

# Introduction to Excel and Power BI

BOKSS IMHS Internal Training

30-May-2024 @ K83 & Zoom

# Chapter 1

## Basic Concept of Data Science

# Data is everywhere



A word cloud featuring various terms related to data and technology. The words are arranged in a cluster, with some appearing larger and more prominent than others. The colors used for the words include shades of orange, red, purple, and blue. The terms include: assessment, happiness, name, calendar, address, app, distance, preference, instagram, feedback, sleep, facebook, gender, email, attendance, opinion, and purchase.

assessment  
happiness name calendar  
address  
app distance preference  
instagram feedback sleep  
facebook gender email  
attendance opinion  
purchase

# Type of Data

- Structured Data vs unstructured data
- Quantitative vs. qualitative data

# Structured vs unstructured data

## Structured data

- Organized
- Tabular format
- Predefined structure
- Text and numbers

## Unstructured data

- Unorganized
- No specific format
- No predefined structure
- Text, images, audio, video

# Structured vs unstructured data

## Structured data

Name	Age	Gender
James	16	Male
Elizabeth	14	Female
Thomas	17	Male

## Unstructured data

There are three students named James, Elizabeth, and Thomas. Their respective genders and ages are male 16, female 14, and male 17.

# Quantitative vs. qualitative data

## Quantitative data

- Numerical data
- Count, measure, percentage

## Examples

- Age
- Temperature

## Qualitative data

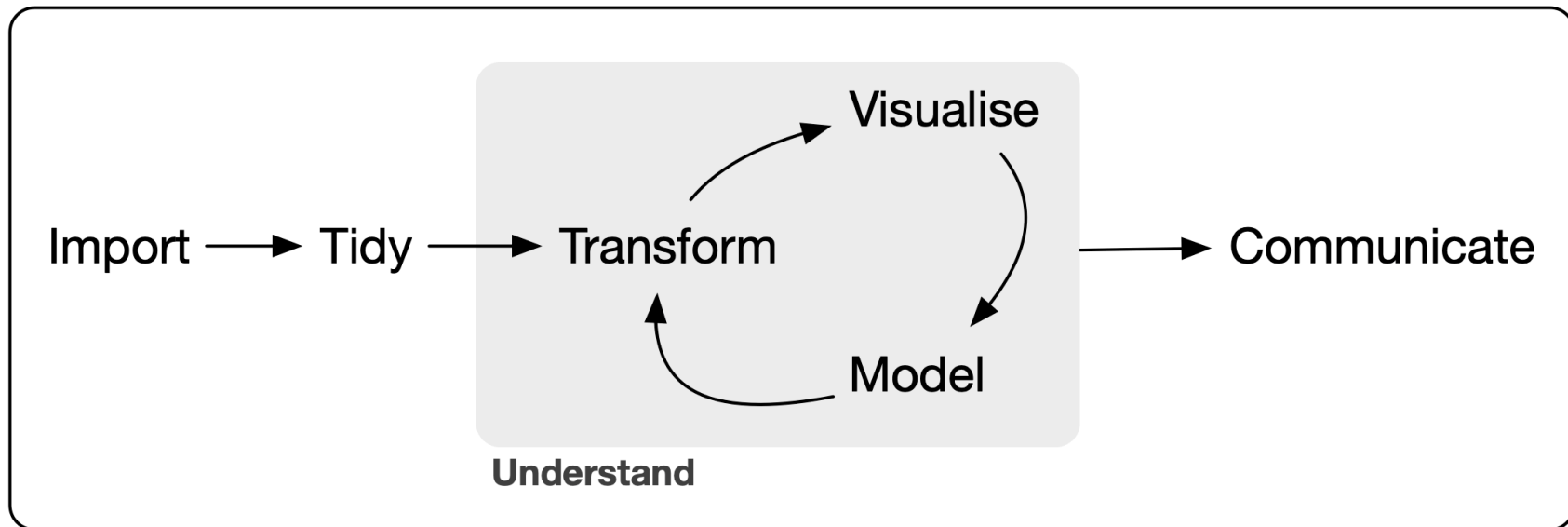
- Categorical data
- Group into categories

## Examples

- Gender
- Holiday

# Workflow of Data Science

“R for Data Science” (Wickham and Grolemund 2017)





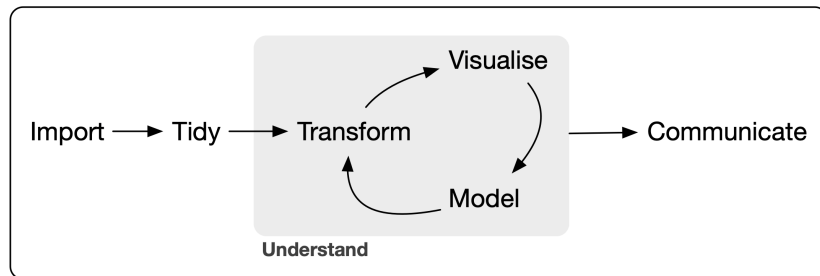
# Workflow of Data Science

## Import

- Open the file using one software
  - .csv / .tsv / .txt
  - .xlsx / .xls
  - .json

## Tidy

- Format in tabular
  - Every column is a variable
  - Every row is an observation
  - Every cell has a single value



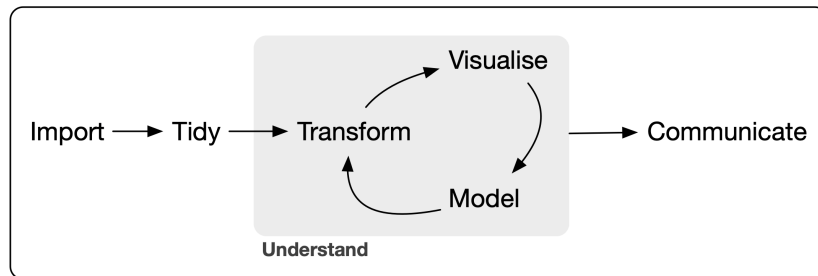
# Workflow of Data Science

## Transform

- Create new column
- Re-group categories
- Filter your sample
- Combine tables
- Handle missing data

## Visualize

- Get the insight of your data
- Check the data quality
  - Missing (Completeness)
  - Validity / Accuracy



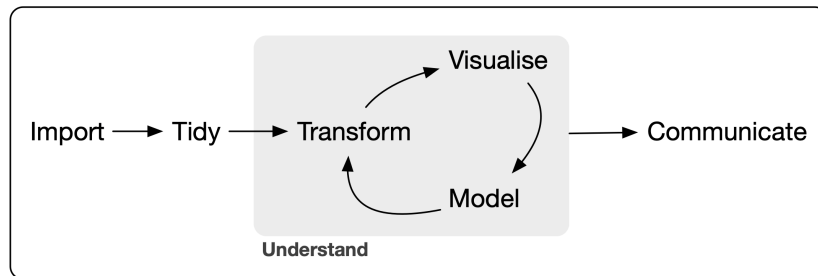
# Workflow of Data Science

## Modeling

- Descriptive (Business Intelligence)
- Out-of-scope
  - Predictive (Machine Learning)
  - Interference (Statistic)

## Communicate

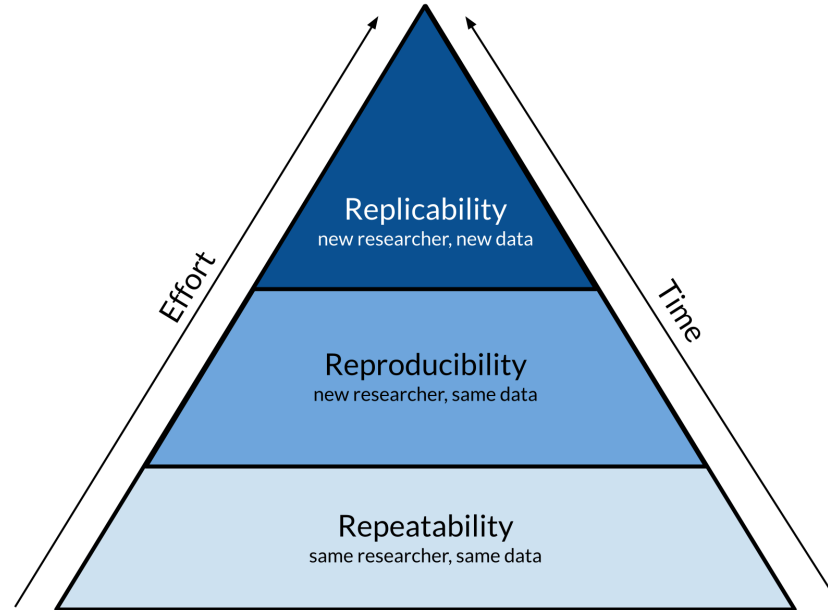
- Making (interactive) dashboard
  - Excel, Google sheet
  - Power BI, Looker, Tableau
  - R, Python



# Common data cleaning challenges

- Missing data
- Inconsistent
  - units
  - format
  - spelling variations
  - typo
- Outliers and errors
- Duplicate
- Unstructured
- Wrong data types

# 3-R's in data science



Based off of a figure from Essawy et al, 2020 <https://doi.org/10.1016/j.envsoft.2020.104753>

# Chapter 2

Some Basic Tricks of Excel

# Edit, Copy and Paste

## Method 1

1. Select the cell
2. Make your edit, copy, or paste
3. When you are editing, **arrow** keyboard will select other cell

## Method 2

1. Double click (F2) the cell
2. Make your edit, copy, or paste
3. When you are editing, **arrow** keyboard will be as usual

