The Power BI Service

**For collaboration and sharing of reports**

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# Power BI - Components

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Workspace Structure

Power BI Service for Organisation

Workspace 1
- Roles assigned to Users
- Publish reports (PBIX)
- View Reports (end users)
- Edit Reports (designers)

Workspace 2

Designers — Publish / Edit
Consumers — View

Report 1 | Report 2 | Report 3

Semantic Model 1 | Semantic Model 2 | Semantic Model 3

Only your Organisation can access this

Admin
Member
Contributor
Viewer

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Sharing and Collaboration
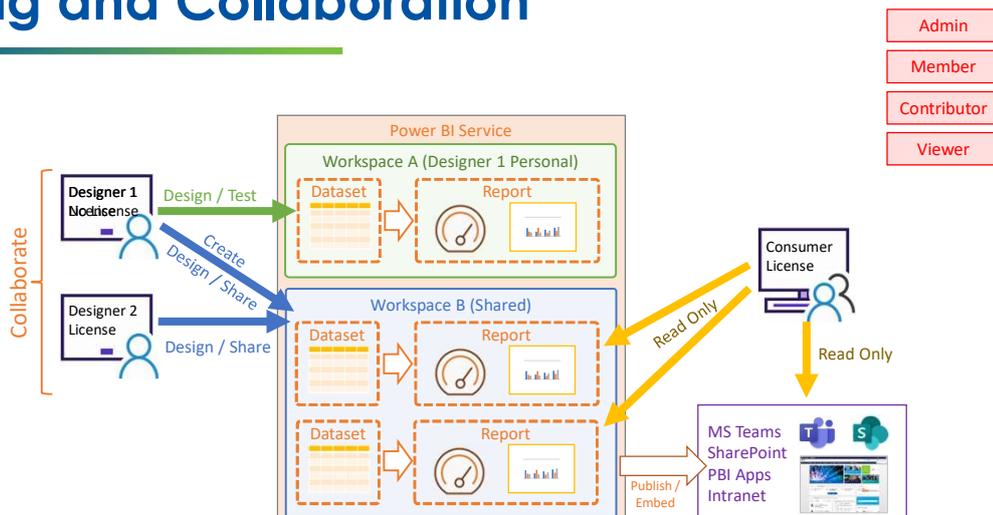
Admin
Member
Contributor
Viewer

Power BI Service

Workspace A (Designer 1 Personal)
Dataset | Report

Designer 1 No License — Design / Test
Create Design / Share
Designer 2 License — Design / Share

Collaborate

Workspace B (Shared)
Dataset | Report
Dataset | Report

Consumer License — Read Only

Read Only

Read Only

Publish / Embed

MS Teams
SharePoint
PBI Apps
Intranet

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Let's go and play …

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The back-end stuff

Creating the Analysis Model

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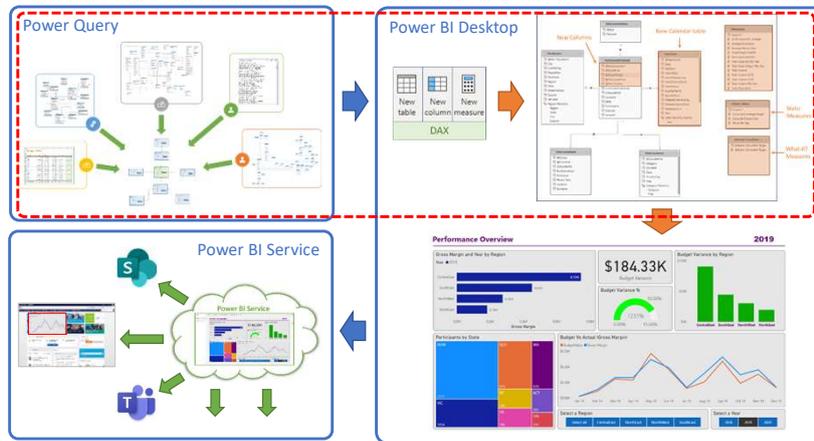
Power BI Process: Simple – single table

