

# 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 of various data-related terms in different colors and sizes. The words are arranged in a roughly circular pattern. The colors include shades of orange, red, purple, and blue. The sizes of the words vary, with 'assessment' and 'name' being the largest.

assessment  
happiness name calendar  
app distance address 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

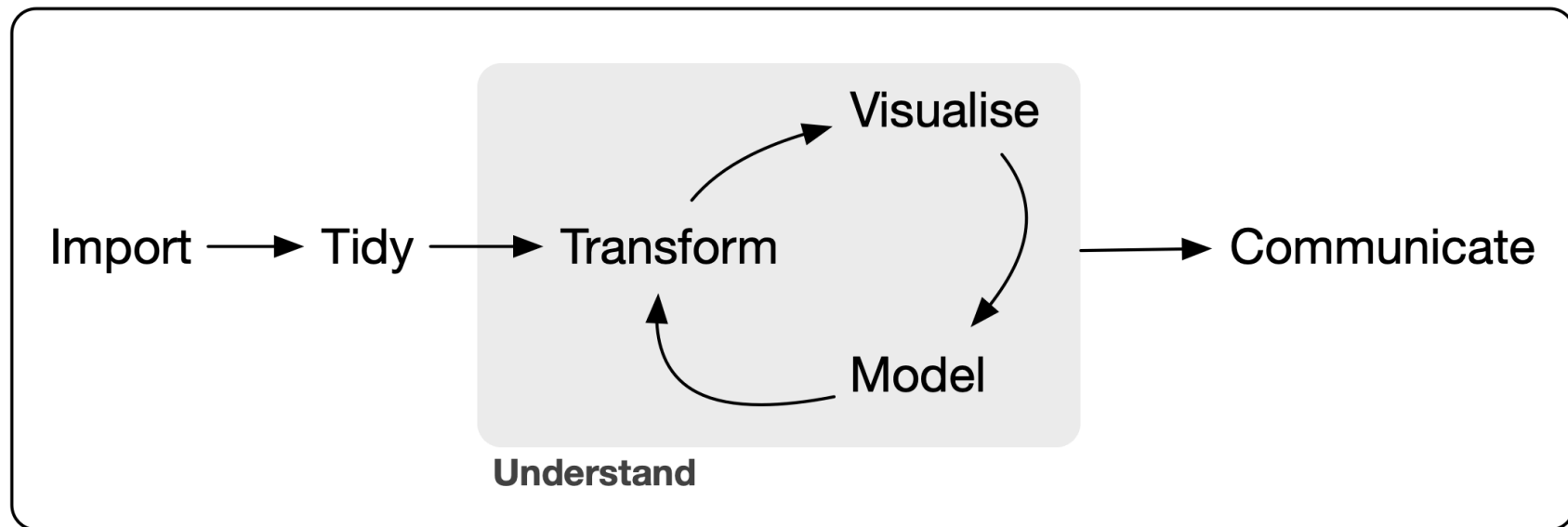
- Categorical data
- Group into categories

## Examples

- Gender
- Holiday

# Workflow of Data Science

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





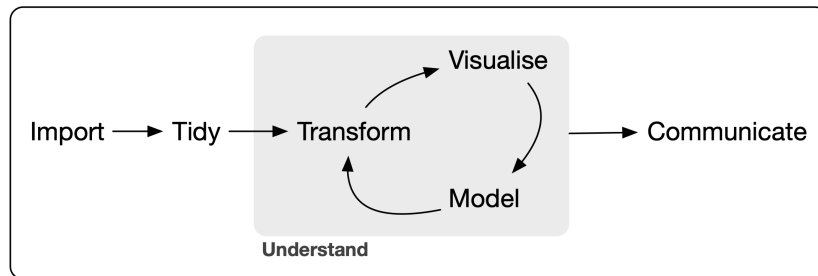
# Workflow of Data Science

## 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



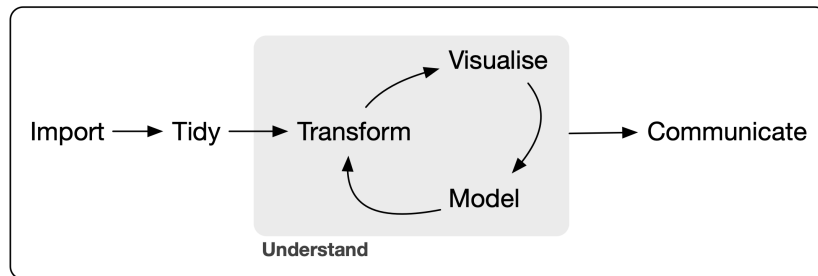
# Workflow of Data Science

## 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



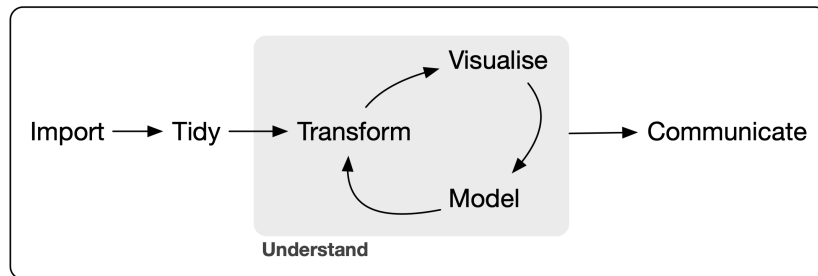
# Workflow of Data Science

## Modeling

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

## Communicate

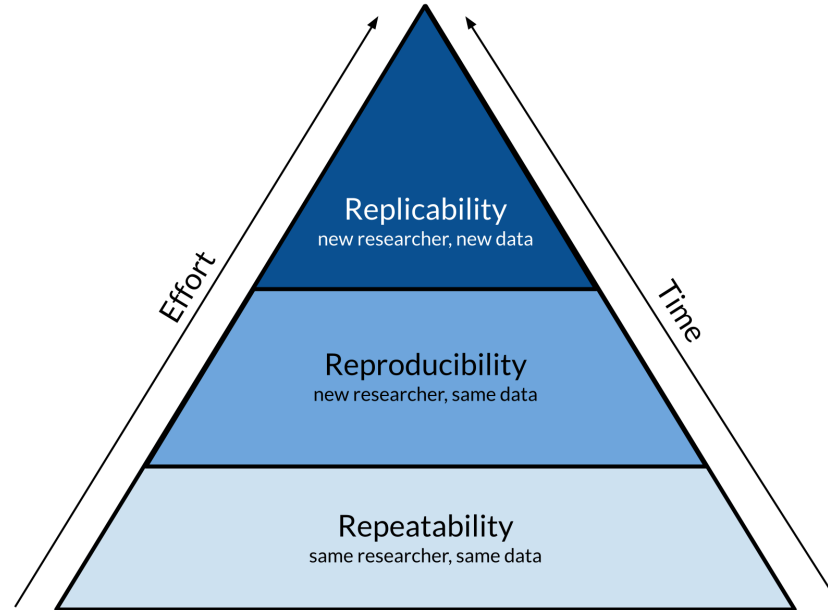
- Making (interactive) dashboard
  - Excel, Google sheet
  - Power BI, Looker, Tableau
  - R, Python



