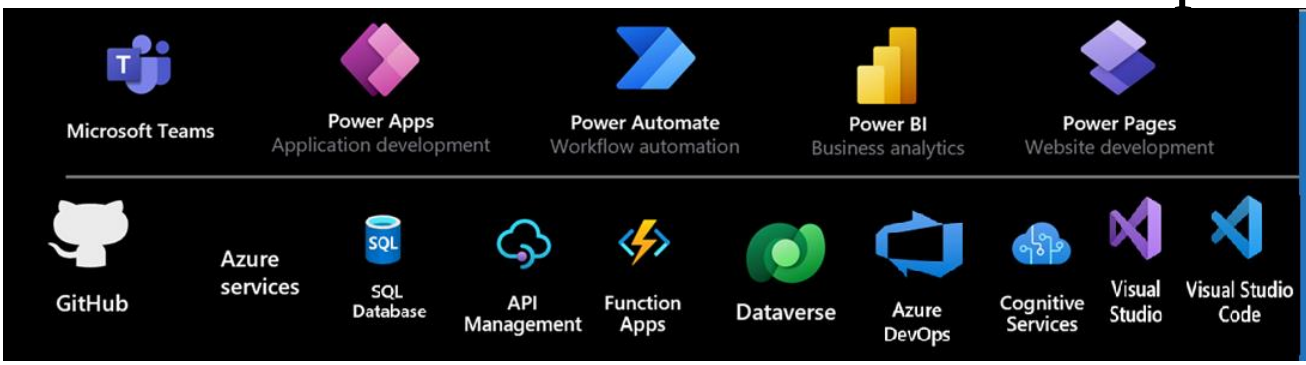
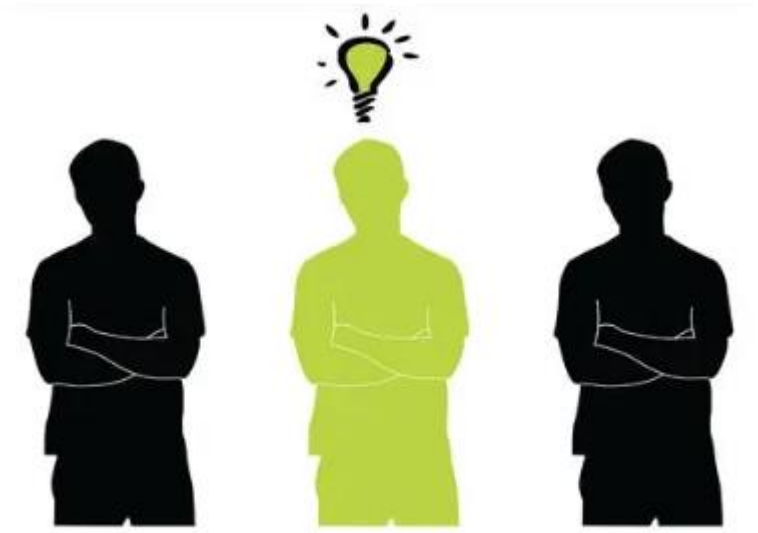
Power BI Training

Trainer – Pavan Mani Deep Y





ECELLORS CRM Blog

1 Welcome

Welcome to your Power BI Training Course.

This manual contains all our notes for this course … but these are only half the story!

For you to get the most out of this course, you'll want to make your own notes on the pages that follow.

Please ask questions as we go and remember that if you have a question about something, someone else is probably thinking the exact same thing!

The course outline is flexible to a certain extent so if there are particular areas of interest, we may be able to cover these in greater depth … or vice versa for areas that everyone is already very familiar with.

As we go, please share your experiences and frustrations as they help both you and the other participants to get the most from it.

Enjoy!

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Throughout these notes you will find useful and timesaving advice. Down the left-hand side of some pages, you'll see icons that highlight certain points and make the guide easier to follow.

There are four types of icons:

TIPS > pointers that make your work easier and make you a star!

TECHNICAL > Non-essential points for the more technically minded

TRAPS > Things that may catch you out if you're not aware

EXTRA EXERCISE > Examples for you to perform, often using pre-prepared files.

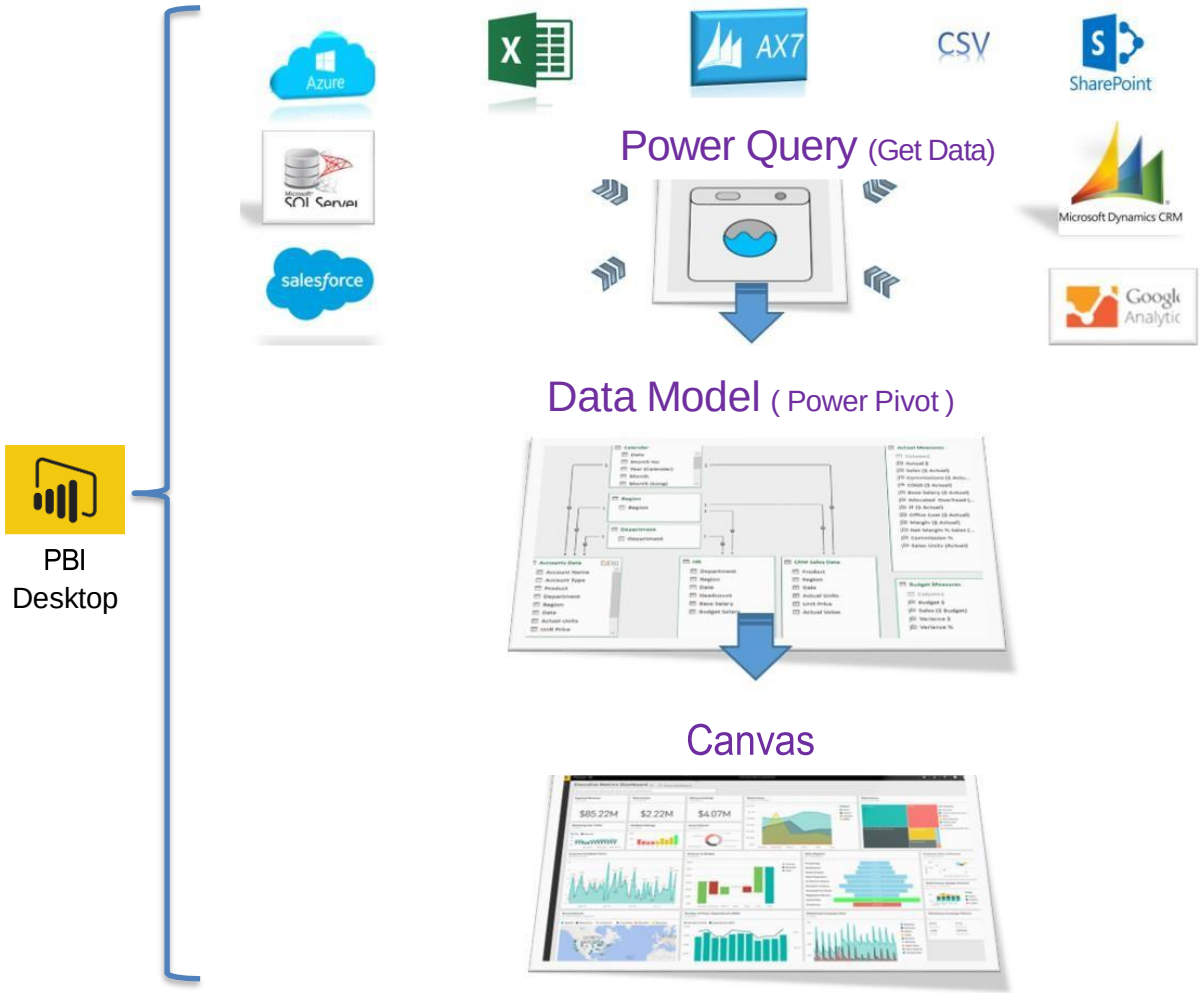
1. Introduction to Power BI Desktop and Power BI.com

Power BI consists of 2 main elements:

- Power BI Desktop (connect to data build and design your reports)
- PowerBI.com (publish and share your reports, control who has access)

Power BI DESKTOP consists of 3 key elements

- Power Query for importing and transforming data
- The Data Model (Power Pivot) for storing and joining data together
- The Canvas, where you design your report



www.ecellorscrm.com

1.1 How to get Power BI Desktop

Go to www.Power BI.com and select Products > Power BI Desktop

1.2 First Look at Power BI Desktop Report

Open the file

Exercises\First Look.pbix

We can explore slicers, cross filtering, drill down, drill through, tooltips

We will build this report later but in order to build reports we must first get the data.

This is where Power Query comes in.

1.3 Introducing Power Query

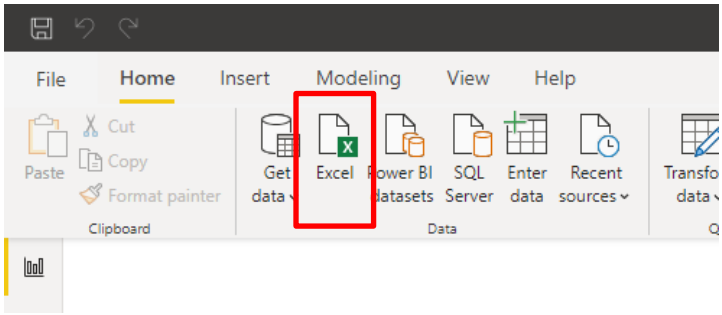
Extract: Pull data from multiple sources

Transform: Clean up and re-organise data

Load: Push that data to location to analyse it

We are going to use Get Data (Power Query) to grab the data from EmployeeData.xlsx then choose the columns we require and extract additional information.

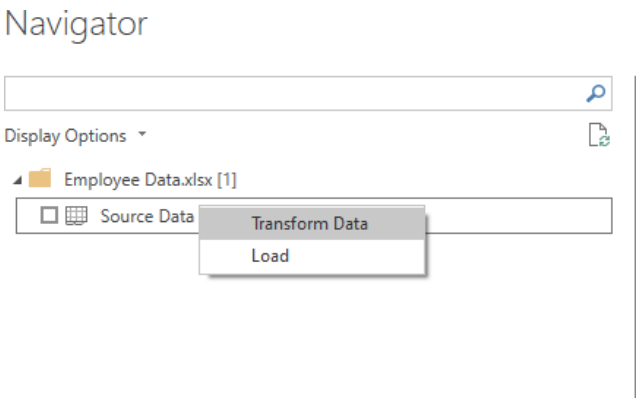
- Home > Excel



Find this file and double click it:

Exercises \ Get Data (Power Query) \ Employee Data.xlsx

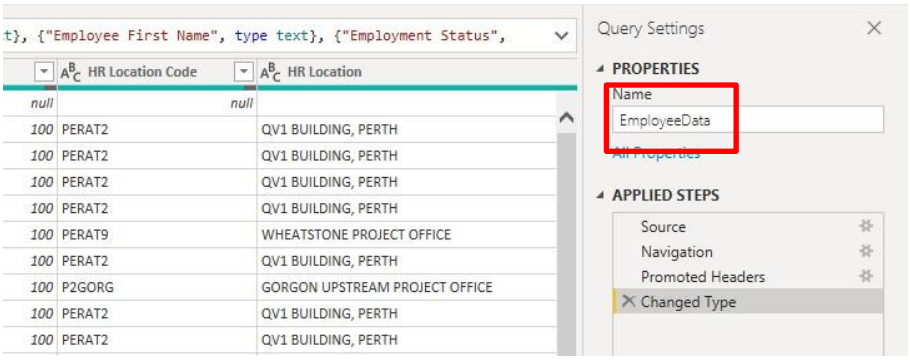
Right-Click (will use the shorthand RC in this manual) on the word Source Data (this is a sheet name in the Excel file).
Choose Transform Data



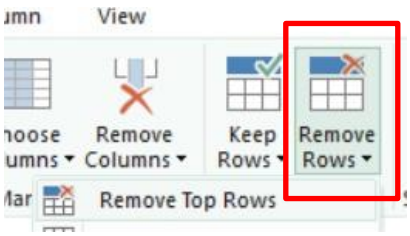
Now we are in the Power Query Editor window. Let's take a moment to look through this and talk about how it works and what it does.

- Name the Query as “EmployeeData”.

Tip – use CamelCase (proper name is Pascal Case) for naming tables

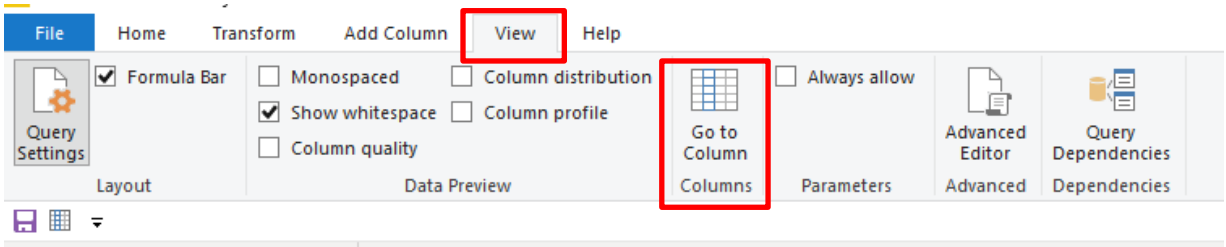


- Remove the first row (although probably safer to filter where Emp ID <> null)



- Next, we will extract Department from a column called “Organisational Hierarchy”

To find the Organisational Hierarchy column we can use the Go to Column button on the View Tab

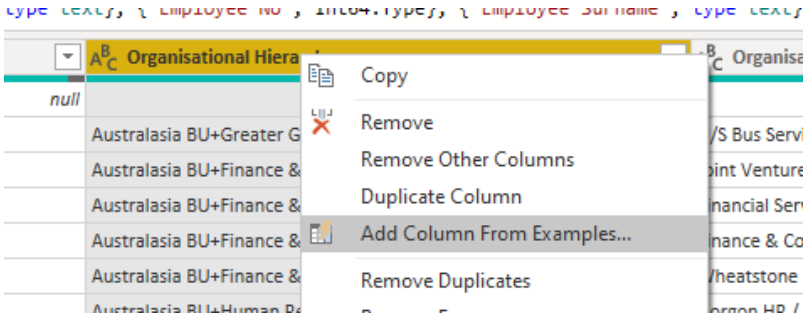


Tip 1: I’d recommend adding that button to your Quick Access Toolbar by Right-Clicking it.

Tip 2: Make sure the formula bar check box is ticked

After clicking the Go to Column button type Org and then double click Organisational Hierarchy.

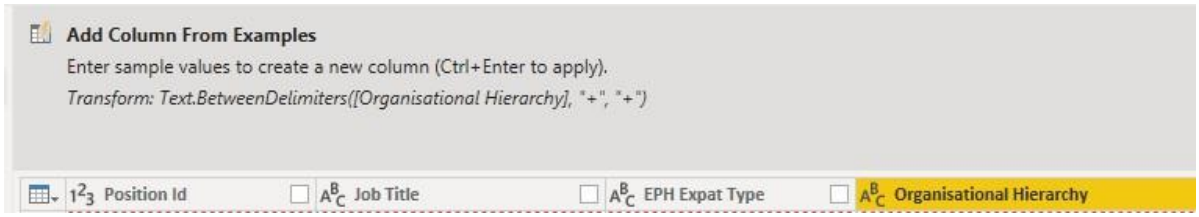
Right Click on the Org Hierarch column and choose Add Column from Examples…



Here we can simply type what we want to extract such as Greater Gorgon and press Enter

Try typing over Greater Gorgon with all capitals then press Enter

Tip: Always read the formula in the top left to see what is happening



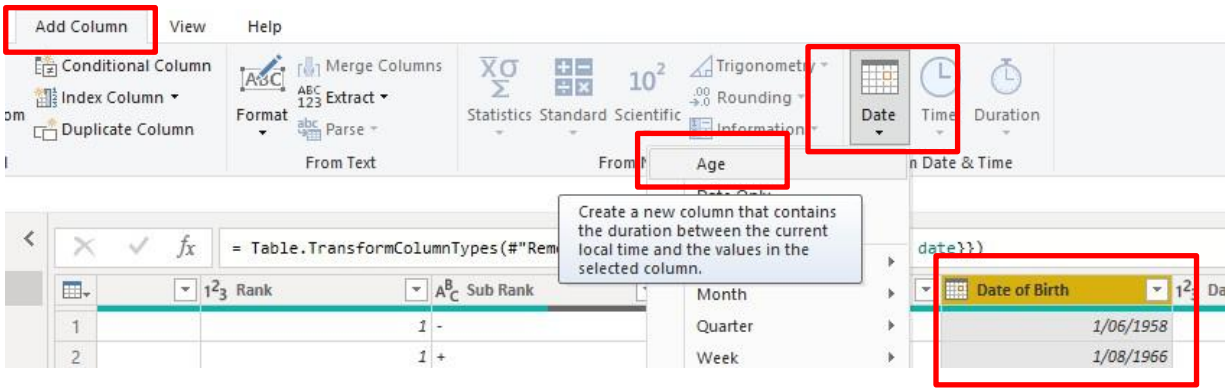
Rename the column “Text Between Delimiters” as Department before clicking OK
(double click on a column heading to rename it)

- Add Age Column

Go to Column > Date of Birth

Firstly, change the data type for Date of Birth to a “Date”

Then with that column selected, go to Add Column tab > Date > Age



This generates an Age in Days

RC > Transform > Total Years

RC > Transform > Round > Round Down

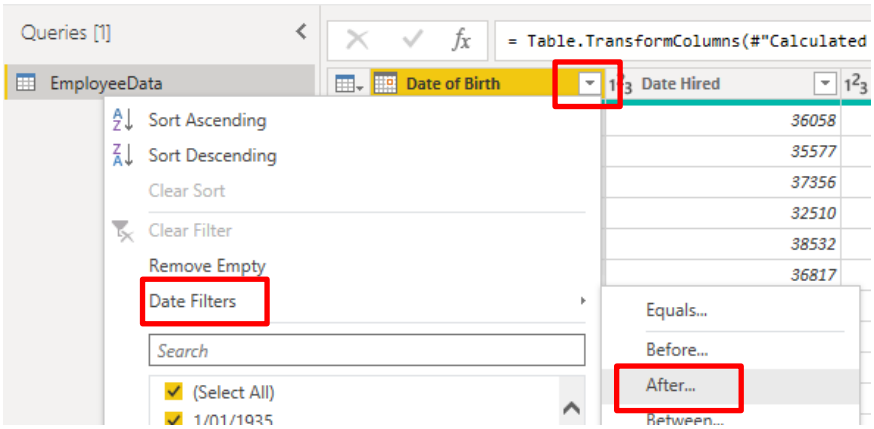
- Merge Rank and Sub Rank into a single column and name it Full Rank

  Use Ctrl to highlight multiple columns, then Right Click Merge

- Merge First Name, Surname and Employee Number and call it Full Name

  Use Ctrl to select the columns in the required order, then Right Click Merge
  Note: The order of selection is the order they will be combined

- Filter out anyone born before 01/03/1974
  Find Date of Birth
  Apply a Filter > Date Filter > After (then change to after or equal to 01/03/1974)



- Ctrl-click these columns then Right-click and select Remove Other Columns

	Full Name	Full Rank	Gender	Age	Department
1	Amy Aylett 103	1-	Male	61	Greater Gorgon
2	Adrian Agnew 104	1+	Male	53	Finance & Compliance
3	Adrian Agrawal 107	3+	Female	45	Finance & Compliance
4	Alexandra Aravidis 109	3	Male	71	Finance & Compliance

Tip: Alternative is to use the Choose Columns button on Home tab

- Select Home > Close and Apply

Top 10 Power Query Tips:

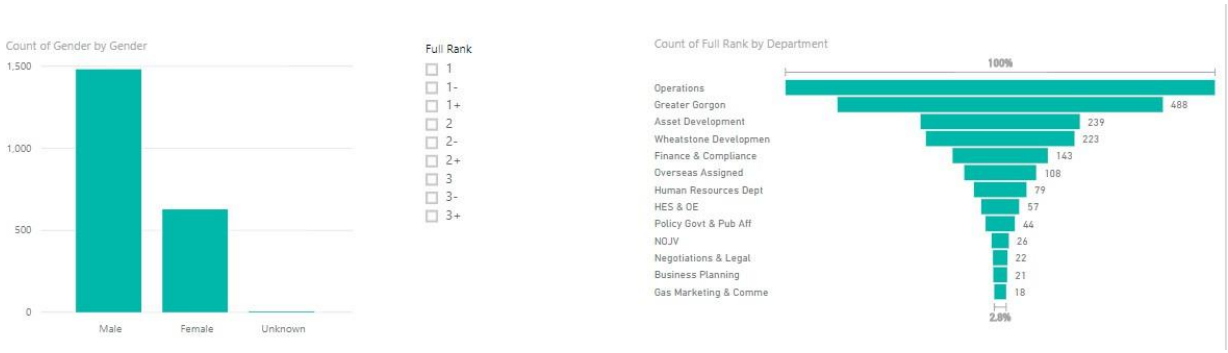
1. Always have the formula bar turned on (via View > Formula Bar)
2. Rename applied steps to be more meaningful
3. Add comments explaining WHY you did your steps. Right-Click on a step and choose Properties to add comments. I then used to add i to the start of a step name to flag a comment exists, however, now, thanks to the power of ideas.powerbi.com, we have that happen automatically.
4. Avoid spaces in Table names – use CamelCase. It makes measures easier to read later.
5. Never have a column and a loaded query (table) with the same names

   e.g. don't have a table and column called Product. Rename the Table as ProductData or similar
6. Never have a column with the same name as a Measure.

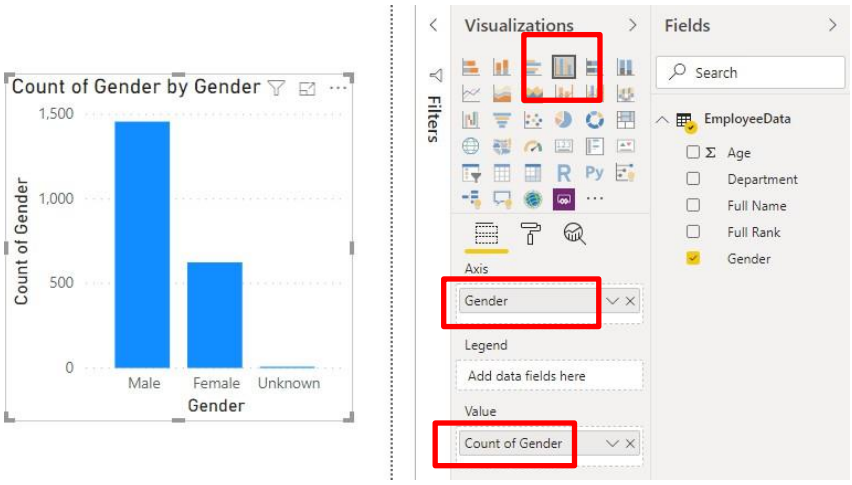
   e.g. Budget is a good measure name so rename the column of values as Budget Value Column
7. Name your loaded queries (tables) something short and to the point.

   e.g. SalesOrderHeader_DB145_PROD is not great
8. Spaces in Column names are fine
9. Never leave a data type as ABC123
10. Only load the columns you need. Long thin tables are good.

Now we can build a simple set of visuals by following the steps below

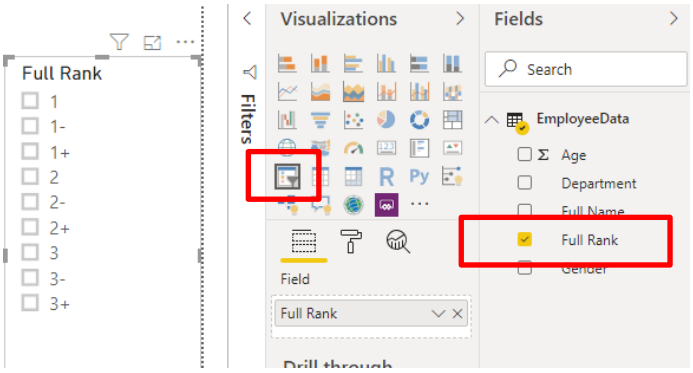


1. Click the Column Chart Icon and then tick Gender followed by dragging Gender into the Value box

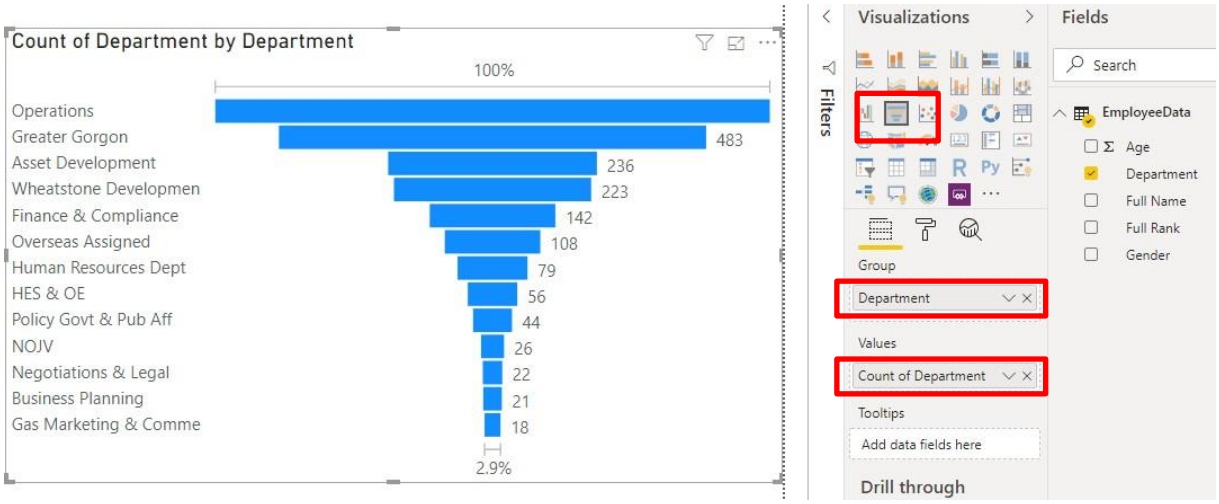


2. Add a slicer for Full Rank

Click on some white space and tick Full Rank then choose the slicer icon



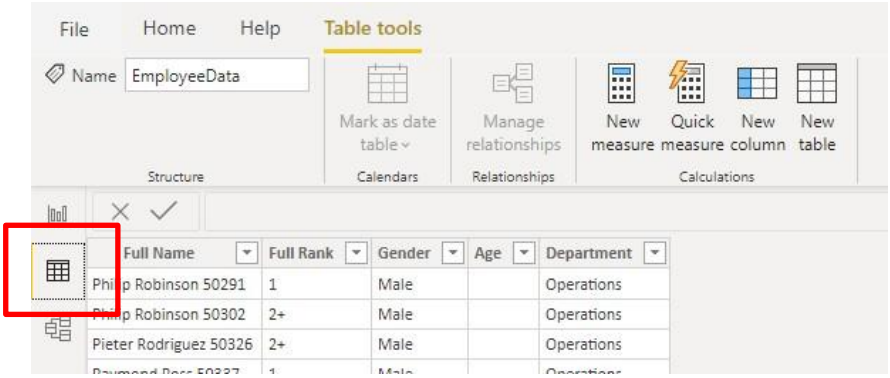
3. Add a Funnel chart showing number of people by department



Tip: You can turn off the top and bottom % by going to Paint Roller, Conversion Rate Label > Off

You've now built an interactive report

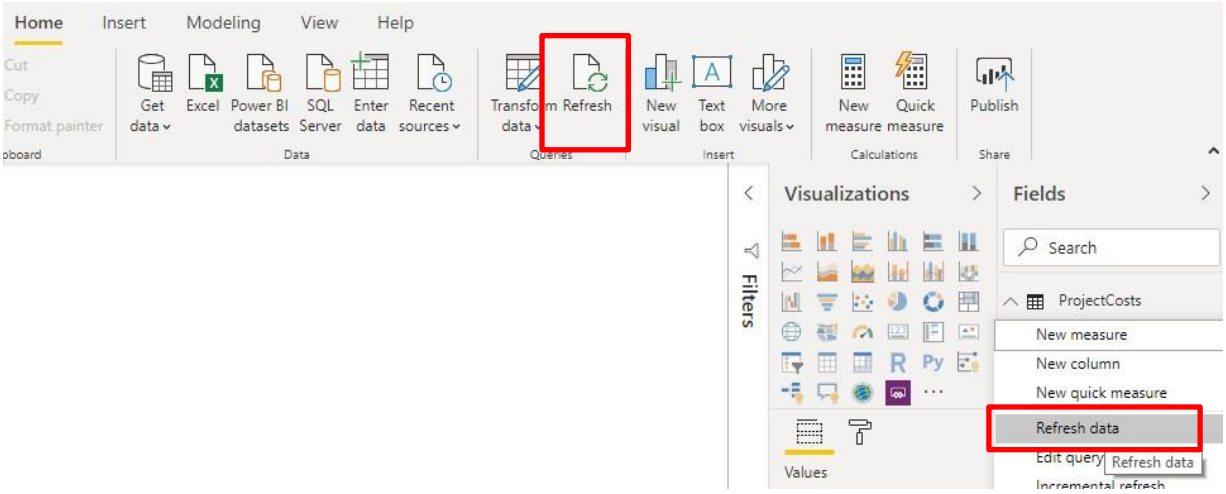
Let's take a quick look at where the data is stored - i.e. the Data Model



Let's address some questions:

- How do we refresh?

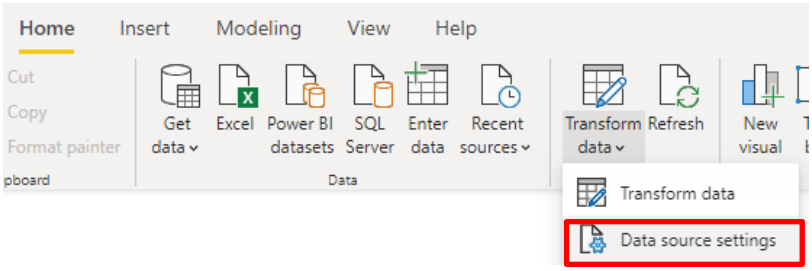
There are 2 options…



- How do we change the Edit the Query or Change the data source?

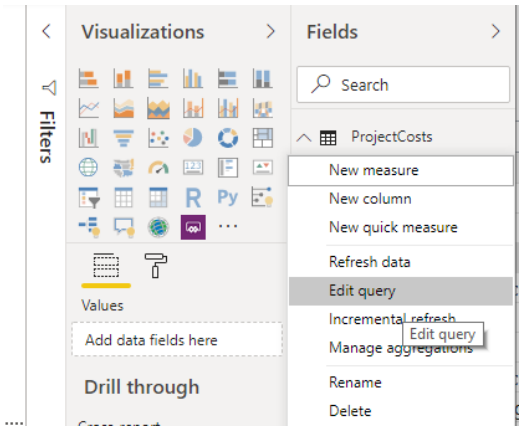
  2 options:

  1. Home Tab > Transform Data drop down > Data Source Settings

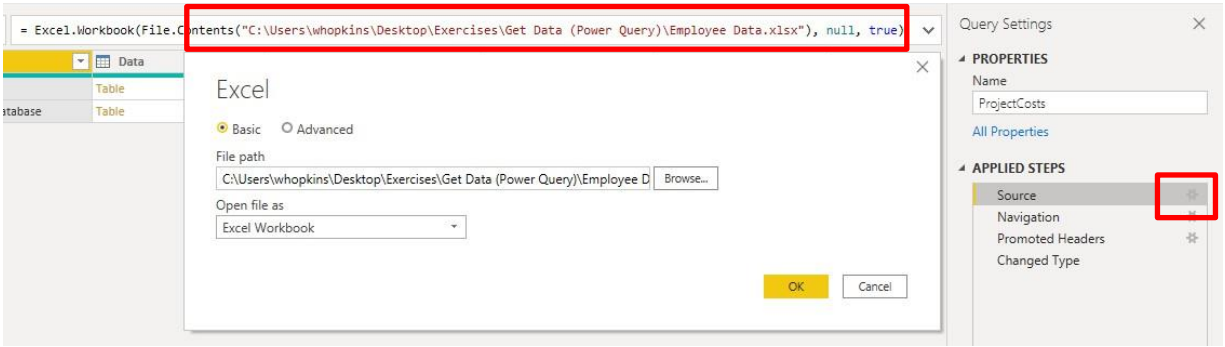


  Or

  2. Right Click on the table name > Edit Query,



  Then…
  … go to the source step and click the cog or type over the formula



SAVE YOUR FILE AS EMPLOYEE DEMO.pbix

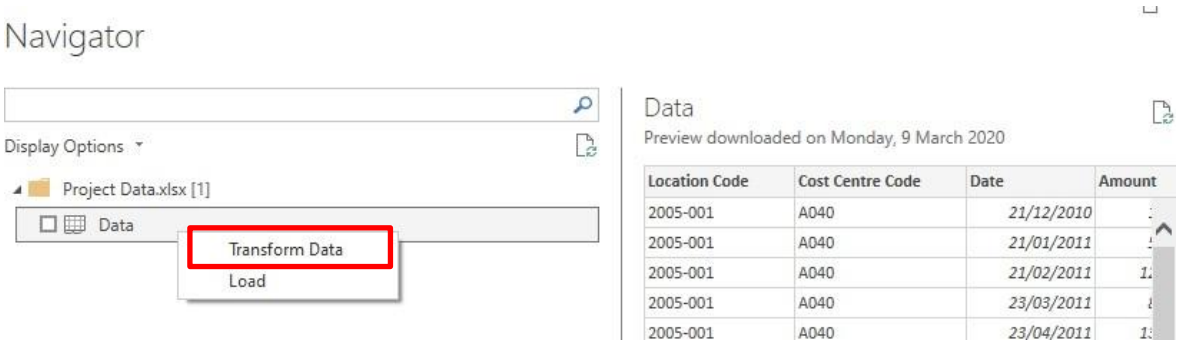
1.5 Building our first report

Exercise: Pulling data from a source

Open Power BI Desktop (PBID)

Select the Excel button to Get Data from Excel:

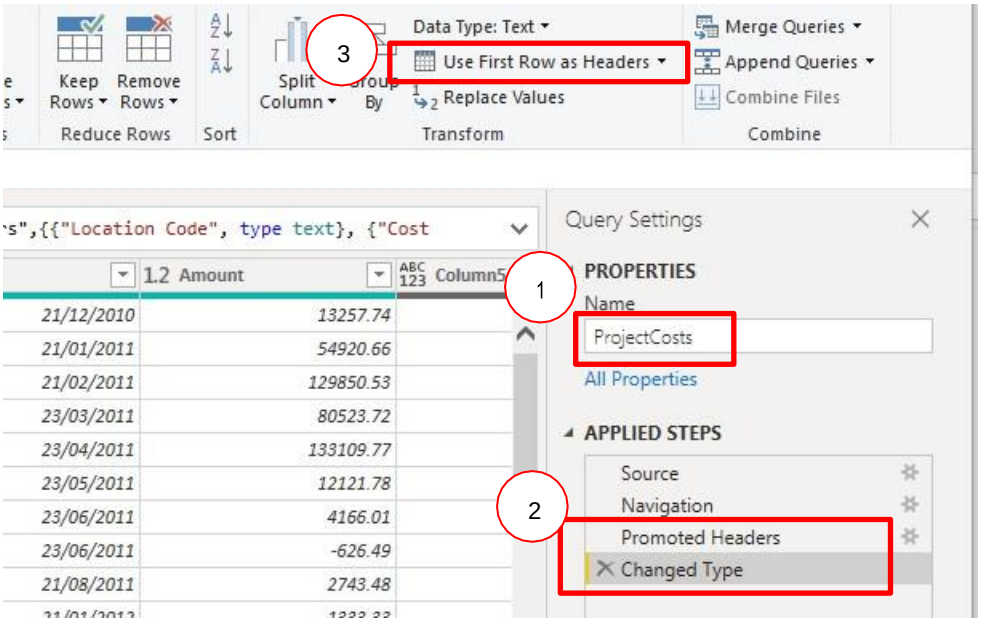
Exercises\Source Files\Data Set 1\Project Data.xlsx



Right click the sheet named data and choose Transform Data

Name the Query something meaningful as ultimately this will show up for the user of your Power BI reports

- Step 1 (circled below) Rename it ProjectCosts
- Step 2 (circled below) Delete the last 2 steps (change type, promoted headers)
- Step 3 (circled below) Click use First Row as Headers.



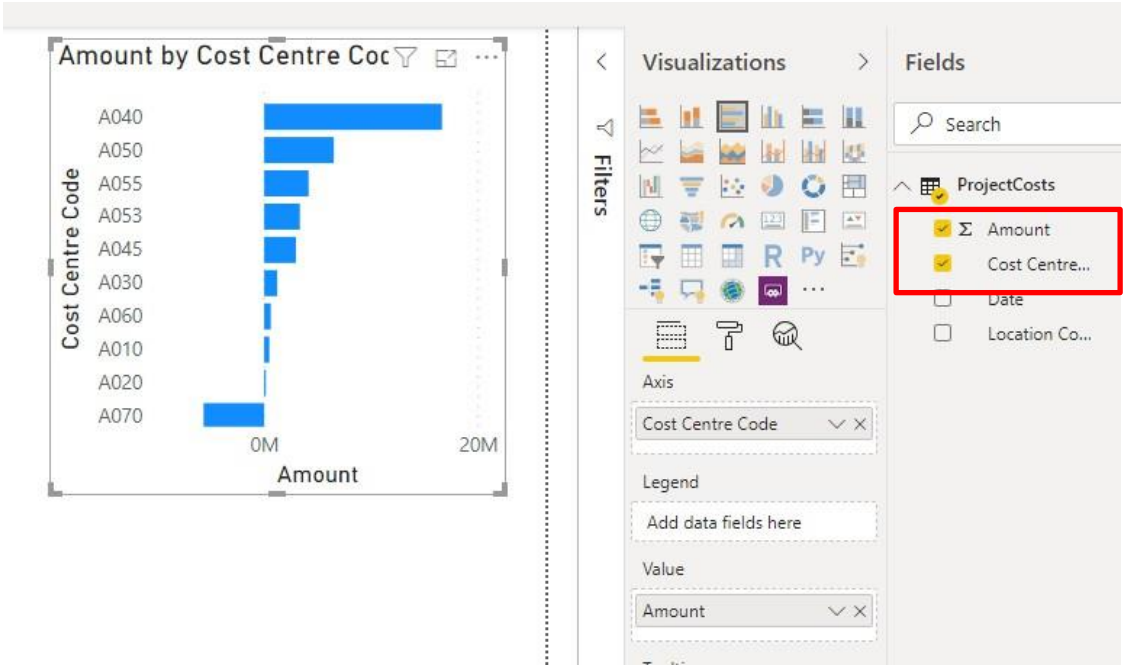
- Click and hold SHIFT to highlight the first 4 columns (Location Code to Amount)
- RIGHT CLICK and Remove OTHER Columns
- Review the data type in each column and ensure they are set correctly

- Click on each of the Applied Step down the right-hand side to see what happens.
- Rename some of the steps to make them more meaningful
- Go to Home > Click on Close and Apply

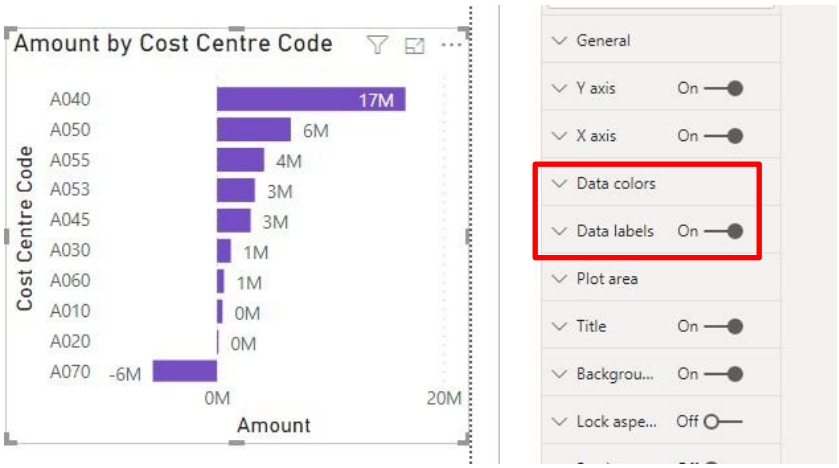
SAVE YOUR FILE AS DEMO 1.pbix

1.6 The Report Canvas

- Tick Amount from the Field list and it will drop on to the Canvas as a column chart (*you could drag Amount instead if you prefer*)
- Tick Cost Centre Code



- Change the Column chart to a horizontal bar chart (3rd visualization icon)
- Click on the Paint Roller
- Turn on Data labels and change Data colour to purple



1.7 Mapping Tables

Quite often our source data doesn't have the terminology or summary level labels that we need. This is where you create mapping tables.

e.g. we need to get Cost Centre Name and Location Name

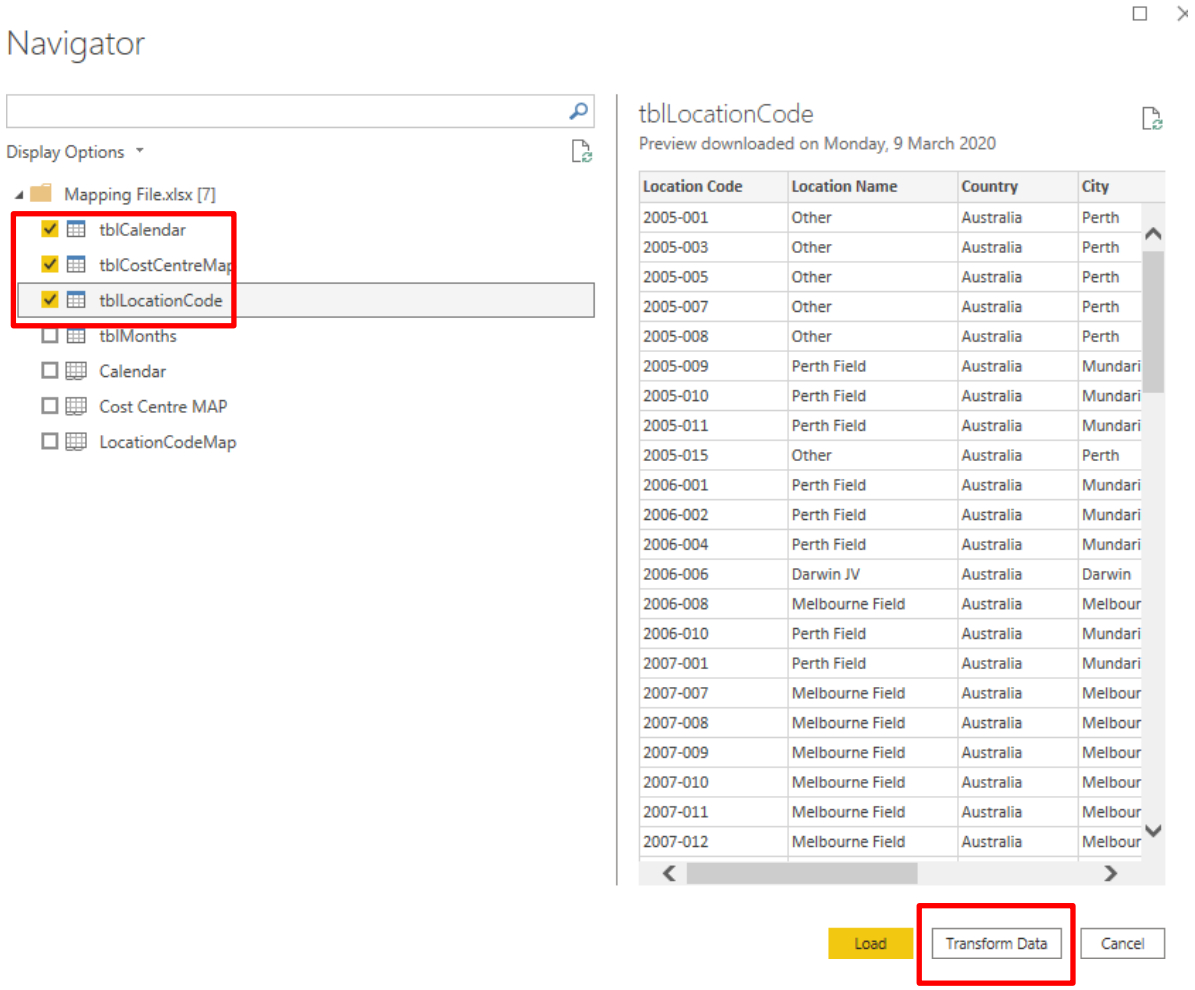
Fortunately, we have already created some mapping tables.