## Remark

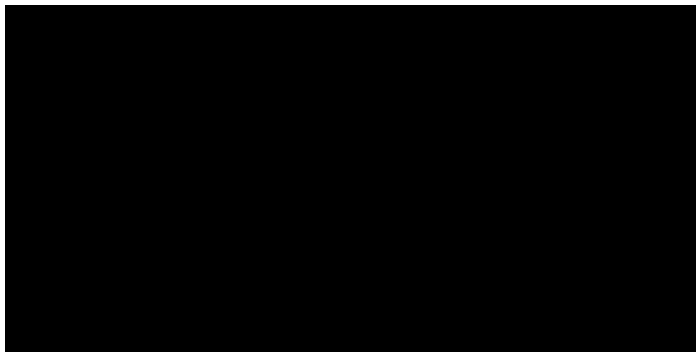
- You can only use the same method to copy and paste

# Referencing

## Absolute referencing

- **constant** when copied to other cell

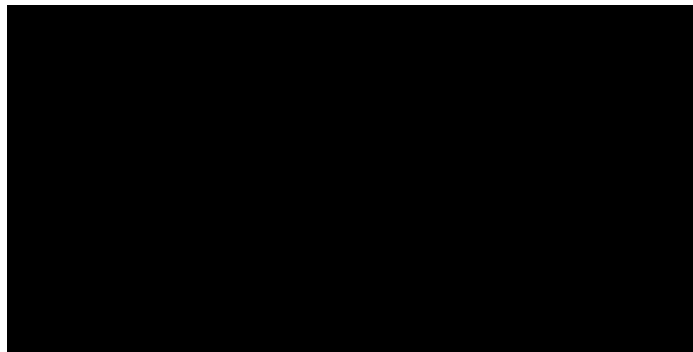
1    =\$A\$2 / =A\$2 / =\$A2



## Relative referencing

- **change** when copied to other cell

1    =A2 / =Sheet1!A2



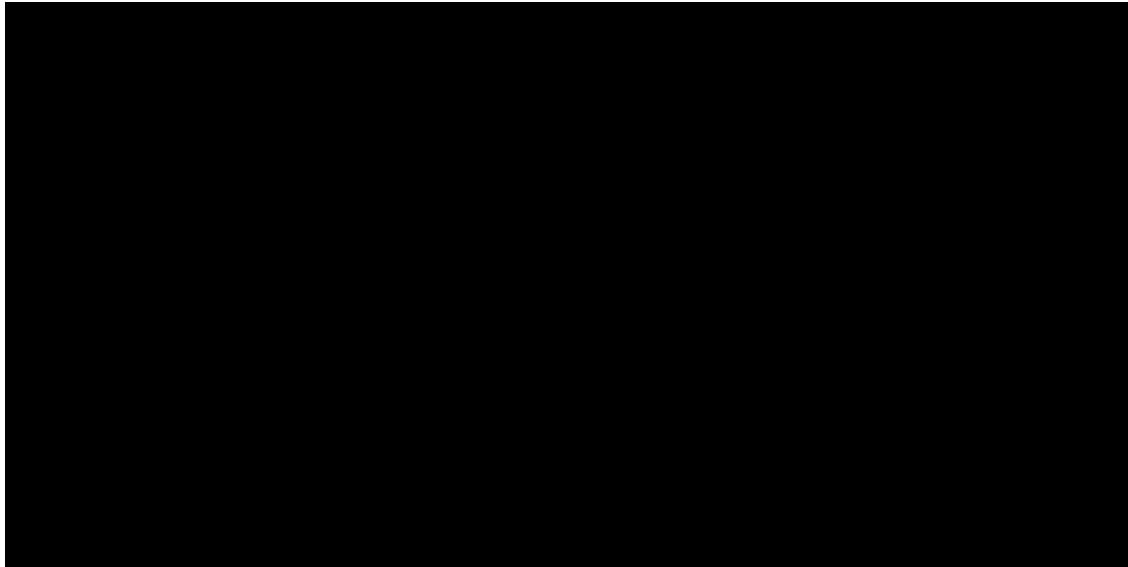


# Other topic

- Multiple lines in one cell
- Freeze cell
- Custom format
- F4 Hotkey
- Resize width and height
- Paste special

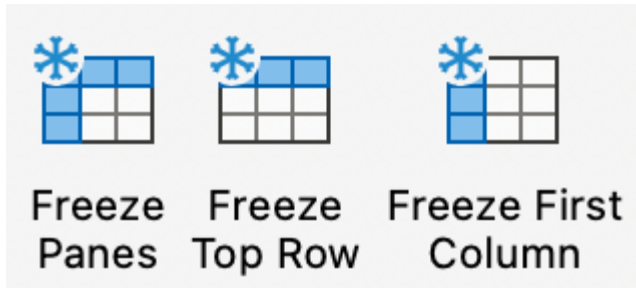
# Multiple lines in one cell

- Press Alt + Enter



# Freeze cell

- View ->
  - Freeze Panes (Custom the Freezing behavior)
  - Freeze Top Row
  - Freeze First Column

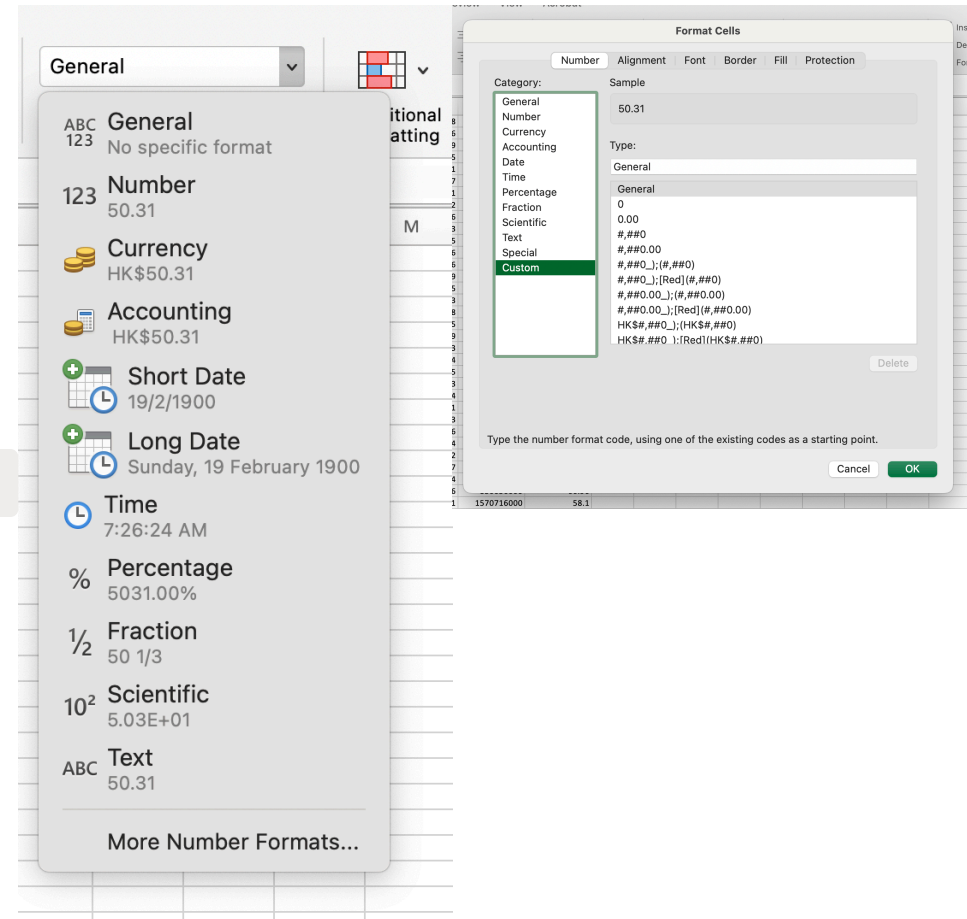


# Formatting

- Build-in format
- Custom format
- Using formula

1     =TEXT(A2, "[\$-404]aaaa")