# 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

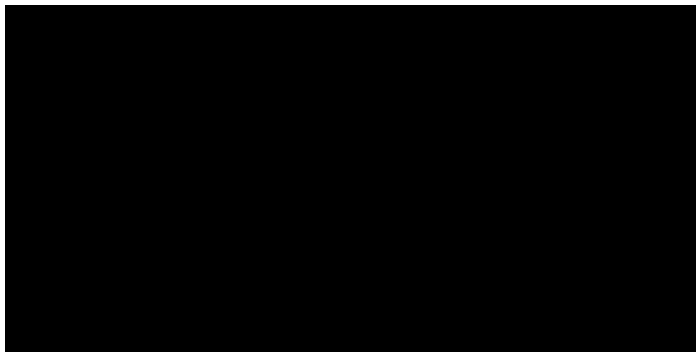
- You can only use the same method to copy and paste

# Referencing

## Absolute referencing

- **constant** when copied to other cell

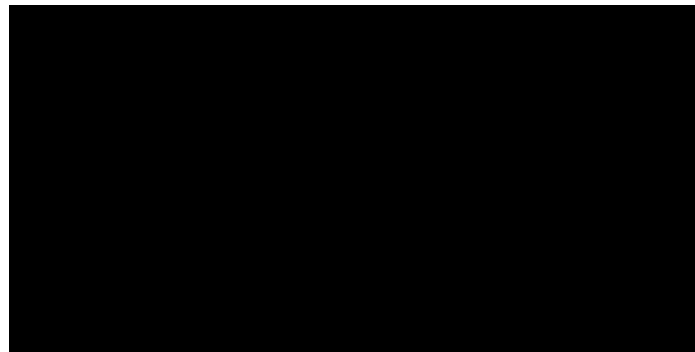
1    =\$A\$2 / =A\$2 / =\$A2



## Relative referencing

- **change** when copied to other cell

1    =A2 / =Sheet1!A2



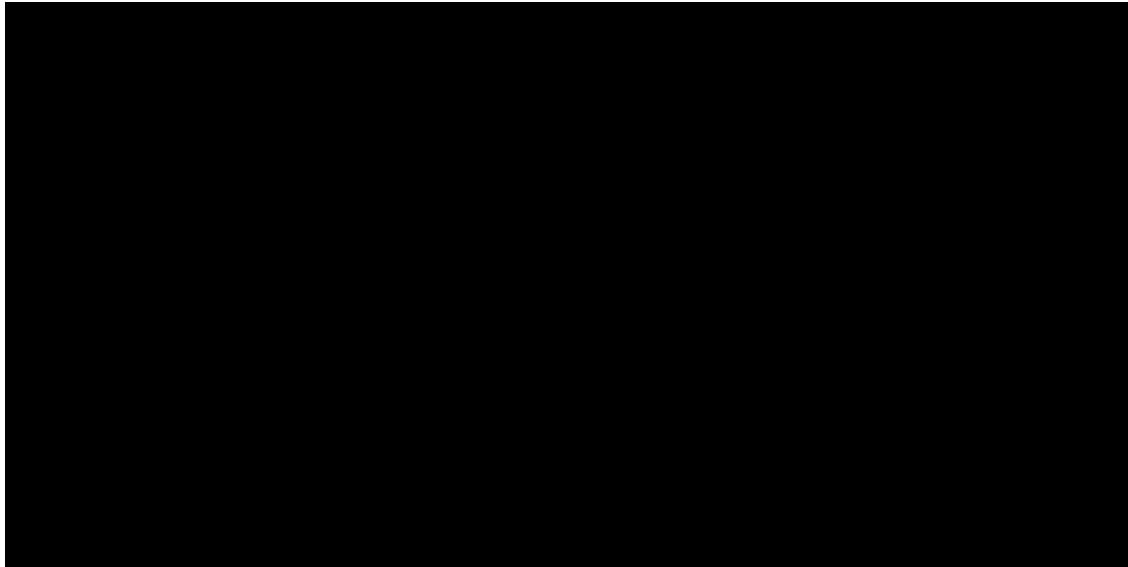


# Other topic

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

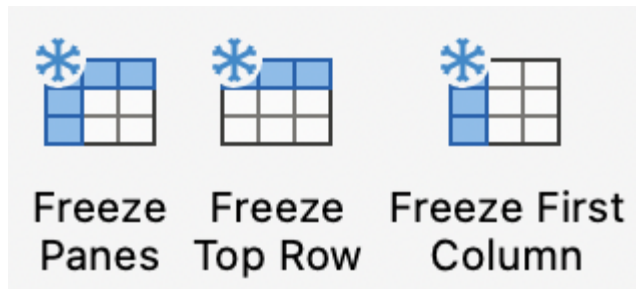
# Multiple lines in one cell

- Press Alt + Enter



# Freeze cell

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

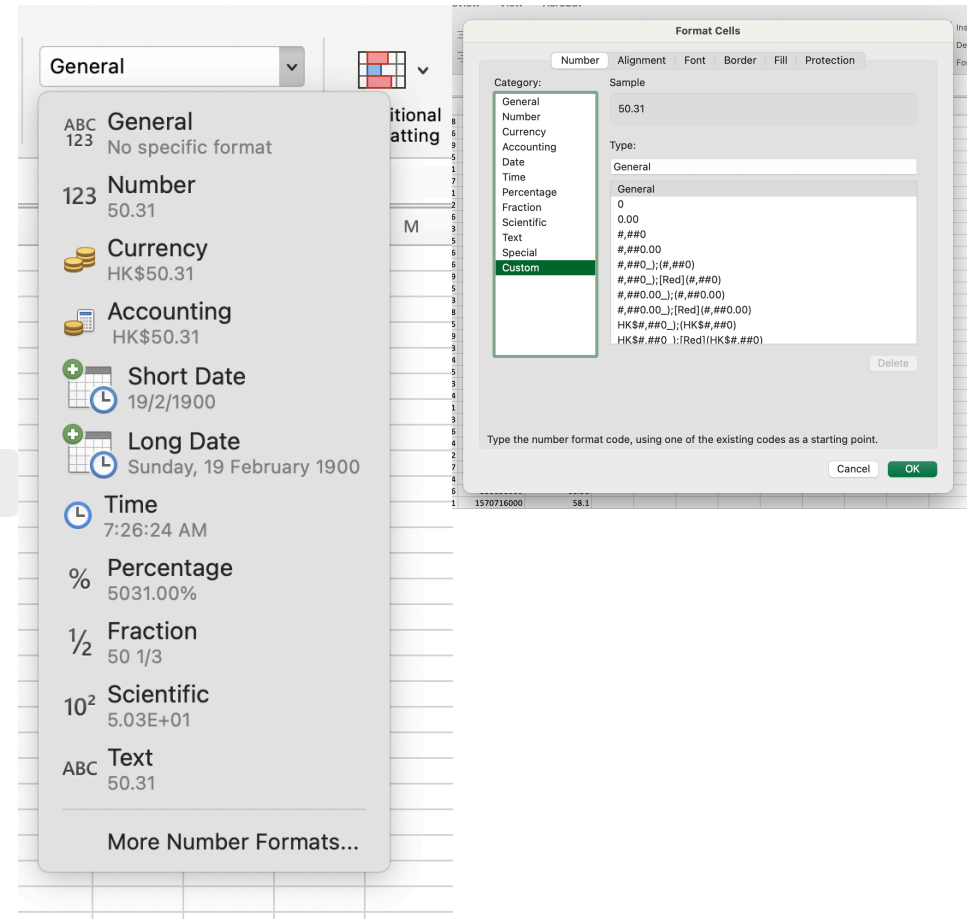


# Formatting

- Build-in format
- Custom format
- Using formula

1     =TEXT(A2, "[\$-404]aaaa")