Let's connect to this this file

- Click the Excel icon on our Home ribbon

Exercises\Source Files\Data Set 1\Mapping File.xlsx

Select the first 3 tables

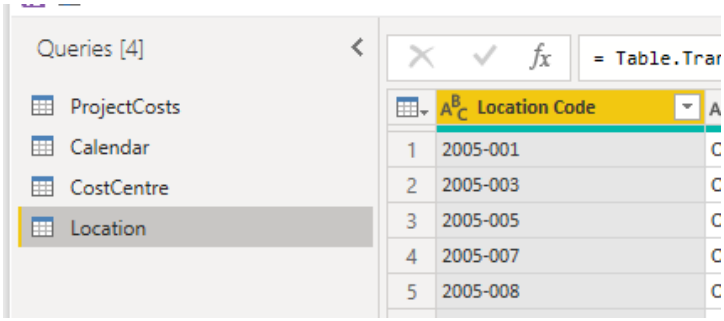


The mapping ("lookup") tables are formatted as Excel Tables and therefore show up with Blue headers in the screenshot above. This has many advantages including the fact that Power BI "finds" them easier.

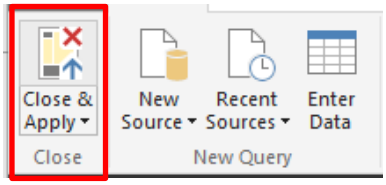
Note: the tblMonths table is just a helper for tblCalendar

The Power Query window will open. Re-name the queries (in the left hand pane) to be

- Calendar
- CostCentre (note no gap in the name)
- Location
-



- Then click the Close & Apply button

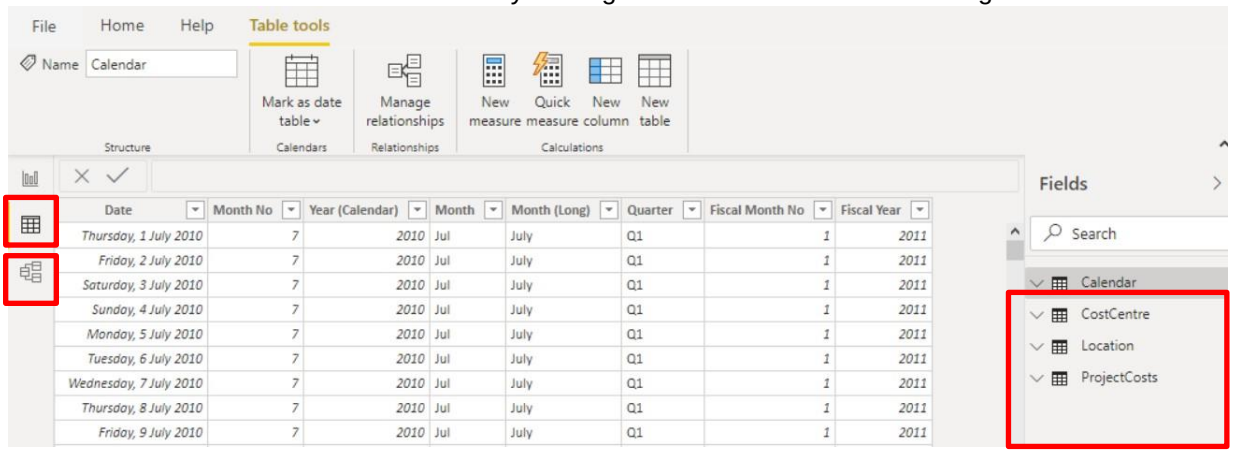


SAVE YOUR FILE

1.8 Joining Tables

Now we have loaded our 3 mapping tables into the model let's look at them by clicking on the Data View icon

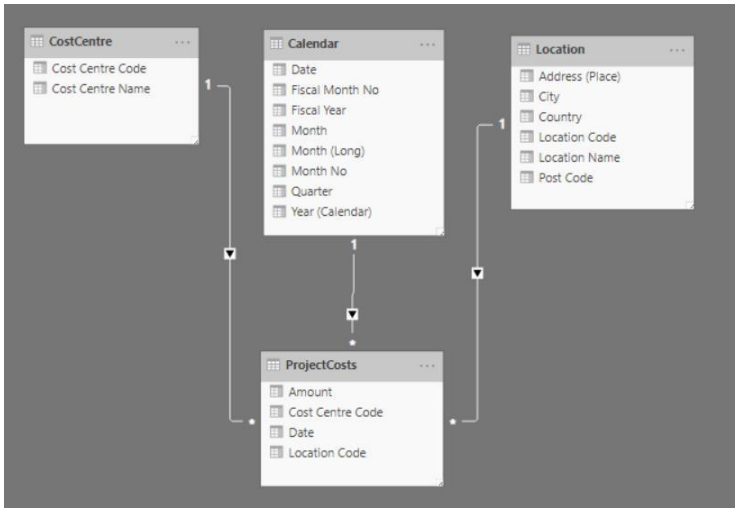
We can then look at the data in each table by clicking on the table names down the right-hand side.



Date	Month No	Year (Calendar)	Month	Month (Long)	Quarter	Fiscal Month No	Fiscal Year
Thursday, 1 July 2010	7	2010	Jul	July	Q1	1	2011
Friday, 2 July 2010	7	2010	Jul	July	Q1	1	2011
Saturday, 3 July 2010	7	2010	Jul	July	Q1	1	2011
Sunday, 4 July 2010	7	2010	Jul	July	Q1	1	2011
Monday, 5 July 2010	7	2010	Jul	July	Q1	1	2011
Tuesday, 6 July 2010	7	2010	Jul	July	Q1	1	2011
Wednesday, 7 July 2010	7	2010	Jul	July	Q1	1	2011
Thursday, 8 July 2010	7	2010	Jul	July	Q1	1	2011
Friday, 9 July 2010	7	2010	Jul	July	Q1	1	2011

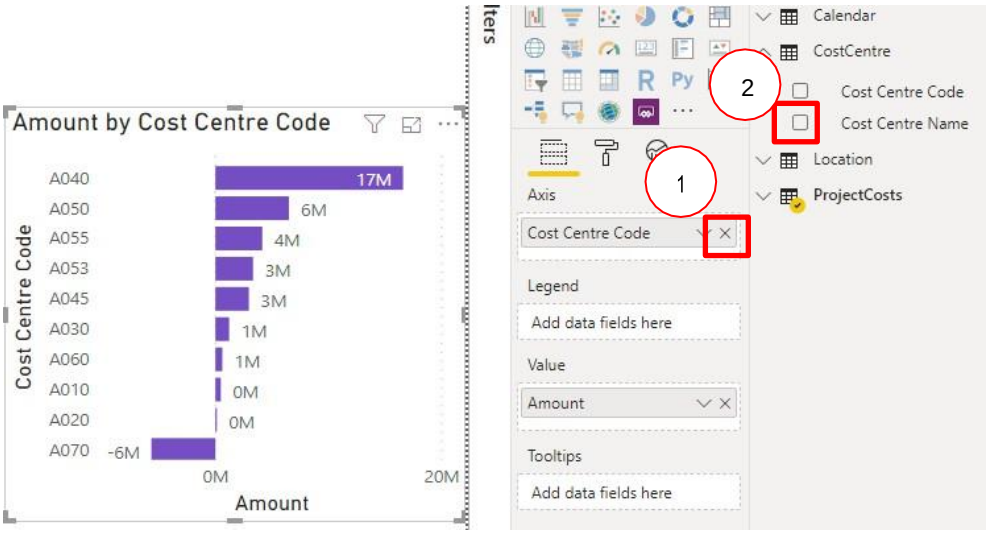
Click on the Relationships icon (underneath the Data View icon)

- Drag Project costs down to the bottom centre of the screen.
- 2 Relationships may have been automatically created (with Cost Centre Code and Location Code). If not then drag and connect Cost Centre Code, Location Code and Date to the respective "lookup / Dim" tables.

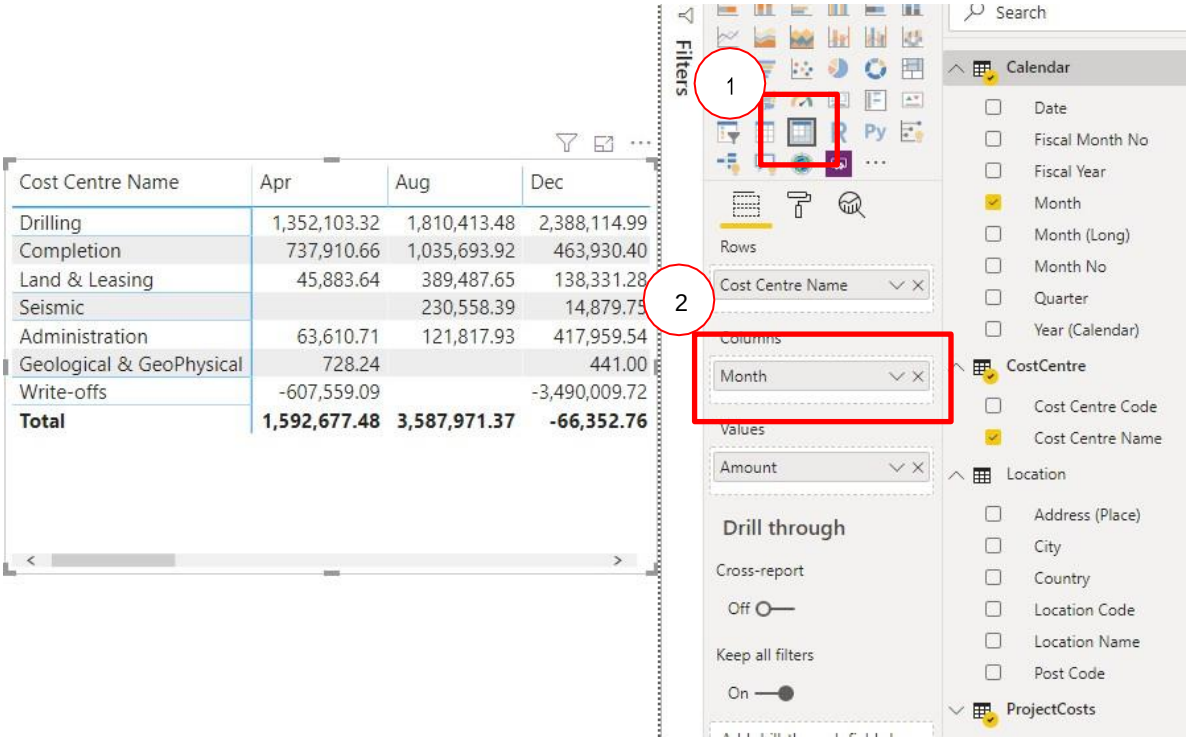


- Click on the Report Icon (above the Data View Icon) to go back to the canvas

- Click on the Chart you created earlier
- Click on the cross next to Cost Centre Code (see 1 in image) to remove it from the chart
- Click Cost Centre Name instead (from CostCentre – see 2 in image)



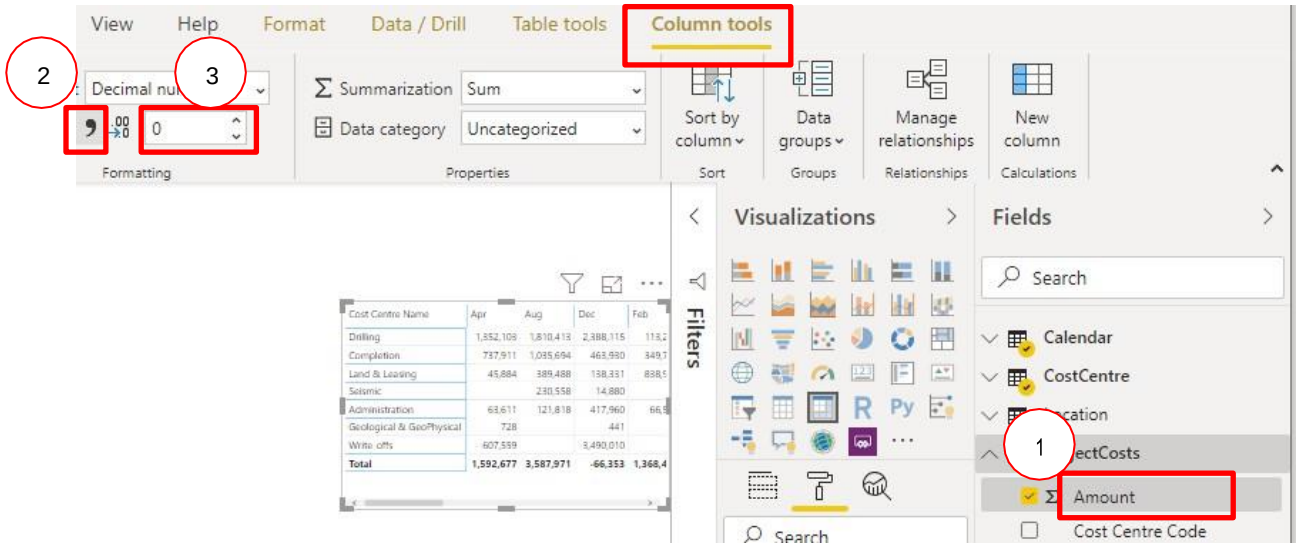
- Change the Visualization to a Matrix (see image item 1)
- Drag Month, from Calendar, into the Columns box (see image item 2)



Click on the paint roller and choose Style – Minimal

1.9 Formatting Numbers

- Click on (don't untick) the word Amount in the ProjectCosts table (item 1 in image)
- format it via the Column Tools ribbon as , and 0 decimals (items 2 and 3 in image)

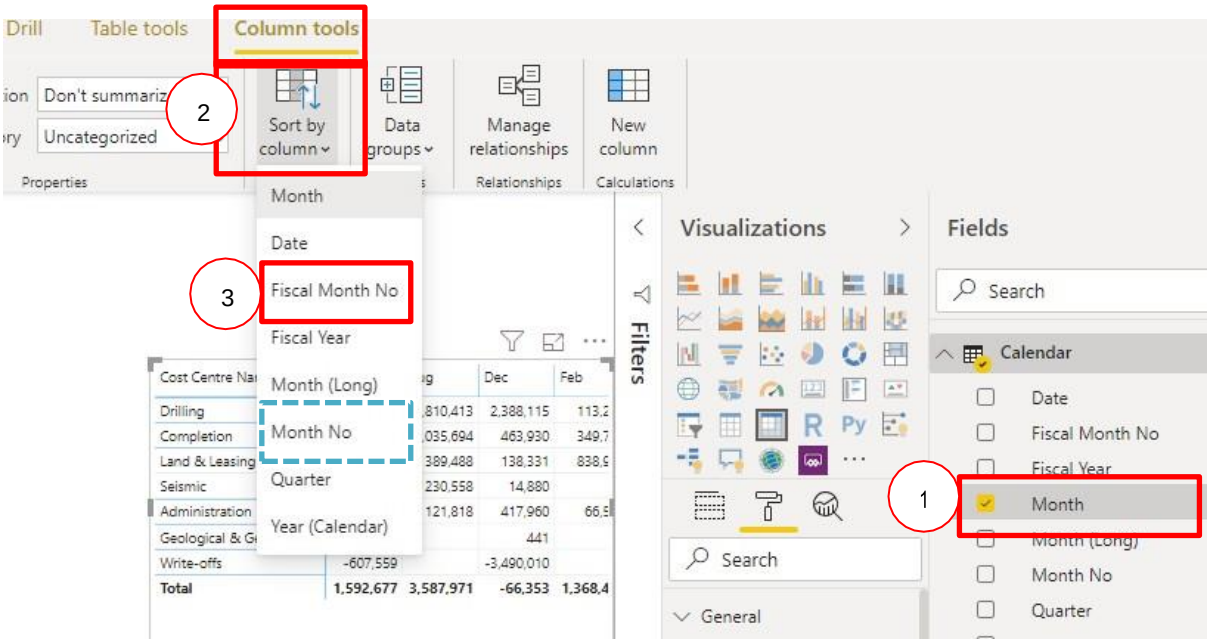


1.10 Sorting the Month of a Calendar Table

As you will notice the months are sorted alphabetically which is of no use

We'd like to Sort by July to June (Fiscal Month)

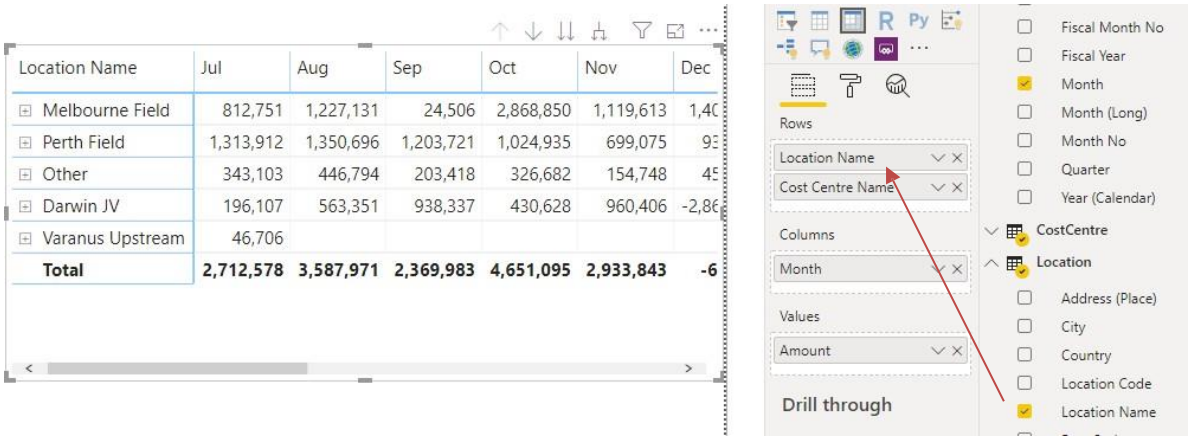
- Expand Calendar and click on the word Month (item 1 in image)
- Click the Sort by Column (via the Column tools tab), and click on Fiscal Month No.



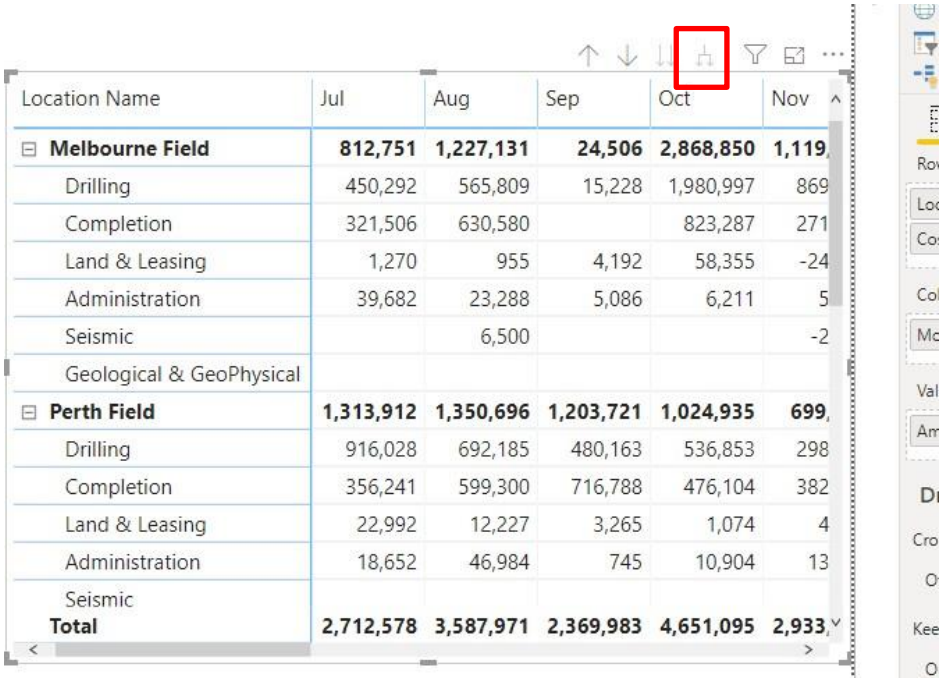
To sort by January to December you would choose Sort by Month Number

1.11 Drilling Down / Up

- Drag Location Name above Cost Centre Name

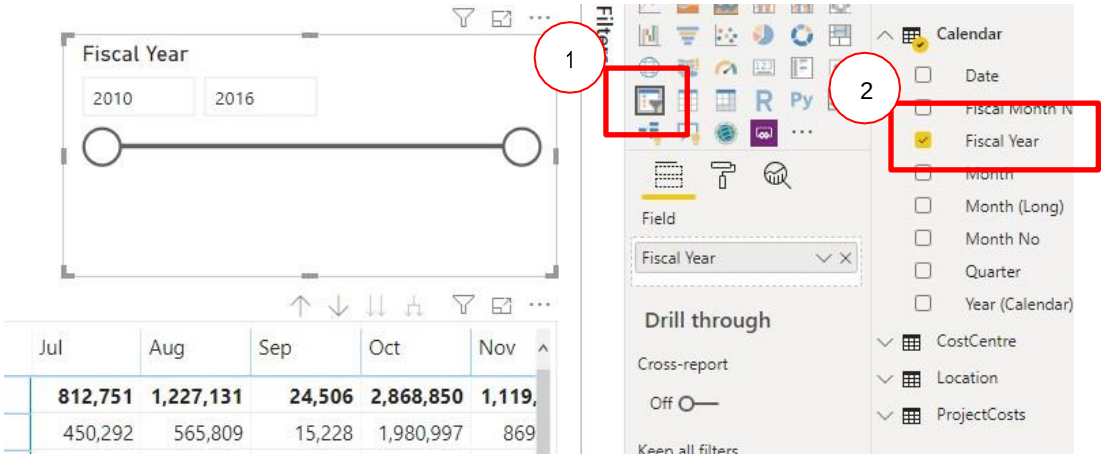


- Click on any + sign to expand
- Or click the “Bident” to expand All to the next levels



1.12 Date Slicer

- Click the Slicer Icon then tick Fiscal Year from “Calendar”

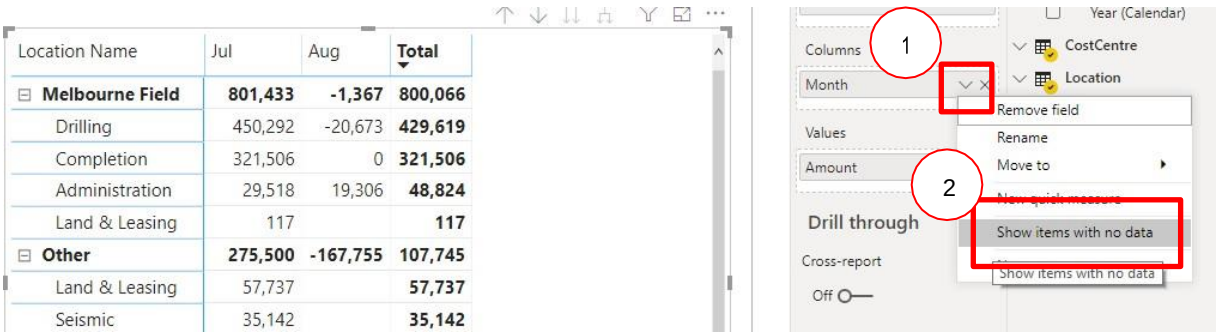


- Drag the left slicer button to the right just to show 2015-2106

- Note that only the months with data will show.

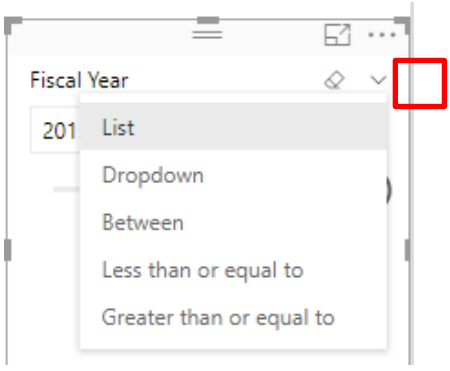
To show months with no data you must

- click on the matrix visual on your canvas (item 1 in image)
- then click on the drop down next to Month and choose “Show items with no data”



1.13 Alternative Slicer

- The slicer visual has a number of options accessed via a small drop down in the top right corner

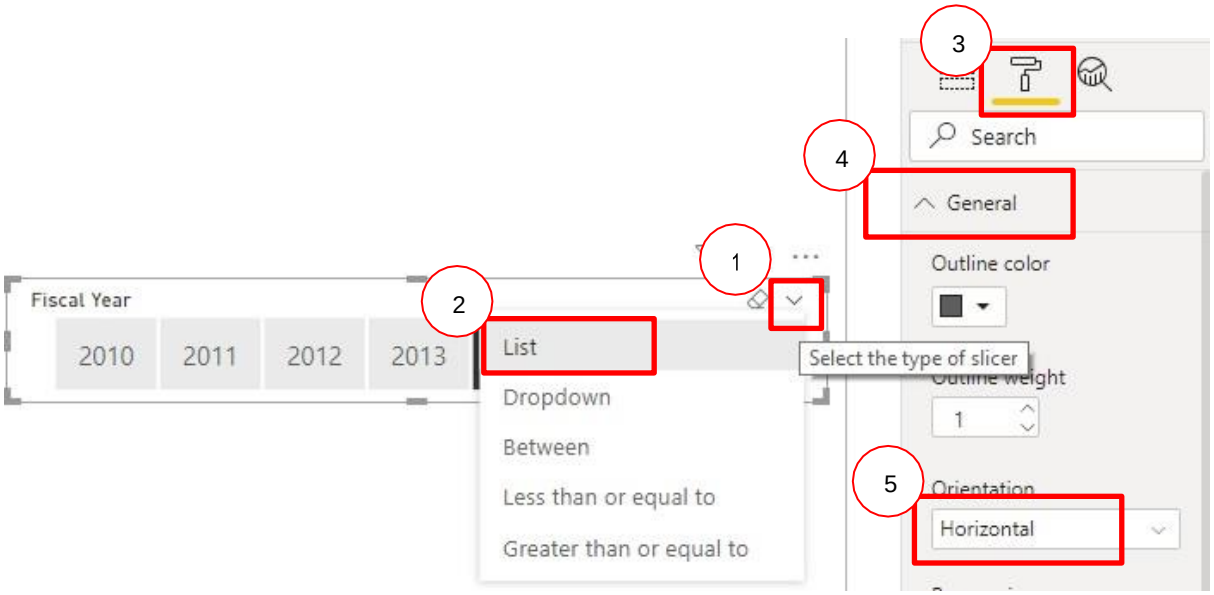


Try them out

For nice big buttons you must follow these steps

List > “Roller” > General > Orientation – Horizontal

See steps 1 to 5



Location Name	Aug	Dec	Feb	Jan	Jul	Jun	Mar	May	Nov	Oct	Sep	Total
Melbourne Field	,085	1,227,131	1,407,829	377,185	2,384,917	812,751	3,044,168	1,959,207	244,742	1,119,613	2,868,850	24,506	17,168,9
Drilling	3,184	565,809	1,103,878		1,539,851	450,292	1,857,279	855,881	141,046	869,945	1,980,997	15,228	10,313,3
Completion	5,454	630,580	279,144		755,330	321,506	1,036,231	824,496	0	271,154	823,287		5,638,1
Land & Leasing	2,428	955	18,416	318,867	82,278	1,270	108,005	221,963	2,165	-24,979	58,355	4,192	813,9
Administration	5,020	23,288	5,950	58,317	7,023	39,682	42,308	56,867	77,024	5,982	6,211	5,086	373,7

1. Row height and separator width can be adjusted

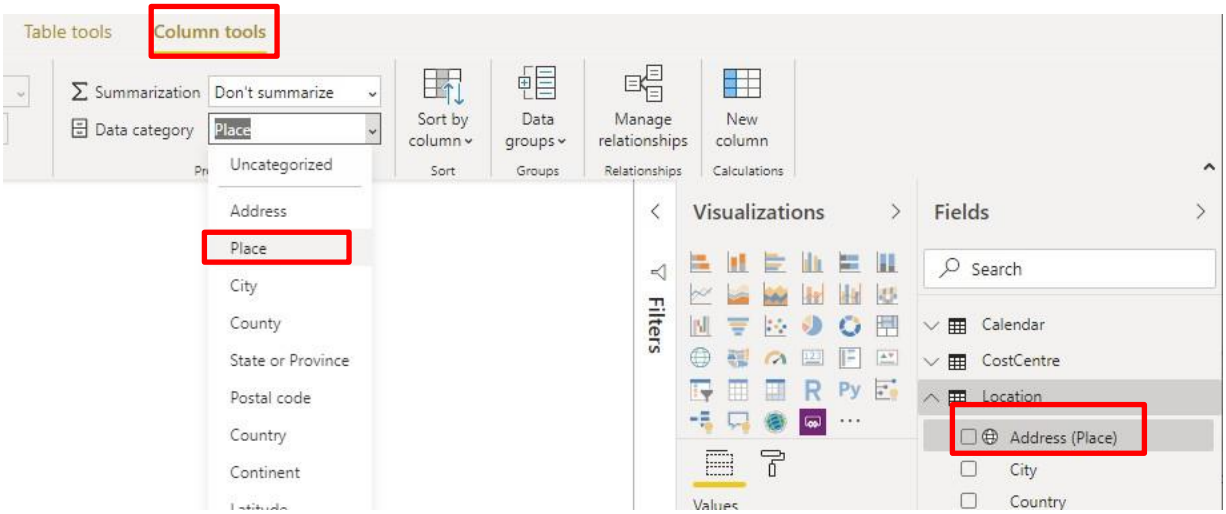
   Try these out after clicking on your table of numbers and then clicking the Paint Roller

   - Grid > Row Padding (this is Row Height)
   - Row Headers > Stepped Layout Off (this is tabular view instead of compact view)
   - Subtotals – take a look through the options

SAVE YOUR FILE

1.14 Introducing Maps

- Create a new page
- Click on the word Address (Place) under “Location”
- Choose Column tools > Data Category > change to Place
- Tick Address (Place)



If you have an internet connection, then your locations will be mapped automatically.

- Tick Amount (from ProjectCosts)

Clicking on the Paint Roller gives you a Styles option to pick different map styles

- Add a Column Chart to the right of the MAP and tick Amount followed by ticking Location Name
- Click on the bar for Melbourne to see what happens…

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2 Introduction to Additional Power Query Functionality

One feature of Power Query that makes it immediately stand out as something you should find out more about is the UNPIVOT functionality.

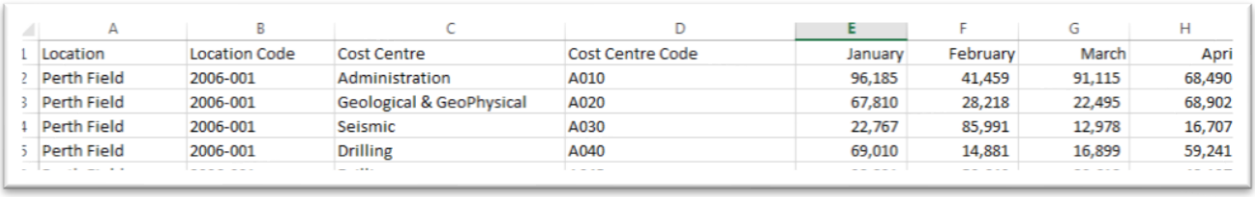
2.1 Power Query Unpivoting

Pivot Tables and Power Pivot need data to be in columns but data is often captured in a matrix layout.

2.1.1 Exercise – Unpivoting a data set

Let's take a look at the following file by simply opening it in Excel:

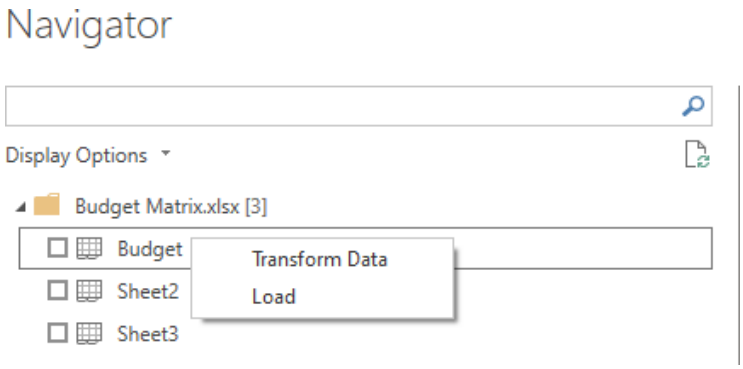
Exercises\Source Files\Data Set 1\ Budget Matrix.xlsx



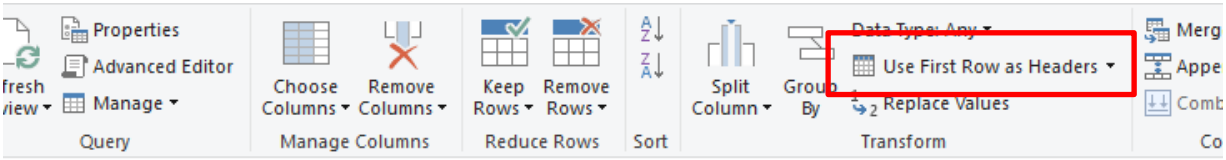
	A	B	C	D	E	F	G	H
1	Location	Location Code	Cost Centre	Cost Centre Code	January	February	March	Apri
2	Perth Field	2006-001	Administration	A010	96,185	41,459	91,115	68,490
3	Perth Field	2006-001	Geological & GeoPhysical	A020	67,810	28,218	22,495	68,902
4	Perth Field	2006-001	Seismic	A030	22,767	85,991	12,978	16,707
5	Perth Field	2006-001	Drilling	A040	69,010	14,881	16,899	59,241

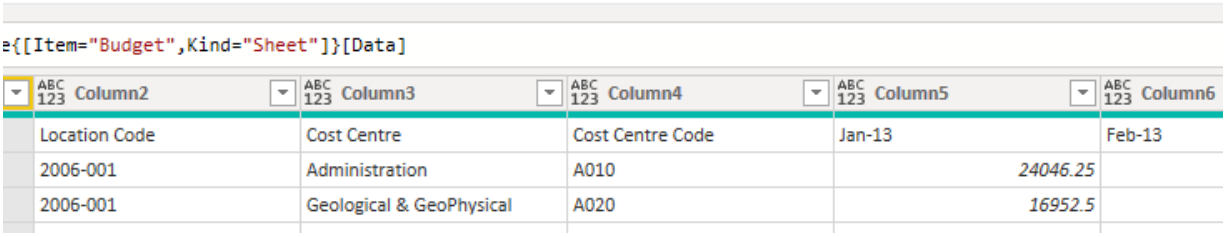
The data is laid out with Months across the top. This is a typical matrix style layout. Pivot Tables and Power Pivot would much prefer a single column called Month and a single column called Value.

- Close the Excel file and go back into your Demo1 file.
- Use Power Query (Get Data) to pull the data from that Excel File Budget Matrix.xlsx
- Right Click on Budget and click Transform Data

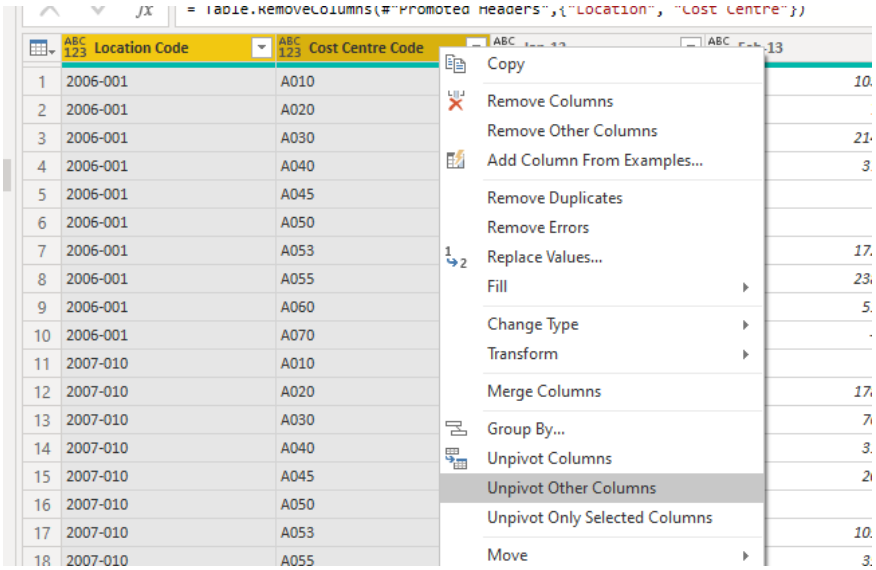


- Delete the “Change Type” step from the applied steps
- Use First Rows as Headers

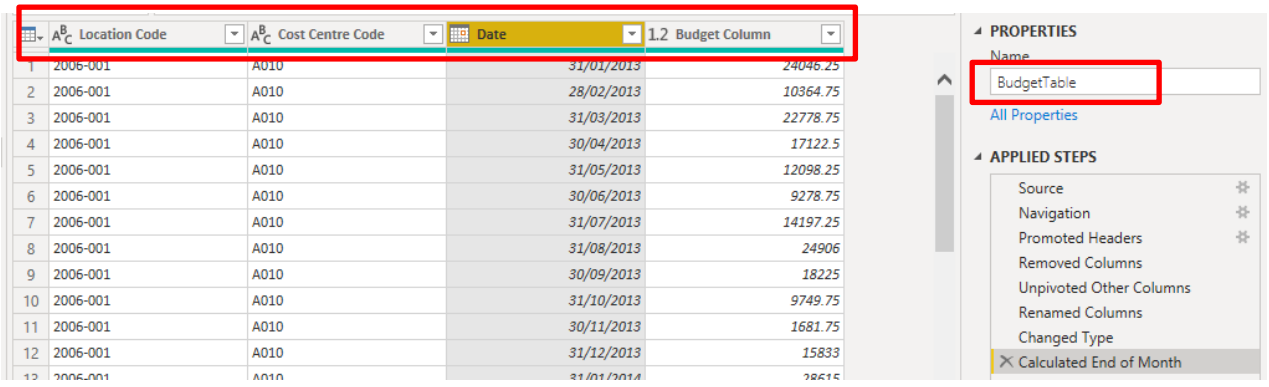




- Again, remove the changed type step if it gets automatically added
- Right Click - Remove the columns Location and Cost Centre (do not delete the Code Columns)
- Highlight the first 2 columns (Location Code and Cost Centre Cod) and then Right Click > Unpivot OTHER columns

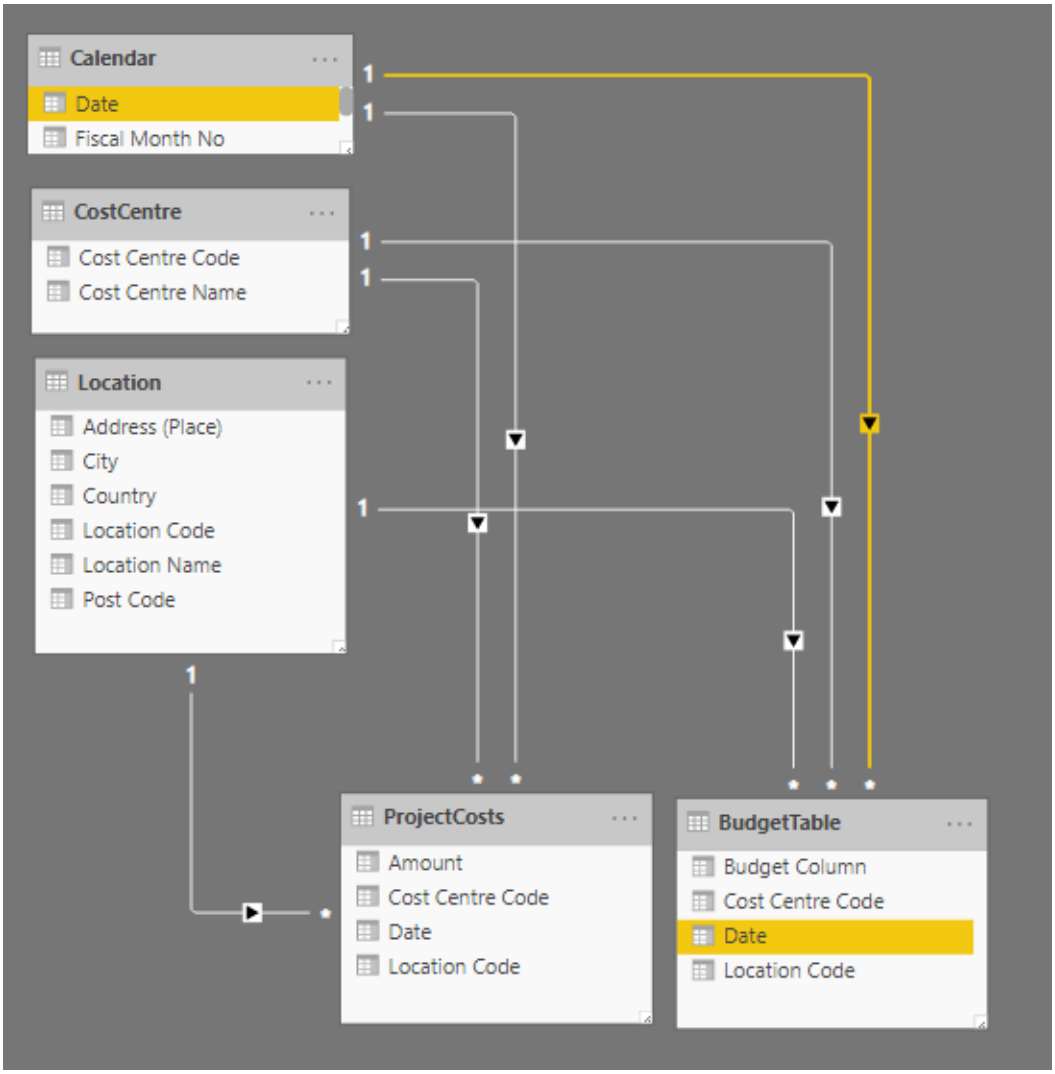


- Rename the 2 new columns Date and Budget Column
- Change the Date to a Data Type of Date
- Then we can change it to month end if we wish with a simple RC on the Date Column and choose Transform > Month > End of Month
- Make sure all the Data Types are set correctly



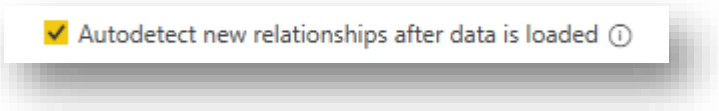
- Ensure the Query is named correctly - let's call it BudgetTable
- Click the button "Close and Apply"

- Go to the Model View (Relationship / Diagram)
- Location Code and Cost Centre Code relationships will automatically be set up.
- Connect the Date fields from the BudgetTable to the Calendar

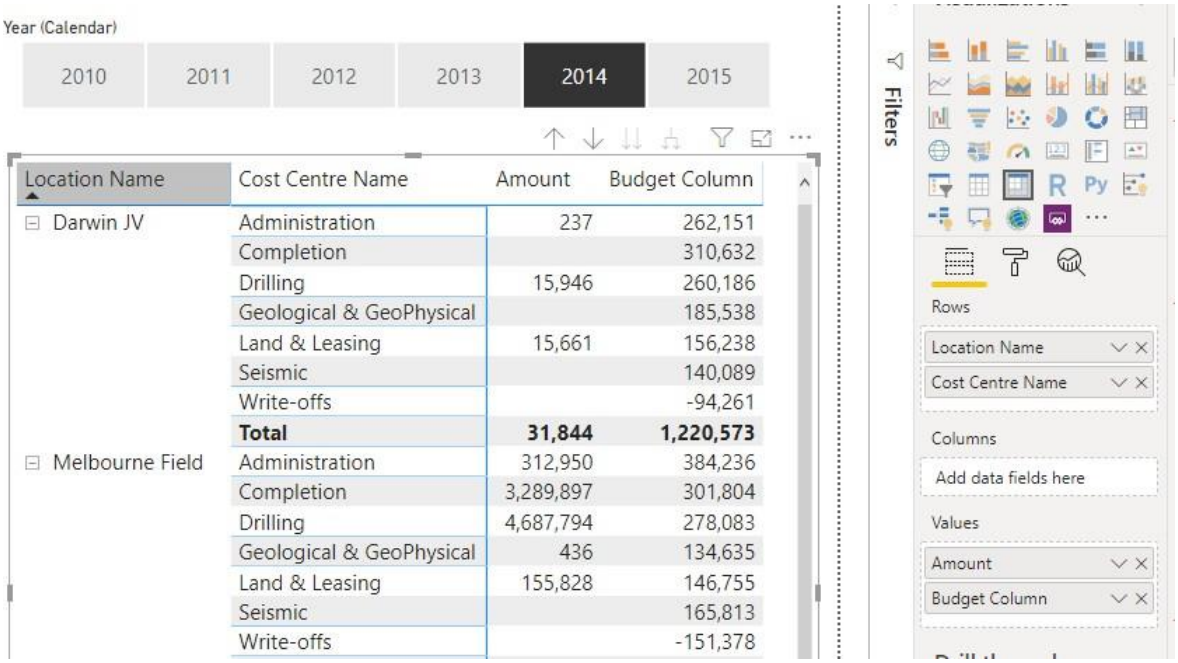


Tip:
We'd recommend turning off the autodetection of relationships. Unfortunately this has to be done on an individual file basis (consider adding this setting to a "Template" file)

See File > Options and Settings > Options > Current File > Data Load. UN CHECK this box



- Create a New Page and Re-create this layout (see notes below)



The Slicer is for CALENDAR YEAR (found in your Calendar table)

The main visual is a Matrix with Location Name and Cost Centre Name in the rows box and then Amount and Budget Column in the Values box

You will need to click on the “Bident” to expand out

You will need to turn the Stepped Layout off (use the Paint Roll search box to find this)

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3 Report Design

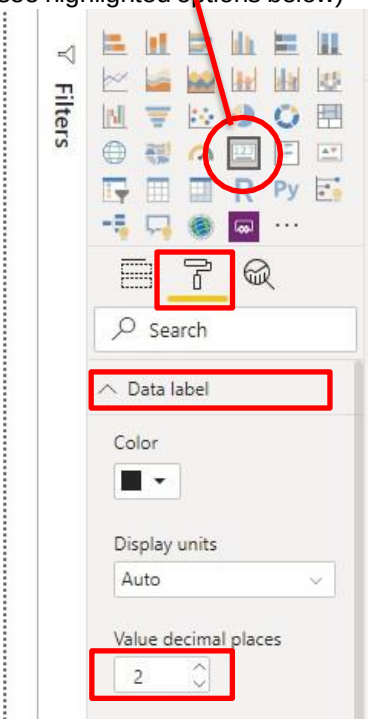
We are going to create this report on a new Page.