reference-date-format



# F4 Hotkey

- Make previous action

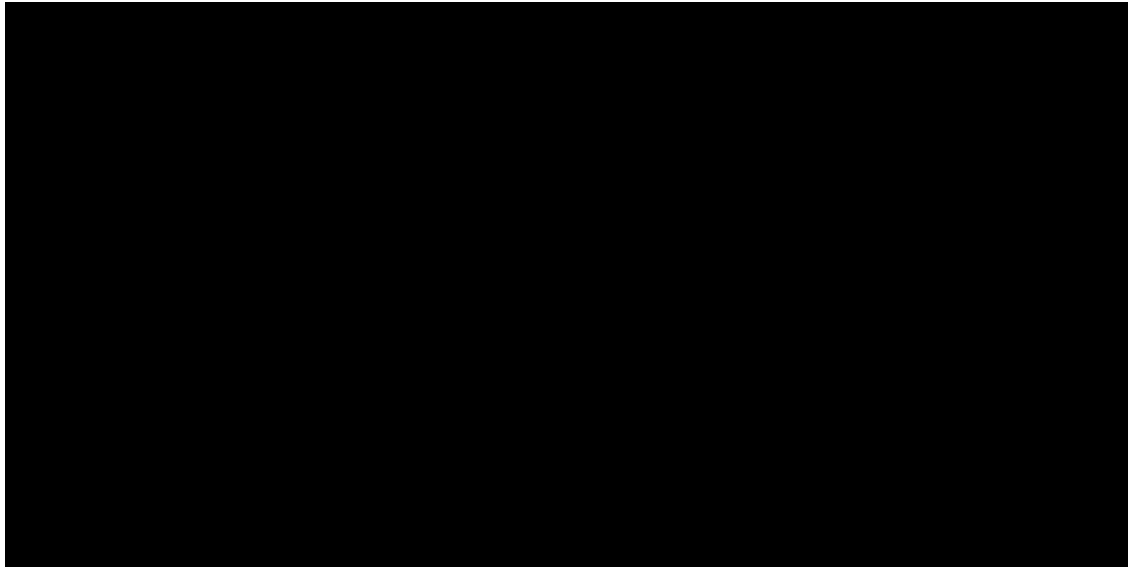


- Change referencing style



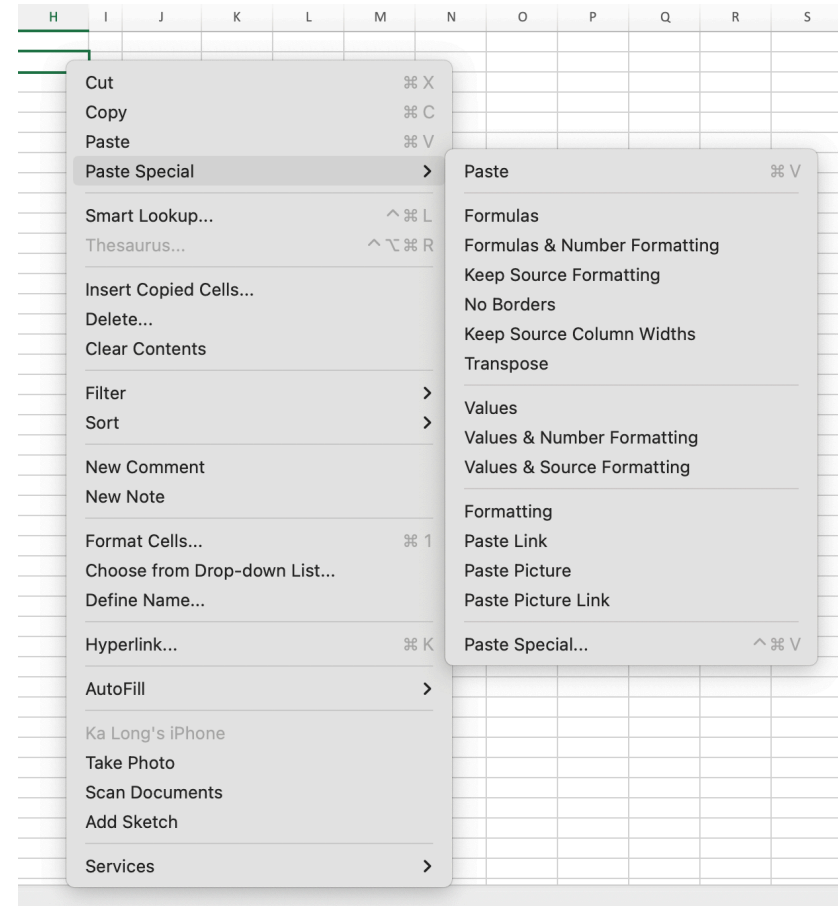
# Resize width and height

1. Select all
2. Double click the height line or width line



# Paste special

- Transpose
- Values



# Chapter 3

## Using Table in Excel



# Feature of Table in Excel

- Column header row
  - Unique header name
- Body
- Total row
  - Disable by default
  - Build-in function (SUM / AVERAGE)
  - Custom function

	A	B	C	D	E
1	OrderNo	SalesOrderLineKey	OrderQuantity	ItemCost	ItemPrice
2	SO43697	43697001	1	\$2,171.29	\$3,578.27
3	SO43698	43698001	1	\$1,912.15	\$3,399.99
4	SO43699	43699001	1	\$1,912.15	\$3,399.99
5	SO43700	43700001	1	\$413.15	\$699.10
6	SO43701	43701001	1	\$1,912.15	\$3,399.99
7	SO43702	43702001	1	\$2,171.29	\$3,578.27
8	SO43703	43703001	1	\$2,171.29	\$3,578.27
9	SO43704	43704001	1	\$1,898.09	\$3,374.99
10	SO43705	43705001	1	\$1,912.15	\$3,399.99
11	SO43706	43706001	1	\$2,171.29	\$3,578.27
12	SO43707	43707001	1	\$2,171.29	\$3,578.27
13	Total		11	\$20,816.29	\$35,565.40

# Benefit of using Table

## Structured referencing

- Automatically updates as data is added

```
1  =[colName]
```

## Data quality

- Automatically add new column
- Build-in filtering and sorting
- Data validation automatically updates
- Re-size table to add or remove data

# Chapter 4

## Basic Functions in Excel

# Type of functions in Excel

- Operations
- Command button in Ribbon
  - Data validation
  - Conditional formatting
  - Remove duplicates
  - Flash fill
  - Split text to columns
- Function
  - Aggregate
  - Text
  - Date & Time
  - Maths
  - Logical
  - Lookup

# Operations

Symbol	Operation
+	Addition
-	Subtraction
*	Multiplication
/	Division
^	Exponentiation

Symbol	Operation
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
<>	Not equal
=	Equal to

# Aggregate function

```
1  =SUM(A2:A10)
2  =AVERAGE(A2:A10)
3  =MAX(A2:A10)
4  =MIN(A2:A10)
5  =COUNT(A2:A10)
6  =COUNTBLANK(A2:A10)
```

# Text function

```
1  =LEFT()  
2  =RIGHT()  
3  =TRIM()  
4  =CLEAN()  
5  =CONCAT()  
6  =CONCATENATE()  
7  =TEXTJOIN()  
8  =TEXTSPLIT()  
9  =UPPER()  
10 =LOWER()  
11 =PROPER()  
12 =LEN()  
13 =REPLACE()  
14 =SUBSTITUTE()
```

# Date & Time function

## Date

```
1  =DATE()  
2  =YEAR()  
3  =MONTH()  
4  =DAY()  
5  =DAYS()  
6  =TODAY()  
7  =WEEKDAY()  
8  =WEEKNUM()
```

## Time

```
1  =TIME()  
2  =NOW()  
3  =HOUR()  
4  =MINUTE()  
5  =SECOND()
```



# Maths function

```
1  =ROUND()  
2  =ABS()  
3  =INT()
```

# Logical function

```
1  =AND()  
2  =OR()  
3  =NOT()  
4  =ISNUMBER()  
5  =ISERROR()  
6  =ISERR()  
7  =ISBLANK()  
8  =IF()  
9  =IFS()  
10 =IFERROR()
```

# Logical + Aggregate function

[Aggregate][Logical]()

```
1 =COUNTIF()  
2 =COUNTIFS()  
3 =SUMIF()  
4 =SUMIFS()  
5 =AVERAGEIF()  
6 =AVERAGEIFS()
```

D[Aggregate]()

```
1 =DMAX()  
2 =DMIN()
```

# Lookup function

```
1 =VLOOKUP()
```

# Other useful function

```
1  =INDEX()  
2  =INDIRECT()  
3  =OFFSET()  
4  =LARGE()  
5  =SMALL()  
6  =ROW()  
7  =ROWS()  
8  =COLUMN()  
9  =COLUMNS()  
10 =CHOOSE()  
11 =SEARCH()  
12 =FIND()  
13 =MATCH()
```

# Other useful function only in Excel 2021 or Excel Web

```
1  =SORT()  
2  =SORTBY()  
3  =UNIQUE()  
4  =FILTER()  
5  =XLOOKUP()  
6  =XMATCH()  
7  =SWITCH()
```

# Wildcards in Excel

Use to match pattern in function

- Find and Replace
- Conditional Formatting
- Filter
- SEARCH()
- XMATCH()
- [Aggregate][Logical]()

Symbol	Meaning
?	1 character
*	0 or more character
~	Escape wildcards

# Use case

- Find the unique value
- Combine two table (Vlook + Column)
- Data validation with function
- Conditional formatting with function



# Pivot Tables

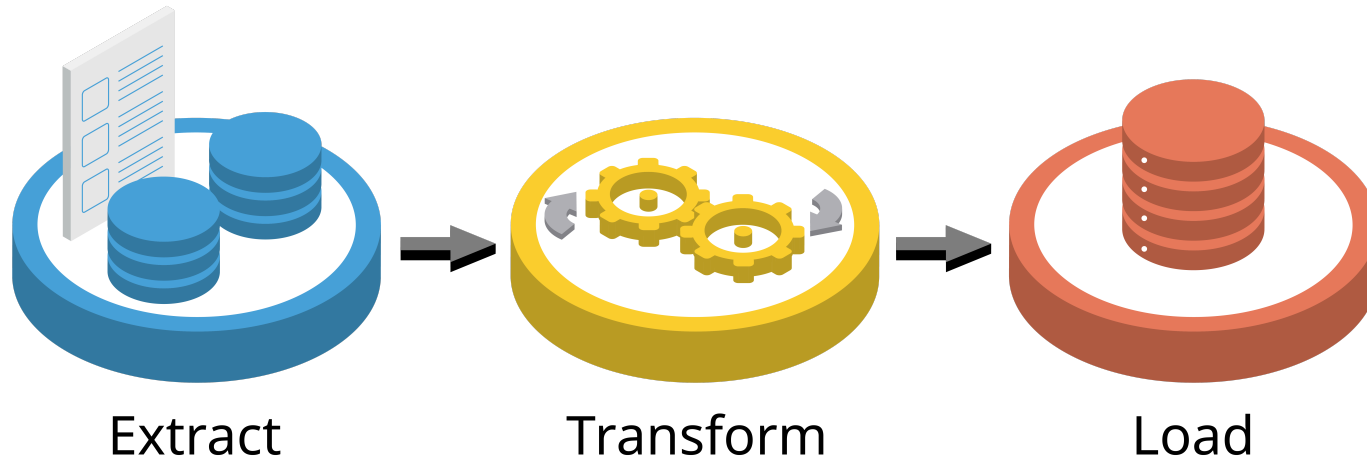
## Benefit

- Aggregate and organize data in dynamic tables
- Transform rows to columns, or vice versa
- Group, filter, aggregate without need to make changes

