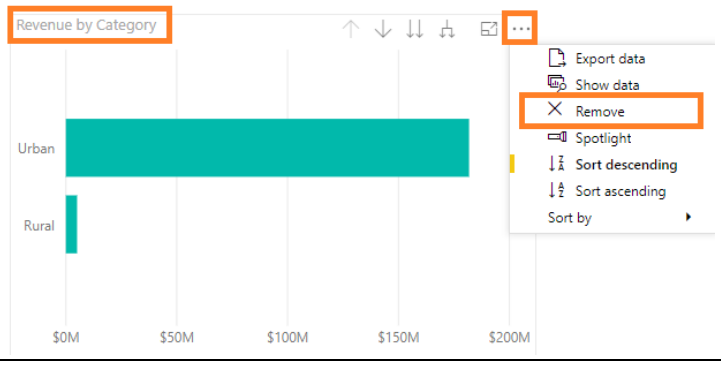
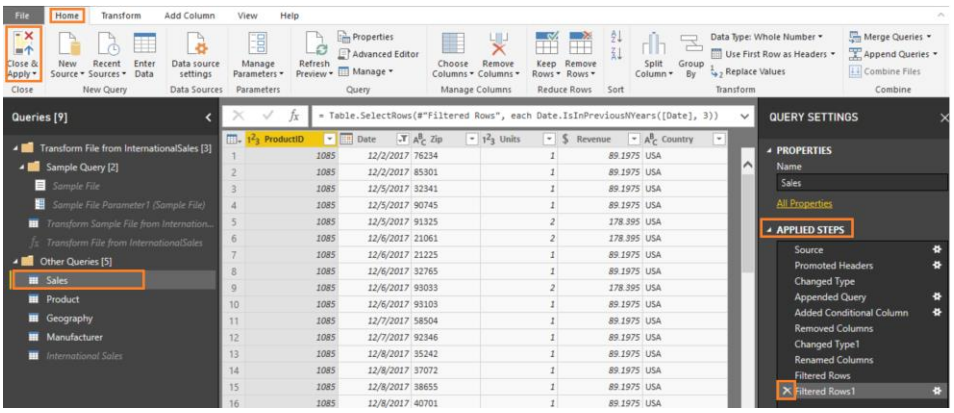
Note: Conditional formatting can also be based on another column using **Color based on** drop down.

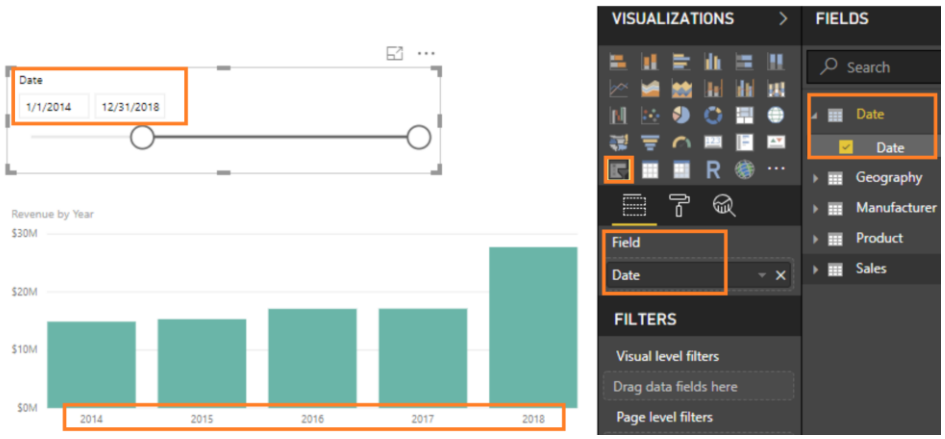
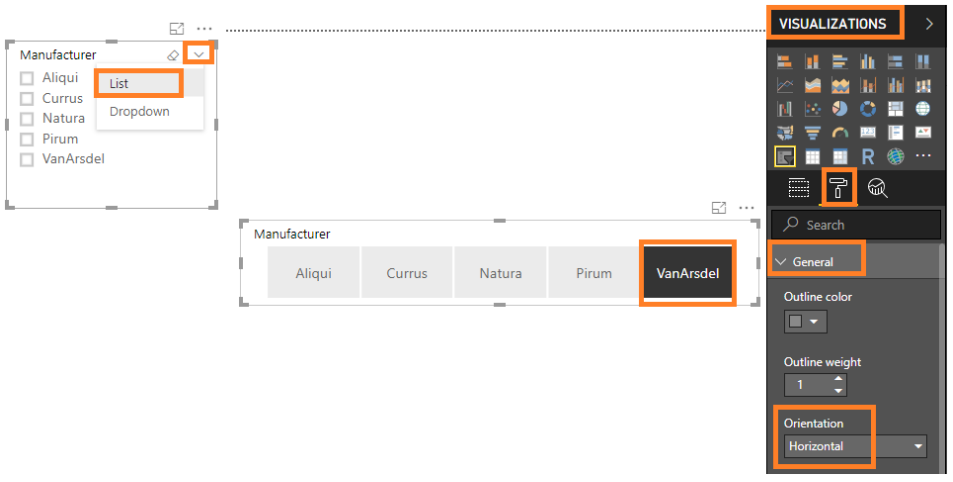


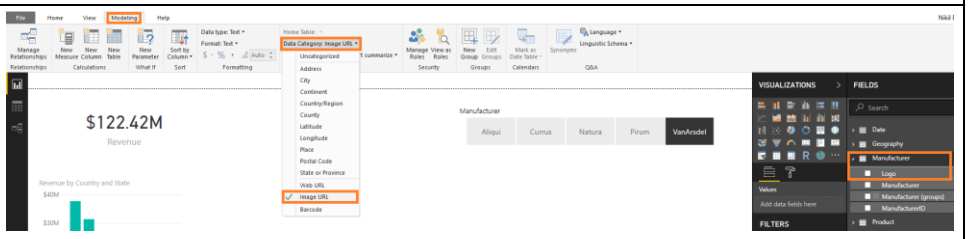
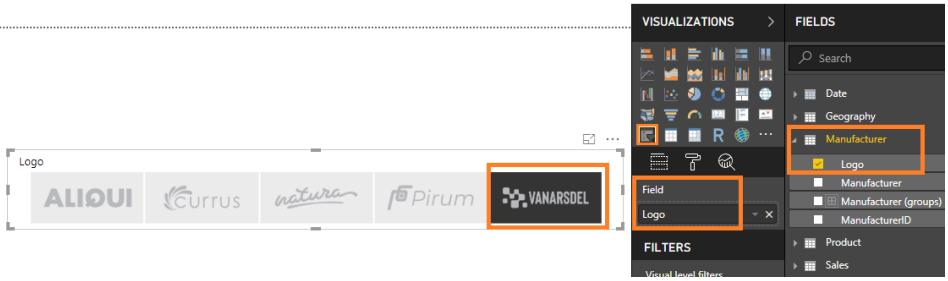
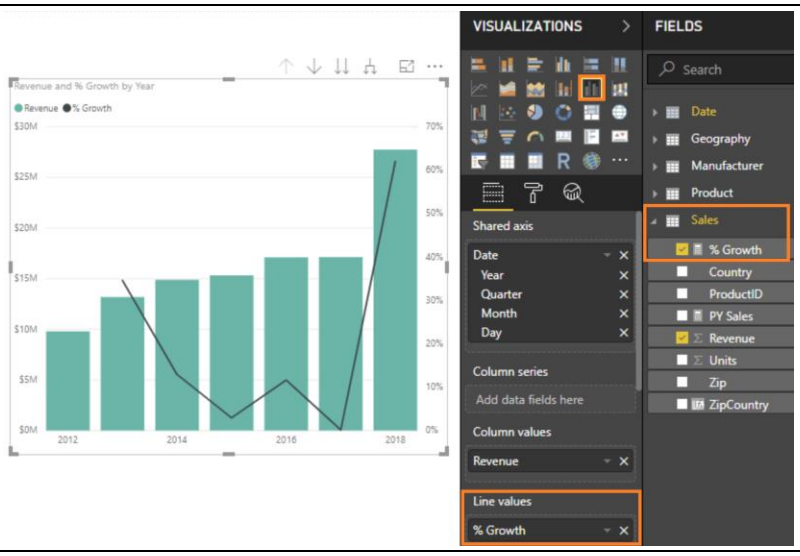
Power BI Desktop – Data Visualization

Having done the data exploration and visualization you have found good insights to share with your team. In this section, you will create a professional report from which you and your entire team can benefit.

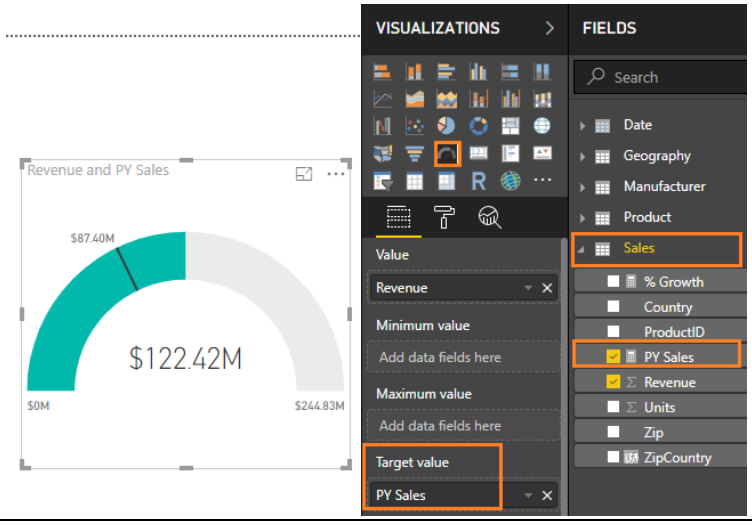
<table>
<tr>
<td>At the end of this section, you will build a report like the one shown in the screenshot.</td>
<td> 
</td>
</tr>
<tr>
<td>Let’s add Collapse and Expand capability to the matrix visual.
1. Select matrix visual.
2. In the VISUALIZATIONS panel, select the paint roller icon to format the visual.
3. Scroll down and expand Row headers section.
4. Scroll down to +/- icons and using the slider, turn the feature On.
Notice now you have the Expand/Collapse icon in the matrix, giving a pivot table like experience. Color/size of these icons can be further formatted.</td>
<td> 
</td>
</tr>
</table>

Let's remove Revenue by Category clustered bar chart. 5. Hover over **Revenue by Category** visual. 6. From the top right corner select the **ellipsis** 7. Select **Remove** to delete the visual.	
Initially we added a filter to load 3 years of data. Let's load the complete data. 8. From the **ribbon**, select **Home -> Edit Queries**. Power Query Editor window opens. 9. From the left panel, select **Sales** query. 10. From the right panel, under **APPLIED STEPS** click on the **X** next to **Filtered Rows1** to remove the 3-year filter. 11. Select **Home -> Close & Apply** to load the data. Sales data is reloaded, this time all the data is loaded. It might take a couple of minutes as we are loading ~7 million rows.	
Make sure the report is filtered by VanArsdel using Manufacturer slicer. Remove all other filters. At this point your report page should look something like the screenshot. Once data is loaded, notice **Revenue by Year visual**. You will see columns for years 2012 through 2018.	

Let's add a Date slicer so we can control how many years of data we want to analyze. 12. Click on the white space in the canvas. From the **VISUALIZATIONS** section, select **Slicer** visual. 13. From **FIELDS** section, expand **Date** table. 14. Click the checkbox next to **Date** field. Notice we have a range slicer with a slider. 15. Move the slicer to filter the data to **1/1/2014 to 12/31/2018** or type in the values.	
16. **Hover** over the date slicer. 17. Select the **arrow** from the **top right corner**. Notice following options are available – Before, After, List, Dropdown and Relative. Feel free to try out the various options. 18. Select **Relative**. Notice this has options to filter data by the Last x years, months, days or Next x years, months, days, etc. Feel free to try out various options.	
19. Hover over **Manufacturer slicer visual**. 20. On the top right corner select the **arrow**. 21. Select **List**. 22. in **VISUALIZATIONS** panel select the paint roller icon. This opens the formatting options available for a visual. 23. **Expand General** section, select **Horizontal** from the **Orientation** dropdown. 24. Notice the Slicer visual is updated. You can **resize** the visual, so all the manufacturers are listed horizontally. **Note**: There are other options to change the Outline color, weight, etc. 25. Select **VanArsdel**. 26. **Collapse General** section.	

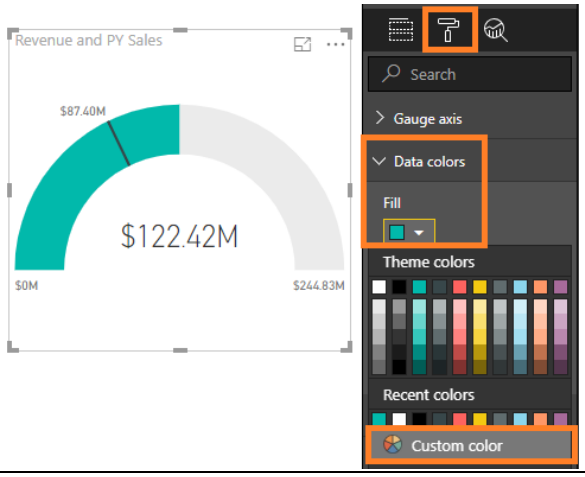
27. **Note**: Expand Selection Controls section. Notice there is an option to enable Select All option in the visual. There is also an option to make the slicer multi select. Feel free to explore other formatting options.	
It will be nice to add logos of the manufacturer to the slicer. Let's do it. 28. From **FIELDS** section, expand **Manufacturer** table. 29. Click the checkbox next to **Logo** field. 30. From the ribbon, select **Modeling -> Data Category -> Image URL.** Setting data category to Image URL helps Power BI to understand that it is a URL and it can access the data.	
31. From the canvas, select **Manufacturer slicer**. 32. From **FIELDS** section, expand **Manufacturer** table. 33. Drag and drop **Logo** to Field section. 34. Select **Logo** field. 35. **Resize** slicer visual as needed. 36. **Select VanArsdel** logo to filter all the other visuals.	
37. Select **Revenue by Year** visual. 38. From **VISUALIZATIONS** panel, select **Line and clustered column chart** to change the visual type. 39. From **FIELDS** section, expand **Sales** table. 40. Drag and drop **% Growth** field to **Line values**. This provides a representation of the revenue and growth over time.	

41. Select **Revenue Card** visual. Let's change this to a Gauge visual.
42. From **VISUALIZATIONS** panel, select the **Gauge** visual.
43. From **FIELDS** section, expand **Sales** table.
44. Drag and drop **PY Sales** field to **Target value**.
45. **Resize** the visual as needed. Now we can compare Revenue with the target.

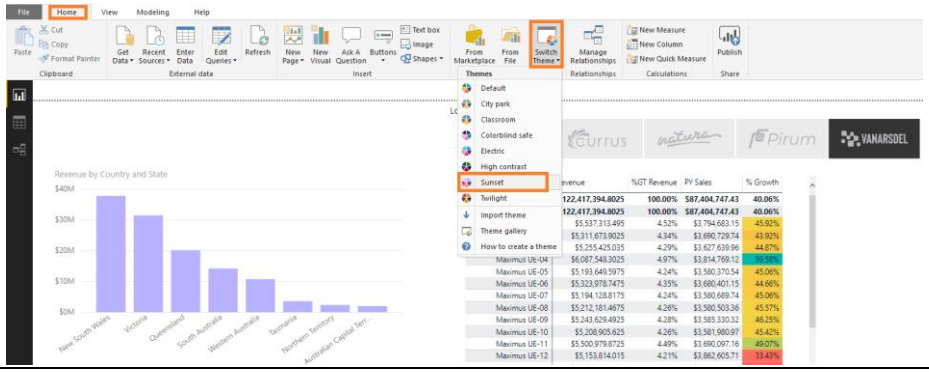


It will be nice to change the colors on the visuals.
46. Select **Gauge** visual.
47. From **VISUALIZATIONS** panel, select **paint roller** icon.
48. Expand **Data Colors** section.
49. Select the **arrow** next to **Fill** color.

Notice you can pick a color from the default color palette or pick Custom colors.

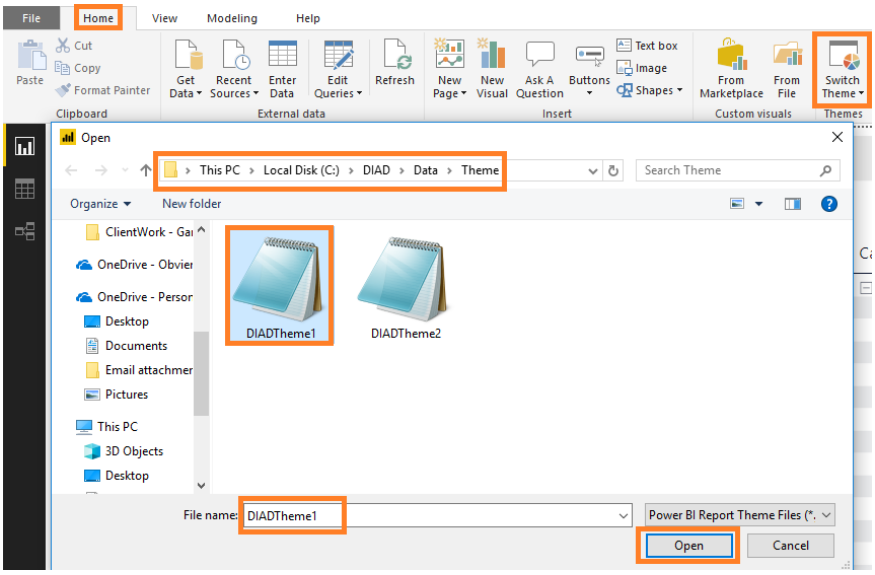


Let's check out some of the themes available.
50. From the ribbon, select **Home -> Switch Theme -> Sunset**.
Notice colors on all the visuals updated. Feel free to try the other out of the box themes.



