Fast-track Power BI & DAX

Sample manual - first two chapters

Manual 1294 - 348 pages –

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CHAPTER 1 - GETTING STARTED

1.1 Getting Started in Power BI Desktop

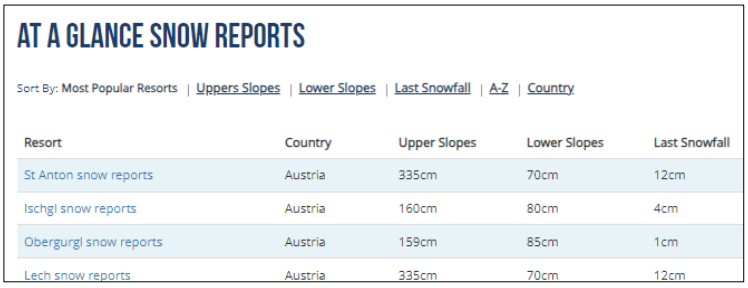
This chapter describes the basic workflow you'll use to build a report in Power BI Desktop:

Stage	Details
Loading and transforming data	Loading one or more tables from various data sources, cleansing the data and linking the tables together if necessary.
Creating a report	Using the data that you've loaded to create a report, including visuals like charts.
Publishing this	Publishing the results to your report server (usually Microsoft's Power BI Service) so that other people can view your reports.

You'll find much more detail on the ideas mentioned in this chapter in later parts of this courseware.

Example for this Chapter

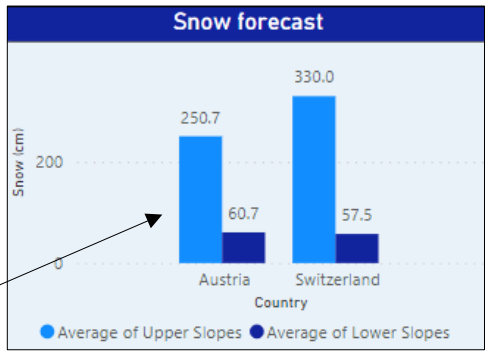
To demonstrate the basic process of building a report, we'll import a table of data from a webpage and create and publish a report based upon this:



Resort	Country	Upper Slopes	Lower Slopes	Last Snowfall
St Anton snow reports	Austria	335cm	70cm	12cm
Ischgl snow reports	Austria	160cm	80cm	4cm
Obergurgl snow reports	Austria	159cm	85cm	1cm
Lech snow reports	Austria	335cm	70cm	12cm

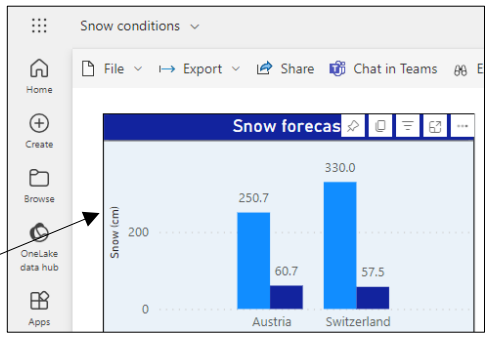
At the time of writing these are the snow conditions at selected resorts courtesy of https://www.igluski.com/snow-reports . We'll *transform* the data to tidy it up (for example, we can remove columns we don't need).

We'll then present this data using *visuals* such as this chart:



We can use the imported, cleaned data to create a variety of visuals, such as this chart.

Finally we will publish this report to the Power BI Service, so that anyone in your organisation can see it:

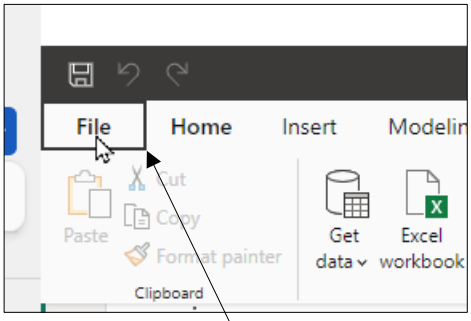


The final report published to Power BI Service, and viewed through your browser.

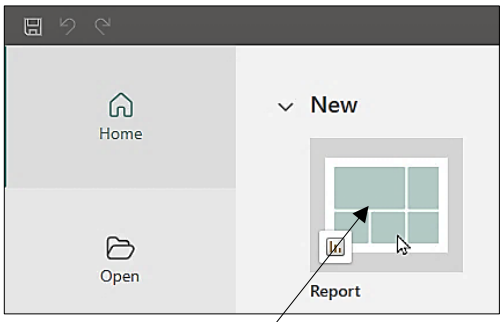
1.2 Working with Files

Creating New Files

You can create a new report in Power BI Desktop in the following ways:



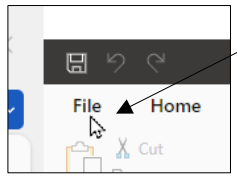
a) If you already have Power BI Desktop open, select the **File** menu.



b) Click on this icon to create a new report.

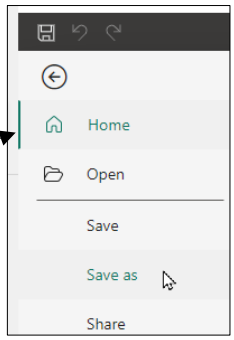
Opening and Saving Files

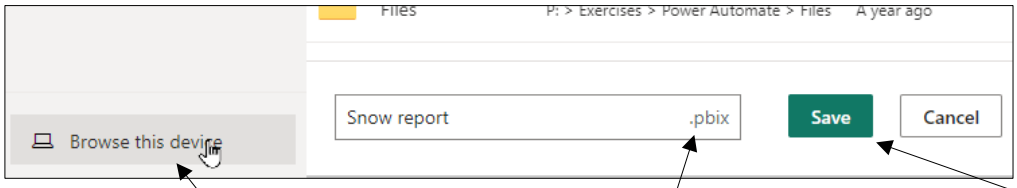
You can open and save files using options in the **File** menu:



a) From the Power BI Desktop menu choose the **File** menu.

b) Choose one of these menu items to open or save a report (the dialog box which appears is similar whichever you choose).





c) Click on this button to find the folder which contains (or will contain) your report.

d) Files that you save in Power BI Desktop will have a **pbix** extension.

e) Click on this button to open the report you've chosen or to save this report

Wise Owl's Hint

Every time you open a Power BI Desktop report a new instance of the application will launch, leaving the current report you're working on unaffected. To close a report you must close down the Power BI Desktop application containing it (there is no option to close a report but still leave Power BI Desktop running).

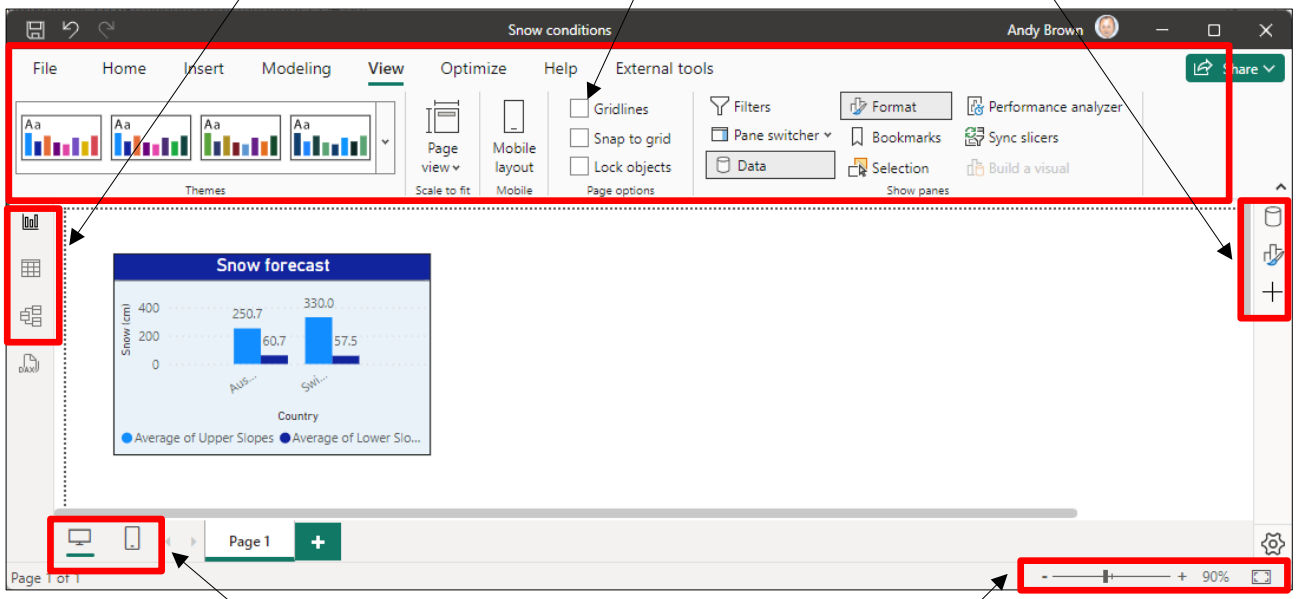
1.3 Views in Power BI Desktop

The most important components of the *Power BI Desktop* screen are as follows:

These tools allow you to switch between the 3 main views in Power BI Desktop: **Report** view, **Table** view and **Model** view.

This is the Power BI Desktop menu and ribbon.

You can use the *Pane Switcher* to change what to look at. The two main views are **Data** and **Format**, as explained below.

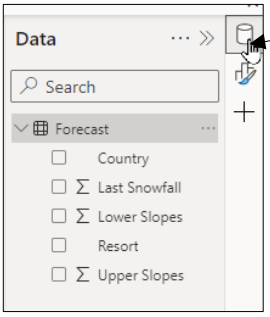


These tools allow you to switch between designing reports for viewing on desktop computers or mobile phones.

You can use the slider to zoom in and out, although you may find it easier to hold down the Ctrl key and use your mouse wheel instead.