Actual v Budget

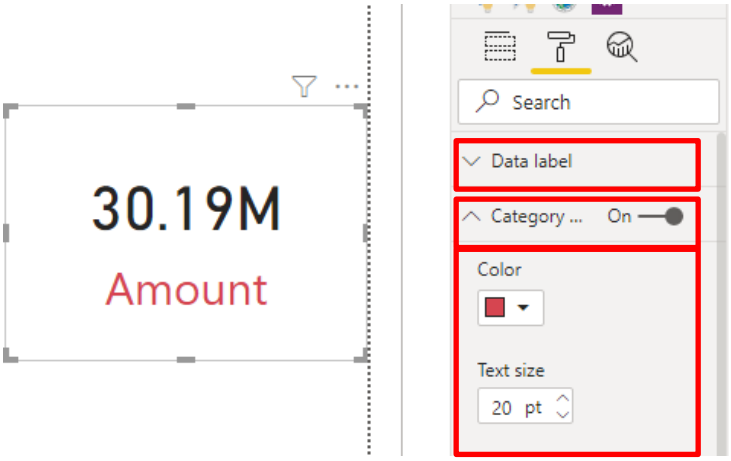
Cost Centre Name	Amount	Budget Column
Administration	1,091,674	3,383,205
Completion	9,827,351	2,982,168
Drilling	19,551,777	2,931,207
Geological & GeoPhysical	12,724	1,504,322
Land & Leasing	4,145,652	1,424,552
Seismic	1,217,427	1,472,242
Write-offs	-5,657,916	-1,328,000
Total	**30,188,689**	**12,369,696**

3.1 Report Building Basics

- Tick Amount (under ProjectCosts) and then click the Card Visual
- Then format the visual to show 2 decimals (see highlighted options below)



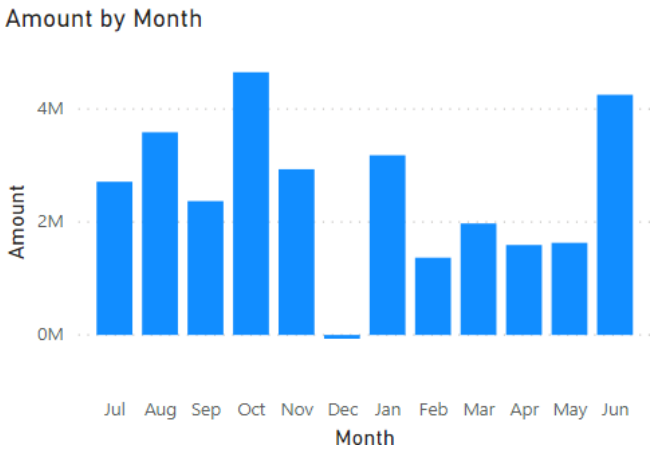
- Then, with the visual selected reduce the Data Label size to 30
- Change the Category Label to size 20 and make it red



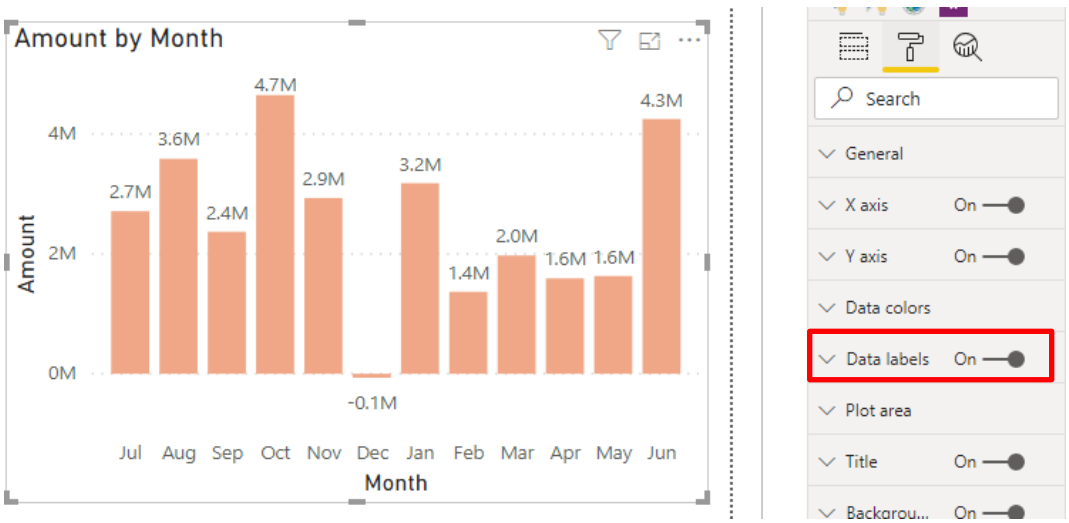
- You could also add rounded borders, via Borders on > Radius 30

Next Chart:

- Click anywhere on the canvas (away from the Card graphic)
- Tick Amount (from ProjectCosts)
- Tick Month (from Calendar)



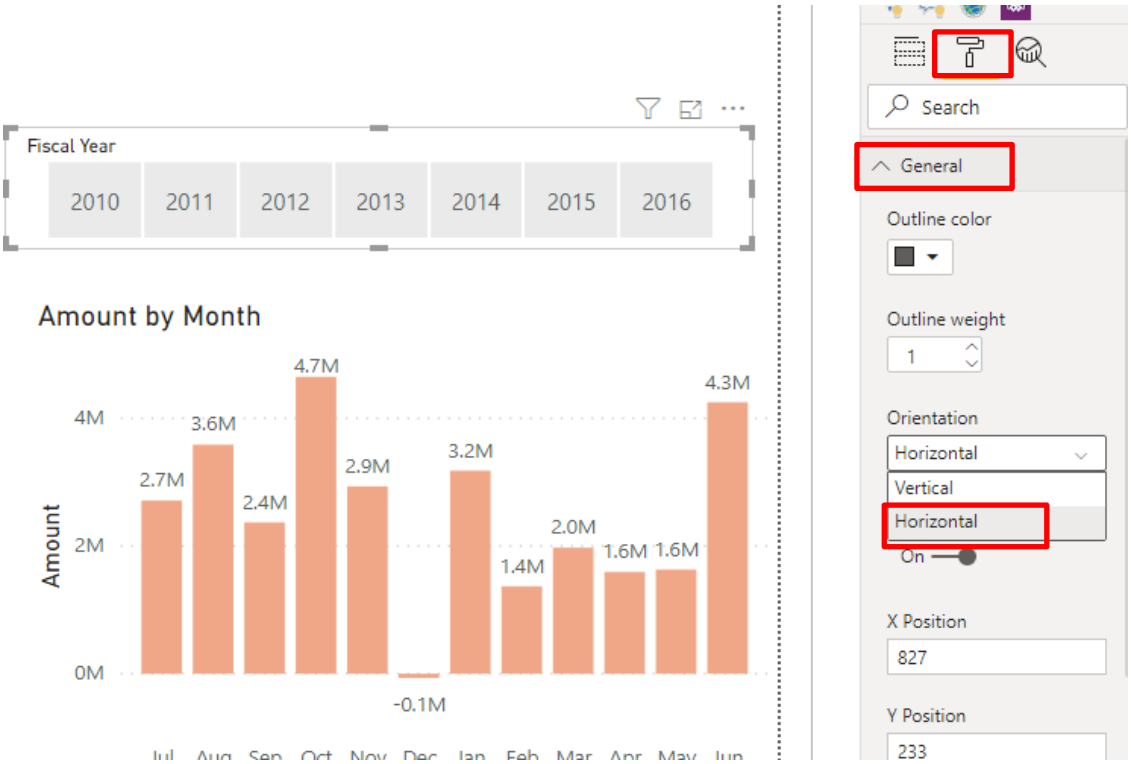
- While the Chart is highlighted click on the formatting icon (roller) and select Data Labels – On
- Change the Data Color (spelled US way) to one you like



The Card and Chart are showing the data for all years.

We need to add a filter for year. One way of doing this is to add a slicer

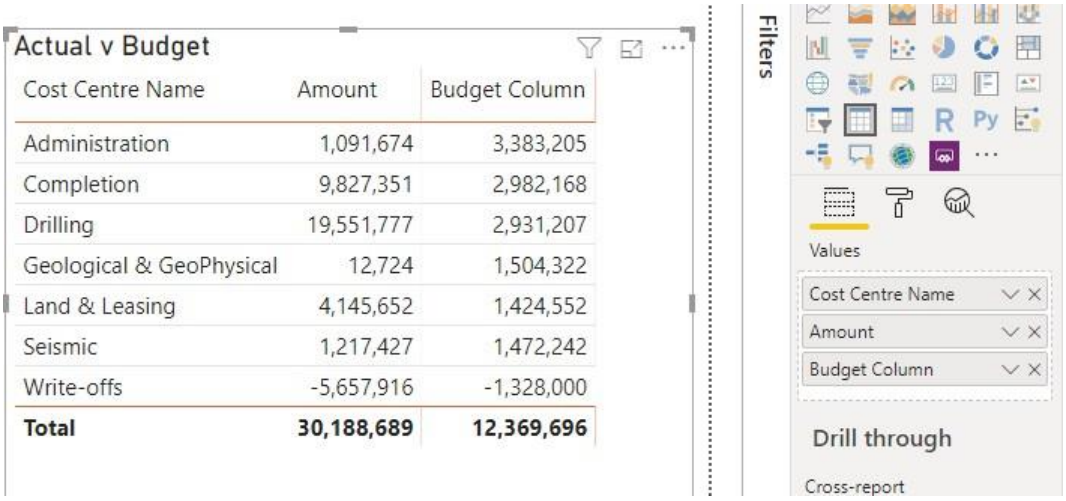
- Click away from any visual and then tick Fiscal Year (*from "Calendar"*)
- Click the Slicer Icon (see image below)
- Change it to a list (via the small drop down in the top right of the slicer)
- Click the Format Icon (Paint Roller)
- General > Orientation > Horizontal



SAVE YOUR FILE

Finally, we will add some Cost Centre information with Actuals and Budget

- Tick Cost Centre Name (from CostCentre). It should automatically come in as a Table
- Tick Amount (from ProjectCosts)
- Tick Budget Column (from the BudgetTable)
-



- Format the Table to look like the image below by selecting Paint Roller > Style > Minimal
- Also go to Grid and choose an outline colour and text size
- Re-organise your dashboard to look like this

TIP: Go to the View Ribbon and tick Show Gridlines try out Gridlines and Snap Objects to Grid

- Rename this page as Main

3.2 Interactions

- Copy the Amount by month and paste (Ctrl c Ctrl v)

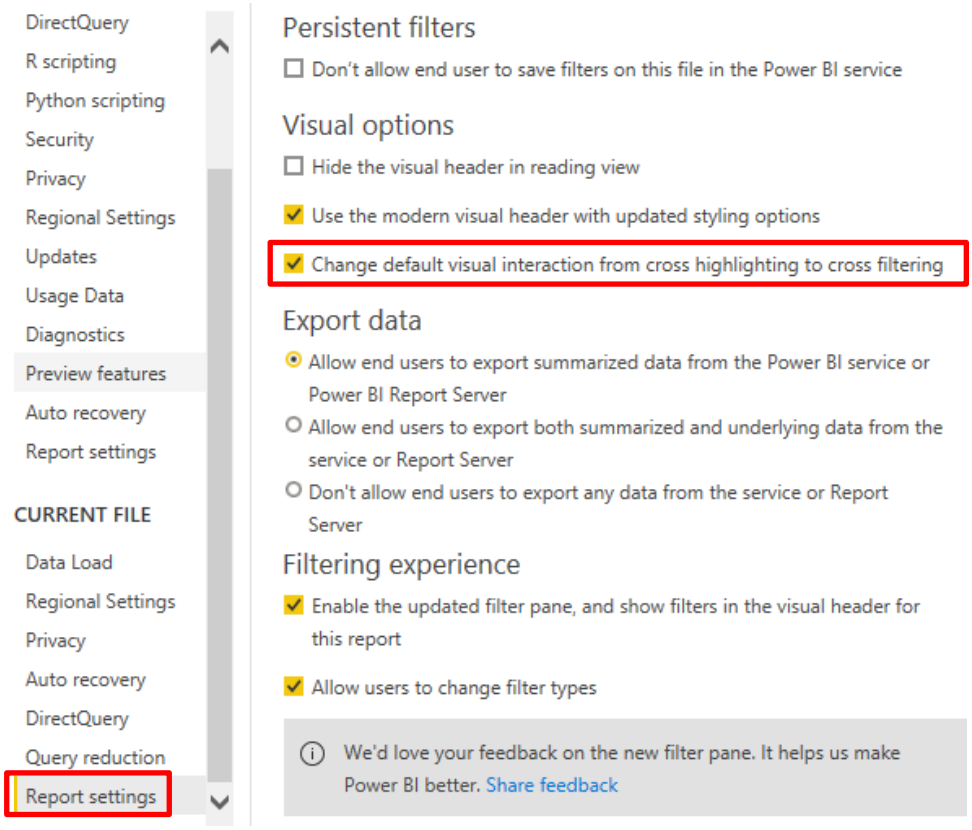
Swap out Month for Location Name and change it to a horizontal bar chart

And now for the clever stuff…..

Clicking on a bar in the chart will cause an interaction with the other data e.g. clicking on Melbourne Field will autofilter the other visualisations.

But the default interaction is to “highlight” rather than filter.

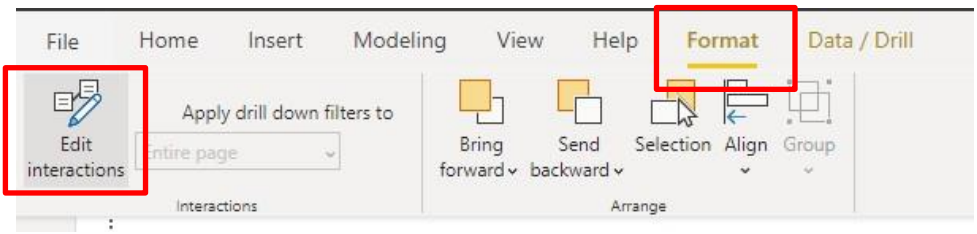
TIP: Go to File > Options and Settings > Options > Current file > Report Settings



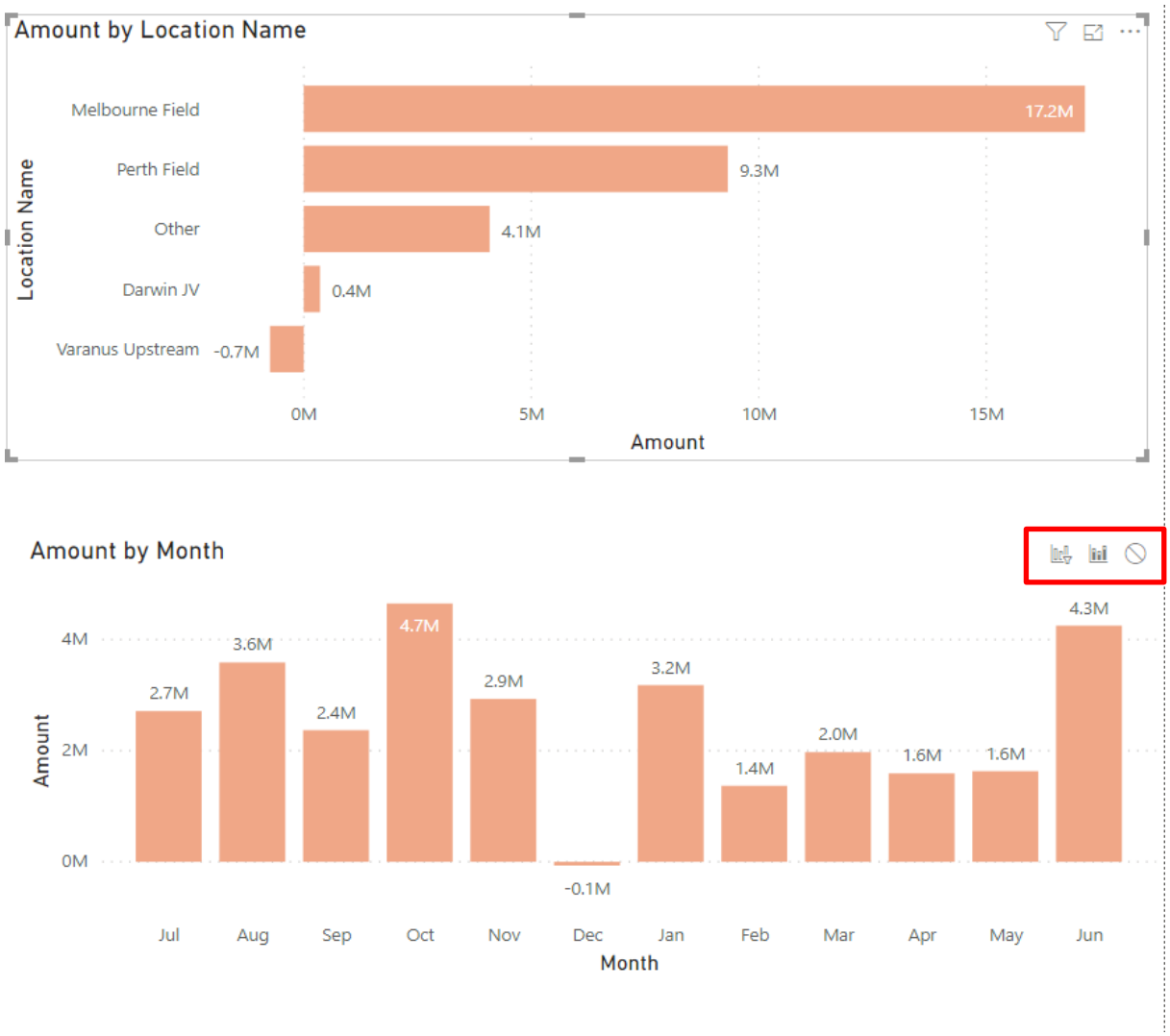
Tip: This is another setting we'd recommend enabling on your "Template file"

We can also control the interactions on a visual by visual basis

- Click on a chart and select Format > Edit Interactions



- If you have Amount by location name selected then you will see 3 icons appear above Amount by Month



- Click these icons then click on the bar for Perth Field to see the different interaction modes

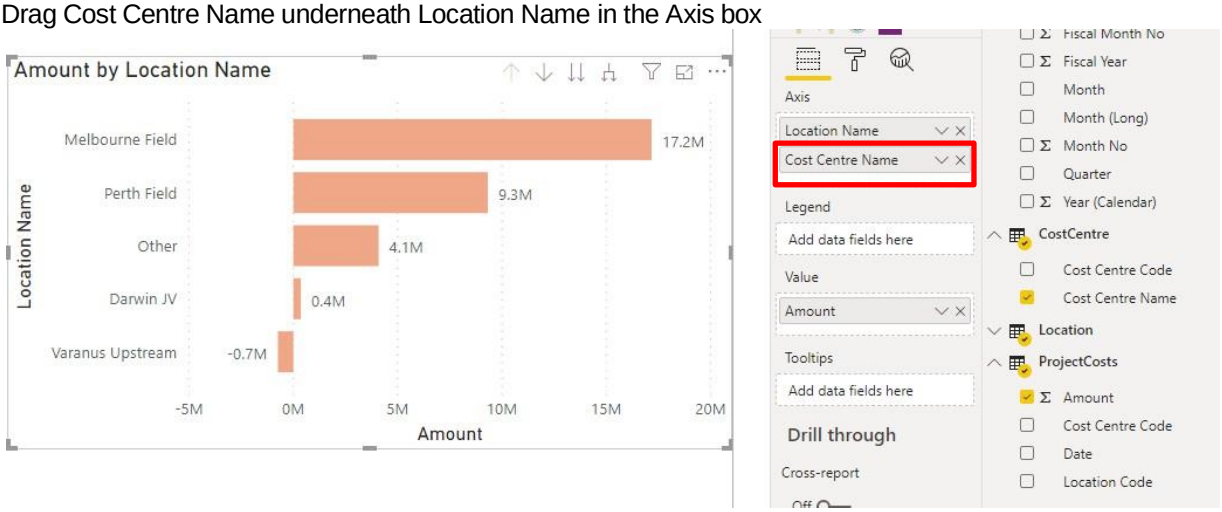
If you click on the chart for Amount by month you will see the same icons appear above the Amount by Location chart.

3.3 Drill Down

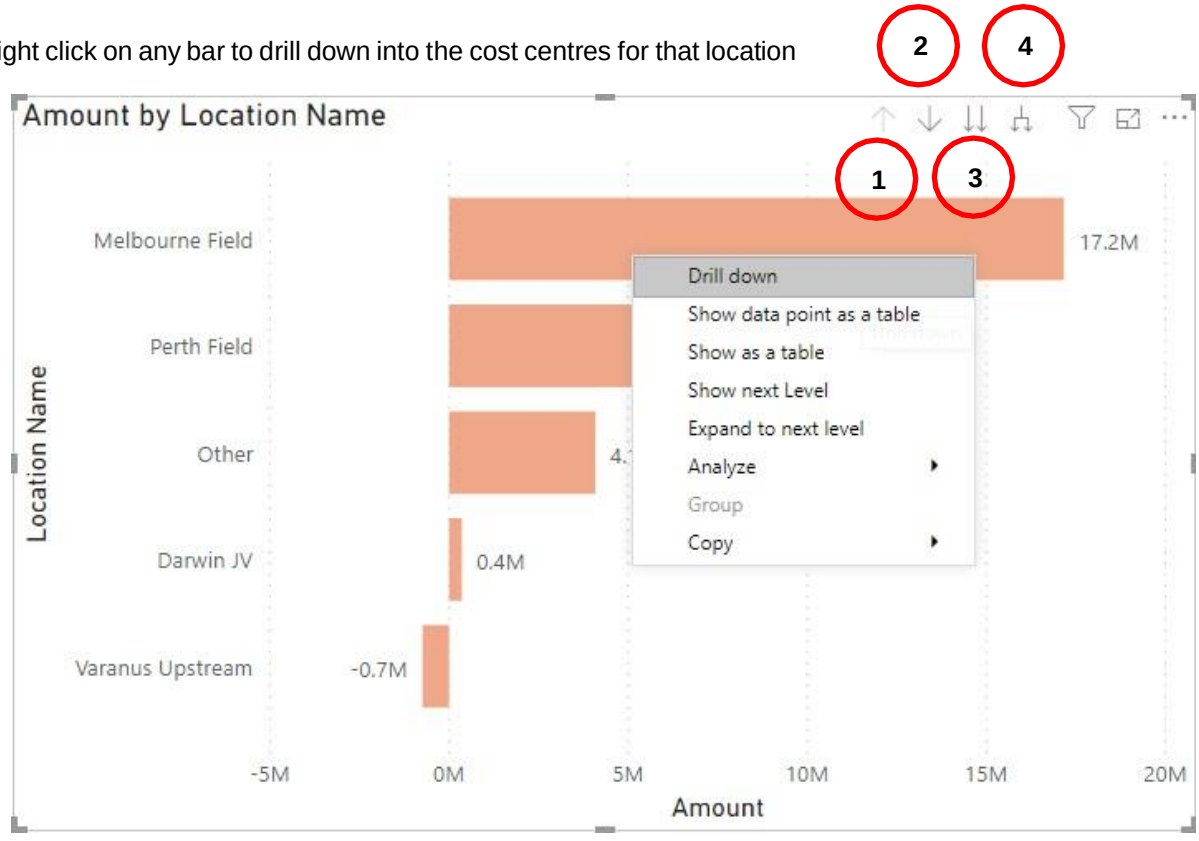
We can also set up charts so that we can drill down into the data

For example, if we want to be able to drill down from a location into the cost centres.

- Click on the Amount by Location Chart
- Drag Cost Centre Name underneath Location Name in the Axis box



Right click on any bar to drill down into the cost centres for that location



1. Drill up
2. Enable Drill down. Not particularly useful other than on touch screen. Enabling it means clicking on a bar drills down rather than acting as filter. Better option is to RC drill down
3. Jump down to next level. e.g. Cost Centre Name view
4. Expand to show all levels i.e. All combinations of Location and Cost Centre

SAVE YOUR FILE

4 Introducing DAX Formulas (Data Analysis eXpressions)

DAX Formulas (called Measures) open up another layer of functionality in Power BI.

Measures are never row or column labels, or axis, or legends. They are the calculated values.

You should always create a measure for any value you put in the VALUES box even if it is just replicating something as simple as Sum of Sales. Adopting this approach goes a long way to future proofing your model for those unplanned changes.

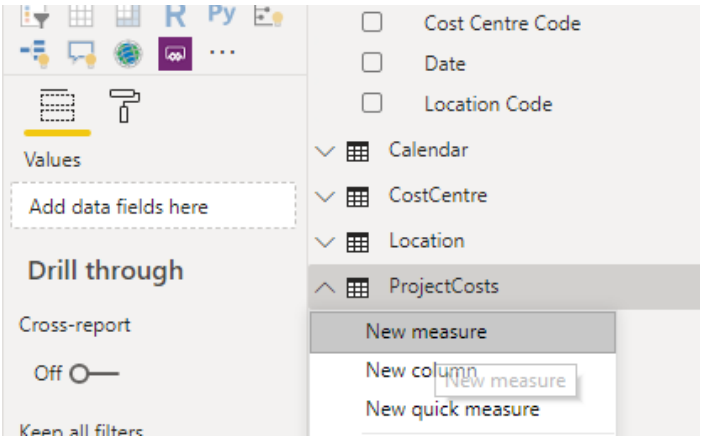
- Save and Close any files and just have your DEMO 1.pbix file open

We will be creating 3 Measures

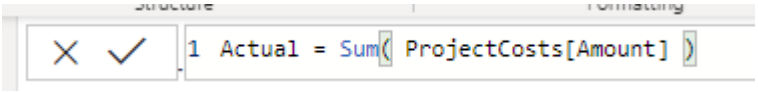
Actual, based on ProjectCosts > Amount)
Budget, based on BudgetTable > BudgetColumn)
Variance, using Actual - Budget

Actual

RC on ProjectCosts and select New measure

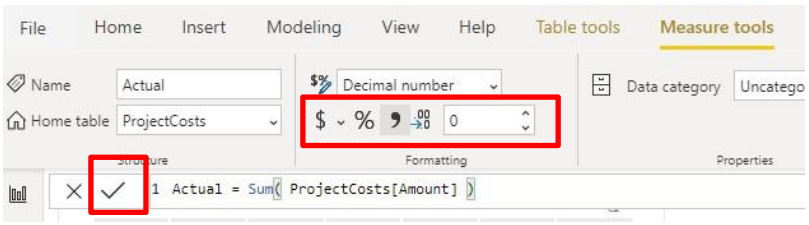


- In the formula bar type the following



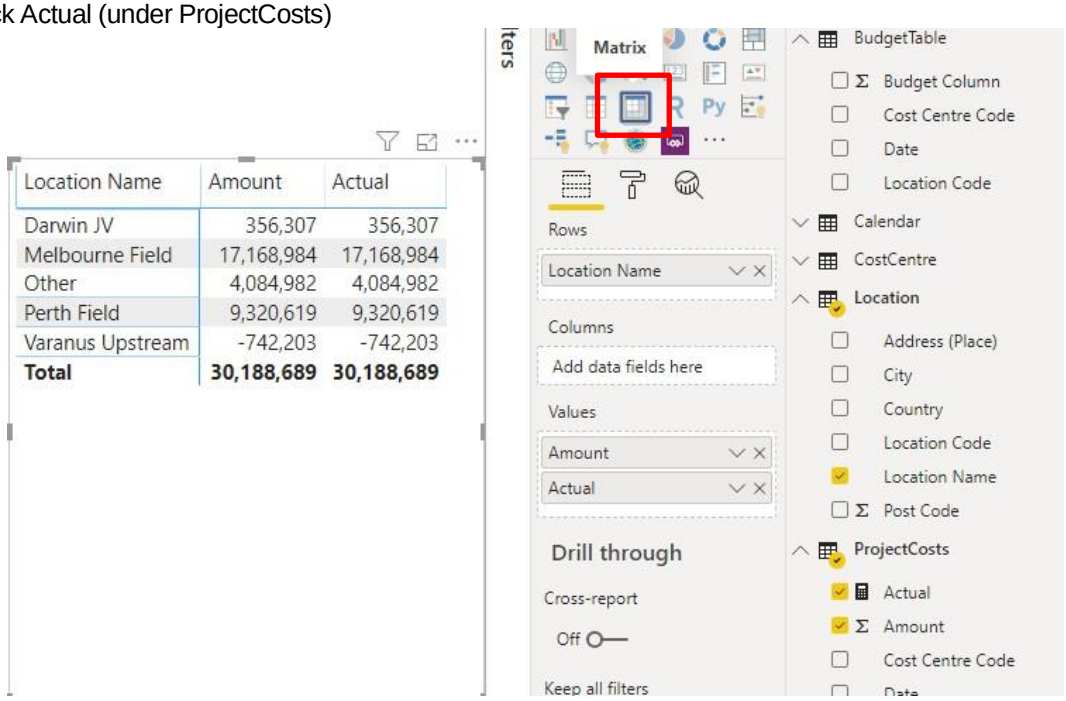
Tip: Use spaces after the opening bracket and before the closing bracket to make your formula easier to read.

- Click the Tick and while you are there let's format the measure, with a comma and 0 decimals



Let's test out this measure.

- Create a new page and call it Actual v Budget
- Click on the Matrix Visual (see red box in screenshot below)
- Tick Location Name
- Tick Amount (under ProjectCosts)
- Tick Actual (under ProjectCosts)



As you can see the figures are identical – so why bother?

The power of Measures comes from the fact that they are building blocks for reports and can be referenced by other measures.

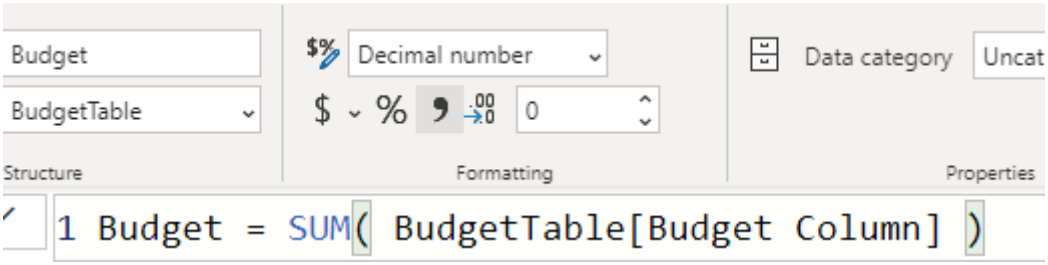
For example, if we now build a Budget measure we can then build an Actual v Budget Variance measure or a YTD Actual measure or a This Month v Last Month Actual variance.

Also, if you discover that Amount was the wrong column to use (e.g. it should have been a column called "Pre Tax Amount"), then it's simple to change your measure once and have that change flow through your entire report instantly. So a 1 minute fix, rather than many hours of rebuild.

Let's create a Budget Measure

- Right Click on the BudgetTable
- Select New Measure
- Type in this formula for Budget Budget = SUM (BudgetTable [BudgetColumn])
- Click the tick
- Format as comma and 0 decimals

Tip: You can "zoom into" your formula using Ctrl and the mouse wheel or track pad.



Note: If our column had been called Budget and we tried to set up a measures called budget we would see this warning up this measure in the Budget Table it would stop me since there is already a column in the Budget table called Budget.

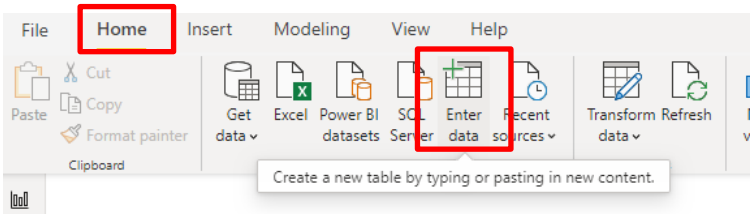
We would recommend that you never name columns and measures the same as this can lead to ambiguity.

4.1 Creating a table to store your measures

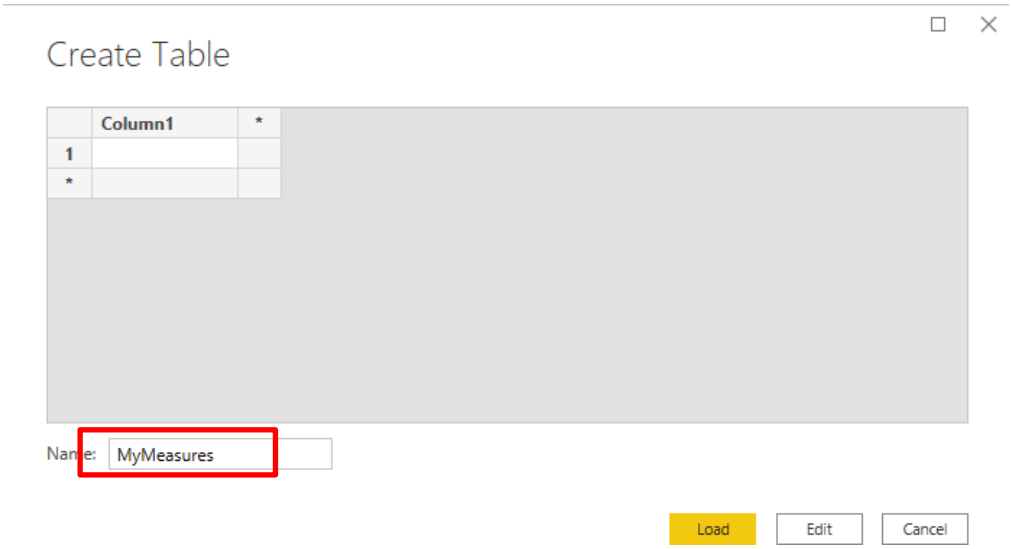
Before we create our 3rd measure: Variance, we will first set up a MyMeasures table to store all our measures in rather than have them dotted around all different tables.

This can also add an element of future proofing should one of your Fact tables no longer be loaded (and the measures saved there would disappear). Again, this is about future proofing your model and making it easier to use.

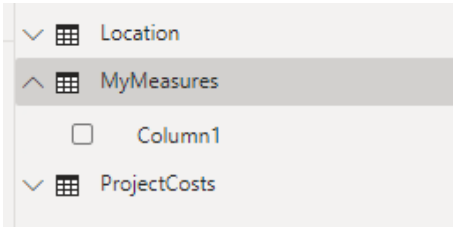
- Click in Enter Data to create an empty table



- Change the name to MyMeasures



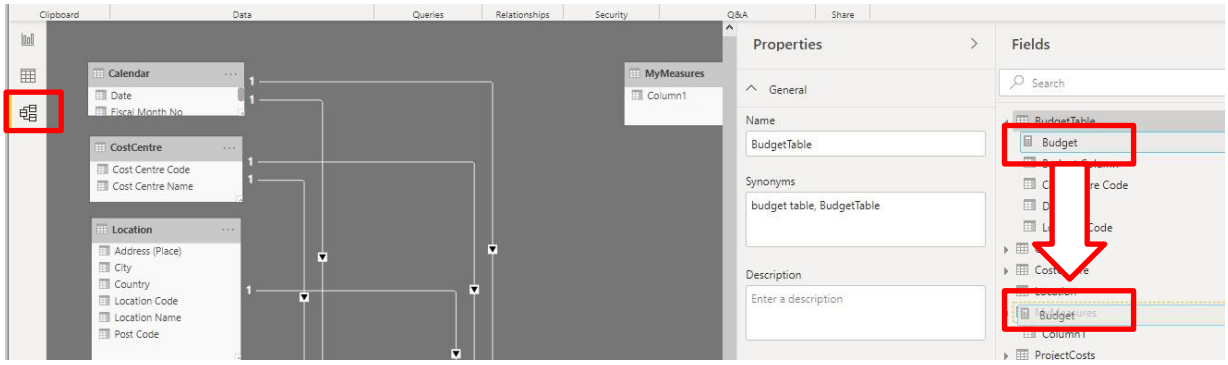
- Click Load



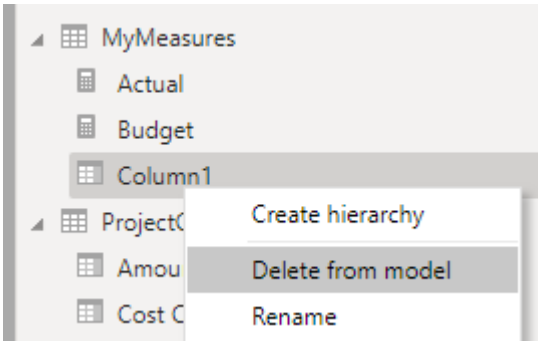
- We do not need Column1 BUT "*** don't delete it yet ***" Your table would disappear!!