Marketing department has provided standard color themes to be used across reports. We can use Report Theme feature in Power BI by uploading a theme. Report Theme requires a JSON file where the data colors, background, foreground and table Accent colors are defined. The JSON file can be used across all the reports.

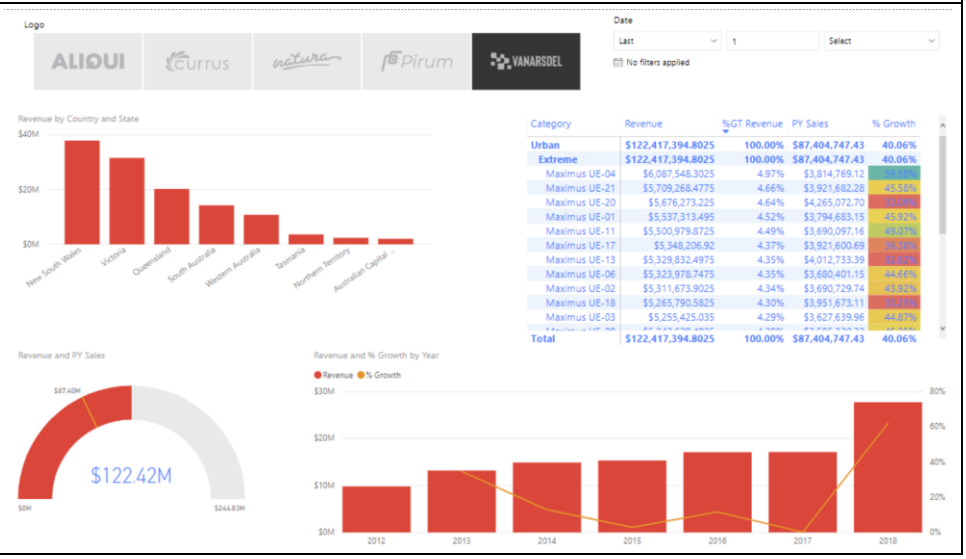
51. From the ribbon, select **Home -> Switch Theme -> Import Theme**.
52. File browser dialog opens. Navigate to **/Data/Theme** folder.
53. Select **DIADTheme1** file and select **Open**.
54. Once theme is imported, a success dialog opens. Select **Close**.

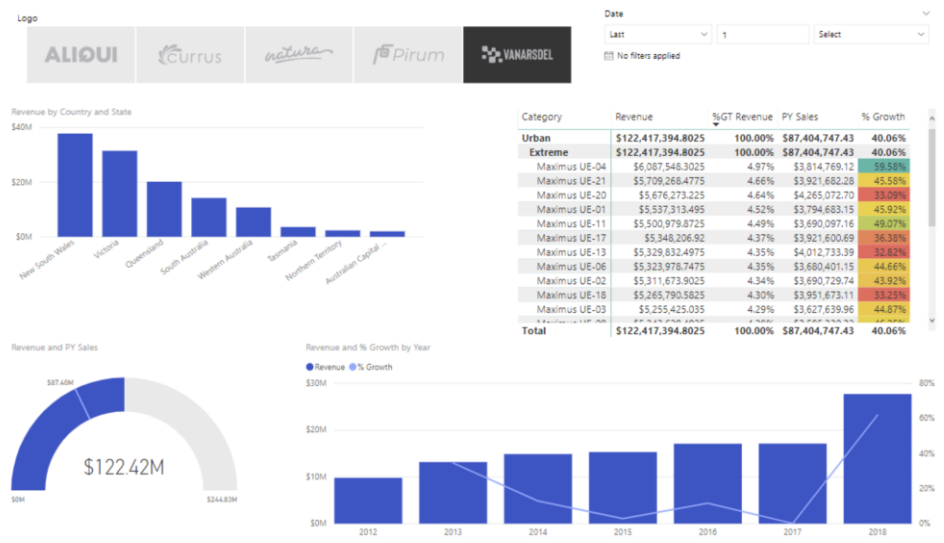
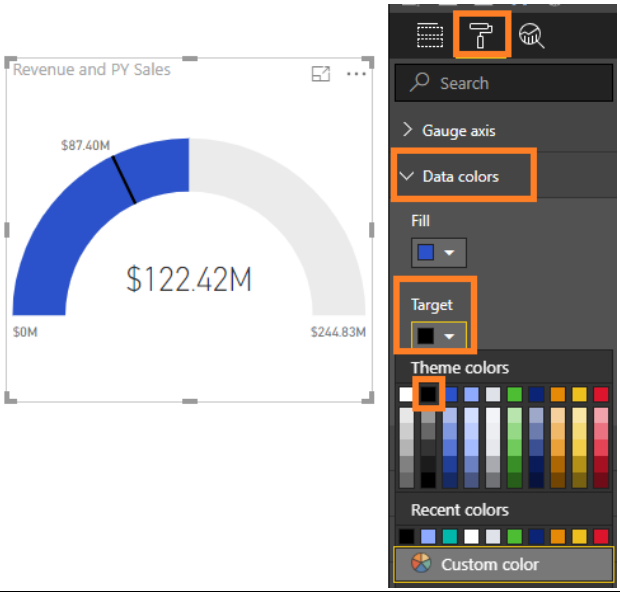
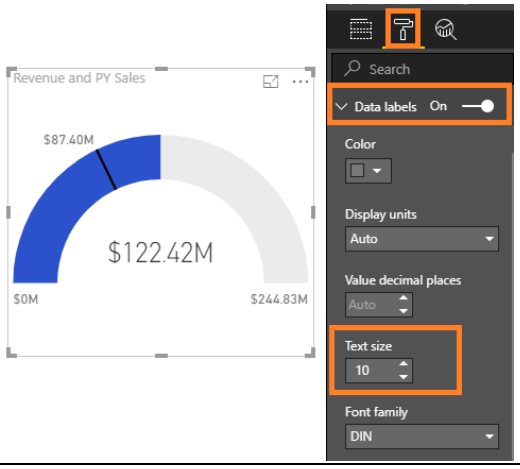


Notice colors on all the visuals updated. Your report should look something like the screenshot at this point.

This one is good, but too much red in it. Marketing team has provided two more themes, let's try the next one.

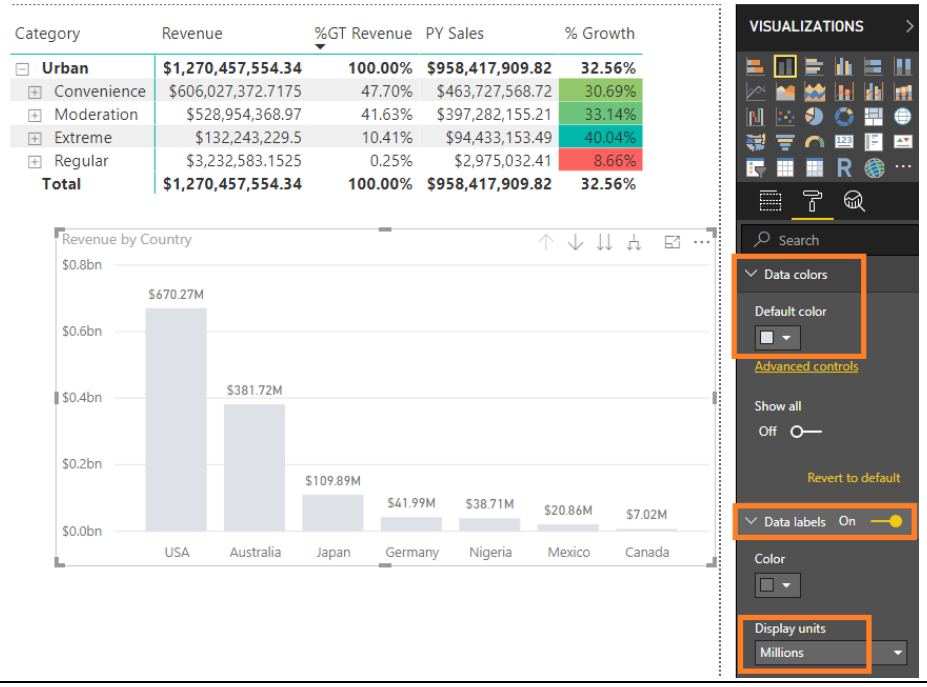
55. From the ribbon, select **Home -> Switch Theme -> Import Theme**.
56. File browser dialog opens. Navigate to **/Data/Theme** folder.
57. Select **DIADTheme2** file and select **Open**.
58. Once theme is imported, a success dialog opens. Select **Close**.



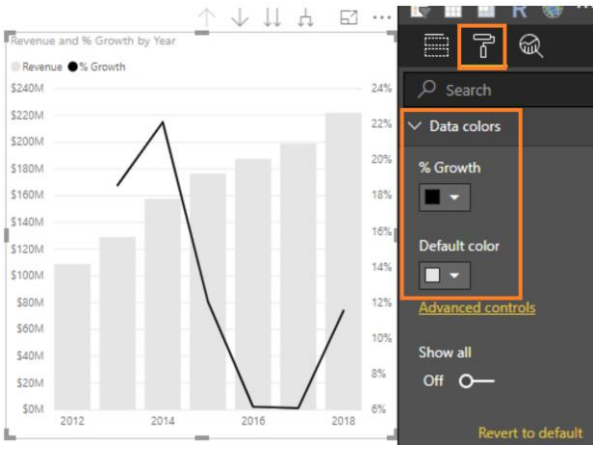
Notice colors on all the visuals updated. Your report should look something like the screenshot at this point. This theme looks good. Now most of the visuals are blue in color, let's add some contrast.	
59. Select the **Gauge** visual. 60. From **VISUALIZATIONS** panel, select **paint roller** icon. 61. Expand **Data colors** section. 62. Select the drop down next to **Target**. Notice the color palette is different now. 63. Select **black** color. Notice the change in the visual.	
64. Collapse **Data colors** section. 65. Expand **Data Labels** section. 66. Increase **Text size** to **10**. 67. Expand **Target** section. 68. Increase **Text size** to **10**.	

69. Select **matrix** visual.
70. Drill up to **Segment** level.
71. Select **Revenue by Country** visual.
72. Drill up to **Country** level.
73. From **VISUALIZATIONS** panel, select **paint roller** icon.
74. Expand **Data colors** section.
75. Select a light shade of **gray** as the **Default color**.
76. Enable and expand **Data labels**.
77. Change Display units to **Millions**.

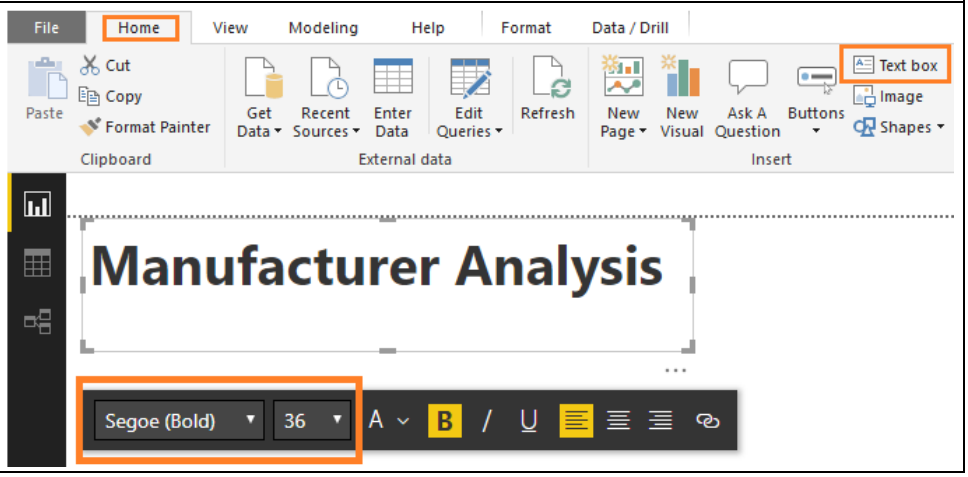
Notice there a lot of formatting options. E.g. visual title can be changed and formatted, you can add a border and background to the visual, etc. Feel free to explore the options.



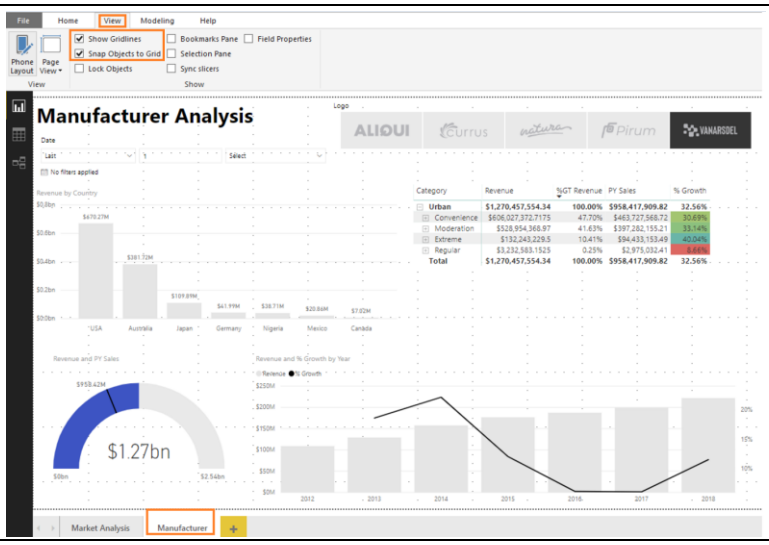
78. Select **Revenue and % Growth by Year** visual.
79. From **VISUALIZATIONS** panel, select **paint roller** icon.
80. Expand **Data colors** section.
81. Select **black** color for **% Growth.**
82. Select a light shade of **gray** as the **Default Column color**.



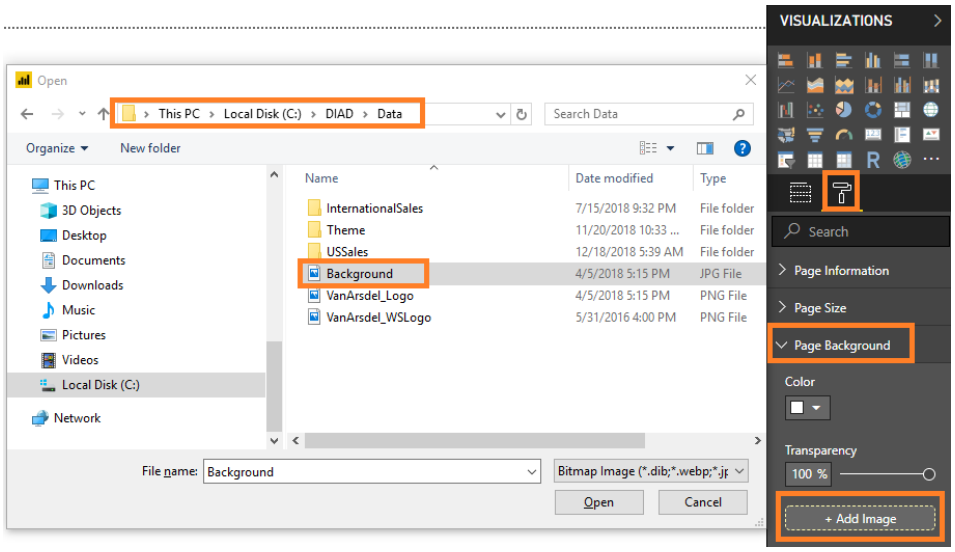
Let's add a report title.
83. From the ribbon, select **Home -> Text box**. Notice a text box visual is added.
84. **Resize** the visual as needed.
85. Enter **Manufacturer Analysis** in the Text box.
86. **Highlight** Manufacturer Analysis to format the text.
87. Select **Segoe (Bold)** as the **font**.
88. Select **36** as the **font size**.
89. **Resize** the text box as needed.



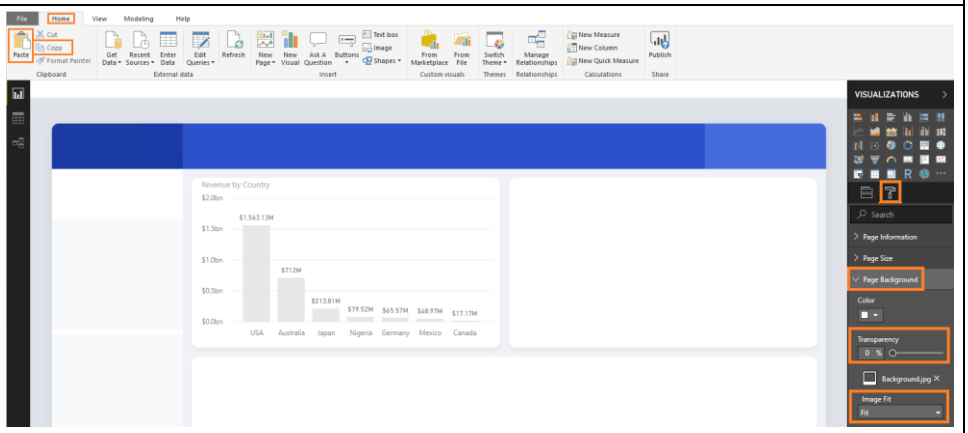
90. From the **ribbon**, select **View**.
91. Select the checkbox next to **Show Gridlines** and **Snap Objects to Grid**. This will help with aligning the visuals.
92. **Move and align** the visuals like the screenshot. As you move visuals notice the red smart guide helps aligning them. Uncheck **Show Gridlines** and **Snap Objects to Grid** options to disable these features.
93. **Rename** the page to Manufacturer.