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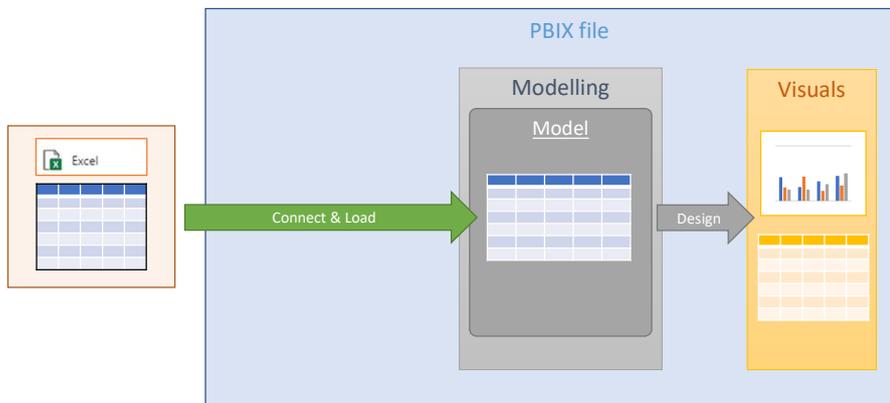
Power BI Process: Simplify and tidy the table

10

Let's go and play …

11
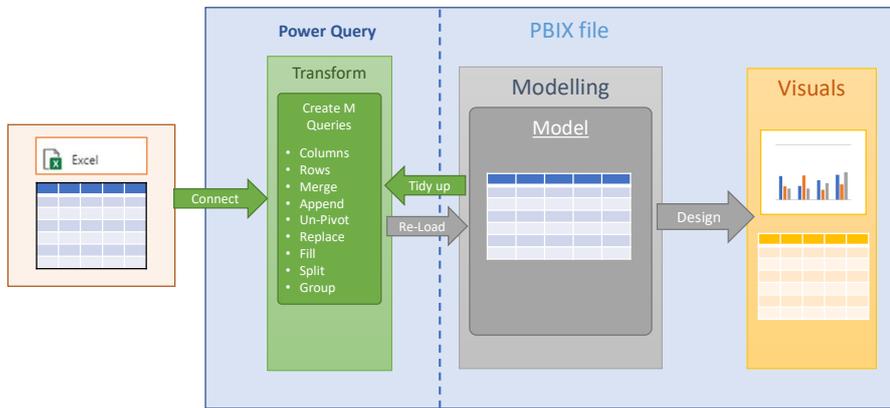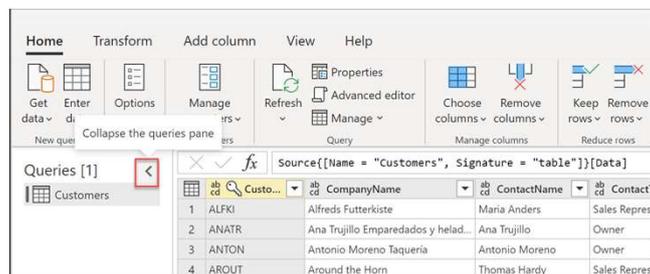
Exercise: Create 2 visuals
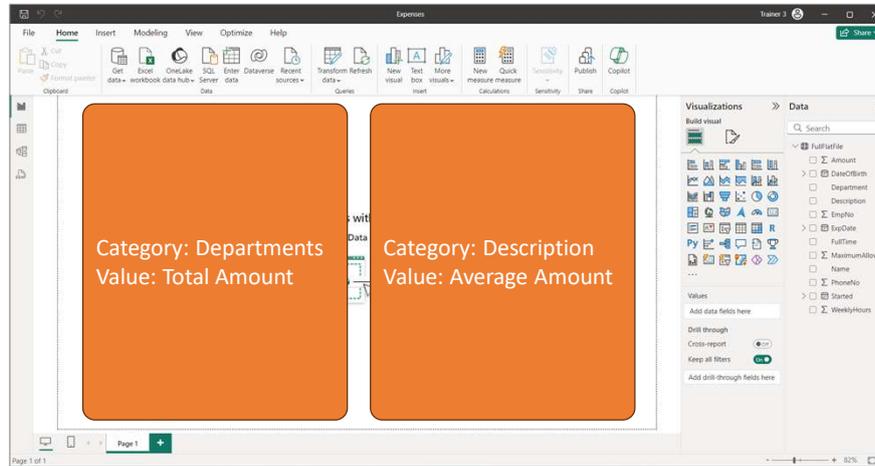
Category: Departments
Value: Total Amount

Category: Description
Value: Average Amount

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Database table structures

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What Database designers do …

 When they are designing the software you will connect to.