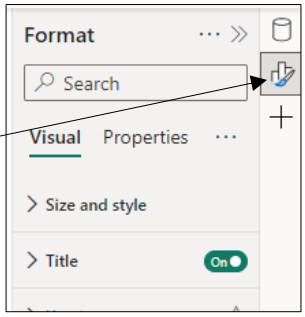
Switching Panes

You can use the icons on the right-hand side of your Power BI screen to choose what to show:

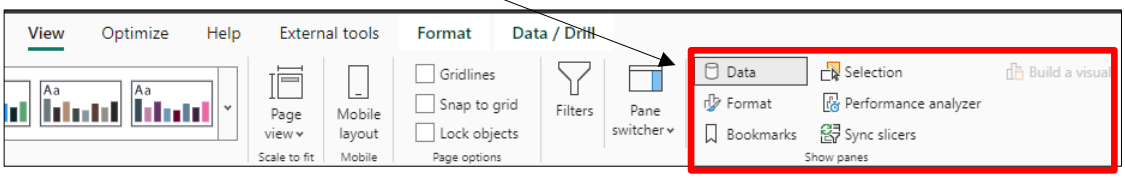


Click on this icon to see the data tables in your model …

… or this icon to see the format properties of the thing you currently have selected (in this case a chart visual).

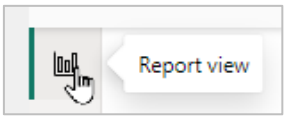
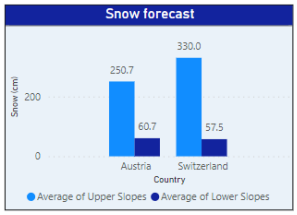
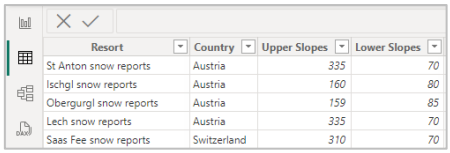
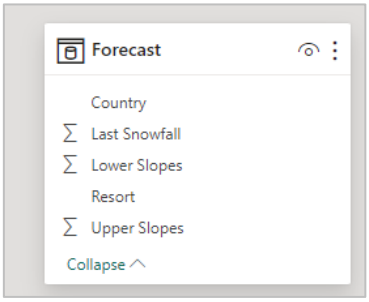


You can also use these tools on the **View** tab of the Power BI Desktop ribbon to choose what you want to view.



Report, Table and Model View

You can switch between the three views of a report using the tools on the left of the screen:

View	Icon	What it shows	Example view
Report		The report that you're creating, consisting of visuals and shapes.	
Table		The tables of data that you've loaded into your model (you can see one table at a time in this view).	
Model		The links between the tables in your model, called *relationships* in Power BI Desktop.	

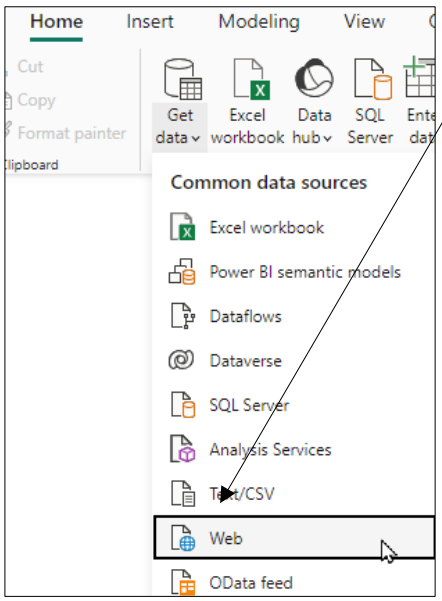
Resort	Country	Upper Slopes	Lower Slopes
St Anton snow reports	Austria	335	70
Ischgl snow reports	Austria	160	80
Obergurgl snow reports	Austria	159	85
Lech snow reports	Austria	335	70
Saas Fee snow reports	Switzerland	310	70

Wise Owl's Hint

The 4th icon – if present – allows you to create queries in DAX to interrogate the data upon which your report is based, but this is definitely not something to consider in this courseware chapter!

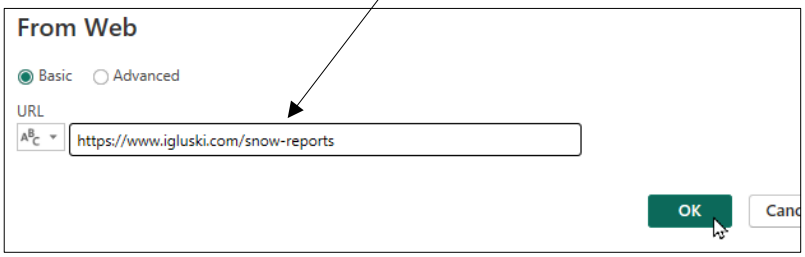
1.4 Getting Data

The first stage in building a report is to find some data!

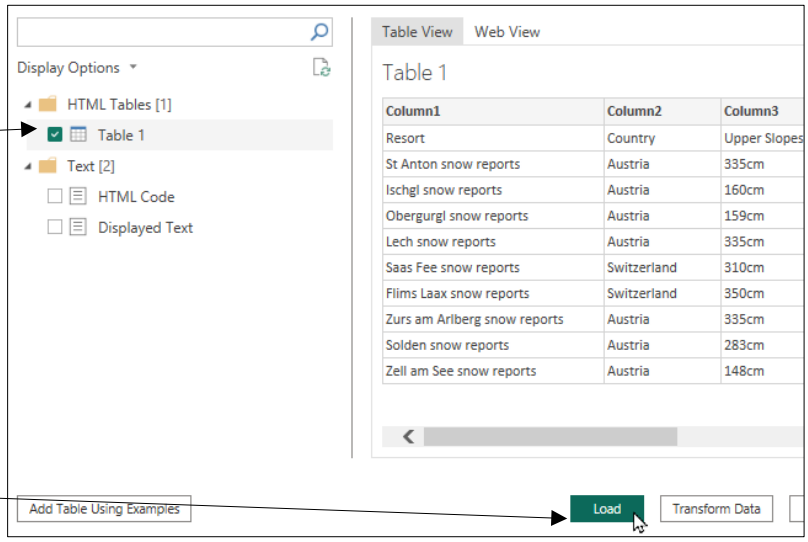


a) From the ribbon, choose **Home | Get Data** then choose a type of data source. Here we're choosing a **Web** source.

b) Each type of data source requires different information to allow your report to connect to it. For a web source you need to enter the URL of the page and then click **OK**. You may also be asked to enter credentials if the website requires some.



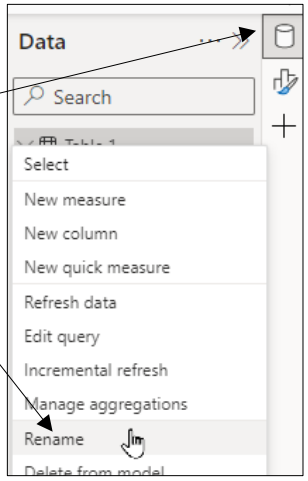
c) Tick which table you want to import from this page (the best way to see what each looks like is to click on it).



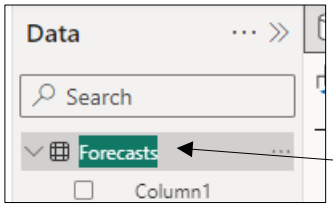
d) Click on this button to load the data into your model.

You can optionally rename a table after importing it into your report:

a) Click on this icon to show the **Data** pane.



b) Choose **Rename** from the menu which appears.



c) Enter a new name for your table and press Enter .

1.5 Transforming Data

You'll often need to make changes to the data you have imported so that it can be presented easily in visuals. This process is known as *transforming* data.

Column1	Column2	Column3	Column4	Column5
Resort	Country	Upper Slopes	Lower Slopes	Last Snowfall
St Anton snow reports	Austria	335cm	70cm	12cm
Ischgl snow reports	Austria	160cm	80cm	4cm
Obergurgl snow reports	Austria	159cm	85cm	1cm
Lech snow reports	Austria	335cm	70cm	12cm
Saas Fee snow reports	Switzerland	310cm	70cm	1cm
Flims Laax snow reports	Switzerland	350cm	45cm	1cm
Zurs am Arlberg snow reports	Austria	335cm	70cm	12cm
Solden snow reports	Austria	283cm	30cm	1cm
Zell am See snow reports	Austria	148cm	20cm	1cm

We will change the column headings, turn some column into numbers and remove the final column.

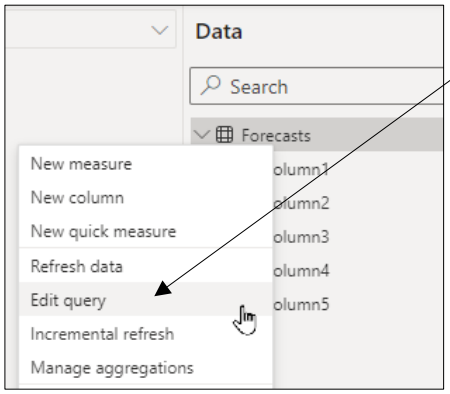
	Resort	Country	Upper Slopes	Lower Slopes
1	St Anton snow reports	Austria	335	70
2	Ischgl snow reports	Austria	160	80
3	Obergurgl snow reports	Austria	159	85
4	Lech snow reports	Austria	335	70
5	Saas Fee snow reports	Switzerland	310	70
6	Flims Laax snow reports	Switzerland	350	45
7	Zurs am Arlberg snow reports	Austria	335	70
8	Solden snow reports	Austria	283	30
9	Zell am See snow reports	Austria	148	20

Wise Owl's Hint

As with everything else in this chapter, we will go into this topic in much more detail later in this courseware.

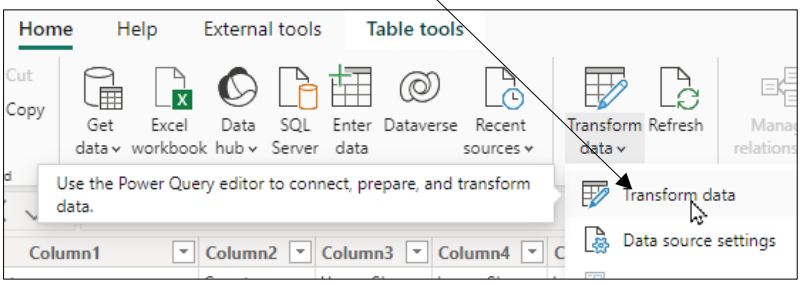
Editing Queries / Transforming Data

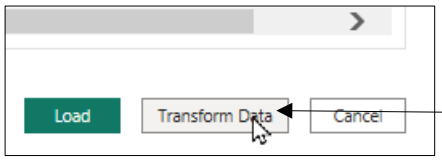
Each table that you import into a report generates a *query* which tells Power BI Desktop which data to get (and how to get it). You can edit these queries in (at least) 3 different ways:



You can right-click on a table in the **Fields** pane and choose **Edit query**…

…or you can choose this option from the **Home** tab of the ribbon (although it says it's doing something different, transforming data and editing a query are actually the same thing!).