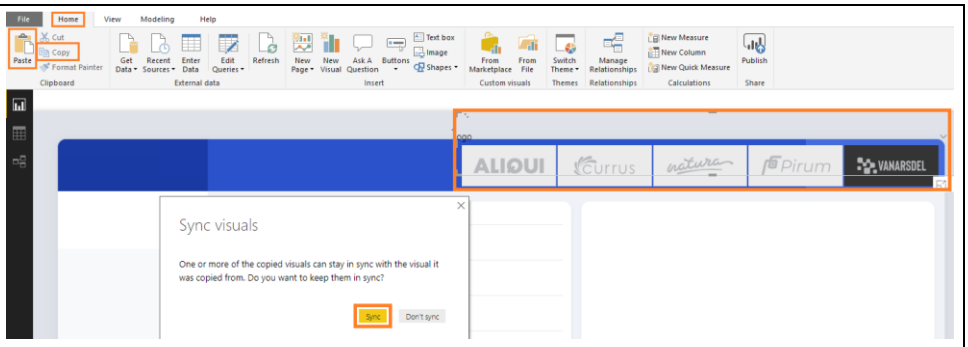
We can also use a background image to format the reports. Let's try it.
94. Select **+ icon in** the bottom of the page to create a new page. You will be navigated to a Page 1.
95. Click on the **white space** in the canvas.
96. From **VISUALIZATIONS** panel, select **paint roller** icon.
97. Expand **Page Background** section.
98. Select **Add Image** button.
99. File browser dialog opens. Browse to **/DIAD/Data** folder.
100. Select **Background** file.
101. Select **Open**.



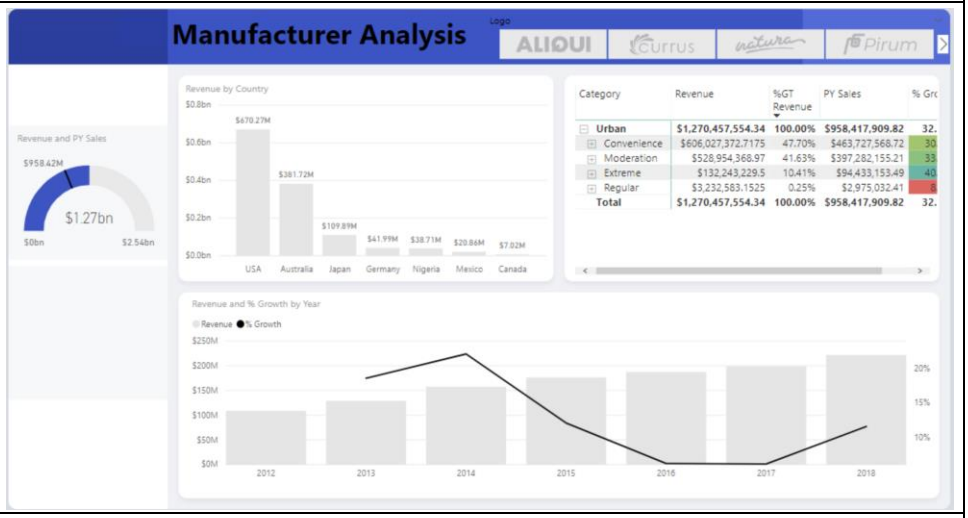
102. From **Image Fit** drop down, select **Fit**.
103. Slide **Transparency** slider to **0%**. Notice we have a template which has place for header and slots for images.
104. Navigate to **Manufacturer page**.
105. Select **Revenue by Country** visual.
106. From the ribbon select **Home -> Copy**.
107. Navigate to **Page 1**.
108. From the ribbon select **Home -> Paste**.
109. **Resize** the visual and place it as shown in the screenshot.



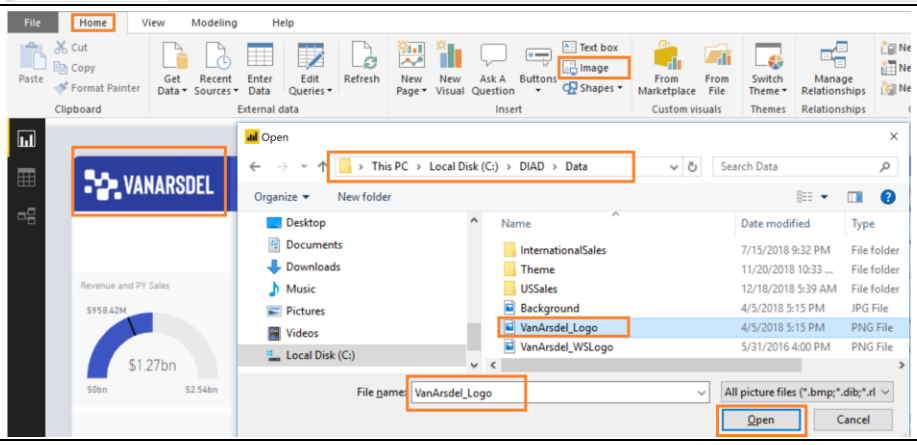
110. Navigate to **Manufacturer page**.
111. Select **Manufacturer slicer**.
112. From the ribbon select **Home -> Copy**.
113. Navigate to **Page 1**.
114. From the ribbon select **Home -> Paste**.
115. Sync visuals dialog opens. Select **Sync**.
This will keep Manufacturer slicer in both the pages in sync. Changing slicer in one of the pages will update visuals in both the pages.
116. **Resize** the slicer and place it as shown in the screenshot.



117. Similarly, **copy** the **report title, gauge, matrix and the line and clustered column visual.**
118. **Resize** and **arrange** the visuals as shows in the screenshot.

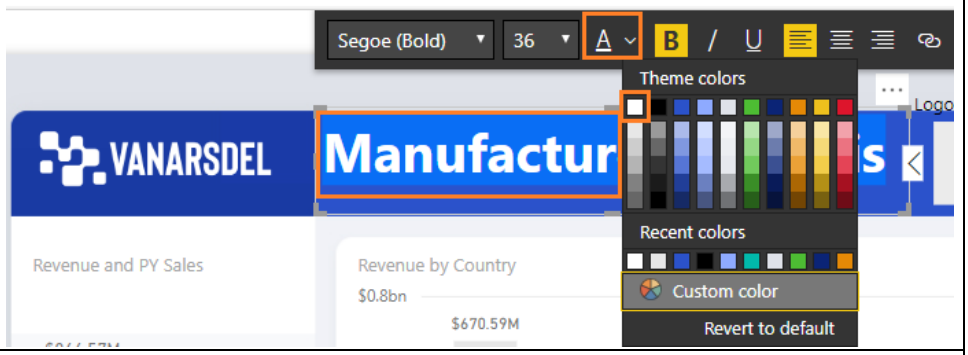


Let's add a logo.
119. From the ribbon, select **Home -> Image**.
120. File browser dialog opens. Browse to **/DIAD/Data** folder.
121. Select **VanArsdel_Logo** file.
122. Select **Open**.
123. **Resize** the visual as needed.
124. **Drag** the visual to the top left corner of the page.



Let's change the font color of report title.

125. Highlight **Manufacturer Analysis**.
126. Select the arrow next to **A** for font color.
127. Select **white** color.



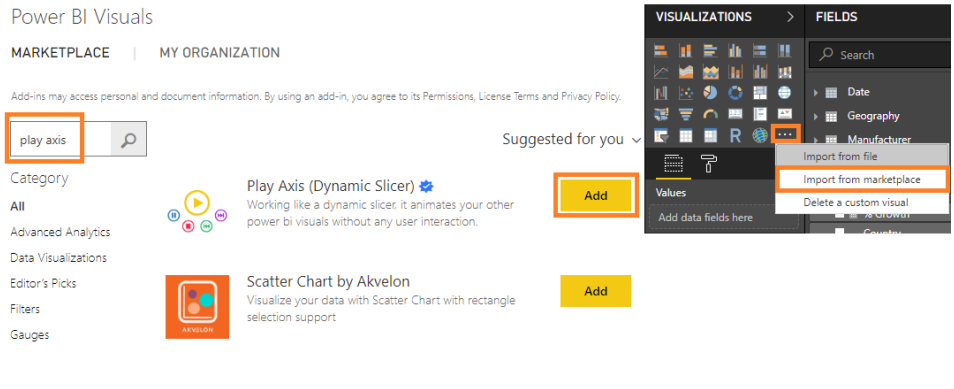
Out of the box, Power BI has a good selection of visuals. However, there is always a use-case where you need a custom visual. To meet this need, the visualization engine is open sourced. Power BI community contributes visuals which are available in the marketplace. You can add and use these visuals in your reports.

There is also an option to create your own visual and import it into Power BI Desktop.

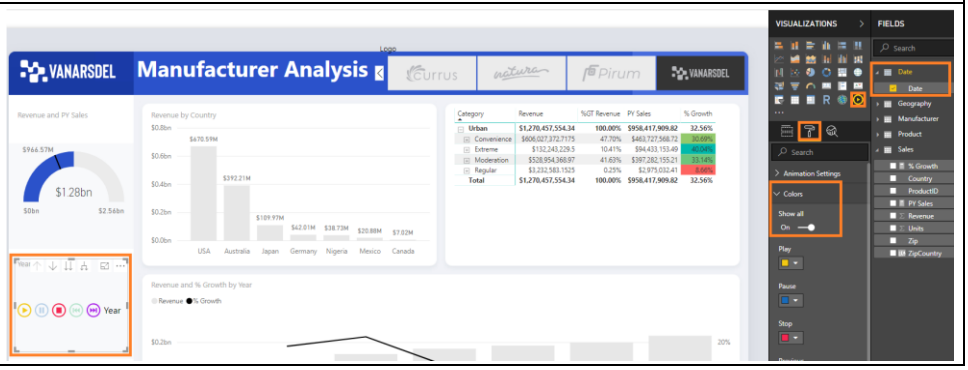
Let's add a custom visual.

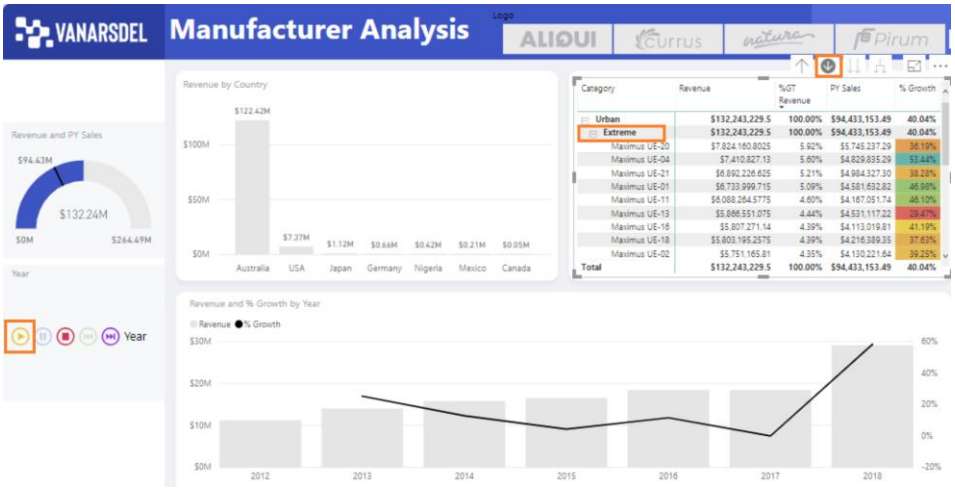
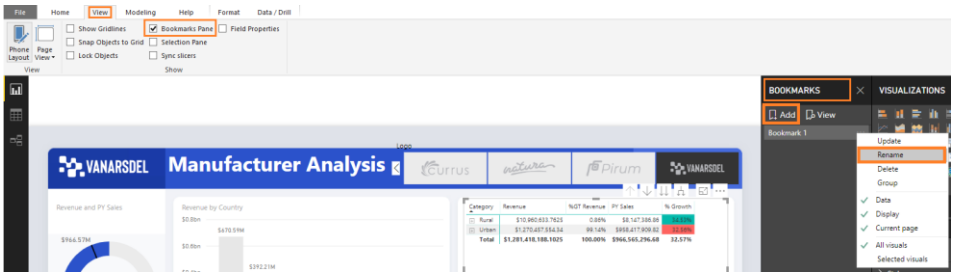
128. From **VISUALIZATIONS** section, select the ellipsis in the last row of visuals.
129. Select **Import from marketplace**.
130. Type **play axis** in the **search box** and select search.
131. Select **Add** next to **Play Axis (Dynamic Slicer)**.
132. Import custom visual dialog opens. Select **OK**.

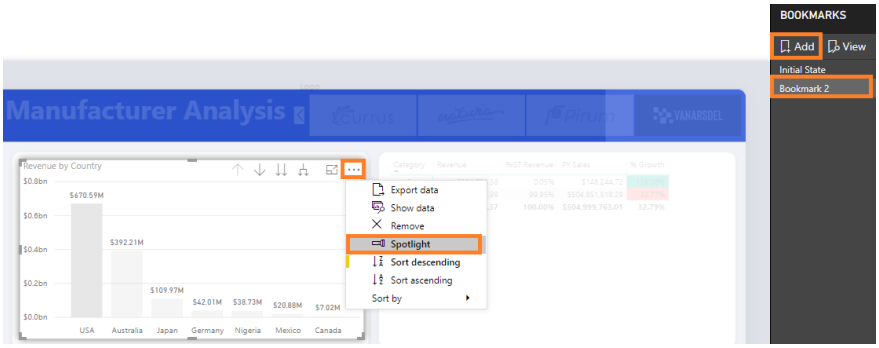
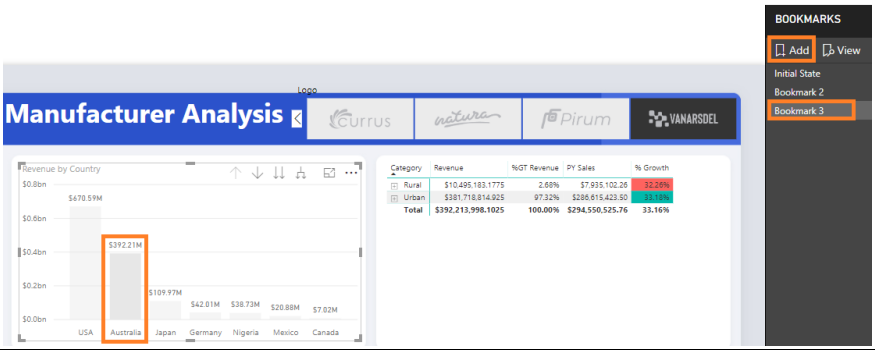
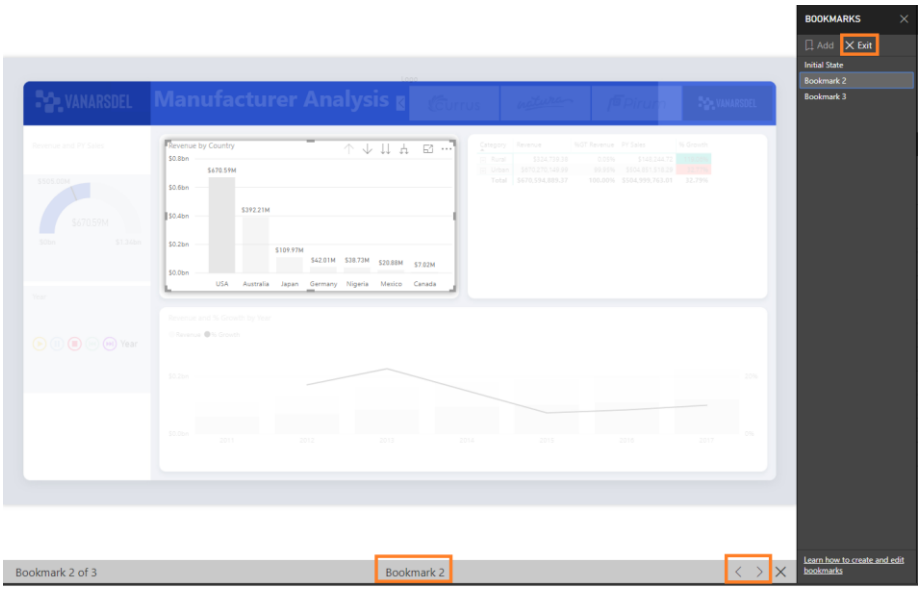
Notice a new visual is added to the list of available visuals.