 They want the most efficient / compact way to store the data.

 They remove repetition by splitting tables and adding relationships.

 One table 'looks up' another table.

 They end up with lots of tables with lots of relationships.

 This is called the Storage Model.

 This is very good for Storage but is usually too complex for Analysis.

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A typical data Storage Model

This is great for data storage, but not great for analysis and reporting

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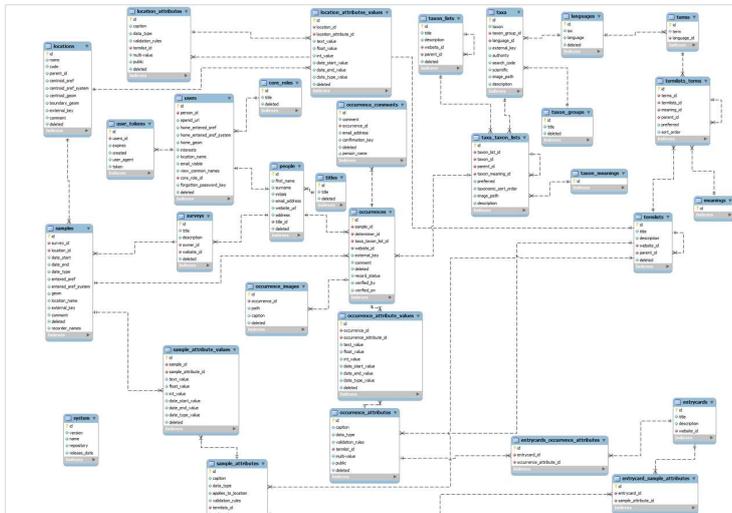
One to Many relationships

Child

Parent

One to Many

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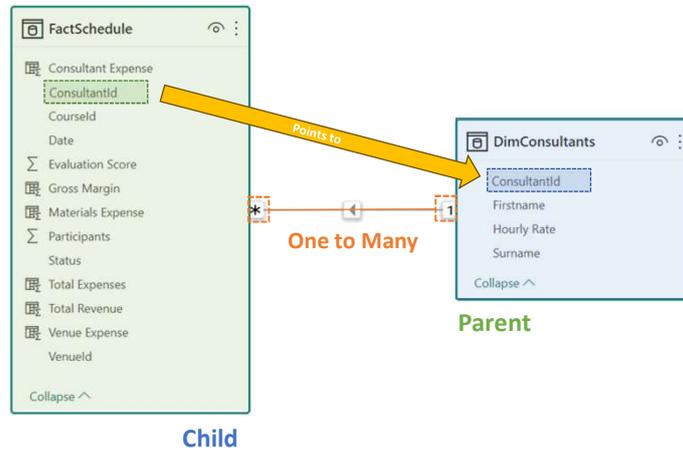
Business Intelligence Process

Before using your BI Tool

Back end (creating the model)

Front end (creating / sharing reports)

| Business Analysis | Data Analysis | Connect & Transforming | Adding Calculations | Creating Reports | Sharing Reports |