reference-date-format



# F4 Hotkey

- Make previous action

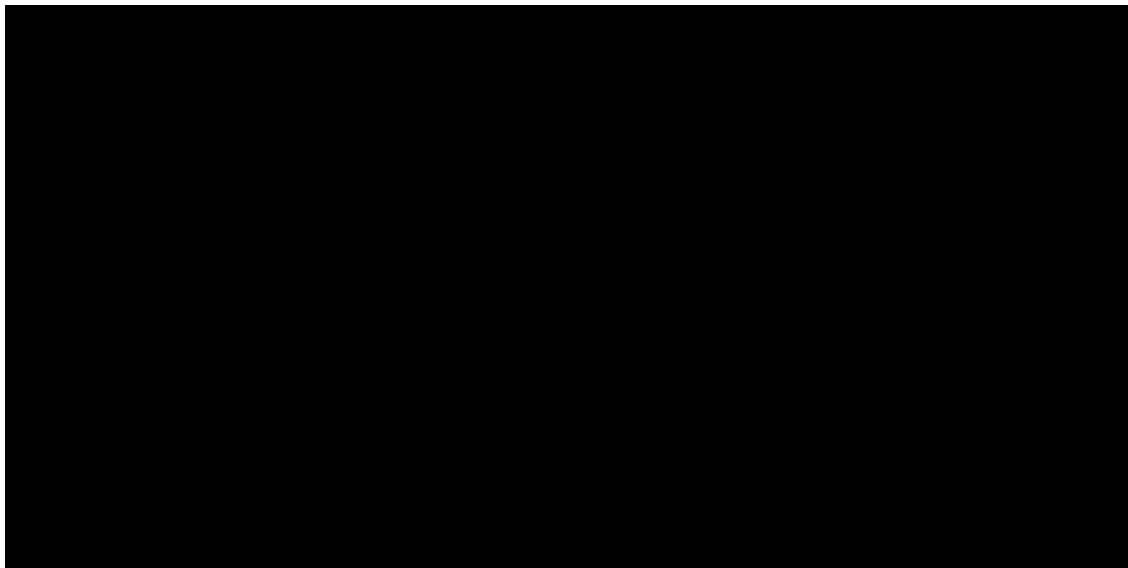


- Change referencing style



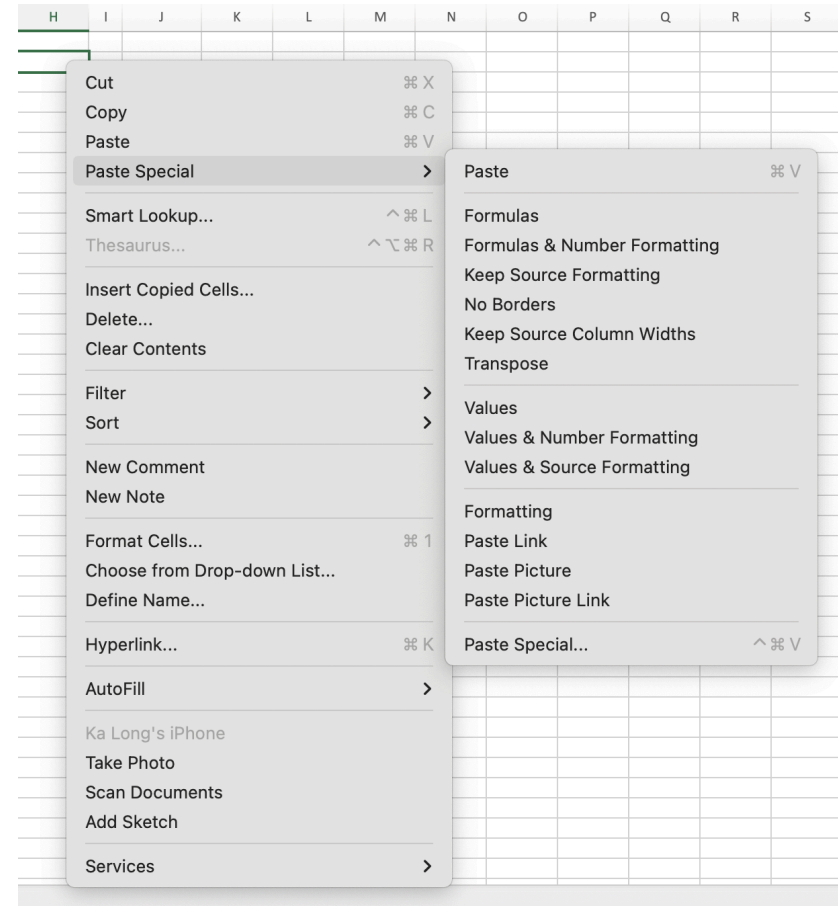
# Resize width and height

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