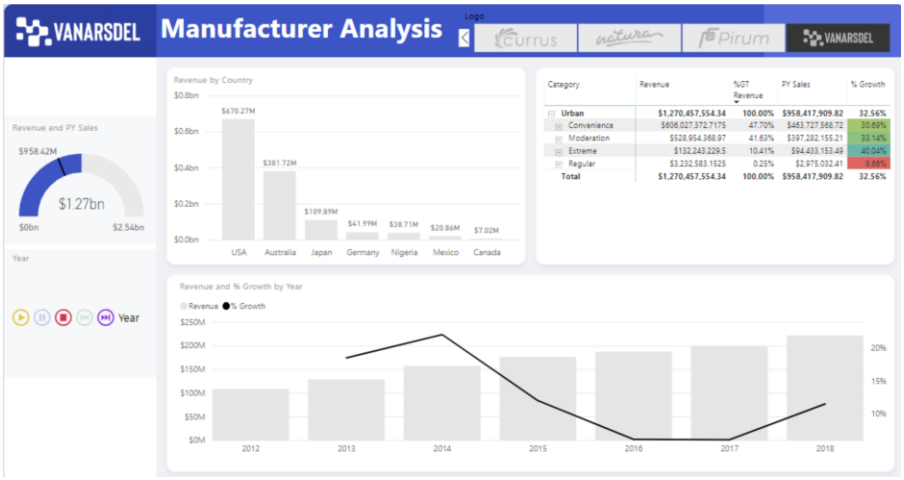
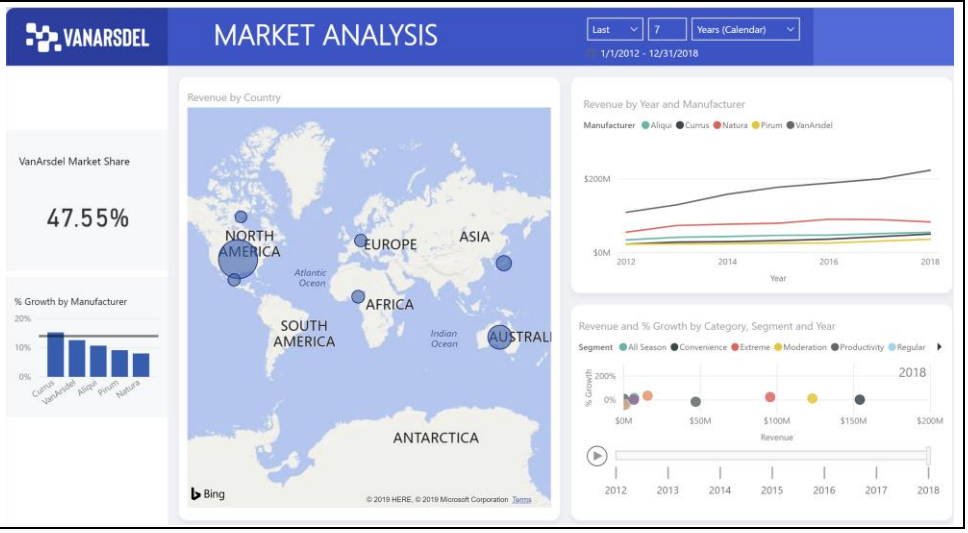


133. Click on the **white space** in the canvas.
134. From **VISUALIZATIONS** section, select the newly imported **Play Axis** visual.
135. From **FIELDS** section, expand **Date** table.
136. Click the checkbox next to **Date** field.



137. From **VISUALIZATIONS** panel, select **paint roller icon**. 138. Expand **Colors** section. 139. Enable **Show all** option. 140. **Resize** and **position** the visual as shown in the screenshot.	
141. Enable **drill mode** in **matrix** visual. 142. Select **Extreme** category to drill down to Extreme products. 143. Select **Play** in the **Play axis** visual. Notice all the visuals update as play axis moves through years. You can view Product performance over time as well as performance of countries over time. Play axis provides an option to analyze data over time (or any other dimension) across all visuals in the page. 144. Once you are done playing through the years, in the matrix visual **drill back up** to **Product Category** level. 145. **Disable drill mode** in matrix visual. There are a lot of custom visuals available and new ones are added periodically.	
Now we have a report ready, let's use Bookmarks to tell the story we discovered. Bookmarks capture the currently configured view of a report page, including filtering and the state of visuals which makes it easy to present the story. 146. From the **ribbon**, select View. 147. Select the **checkbox** next to **Bookmarks Pane** to enable Bookmarks. BOOKMARKS pane opens. 148. Click on **Add** in **BOOKMARKS** pane. This will add the current state of the visual to the bookmark. 149. Click on the **ellipsis** next to the newly created **Bookmark 1**. 150. Select **Rename** to rename it to **Initial State**	

151. In **Revenue by Country** visual, select **USA** column. 152. Hover over **Revenue by Country** visual and select the **ellipsis** on the top right corner. 153. Select **Spotlight**. 154. In the **BOOKMARKS** pane, select **Add**. This will add a new bookmark with the current state of the report.	
155. Click on the canvas. 156. Select **Australia** in **Revenue by Country** visual. 157. In the **BOOKMARKS** pane, select **Add**. This will add a new bookmark with the current state of the report.	
158. From the **BOOKMARKS** pane, select **View**. You are in Bookmarks slide show mode. You will be in the first bookmark which we called Initial State. Notice on the bottom of the report pane there is an option to navigate between bookmarks. 159. You can use the **arrows** to navigate between bookmarks and tell your story. 160. From **BOOKMARKS** pane, select **Exit** to exit Bookmarks slide show mode. If time permits, feel free to explore other options available with Bookmarks like Selected Visuals and more as you continue to build the story.	

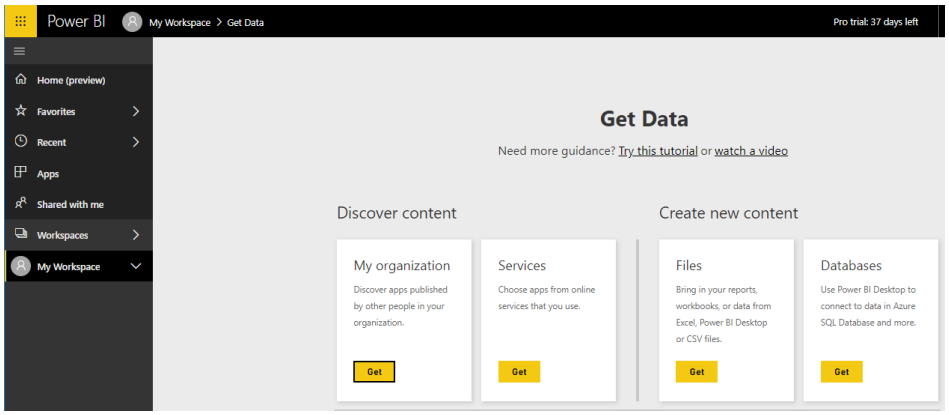
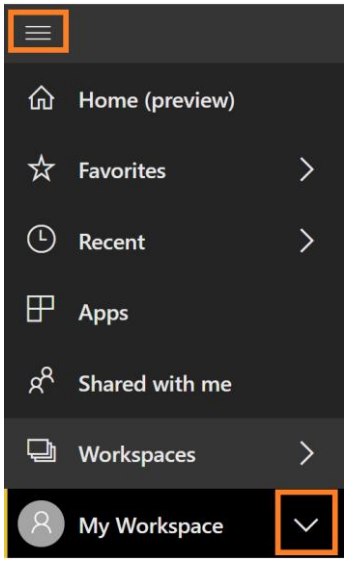
161. From the ribbon, select **View**. 162. **Uncheck Bookmarks Pane**. 163. **Collapse** the **Visualizations** and **Filters** pane by clicking on the arrows. **Report** should look as shown in the figure. **Save** the file. 164. Select **File -> Save**. You have built your first report!!!	
165. Navigate to **/DIAD/Reports** folder. 166. **Open DIAD Final Report.pbix** file. This file uses the same dataset that you used for the lab. We have added a few more visuals and formatted the reports. Feel free to explore the report.	

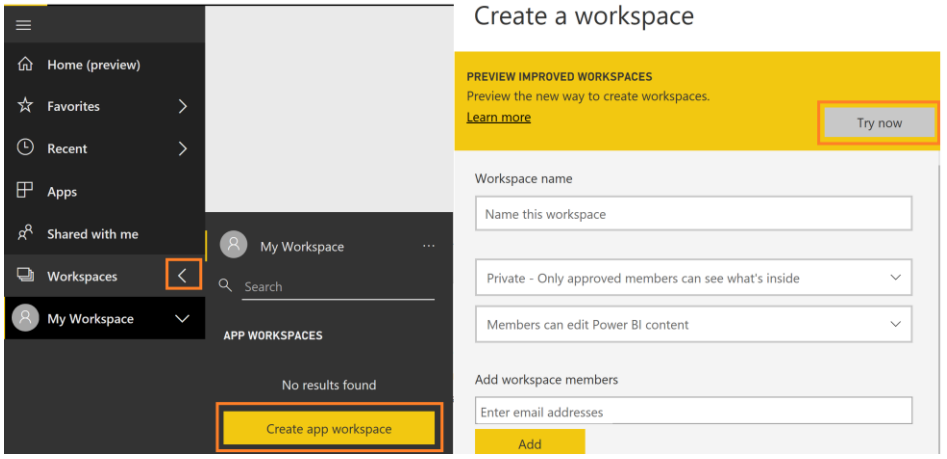
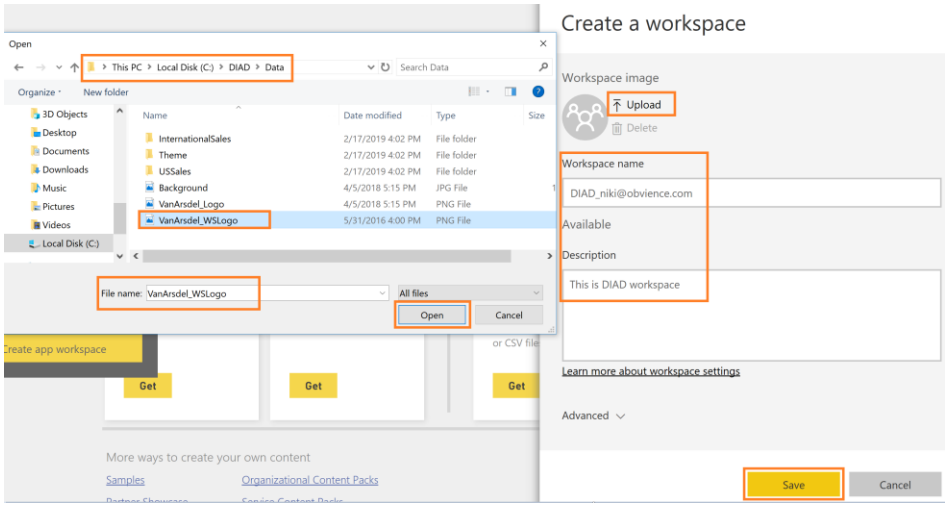
You have successfully completed the hands-on lab in creating a report to share to your team. The next section covers creating a dashboard from this report so that you can easily share it to your team. You have learned a quick overview of various functionality in Power BI Desktop to get accelerated. There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

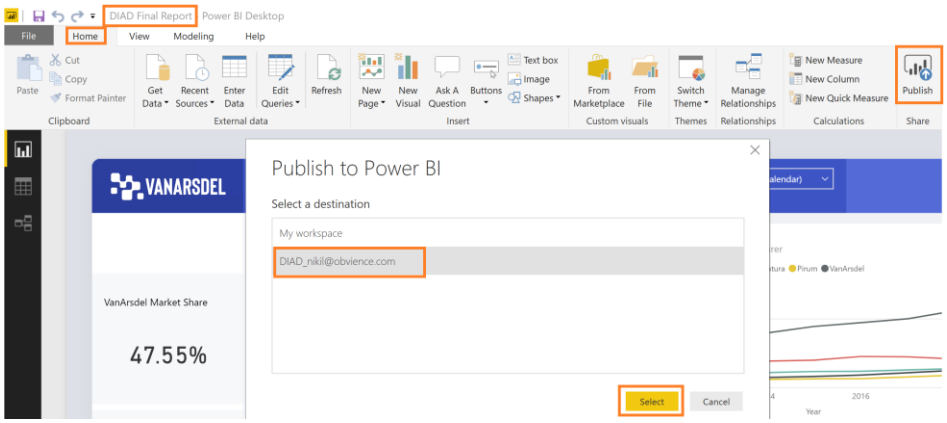
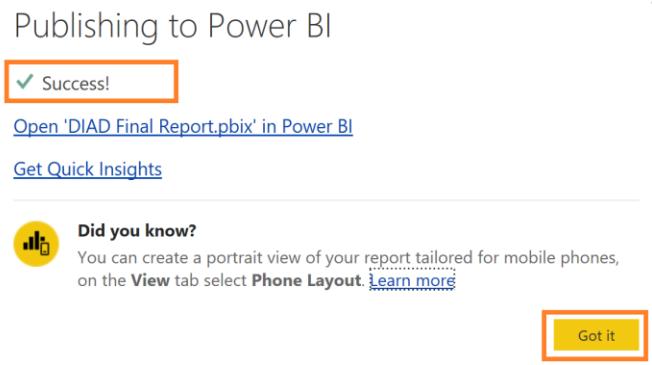
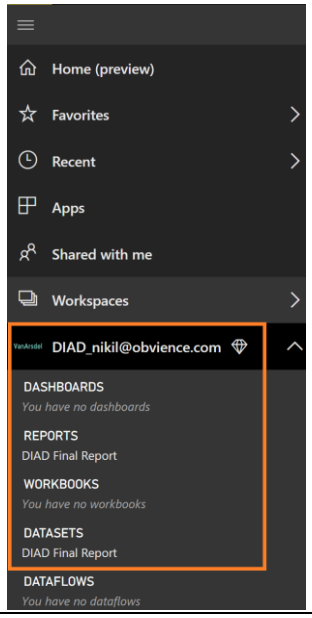
Power BI Service

You will now leverage the report authored using Power BI Desktop and create a dashboard for VanArsdel data analysis team and share it with the CMO. A Power BI Desktop file with additional reports / visuals is provided. Please use this for the next section of the lab.

Power BI Service - Publishing Report

1. If you have not signed up for a Power BI account, go to http://aka.ms/pbidiadtraining and sign up for Power BI with a business email address. 2. If you have not already opened app.powerbi.com page, please open the browser and navigate to http://app.powerbi.com. 3. Sign in to Power BI using your user account. Once logged in, you will see a screen like the screenshot.	
4. If the left navigation is collapsed, select  icon below Power BI on the top left of the screen to expand the left navigation. Following options are listed in the left navigation: **Favorites**: Lists all your favorite dashboards (we will create a favorite in a later section). **Recent**: Lists the most recent dashboards you have viewed. **Apps**: List all the apps you have installed. **Shared with me**: Lists the dashboards that are shared with you (we will share dashboards in a later section). **Workspaces**: Lists all the workspaces you are assigned. By default, you are assigned My Workspace.	

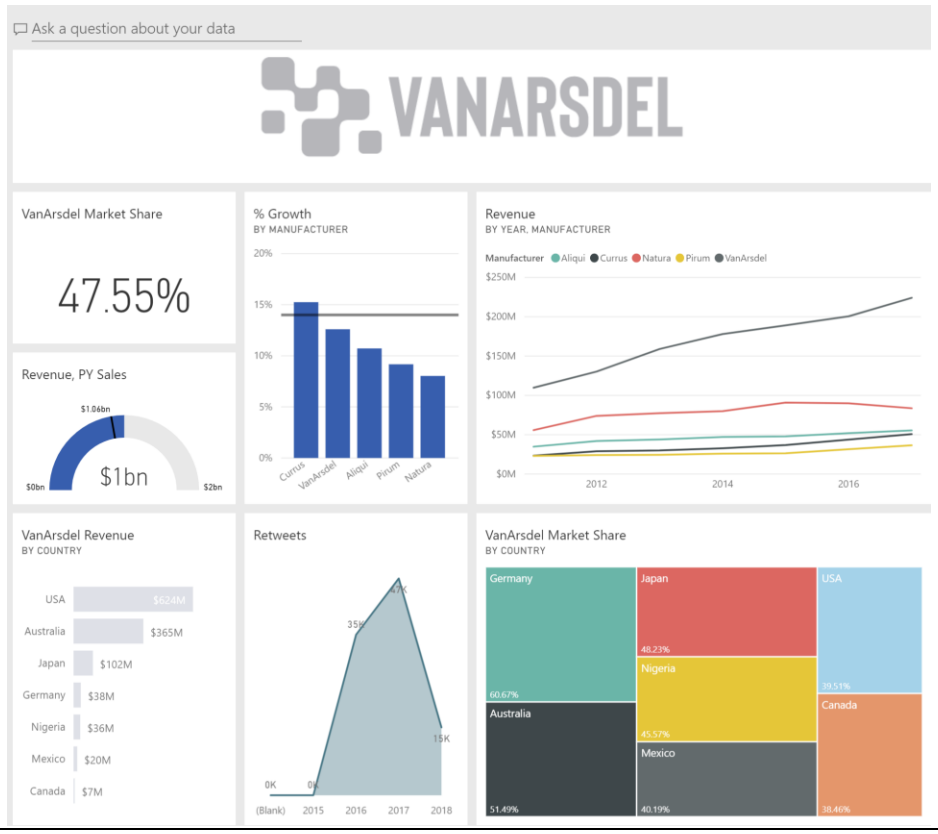
5. Select the down arrow next to **My Workspace**. Notice DASHBOARDS, REPORTS, WORKBOOKS and DATASETS section are empty. Let's import a Power BI Desktop file and create dashboards. **Note**: If you have previously signed into Power BI, then your screen will look different. You will be directly navigated to your Workspace skipping the Welcome page.	
My Workspace is your personal workspace. We need to create a workspace where we can collaborate with team members and distribute content to end users. Let's create a workspace. 6. In the left panel, select **Workspaces -> Create app workspace**. Create an app workspace dialog opens. 7. Let's try the improved workspace. This is a preview feature. Select **Try now**. **Note**: Creating workspace is a **Pro feature**. If you do not have Pro license, please choose the trial option.	
8. In the Create an app workspace, select **Upload Image**. 9. File browser dialog opens. Browse to **/DIAD/Data** folder. Select **VanArsdel_WSLogo** file. 10. In **Name your workspace** text area, enter **DIAD_<youremailaddress>**. **Note**: you are entering your email address as part of the workspace name to keep it unique. 11. In **Description** text area, enter "**This is DIAD workspace**". 12. Select **Save** to create the workspace. Notice you are now navigated from My Workspace to the workspace you just created.	