Can get complex May need help

Tomorrow

Today

Overview Only

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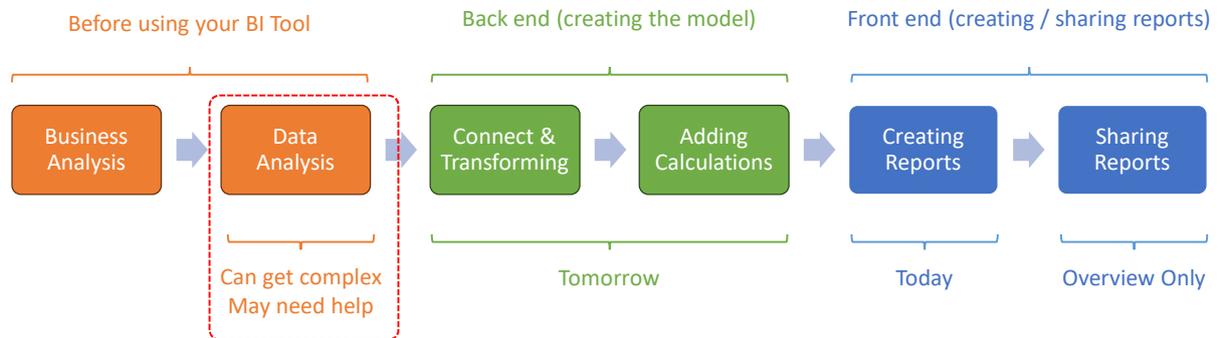
Our original Storage Model
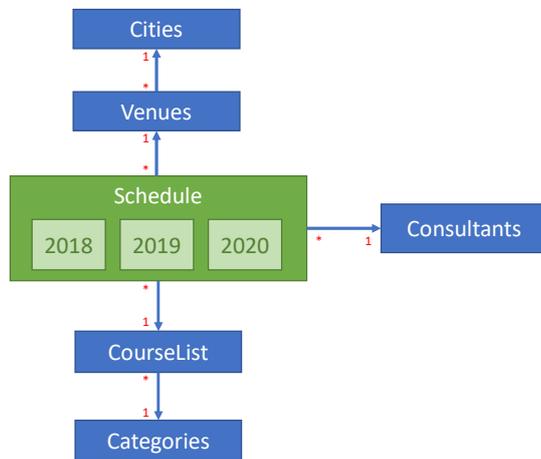
Not as complex,

but still too complex for a Report Designer to work with!

18

Our desired Analysis Model
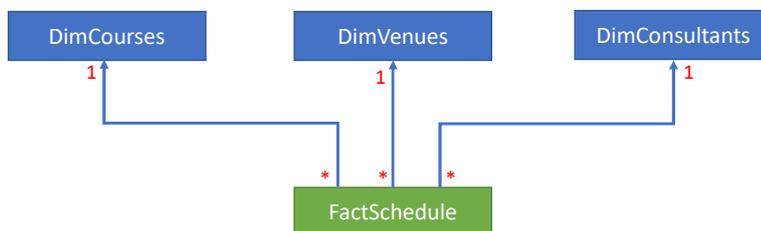
19

Need to simplify & tidy the tables

Storage Model (Structure)
- Managed by the Database Server
- Efficient for storing data, but no good for analysis

Analysis Model (Structure)
- Managed by the VertiPaq Engine
- Not great for storage, but good for analysis

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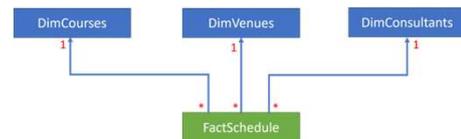
What Power Query can do for us

1. Individual tables: simplify, fix, tidy up and add columns.
2. Multi-table related models: Simplify the structure:
   - Append
   - Merge
3. Combine tables from different (non-related) data sources. (Advanced course)

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Power Query does the transformation

22
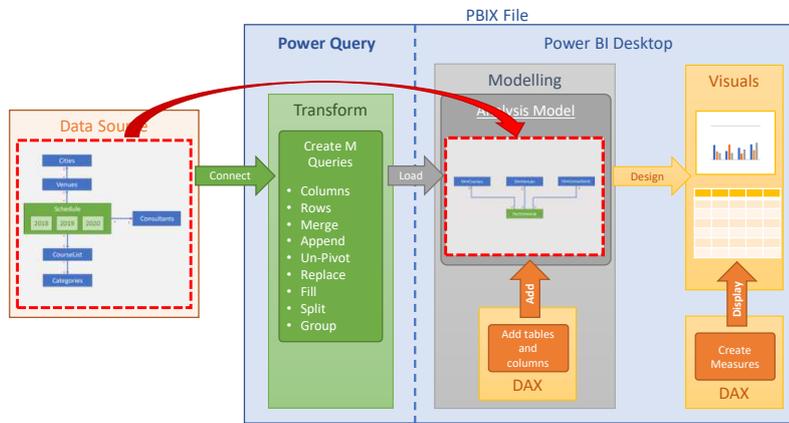
Power Query: Storage Model to Analysis Model