# Chapter 5

## Power Query in Excel

# Big data era

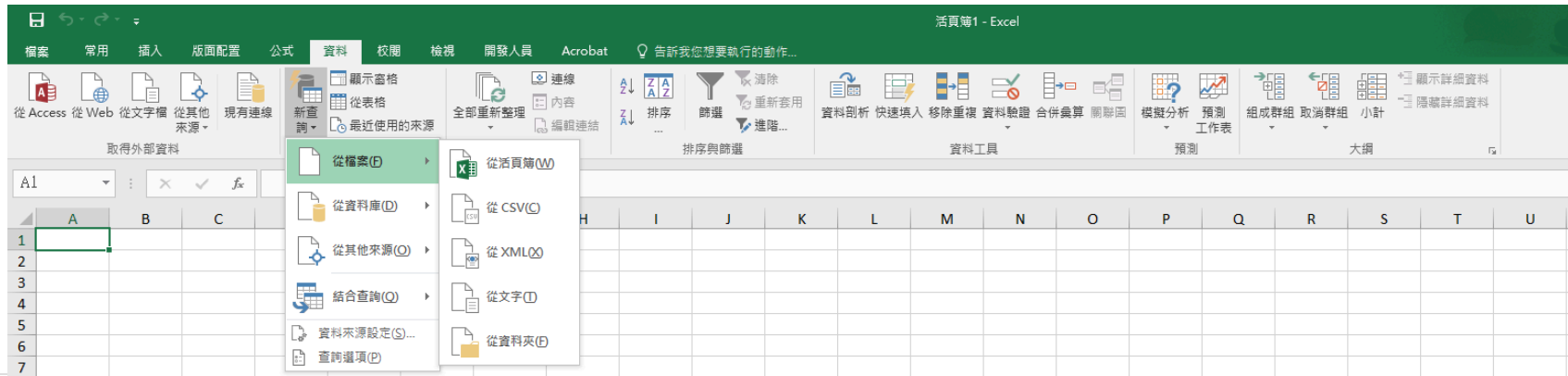


# Benefit of power query

- Combine data from different source
- Keep track of every step in the workflow
- Easy to do every step in workflow
- Update the analytics when the data source update
- Ensure the reproducibility

# Import data

- Single file
- Multiple files with same structure
- Multiple sheets in Excel with same structure
- File from Onedrive Business (BOKSS)



# Transform

- Modify current column
- Add new column

Sheet1 - Power Query 編輯器

檔案 常用 轉換 新增資料行 檢視表

關閉並載入 重新整理預覽 內容 進階編輯器 選擇資料行 移除資料行 保留資料列 移除資料列 分割資料行 分組依據 資料類型: 日期 使用第一個資料列作為標頭 合併查詢 附加查詢 合併檔案 管理參數 資料來源設定 新來源 最近使用的來源

關閉 查詢 管理資料行 縮減資料列 排序 轉換 合併 參數 資料來源 新增查詢

fx = Table.TransformColumnTypes(已將標頭升階,{{"date", type date}, {"pageTitle", type text}, {"fullPageUrl", type text}, {"pagePath", type text}, {"eventName", type text}, {"hostName", type text}})

	date	pageTitle	fullPageUrl	pagePath	eventName	hostName
1	1/13/2022	線上精神健康自助平台	refresh.bokss.org.hk/	/	user_engagement	refresh.bokss.org.hk
2	1/13/2022	線上精神健康自助平台	refresh.bokss.org.hk/	/	page_view	refresh.bokss.org.hk
3	1/13/2022	線上精神健康自助平台	refresh.bokss.org.hk/	/	session_start	refresh.bokss.org.hk
4	1/13/2022	線上精神健康自助平台	www.refresh.bokss.org.hk/	/	page_view	www.refresh.bokss.org.hk
5	1/13/2022	線上精神健康自助平台	www.refresh.bokss.org.hk/	/	user_engagement	www.refresh.bokss.org.hk
6	1/13/2022	線上精神健康自助平台	refresh.bokss.org.hk/	/	first_visit	refresh.bokss.org.hk

# Load

- Load to excel sheet
- Load to excel connection

Excel | 😊 | Sheet1 - Power Query 編輯器

檔案 常用 轉換 新增資料行 檢視表

關閉並載入 重新整理預覽 內容 進階編輯器 選擇資料行 移除資料行 保留資料列 移除資料列 排序 分割資料行 分組依據 資料類型: 日期 使用第一個資料列作 1 2 取代值 轉換

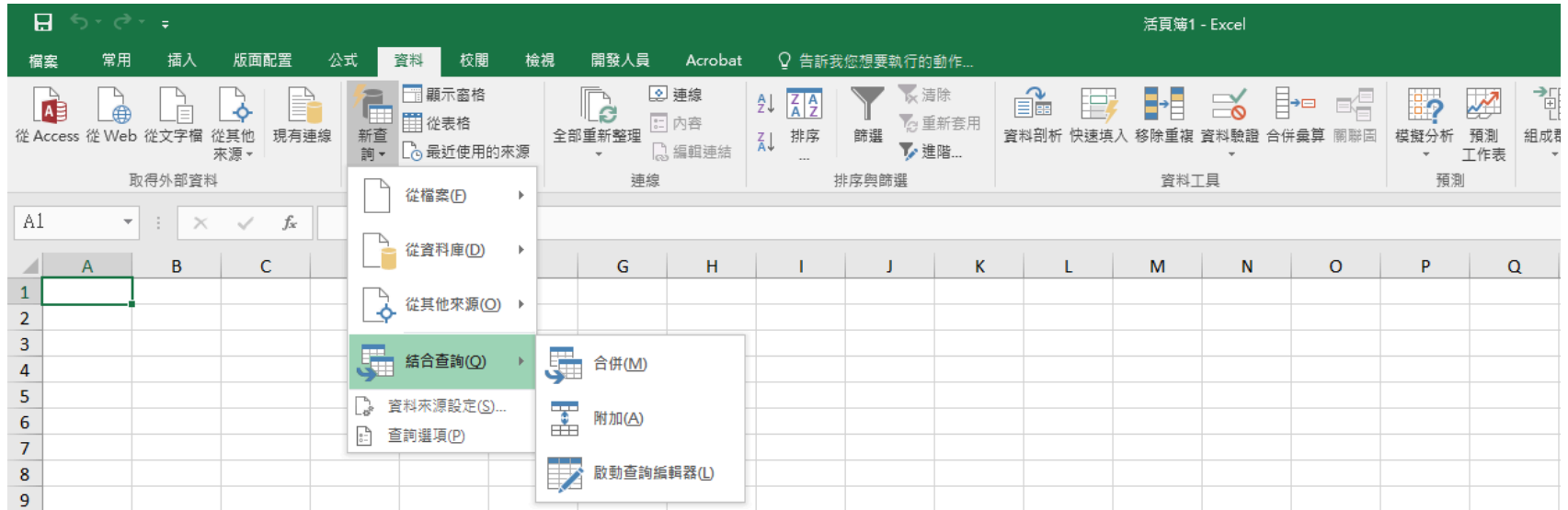
關閉並載入 關閉並載入至...

= Table.TransformColumnTypes(已將標頭升階,{{"date", type date}, {"pageTitle

	date	pageTitle	fullPageUrl
1	1/13/2022	線上精神健康自助平台	refresh.bokss.org.hk/
2	1/13/2022	線上精神健康自助平台	refresh.bokss.org.hk/
3	1/13/2022	線上精神健康自助平台	refresh.bokss.org.hk/

# Combine query

- Merge (Join or map)
- Append





# Different type of join

- Full join
- Left join or right join
- Inner join
- Anti join

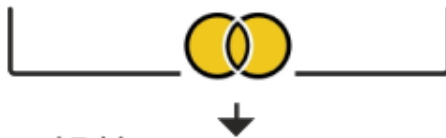
# Full join

Left Table

Date	CountryID	Units
1/1/2020	1	40
1/2/2020	1	25
1/3/2020	3	30
1/4/2020	2	35

Right Table

ID	Country
1	USA
2	Canada
3	Panama
4	Spain



Merged Table

Date	CountryID	Units	Country
1/1/2020	1	40	USA
1/2/2020	1	25	USA
1/4/2020	2	35	Canada
1/3/2020	3	30	Panama
null	null	null	Spain

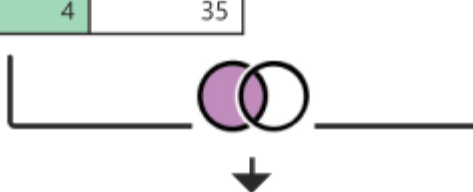
# Left join (Right join)

Left Table

Date	CountryID	Units
1/1/2020	1	40
1/2/2020	1	25
1/3/2020	3	30
1/4/2020	4	35

Right Table

ID	Country
1	USA
2	Canada
3	Panama



Merged Table

Date	CountryID	Units	Country
1/1/2020	1	40	USA
1/2/2020	1	25	USA
1/3/2020	3	30	Panama
1/4/2020	4	35	<i>null</i>