Let's publish the report to Power BI Service and then we will come back to the browser. 13. Navigate to **/DIAD/Reports** folder. 14. **Open DIAD Final Report.pbix** file. 15. From the ribbon select **Home -> Publish**. 16. If you have not already logged into Power BI, a **Sign in** dialog opens. Please sign in. 17. Once you are signed in, Publish to Power BI dialog opens. Select **DIAD_<youremailaddress>** from the dialog. 18. Click **Select**.	
Publishing to Power BI dialog opens. Once completed, a success message is displayed. 19. Select **Got it** to close the dialog. Now we have published the report to Power BI service. Let's navigate back to the browser and start exploring.	
Once you are in the browser, in the left panel notice under **DIAD_<youremailaddress>**, you will see **REPORTS -> DIAD Final Report** and **DATASETS -> DIAD Final Report**.	

Power BI Service – Building Dashboard

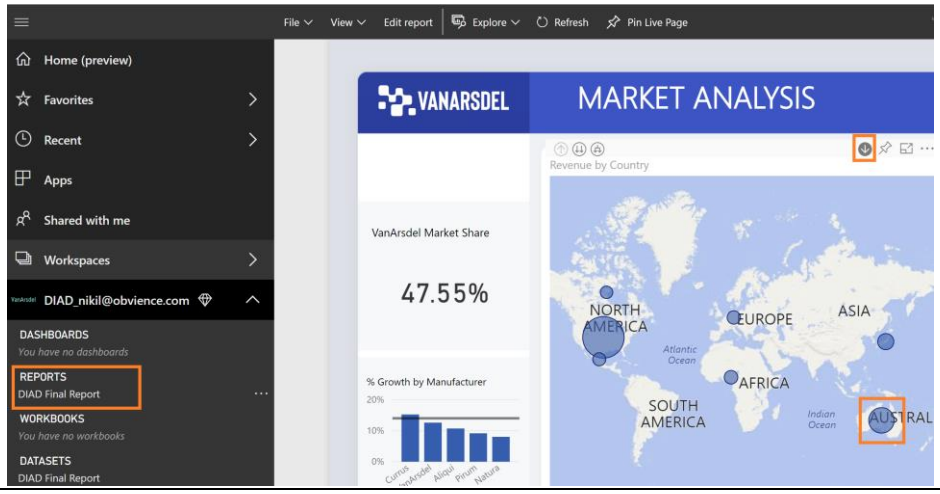
In this section, we will create a dashboard that will help compare VanArsdel's market share and performance over time.

At the end of the section, we will create a dashboard that looks like the screenshot.

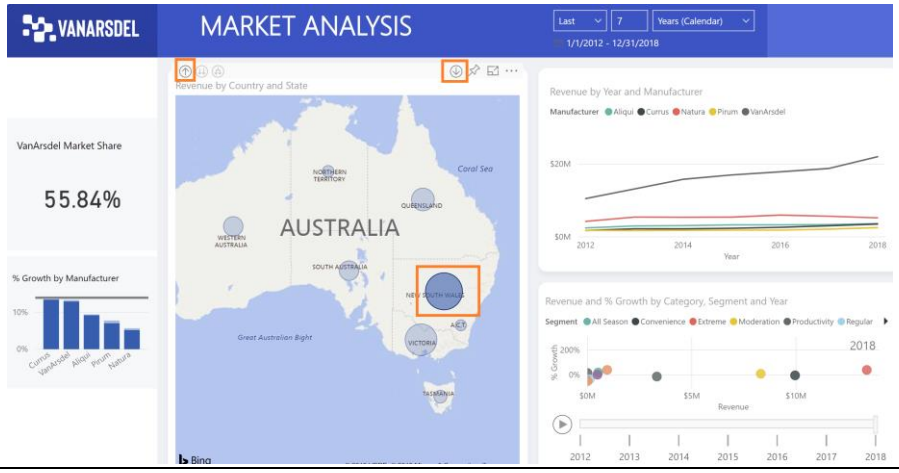


Let's start with exploring the report.

20. From the left menu, select **REPORTS -> DIAD Final Report.** You will be navigated to the report you just uploaded.
21. In the **map visual**, enable drill down by **hovering** over the visual.
22. Select the **down arrow** on the top right corner of the visual.
23. Select **Australia** to drill down to **State level**.



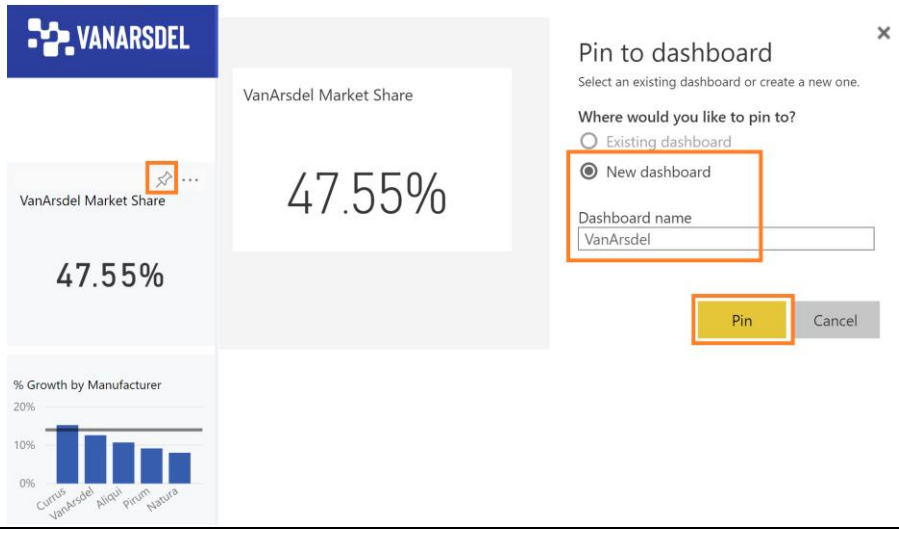
24. In the map visual, disable drill mode by selecting the **down arrow** on the top right corner of the visual.
25. Select the **bubbles on different states** and notice that as you select the states, other visuals get cross filtered. The behavior is like that of Power BI Desktop.
26. Select the **top arrow** on the top left corner to **drill up to Country level**.

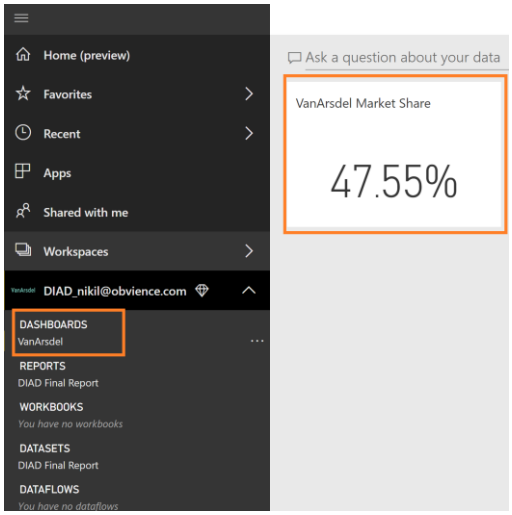
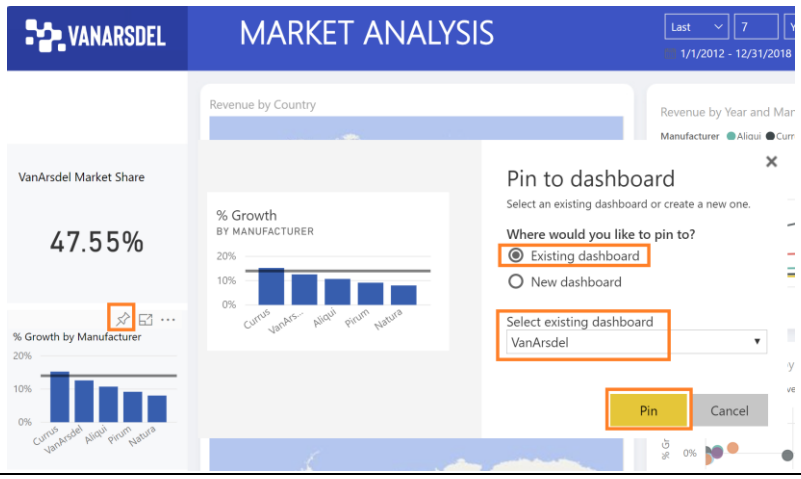
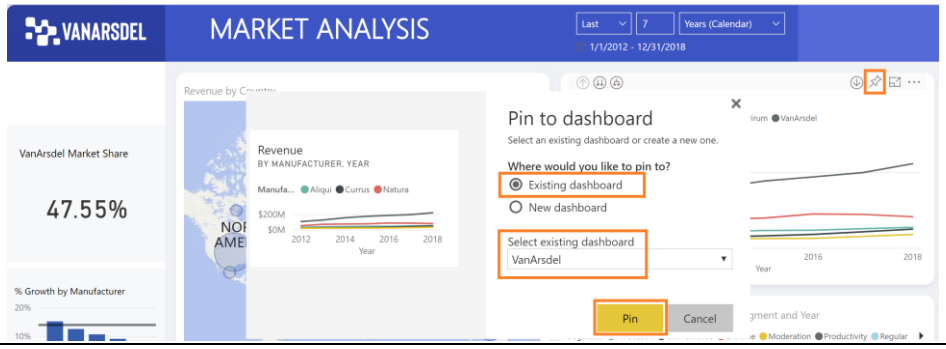


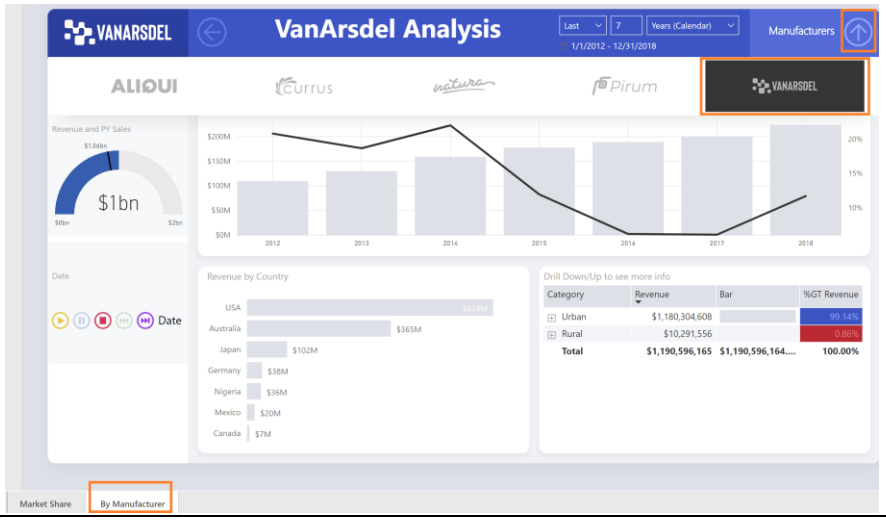
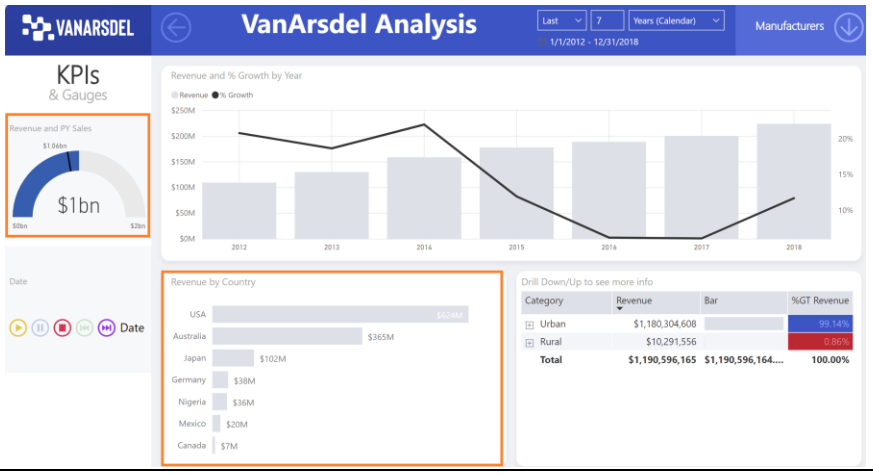
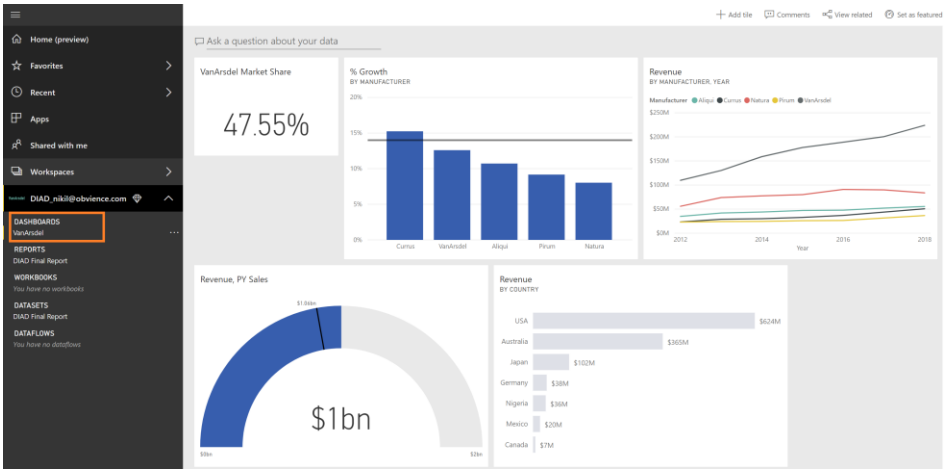
27. Hover over the **bubble chart** on the bottom right of the screen.
28. Select **Focus mode icon** so the visual fits in the canvas.
29. Select **Extreme from the legend**. This will highlight the performance of Extreme segment over time. Notice the spike in 2018.
30. Select the **Play axis** on the bottom left of the screen. This will show the revenue and % growth of each Product Segment over time.
31. Select **Extreme from the legend** again to remove the filter.
32. Select **Back to Report** on the top left to navigate back to report view.