23

Our desired Analysis Model

24
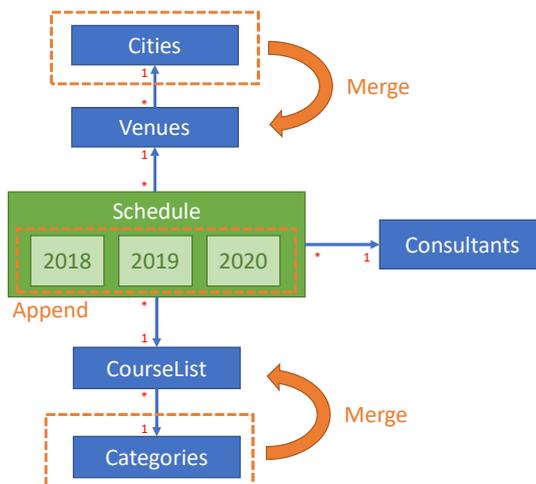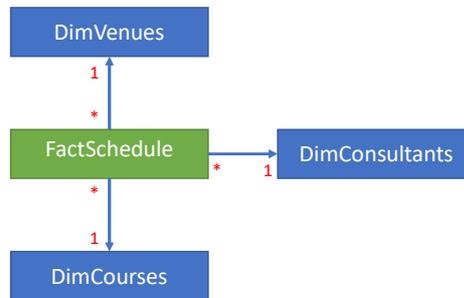
Our desired Analysis Model (rearranged)

25
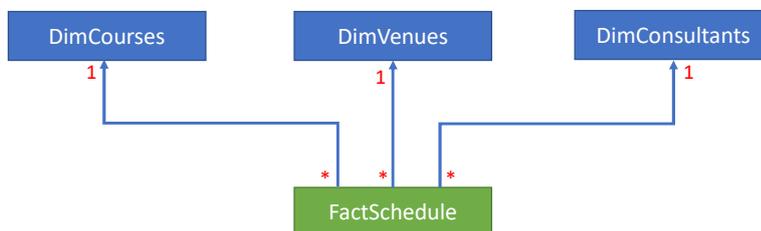
Tidying up the tables

Table	Old Name	New Name
FactSchedule	ConsultantEvalScore	Consultant Evaluation Score
DimCourses	MaterialsPerParticipant	Materials Cost Per Participant
DimCourses	PricePerDay	Course Price Per Day
DimCourses	Days	Duration
DimVenues	StreetAddress	Street Address
DimVenues	PostCode	Post Code
DimVenues	CostPerDay	Venue Cost Per Day
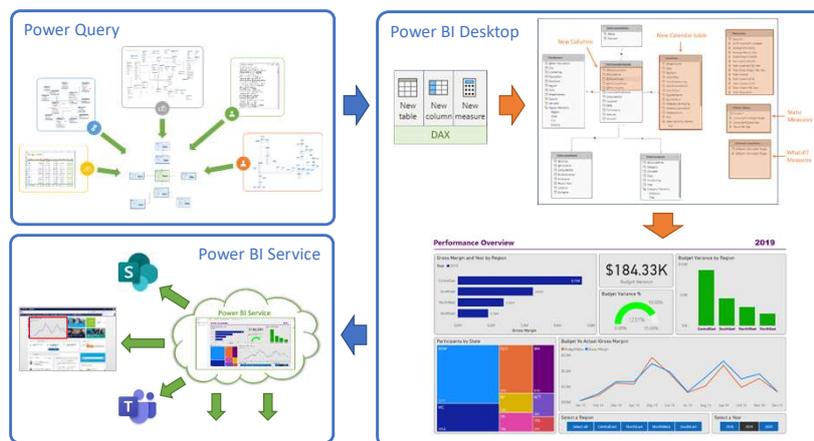
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26