We can now drag our Actual measure and Budget Measure into the new MyMeasure Table

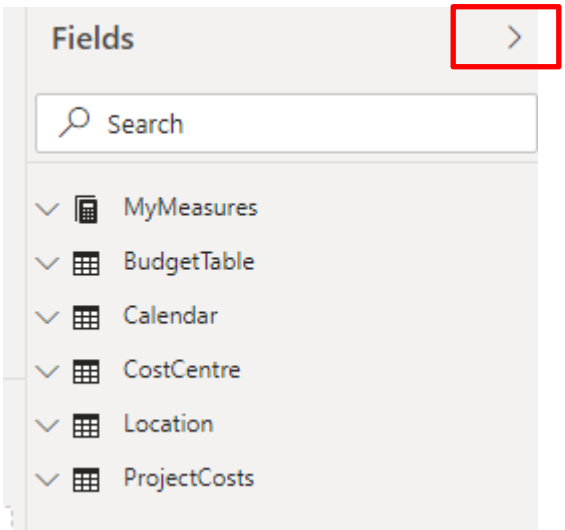
BUT!
You can only drag measures between tables in the “Model view”



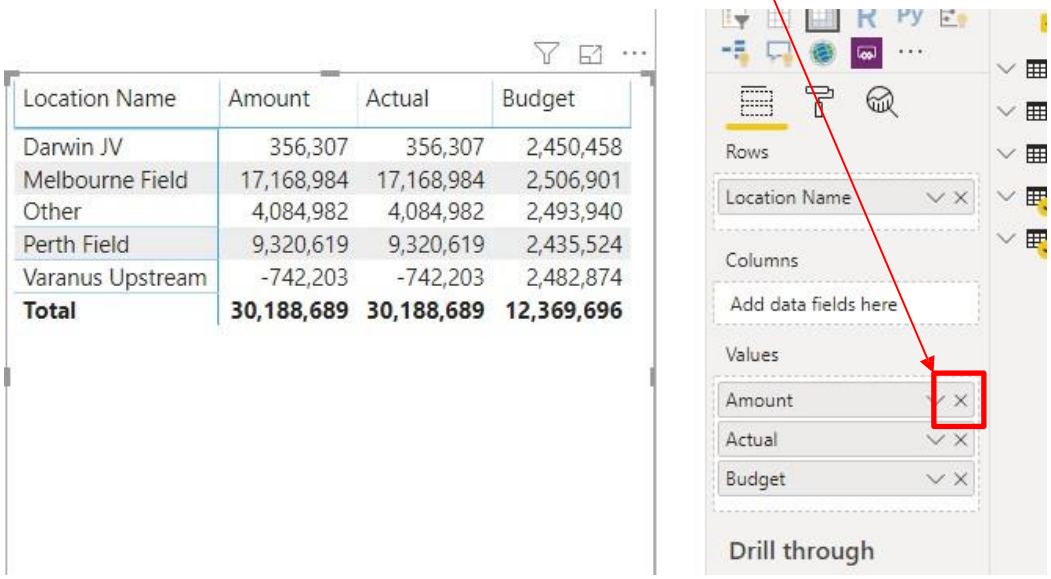
Now we can RC and delete Colum1



- Now return to the Report view where you can see your matrix of numbers
- A final trick is to minimise and maximise the Field Pane, and your MyMeasures will magically jump to the top of your list.



- Click on the Matrix visual
- Remove Amount from the Matrix (by clicking on Cross next to Amount in Values box)
- Tick the Budget Measure



Location Name	Amount	Actual	Budget
Darwin JV	356,307	356,307	2,450,458
Melbourne Field	17,168,984	17,168,984	2,506,901
Other	4,084,982	4,084,982	2,493,940
Perth Field	9,320,619	9,320,619	2,435,524
Varanus Upstream	-742,203	-742,203	2,482,874
Total	**30,188,689**	**30,188,689**	**12,369,696**

- RC on the MyMeasures Table and select New Measure

  Enter this formula

  Variance = [Actual]-[Budget]

Note: You could write this:

Variance = MyMeasures[Actual] – MyMeasures[Budget]

BUT…

NEVER use a Table Name prefix before a measure

ALWAYS use a Table Name prefix when referring to a column
e.g. SUM(BugetTable[BudgetColumn])

Any other approach is asking for trouble and confusion.

This is CRITICAL best practice

You can now create this measure also

Variance% = [Variance] / [Budget]

Format as % with 0 decimals

Question:
What happens if the Budget is Zero? We will get an error for Variance as you will be trying to divide by Zero.

4.2 IF

(info only – don't use this approach)

To avoid this happening we could use the IF formula which is very similar to the Excel version.
Let's edit the Variance%

Variance% = IF ([Budget] = 0 , BLANK() , [Variance] / [Budget])

Returns a Blank where there was no budget.
Could type 0 but that implies no variance

4.3 DIVIDE

A better alternative to this particular issue of dividing by 0 is to use the DIVIDE function

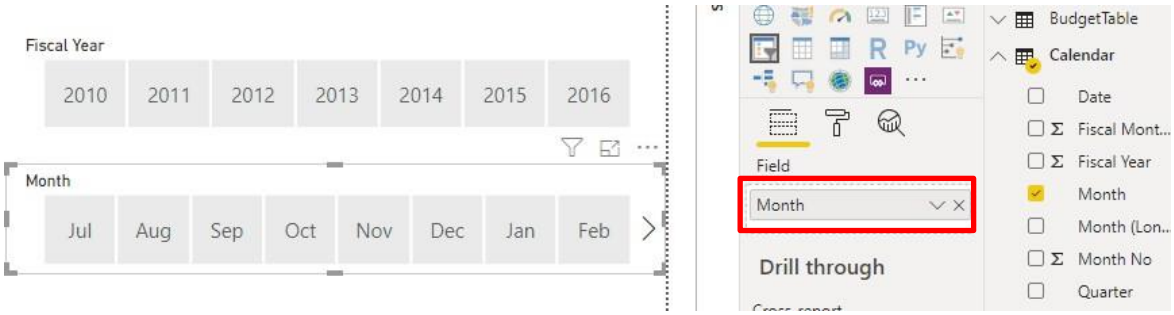
Variance% = DIVIDE ([Variance] , [Budget])

Notice there is a comma rather than a divide symbol. The DIVIDE function defaults to BLANK if dividing by zero.

5 DAX Time Intelligence Functions

There are entire books and courses just on DAX so this course can only scratch the surface on what's possible.

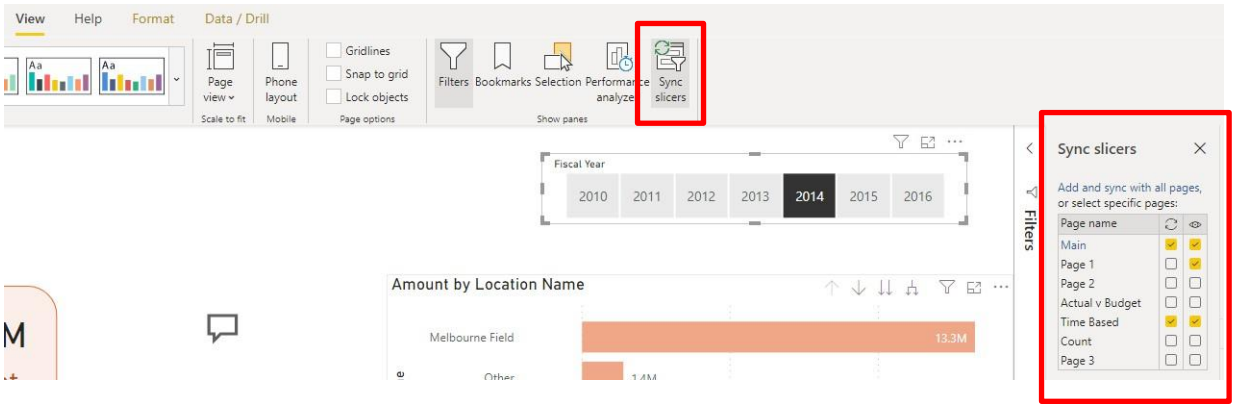
- Create a new page and call it Time Based
- Copy the Fiscal Year Slicer from your original page called "Main"
- When you paste you will be prompted to "Sync" slicers. Click Sync, this then means changing the slicer on this page will have the same effect on the "Main" page.
- Paste again this time DON'T sync
- Remove Year from the Slicer Field and then tick Month



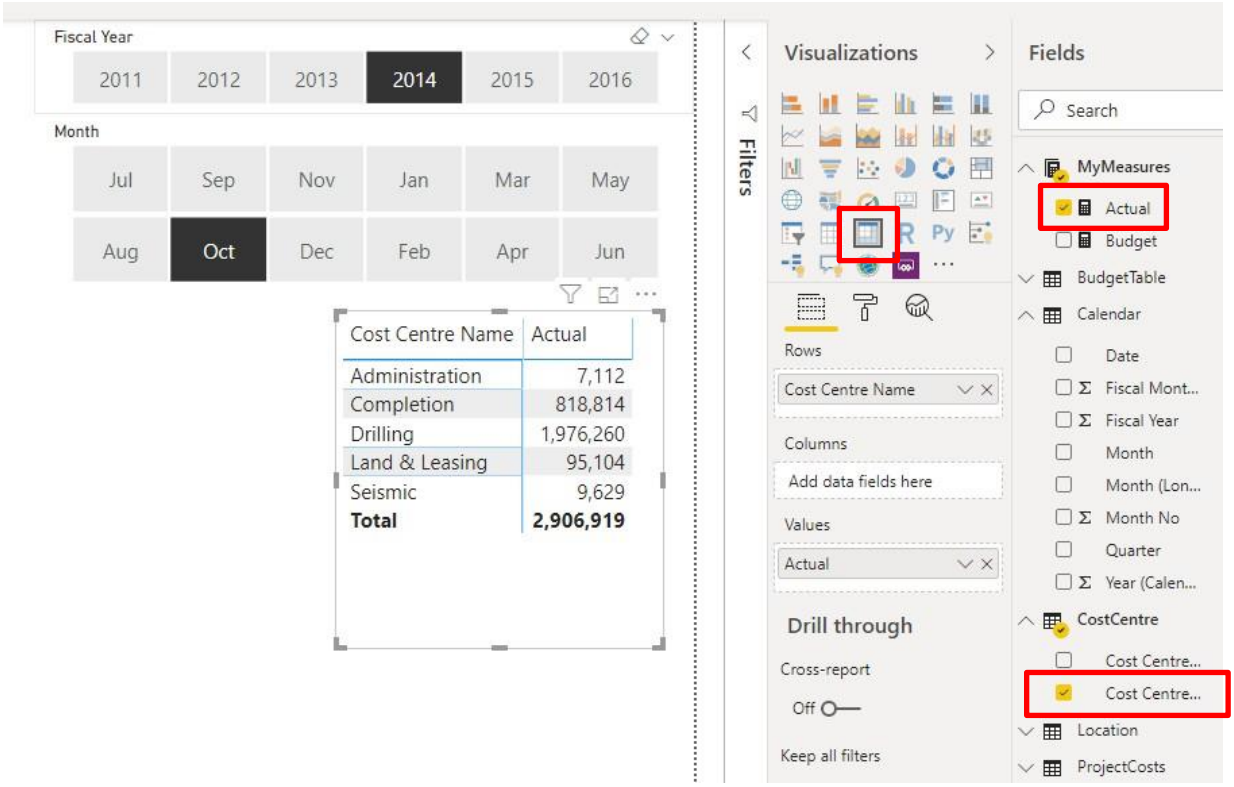
Side note: Sync Slicers

If you add a slicer to one page you can make that slicer control all or some of the other pages.

You can also control whether that slicer appears on all pages.
click View > Sync Slicers



- Set up a matrix visual then tick Cost Centre Name followed by the measure “Actual”



5.1 TOTALYTD

- Create a new measure in the MyMeasures table (via Right Click), call it Actual YTD

  Actual YTD = TOTALYTD([Actual] , Calendar[Date] , Optional Filter , "30/06")

[Actual]	Calendar[Date]	Optional Filter	"30/06"
What you are totalling	The Date Column of your Calendar	Optional filter (completely ignore)	Optional Year End Date if not 31 /12

  Actual YTD =TOTALYTD([Actual] , Calendar[Date] , "30/06")

  You only need to add the optional "30/06" if your year end is not 31 December

  i.e. =TOTALYTD([Actual] , Calendar[Date])

- Format your new measure with comma and 0 decimals
- Select the Matrix and then tick your new measure

Cost Centre Name	Actual	Actual YTD
Administration	7,112	28,827
Completion	818,814	1,450,317
Drilling	1,976,260	2,603,853
Geological & GeoPhysical		3,679
Land & Leasing	95,104	298,469
Seismic	9,629	121,695
Total	**2,906,919**	**4,506,840**

- On the slicer click July, the numbers should match exactly
- Click August, now you will see a difference (to check this you could highlight July and August while holding Ctrl)

Note: To force all Cost Centres to show you can click on the drop down for Cost Centre Name and choose Show items with no data

Cost Centre Name	Actual	Actual YTD
Administration	15,884	15,884
Completion	631,503	631,503
Drilling	627,593	627,593
Land & Leasing	203,366	203,366
Seismic	112,066	112,066
Total	**1,590,411**	**1,590,411**

5.2 CALCULATE – ALL

(to get Full Year Budget)

To get the Full Budget for the year we could just pull in [Budget] and then take away the slicer for Month. That way the visual would always show 12 months of data.

However, that's not practical, as we want to see monthly data in our existing columns but a full year budget in another column.

We use the CALCULATE function to create our Measure

CALCULATE is hugely powerful and is the basis for many different measures.

CALCULATE should have been named "CHANGE FILTER"

- Add a measure to MyMeasures, call it Full Year Budget

  Full Year Budget =CALCULATE([Budget] , All (Calendar[Month]))

  Use ALL to ignore a filter

- Unfortunately, there is a "feature" in Power BI where this formula on its own does not always produce the correct result.

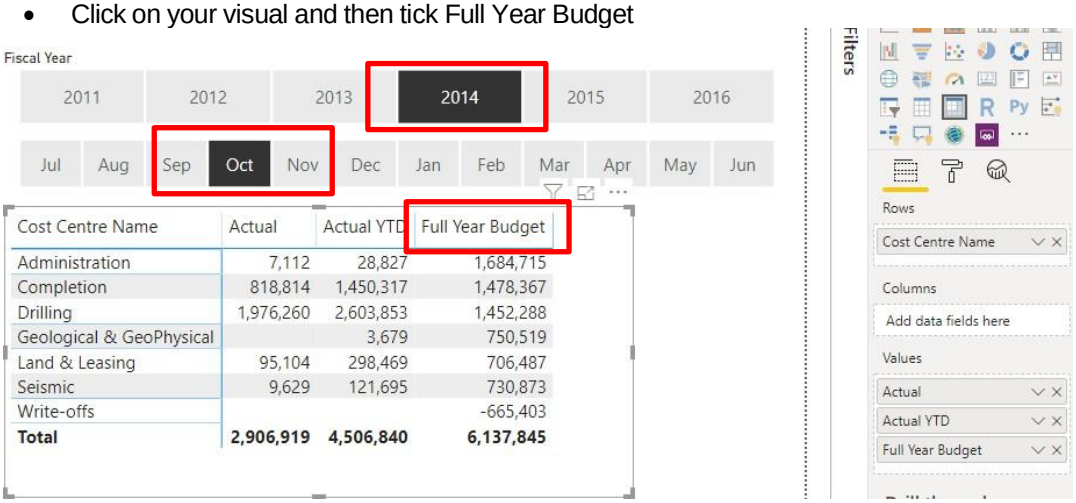
  This is caused by the fact we used a "sort by" on the Calendar Month

  Edit your formula to now show this…

  =CALCULATE([Budget] , All (Calendar[Month] , Calendar[Fiscal Month No]))

  A bug in Power BI means you also need to add the column you've used to "Sort By" here

- Click on your visual and then tick Full Year Budget



- Turn the Months filter slicer off and your figures should match exactly
- Then clicking on each month should only change Budget
- Change the Year however and both sets of figures will change

5.3 CALCULATE – DATEADD

(to get results from Prior Year)

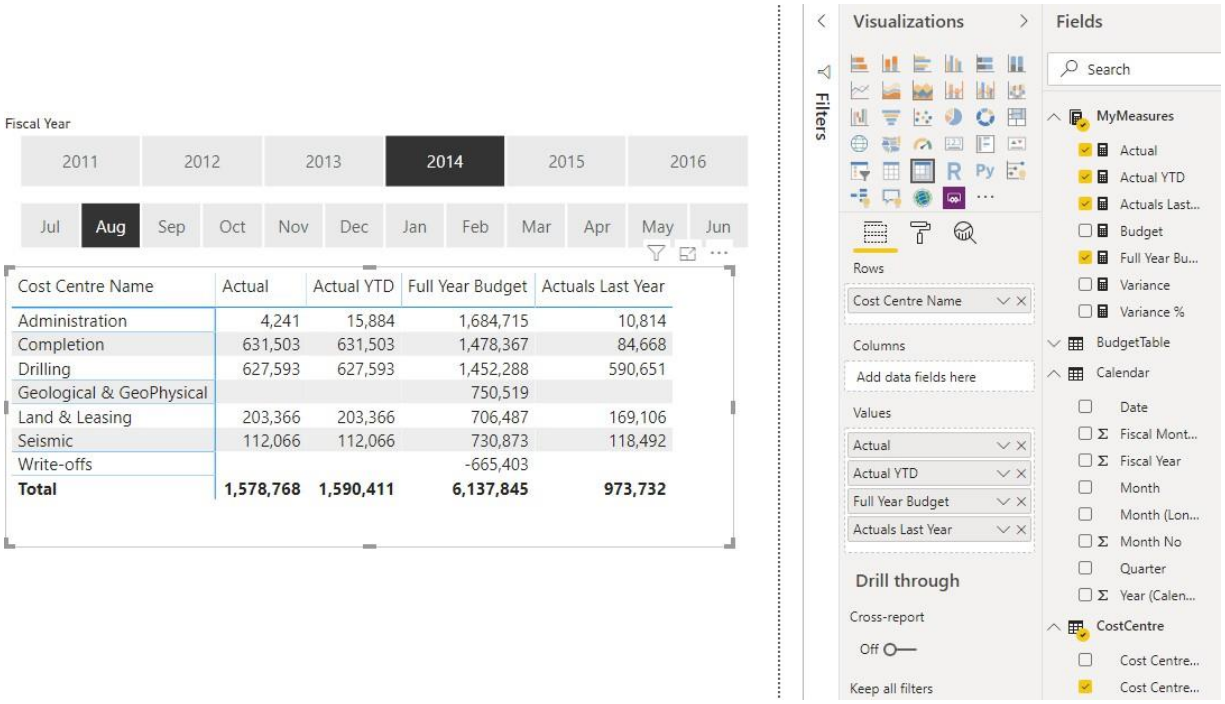
- Add a new measure to MyMeasures, call it Actuals Last Year

  =CALCULATE([Actual] , DATEADD(Calendar[Date] , -1 , Year))

The filter you want to apply In this case we use the DATEADD function to look back 1 year	Periods and Type (Month or Year)

- Tick this new measure to add it to your Matrix

Your results should look like this:



Cost Centre Name	Actual	Actual YTD	Full Year Budget	Actuals Last Year
Administration	4,241	15,884	1,684,715	10,814
Completion	631,503	631,503	1,478,367	84,668
Drilling	627,593	627,593	1,452,288	590,651
Geological & GeoPhysical			750,519	
Land & Leasing	203,366	203,366	706,487	169,106
Seismic	112,066	112,066	730,873	118,492
Write-offs			-665,403	
Total	**1,578,768**	**1,590,411**	**6,137,845**	**973,732**

5.3.1 SAMEPERIODLASTYEAR()

INFORMATION ONLY*

This is the "shortcut" to DATEADD -1 YEAR

This would be the formula:

=CALCULATE([Actual] , SAMEPERIODLASTYEAR(Calendar[Date]))

There are a number of functions such as DATEADD and SAMEPERIODLASTYEAR that are used within the CALCULATE function. On their own they are fairly useless.

SAVE YOUR FILE

If you finish early, check out the Extra Insights PDF in the Appendix Folder

5.4 COUNTROWS()

It can often be very useful to count the number of records or transactions. Especially where this is related to Sales or Production data.

Add a new page called COUNT

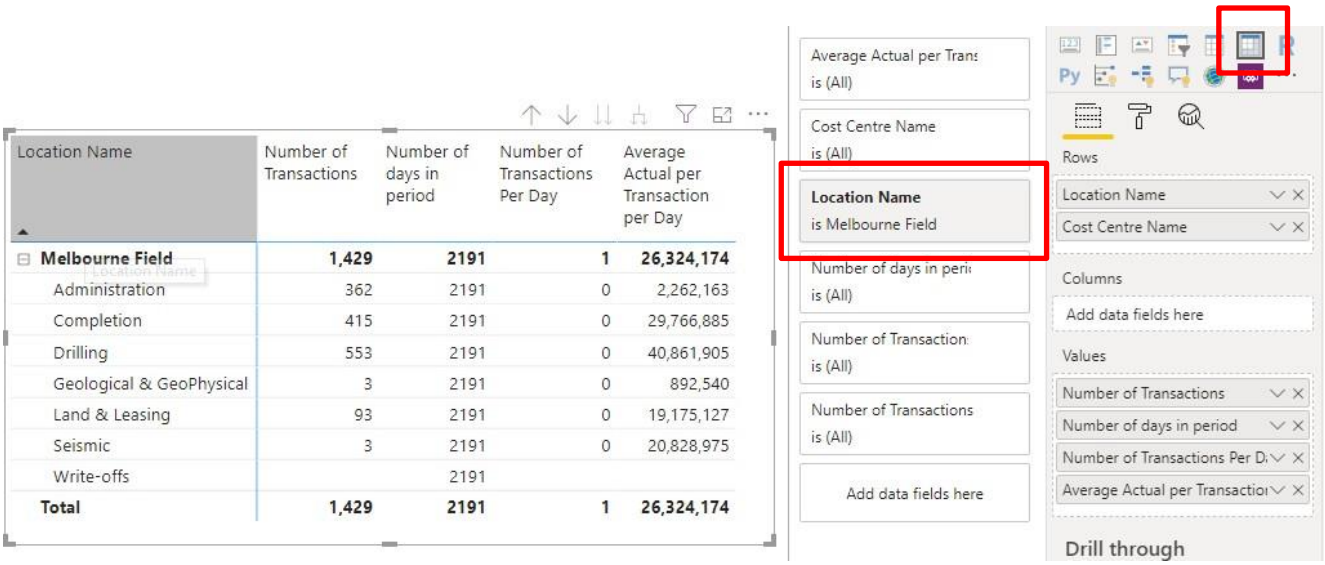
We will recreate a Matrix using DAX measures (note the filter applied to Melbourne Field)

Number of Transactions = COUNTROWS(ProjectCosts)

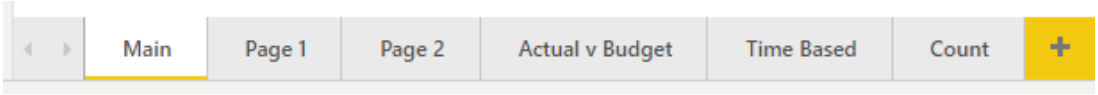
Number of Days in Period = COUNTROWS('Calendar')

Number of Transactions Per Day = [Number of Transactions] / [Number of Days in Period]

Average Actual per Transaction per Day =DIVIDE([Actual] , [Number of Transactions Per Day])



Move your Main sheet to the beginning of the Report.

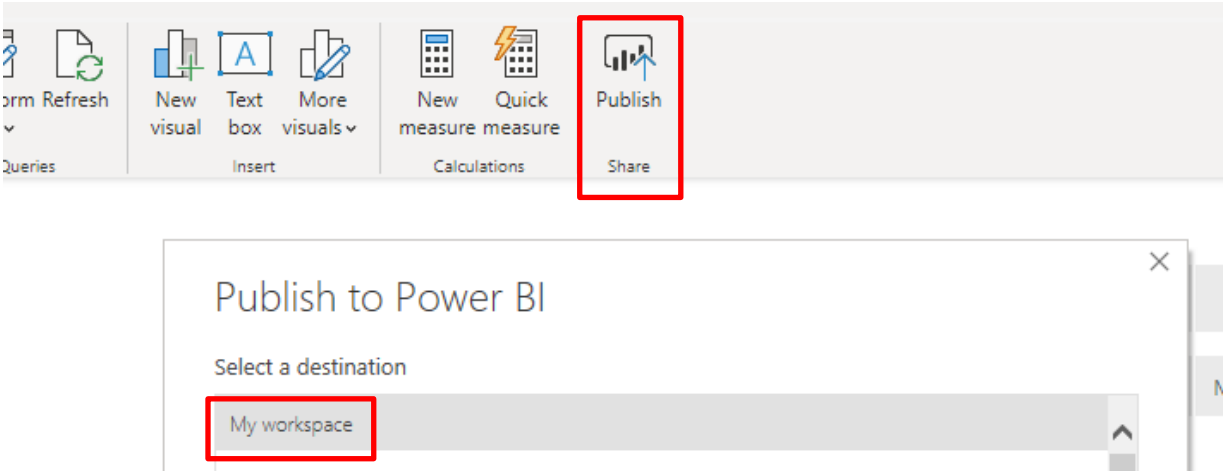


Save your file

6 Publish your dashboard to Power BI.com

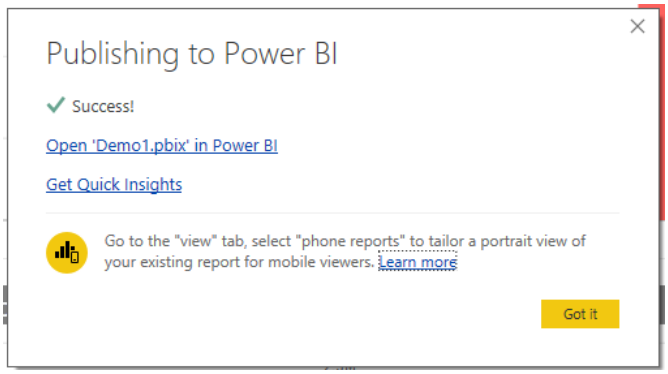
You can easily publish your Power BI Desktop to Power BI.com in order to share it with your colleagues.

- Click on the Publish Icon



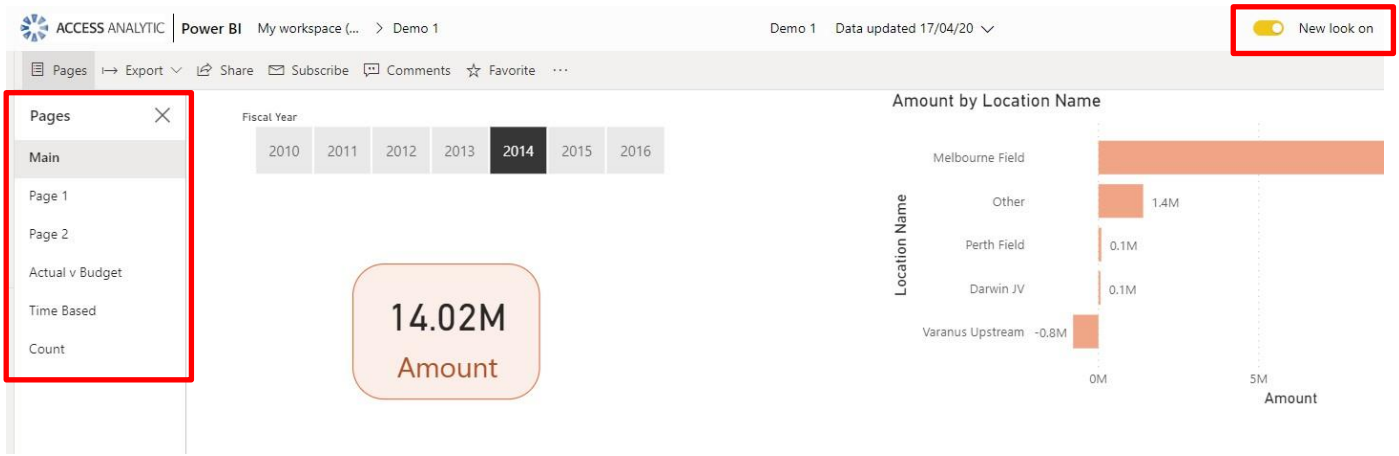
You may be prompted to login with your Power BI account and Password.

- Click on the hyperlink “Open Demo1.pbix in Power BI”

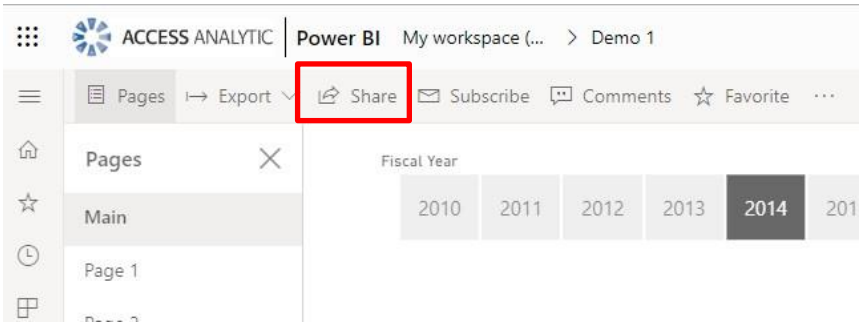


Important:
In reality you won’t publish “production” reports into MyWorskpace as it is deleted when you leave the organisation.
When you have a Power BI Pro license you are able to set up Workspaces allowing a number of people to load and edit reports in the same workspace.

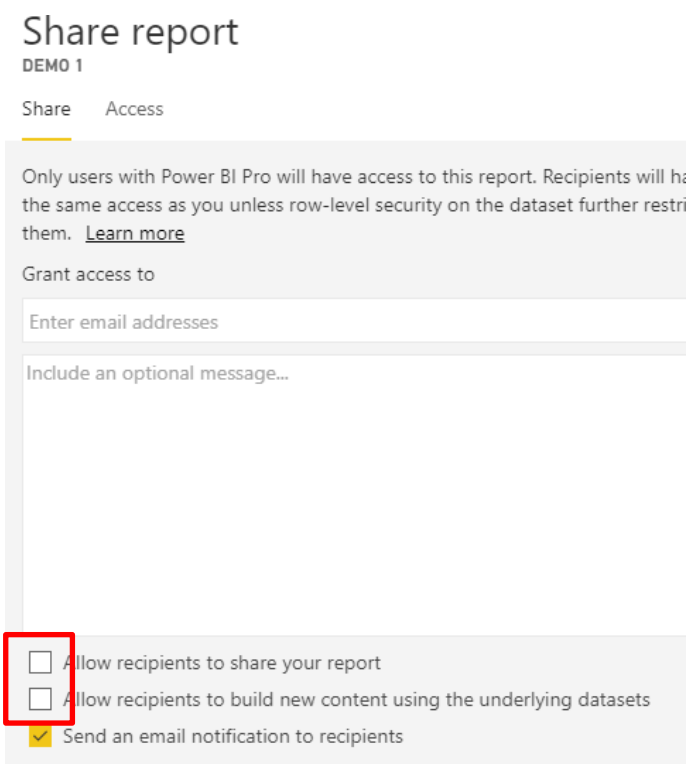
- Make sure “New Look is on” or that the page names are appearing down the left hand side



- The simplest way to share a report is to click the Share Icon. You will need a Pro Licence as will the recipient for this to work



- Then enter emails (we’d suggest unticking the higlighted boxes if you are unsure)



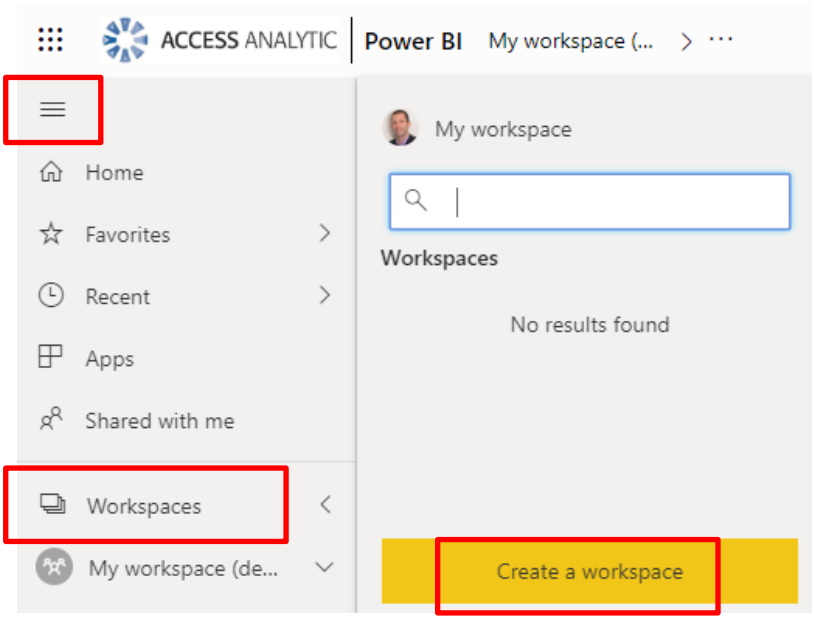
- However, in reality you should NEVER share formal reports from your “MyWorkspace”, as this space is wiped when you leave the organisation, and also can’t be accessed if you are away.

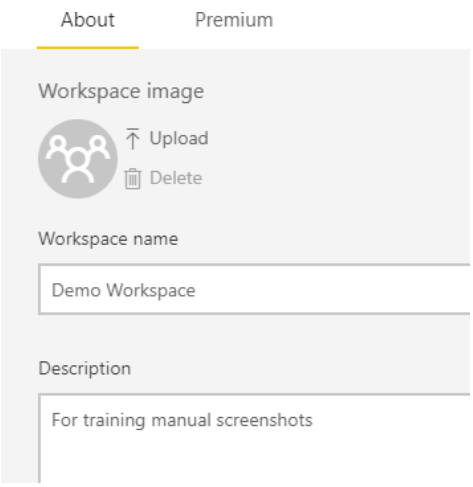
Instead, you should first create a Workspace (this is like a folder) and make at least one other person an Admin of that workspace

Creating a Workspace

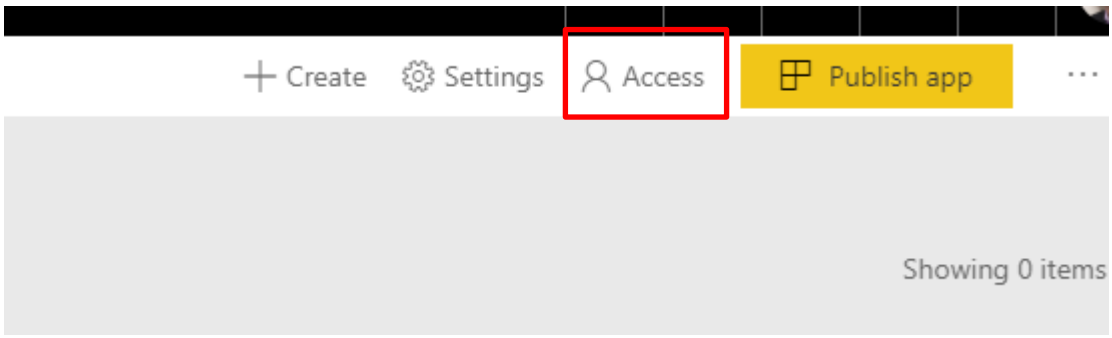
- Click on the”hamburger” in the top left
- Click Workspaces
- Click Create a workspace

You will need a Pro Licence to do this





You can then add other admins and developers to the workspace via the Access Icon in the top right corner



The simplest approach is to have at least 2 admins and then make other developers admins or members. It's generally not best practice to give end users access here.

If you are going to give end users access here then make them a Viewer Role.

If you assign them to any other Role then Row Level Security will be ignored! (we look at RLS later)

Teams and Other Distribution groups can be added to this Access, but again, best practice would be to allow end users access via the Published App (See next)

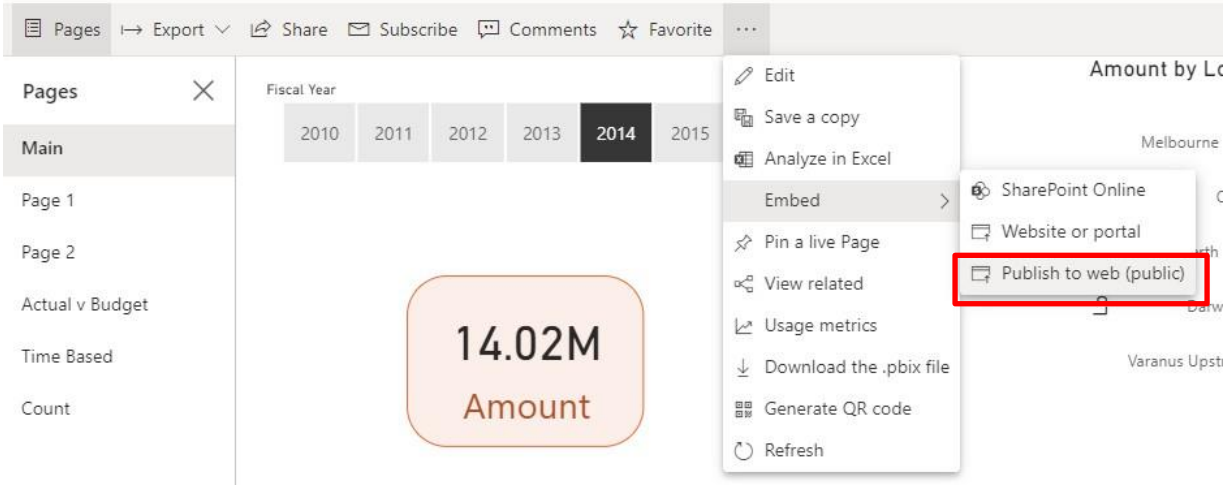
Capability	Admin	Member	Contributor	Viewer
Update and delete the workspace.	X			
Add/remove people, including other admins.	X			
Add members or others with lower permissions.	X	X		
Publish and update an app.	X	X		
Share an item or share an app.	X	X		
Allow others to reshare items.	X	X		
Create, edit, and delete content in the workspace.	X	X	X	
Publish reports to the workspace, delete content.	X	X	X	
View an item.	X	X	X	X

Once your worskpace is created, you should then publish your Power BI desktop reports here, instead of ti MyWorkspace

6.1.1 Publishing to Web

An unsecure way of publishing to outside parties or your website is to publish a report to web

This may have been turned off by your Organisation Admin.



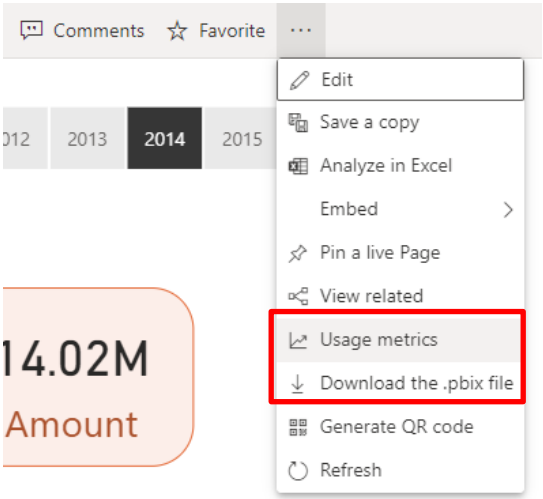
Publishing to web will give a warning that data from now on will become publicly available to everyone who has the link. You'll then see an option to create an embedded code.

This highlights an important data privacy issue.

Therefore, the option to publish to web should never be used if your project contains confidential data.

6.1.2 Usage Metrics & Editing Reports

Note: via the same 3 dots you can get Usage Metrics, and you could download the Power BI Desktop file if you should lose your copy.



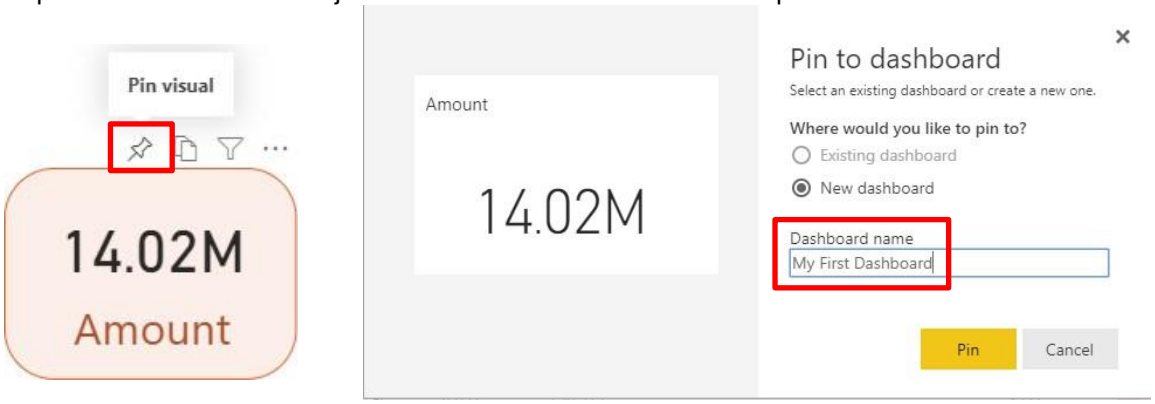
While you can edit the report here, it is better to edit your Power BI Desktop file and then upload it again.

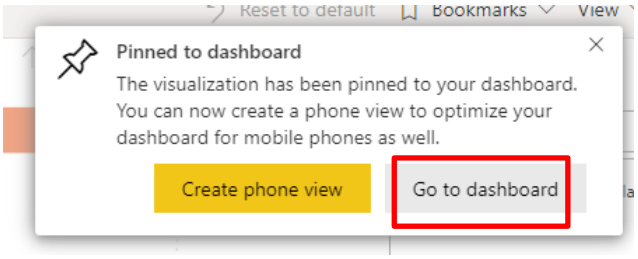
6.1.3 Dashboards

Dashboards can be created from reports by “pinning”visuals or “pinning” pages

Let’s create a dashboard by “pinning a tile”

- To pin a “tile” to a dashboard just hover over the visual and click the pin



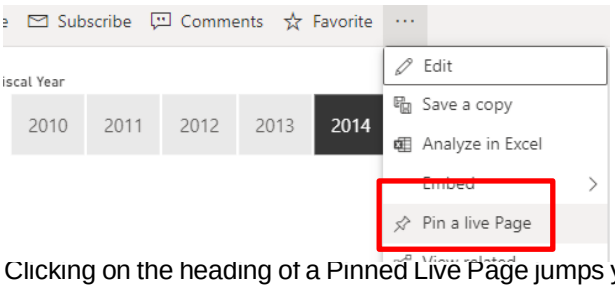


The “tile” can be moved and resized by dragging.

Clicking on the tile jumps you to the report.

Be careful what you pin, as there needs to be sufficient context for it to be meaningful to the user

Note: You can also pin an entire report using the Pin Live Page option in the heading menu



Clicking on the heading of a Pinned Live Page jumps you to the report

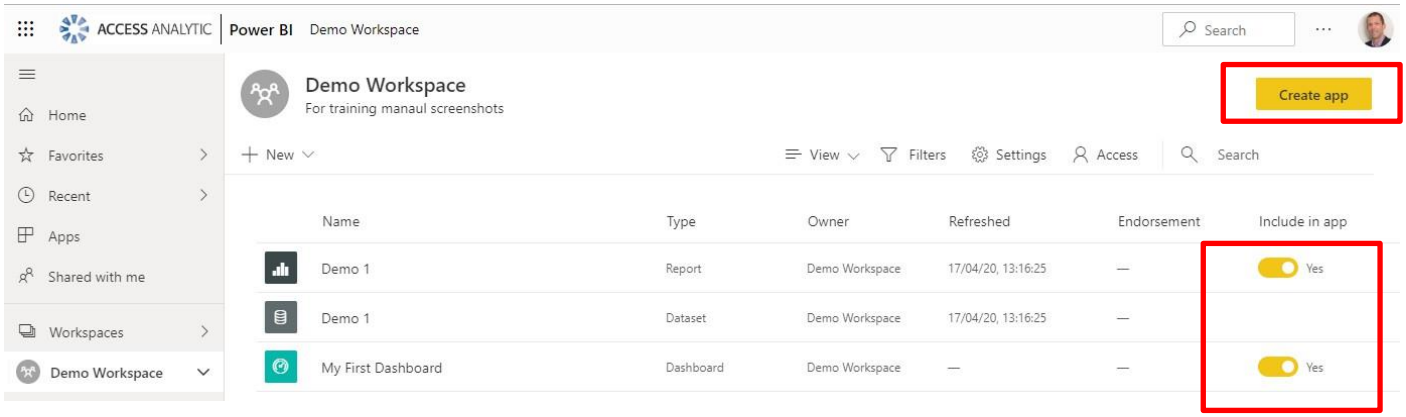
6.2 Publishing an App

The recommended way of sharing reports and dashboards is to package them up into an “App”.