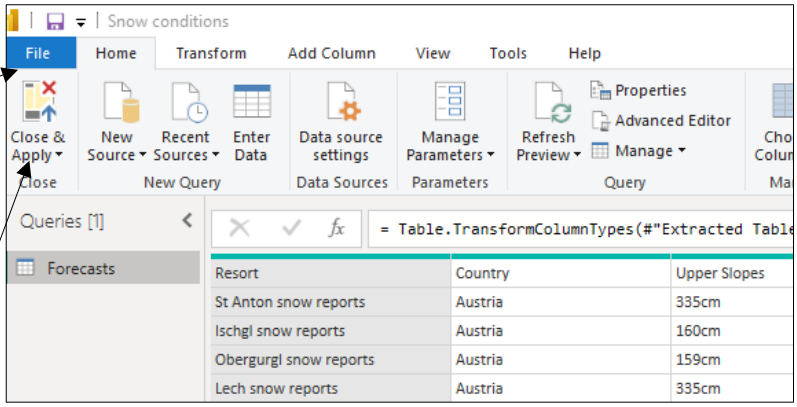
Alternatively, you could click on this button at the point at which you're first loading data to go directly into the Power BI Query Editor.

The Power BI Query Editor

Choosing to edit a query as described above opens the *Power Query Editor* tool within Power BI Desktop.

Although you're still working in the same Power BI Desktop file, the Power Query Editor has a different ribbon with options related to modifying data.

When you have finished cleaning your data click **Close & Apply** to close the Power Query Editor.

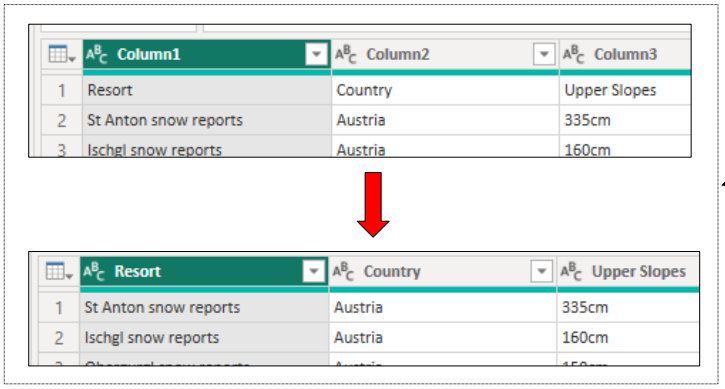


Wise Owl's Hint

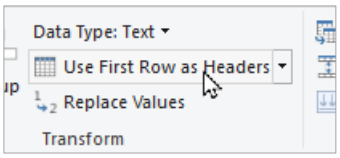
*This program to edit Power BI queries has gone by many names in the past! This courseware will call it **Query Editor**, although this name seems to have been abandoned by Microsoft. Little known fact: everything that you can do using Query Editor in Power BI Desktop you can also do when getting data in Excel.*

Promoting Row Headers

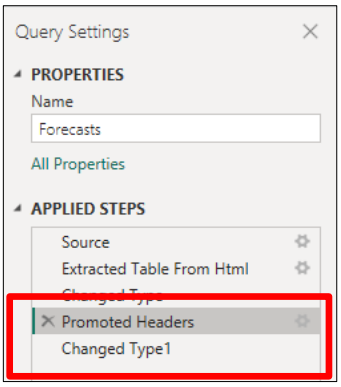
For our example the first thing you need to do is to make the first row your table headers:



a) To tell Power BI Desktop to use the first row of the table as column headers, click on this tool on the **Home** tab of the Query Editor ribbon:

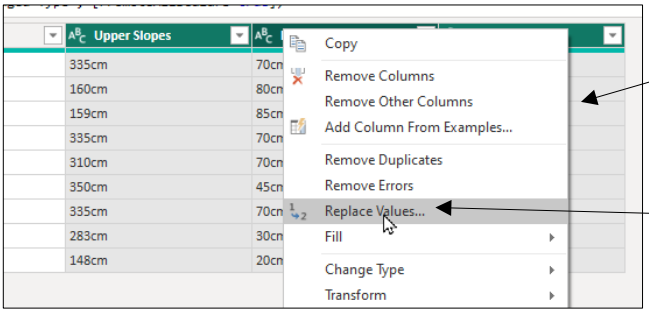


b) Query Editor will add two steps: one to promote your row headers (as requested), and then another to change the data types of the columns following this step. Query Editor will often insert silent additional steps like this to second-guess your intentions, and (to be fair) nearly always gets these right.



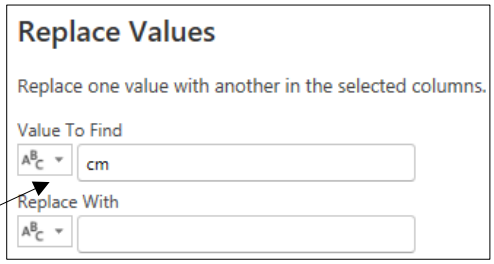
Replacing Values

To allow us to average snowfalls for our data we need to remove the **cm** suffices then convert the resulting data to integer numbers:



a) Select the first column whose **cm** suffices you want to remove, then hold down the Shift key and select the last one (this is the easiest way to select multiple columns in Query Editor).

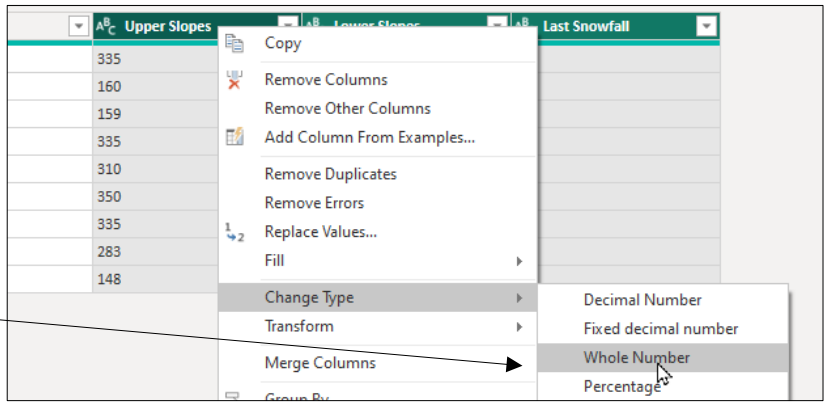
b) Right-click on the selected columns and choose to replace values.



c) Choose to replace the text **cm** with nothing, then select OK .

Changing Data Types

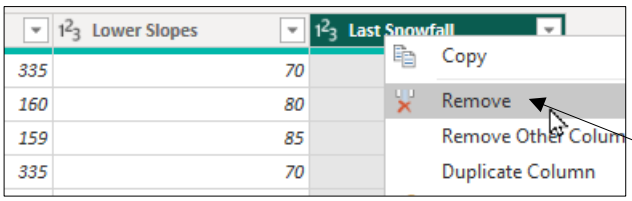
You can now change the data types of the 3 columns you have selected:



Right-click on the 3 columns and choose to change their data types to **Whole Number** (note that this would have generated errors if we had done this earlier).

Removing Columns

Finally, we're not interested in the last snowfall depth, so we'll remove this column.



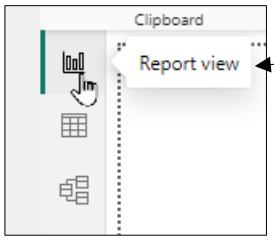
Right-click on the **Last Snowfall** column and remove it from your query.

1.6 Creating Visuals

Visuals are the tables, charts or other gizmos which display the data in your report. There are many types of visual (you'll learn a lot more about them in later chapters of this courseware).

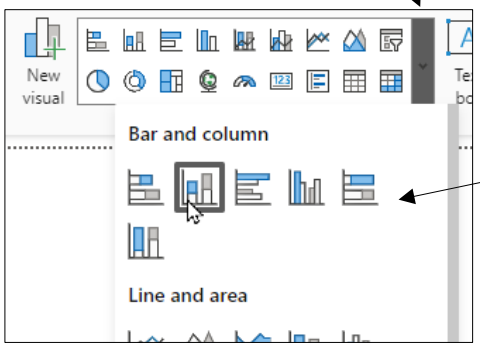
Inserting a Visual

Probably the easiest way to add a visual to a report is as follows:

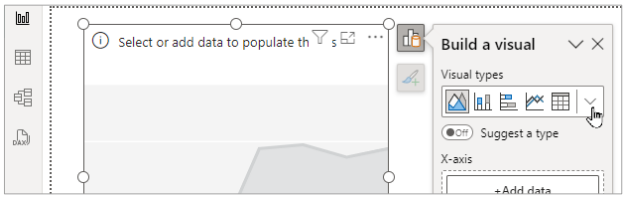


a) Make sure that you're in **Report** view, otherwise you won't be able to add visuals!

b) Click on the side bar to the right of the visuals pane (this appears on both the **Home** tab and the **Insert** tab of the ribbon).