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27

28
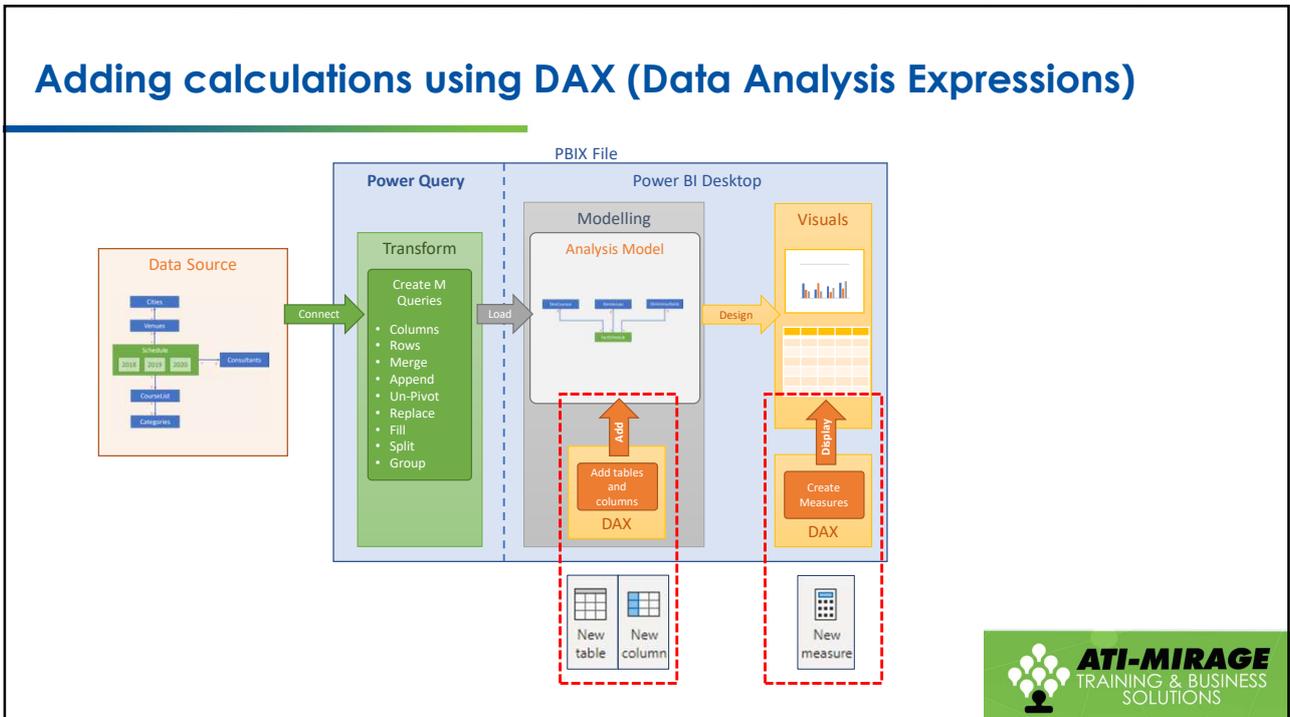
29

Syntax for Tables and Columns

- To refer to a **table**:

  FactSchedule

  'Fact Schedule'

- To refer to a **column** in a table:

  FactSchedule[Participants]

- It is possible to leave out the table name in column formulas if the column is in the same table:

  [Participants]
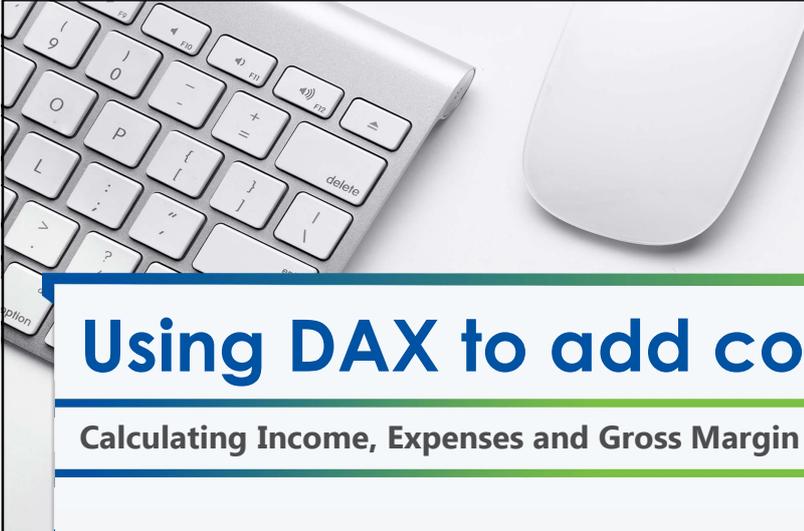
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Using DAX to add columns

Calculating Income, Expenses and Gross Margin

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Gross Margin Calculations - Formula Logic

Gross Margin = Revenue (FactSchedule)   -   Expenses (FactSchedule)

Revenue (FactSchedule)
= Participants (FactSchedule)
   x   Course Price (DimCourses)