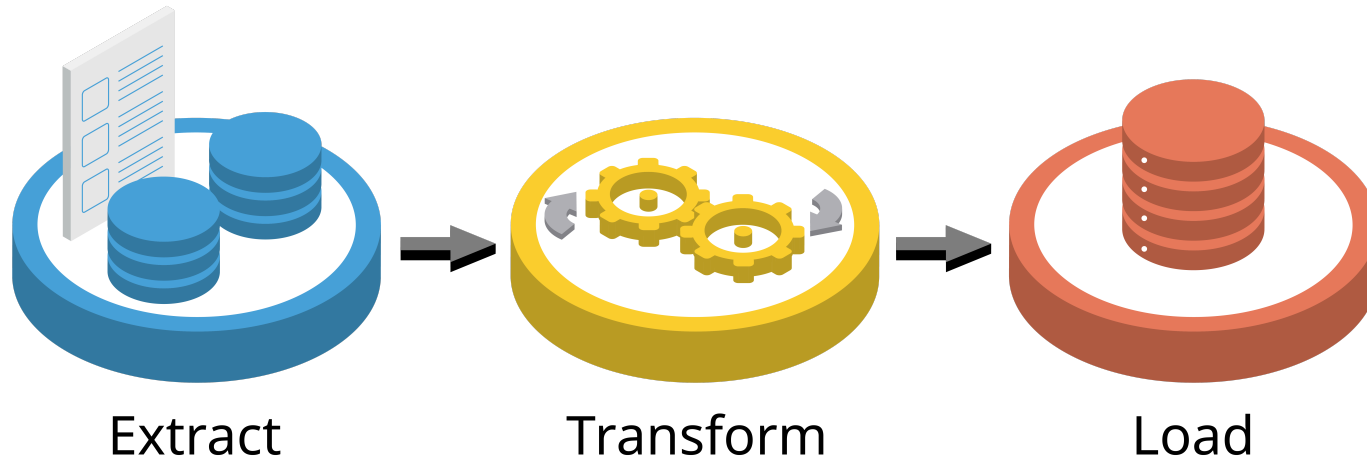
## Benefit

- 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

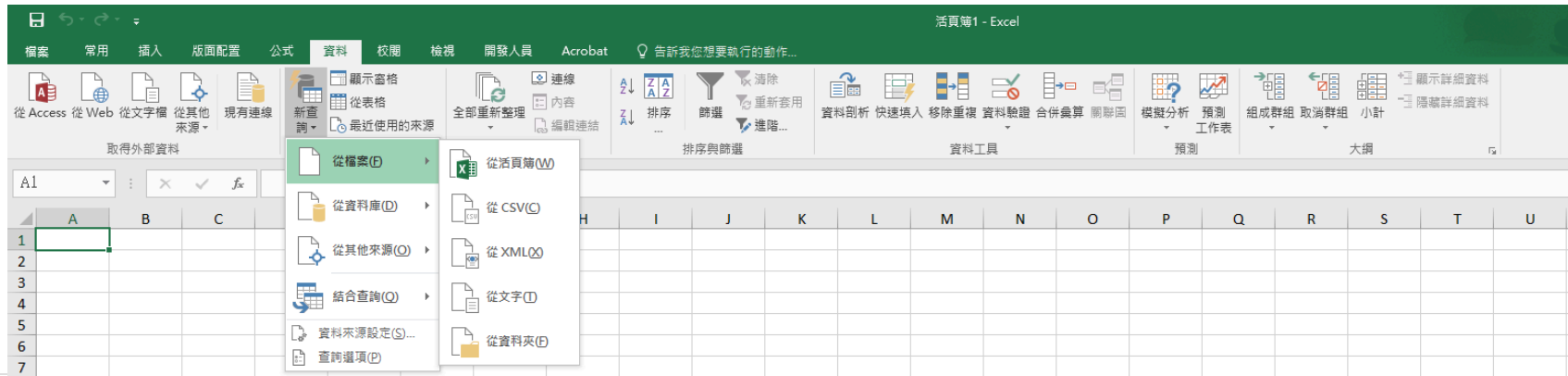


# Benefit of power query

- 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

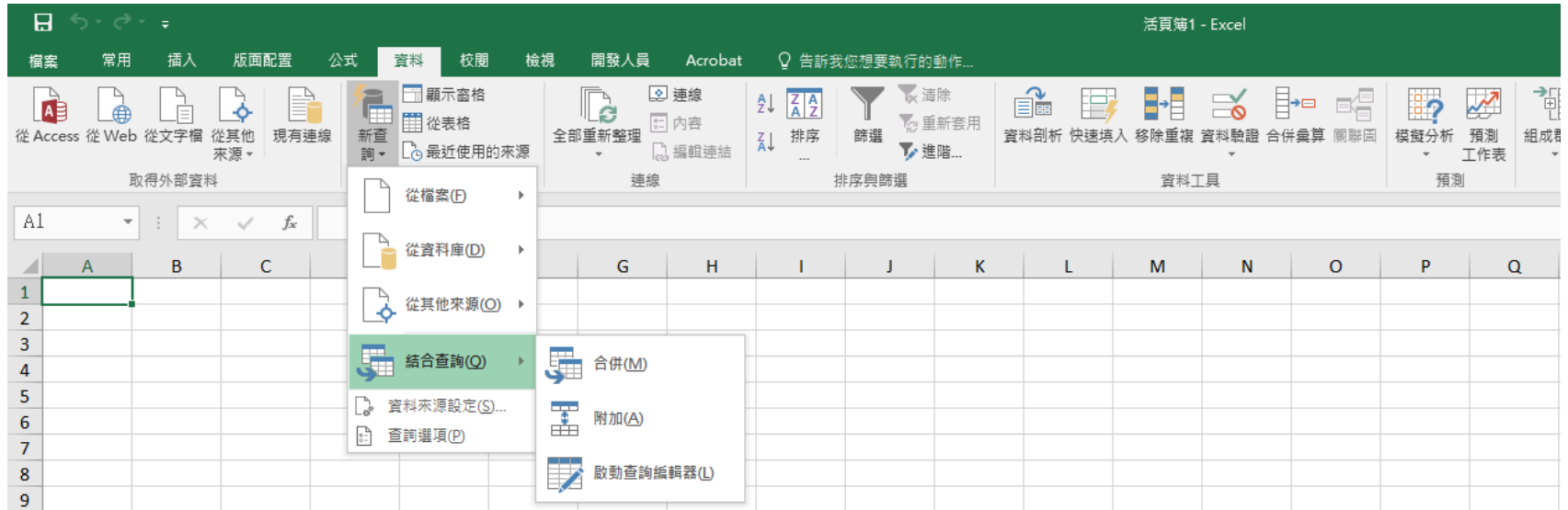
關閉並載入 關閉並載入至...