The end user can then install the App from Apps in the left-hand panel

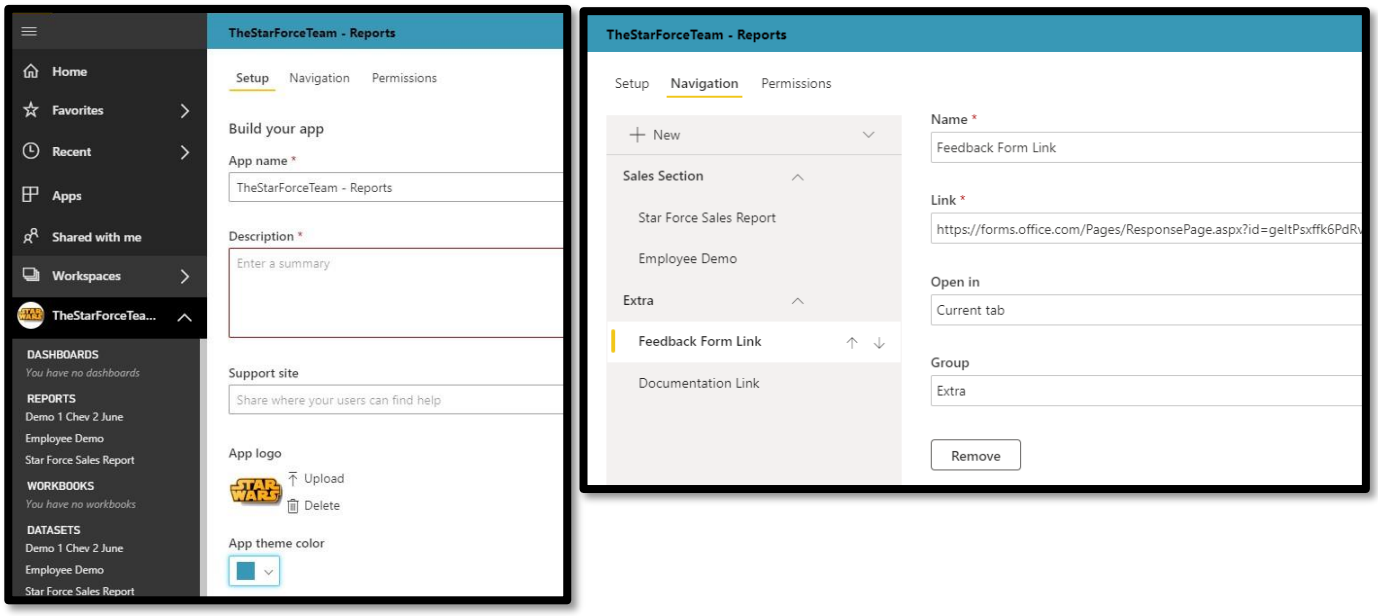
To publish the App, click on the Workspace name at the top of the screen

Ensure the reports and dashboards you want to share are marked as “Included in App” and then click Create app as shown in the picture below

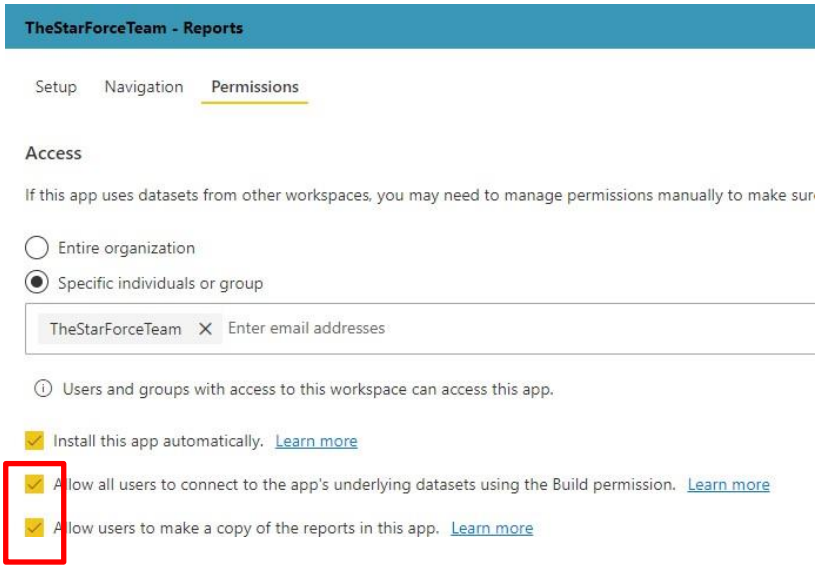


You can then give your app a name and set up the Navigation Experience, including adding Section breaks, and links to external pages

Note: Screenshots are now from different workspace:

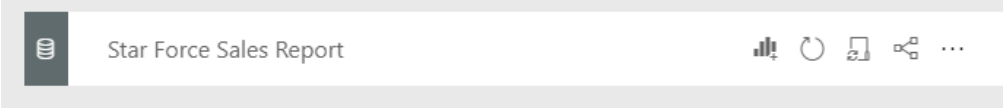


Then give permissions to groups or individuals

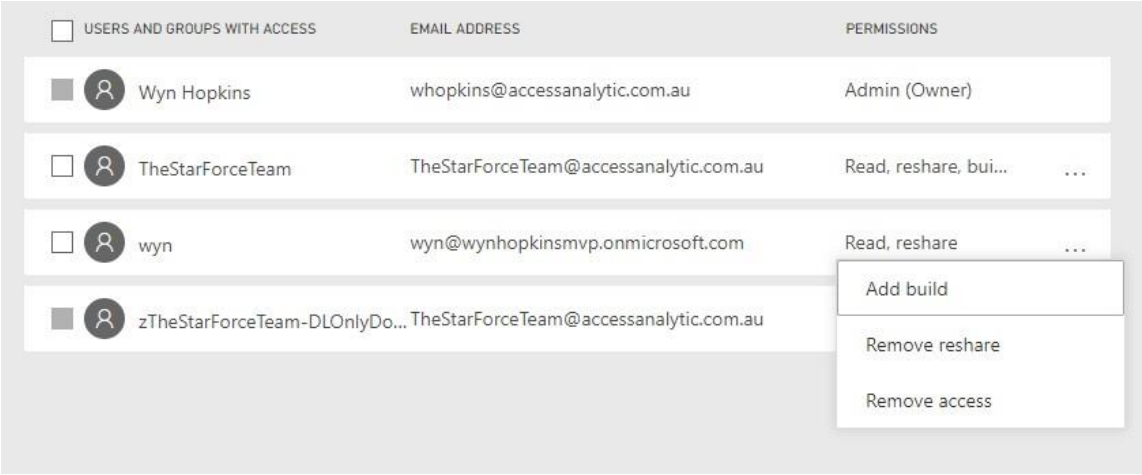


We'd suggest initially turning off the option to allow all users to connect to the app's underlying datasets allows or make a copy of the report.

Note: Data set access can be controlled on a more granular level by turning this off and then going to each data set and clicking the 3 dots…



Choose Manage Permissions

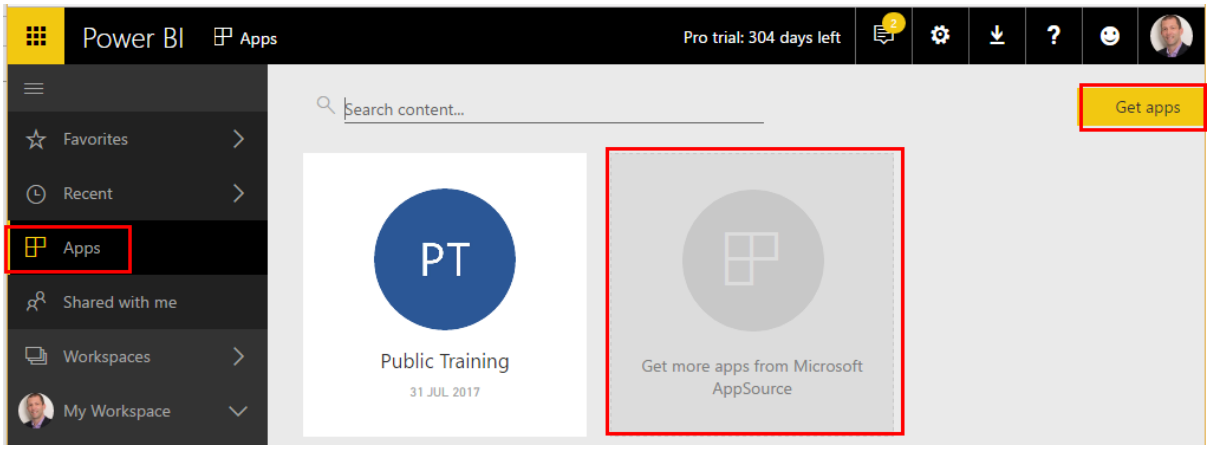


With it, users can build new content on a dataset, such as reports, dashboards, pinned tiles from Q&A, and Insights Discovery. They can also build new content on the dataset outside Power BI, such as Excel sheets via Analyze in Excel, XMLA, and export.

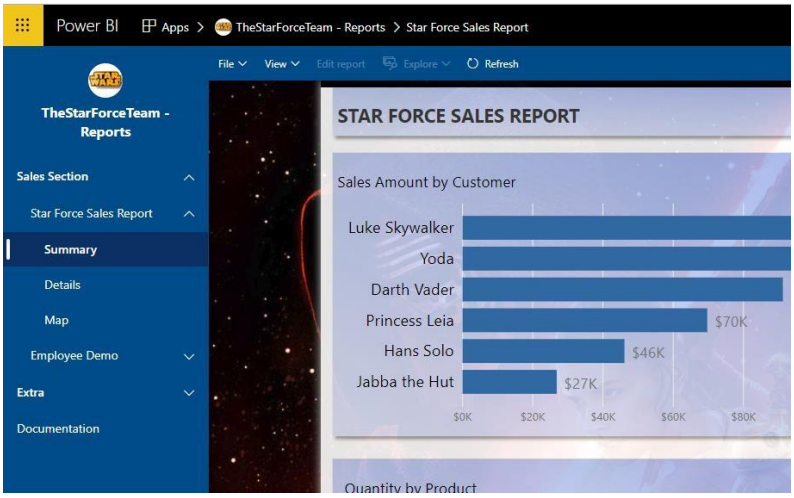
With this more granular Build permission, you can choose who can only view the content in the existing report or dashboard and who can create content connected to the underlying datasets.

6.2.1 Getting an App

If the “install Apps automatically” option wasn’t ticked when you published the app then apps can be accessed via the Apps option in the Navigator



It will look like this…

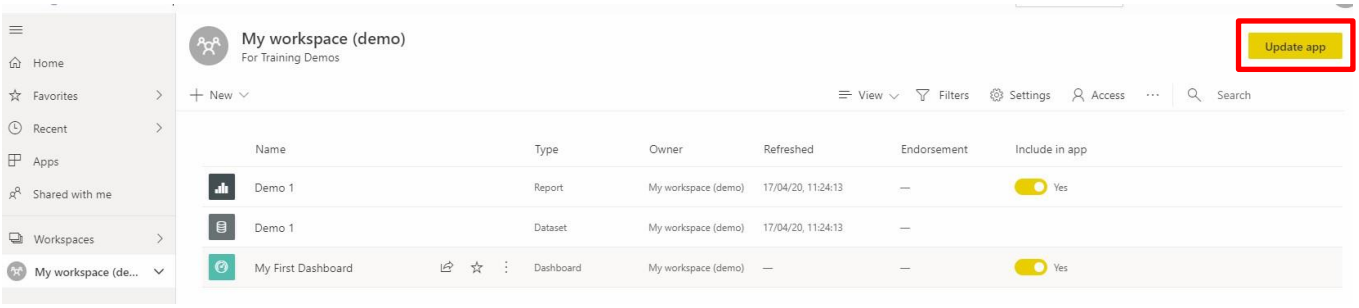


6.2.2 Updating an App

Updates to data will flow through to the reports and dashboards in the App following a refresh.

BUT, if there were physical changes made to the original report these DO NOT FLOW THROUGH AUTOMATICALLY

You must click on your Workspace and click on Update app for physical changes to flow through to end users

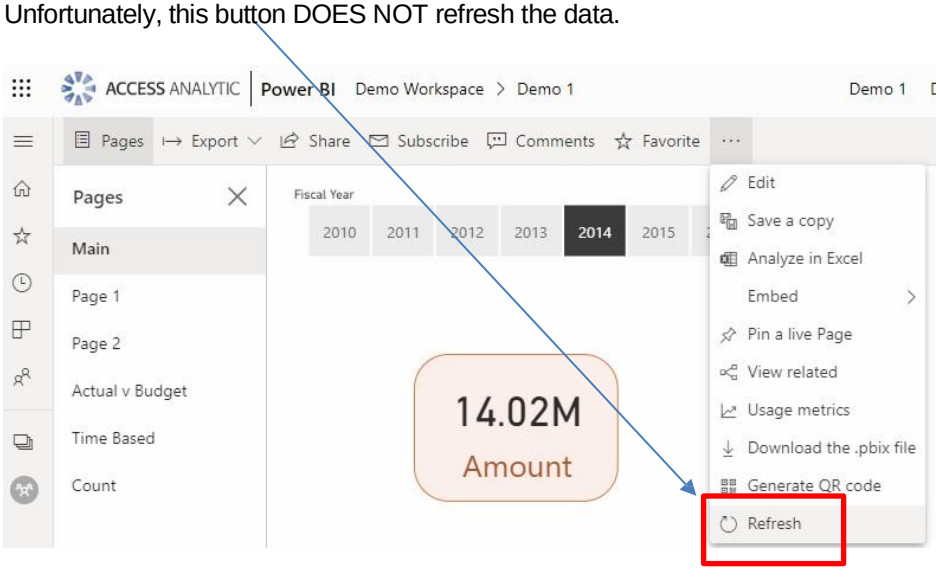


To re-iterate, Data Refreshes WILL flow through to the APP automatically. You do not need to click Update App for data refreshes.

6.3 Refresh a Report

Keeping your data up to date is crucial for decision making. This may require the regular refresh of your datasets.

Unfortunately, this button DOES NOT refresh the data.



This button is occasionally used if you are viewing a report and the data has updated while you are viewing it. It is the same as clicking the refresh button on your browser.

There are 3 main types of data refresh in Power BI:

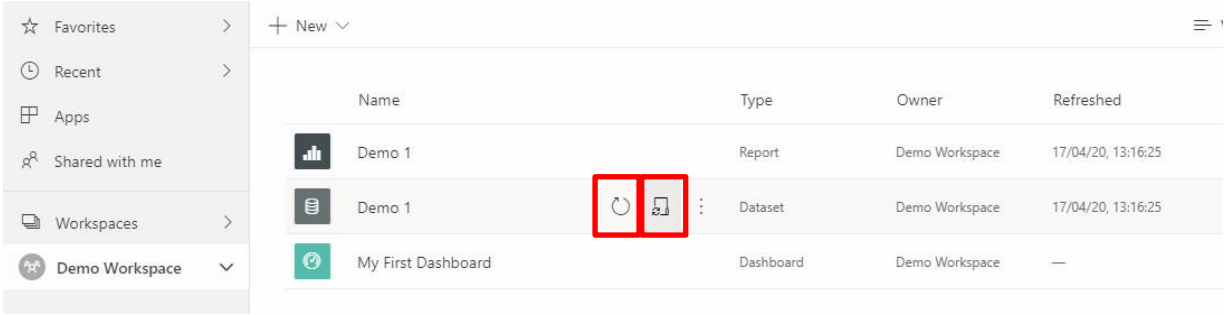
- Manual Desktop refresh (e.g. refresh and re-publish you Power BI Desktop file)
- Manual and Scheduled Refresh if your data sources are all online.
- Manual and Scheduled refresh via the Data Gateway where data sources are “on-prem”

Option 1: Manual refresh and re-publish of Desktop file.

This is the simplest. Refresh your Power BI Desktop file then click Publish, and save over the top of the existing report when prompted to “replace dataset”

Option 2: If all of your data sources are online

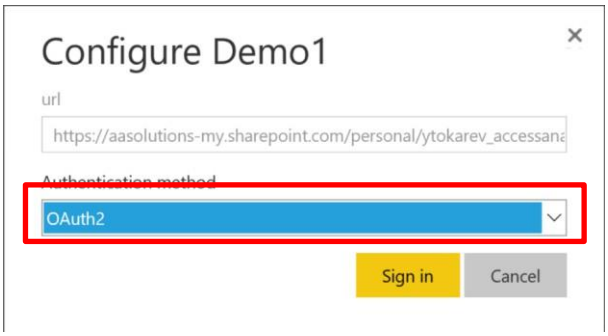
If all of your data sources are online then you can click on your workspace and go to the Datasets section and click on the schedule refresh icon.



You will need to enter your password etc for your online data sources

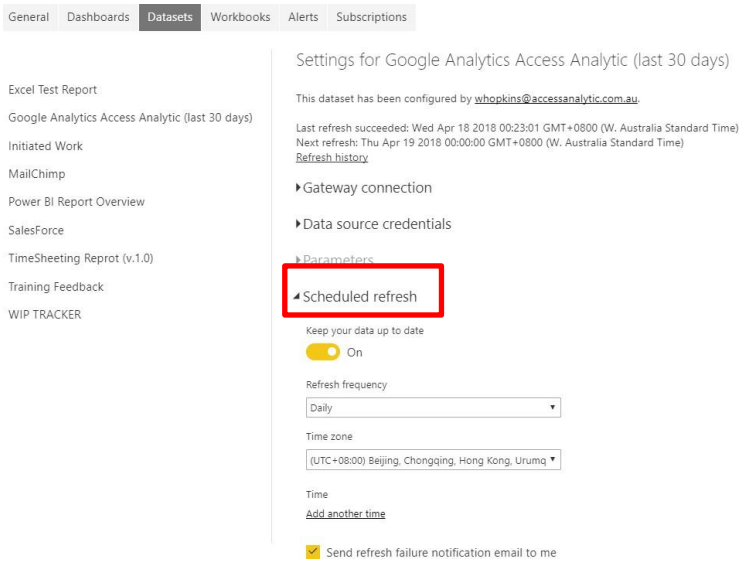
e.g if connecting to a OneDrive / SharePoint Excel file then configure the data source by clicking Schedule Refresh -> Data Source Credentials->Web.

For the authentication method, select OAuth2.



For Scheduled refresh you can choose to refresh up to 8 times a day

(if the workspace has a Diamond against it, indicating a Premium workspace, then you can set 48 refreshes per day)



Option 3: Data Gateway

See the Extra Insights PDF in the Appendix Folder

6.4 Connecting to a file on OneDrive / Sharepoint

See the Extra Insights PDF in the Appendix Folder and this Article / YouTube video
https://youtu.be/igcCbKqtwrk

6.5 Dashboard Alerts

See the Extra Insights PDF in the Appendix Folder

6.6 Analyze in Excel

See the Extra Insights PDF in the Appendix Folder

6.7 Row Level Security

Row-Level Security can be used to restrict what a particular user can see.

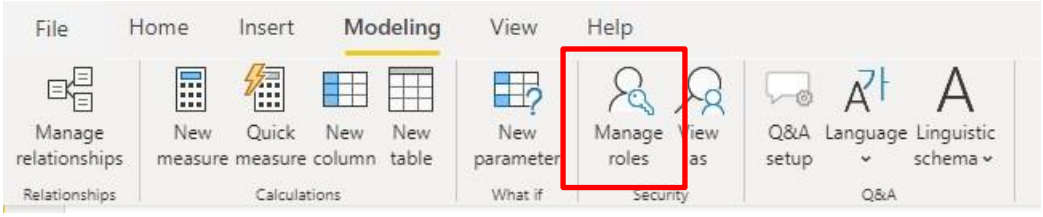
This functionality allows us to create one report, make it available to many users, yet configure it so that when each user logs in, they only see a filtered view of the report that shows just the data they're authorised to see.

For example, if we want the drilling manager to see only the Drilling cost centre data, we can set up a Drilling Role, then apply a filter and assign that Manager as a member of the Drilling role.

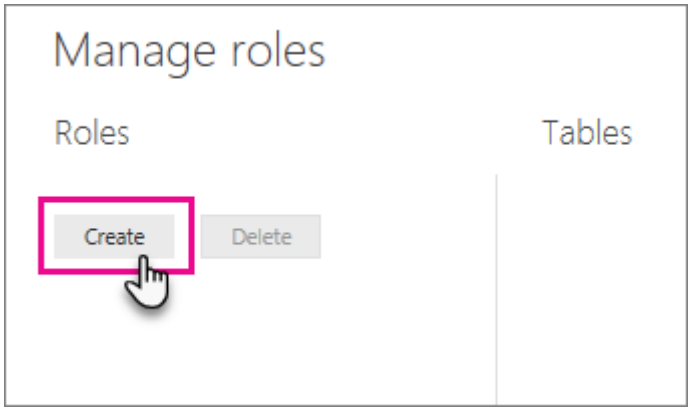
6.7.1 Setting up Row-Level Security

To define security roles, follow the steps below.

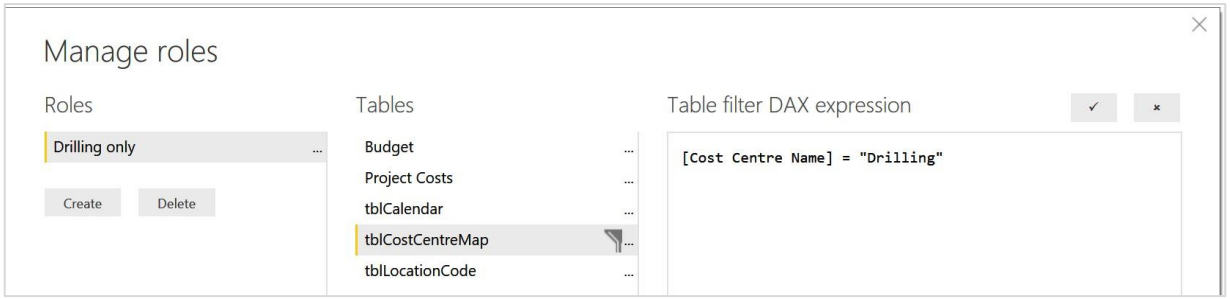
1. Open your Power BI Desktop report.
2. Select the **Modeling** tab.
3. Select **Manage Roles**.



4. Select Create.



5. Provide a name for the role.
6. Select the table that you want to apply a DAX rule.
7. Enter the DAX expressions. This expression should return a true or false. For example: [Entity ID] = "Value".



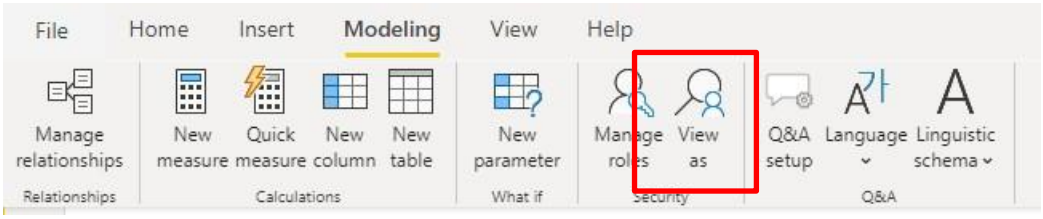
8. After you have created the DAX expression, you can click the tick button above the expression box to validate the expression.

9. Select Save.

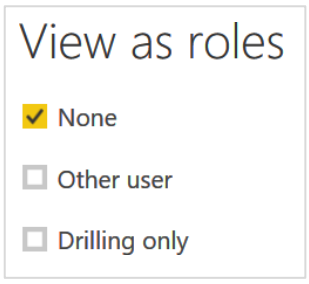
You cannot assign users to a role within Power BI Desktop. This is done within the Power BI service. Note: You can enable dynamic security within Power BI Desktop by making use of the *username()* or *userprincipalname()* DAX functions and having the proper relationships configured. This is an advanced topic and not covered here.

6.7.1.1 Validating the role within Power BI Desktop

After you have created your role, you can test the results of the role within Power BI Desktop. To do this, select **View As Roles**.



The **View as roles** dialog allows you to change the view of what you are seeing for that specific user or role. You will see the roles you have created.



You select the role you created and then select **OK** to apply that role to what you are viewing. The reports will only render the data relevant for that role.

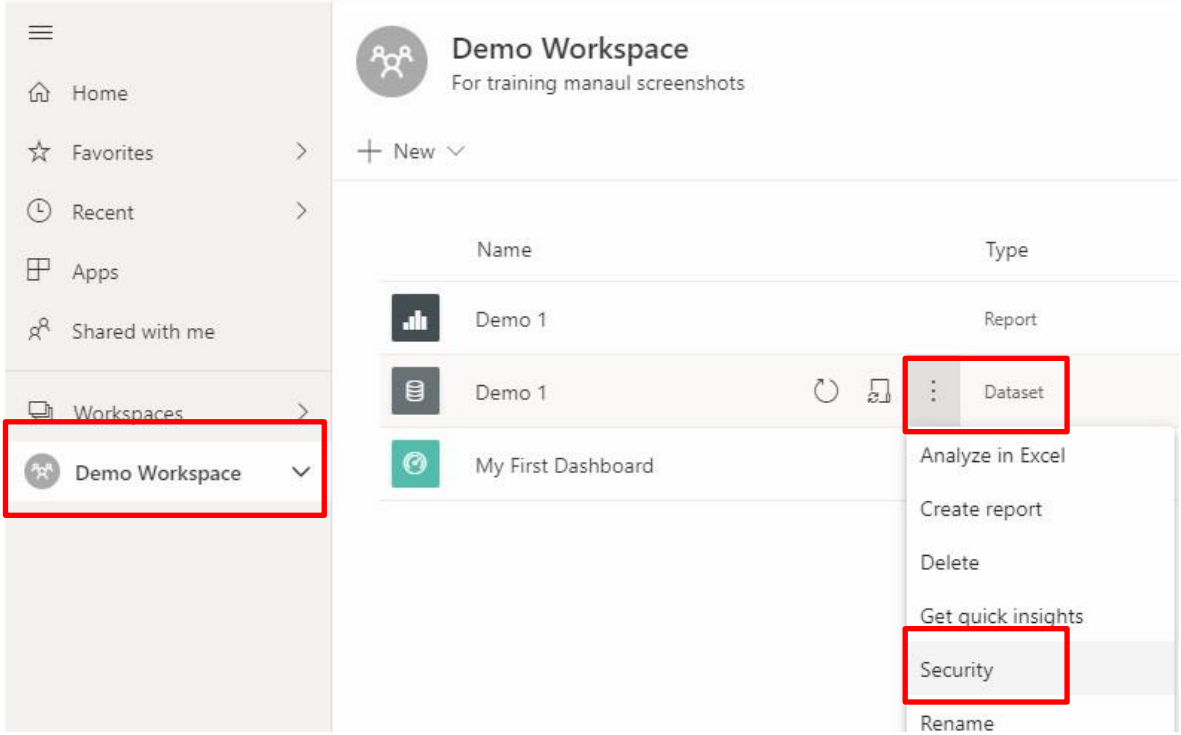
You can also select Other user and supply a given user. It is best to supply the User Principal Name (UPN) as that is what the Power BI service will use.

Select **OK** and the reports will render based on what that user can see.

Note:
Within Power BI Desktop, this will only display different results if you are using dynamic security based on your DAX expressions.

6.7.2 Manage security on your model

To assign people to roles first Publish your desktop file and then go to Power BI.com and click the 3 vertical dots for your Dataset and choose Securtiy

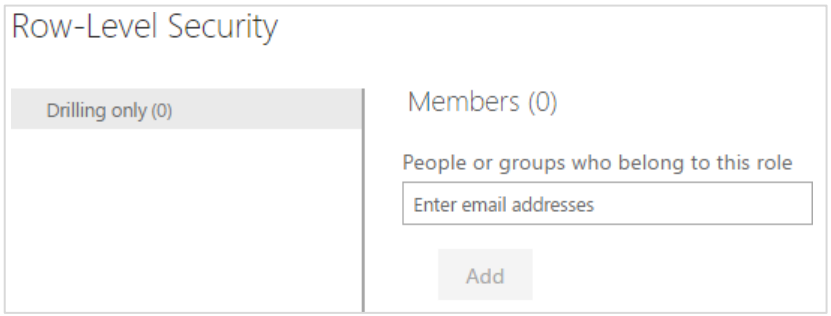


This will take you to the RLS page for you to add members to a role you created in Power BI Desktop. Only the owners of the dataset will see Security available. If the dataset is in a Group, only Administrators of the group will see the security option.

You can only create or modify roles within Power BI Desktop.

6.7.3 Adding members

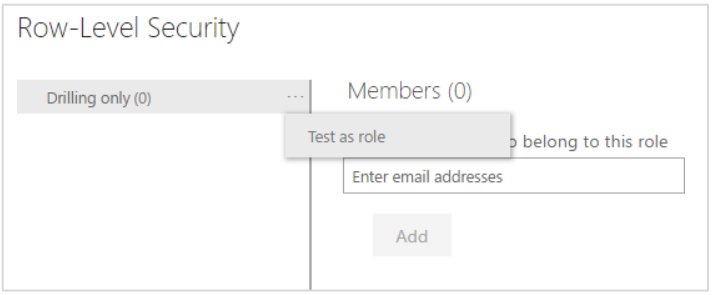
You can add a member to the role by typing in the email address, or name, of the user, security group or distribution list you want to add. This member must be within your organisation. You cannot add Groups created within Power BI.



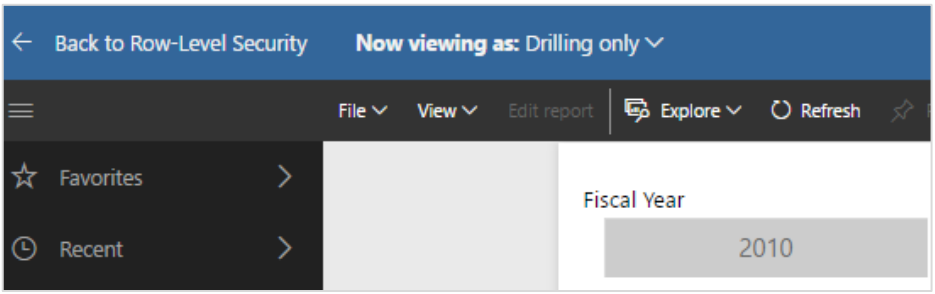
6.7.4 Validating the role within the Power BI service

You can validate that the role you defined is working correctly by testing the role.

1. Select the **ellipsis (...)** next to the role.
2. Select **Test data as role**



You will then see reports that are available for this role



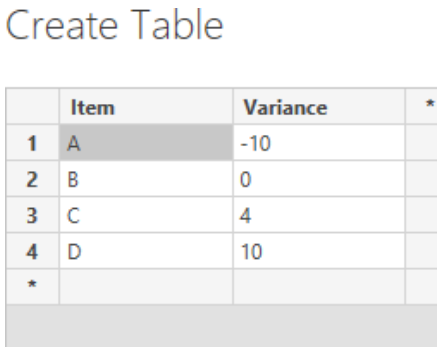
You can test other roles, or combination of roles, by selecting **Now viewing as**.

You can choose to view data as a specific person, or you can select a combination of available roles to validate they are working.

To return to normal viewing, select **Back to Row-Level Security**.

7 ICON Sets (Traffic Lights) and Conditional Formatting

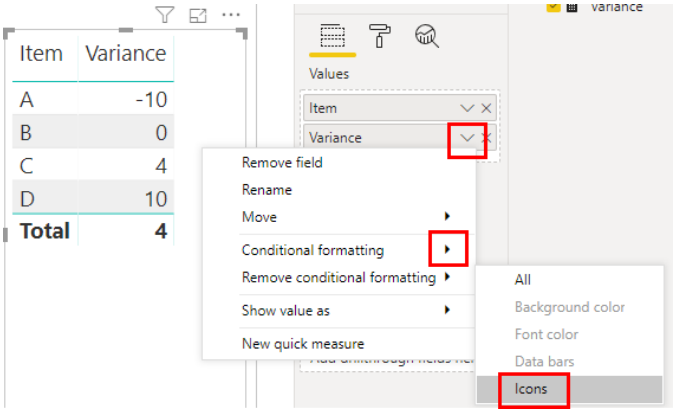
Enter this data into a table via the Enter Data button on the Home Tab



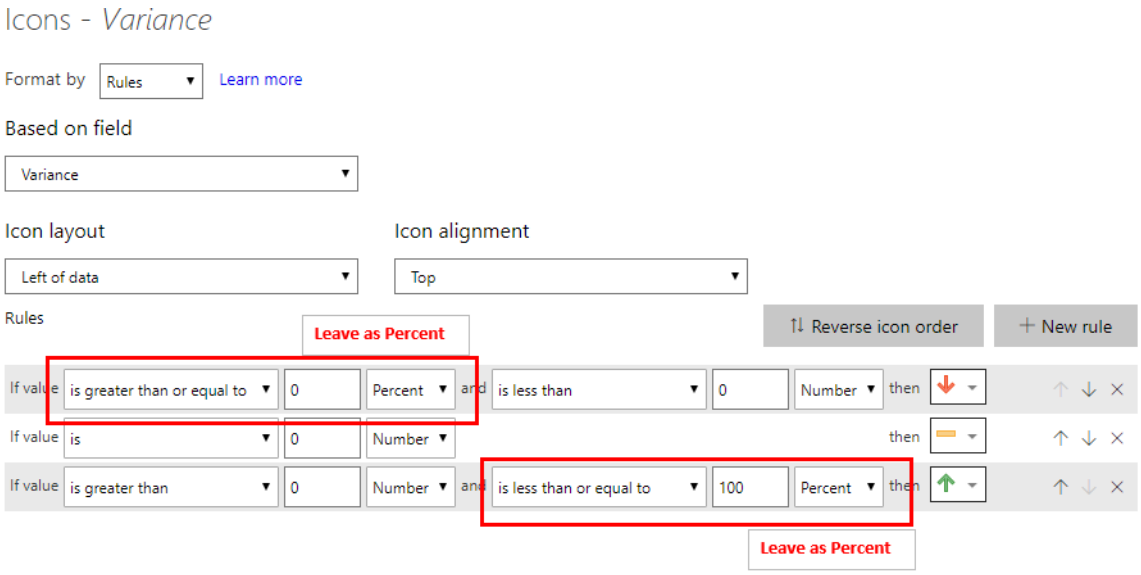
Name the Table as IconTable and Load

Then tick Item and Tick Variance to create a table visual.

Click per the image to get to “Icons”



Set it up as follows



More info: https://accessanalytic.com.au/icon-sets-in-power-bi-and-excel/

8 Reporting from a Database

Every company is different but for many, the most common sources of data are Excel File, CSV files and Databases.

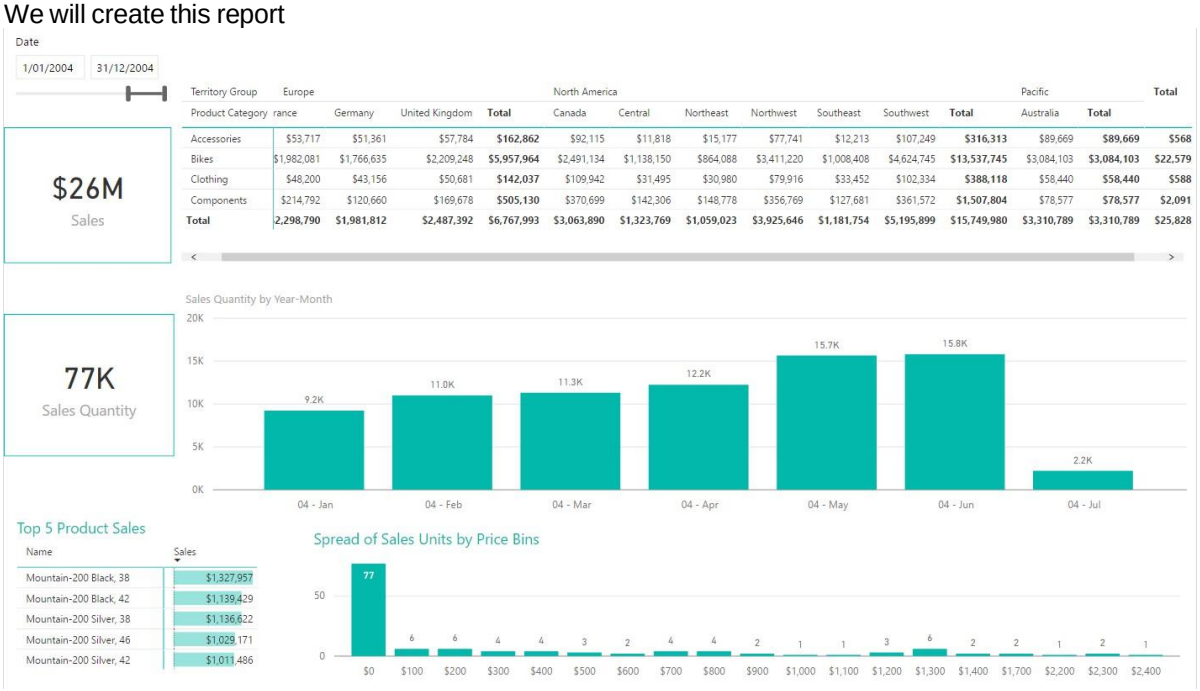
This example will illustrate a few of the traditional “quirks” of pulling data from databases.

Ideally, we would ask our database administrator to create the exact views of the data that we need and then connect to those views.

We are going to access the Sales Data from the AdventureWorks Database (for ease of training we have put these tables into an Excel file)

\Exercises\Source Files\Data Set 2\AdventureWorks.xlsx

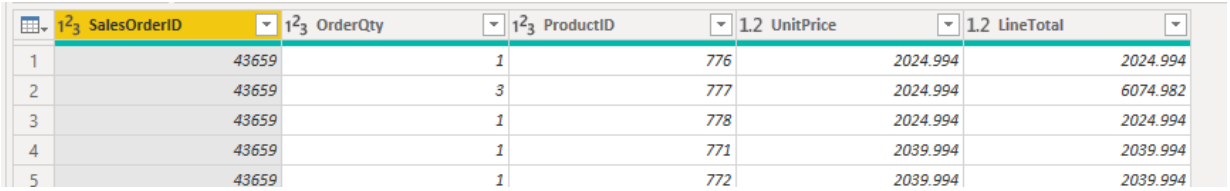
We will create this report



8.1 Connecting to a Database

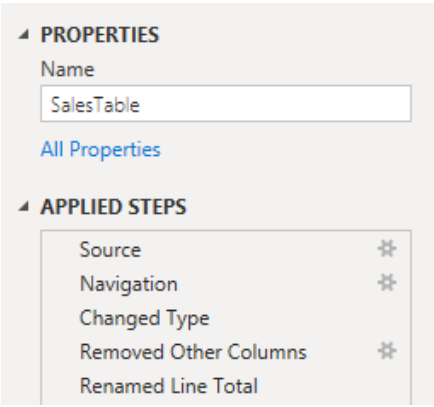
- Start a new file and save it as Demo2.pbix
- Get Data > Excel Workbook
- Exercises \ Source Files \ Data Set 2\ AdventureWorks.xlsx
- Right click on Sales_SalesOrderDetail and select Transform Data
- Click on these columns and then Remove Other Columns

  SalesOrderID, OrderQty, ProductID, LineTotal



	SalesOrderID	OrderQty	ProductID	UnitPrice	LineTotal
1	43659	1	776	2024.994	2024.994
2	43659	3	777	2024.994	6074.982
3	43659	1	778	2024.994	2024.994
4	43659	1	771	2039.994	2039.994
5	43659	1	772	2039.994	2039.994

- Rename Line Total as Sales Value after discount (type over LineTotal)
- Change your Applied Step description from Renamed Columns to Renamed LineTotal *(click on Renamed Columns and either press F2 or Right-Click Rename)*
- Rename your query as SalesTable



This gives us our Sales Quantity and Total Value, but we are missing Product Name, Order Date, Customer, Sales Person, Territory

8.2 Data Modelling

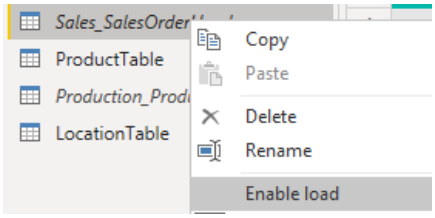
We will get some of these fields from the Sales Order Header Table

- Click on Recent Sources and select the AdventureWorks database
- Right Click on Sales_SalesOrderHeader and select Transform Data
- Click on these columns while holding Ctrl
    - SalesOrderID, OrderDate, CustomerID, SalesPersonID, TerritoryID
- Remove Other Columns

	SalesOrderID	OrderDate	CustomerID	SalesPersonID	TerritoryID
1	43659	1/07/2001 12:00:00 AM	676	279	5
2	43660	1/07/2001 12:00:00 AM	117	279	5
3	43661	1/07/2001 12:00:00 AM	442	282	6

We don't want to load this into our model we just want to add some of the columns to our Sales Table

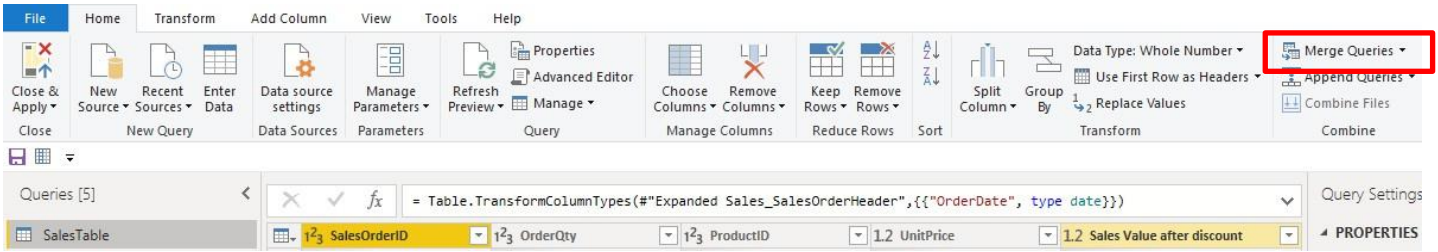
- Right Click on Sales_SalesOrderHeader and "untick" Enable Load



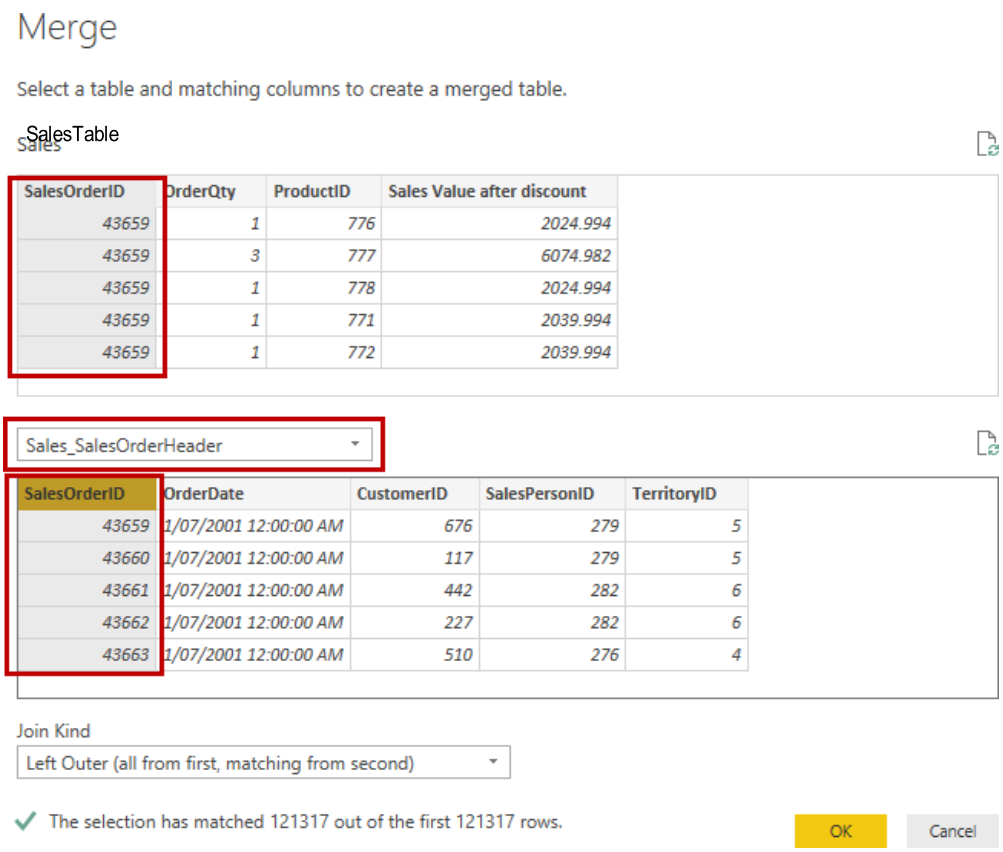
Now we will go back to Sales and pull in these new columns we need.