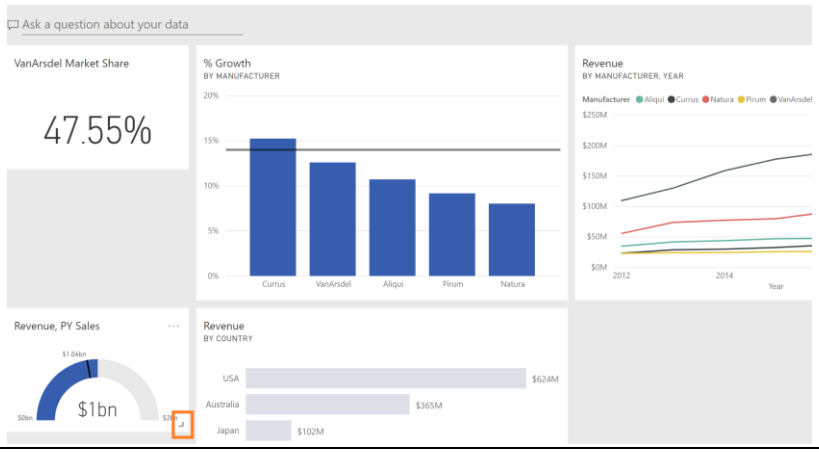
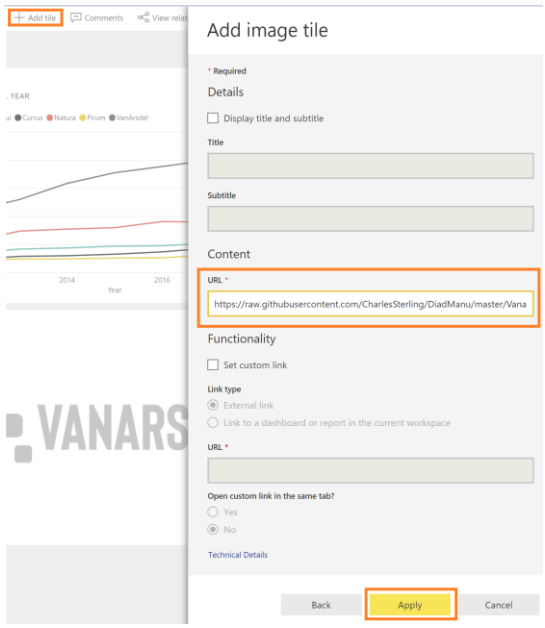
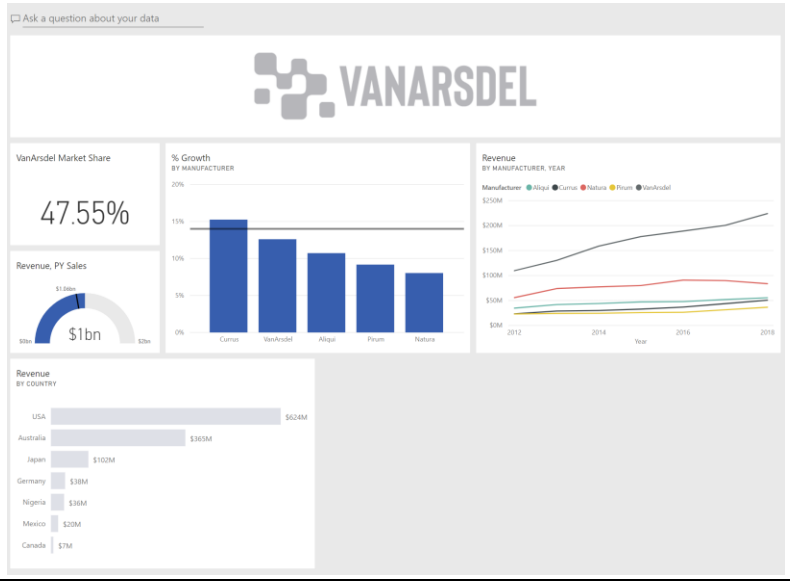
Let's pin visuals to the dashboard.
33. Hover over **VanArsdel Market Share** card visual.
34. Select the **pin icon** on the top right of the visual. Pin to dashboard dialog opens.
35. We do not have a dashboard yet. Let's create one. With **New dashboard** selected, enter **VanArsdel** in the text box.
36. Select **Pin**.

Notice alert messages are displayed stating the dashboard is ready to view.



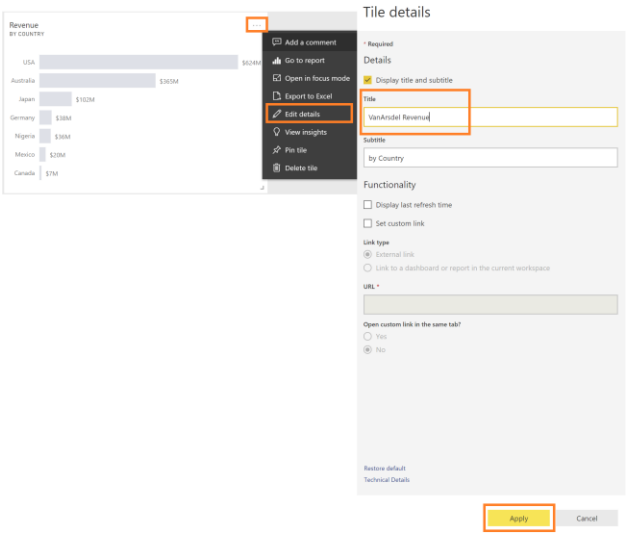
Notice in the left panel, VanArsdel Dashboard is created under DASHBOARDS. 37. From the left panel, select **DASHBOARDS -> VanArsdel**. Notice the VanArsdel Market Share tile is pinned to the dashboard. 38. Click on **VanArsdel Market Share,** notice you are navigated to the report. Tiles in dashboard are not interactive.	
39. Hover over **% Growth by Manufacturer** visual. 40. Select the **pin icon** on the top right of the visual. Pin to dashboard dialog opens. 41. Make sure **VanArsdel** is selected in the dropdown. 42. Select **Pin**.	
43. Close out alert dialogs. 44. Hover over **Revenue by Year and Manufacturer** visual. 45. Select the **pin icon** on the top right of the visual. Pin to dashboard dialog opens. 46. Make sure **VanArsdel** is selected in the dropdown. 47. Select **Pin**.	

48. Close out alert dialogs. 49. Navigate to **By Manufacturer** page. 50. From the top right corner, select the **down arrow**. Notice manufacturer slicer displays. 51. Select **VanArsdel** from the slicer. This will filter the visuals. 52. From the top right corner, select the **up arrow**. Notice manufacturer slicer collapses.	
53. **Pin** the **gauge visual** to the dashboard. 54. **Pin Revenue by Country** visual to the dashboard. 55. Close out alert dialogs. Note: VanArsdel filter is applied to the tile that is pinned to the dashboard.	
56. From the left panel, select **DASHBOARDS -> VanArsdel**. Notice all the visuals are pinned as tiles to the dashboard. You will see the visuals on the dashboard like the screenshot. 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 in the data model updates. Tiles are not interactive. Let's organize the dashboard now.	

57. Select and move the **gauge tile** as shown in the screenshot. 58. Select the **bottom right corner** of the tile and move it diagonally to change the image size. Tiles can be of **various sizes (1x1 to 5x5)**. Drag the tile using the bottom right corner to resize. As you are dragging, note the gray shadow which indicates the size of the tile when you stop dragging.	
59. From the top menu, select **Add tile**. Add tile dialog opens. 60. Select **Image** as the source. 61. Select **Next**. 62. In **URL** text box, enter https://raw.githubusercontent.com/CharlesSterling/DiadManu/master/Vanarsdel.png 63. Select **Apply**. Notice a new tile with VanArsdel logo is added to the dashboard.	
64. **Resize** and **rearrange** the tiles as shown in the screenshot.	

Revenue by Country tile shows Revenue by Country for VanArsdel, so let's rename it.

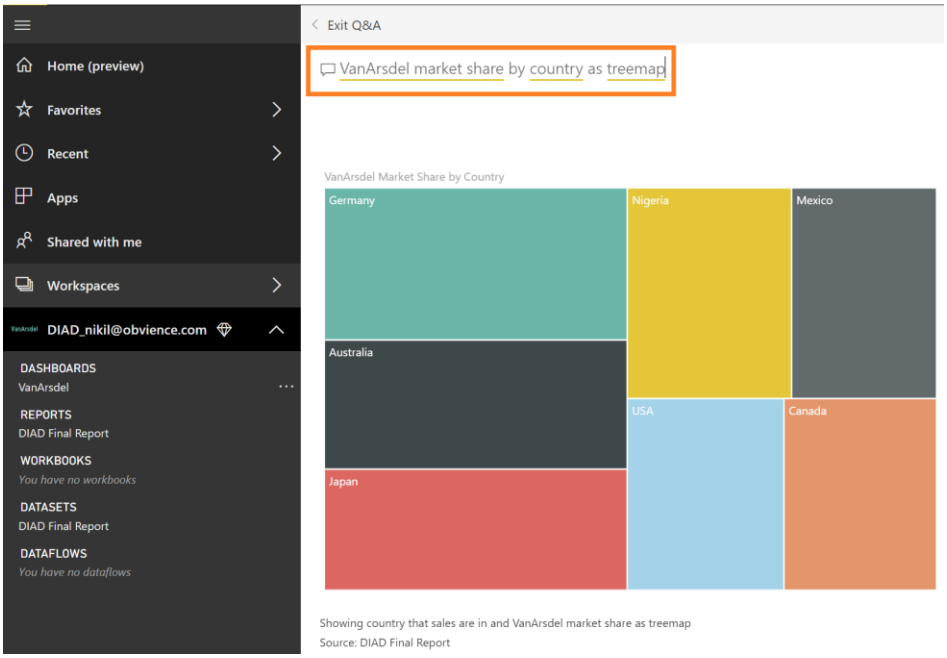
65. **Hover** over Revenue by Country tile.
66. Select the **ellipsis** on the top right corner of the tile.
67. Select **Edit Details**. Tile Details dialog opens.
68. Change **Title** to **VanArsdel Revenue**.
69. Select **Apply**.



It will be nice to have a visual that represents Market Share by country. Notice on the top of the visual, there is an option to **Ask a question about your data**.

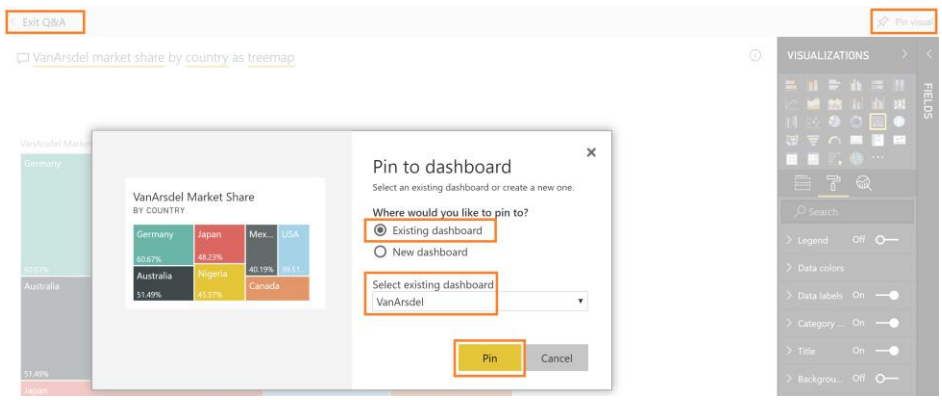
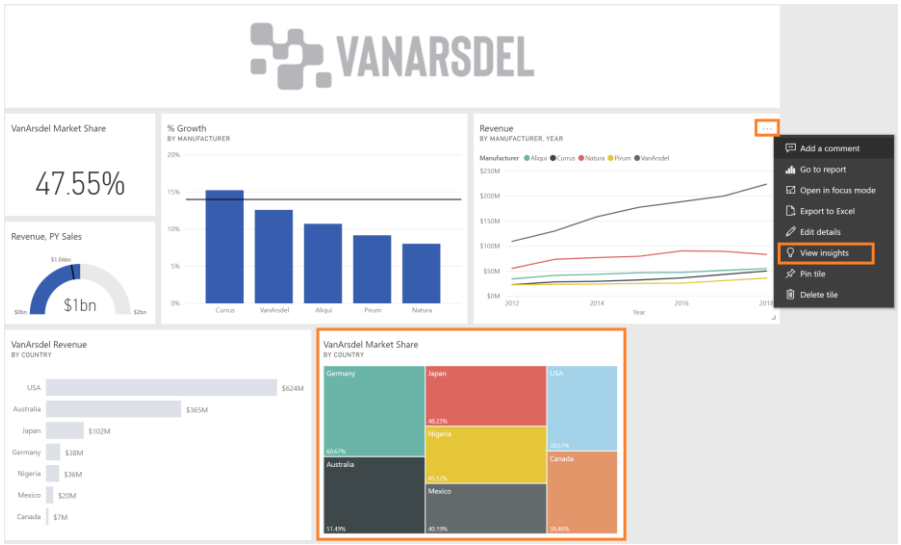
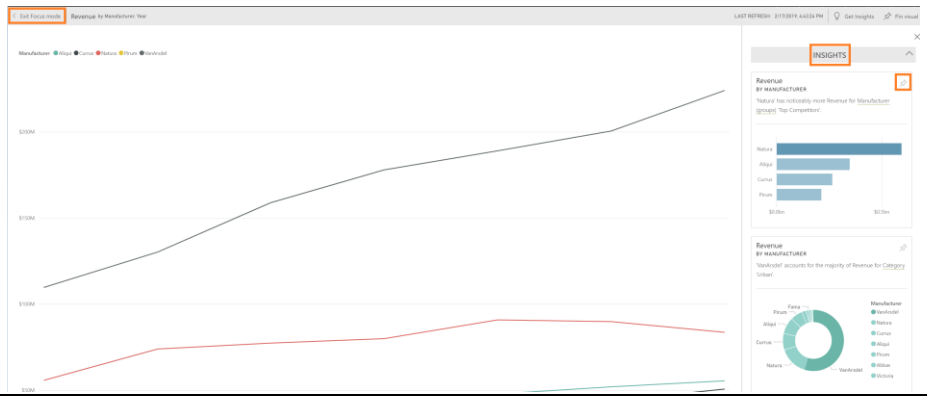
70. In the text box start typing, **VanArsdel market share.** Notice a card visual is created.
71. Continue typing **VanArsdel market share by country**. Notice a bar chart is created.
72. Continue typing **VanArsdel market share by country as treemap**. Notice a treemap visual is created.

Note: Remember we renamed tables. One of the reasons we did it is to make it user friendly for Q&A.

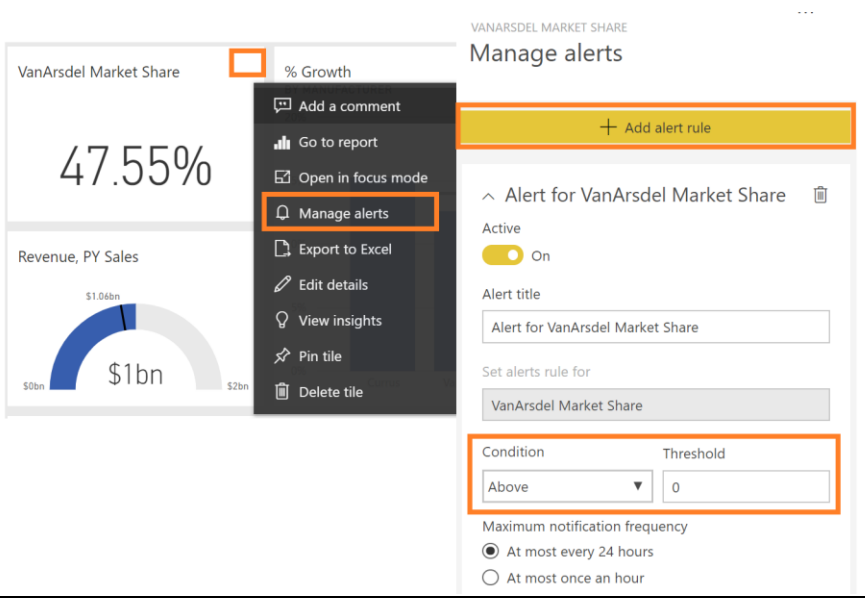


73. From the right panel, select the **arrow** next to **VISUALIZATIONS** to expand the section.
74. Select the **paint roller icon**.
75. Enable **Data labels**.

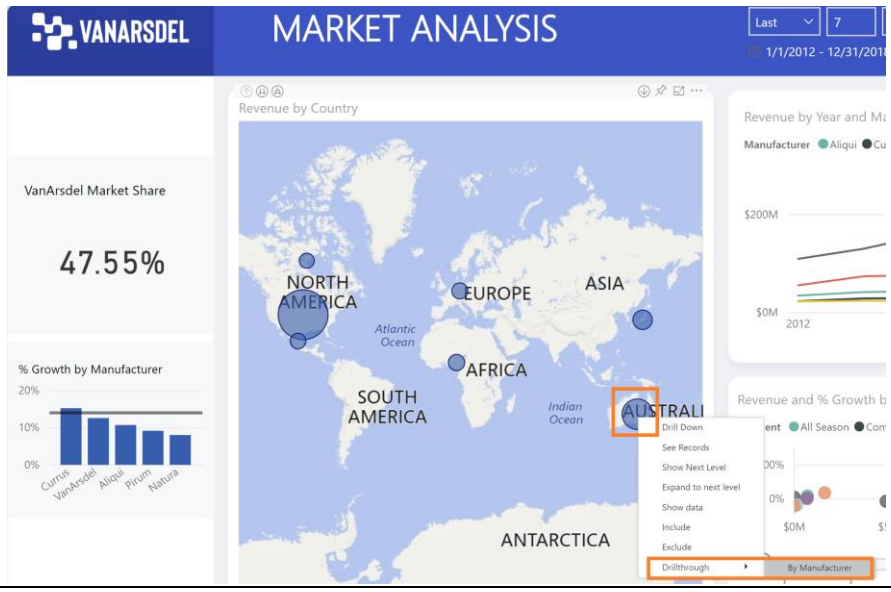
Note: The visual can be modified and formatted like we did in Power BI Desktop. You can expand FIELDS section to add fields like Power BI Desktop.

76. From the top right of the screen, select **Pin Visual**. 77. Pin to dashboard dialog opens. Select **Pin** to pin the visual to VanArsdel dashboard. 78. Close the alert dialogs. 79. Select **Exit Q&A** to navigate back to the dashboard. Notice the visual is added as tile to the dashboard. Clicking on the tree map visual will navigate you back to the Q&A section.	
80. Hover over the **line chart** on the dashboard. 81. Select the **ellipsis** on the top right corner. 82. Select **View Insights**.	
You will be navigated to **Focus mode** for the line chart. 83. **Scroll** on the Insights panel to review the various insights Power BI can generate. Notice that there is an option to pin insight visuals to the dashboard. 84. Click on **Exit Focus mode** on the top left to navigate back to the dashboard.	