= 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

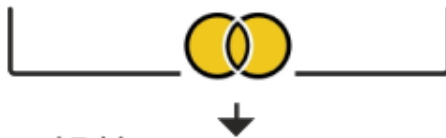
# Full join

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  |
| <i>null</i> | <i>null</i> | <i>null</i> | Spain   |

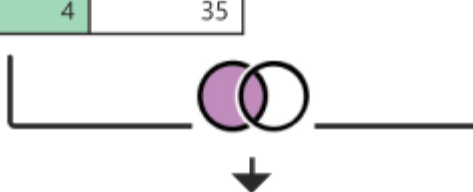
# Left join (Right join)

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> |

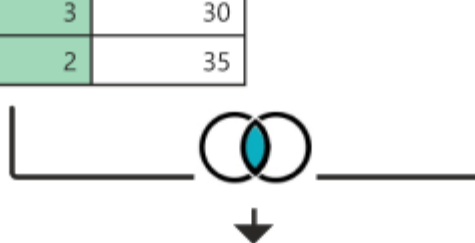
# Inner join

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  |

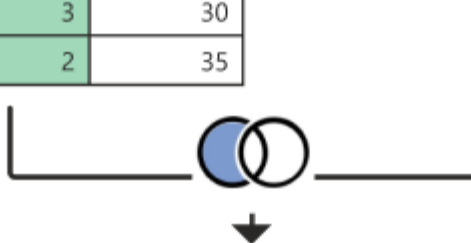
# Anti join

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> |

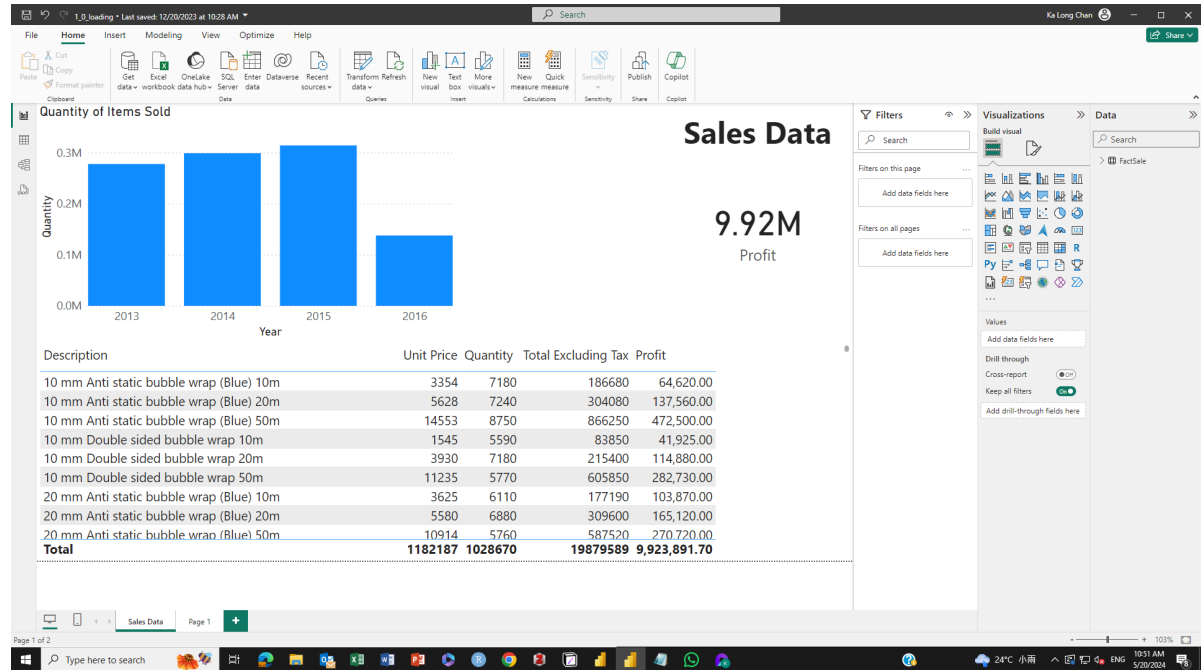
# Make your decision

# 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

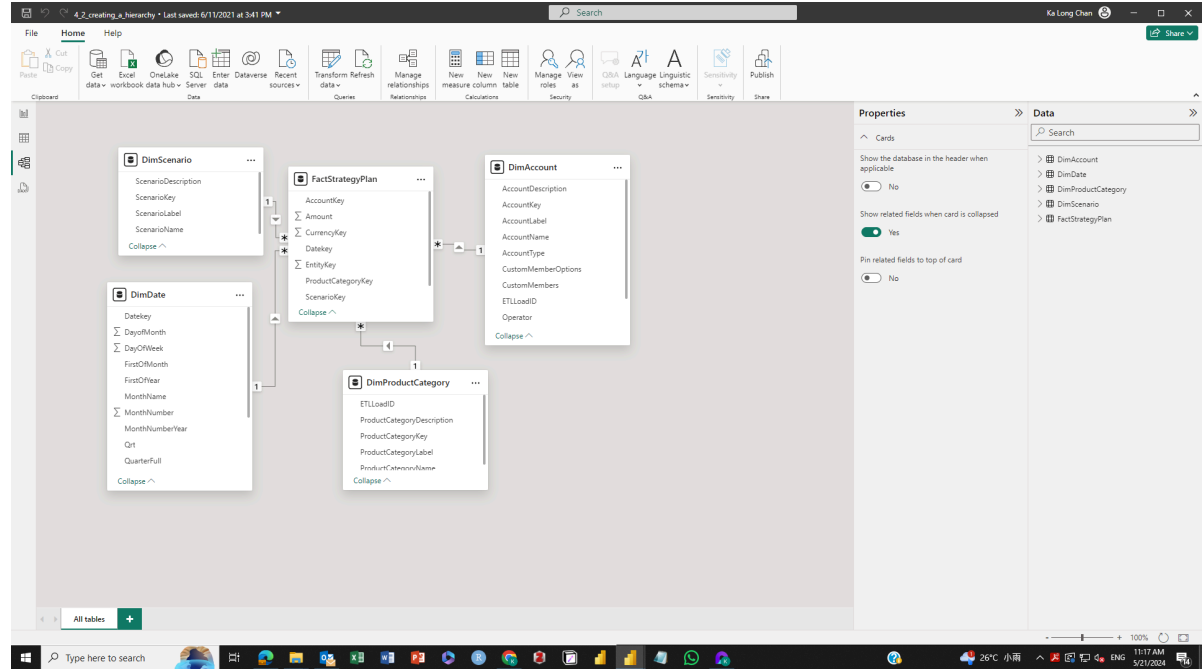
4. Table Tools

Table: FactSale (8130 rows)