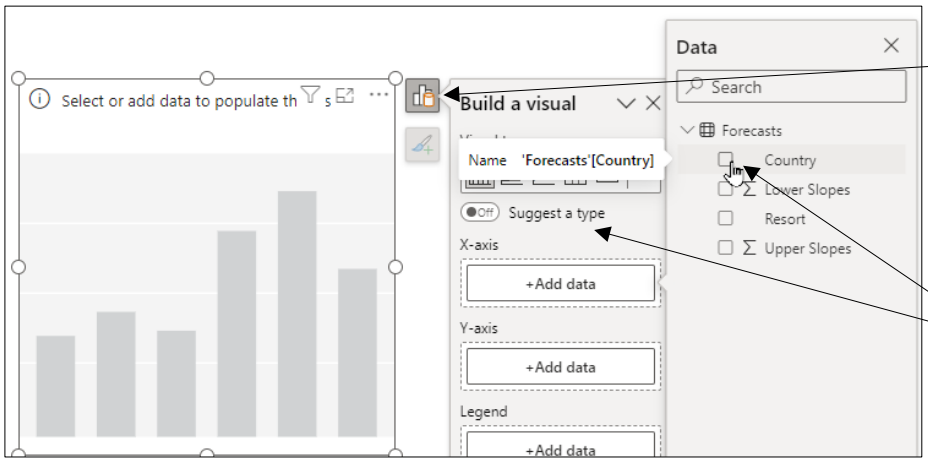


b) Choose which visual you want to create. If you get this wrong, you can always change it after creating your visual by clicking here:



Assigning Grouping Fields to a Visual

Once you have inserted a visual you can begin assigning fields to it:

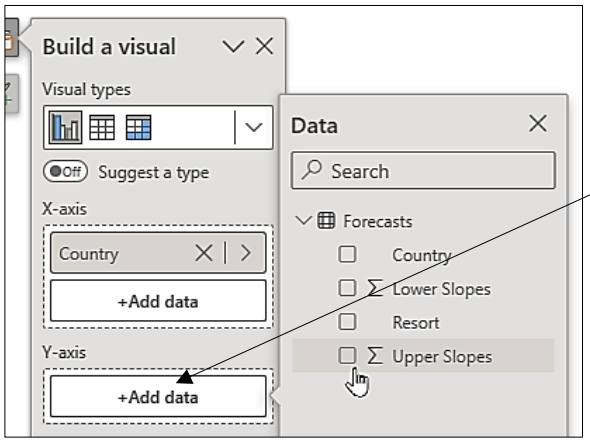


The easiest way to assign fields to a visual is to click on this tool.

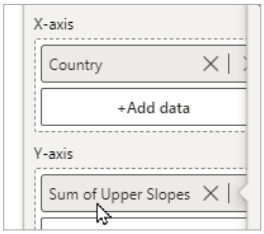
You can then click on each part of a chart (here we're saying what will appear on the horizontal axis of this column chart) then tick the field you want to include.

Assigning Numerical Fields

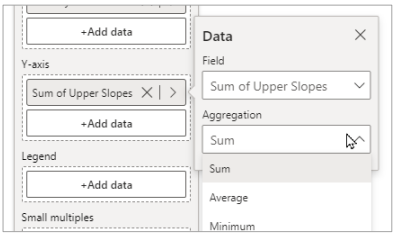
You can assign numerical fields in the same way, then change how you want to aggregate them:

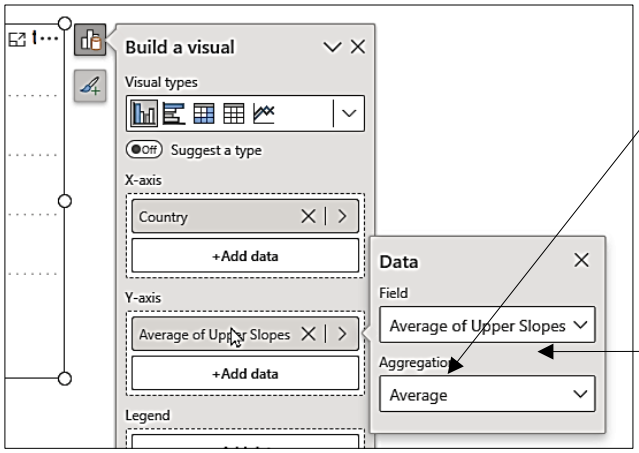


a) Click on the **Y axis** box the field well and choose to show the **Upper Slopes** snow depth to get this:



b) Click on the field you've added and change it:

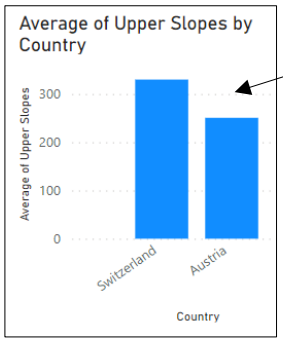




c) Once you've assigned a numerical field to a chart you can click on it to say how you want to aggregate it (here we've changed from summing the upper slopes' snow depth for each country – which would be fairly meaningless – to averaging it).

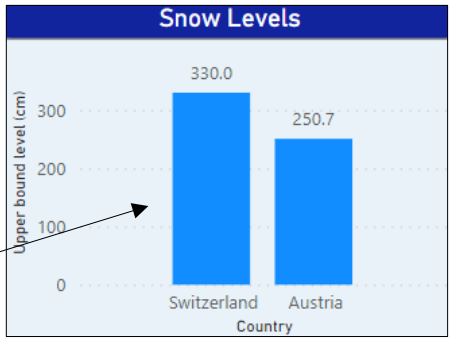
1.7 Three Ways to Format Visuals

Much of your time in Power BI Desktop will probably be spent applying formatting like this:



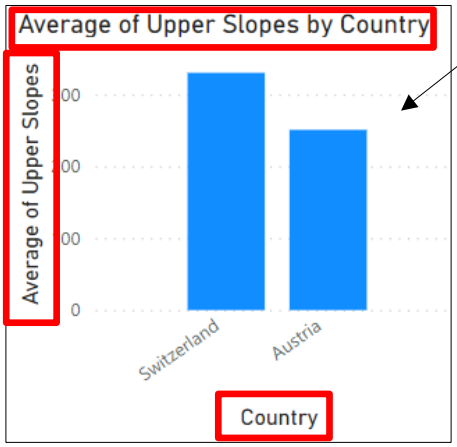
The chart as it initially appears – the title is hard to read and doesn't stand out, and it could do with a bit of oomph.

A chart which has been formatted within an inch of its life (including the addition of data labels showing the average upper bound snow level by country).



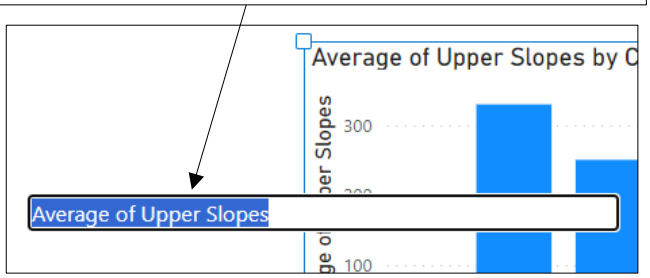
In Situ Selection

There are a few parts of a chart that you can edit on the chart itself:



The parts of the chart you can edit directly are shown in red boxes.

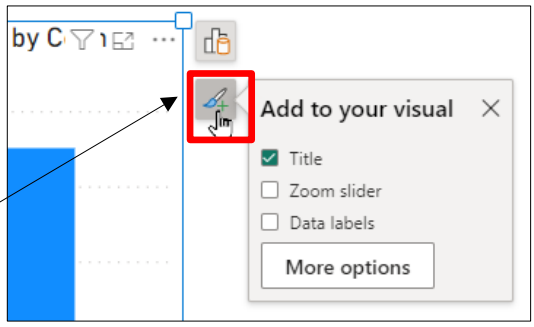
When you double-click on any of these with the chart selected you will be able to change the text displayed.



Changing what's on your Chart

You can choose to add or remove some parts of your chart using the following icon:

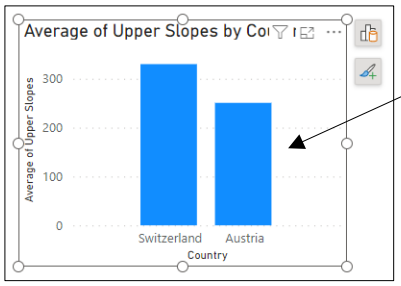
Click on this icon to add or remove certain chart components (here we can add or remove the title, data labels or a slider).



*The **More options** button is less useful than you might think: it just takes you to the **Format** pane on the right-hand side of Power BI Desktop.*

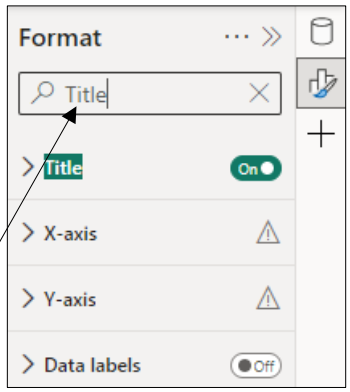
The Format Pane

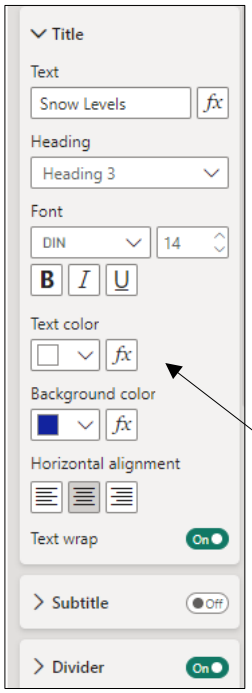
You'll spend much of your time in Power BI Desktop using the **Format** pane:



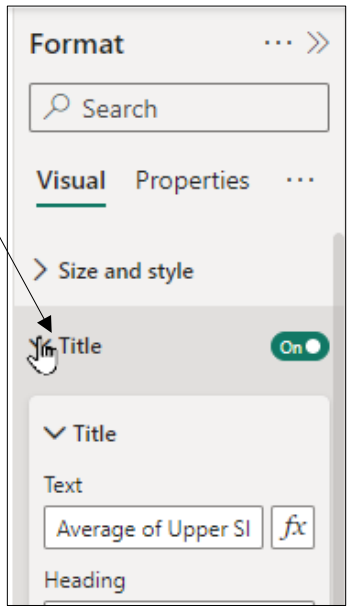
a) Select the visual you want to format (otherwise you'll see the formatting properties of the page to which it belongs instead).

b) Optionally, reduce the number of properties displayed by typing in part of the name of the one you want to change (here we've typed **Title** in the search box).