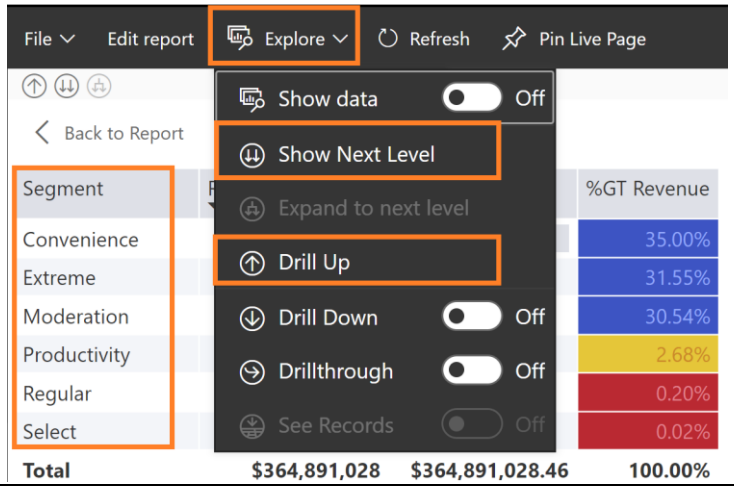
85. Hover over **VanArsdel Market Share** tile.
86. Click on the **ellipsis** on the top right corner of the tile.
87. Select **Manage alerts**. Manage alerts dialog opens.
88. Select **Add alert rule dialog**.
Notice you can add Above and Below threshold and notification frequency can be set.
This is an introduction to managing alerts. Complete functionality is not covered in this lab.
89. Select **Cancel** to close the dialog.
90. Select **Don't Save**.



91. Click on **VanArsdel Market Share** tile to navigate to the report.
92. In map visual, right click on Australia bubble and select **Drillthrough -> By Manufacturer**.
You will be navigated to By Manufacturer page of the report with Australia filter applied to the report page.

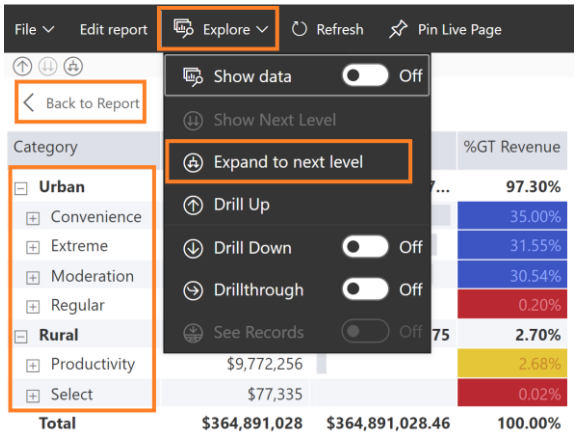


93. Hover over **matrix** visual.
94. Select **focus mode icon** on the top right corner of the visual.
95. From the top menu, select **Explore -> Show Next Level.** Notice now data is at Product Segment level.
96. From the top menu, select **Explore -> Drill up**.

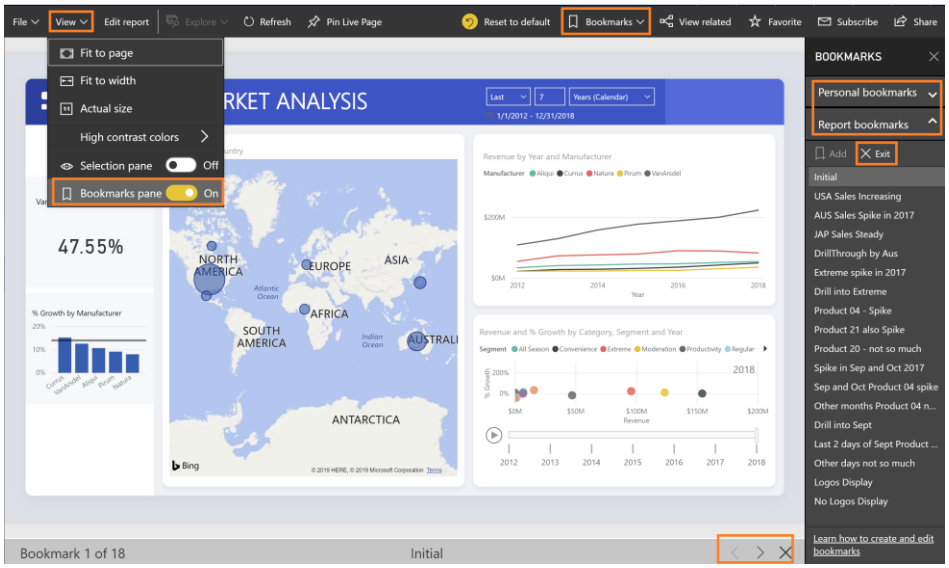


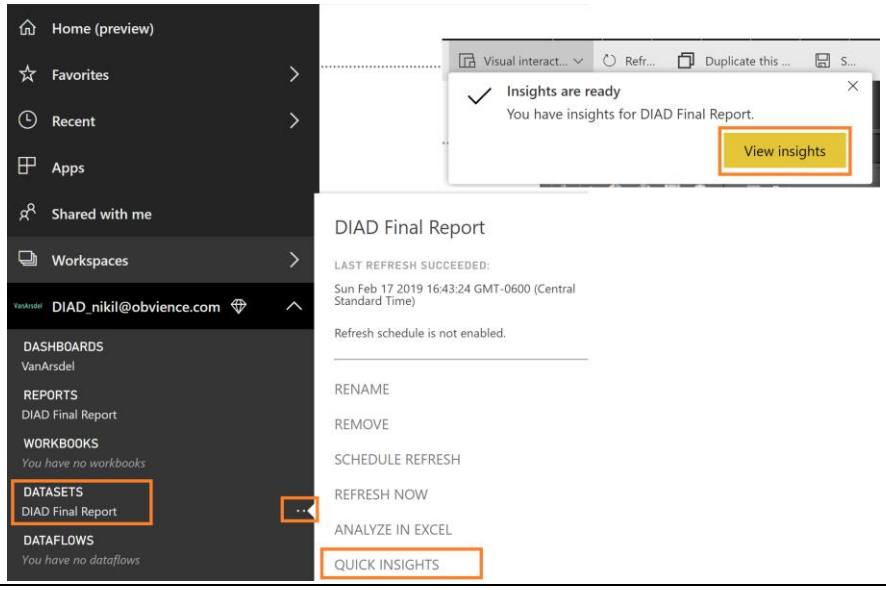
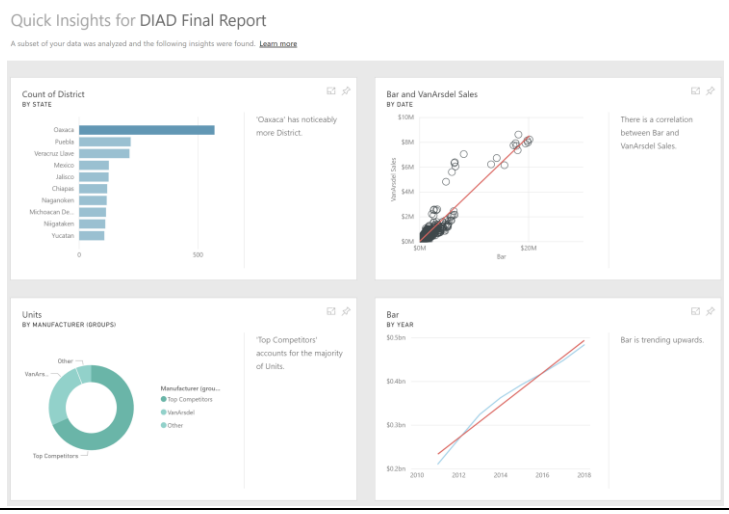
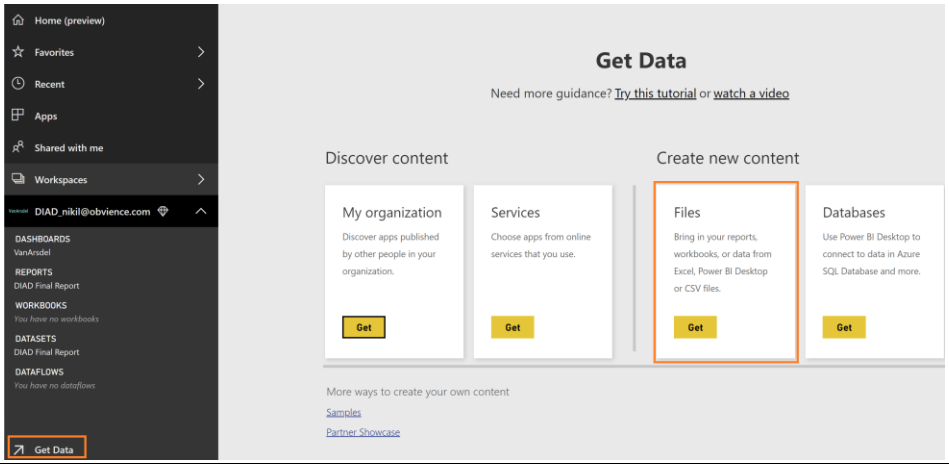
97. This time from the top menu, select **Explore -> Expand to next level**. Notice now data is at Segment level but laid out as a hierarchy.
98. Select **Back to Report** to navigate back to the report view.

Notice all the functionality that is available in Power BI Desktop is available in the service. E.g. Show Data, See Records, etc.

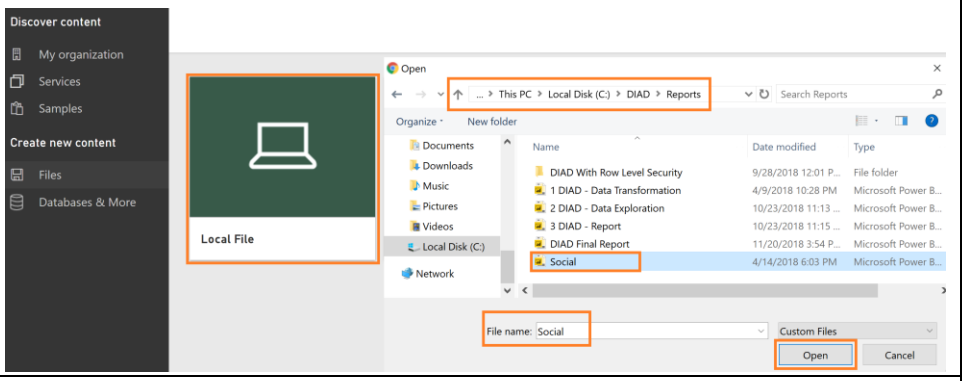


99. From the top menu, select **View** and **enable Bookmark pane**. Bookmark pane opens on the right. There are 2 options, Personal bookmarks and Report bookmarks.
Report bookmarks: are the bookmarks report author created (we did this in Power BI Desktop).
Personal bookmarks: Report consumer can create their own bookmarks.
100. Select **View** in the Report bookmarks pane.
Notice you can view and navigate through the bookmarks using the arrow in the bottom of the screen. The behavior is like in Power BI Desktop.
101. Select **Exit** in Bookmark pane to close it.

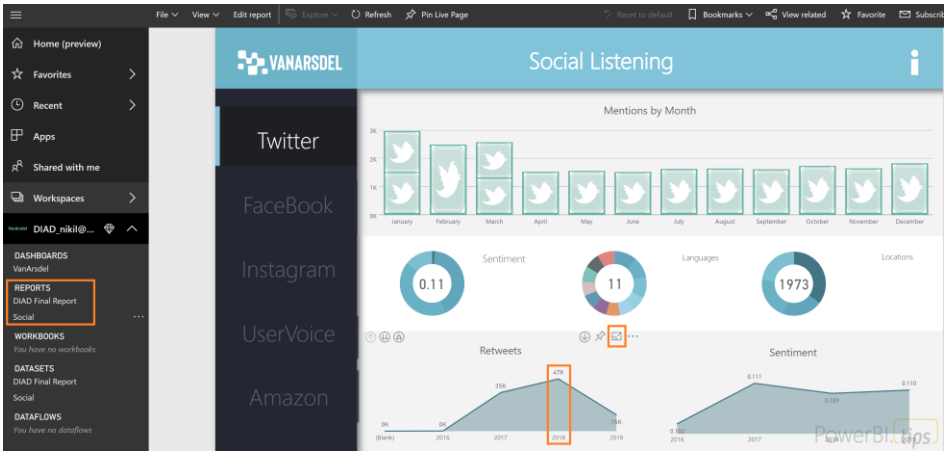


Power BI provides an option to get quick insights into the complete dataset. 102. In the left panel, hover over **DATASETS -> DIAD Final Report**. 103. Select the **ellipsis**. 104. Select **Quick Insights**. It might take a few minutes for the insights to be created. Once insights are ready a message appears of the top right corner. 105. Select **View insights.**	
A quick insights report is displayed based on the dataset. This provides insights into data you may have missed and helps to get a quick start with creating dashboards. Hovering over each report provides an option to Pin it to a dashboard.	
Marketing team has captured data from social networks and built a Power BI report. Let us publish this report to Power BI service and analyze the data. 106. From the bottom of the left panel, select **Get Data.** 107. **Get Data** screen is displayed. Under Import or Connect to Data, select **Files**.	

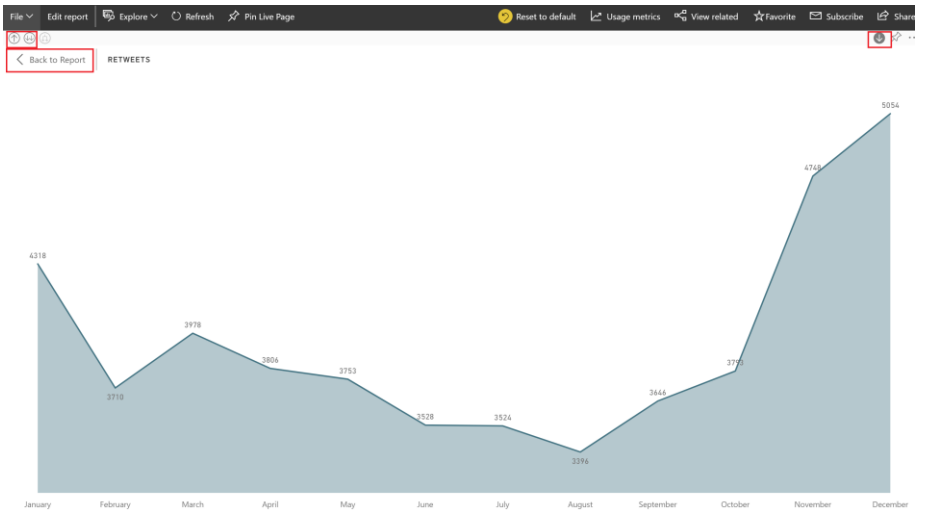
108. From Get Data -> Files screen select **Local File**.
109. File browser dialog opens. Navigate to **/DIAD/Reports** folder.
110. Select **Social.pbix** file and click **Open**.

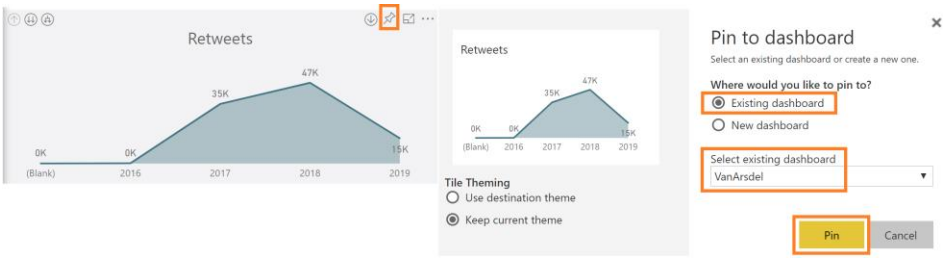
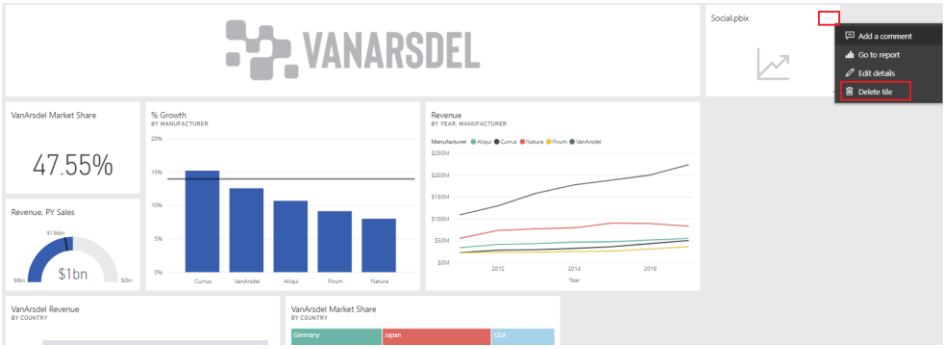


111. Once the report is published, an alert message appears**. Close the alert dialog**.
In the left panel, notice under REPORTS, we see Social.
112. Select **REPORTS -> Social** to be navigated to the Twitter page of the Social report.
Marketing team has captured the retweets of #VanArsdel. Notice there is a spike in 2018. Does this have any correlation to the spike in sales in Australia? Let's investigate.
113. Hover over **Retweets visual** and click on **Focus mode icon**.