8.3 Merging Queries

- Click on the SalesTable query and then select the Merge Queries button

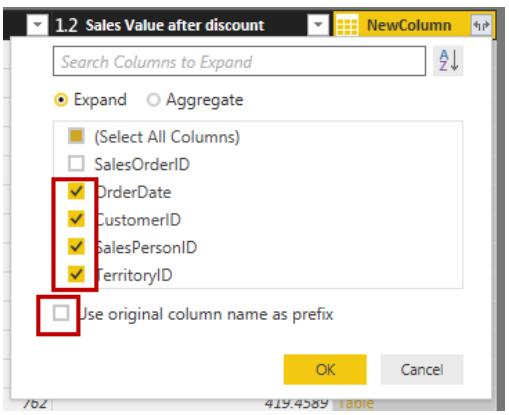


- As per the screenshot below choose Sales_SalesOrderHeader from the drop down box and then click on the SalesOrderID column in both tables to set the common lookup key.



- Click OK
- Click on the Expand button in the new column

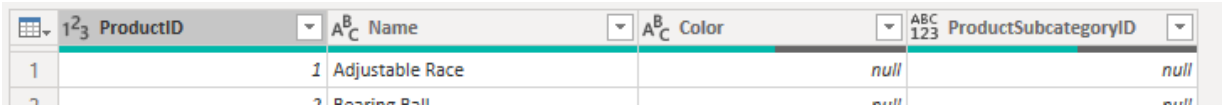
- Uncheck “Use original column name as prefix”
- Uncheck SalesOrderID
- Click OK



- Change the Order Date to a Date format rather than DateTime

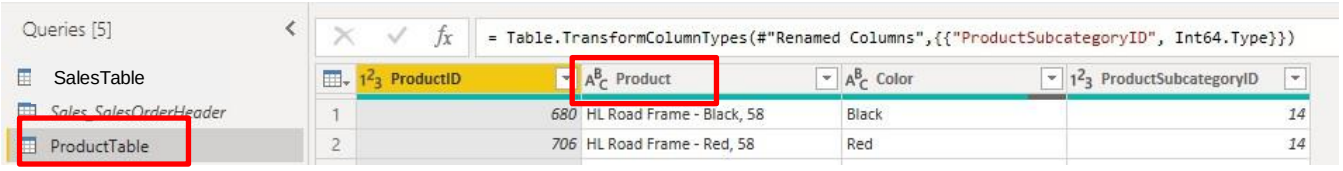
Now we need product information

- Go to Recent Sources > AdventureWorks
- Right Click on Production_Product and select TransformData
- Click on the following 4 columns while holding Ctrl
    - ProductID, Name, Color, ProductSubcategoryID
- Then Right Click - Remove Other Columns



	ProductID	Name	Color	ProductSubcategoryID
1	1	Adjustable Race	null	null

- Change Type for ProductSubCategoryID to Whole Number
- Filter ProductSubCategoryID to remove nulls
- Rename the 2nd column that is currently labelled Name. Change it to Product
- Rename the Query as ProductTable

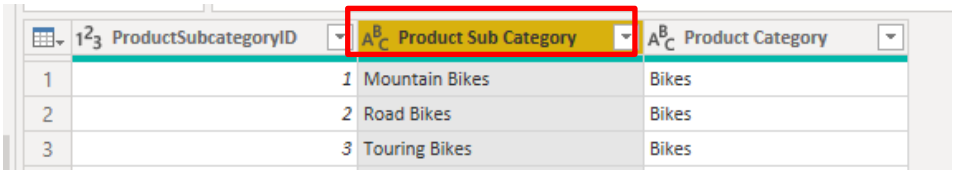


Product Categories and Descriptions

We have SubCategoryID but not a description of this or the Category

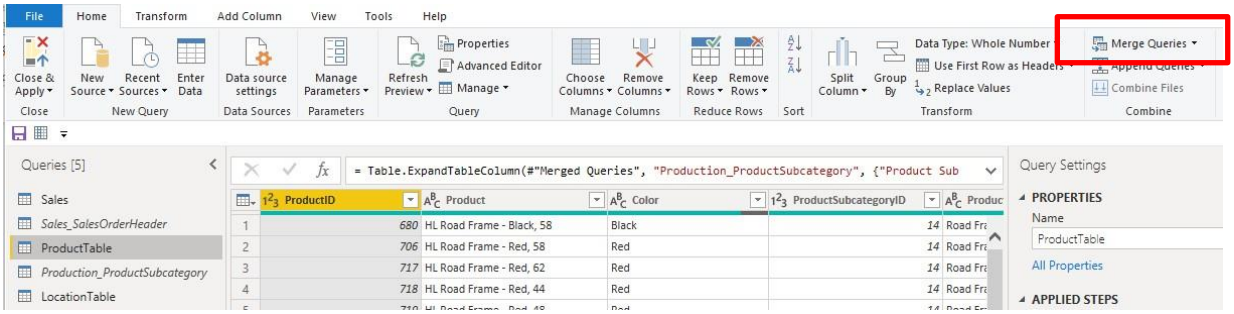
We need to get that from the Production_ProductSubcategory table

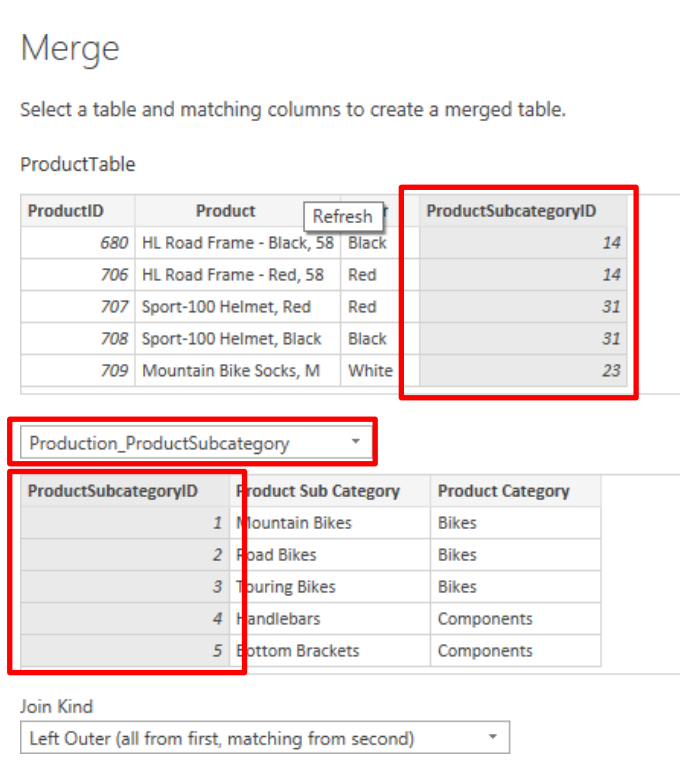
- Go to Recent Sources > AdventureWorks
- Right Click on Production_ ProductSubcategory and select Transform Data
- Click on the following 3 columns while holding Ctrl
    - ProductSubcategoryID, Name, Product Category
- Remove Other Columns
- Rename the 2nd column (Name) as Product Sub Category



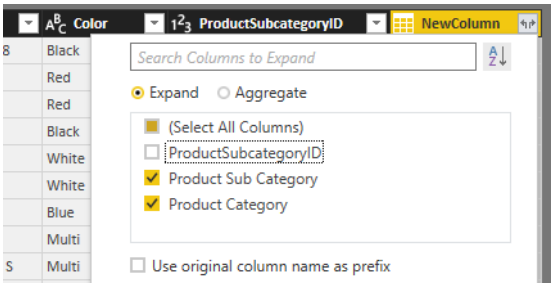
	ProductSubcategoryID	Product Sub Category	Product Category
1	1	Mountain Bikes	Bikes
2	2	Road Bikes	Bikes
3	3	Touring Bikes	Bikes

- Disable Load by Right Clicking on Production_ProductSubcategory and and “unticking” Enable load.
- Go back into the ProductTable query
- Click on Merge Queries (see next page)



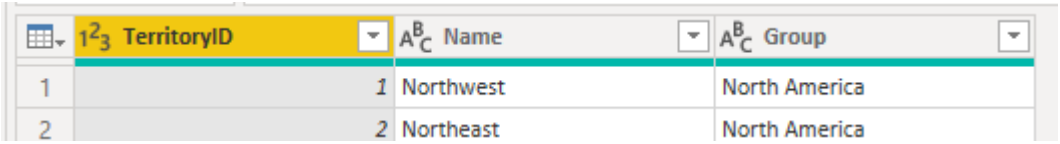


Expand out the new column



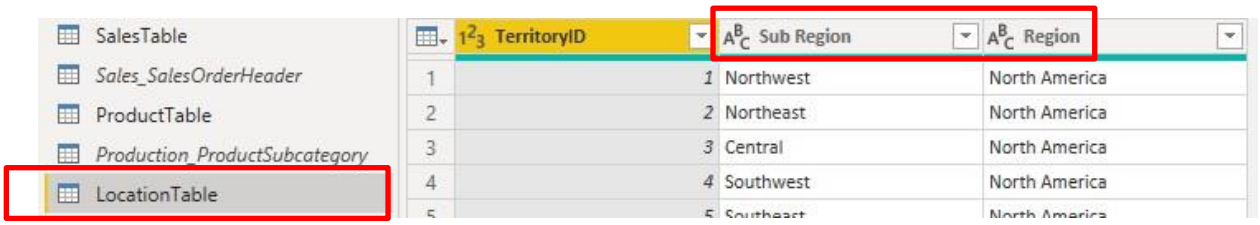
Finally we need to bring in Location data

- Go to Recent Sources > AdventureWorks
- Right Click on Sales_SalesTerritory and select Edit
- Click on the following columns while holding Ctrl
  - TerritoryID, Name, Group
- Remove Other Columns



	TerritoryID	Name	Group
1	1	Northwest	North America
2	2	Northeast	North America

- Rename the 2nd column (Name) as Sub-Region
- Rename Group as Region
- Rename the Query as LocationTable



SalesTable
Sales_SalesOrderHeader
ProductTable
Production_ProductSubcategory
LocationTable

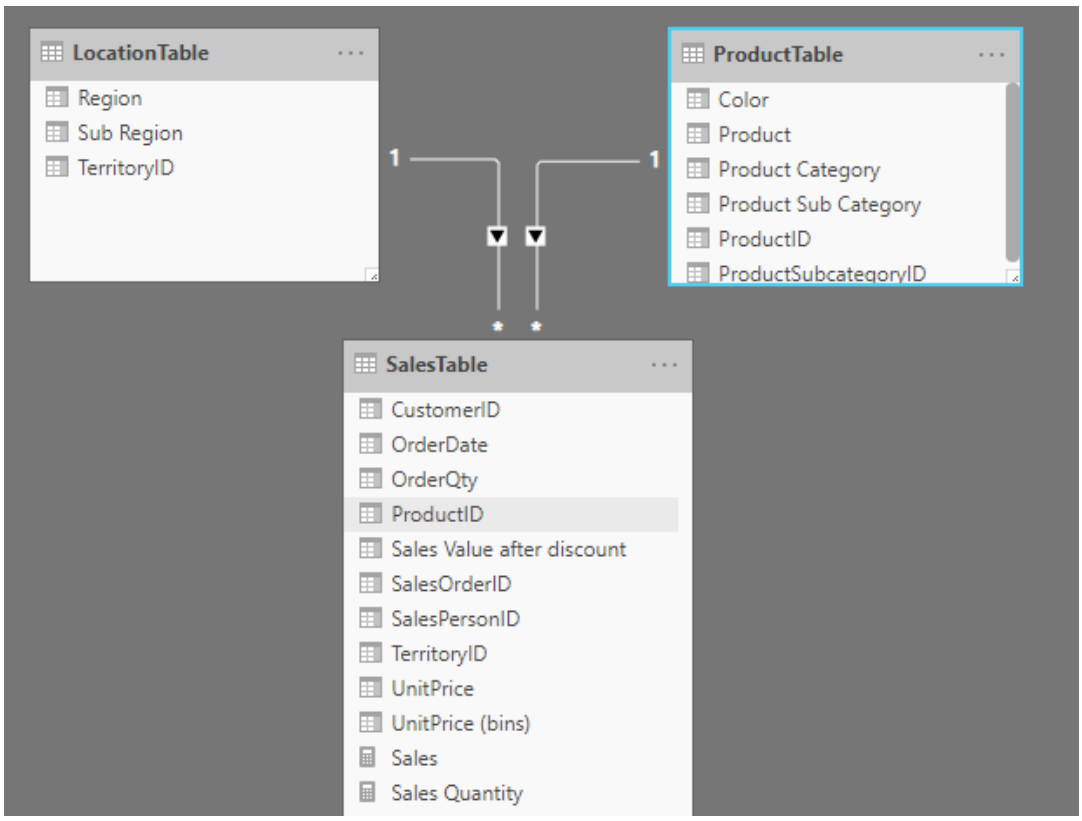
	TerritoryID	Sub Region	Region
1	1	Northwest	North America
2	2	Northeast	North America
3	3	Central	North America
4	4	Southwest	North America

- Close and Apply

SAVE YOUR FILE AS DEMO 2.pbix

Take a look at the Relationship View

The joins will have happened automatically



8.4 CALENDAR

We always need a Calendar table when building a Power BI model. Even if you don't think you need one to start with you will end up needing one so put it in from the start.

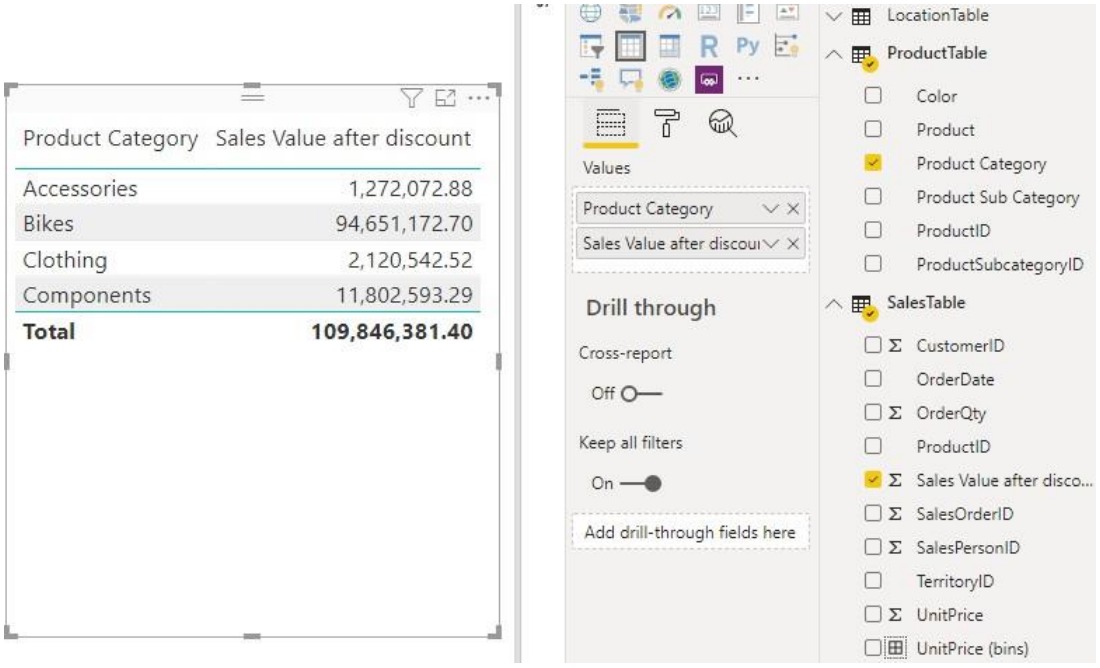
Later on we will look at writing some custom M code to generate a Calendar for us, however for now we will use some DAX (Data Analysis Expression) formulas to do it for us.

- Click on the Data View Icon
- Click Modelling > New Table
- Type: Calendar = CALENDARAUTO() press Enter
- Then click the button New Column to add each of the following
- Year = Year (Calendar[Date])
- Month No = Month (Calendar[Date])
- Month = FORMAT(Calendar[Date],"MMM")
- Month (Long) = FORMAT(Calendar[Date], "MMMM")
- Year-Month = RIGHT(Calendar[Year],2) & "-" & Calendar[Month]

- Join the Calendar to the Sales table in the Relationship View (Order Date to Date)

Save your file

- In the report screen tick Product Category *(under ProductTable)*
- Tick Sales Value after Discount *(Under SalesTable)*

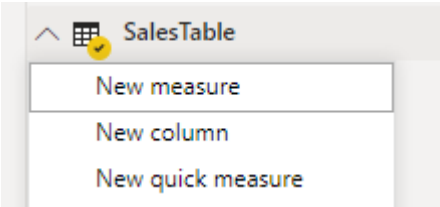


8.5 Adding a Basic Measure (DAX)

Rather than using Sales Value after Discount we are going to create a measure called Sales

You should always create measures for values you want to show in your reports.

Right Click on the heading of the SalesTable and select New Measure



- Then in the formula bar enter this

  Sales = SUM(SalesTable[Sales Value after discount])

```
1 Sales = Sum(SalesTable[Sales Value after discount])
```

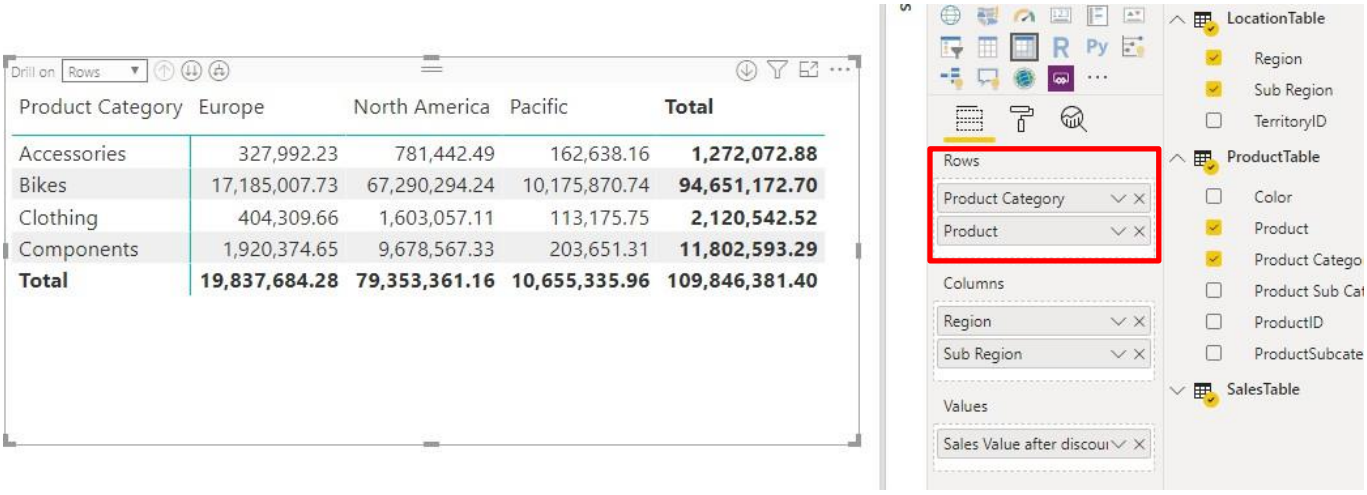
- Click on the tick
- Drag the new Sales Measure into the Table and you should get exactly the same figure

  Measures are like building blocks. We set up the very simplest to start with and then reference them with more complicated measures later.

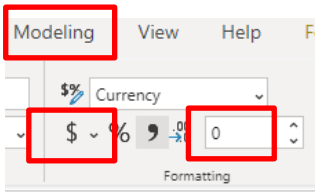
- You can now remove the Sales Value after Discount calculation from the Table

Let's turn our table into a Matrix Visual with the new Sales measure and items as per the screenshot.

Note the red boxes, we have pulled in 2 items into both Rows and Columns.

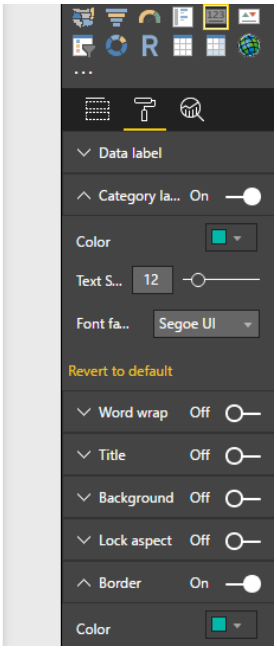


- Right Click on the word Europe and choose Expand to next Level
- Click on the Paint Roller > Style > Minimal
- Remove decimal places by clicking on the Sales Measure (in the SalesTable) and then clicking on the Modelling menu and choosing the $ format with 0 decimal places.



Next we'll create a Card for Total Sales

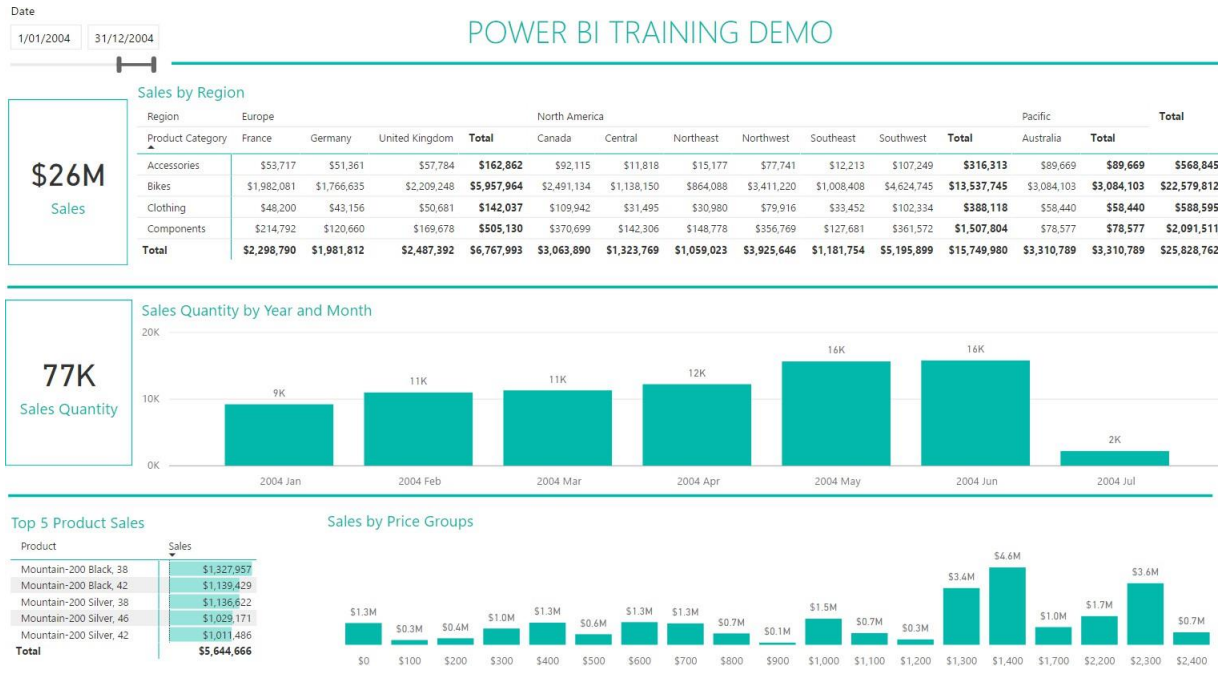
- Drag Sales measure onto an empty part of the canvas
- Click the Card Icon
- Format it as below



Save your file

8.6 Creating our Report

We are on our way to creating this….



Next let's add a measure for Sales Quantity

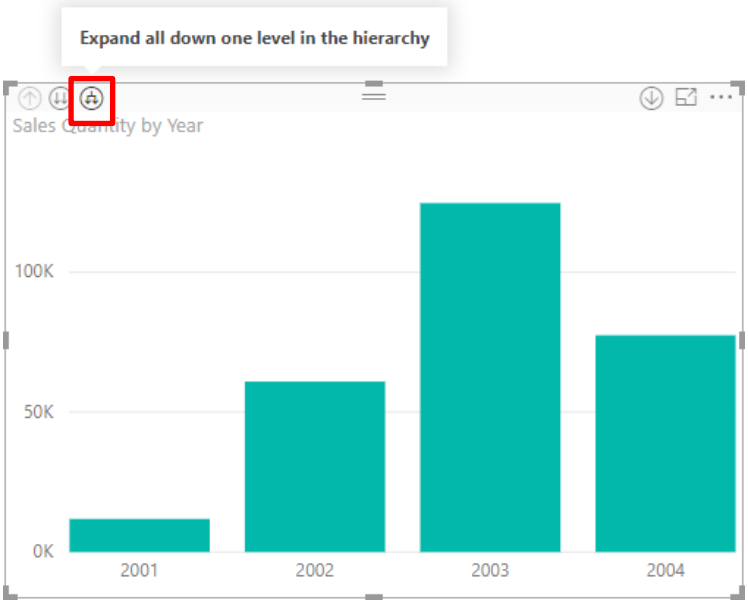
- Right Click on the heading of the SalesTable and select New Measure
- Then in the fomula bar type this

```
Sales Quantity = SUM( SalesTable[OrderQty] )
```

- Format it as "," and 0 decimal places (via the Modelling menu)
- Click the Tick

Column Chart showing Sales Quantity by Month

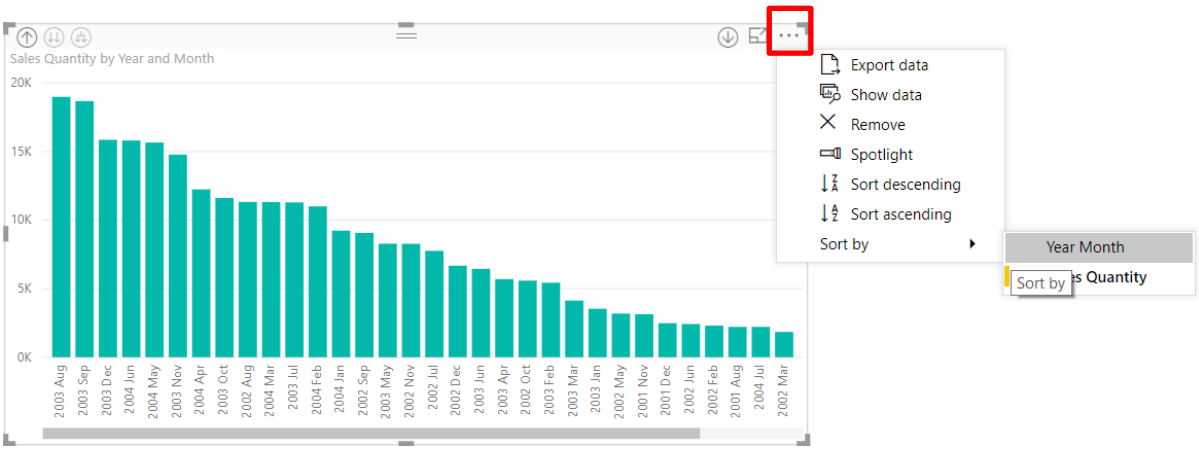
- Drag Sales Quantity onto the canvas
- Drag Year into the Axis Box *(from the Calendar table)*
- Drag Month in to the Axis Box (underneath Year)
- Click on the double headed arrow (bident) to expand down



You will see that the values are being sorted Max to Min

To fix that click on the following 3 steps:

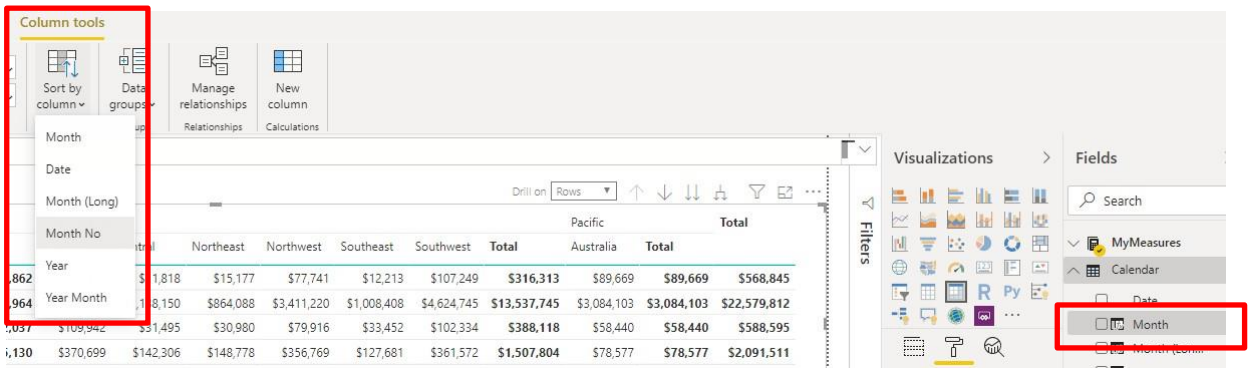
1. Click the … in the top right and Sort by Year Month

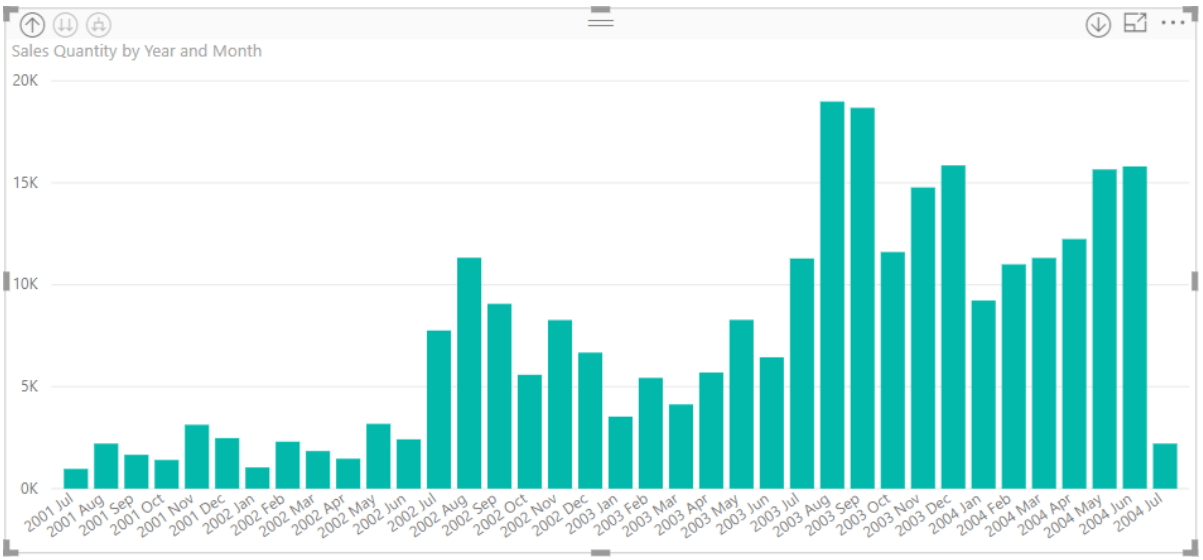


2. Again click the … and Sort Ascending

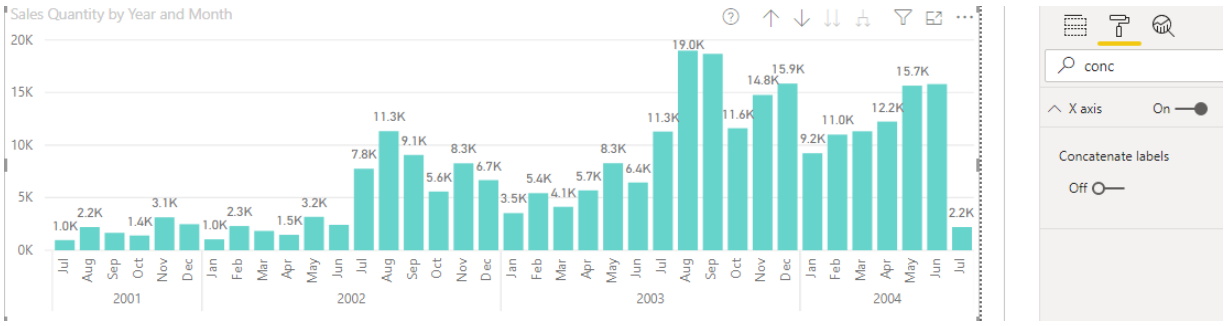
3. Unfortunately our months are sorted alphabetically and we always have to fix this when using our Calendar

    1. Click on the word Month in the Calendar Table so it puts a grey box around it
    2. Column tools > Sort by Column
    3. Month No



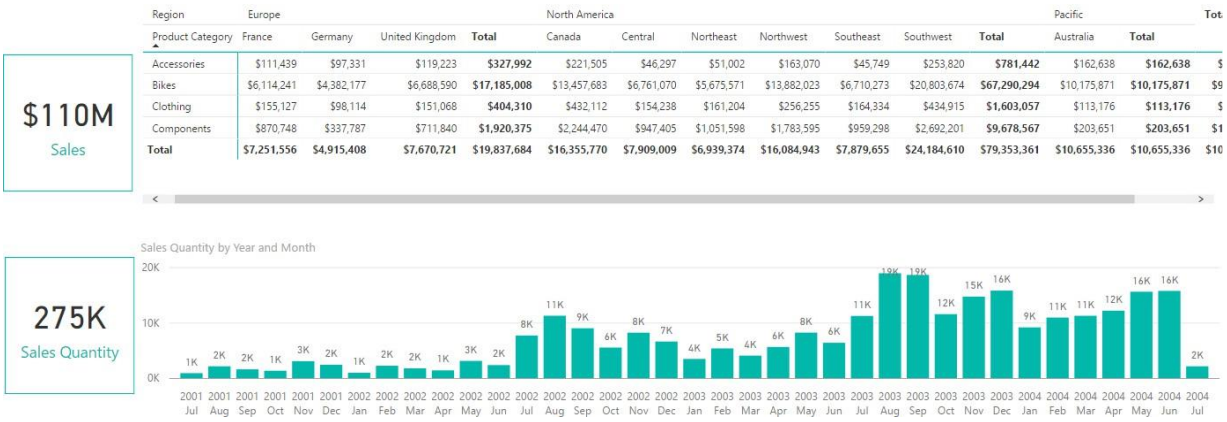


- Then Type “Conc” in the format search box and turn Concatenate Labels Off



- Add data labels to the chart

- Add a Card visual for Total Quantity by making a copy of the existing Sales Card (Ctrl C then Ctrl V)
- Then in that card Change Sales to Sales Quantity

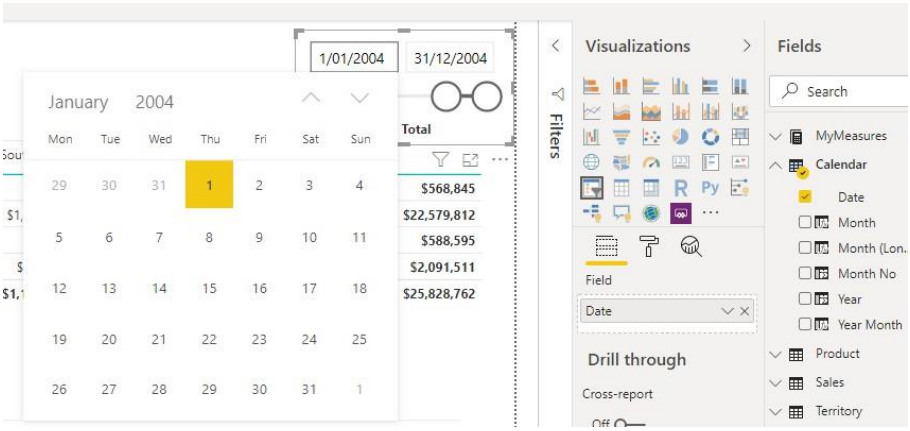


8.7 DATE SLICER

These charts and cards are showing data that is not filtered by year or date.

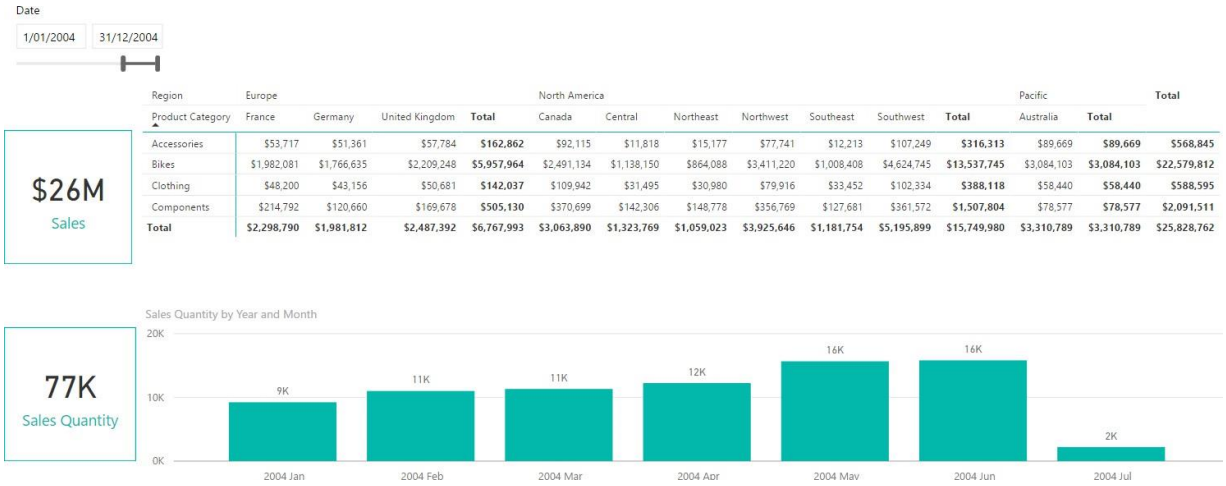
We can add a Date Slicer to control the date range included in each of our visuals

- Click on some white space in your canvas
- Click the slicer icon
- Tick Calendar – Date



- Start the date for 1/1/2004

You should now have this…

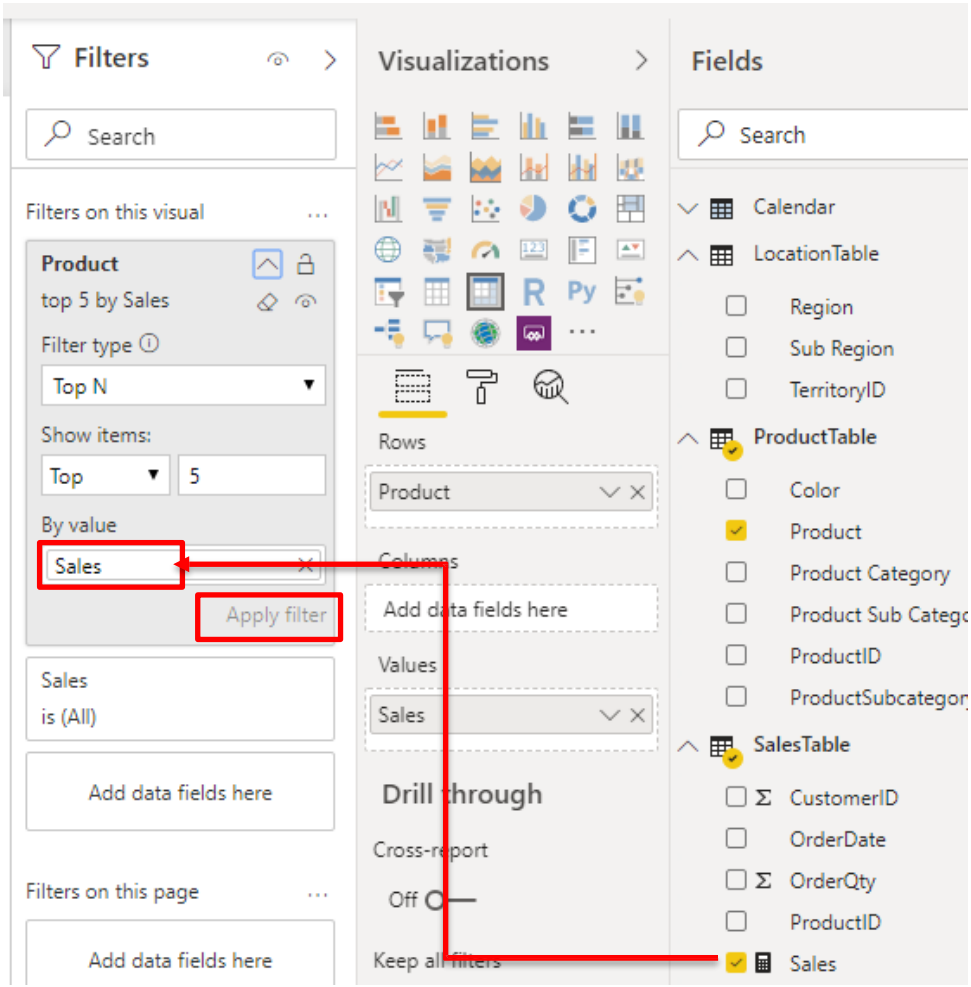


Region	Europe				North America							Pacific		Total
Product Category	France	Germany	United Kingdom	Total	Canada	Central	Northeast	Northwest	Southeast	Southwest	Total	Australia	Total	
Accessories	$53,717	$51,361	$57,784	$162,862	$92,115	$11,818	$15,177	$77,741	$12,213	$107,249	$316,313	$89,669	$89,669	$568,845
Bikes	$1,982,081	$1,766,635	$2,209,248	$5,957,964	$2,491,134	$1,138,150	$864,088	$3,411,220	$1,008,408	$4,624,745	$13,537,745	$3,084,103	$3,084,103	$22,579,812
Clothing	$48,200	$43,156	$50,681	$142,037	$109,942	$31,495	$30,980	$79,916	$33,452	$102,334	$388,118	$58,440	$58,440	$588,595
Components	$214,792	$120,660	$169,678	$505,130	$370,699	$142,306	$148,778	$356,769	$127,681	$361,572	$1,507,804	$78,577	$78,577	$2,091,511
Total	$2,298,790	$1,981,812	$2,487,392	$6,767,993	$3,063,890	$1,323,769	$1,059,023	$3,925,646	$1,181,754	$5,195,899	$15,749,980	$3,310,789	$3,310,789	$25,828,762

8.8 TOP N ITEMS

Now we will add a table showing the top 5 selling products for the selected time period

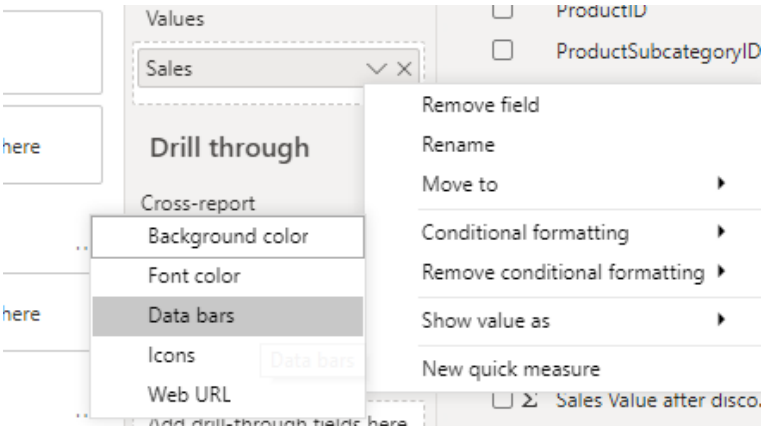
- Click on a blank piece of canvas
- Select the Matrix Icon and then set it up as below including setting the filter on Product to show the TOPN (5) items by SALES value



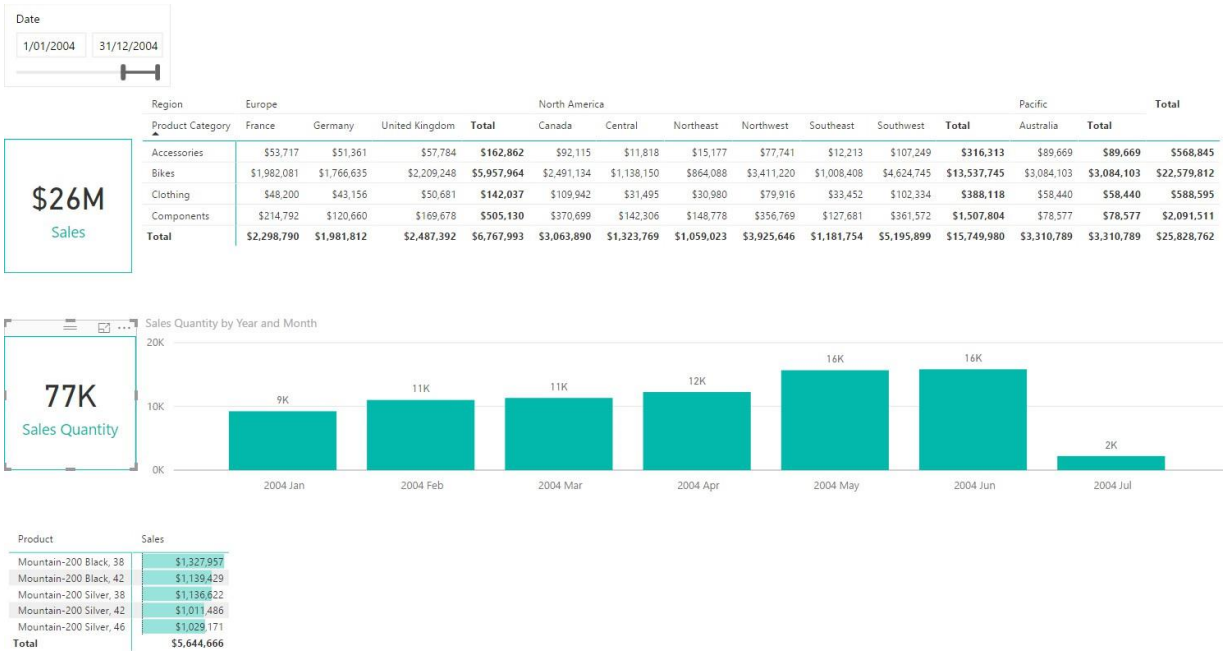
Remember to click the Apply Filter!