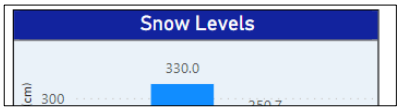




c) Expand a card to show its range of formatting options, and make changes.



d) Some of the changes made to change the title to this:

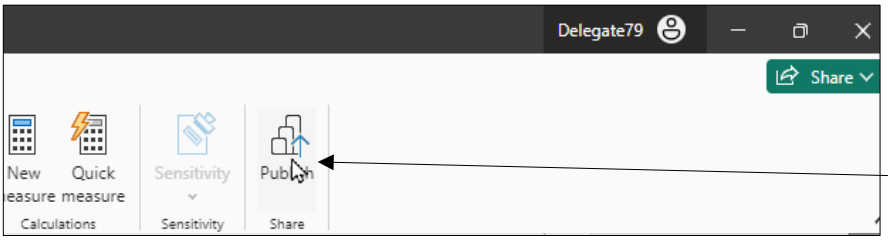


Wise Owl's Hint

*As a short-cut, double-click on a visual to select any part of it that you want to format; the relevant card will automatically then be selected in the **Format** pane.*

1.8 Publishing your Report

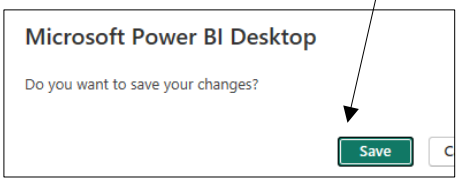
When you've finished your report you will probably want to share it!



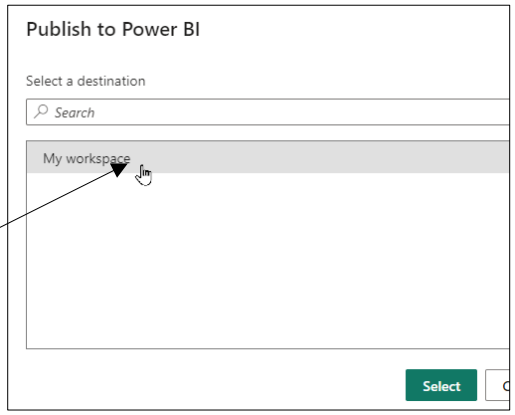
a) Check that you're signed in to a Power BI account.

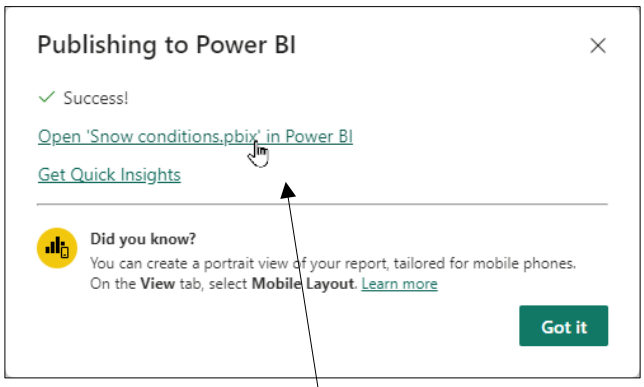
b) Click on this **Publish** button on the **Home** tab of the Power BI ribbon.

c) If you have unsaved changes you will be asked at this point to save them (you can't publish a report which contains unsaved changes).

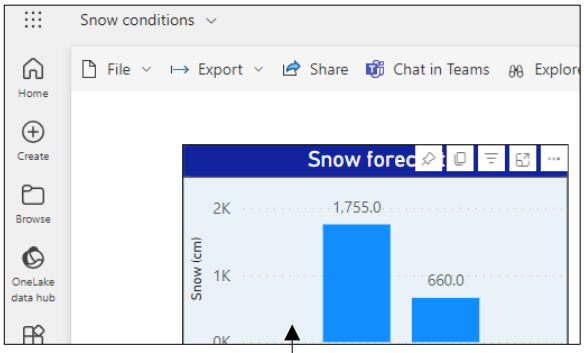


d) Choose to publish to the default **My workspace** (see hint below for more on this).





e) Click on this link to see your report in Power BI Service on the Internet (you may be asked to log in to your account again at this point).



f) Your report as it will appear to the world (provided of course that they have the right security level and licence …).

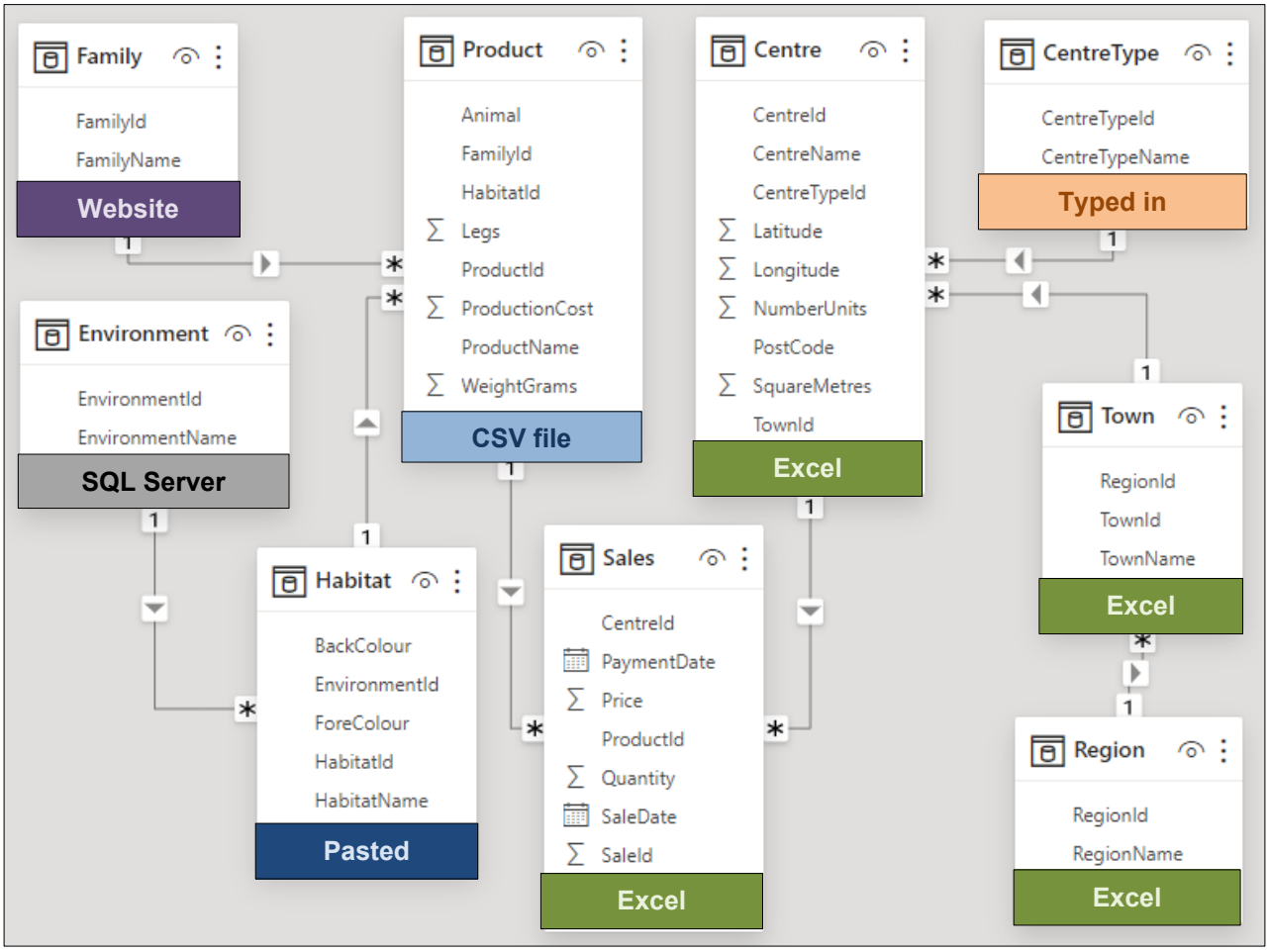
Wise Owl's Hint

A (much) later chapter in this courseware will cover publishing in more detail, including an explanation of workspaces (and why you might want to create them), how to create dashboards and much more besides.

CHAPTER 2 - IMPORTING DATA

2.1 Our Example

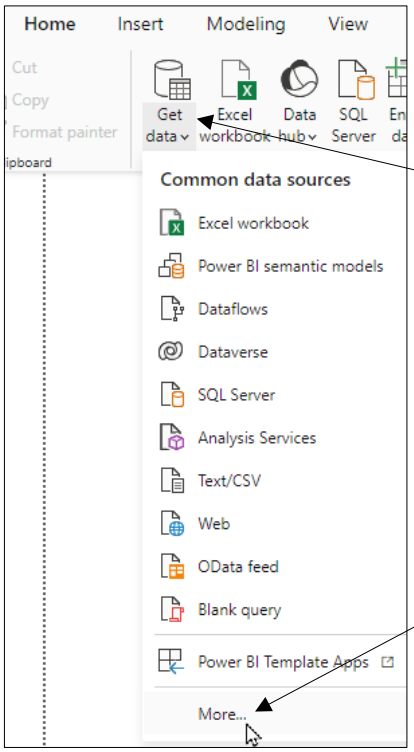
Our example is based on a relational database which keeps track of sales of soft toys. The diagram below shows which type of data source we'll use to import each table:



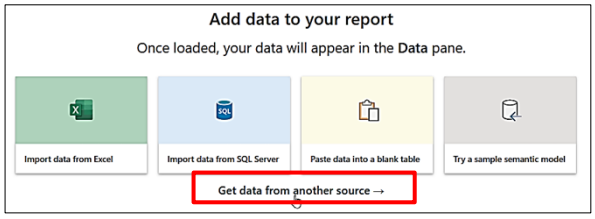
Once you've loaded your data into Power BI from disparate data sources all tables will be treated equally (so for example you can join a table imported from Excel with one imported from a website without any problem).

2.2 Importing from Different Sources

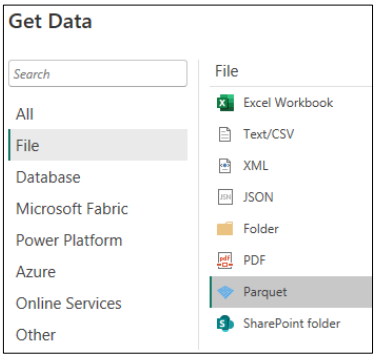
This section shows how to import data into a report from a variety of common data source types. Regardless of which data source type you're using, you can begin the import process as follows:



a) From the ribbon choose **Home | Get Data**. You can also click the top half of the **Get Data** tool to open the dialog box shown below, or click on this link in a new report:



b) Pick a data source type from the **Common data sources** list, or click **More…** to see more choices.