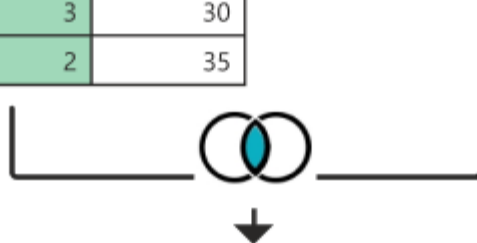
# Inner join

Left Table

Date	CountryID	Units
1/1/2020	1	40
1/2/2020	1	25
1/3/2020	3	30
1/4/2020	2	35

Right Table

ID	Country
3	Panama
4	Spain



Merged Table

Date	CountryID	Units	Country
1/3/2020	3	30	Panama

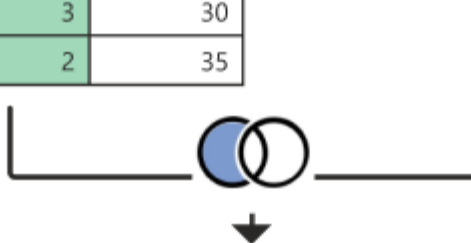
# Anti join

Left Table

Date	CountryID	Units
1/1/2020	1	40
1/2/2020	1	25
1/3/2020	3	30
1/4/2020	2	35

Right Table

ID	Country
3	Panama
4	Spain



Merged Table

Date	CountryID	Units	Country
1/1/2020	1	40	<i>null</i>
1/2/2020	1	25	<i>null</i>
1/4/2020	2	35	<i>null</i>

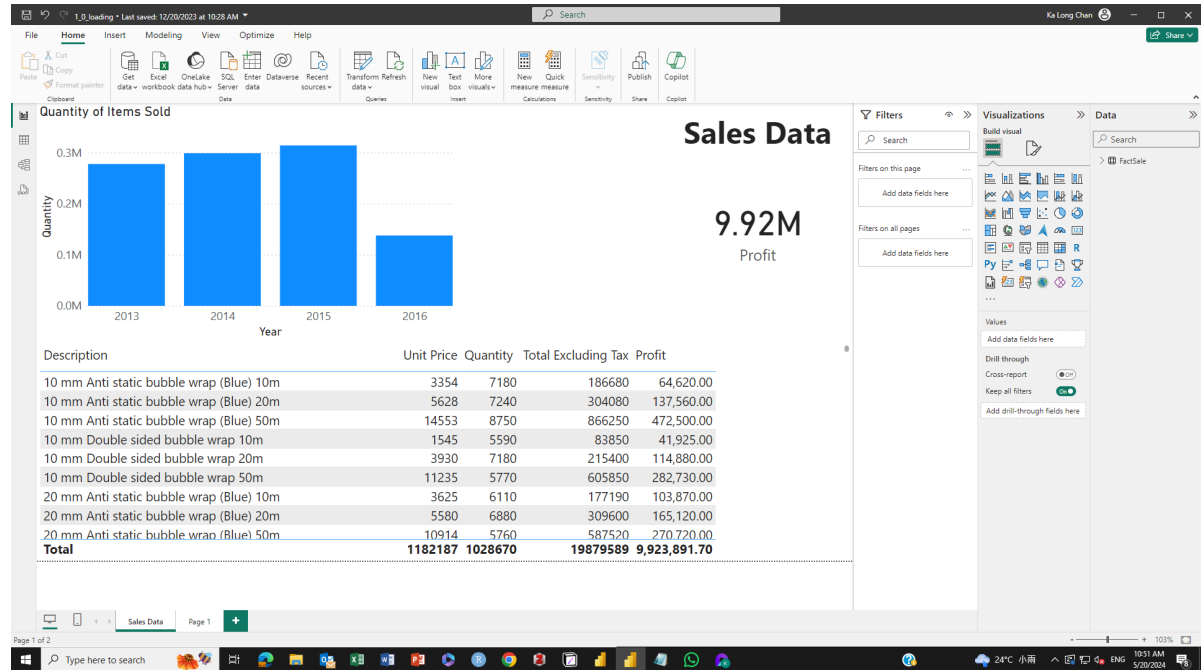
# Make your decision

# Chapter 6

## Power BI Navigation

# Report View

1. Canvas
2. Filters Pane
3. Visualization Pane
  - Build visual
  - Format page
4. Data Pane
5. Page Overview





# Table View

1. Data Grid

2. Data Pane

3. DAX Formula bar

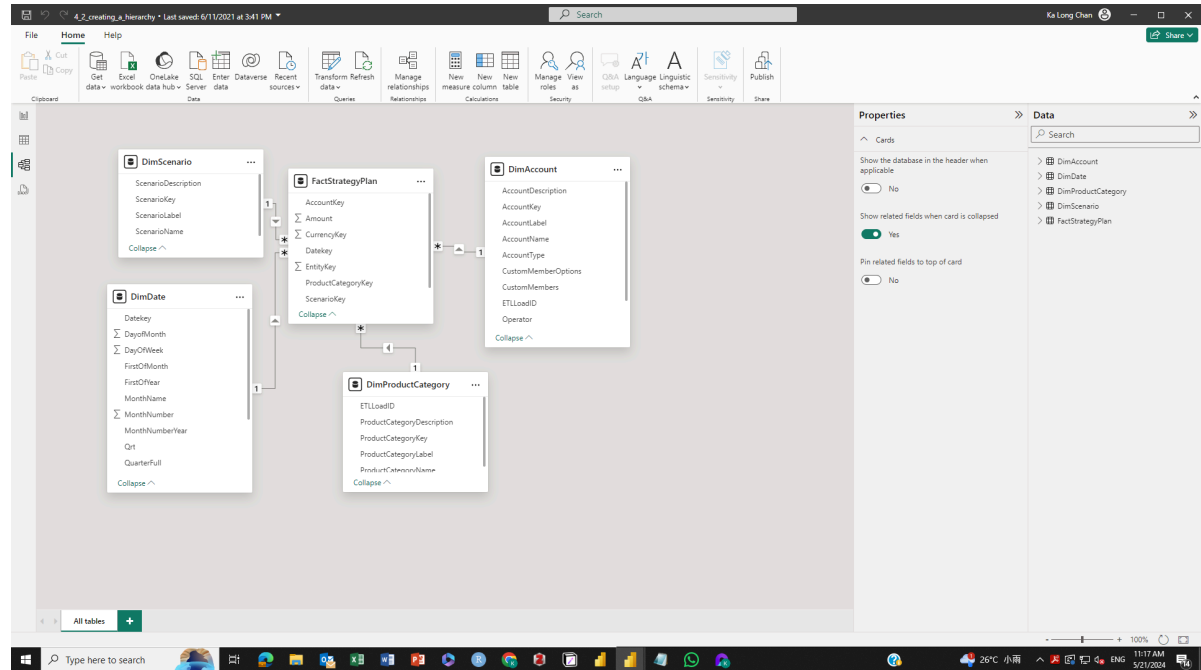
4. Table Tools

The screenshot displays the Microsoft Excel Table View interface. The main area is a data grid with columns: Sale Key, City Key, Customer Key, Bill To Customer Key, Stock Item Key, Invoice Date Key, Delivery Date Key, Salesperson Key, WWI Invoice ID, and Description. The data pane on the right shows a search bar and a list of table relationships. The DAX formula bar at the bottom shows the formula: Table: FactSale [D6:397 row].