| 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 | Quantity |
|----------|----------|--------------|----------------------|----------------|------------------------------|------------------------------|-----------------|----------------|--|---------|----------|
| 49532    | 89925    | 0            | 0                    | 192            | Wednesday, October 23, 2013  | Thursday, October 24, 2013   | 85              | 15267          | DBA joke mug - two types of DBAs (White)                                 | Each    | 1        |
| 49901    | 89925    | 0            | 0                    | 194            | Friday, October 25, 2013     | Saturday, October 26, 2013   | 84              | 15380          | DBA joke mug - SELECT caffeine FROM mug (White)                          | Each    | 1        |
| 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    | 1        |
| 51171    | 72084    | 0            | 0                    | 188            | Friday, November 1, 2013     | Saturday, November 2, 2013   | 74              | 15772          | DBA joke mug - it depends (White)  | Each    | 1        |
| 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    | 1        |
| 52415    | 47134    | 0            | 0                    | 179            | Saturday, November 9, 2013   | Sunday, November 10, 2013    | 39              | 16149          | Developer joke mug - (hip, hip array) (Black)                            | Each    | 1        |
| 53369    | 72125    | 0            | 0                    | 197            | Friday, November 15, 2013    | Saturday, November 16, 2013  | 91              | 16433          | DBA joke mug - it depends (Black)  | Each    | 1        |
| 55529    | 47741    | 0            | 0                    | 184            | Wednesday, November 27, 2013 | Thursday, November 28, 2013  | 74              | 17096          | Developer joke mug - when your hammer is C++ (White)                     | Each    | 1        |
| 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    | 1        |
| 57659    | 48763    | 0            | 0                    | 197            | Tuesday, December 10, 2013   | Wednesday, December 11, 2013 | 90              | 17755          | DBA joke mug - it depends (Black)  | Each    | 1        |
| 57922    | 47855    | 0            | 0                    | 191            | Thursday, December 12, 2013  | Friday, December 13, 2013    | 81              | 17840          | DBA joke mug - two types of DBAs (Black)                                 | Each    | 1        |
| 57987    | 47757    | 0            | 0                    | 197            | Friday, December 13, 2013    | Saturday, December 14, 2013  | 39              | 17862          | DBA joke mug - it depends (Black)  | Each    | 1        |
| 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    | 1        |
| 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    | 1        |
| 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    | 1        |
| 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    | 1        |
| 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    | 1        |
| 2686     | 65578    | 0            | 0                    | 190            | Thursday, January 17, 2013   | Friday, January 18, 2013     | 25              | 925            | DBA joke mug - it depends (White)  | Each    | 1        |
| 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    | 1        |
| 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    | 1        |
| 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    | 1        |
| 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    | 1        |
| 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    | 1        |
| 8290     | 48937    | 0            | 0                    | 187            | Saturday, February 23, 2013  | Sunday, February 24, 2013    | 49              | 2551           | DBA joke mug - it depends (Black)  | Each    | 1        |
| 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    | 1        |
| 11393    | 44333    | 0            | 0                    | 197            | Wednesday, March 13, 2013    | Thursday, March 14, 2013     | 52              | 3497           | DBA joke mug - it depends (Black)  | Each    | 1        |
| 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    | 1        |
| 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    | 1        |
| 13424    | 72084    | 0            | 0                    | 198            | Monday, March 25, 2013       | Tuesday, March 26, 2013      | 52              | 4117           | DBA joke mug - it depends (White)  | Each    | 1        |
| 14115    | 49233    | 0            | 0                    | 198            | Friday, March 29, 2013       | Saturday, March 30, 2013     | 19              | 4330           | DBA joke mug - it depends (White)  | Each    | 1        |
| 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    | 1        |
| 14863    | 48763    | 0            | 0                    | 192            | Wednesday, April 3, 2013     | Thursday, April 4, 2013      | 39              | 4564           | DBA joke mug - two types of DBAs (White)                                 | Each    | 1        |
| 17462    | 66176    | 0            | 0                    | 201            | Thursday, April 18, 2013     | Friday, April 19, 2013       | 39              | 5386           | DBA joke mug - database is (Black)                                       | Each    | 1        |
| 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    | 1        |
| 22615    | 47741    | 0            | 0                    | 165            | Friday, May 17, 2013         | Saturday, May 18, 2013       | 68              | 6965           | Developer joke mug - old C developers never die (Black)                  | Each    | 1        |
| 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    | 1        |
| 26472    | 49233    | 0            | 0                    | 182            | Friday, June 7, 2013         | Saturday, June 8, 2013       | 72              | 8130           | Developer joke mug - inheritance is the OO way to become wealthy (White) | Each    | 1        |

# Model View

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



# DAX Query View

The screenshot displays the Power BI Desktop interface with the DAX Query View active. The top ribbon shows the 'Home' tab with various editing tools. The main area contains a DAX query that filters for the top 10 products by total order amount.

**DAX Query:**

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

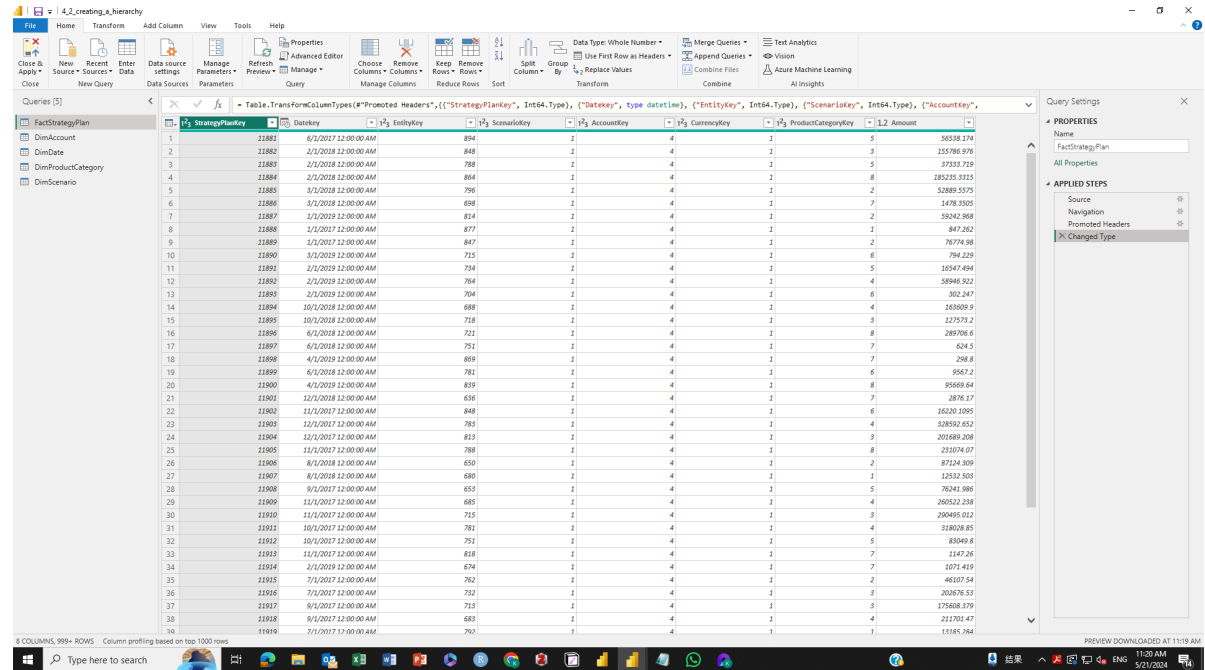
**Results:** The query returns 10 rows of data. The table below shows the first 10 rows of the results.