Finally, we'll add data bars to show the relative importance visually.

- Click on the drop down arrow next to Sales and chose the following…



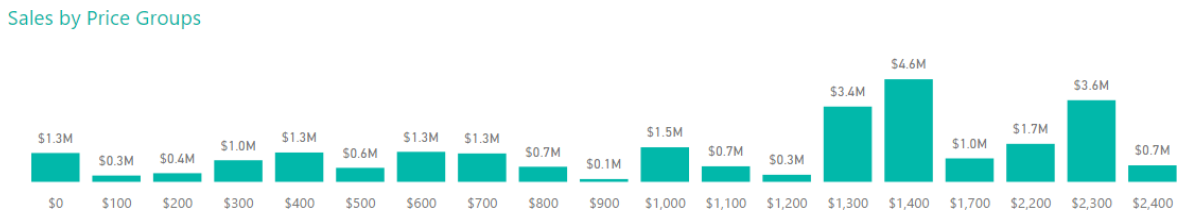
- Change the data bar colour to a light colour



Region	Europe				North America							Pacific	Total
Product Category	France	Germany	United Kingdom	Total	Canada	Central	Northeast	Northwest	Southeast	Southwest	Total	Australia	Total	
Accessories	$53,717	$51,361	$57,784	**$162,862**	$92,115	$11,818	$15,177	$77,741	$12,213	$107,249	**$316,313**	$89,669	**$89,669**	**$568,845**
Bikes	$1,982,081	$1,766,635	$2,209,248	**$5,957,964**	$2,491,134	$1,138,150	$864,088	$3,411,220	$1,008,408	$4,624,745	**$13,537,745**	$3,084,103	**$3,084,103**	**$22,579,812**
Clothing	$48,200	$43,156	$50,681	**$142,037**	$109,942	$31,495	$30,980	$79,916	$33,452	$102,334	**$388,118**	$58,440	**$58,440**	**$588,595**
Components	$214,792	$120,660	$169,678	**$505,130**	$370,699	$142,306	$148,778	$356,769	$127,681	$361,572	**$1,507,804**	$78,577	**$78,577**	**$2,091,511**
Total	**$2,298,790**	**$1,981,812**	**$2,487,392**	**$6,767,993**	**$3,063,890**	**$1,323,769**	**$1,059,023**	**$3,925,646**	**$1,181,754**	**$5,195,899**	**$15,749,980**	**$3,310,789**	**$3,310,789**	**$25,828,762**

If you finish early…..

8.9 Grouping Data into Bins



When analysing data that has a wide range of different values (such as price) then it can be easier to visualise them if we group the data into "Bins".

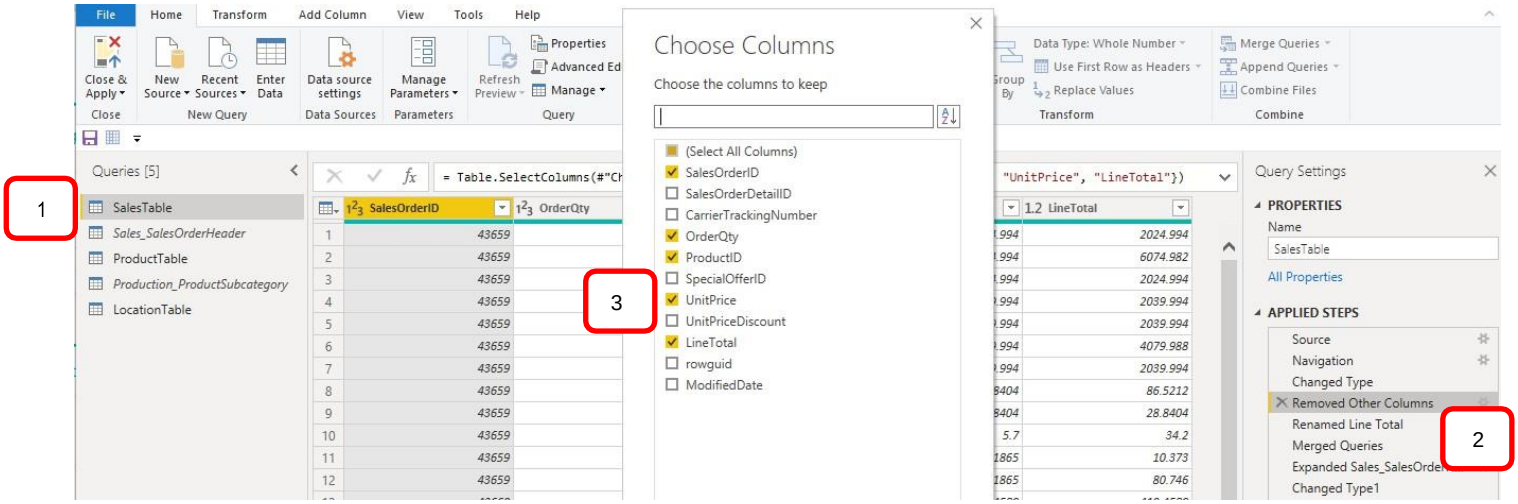
Bins are simply ranges of values e.g 0 – 99, 100-199, 200-299 etc. It is then easier to see how many items fall into these groups.

We are going to create some bins showing the value of Sales grouped by price to give us a sense of the blend of pricing in the business.

However, if you look in the SalesTable we don't have price. We didn't bring it in with our query.

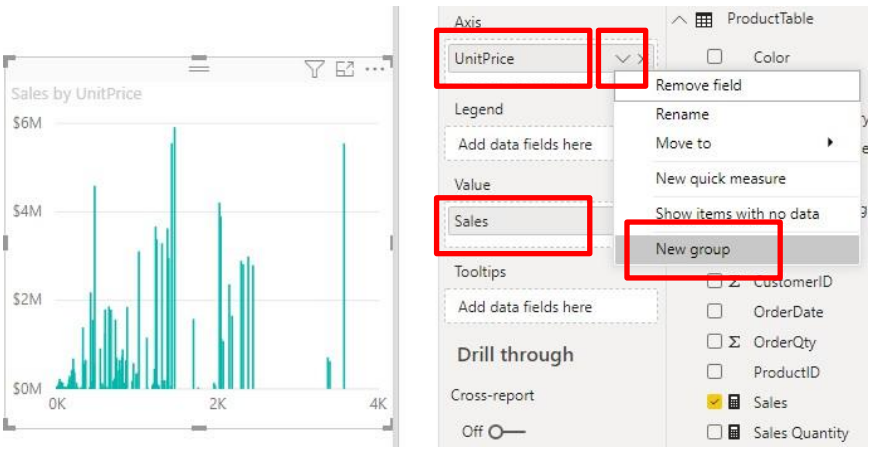
This gives us an opportunity to edit a query to bring some more data in.

- Click on the Transform Data button on the Home tab
- Click on the SalesTable down the left hand side
- Click on the cog for Removed Other Columns in the Applied Steps list
- Select Unit Price



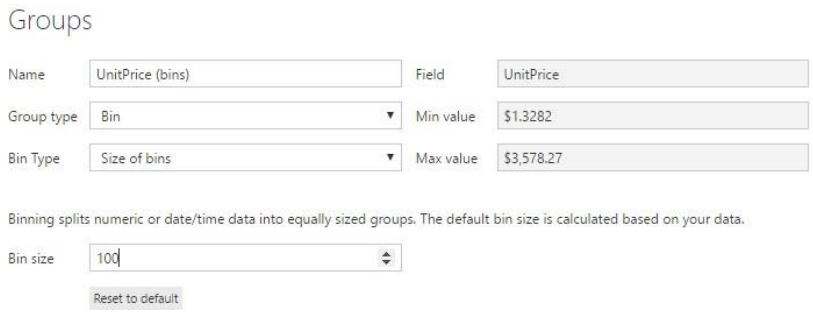
- Click OK followed by Close and Apply

- Click on some white space in the canvas
- Tick the Sales Measure in the SalesTable
- Then drag Unit Price into the Axis box
- Click on the drop down on the UnitPrice Axis field and choose New Group

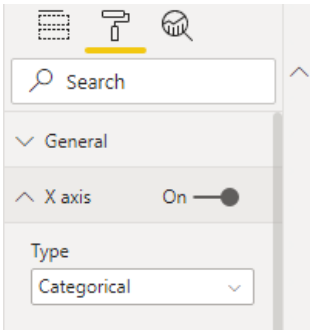


Now for grouping our Prices…

Change the Bin Size to 100 (each group will then be for ranges 0-99, 100 to 199 etc)



- Replace Unit Price with the newly created UnitPrice (bins)
- Use the Format Roller to turn data labels on
- Force the X-Axis labels to all show by setting the X Axis type to Categorical



This may re-order the chart, in which case click on the 3 dots in the top right of the chart and Sort by UnitPrice (you may need to do this twice to get the right order)

- Finally, change the Title to Sales by Price Groups
- Update the interactions to filter each visual
- In the field list hide the fields for Sales Quantity and Sales Value after Discount
- Save

8.10 USERELATIONSHIP

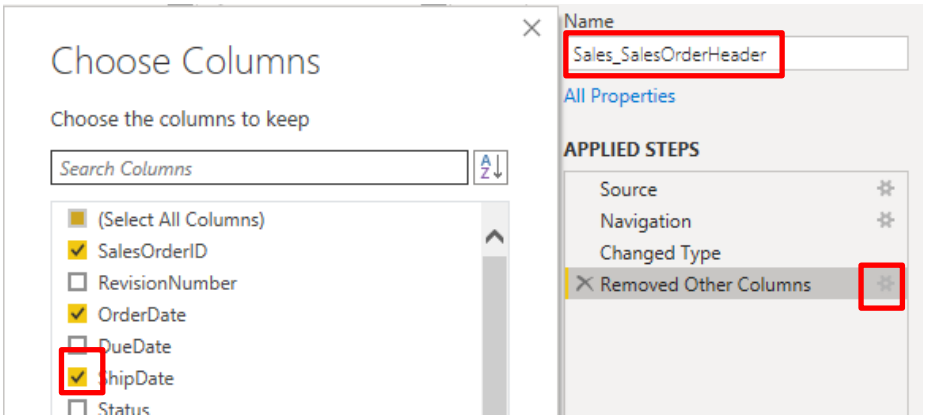
Open up your Demo 2 file

This report has been based on Order Date

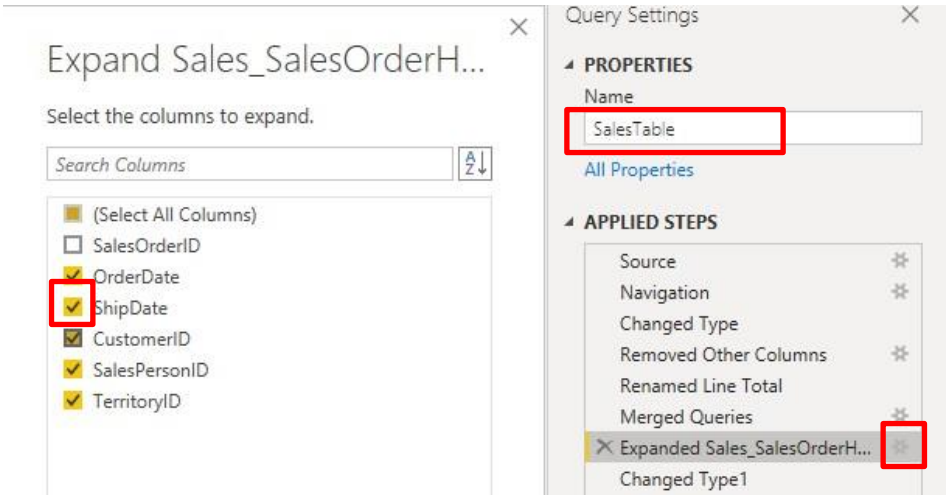
What if we want to do some analysis by Ship Date?

Firstly let's add Ship Date to our data set.

- You'll need to click Transform Data and go to Sales_SalesOrderHeader
- Click the cog next to Removed Other Columns and tick Ship Date



- Go to the SalesTable Query and click on the cog for Expanded Sales_SalesOrderHeader and then click ShipDate



- Click the Changed Type1 step and then change ShipDate to a Date type.
- Close and Apply

Go to Diagram View

- Drag ShipDate up to Date

A dotted line represents an Inactive relationship.

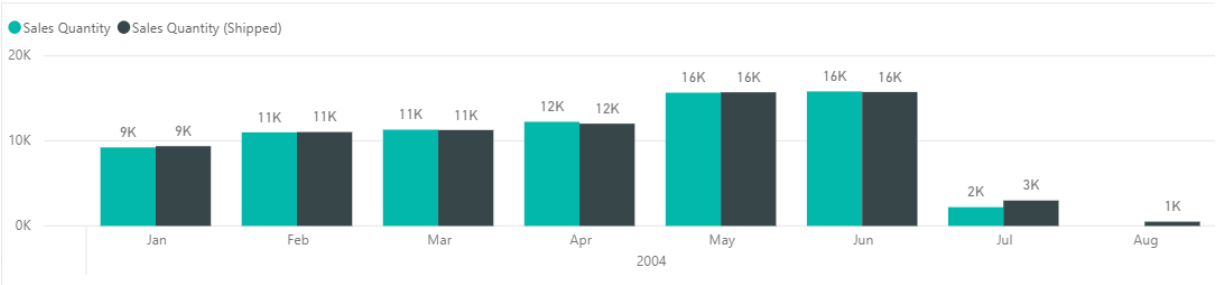
So to use this relationship we must use a CALCULATE function that incorporates a USERELATIONSHIP function.

Right Click on the Sales Table and select New Measure

Use SHIFT & ENTER to start each new line

```
Sales Quantity (Shipped) =
        CALCULATE(
                [Sales Quantity],
                        USERELATIONSHIP(  'Calendar'[Date],  SalesTable[ShipDate]  )
                    )
```

Add the new measure to your Sales Quantity by month chart



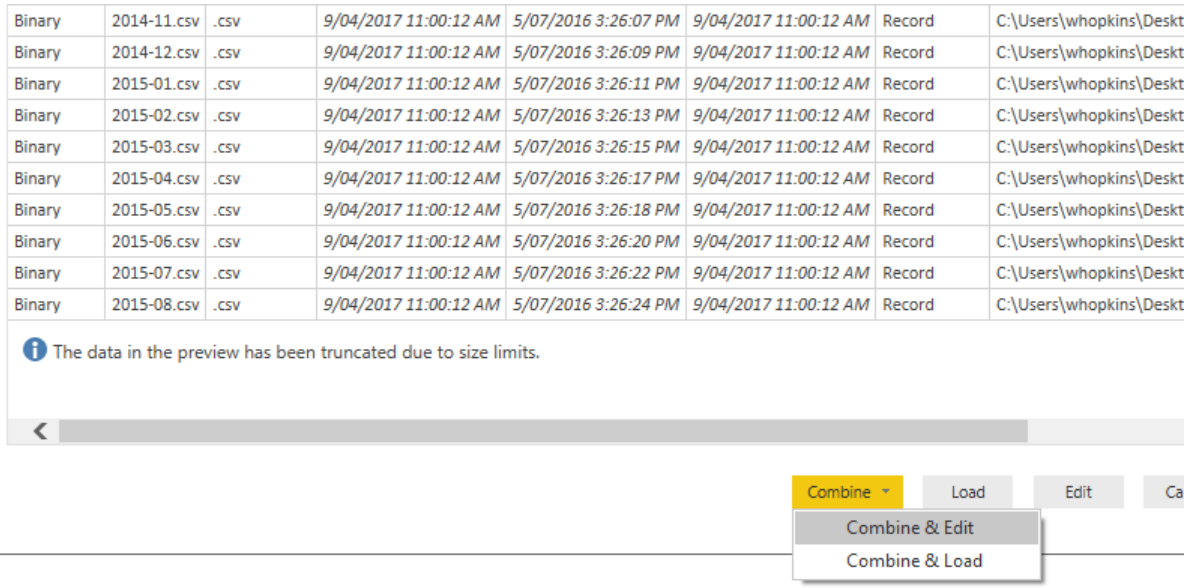
9 Get Data (Power Query) explored

9.1 Merge Data from Multiple CSV files

One powerful feature of Power Query is the ability to merge data from multiple files in one go.

Open a new PBIX file

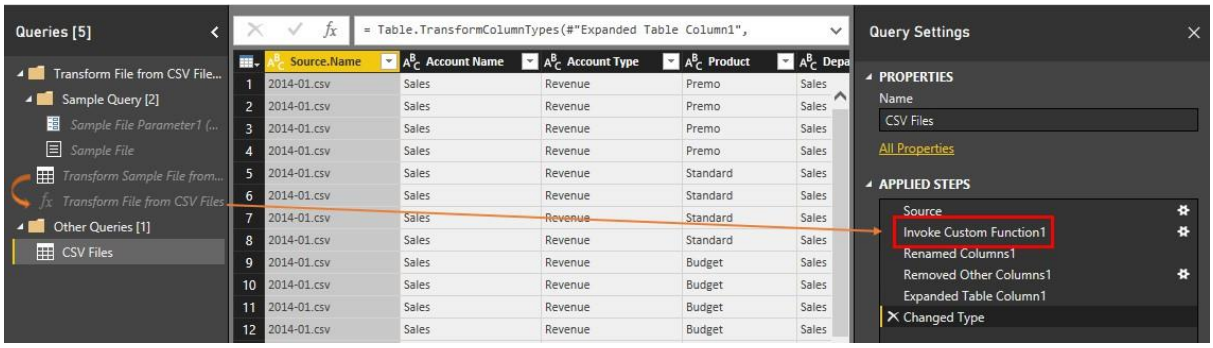
- Click Get Data > Folder > Browse > select the CSV files folder under Exercises
- Select Combine and Edit



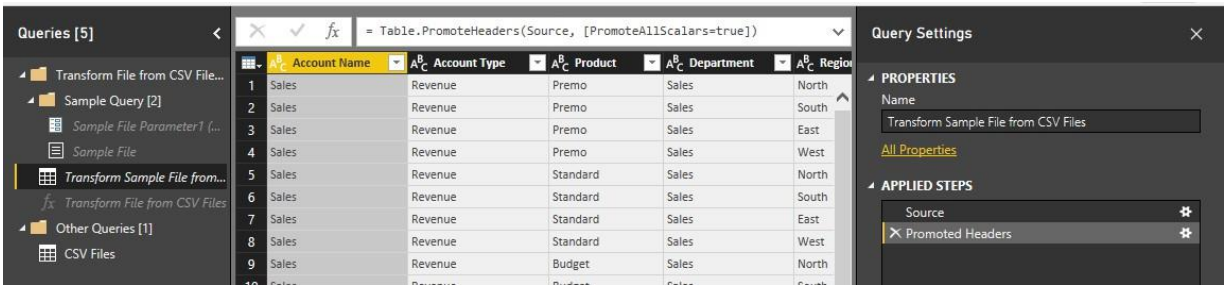
Power Query now consolidates all of the CSV files in a matter of seconds

A few steps have been automatically added

Firstly a custom function as been called or “invoked” to apply required transformations to each CSV file.



To see what steps are being applied by that custom function we can simply look at the Transform Sample File.

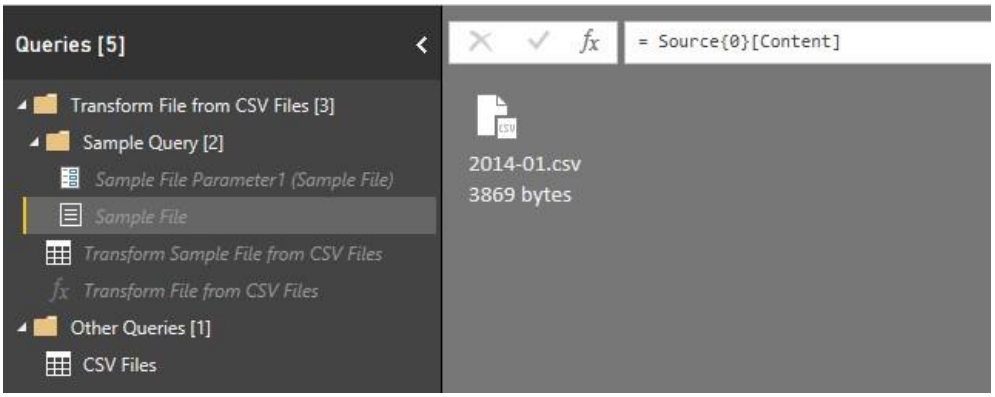


As we can see the only transformation being performed is Promoted Headers.

However if we did want to make some more changes (e.g. filter on Region) then we could do that here and the custom function would automatically be updated.

Hence this Transform Sample file is Power Query’s way of making it easy for us to apply transformations to each file without having to manually edit the code inside the custom function.

The Sample File is simply the 1st file in the folder and is used in the Transform Sample step.



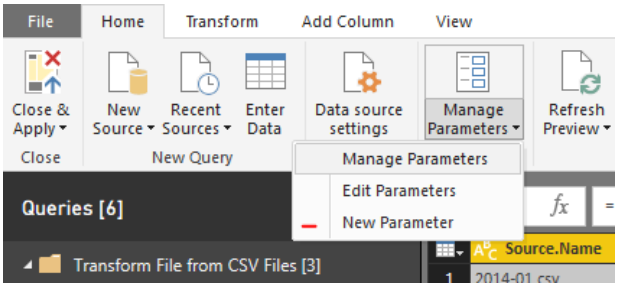
- Click Close and Apply

9.2 Parameters

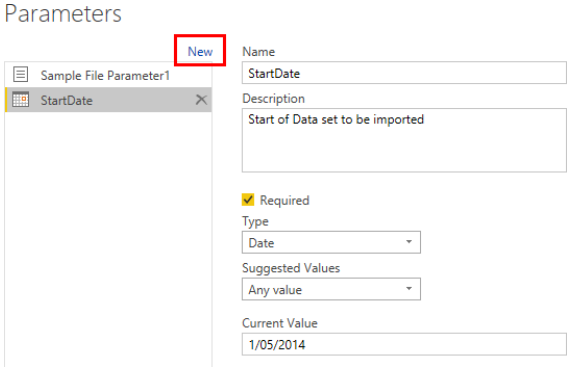
Let's say we only wanted to pull data from May 2014 onwards into our data model. E.g. we might be connecting to a large database with lots of historic records and want to limit our refresh time and PBIX file size.

We could simply Edit our query and apply a date filter but it is more user friendly to use a parameter to do this.

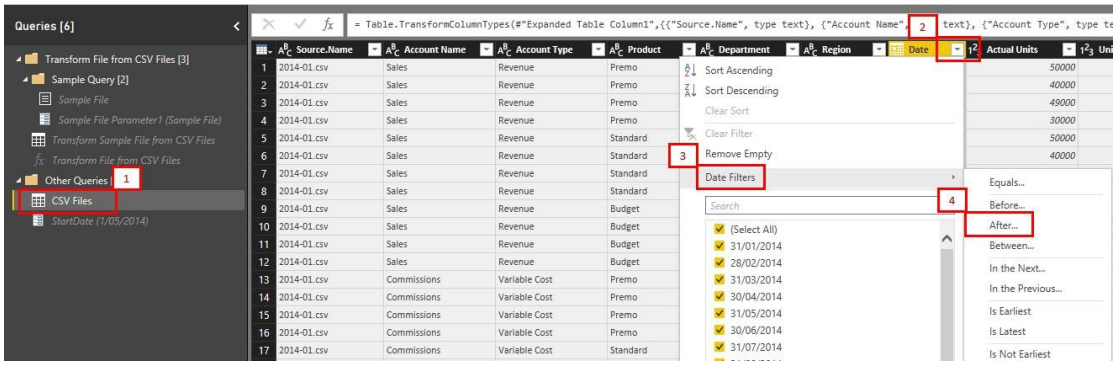
- Click on Transform Data > Manager Parameters Drop Down > New Parameter

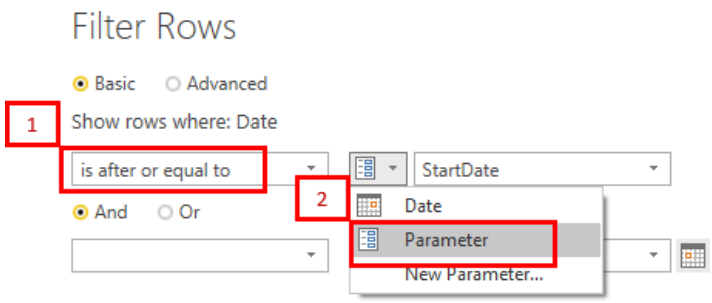


- Click New and re-create these details

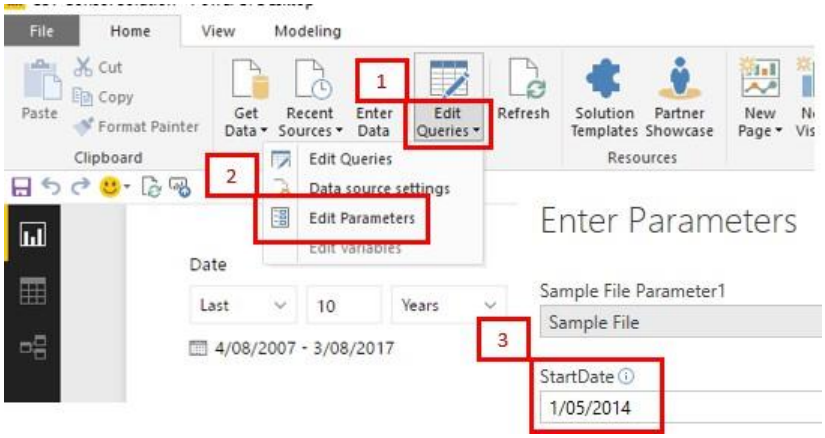


Now we'll filter the CSV Files query by applying the following….





- Then Click Close and Apply
- Users can then easily amend parameters by following the steps below



- Once a change is made you will be prompted to Apply changes in order to refresh the query

9.3 Automatic Calendar Table

Option: Skip the next couple of pages and just open

****

Exercises \ Power Query Calendar \ Power Query Calendar (Solution including Fiscal Year).pbix

Then change the first 3 steps
Fiscal Month (change to the month number corresponding to your year end)
Start Date – type date in formula (should always try to start at the beginning of a financial year)
End Date – type date in formula (should always try to start at the end of a financial year)

You can now copy and paste this calendar (via the Left Hand panel) into any other file

****

Building from scratch….

In our earlier examples we set up our own Calendar Table in Excel or via DAX.
This is a simple approach but the downsides are that

- you must manually update it for the latest date
- the DAX measures are difficult when deriving certain date values (Fiscal Year etc)
- if you are going to publish your dashboard to Power BI.com you may have to set up Gateways to connect to the Excel file.

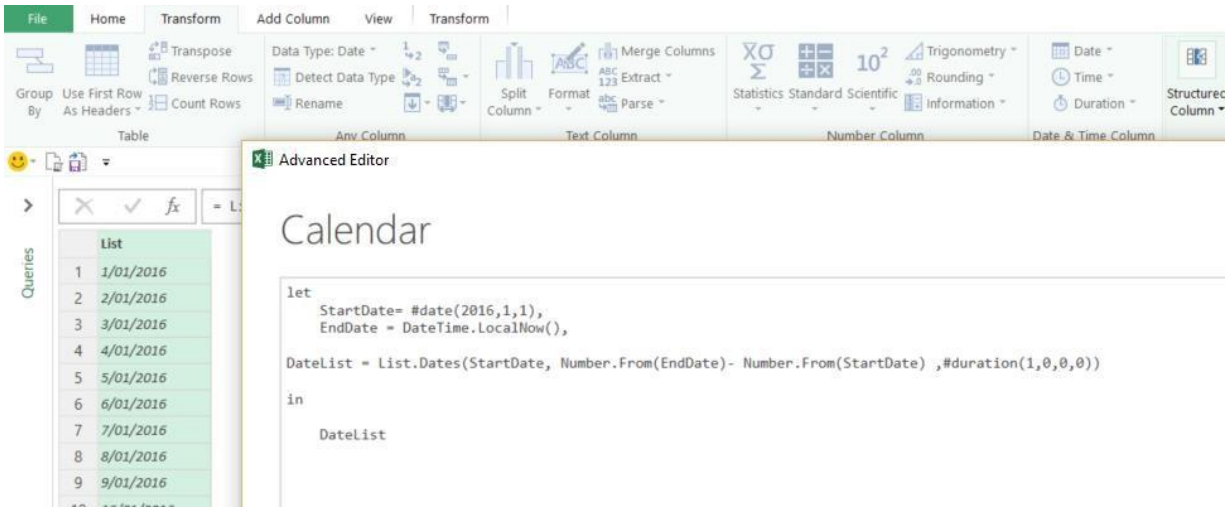
The better approach is to use Power Query to create our own Calendar dynamically.

---

*Open the file Exercises \ Power Query Calendar *

Here we have started off the key pieces of code that you need.

So this is our starting piece of "M" code. It uses the List.Dates function to create a list of dates from Start Date and increments it 1 day for the number of days between Start and End Date.

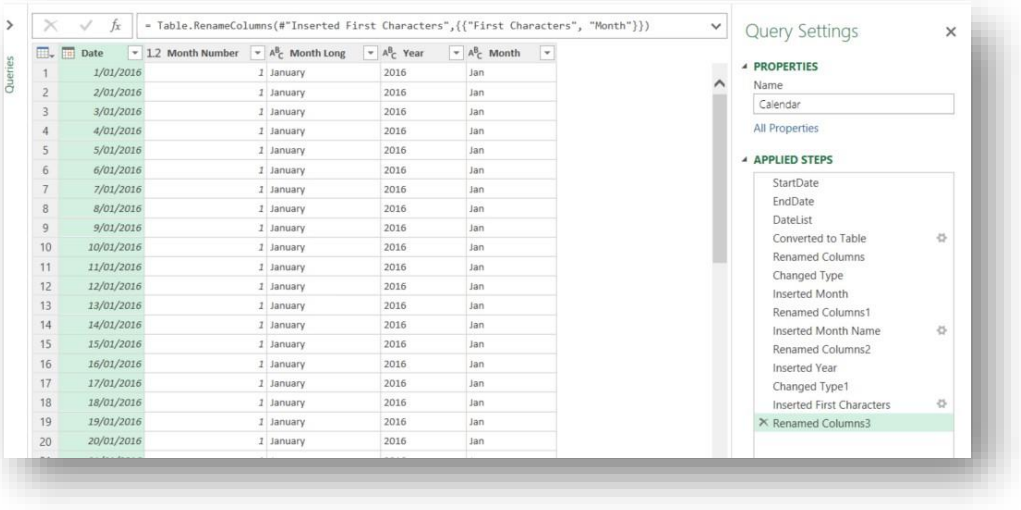


Now we need to turn this list into a Table so that we can use the Power Query utilities to add Month Name, Year etc.

- Click on Transform > To Table (accept the default options when prompted)

- Rename Colum1 as Date, then change the Type to Date format.

Now we can add Month Number, Month Name and Year



- Click on Date Column then > Add Column > Date > Month > Month
- Rename this Month Number

- Click on the Date Column then > Add Column > Date > Month > Name of Month

you could add a custom column and use =Date.ToText([Date] , "MMMM") instead

- Rename this as Month Long

- Click on the Date Column then > Add Column > Date > Year > Year
- Format this as Text

We can also add a Short Month name

- Click on Month Long then Add Column > Extract > First Characters > 3

you could add a custom column and use =Date.ToText([Date] , "MMM") instead

- Rename this as Month

- Home > Close and Apply

SAVE YOUR FILE

You can review your new calendar table by clicking on the data icon down the left hand side of the screen.

We now have a Calendar but it is driven by a hard coded StartDate= #date(2016,1,1), and Today as an End Date = DateTime.LocalNow()

It would be good if we could reference the earliest and latest date in the Sales table.

- Open the Calendar Query by right clicking on the word Calendar in the right-hand window and select Edit Query.
- Click the Advanced Editor button
- Add 2 lines of M code to extract the Min (Start) and Max (End) dates from our Sales query

    Start Date = Record.Field (Table.Min(Sales,"Date") , "Date"),
    End Date = Record.Field (Table.Max(Sales,"Date") , "Date"),

Table.Min gives us a single row table with the smallest value in the Sales query "Date" column

Record.Field extracts the value from the "Date" column of that single row Table

- Then use // to "comment out" the existing StartDate and EndDate parameters
- Click Done

Your query should now change to start from 31/01/2014 and end at 30/06/16

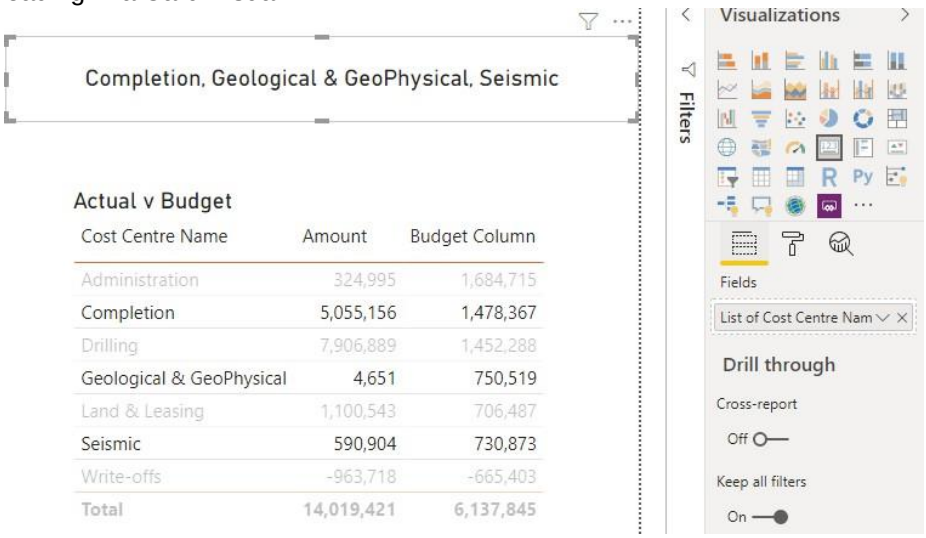
- Click Close and Apply.

You can save and close this file

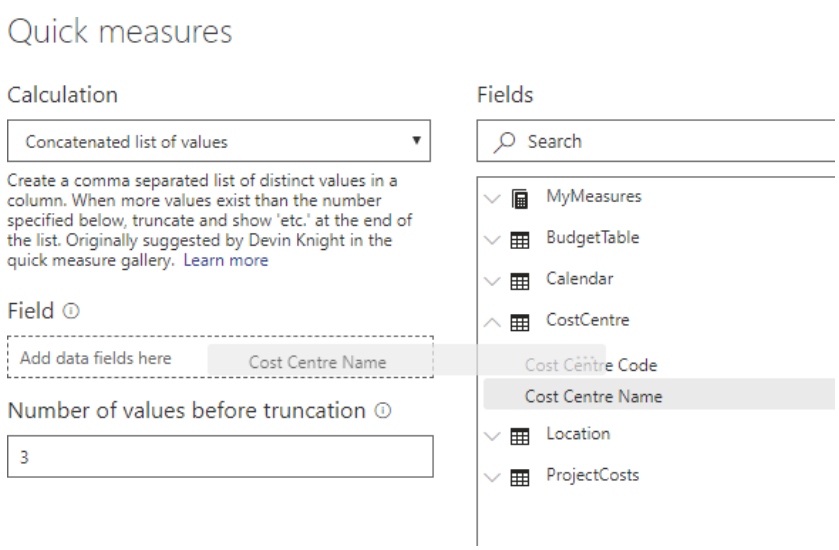
10 Quick Measure

Open up your Demo 1 file

If we select multiple cost centres from our Actual v Budget matrix it would be nice to have a dynamic heading in a Card Visua

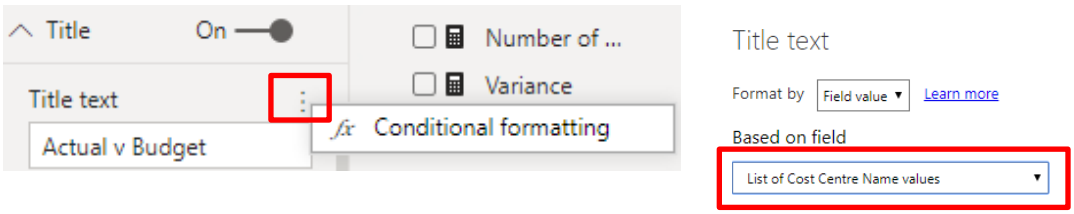


- Right Click on MyMeasures and choose New Quick Measure
- Scroll to the bottom and choose Concatenated List of Values
- Drag Cost Centre Name into the Field box



- Click OK
- You can now put this measure into your Card visual

Tip: You can make the heading of the visual dynamic by clicking on the matrix and going to the Title and clicking on the 3 dots for title text and choosing Conditional formatting.