Sale Key	City Key	Customer Key	Bill To Customer Key	Stock Item Key	Invoice Date Key	Delivery Date Key	Salesperson Key	WWI Invoice ID	Description	Package	Quan
49532	89925	0	0	192	Wednesday, October 23, 2013	Thursday, October 24, 2013	85	15267	DBA joke mug - two types of DBAs (White)	Each	
49901	89925	0	0	194	Friday, October 25, 2013	Saturday, October 26, 2013	84	15380	DBA joke mug - SELECT caffeine FROM mug (White)	Each	
50461	72125	0	0	204	Monday, October 28, 2013	Tuesday, October 29, 2013	81	15551	DBA joke mug - mind if I join you? (White)	Each	
51171	72084	0	0	188	Friday, November 1, 2013	Saturday, November 2, 2013	74	15772	DBA joke mug - it depends (White)	Each	
52175	47741	0	0	188	Friday, November 8, 2013	Saturday, November 9, 2013	86	16085	Developer joke mug - that's a hardware problem (White)	Each	
52415	47134	0	0	179	Saturday, November 9, 2013	Sunday, November 10, 2013	39	16149	Developer joke mug - (hip, hip array) (Black)	Each	
53369	72125	0	0	197	Friday, November 15, 2013	Saturday, November 16, 2013	91	16433	DBA joke mug - it depends (Black)	Each	
55529	47741	0	0	184	Wednesday, November 27, 2013	Thursday, November 28, 2013	74	17086	Developer joke mug - when your hammer is C++ (White)	Each	
57230	87653	0	0	174	Saturday, December 7, 2013	Sunday, December 8, 2013	86	17651	Developer joke mug - a fox walks into a bar (White)	Each	
57659	48763	0	0	197	Tuesday, December 10, 2013	Wednesday, December 11, 2013	90	17755	DBA joke mug - it depends (Black)	Each	
57922	47855	0	0	191	Thursday, December 12, 2013	Friday, December 13, 2013	81	17840	DBA joke mug - two types of DBAs (Black)	Each	
57987	47757	0	0	197	Friday, December 13, 2013	Saturday, December 14, 2013	39	17862	DBA joke mug - it depends (Black)	Each	
58841	44233	0	0	167	Thursday, December 19, 2013	Friday, December 20, 2013	86	18131	IT joke mug - keyboard not found ... press F1 to continue (Black)	Each	
58854	72610	0	0	167	Thursday, December 19, 2013	Friday, December 20, 2013	81	18125	IT joke mug - keyboard not found ... press F1 to continue (Black)	Each	
59954	47757	0	0	187	Wednesday, December 25, 2013	Thursday, December 26, 2013	81	18463	Developer joke mug - that's a hardware problem (Black)	Each	
1365	47741	0	0	182	Wednesday, January 9, 2013	Thursday, January 10, 2013	9	497	Developer joke mug - inheritance is the OO way to become wealthy (White)	Each	
2524	72610	0	0	170	Tuesday, January 15, 2013	Wednesday, January 16, 2013	19	834	Developer joke mug - old C developers never die (White)	Each	
2686	65578	0	0	198	Thursday, January 17, 2013	Friday, January 18, 2013	25	925	DBA joke mug - it depends (White)	Each	
3135	48762	0	0	170	Friday, January 18, 2013	Saturday, January 19, 2013	12	1019	Developer joke mug - old C developers never die (White)	Each	
3880	47757	0	0	181	Friday, January 25, 2013	Saturday, January 26, 2013	35	1245	Developer joke mug - inheritance is the OO way to become wealthy (Black)	Each	
4042	47855	0	0	181	Friday, January 25, 2013	Saturday, January 26, 2013	11	1294	Developer joke mug - inheritance is the OO way to become wealthy (Black)	Each	
5138	48762	0	0	203	Thursday, January 31, 2013	Friday, February 1, 2013	30	1604	DBA joke mug - mind if I join you? (Black)	Each	
7439	65578	0	0	187	Saturday, February 16, 2013	Sunday, February 17, 2013	36	2291	Developer joke mug - that's a hardware problem (Black)	Each	
8290	48937	0	0	187	Saturday, February 23, 2013	Sunday, February 24, 2013	49	2551	DBA joke mug - it depends (Black)	Each	
11247	40971	0	0	199	Tuesday, March 12, 2013	Wednesday, March 13, 2013	19	3451	DBA joke mug - you might be a DBA if (Black)	Each	
11393	44333	0	0	197	Wednesday, March 13, 2013	Thursday, March 14, 2013	52	3497	DBA joke mug - it depends (Black)	Each	
11449	49233	0	0	174	Thursday, March 14, 2013	Friday, March 15, 2013	40	3515	Developer joke mug - a fox walks into a bar (White)	Each	
13376	47432	0	0	168	Monday, March 25, 2013	Tuesday, March 26, 2013	51	4154	IT joke mug - keyboard not found ... press F1 to continue (White)	Each	
13424	72084	0	0	198	Monday, March 25, 2013	Tuesday, March 26, 2013	52	4117	DBA joke mug - it depends (White)	Each	
14115	49233	0	0	198	Friday, March 29, 2013	Saturday, March 30, 2013	19	4330	DBA joke mug - it depends (White)	Each	
14517	48851	0	0	175	Monday, April 1, 2013	Tuesday, April 2, 2013	39	4458	Developer joke mug - there are 10 types of people in the world (Black)	Each	
14863	48763	0	0	192	Wednesday, April 3, 2013	Thursday, April 4, 2013	39	4564	DBA joke mug - two types of DBAs (White)	Each	
17462	66176	0	0	201	Thursday, April 18, 2013	Friday, April 19, 2013	39	5388	DBA joke mug - database is (Black)	Each	
18686	41568	0	0	169	Thursday, May 2, 2013	Friday, May 3, 2013	36	6129	IT joke mug - that behavior is by design (Black)	Each	
22615	47741	0	0	169	Friday, May 17, 2013	Saturday, May 18, 2013	68	6965	Developer joke mug - old C developers never die (Black)	Each	
25649	47692	0	0	168	Tuesday, June 4, 2013	Wednesday, June 5, 2013	49	7898	IT joke mug - keyboard not found ... press F1 to continue (White)	Each	
26472	49233	0	0	182	Friday, June 7, 2013	Saturday, June 8, 2013	72	8150	Developer joke mug - inheritance is the OO way to become wealthy (White)	Each	

# Model View

1. Data Model
2. Data Pane
3. Properties Pane



# DAX Query View

DAX queries will be saved to your model. They won't be visible when published in the Power BI service. [Learn more](#)

**Run** [Share feedback](#)

```

1 // Learn more about DAX queries at https://aka.ms/dax-queries
2
3 // Here is a sample DAX query from your model, click 'Run'
4 // Try other DAX queries by right clicking a table, column, or measure in the data pane and choosing one from 'Quick queries'
5 EVALUATE
6 TOPN(10, 'FactStrategyPlan')

```

**Data** Search

- DimAccount
- DimDate
- DimProductCategory
- DimScenario
- FactStrategyPlan

**Results** Result 1 of 1 Copy

	FactStrategyPlan[Strate...	FactStrategyPlan[Date...	FactStrategyPlan[Entire...	FactStrategyPlan[Scenar...	FactStrategyPlan[Accou...	FactStrategyPlan[Curren...	FactStrategyPlan[Produc...	FactStrategyPlan[Amou...
1	84776	10/1/2019 12:00:00 AM	895	1	5	1	3	98046.06
2	85426	10/1/2019 12:00:00 AM	812	1	5	1	3	109234.1
3	85595	10/1/2019 12:00:00 AM	698	1	5	1	3	68131.29
4	85917	10/1/2019 12:00:00 AM	926	1	5	1	3	127200.62
5	86006	10/1/2019 12:00:00 AM	717	1	5	1	3	82465.22
6	86288	10/1/2019 12:00:00 AM	748	1	5	1	3	48255.24
7	86346	10/1/2019 12:00:00 AM	945	1	5	1	3	2213897.81
8	86502	10/1/2019 12:00:00 AM	831	1	5	1	3	79593.24
9	86801	10/1/2019 12:00:00 AM	862	1	5	1	3	65712.36
10	87101	10/1/2019 12:00:00 AM	736	1	5	1	3	61360.31

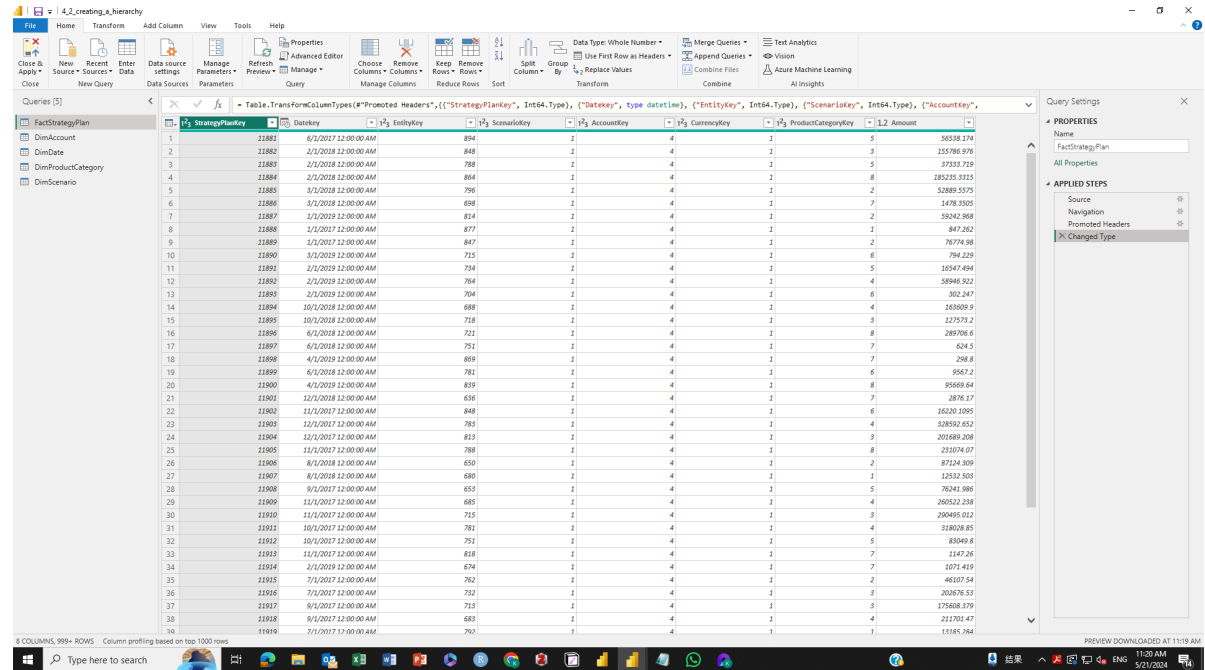
Query 1 +

Success (83.9 ms) Query 1 of 1 Result 1 of 1 8 columns, 10 rows

11:18 AM 5/21/2024

# Power Query Editor

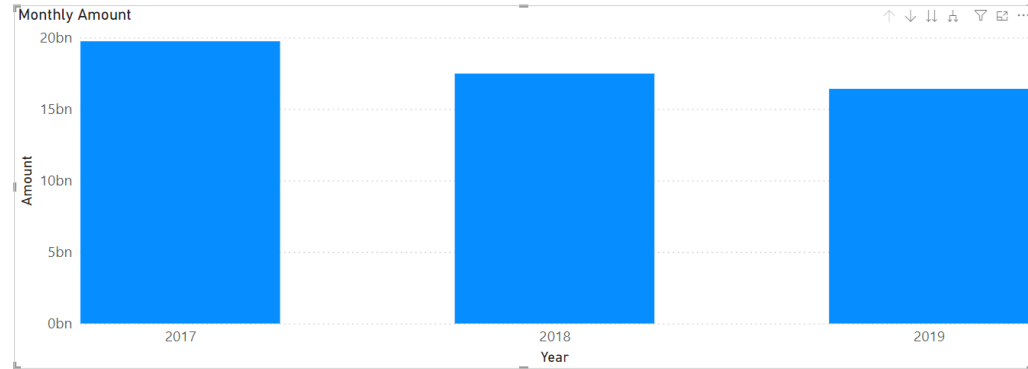
1. Query Editor Ribbon
2. Queries Pane
3. Query Setting
4. Status Bar
5. Table Pane