|    | 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                         | 3                          | 98046.06                   |                          |
| 2  | 85426                      | 10/1/2019 12:00:00 AM    | 812                        | 1                          | 5                         | 3                          | 109234.1                   |                          |
| 3  | 85595                      | 10/1/2019 12:00:00 AM    | 698                        | 1                          | 5                         | 3                          | 68131.29                   |                          |
| 4  | 85917                      | 10/1/2019 12:00:00 AM    | 926                        | 1                          | 5                         | 3                          | 127200.62                  |                          |
| 5  | 86006                      | 10/1/2019 12:00:00 AM    | 717                        | 1                          | 5                         | 3                          | 82465.22                   |                          |
| 6  | 86288                      | 10/1/2019 12:00:00 AM    | 748                        | 1                          | 5                         | 3                          | 48255.24                   |                          |
| 7  | 86346                      | 10/1/2019 12:00:00 AM    | 945                        | 1                          | 5                         | 3                          | 2213897.81                 |                          |
| 8  | 86502                      | 10/1/2019 12:00:00 AM    | 831                        | 1                          | 5                         | 3                          | 79593.24                   |                          |
| 9  | 86801                      | 10/1/2019 12:00:00 AM    | 862                        | 1                          | 5                         | 3                          | 65712.36                   |                          |
| 10 | 87101                      | 10/1/2019 12:00:00 AM    | 736                        | 1                          | 5                         | 3                          | 61360.31                   |                          |

The bottom status bar indicates the query was successful, took 83.9 ms, and returned 8 columns and 10 rows of data.

# Power Query Editor

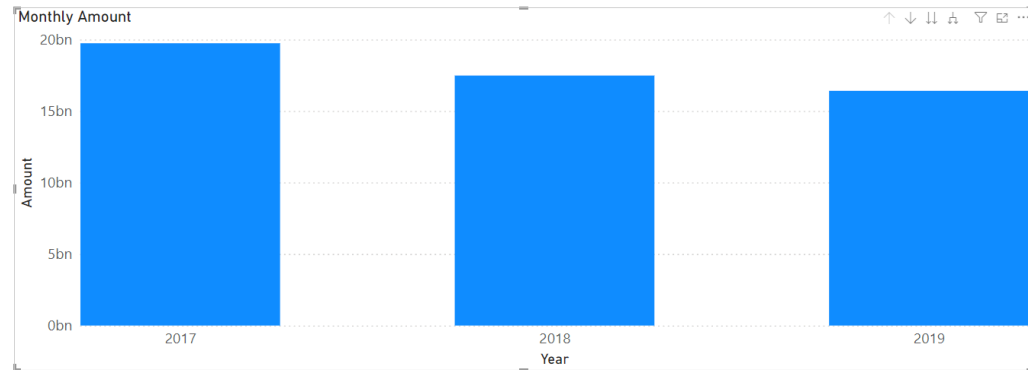
1. Query Editor Ribbon
2. Queries Pane
3. Query Setting
4. Status Bar
5. Table Pane



# Drilling Down

## 1. Date

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

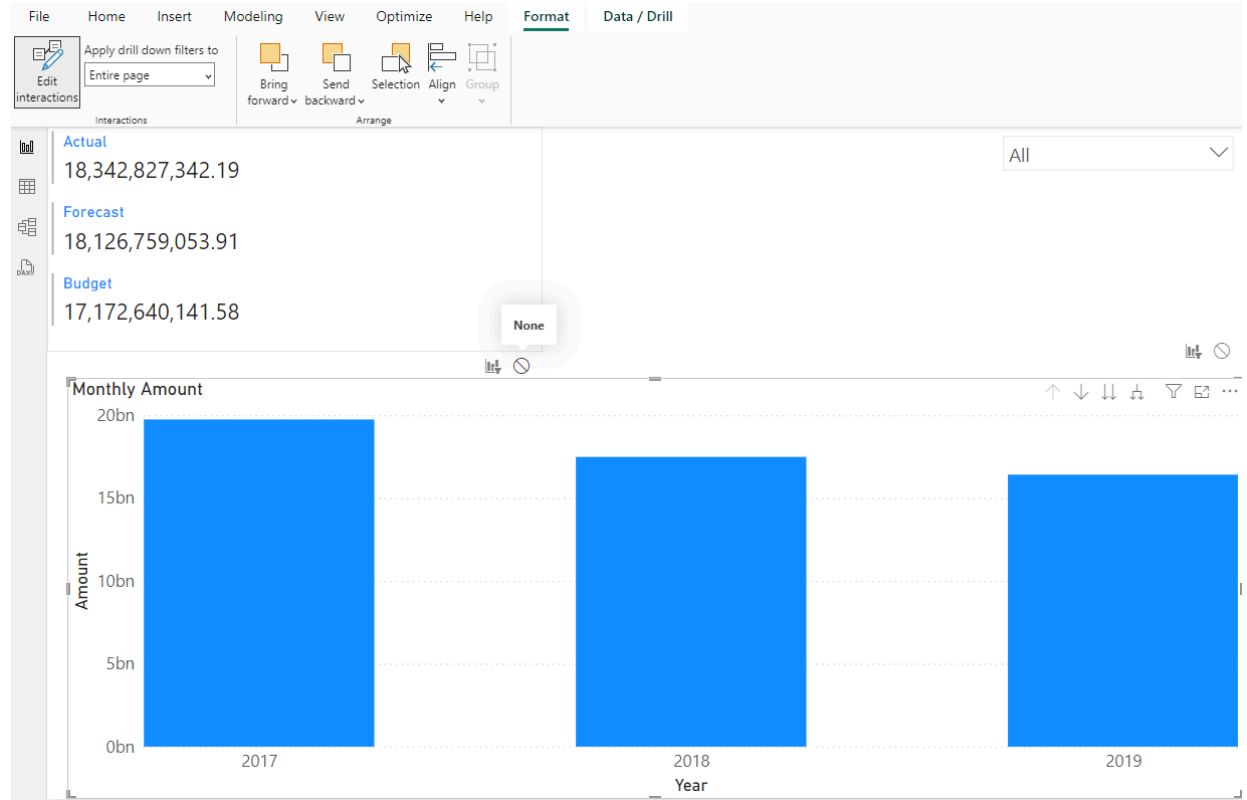


## 2. Custom Hierarchies

- 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 Microsoft Excel interface with the 'Table tools' ribbon active. The 'Column tools' tab is selected, and the 'Sort by column' dropdown menu is open. The table contains data for January 2015, with columns for Datekey, DayOfMonth, MonthNumber, FirstOfMonth, ShortMonth, and MonthName. The 'ShortMonth' column is highlighted, and the dropdown menu shows various sorting options, including 'MonthNumber' which is currently selected.