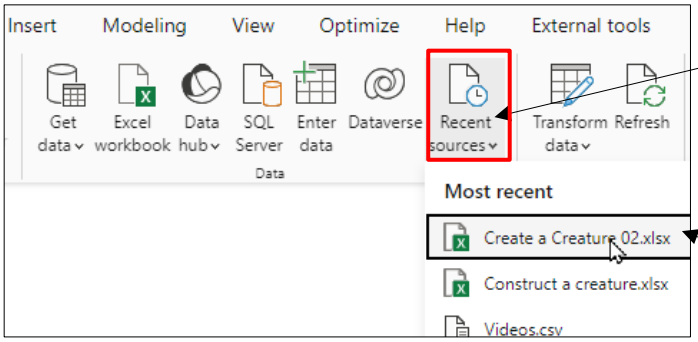


Wise Owl's Hint

What happens next depends on which data source type you've chosen, but it inevitably involves launching some type of wizard which will help you import your data.

Re-Using a Data Source

You can quickly re-use a recent data source as shown below:

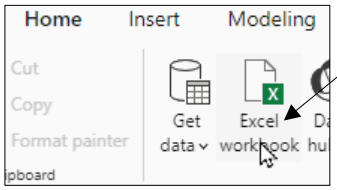


a) From the ribbon choose **Home | Recent Sources**.

b) Pick from the list of databases, workbooks, websites, etc from which you've already imported data.

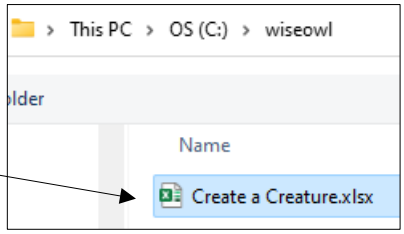
2.3 Importing from Excel

To start importing from an Excel workbook, use this short-cut:



Power BI gives you a special Excel tool because it's such a popular choice.

Double-click on a workbook containing one or more worksheets or named ranges that you want to import.

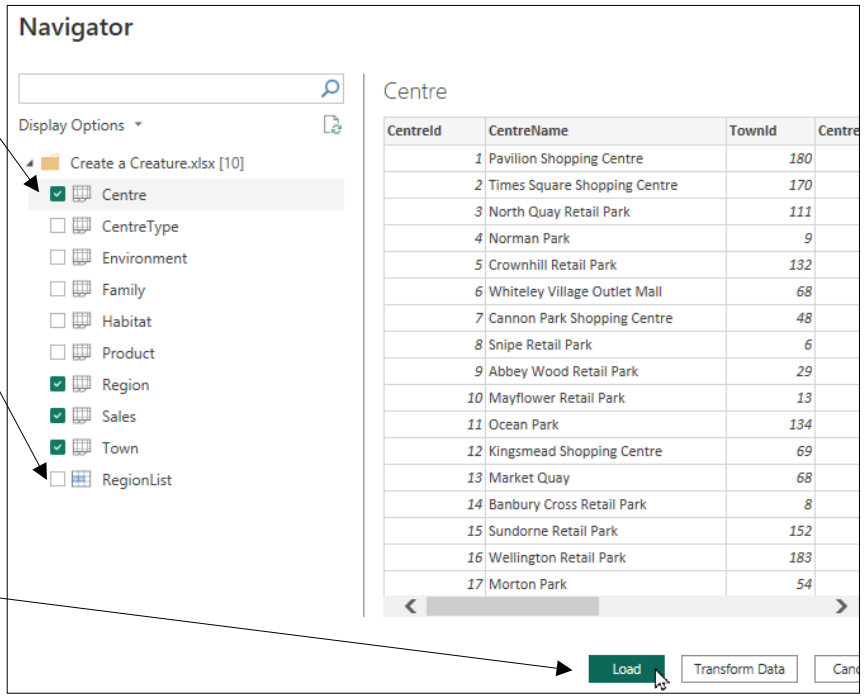


The dialog box which appears lists the contents of the workbook you have selected. You can choose which parts of the workbook you want to import as shown below:

Tick the box next to the name of any item you want to import. Here we've chosen to import the **Centre**, **Region**, **Sales** and **Town** worksheets.

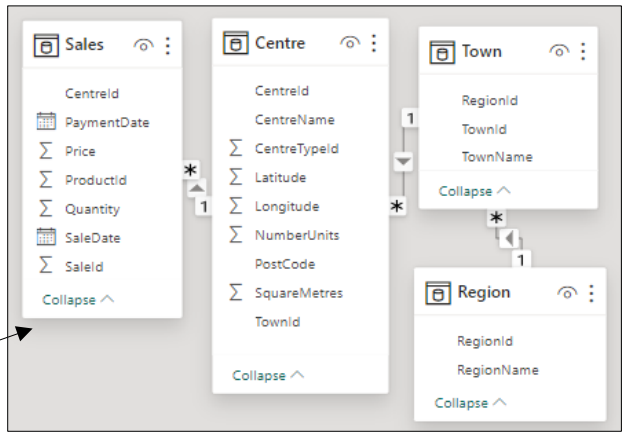
The dialog box will list worksheets in your workbook, but also named ranges in the file such as **RegionList** here. These names ranges have a different icon next to them and appear at the bottom of the list of options.

When you've chosen which worksheets or named ranges you want to import choose either to load them into your model or to go to Query Editor for further processing.



Note that Power BI Desktop will where possible build relationships between the worksheets you've imported:

Power BI Desktop creates these relationships for this example (we've tidied the diagram up a bit). You'll learn how and why Power BI Desktop creates relationships between pairs of loaded tables in another chapter in this courseware.



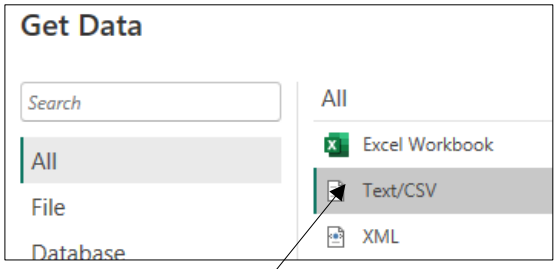
2.4 Importing CSV or Text Files

You can import from CSV files as well as a variety of other text file types.

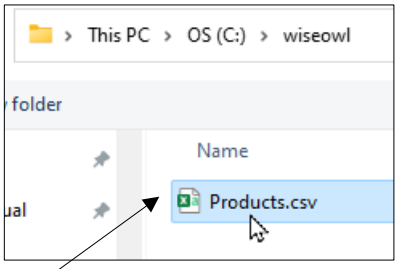
CSV stands for **Comma Separated Values**. The value in one column is separated from the next by a comma. Our example file also includes a row of column headers.

```
ProductId,ProductName,Animal,Hat
1,Sammy,Snake,1,0,1,950,7.19
2,Pokyo,Penguin,4,2,3,850,4.5
3,Fenella,Frog,3,4,4,400,10.79
4,Layla,Lemur,2,2,5,550,4.28
```

To begin importing from a text file like this:



Choose to get data from a **Text/CSV** file …



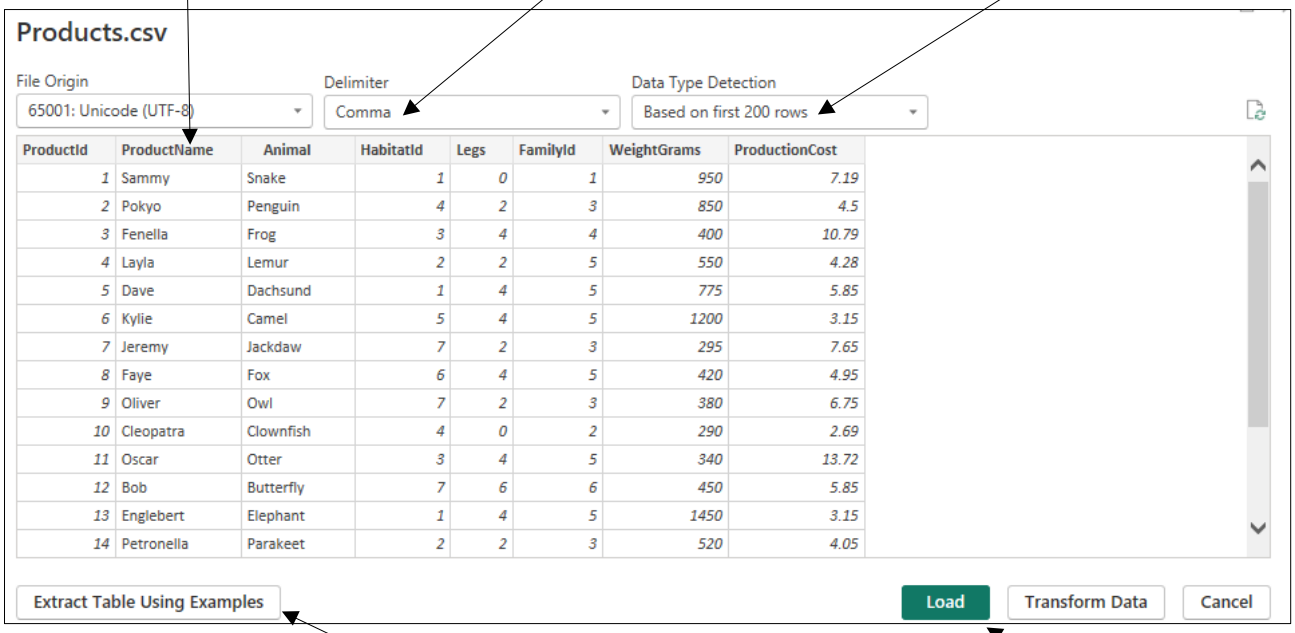
… then browse for and double-click the file you want to import.

You can then choose exactly how the text file is configured using the dialog box which appears:

The preview of your data is a good way to check if you've selected the correct options.

If Power BI Desktop hasn't picked the correct delimiter, you can choose a new one.

Power BI Desktop attempts to work out the data type of each column using a sample of rows. You can set the sample size here.