# Drilling Down

## 1. Date

- Auto create Date Table
- Mark as Date Table
- Using DAX
- Using Power Query (M)

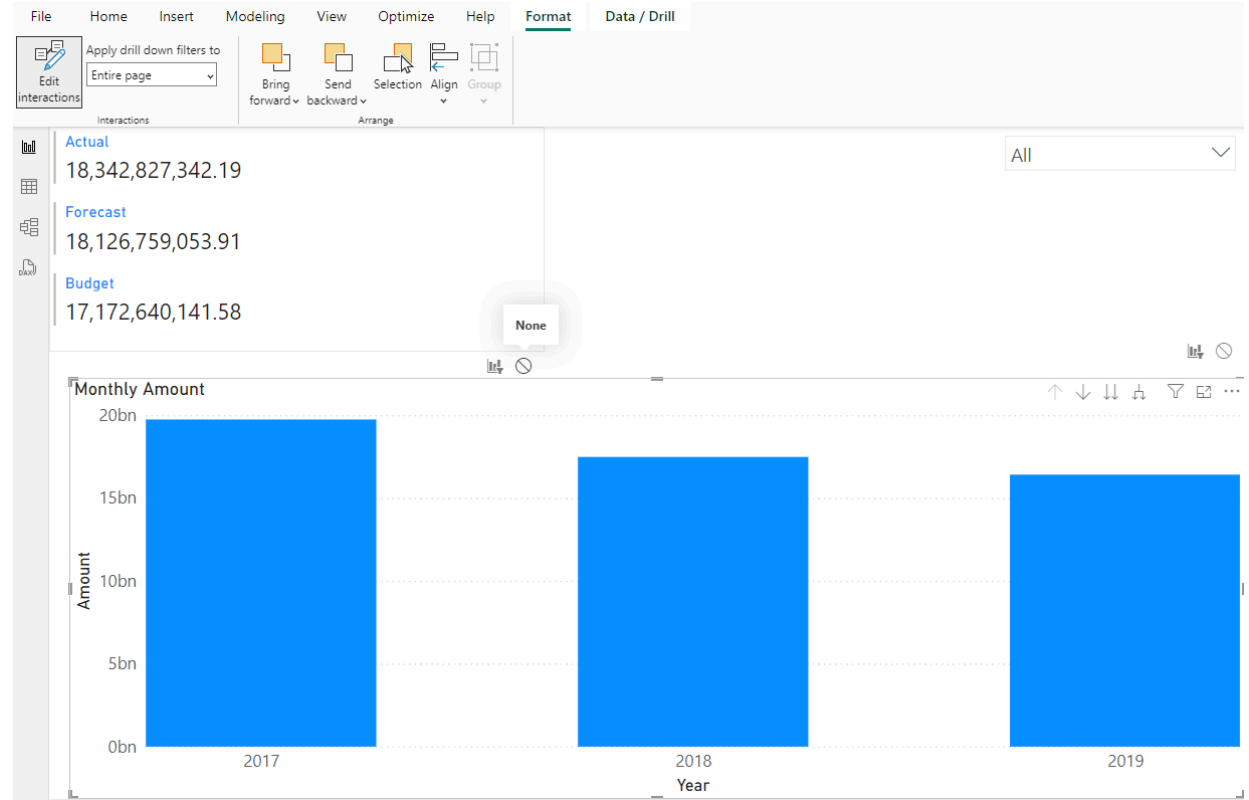


## 2. Custom Hierarchies

- Department -> Unit -> Team

# Filter

1. Visual Level
2. Page Level
3. Report Level
4. Slicer
5. Interactions



# Sorting

1. Sort in Table View
2. sort in Visual
3. Sort by column

The screenshot shows the Excel ribbon with the 'Table tools' and 'Column tools' tabs. The 'ShortMonth' column is selected, and the 'Sort by column' dropdown menu is open, showing options like Datekey, DayOfMonth, DayOfWeek, FirstOfMonth, FirstOfYear, MonthName, MonthNumber, MonthNumberYear, Qrt, QuarterFull, QuarterYear, week, WeekNumber, and Year.

Datekey	DayOfMonth	MonthNumber	FirstOfMonth	ShortMonth	MonthName
Thursday, January 1, 2015	1	1	Thursday, January 1, 201	Jan	January
Friday, January 2, 2015	2	1	Thursday, January 1, 201	Jan	January
Saturday, January 3, 2015	3	1	Thursday, January 1, 201	Jan	January
Sunday, January 4, 2015	4	1	Thursday, January 1, 201	Jan	January
Monday, January 5, 2015	5	1	Thursday, January 1, 201	Jan	January
Tuesday, January 6, 2015	6	1	Thursday, January 1, 201	Jan	January
Wednesday, January 7, 2015	7	1	Thursday, January 1, 201	Jan	January
Thursday, January 8, 2015	8	1	Thursday, January 1, 201	Jan	January
Friday, January 9, 2015	9	1	Thursday, January 1, 201	Jan	January
Saturday, January 10, 2015	10	1	Thursday, January 1, 201	Jan	January
Sunday, January 11, 2015	11	1	Thursday, January 1, 201	Jan	January
Monday, January 12, 2015	12	1	Thursday, January 1, 201	Jan	January
Tuesday, January 13, 2015	13	1	Thursday, January 1, 201	Jan	January
Wednesday, January 14, 2015	14	1	Thursday, January 1, 201	Jan	January
Thursday, January 15, 2015	15	1	Thursday, January 1, 201	Jan	January
Friday, January 16, 2015	16	1	Thursday, January 1, 201	Jan	January
Saturday, January 17, 2015	17	1	Thursday, January 1, 201	Jan	January
Sunday, January 18, 2015	18	1	Thursday, January 1, 201	Jan	January
Monday, January 19, 2015	19	1	Thursday, January 1, 201	Jan	January
Tuesday, January 20, 2015	20	1	Thursday, January 1, 201	Jan	January
Wednesday, January 21, 2015	21	1	Thursday, January 1, 201	Jan	January
Thursday, January 22, 2015	22	1	Thursday, January 1, 201	Jan	January
Friday, January 23, 2015	23	1	Thursday, January 1, 201	Jan	January

# Chapter 7

DAX in Power BI



# What is DAX

- **Data Analysis eXpressions**
- Based on Excel formulas and functions
- Create calculated columns, measures, tables
- DAX reference
  - <https://docs.microsoft.com/en-us/dax/dax-function-reference>

# Calculated columns

- Calculate at row level
- Add new column to existing table
- Based on Excel formulas and functions
- Calculate when data is refreshed

```
1 new_column = Sales[Price] + Sales[Tax]
```

# Calculated measures

- Aggregates multiple rows
- Add a new field for visualization
- Calculated when you interact with the visuals
- Two ways
  - from scratch
  - use Quick Measure

# Context of DAX

Aspect	Custom column	Calculate column	Calculated table	Measure	Visual calculation
Language	M	DAX	DAX	DAX	DAX
Computed at	Data refresh	Data refresh	Data refresh	On demand	On demand
Persistence	Results saved	Results saved	Results saved	Calculated as required	Calculated as required
Context	Row	Row	Row	Filter	Visual
Stored in	Table	Model	Model	Model	Visual
Changes with user interaction in report	No	No	No	Yes	Yes
Usage	Slicers, filters, rows, columns	Slicers, filters, rows, columns	In a measure, calculated column, or visual calculation definition	Value in a visual and visual level filter	Value in a visual and visual level filter

reference

# Row Context

- Use current row (all row)
- Custom column (M language)
- Calculated columns

```
1 Sales[Price] * Sales[Tax]
```

# Filter Context

- Filter before calculation is carried out
- Calculated measures
  - Aggregates on the calculated columns

```
1 SUM(Sales[Profit])
2
3 SUMX(<table>, <expression>)
4 SUMX(Sales, Sales[Price] * Sales[Tax])
5 SUMX(FILTER(Sales, Sales[Region]="EMEA"), Sales[Price] * Sales[Tax])
6
7 CALCULATE(<expression>, <filter1>, ...other filter conditions)
8 CALCULATE(SUM(Sales), Sales[Region]="EMEA")
```

# VAR and RETURN

- Useful for complex calculation

```
1 Sales YoY Growth % =  
2 DIVIDE(  
3     ([Sales] - CALCULATE([Sales], PARALLELPERIOD('Date'[Date], -12, MONTH))),  
4     CALCULATE([Sales], PARALLELPERIOD('Date'[Date], -12, MONTH))  
5 )
```

```
1 Sales YoY Growth % =  
2 VAR SalesPriorYear =  
3     CALCULATE([Sales], PARALLELPERIOD('Date'[Date], -12, MONTH))  
4 RETURN  
5     DIVIDE(([Sales] - SalesPriorYear), SalesPriorYear)
```