| 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

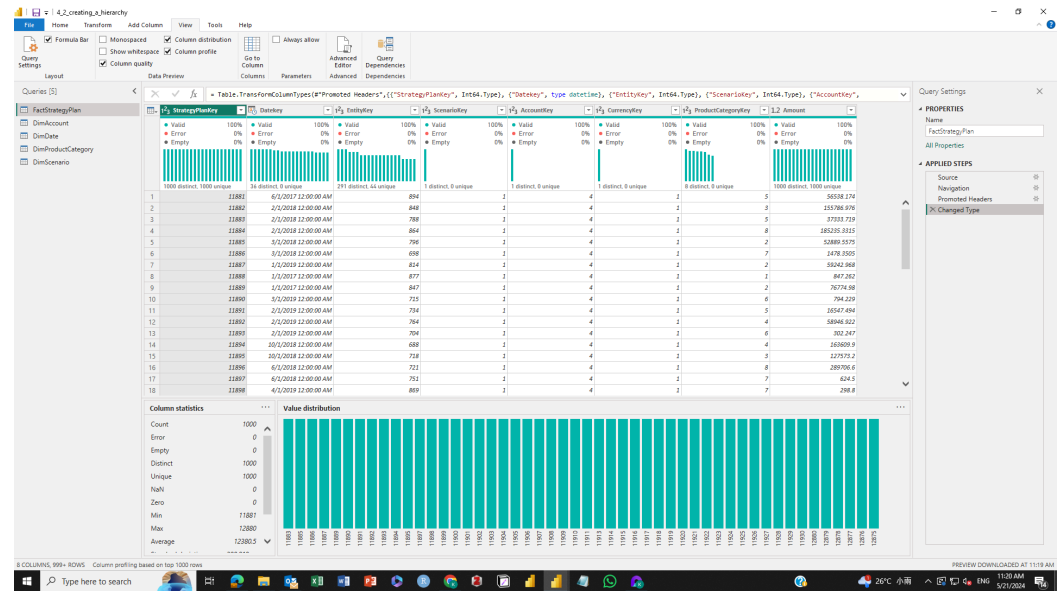
- programme language use in Power Query
- all action in Power Query will be convert to M language
- You can write M language manually in
  - Custom Column
  - Formula bar
  - Advanced Editor
- M language reference
  - <https://learn.microsoft.com/en-us/powerquery-m/>

# 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

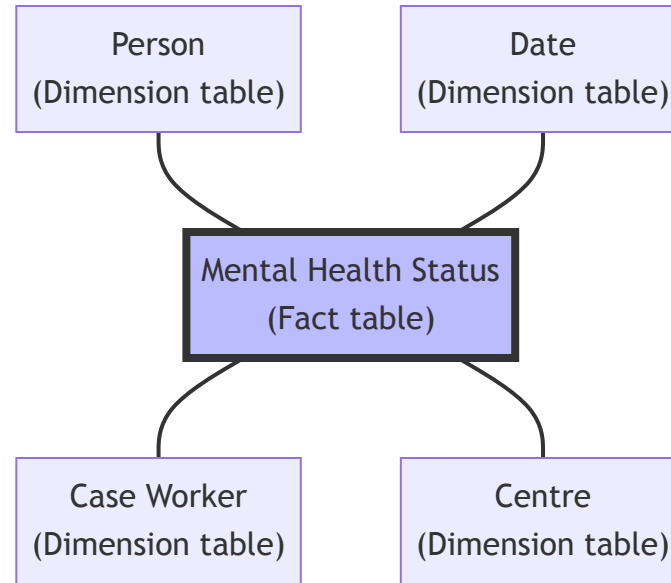
## Data Model in Power BI

# 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               |



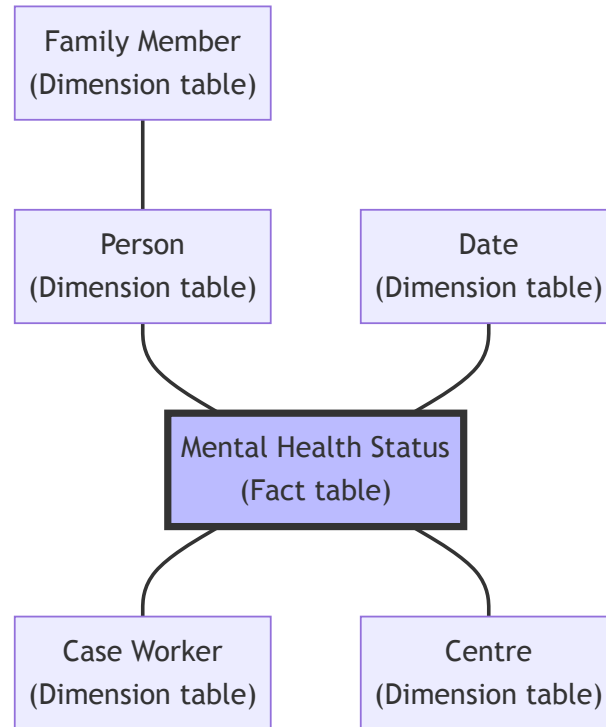
# Dimension table

- 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             |

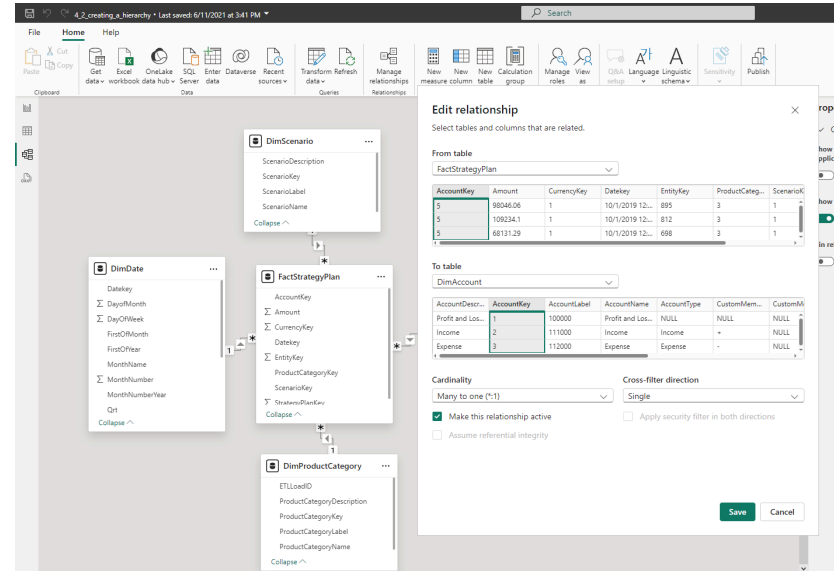
# Snowflake Schema

- 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