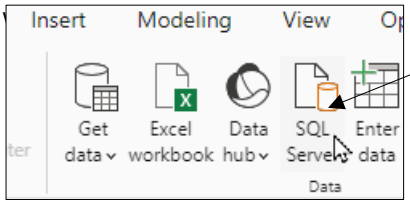
ProductId	ProductName	Animal	HabitatId	Legs	FamilyId	WeightGrams	ProductionCost
1	Sammy	Snake	1	0	1	950	7.19
2	Pokyo	Penguin	4	2	3	850	4.5
3	Fenella	Frog	3	4	4	400	10.79
4	Layla	Lemur	2	2	5	550	4.28
5	Dave	Dachsund	1	4	5	775	5.85
6	Kylie	Camel	5	4	5	1200	3.15
7	Jeremy	Jackdaw	7	2	3	295	7.65
8	Faye	Fox	6	4	5	420	4.95
9	Oliver	Owl	7	2	3	380	6.75
10	Cleopatra	Clownfish	4	0	2	290	2.69
11	Oscar	Otter	3	4	5	340	13.72
12	Bob	Butterfly	7	6	6	450	5.85
13	Englebert	Elephant	1	4	5	1450	3.15
14	Petronella	Parakeet	2	2	3	520	4.05

Optionally you can click on this button to train Power BI on which columns you want to import, although it's usually easier to import everything then remove from the query the columns you don't want.

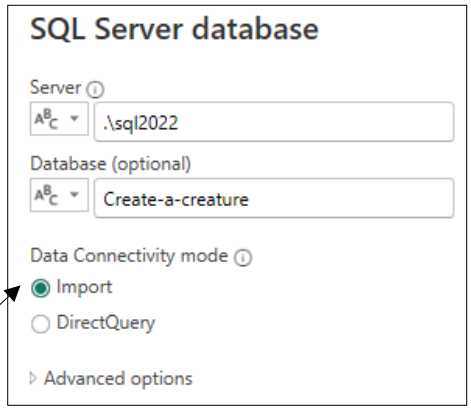
When you've finished configuring the text file, click the **Load** button to import it into your Power BI report.

2.5 Importing from SQL Server

You can import data from a SQL Server database as shown in the diagram below:

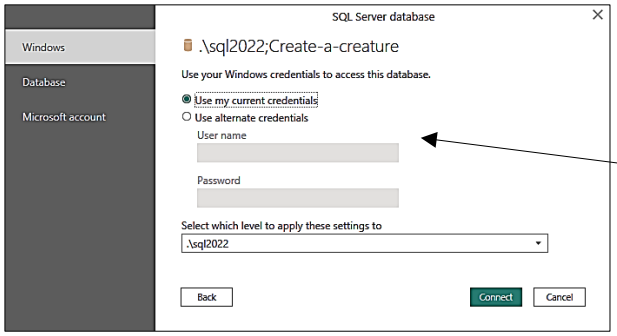


a) Like Excel, SQL Server has a dedicated import tool!

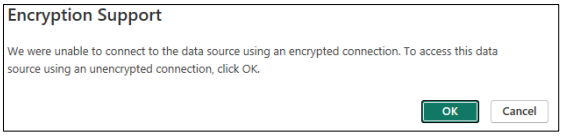


b) Enter a server name and, optionally, the name of a database.

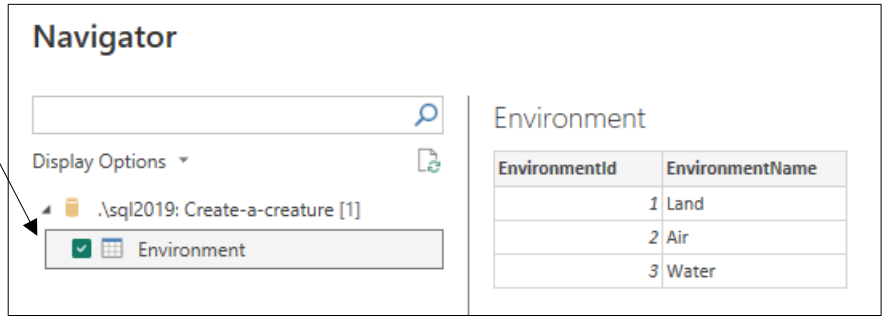
c) Choose to **Import** the data and then click **OK** (see the hint below for more on what **DirectQuery** means).



d) If required enter your credentials to connect to the server you have chosen. Click **Connect** when you've done so - you may then have to confirm you're happy to use an unencrypted connection:



e) In the next dialog box you can pick from a list of tables to import. Here we've chosen to import the **Environment** table.



Wise Owl's Hint

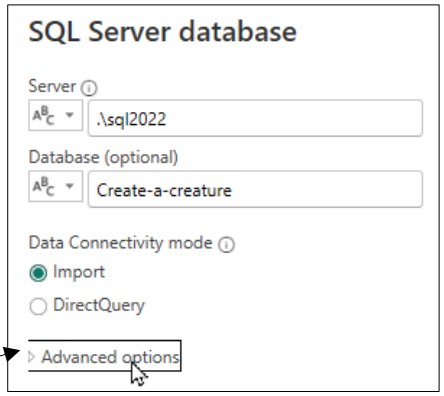
If you're wondering, DirectQuery *means you don't import the data into your model: you just link to it. On the plus side this means that the data in your visuals is always up to date, but on the downside reports may run more slowly, and there are numerous limitations (for example, you can only use a few types of data source and you can't use something called* calculated columns*).*

Using Queries and Stored Procedures

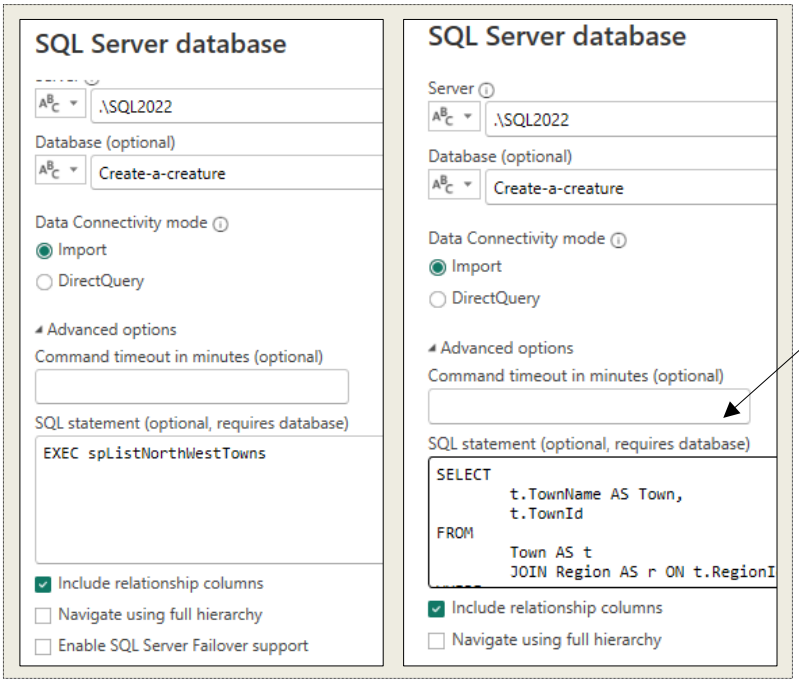
Rather than choosing to import from a list of tables, you can write a *query* to return your data. This is more complicated but provides much more control over which data you get.

```sql
USE [Create-a-creature]
GO

CREATE PROC spListNorthWestTowns
AS

-- list the towns in the North-West
SELECT
    t.TownName AS Town,
    t.TownId
FROM
    Town AS t
    JOIN Region AS r ON t.RegionId = r.RegionId
WHERE
    r.RegionName = 'North West'
```

a) It's much easier to test your query in SQL Server Management Studio than it is to type it into Power BI! When your query or stored procedure is working, copy the query text or the name of the stored procedure to the clipboard.



b) While loading SQL Server data, choose to show advanced options.



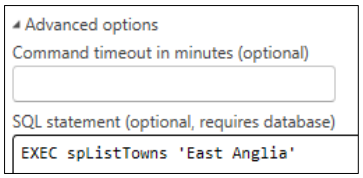
c) Choose either to execute a stored procedure (left) or run a query (right). Either option will then let you load your data:

Be careful: Power BI Desktop seems to have a preference for choosing **Direct Query** when you load data from SQL Server like this; be sure to set this back to **Import**.

Passing Arguments to Stored Procedures

Note that you can now pass arguments to a stored procedure using these advanced options:

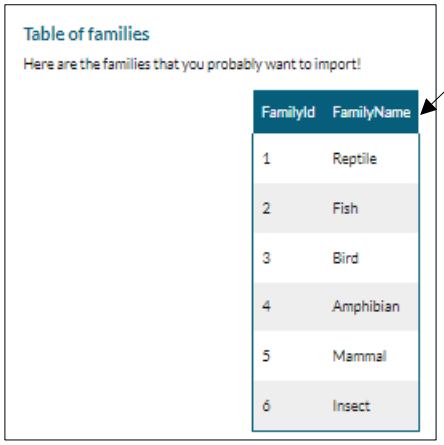
Here we have a stored procedure listing out all the towns for any given region. We could load this as follows:




```sql
CREATE PROC spListTowns(
  @region varchar(100)
)
AS

-- list the towns in any given
region
SELECT
  t.TownName AS Town,
  t.TownId
FROM
  Town AS t
  JOIN Region AS r ON t.RegionId
= r.RegionId
WHERE
  r.RegionName = @region
```

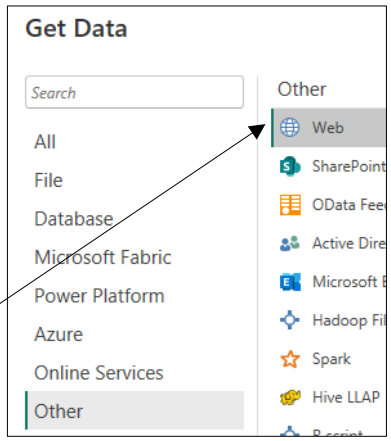
2.6 Importing from a Website

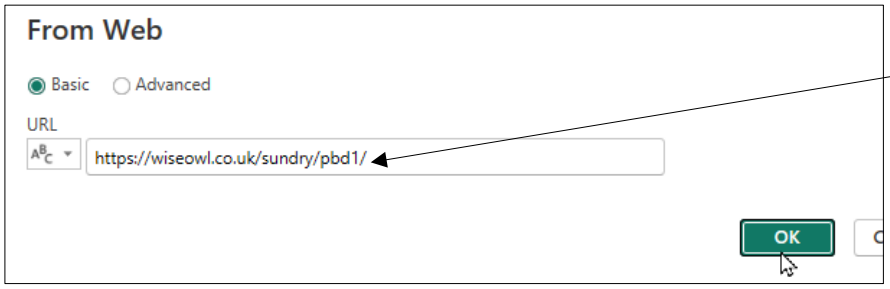
Power BI Desktop makes it easy to grab data from a website, as shown below:



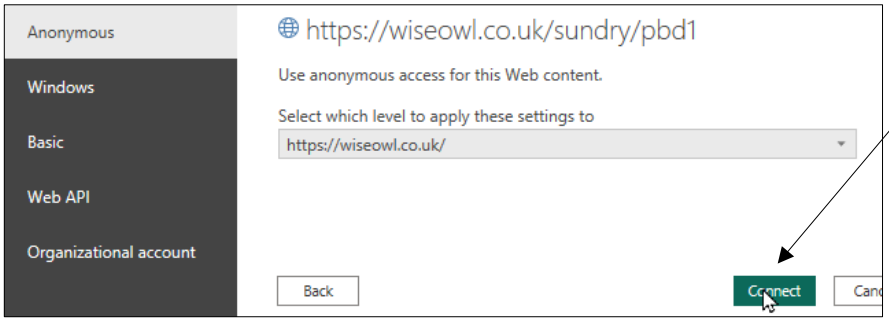
a) Find a website which contains a table of data that you want to import (this one is at wiseowl.co.uk/sundry/pbd1/).

b) Choose to get data from a **Web** source in the **Other** category.

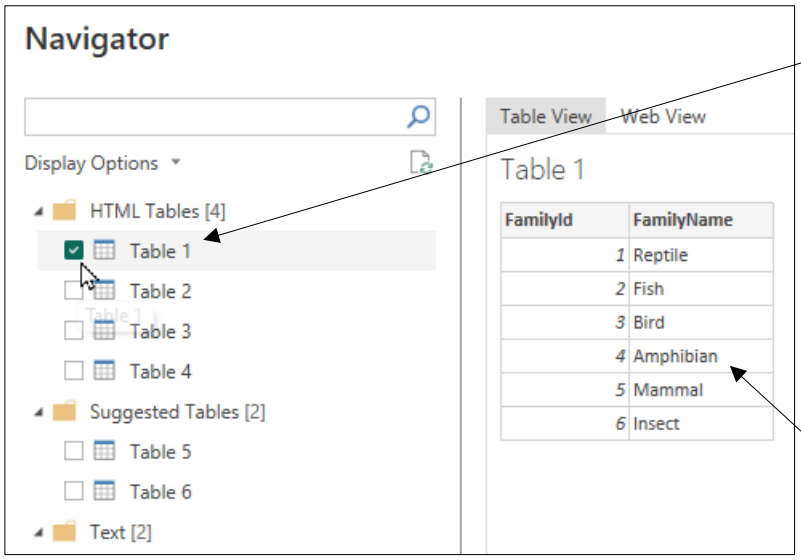




c) Enter the URL of the page containing the table you want to import and click **OK**.

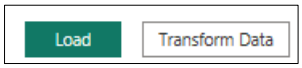


d) If this is the first time you've connected to this page you'll be asked if you want to use any credentials. Here we're opting to connect to the site anonymously.



e) Tick the box next to any table you want to import.

f) Choose one of these buttons to load the data directly or to further process it before loading:



2.7 Entering Data Manually

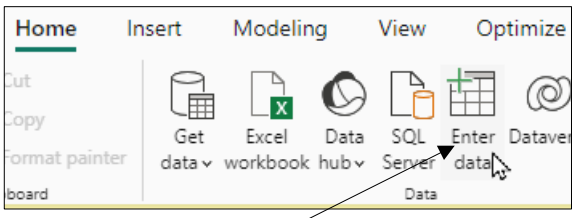
As well as importing existing data, Power BI Desktop allows you to enter data into a model manually.

Pasting Data

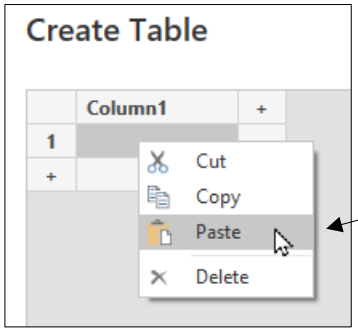
Although you can't import directly from Word, you can copy and paste:

HabitatId	HabitatName	EnvironmentId	BackColour	ForeColour
1	Grasslands	1	Light green	Black
2	Forest	1	Dark green	White
3	Fresh water	3	LightBlue	Dark blue
4	Salt water	3	#78aaf5	White
5	Desert	1	#d6a740	Black

a) In Word, select the table you want to import and copy it.



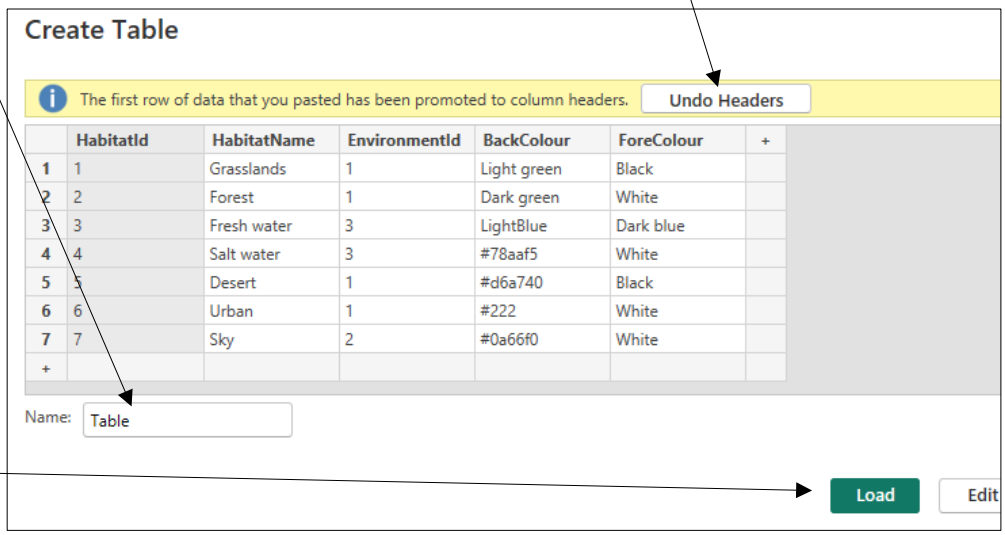
b) Click on this button to enter data into a new table.



c) Right-click on the empty grid and choose to paste in your data.

d) *Power BI Desktop* will decide whether the first row of your table should become the header columns.

e) Give your table a better name.



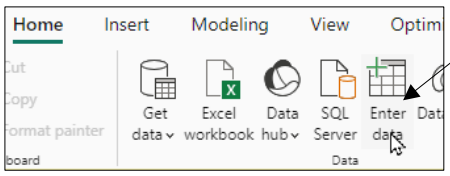
f) Choose to **Load** it into your data model.

Wise Owl's Hint

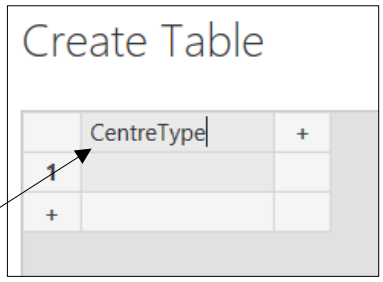
If you copy and paste data, you obviously won't be able to refresh the resulting table to bring in updates.

Typing in Data

The final option for loading data into a model in *Power BI Desktop* is to type it in!

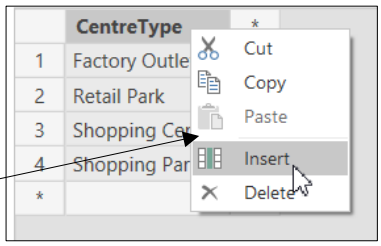


a) From the ribbon select this icon to enter data.

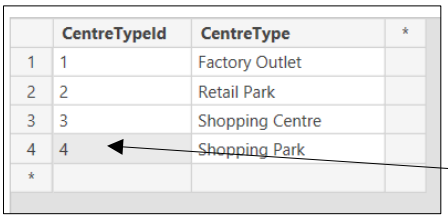


b) You can overtype any column name to rename it.

c) Type in the data that you want to store in the table.

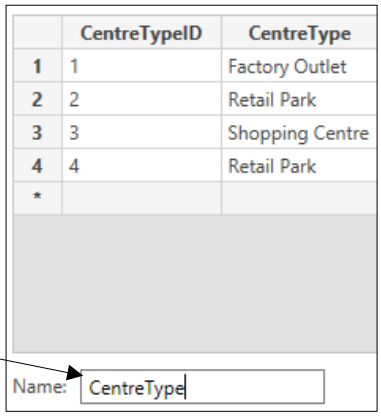


d) Right-click to insert any additional columns that you need.



	CentreTypeId	CentreType
1	1	Factory Outlet
2	2	Retail Park
3	3	Shopping Centre
4	4	Shopping Park

e) Type in any data for new columns that you've added.



	CentreTypeID	CentreType
1	1	Factory Outlet
2	2	Retail Park
3	3	Shopping Centre
4	4	Retail Park

Name: CentreType

f) Give the table a name and click **Load** to add it to the report.

What we do!

		Basic training	Advanced training	Systems / consultancy
Office	Microsoft Excel	✓	✓	✓
	VBA macros	✓	✓	✓
	Office Scripts	✓		
	Microsoft Access			✓
Power BI, etc	Power BI and DAX	✓	✓	✓
	Power Apps	✓		
	Power Automate (both)	✓	✓	
SQL Server	SQL	✓	✓	✓
	Reporting Services	✓	✓	✓
	Report Builder	✓	✓	✓
	Integration Services	✓	✓	✓
	Analysis Services	✓		
Coding and AI	Visual C#	✓	✓	✓
	VB programming			✓
	AI tools	✓		
	Python	✓	✓	✓

Wise Owl Training