# Chapter 8

M language in Power BI



# What is M language

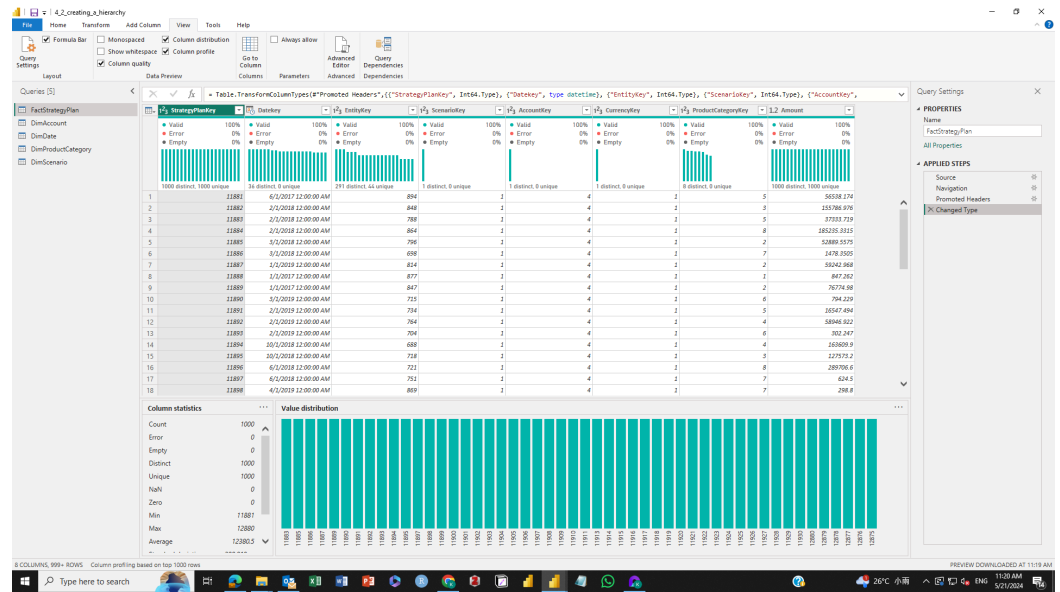
- programme language use in Power Query
- all action in Power Query will be convert to M language
- You can write M language manually in
  - Custom Column
  - Formula bar
  - Advanced Editor
- M language reference
  - <https://learn.microsoft.com/en-us/powerquery-m/>

# Chapter 9

Power Query in Power BI

# Data preview

- Quick analyze the data in power query
- Helps diagnose errors and inconsistencies
- Helps you decide what transformation(s) to use



# Data Transform

- Pivot column : reshape data for report
- unpivot column: reshape data for data analysis
- Transpose: swap column and row name
- Group by

# Chapter 10

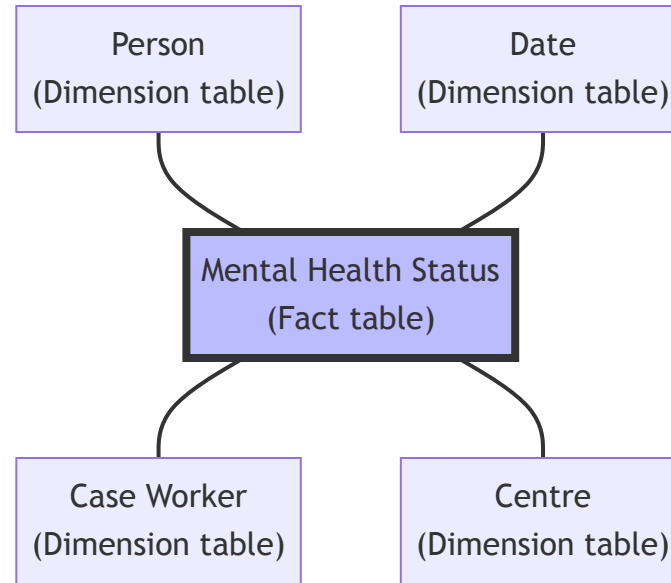
## Data Model in Power BI

# What is data model

- Tables
- Columns
- Data types
- Relationship between tables
- Keys

# Star Schema

- Facts table: metrics
  - Facts (measures)
  - Keys: use to build relationship between tables
- Dimensions table: context
- Benefit
  - Reduce file size
  - Reduce redundant data
  - Easy to manage



# Fact table

- Make up of
  - Facts (measures)
  - Keys: use to build relationship between tables
- Fact tables are long and narrow
  - Lots of rows
  - Fewer columns

id	centre_id	depression_score
1	1	10
2	1	15
3	2	12
4	2	19
5	3	20



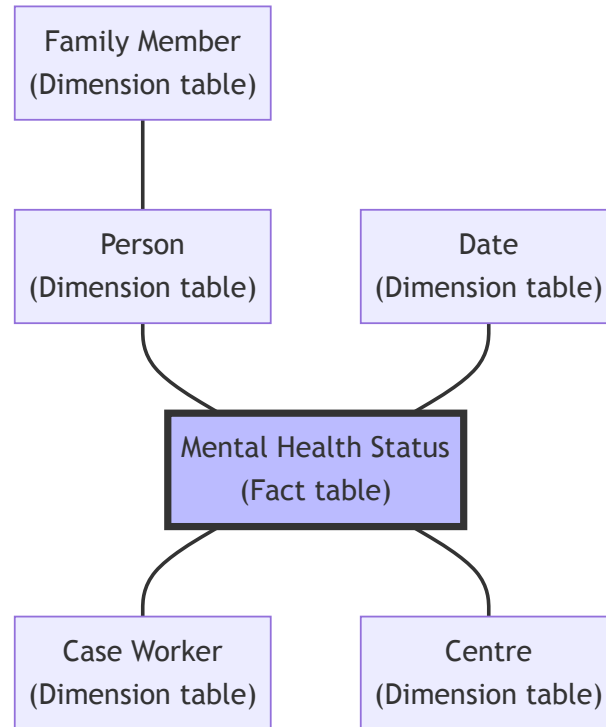
# Dimension table

- Provide context
- Shared concepts
- Contain static data
- Dimension tables are short and wide
  - Few of rows
  - Lots of columns

centre_id	name_centre	district_centre
1	ICCMW (Kwai Tsing)	KT
2	ICCMW (Wan Chai)	WC
3	ICCMW (Eastern)	HKE

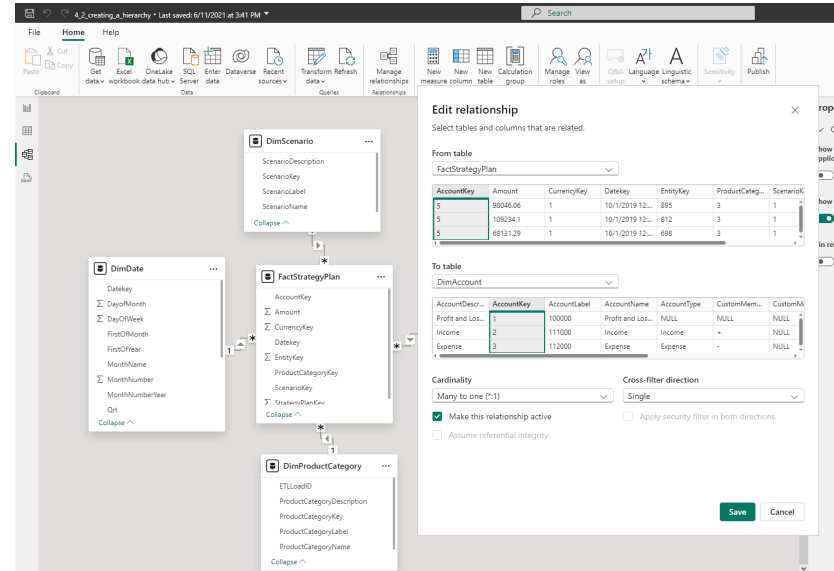
# Snowflake Schema

- Allows relationships between dimensions
- Fact table(s) remain the same
- Benefit
  - Reduce file size
  - Reduce redundant data
  - Easy to manage



# Build data model in Power BI

- Power BI will define relationship automatically
- You can also define relationship between tables in Model View
  - One-to-many relationship
  - Many-to-many relationship
  - One-to-one relationship
- Each pair of table can have more than one relationship



# Build data model in Power BI

- If more than one relationships
  - Set the active relationship in Model View
  - using DAX to activate the relationship when calculating a measure

```
1 = CALCULATE(SUM(InternetSales[SalesAmount]), USERELATIONSHIP(InternetSales[ShippingDate], DateTime[Date]))
```

# Chapter 11

Advanced use case in Power BI

# Advanced use case in Power BI

- Button and action
- Mobile View
- Publish
- Drill-through and tooltip
- Bookmark

# Button and action

- Create a App-like experience
- Add action to buttons
- Actions
  - Negative between pages
  - Filter
  - Bookmark

# Chapter 12

Integration with Other Microsoft Product



# Integration

- Microsoft Power Automate
- Microsoft Forms
- Microsoft Fabric
- Microsoft Power App (Less use in our case)

# Microsoft Forms + Power Automate

1. Collect data using Forms
2. Data of Microsoft Forms -> Excel (Power Automate)
3. Add workflow to the Forms
  - Send email
  - Make approval
  - Add new column
  - Conditional control

# Microsoft Fabric

1. Excel data -> Lakehouse (Dataflow)
2. Power BI or Notebook
3. Create Scorecard / Alert
4. Trigger another workflow using Power Automate