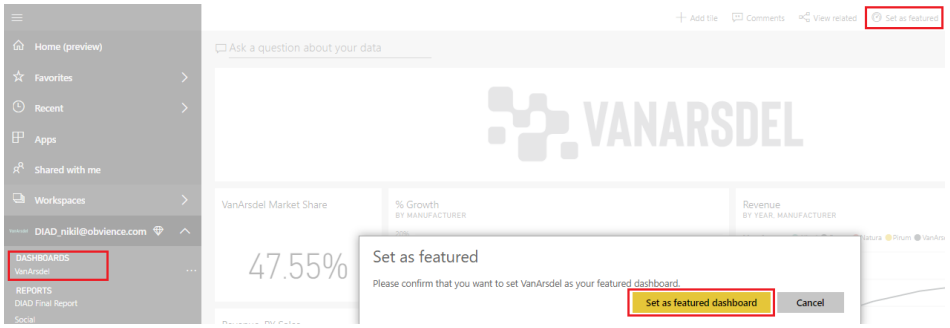
114. **Enable** drill mode.
115. Drill down to **month level** for the year 2018.
Notice there is a big spike in retweets in the last few months of 2018. Maybe this has a correlation to the spike in sales.
116. Drill back up to **Year level**.
117. Select **Back to Report** to navigate back to report view.



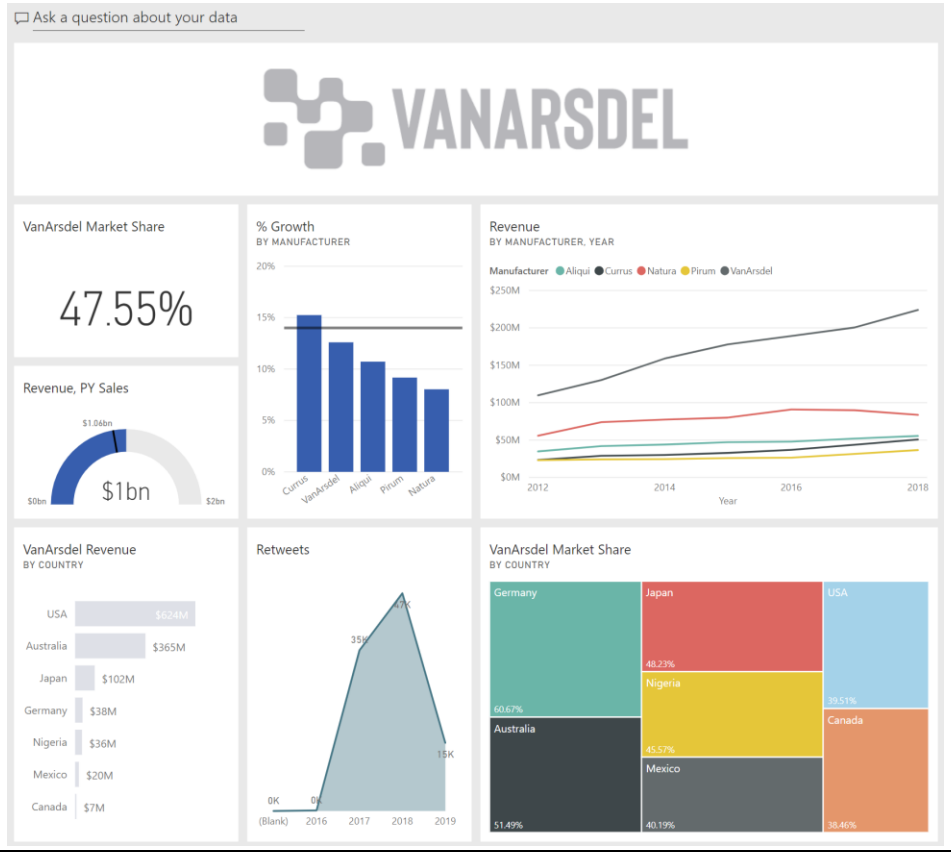
118. **Hover** over Retweets visual. 119. Select the **pin icon** on the top right of the visual. Pin to dashboard dialog opens. 120. Pin the visual to **VanArsdel dashboard**.	
121. **Close** the alert dialogs. 122. From the left panel, select **DASHBOARDS -> VanArsdel** to navigate to the dashboard. Notice two new tiles are added to the dashboard. The retweets tile we just pinned and a default tile that is added when a new dataset is added. 123. Hover over **Social.pbix** tile. 124. Click on the **ellipsis** on the top right corner. 125. Select **Delete tile** to remove the tile. Notice you can have tiles from multiple reports and Q&A section on a single dashboard.	
126. Navigate back to **VanArsdel** dashboard. 127. Notice on the top right of the menu bar, there is options to add this dashboard to the favorites. Click on **Favorite** option. 128. Now click on **Favorite in the left panel**. Notice the dashboard is added to the list. This is an easy way to access all your favorite or most used dashboards quickly. 129. Click on the **ellipsis** on the top right corner of the page, next to **Share** option. Notice there are options to **duplicate, print and refresh dashboard.**	

On the top right corner of the screen, next to Favorite, there is Set as featured option. Set as Featured dashboard sets the dashboard as the default dashboard that user will land on every time they login.

130. In the left panel, select **VanArsdel Dashboard**.
131. Select **Set as Featured** from the top menu.
132. A confirmation dialog is displayed. Select **Set as Featured Dashboard**. This sets VanArsdel as the featured/default dashboard.



133. Navigate back to **VanArsdel** dashboard.
134. If you have not already done so, move the visuals to look like the screenshot.
You have successfully built a dashboard.



Power BI Service – Collaboration and Distribution

You have built the dashboard and ready to get feedback and collaborate with your team members.

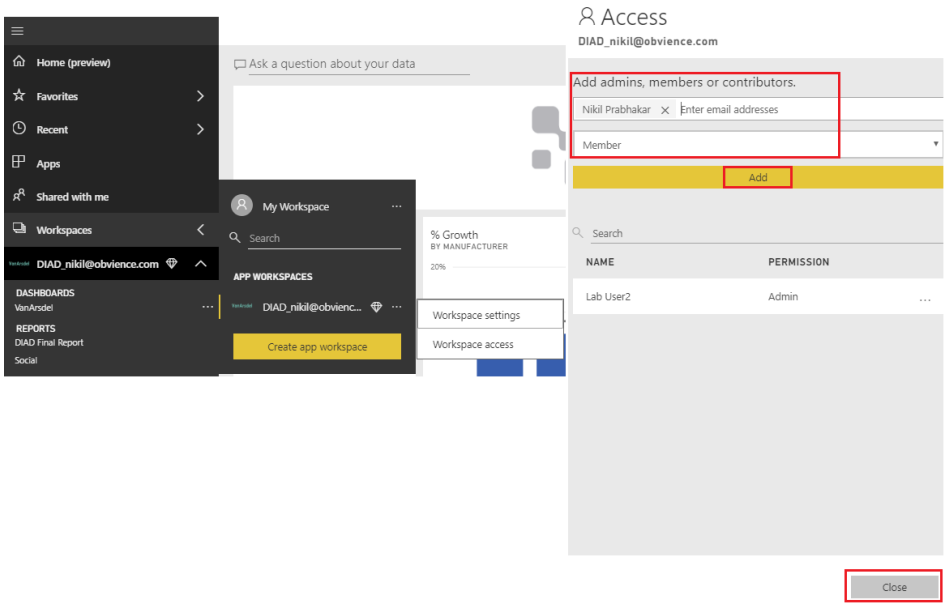
1. From the left panel, select **Workspaces**.
2. Select the **ellipsis** next to **DIAD_<youremailaddress>.**
3. Select **Workspace access**.
4. Access dialog opens. You can **enter email address** of the colleagues you want to collaborate with.

Each user can belong to one of the 3 **roles**:

Admin	Can change/delete workspace. Can add Admins. Everything a member can do.
Member	Re-share. Publish & update Apps. Everything a Contributor can do.
Contributor	Add/edit/delete content within workspace.

5. Select the **role** and select **Add**.
6. Once you finish adding your colleagues and select **Close**.

Note: you can ask your colleague to login and access the workspace.

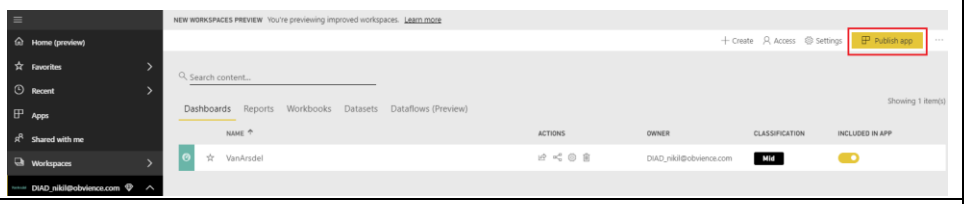
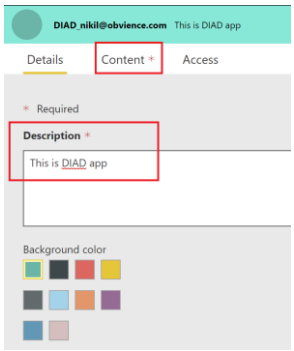
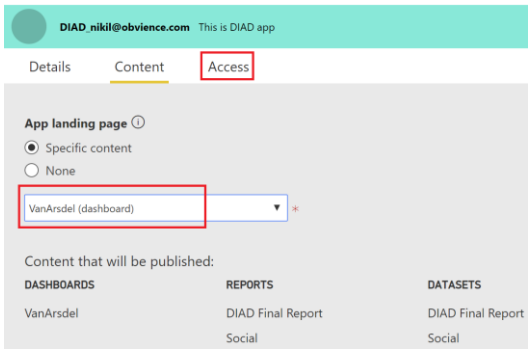
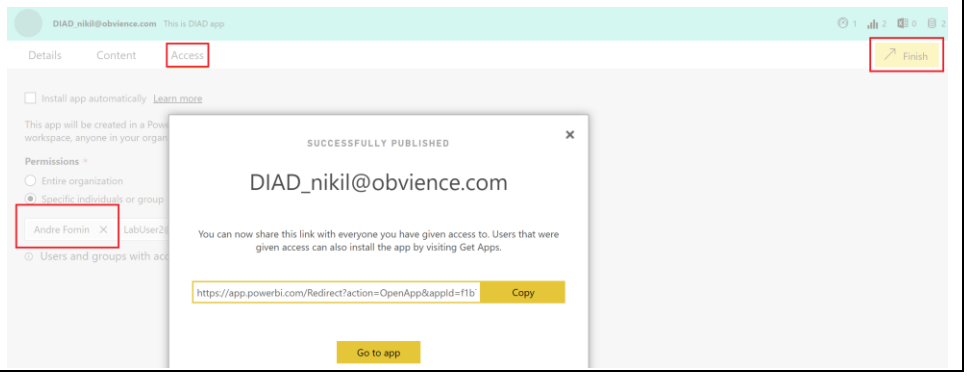


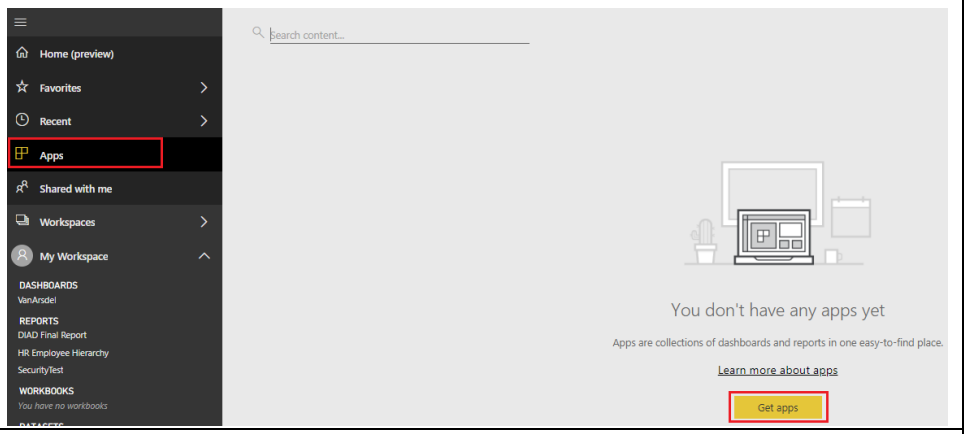
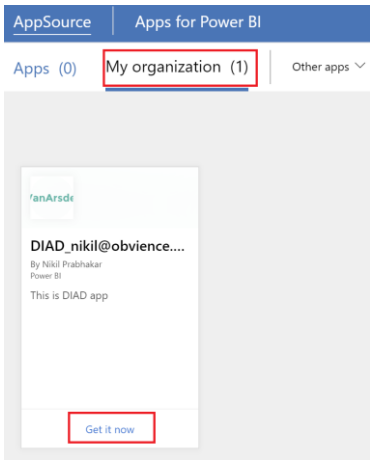
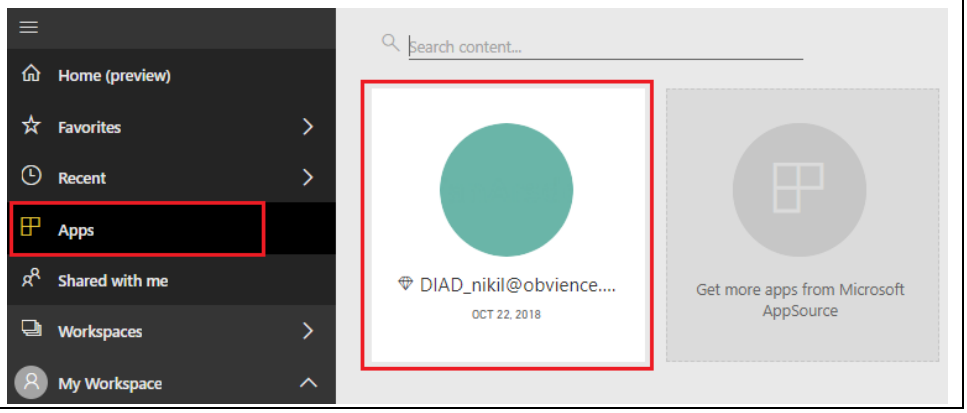
Now let's share the content we created with the report viewers/consumers. We need to publish an app to do this.

7. In the left panel select **DIAD_<youremailaddress> workspace**.
8. In the **Dashboard** page, notice there is an option **INCLUDED IN APP**, to include the Dashboard in the App.

9. Navigate to **Reports** page.
10. Notice there is an option **INCLUDED IN APP** to include the Reports in the App.

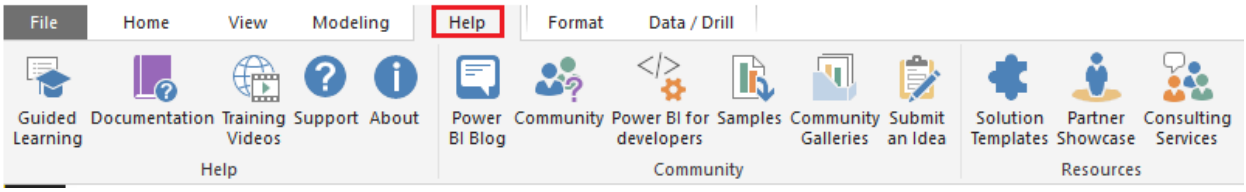
If you have reports and dashboards in your workspace that you do not want to

share with report viewers, you can use this feature.	
11. In the left panel select **DIAD_<youremailaddress> workspace.** 12. From the top right corner of the top menu select **Publish app.**	
13. In the **Details** page, enter "**This is DIAD app**" in the description field. 14. Navigate to **Content** page.	
15. From the dropdown select **VanArsdel (dashboard)**. When a user accesses the DIAD app, we want them to land on the VanArsdel dashboard. 16. Navigate to **Content** page.	
17. **Enter the email address** of the users or groups you want to give access to. 18. On the top right corner, select **Finish**. 19. **Ready to publish** dialog appears. Select **Publish**. 20. Once the App is published a success dialog appears.	

You can copy the link to the App and share it with the individuals via email. But a better way for report viewers to consume the App is by logging onto Power BI Service and registering the App. Let's impersonate a report viewer. 21. From the left menu, select **Apps**. 22. Select **Get Apps**.	
23. AppSource dialog opens. You will notice **DIAD_<youremailaddress>** App listed. Select **Get it now.** This is a one-time registration. Going forward when you select Apps in the left panel, you will see **DIAD_<youremailaddress>** app in the list of Apps you have registered.	
24. Click on **DIAD_<youremailaddress>** tile**.** You will be navigated to VanArsdel dashboard.	

References

Dashboard in a Day introduces you to some of the key functionalities available in Power BI. In the ribbon of Power BI Desktop, the Help section has links to some great resources to help you as needed.



Here are a few more references that will help you with your next steps with Power BI.

Getting started: http://powerbi.com

Power BI Desktop: https://powerbi.microsoft.com/desktop

Power BI Mobile: https://powerbi.microsoft.com/en-us/mobile

Community site https://community.powerbi.com/

Power BI Getting started support page: https://support.powerbi.com/knowledgebase/articles/430814-get-started-with-power-bi

Support site https://support.powerbi.com/

Feature requests https://support.powerbi.com/forums/265200-power-bi

Power BI course https://www.edx.org/course/analyzing-visualizing-data-power-bi-microsoft-dat207x-0

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