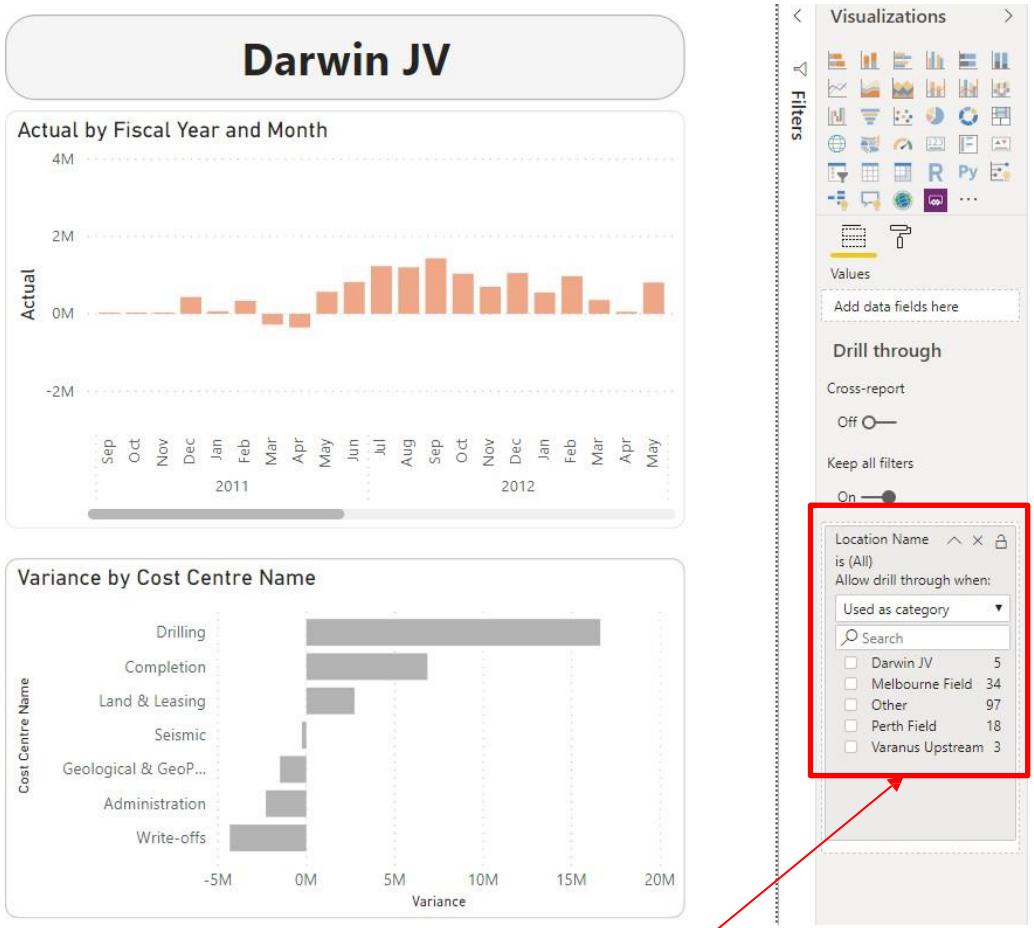


11 Drillthrough Filter

In the Demo 1 file create a new page called Location Drill Through

Replicate this

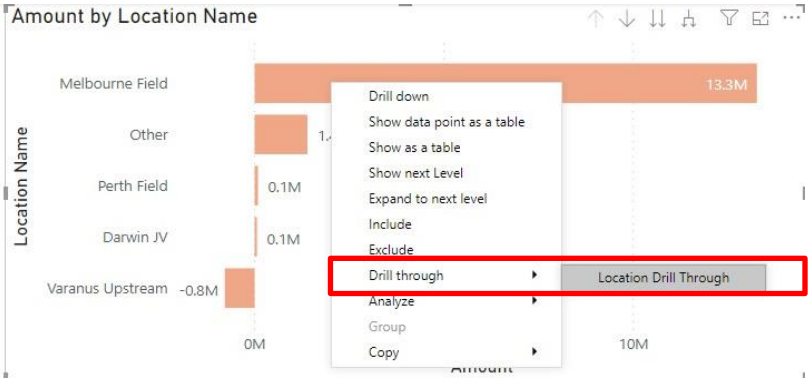
- The card contains Location Name and the category label is off
- chart 1 shows Actual by Fiscal Year and Month
- chart 2 shows Variance by Cost Centre Name



Click on the white space of the canvas and drag Location Name into the Drillthrough filter section

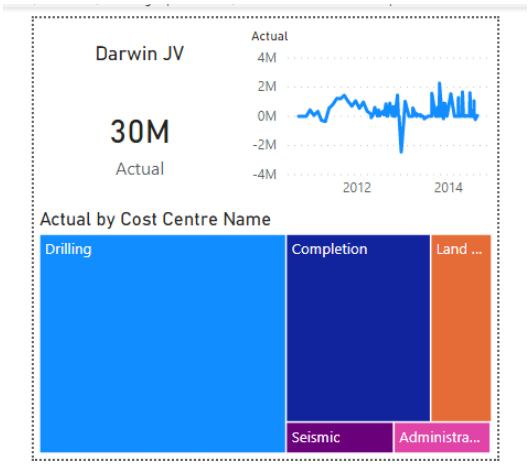
Hide the Tab via Right Click

Go to the Report Tab then Right-Click on the chart showing location and then you can select Drillthrough

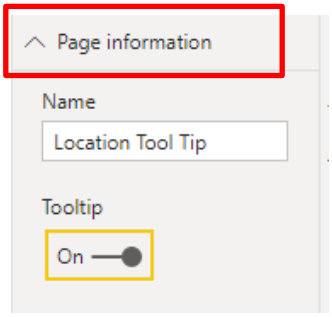


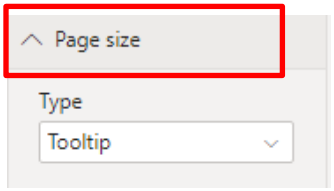
12 ToolTip Page

Create a new page called Location Tooltip, and we will aim to create a tooltip that looks like this…

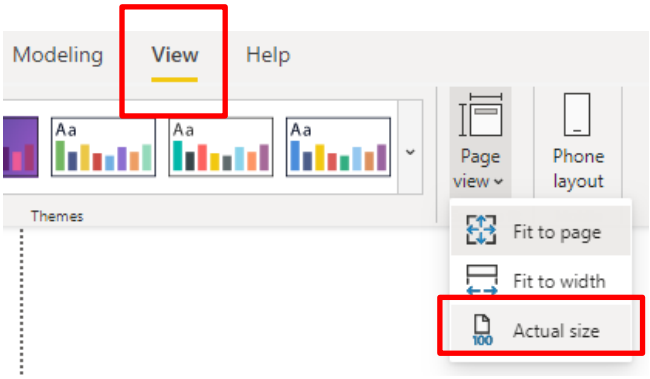


Click on the canvas and then click the format icon and select the below items

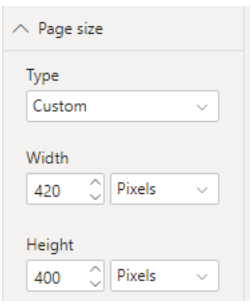




Then change the page View

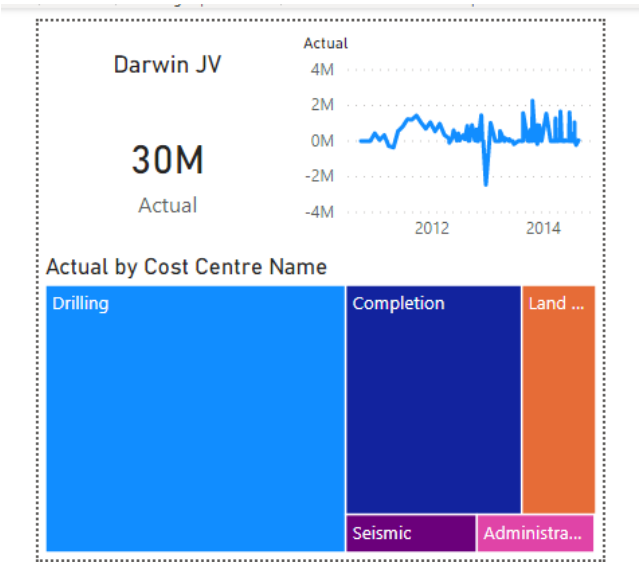


Change the tool tip size to 420 by 400

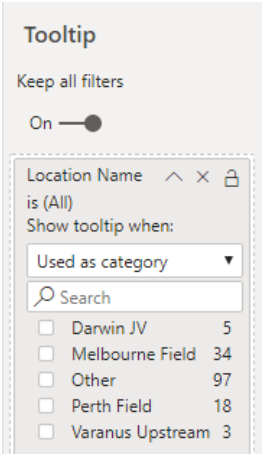


-

- Add Card for Location name with Category Label Off
- Add Card for Actual measure
- Tree Map for Cost Centre Name with Actual Measure
- Line Chart showing Actuals by date (turn off the date hierarchy)

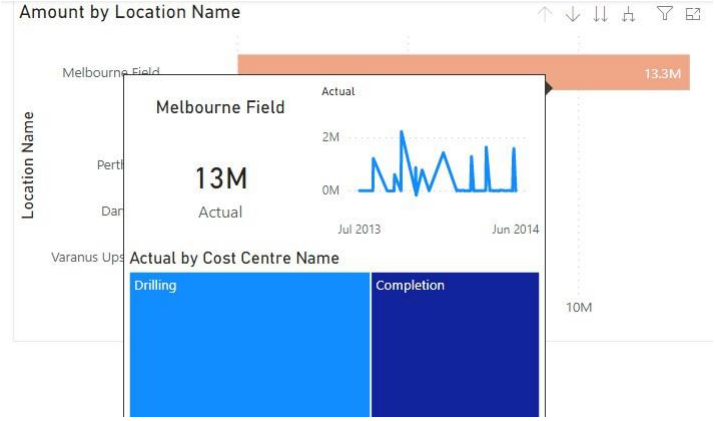


- Finally , drag Location Name into the Tooltip field



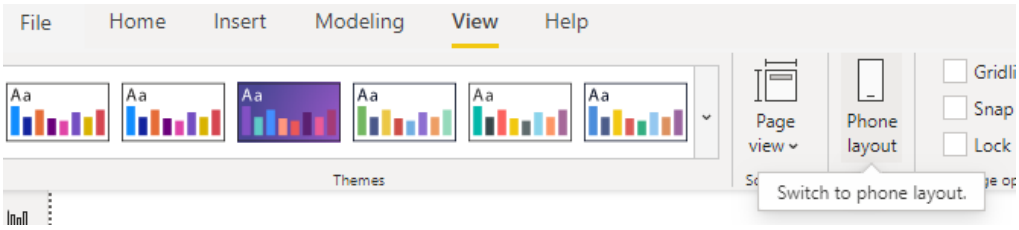
- Hide the Tab

- Now return to your Report page and hover your mouse over the Melbourne Field bar

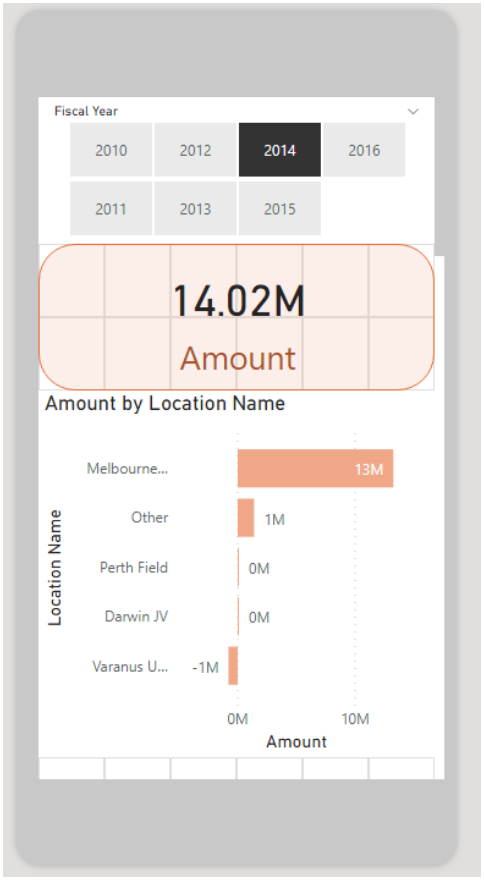


13 Mobile Phone Layout

Go back to your first report page and click View > Phone Layout

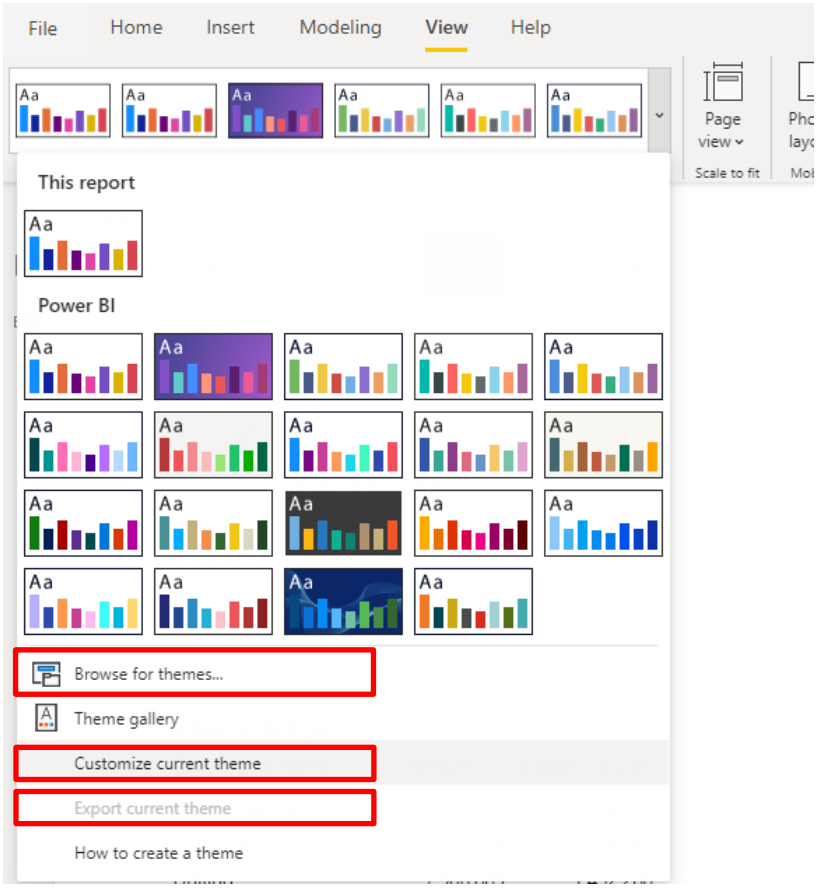


Drag and drop to create this

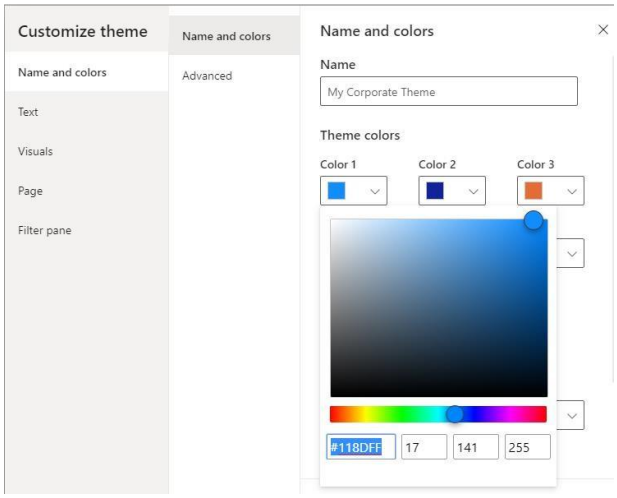


14 Themes – Fonts and Colour Schemes

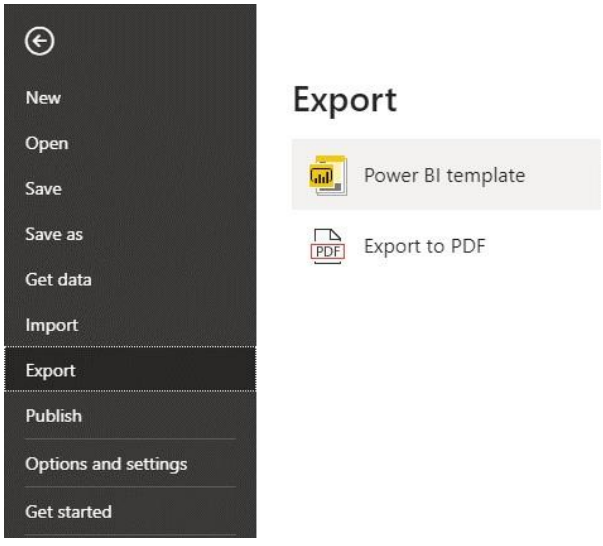
Under the view tab you can view all the in-built themes, customise your own, export it for someone else to use or import one someone else has built already



When you customise a theme you can give it a name and change font colours, text sizes and a whole range of features. Then export it to be used over and over again

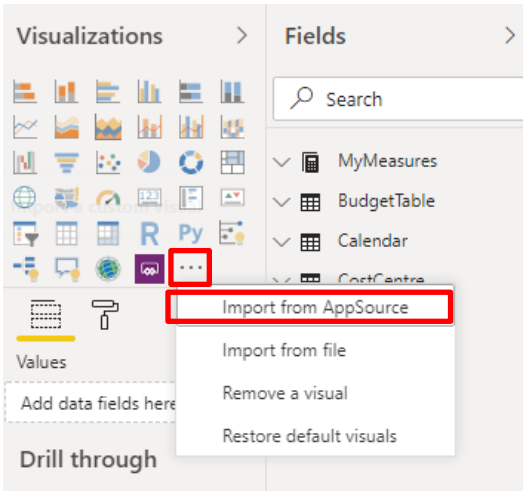


TIP: Add a theme, Calendar and Measure Table to an empty Power BI file then Export as Template. Then next time IMPORT the template

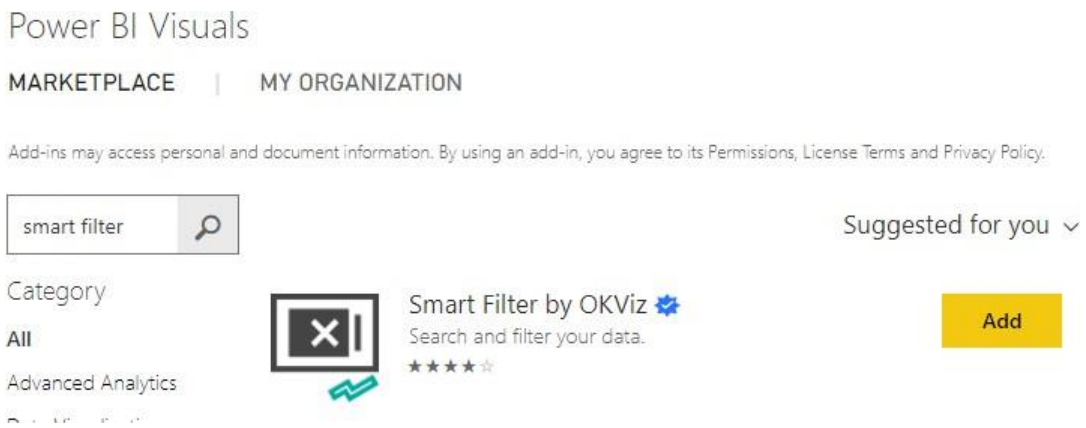


15 Custom Visuals

You are not limited to the default visuals. There are another 147 (at time of writing) available from the Microsoft Store. Most are free.

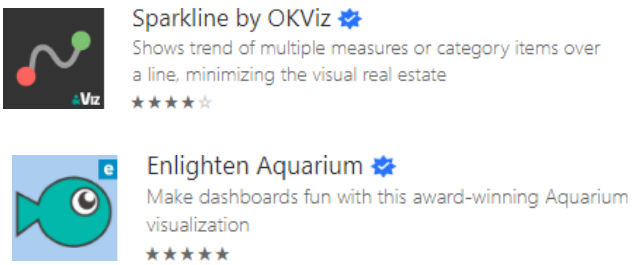


Add the Smart Filter



Then repeat for the

Sparkline and then everyone's favourite the Enlighten Aquarium



1. Click the Sparkline Slicer
2. Tick Month
3. Tick Actual
4. Tick Cost Centre Name

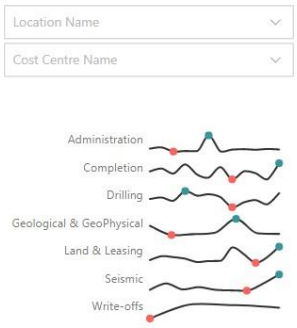
Click away

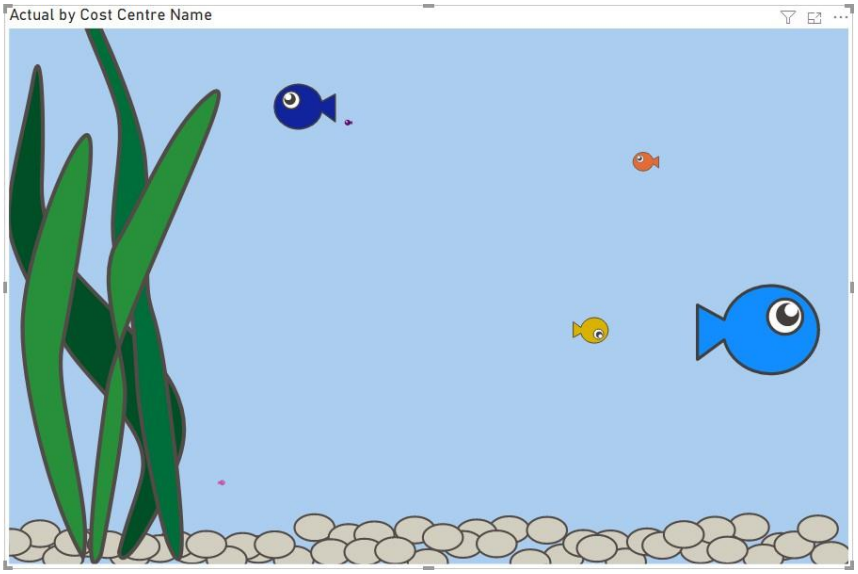
1. Click Smart Filter
2. Tick Location Name
3. Tick Cost Centre Name

Click Away

1. Click the Fish
2. Tick Cost Centre Name
3. Tick Actual

Negative numbers become dead fish



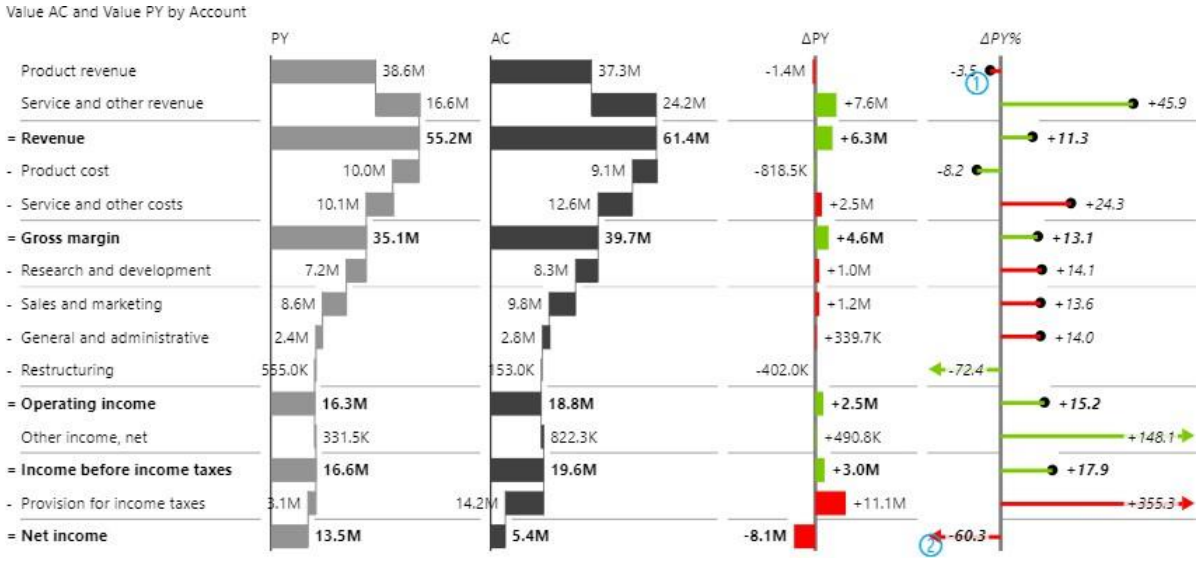


15.1 Custom Visuals for Financial Reporting

We highly recommend the Zebra Power BI Custom visuals for anyone wanting to do financial reporting and analysis. Don't try to build these kinds of reports using just Power BI. It's too hard!

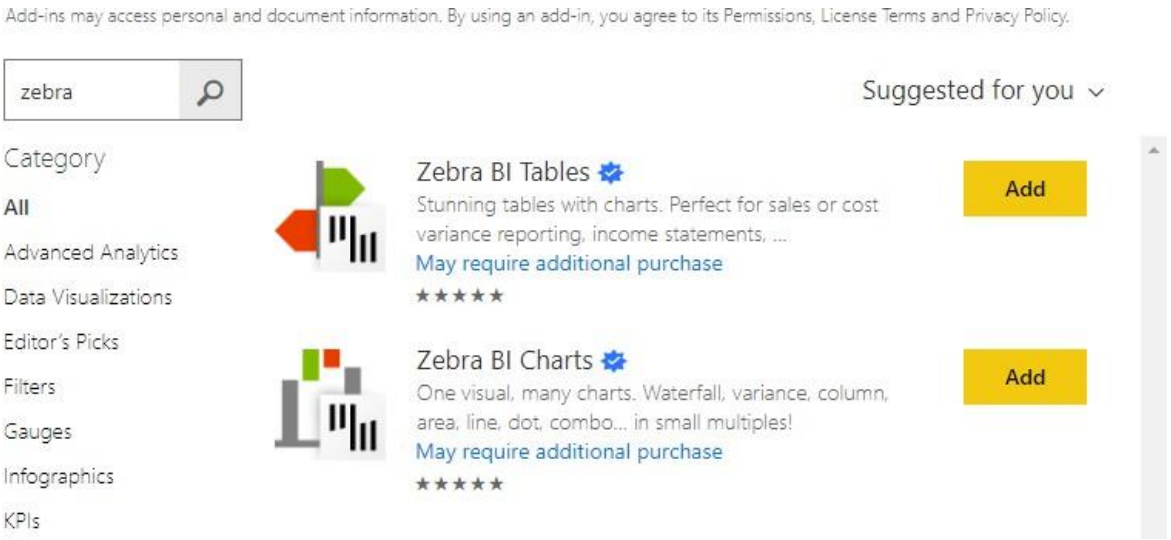
It is a paid custom visual, but the time saved trying to build this can be money well spent.

Samples are in your Custom Visuals folder with your Exercises



For more information and to see it in action visit www.accessanalytic.com.au/zebra

Also check out the Custom Visuals in the Market Place (via the 3 dots)

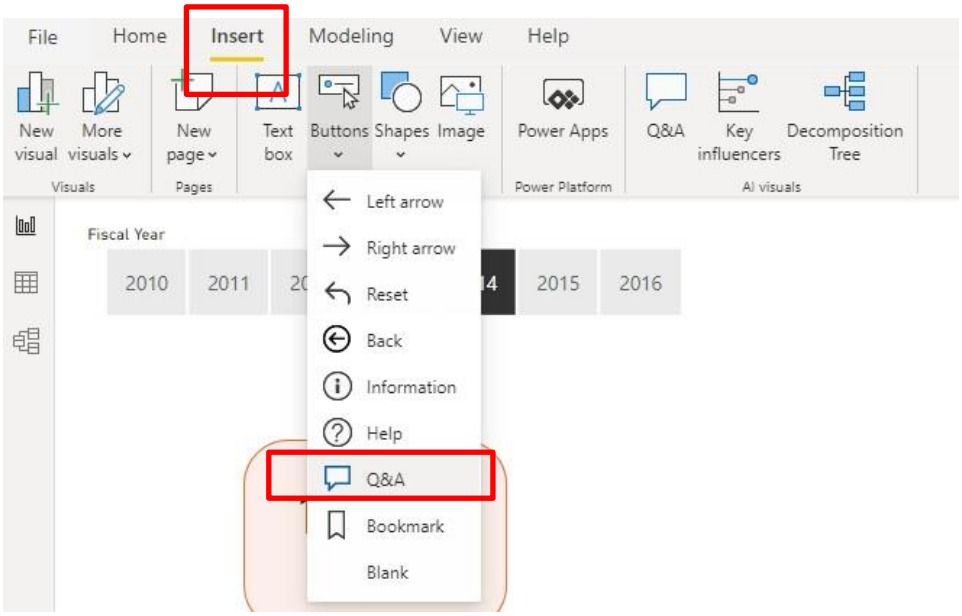


16 Buttons

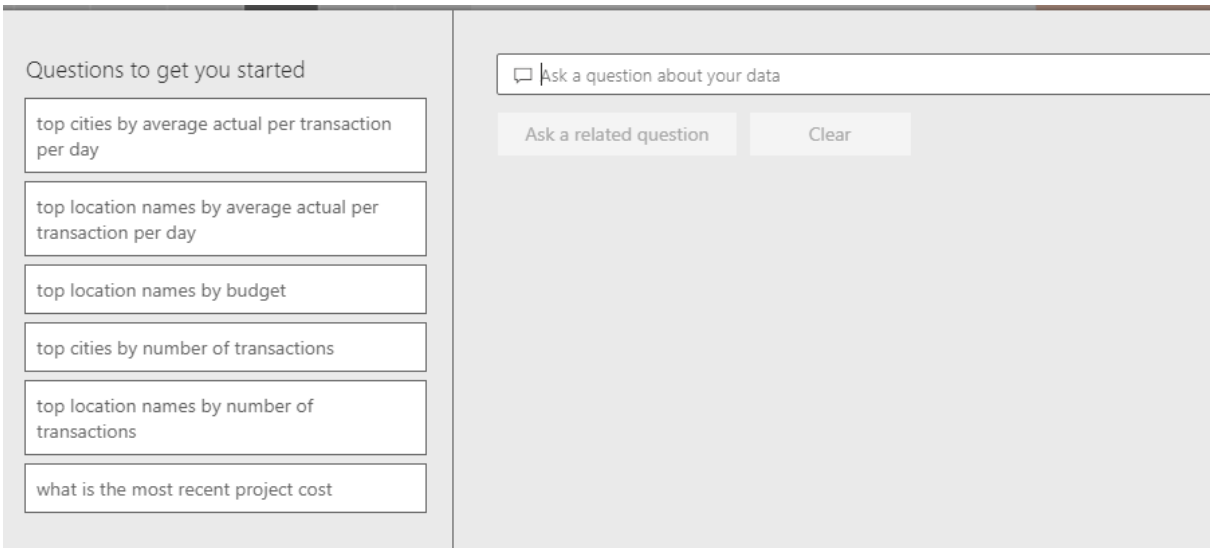
We can add different buttons into our report to make it more interactive

16.1 Q&A Button

Add a Q&A button to the report and pre-populate some questions that our users might be interested in



Ctrl Click on your button, you can add questions to prompt users



17 Bookmarks, Buttons and the Selection Pane

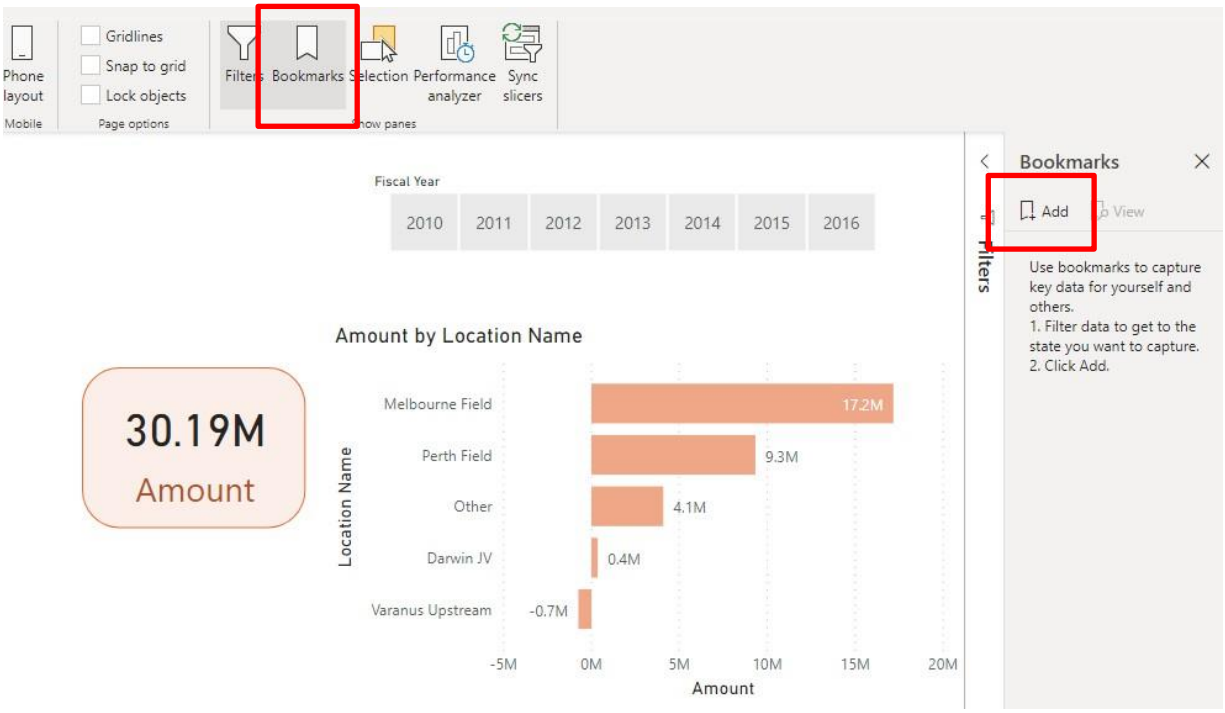
Bookmarks are excellent for helping users navigate through a report

17.1 Clear All Filters Bookmark

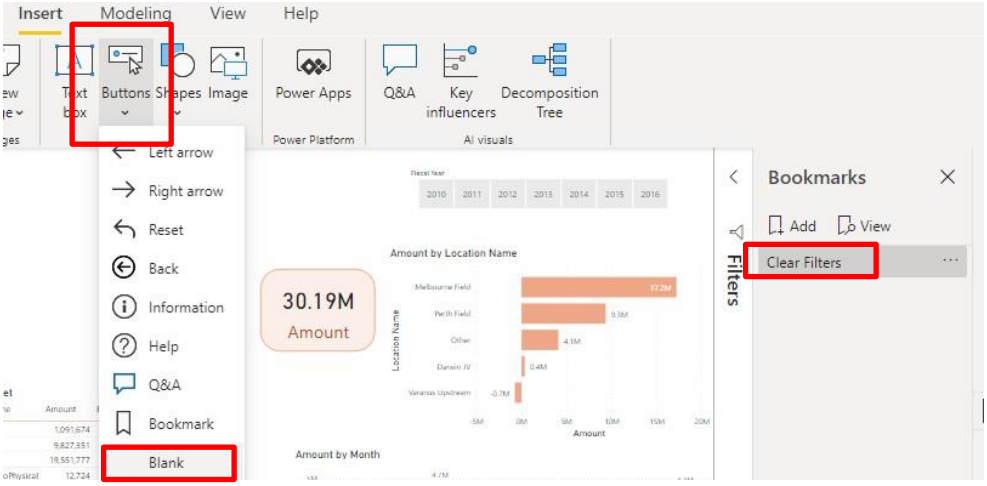
Lets add a bookmark called “Clear Filters” and then trigger that via a button

In the View tab turn on Bookmarks Pane

Make sure no filters are selected

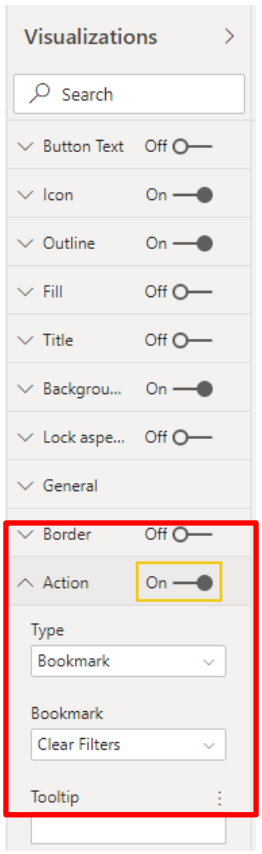


- Click Add in the Bookmarks screen and call it Clear Filters.
- Add a blank button

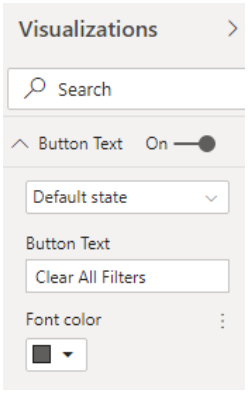


Once the button is created

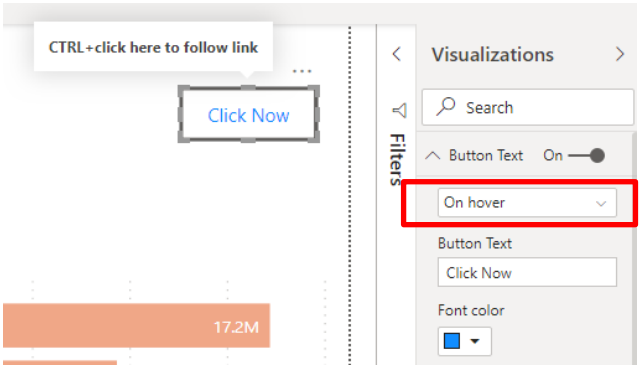
- go to the panel on the right of your screen and choose Action On
- Type is Bookmark
- Choose Clear Filters



- Then go to Button Text
- Turn it On
- Type Clear All Filters

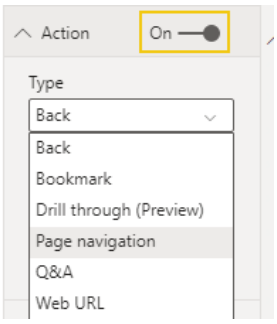


- Finally change Default state to “On Hover”, and type “Click Now” and change the font to a different colour



- Hover your mouse over the button to see the text change
- Ctrl Click the button to clear all filters

17.2 Adding Page Navigation to Buttons



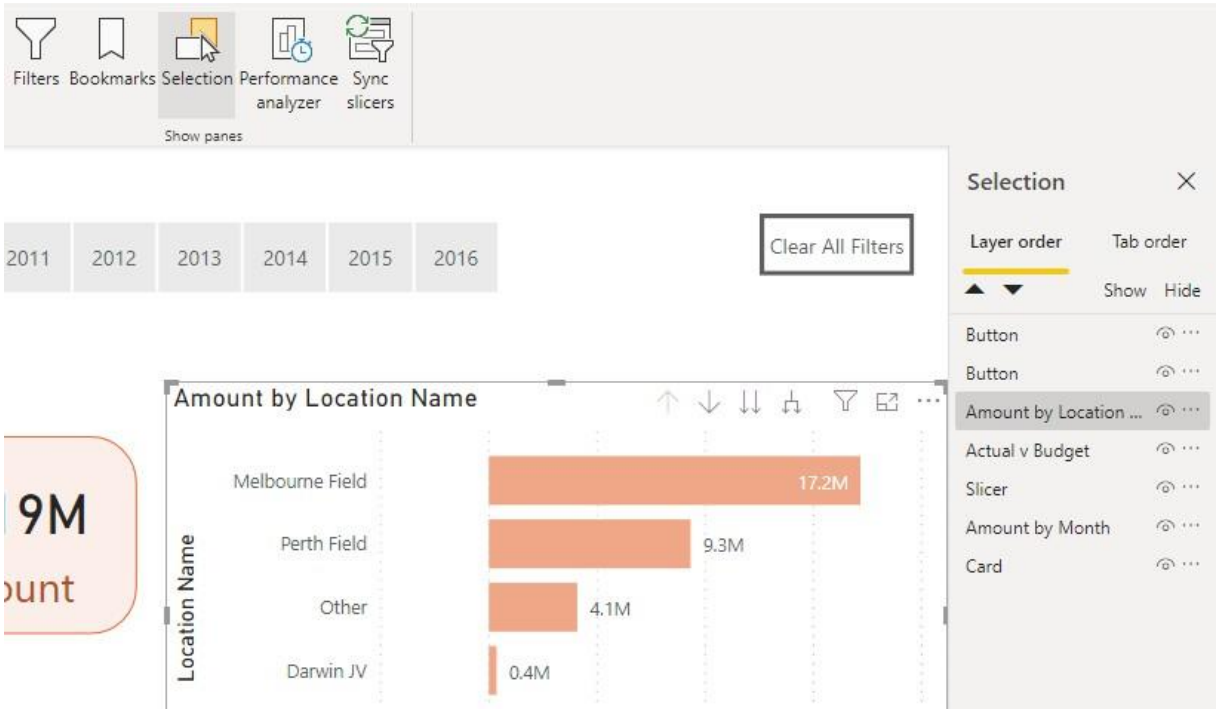
A simple way is to click Action then choose Page navigation and choose the page.

Tip: A Right or Left arrow button is ideal for this 

Tip: Actions can be assigned to shapes and images

17.3 Selection Pane

Turn on the Selection Pane (on the View Tab)



You can hide or show visuals and then capture that view with a boomark

You can also Ctrl select multiple visuals and then Right Click Group to then “act” on them as one.

Suggestions:

- ✓ Multiple text boxes with help tips that users can show and hide by clicking a help button
- ✓ Pop out Slicer Panels (with a light grey semi-transparent box shape behind them)
- ✓ Toggle between a Chart View and a Matrix view

18 Best Practice Tips

General principles:

1. Long thin Data Model Tables are better than short wide ones
2. Make table names short and meaningful
3. Measures always go in the VALUES field
4. Build up your measures rather than creating overly long ones.
5. Always refer to columns as TableName[ColumnName] and measures as [MeasureName]
6. Create a separate table to hold your measures (hide the columns in that table)
7. Make changes and updates in the Power BI Desktop file and then re-publish to Power BI.com
8. Publish to App Workspaces rather than My Workspace so that multiple people have access to edit, refresh and distribute dashboards

Top 10 Power Query tips

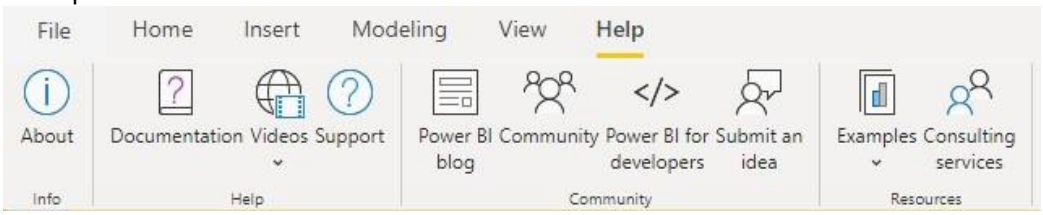
1	Always have the formula bar turned on (via View > Formula Bar)
2	Rename applied steps to be more meaningful
3	Right-Click on a step and choose Properties to add comments as to WHY you do this
4	Add i to the start of a step name when you add a comment (so you remember the comment is there!)
5	Avoid spaces in Table names – use CamelCase. It makes measures easier to read later.
6	Never have a column and a loaded query (table) with the same names e.g. don't have a table and column called Product. Rename the Table as ProductData or similar
7	Never have a column with a name you'll use as a Measure e.g. Budget is a good measure name so name the column of values as BudgetColumn
8	Name your loaded queries (tables) something short and to the point. e.g. SalesOrderHeader_DB145_PROD is not great
9	Spaces in Column names are fine
10	Never leave a data type as ABC123

19 Excel Power Query and Power Pivot

See the Extra Insights PDF in the Appendix Folder

20 Additional resources

The help tab is very useful, especially the Community (where you can ask questions), Video tutorials, and Examples via the Partner showcase.



Best Websites for Help

Website	Comment
https://ecellorscrm.com	Trainers Blog
https://docs.microsoft.com/en-us/power-bi/	End to end guide of Power BI.com
https://www.youtube.com/channel/UCFp1vaKzpfvoGai0vE5VJ0w	Guy in a Cube -a wealth of Power BI info
https://PowerBI.tips/	Power BI Tips and Tricks