Course Price (DimCourses)
= Course Price Per Day (DimCourses)
   x   Duration (DimCourses)

Venue Expense (FactSchedule)
= Venue Cost Per Day (DimVenues)
   x   Duration (DimCourses)

+

Materials Expense (FactSchedule)
= Materials Cost Per Participant (DimCourses)
   x Participants (FactSchedule)

+

Consultant Expense (FactSchedule)
= Hourly Rate (DimConsultants)   x   6
   x   Duration (DimCourses)

Gross Margin calculations

DimCourse table

Course Price = [Duration] * [Course Price Per Day]

FactSchedule Table

Revenue = [Participants] * **RELATED(**DimCourses[Course Price]**)**
Venue Expense = **RELATED(**DimVenues[Venue Cost Per Day]**)** * **RELATED(**DimCourses[Duration]**)**
Consultant Expense = **RELATED(**DimConsultants[Hourly Rate]**)** * **6** * **RELATED(**DimCourses[Duration]**)**
Materials Expense = [Participants] * **RELATED(**DimCourses[Materials Cost Per Participant]**)**
Expenses = [Consultant Expense] + [Materials Expense] + [Venue Expense]
Gross Margin = [Revenue] - [Expenses]

Calendar Tables

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Calendar Tables

- Calendar tables are very useful for data models with dates.

- Having a date table allows you to:
  - Categorise based on date components (year, quarter, month, etc)
  - Create timelines more easily
  - Create 'time intelligence' functions (YTD, MoM, etc)

- You can create them in different places

35

Where does the Calendar table come from?
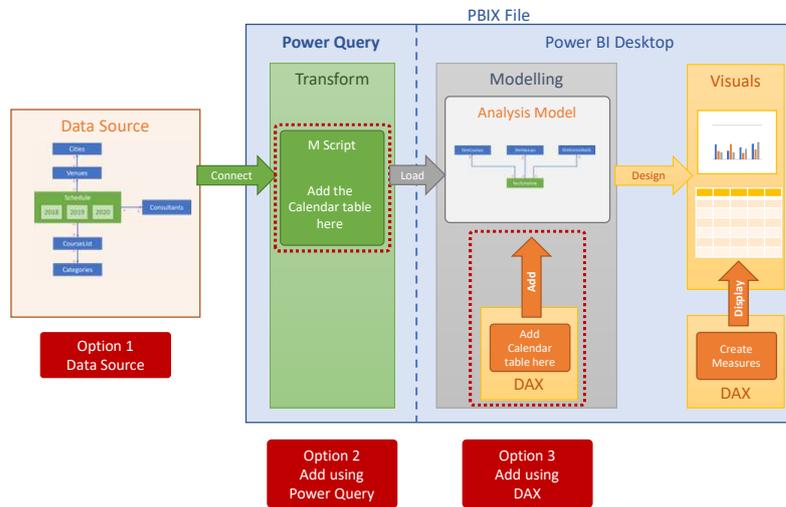
Calendar tables in DAX

- We can use the CALENDAR() or CALENDARAUTO() function to create a new table with the Date column:

```
DimDates = CALENDARAUTO(12)
```

```
DimDates = CALENDAR(DATE(2023,01,01), DATE(2023,12,31))
```

- Then use other DAX functions to create the additional columns:
  - Year()
  - Quarter()
  - Month()
  - Day()
  - Format()

```
Year = YEAR([Date])

MonthNum = MONTH([Date])

MonthName = FORMAT([Date],"MMM")
```

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Measures in DAX

An introduction only

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Activity – Gross Margin calculations

1. Create a Matrix visual on a new page with States in the Rows drop zone
2. Add the new calculated fields into the Values drop zone as shown:

State	Total Revenue	Consultant Expense	Materials Expense	Venue Expense	Total Expenses	Gross Margin
ACT	$621,680.00	$97,890	$57,790	$135,520	$291,200	$330,480
NSW	$3,684,325.00	$597,030	$344,145	$832,355	$1,773,530	$1,910,795
NT	$561,835.00	$95,955	$51,950	$138,460	$286,365	$275,470
QLD	$1,548,775.00	$314,325	$144,385	$484,880	$943,590	$605,185
SA	$643,245.00	$114,780	$62,310	$178,695	$355,785	$287,460
TAS	$532,310.00	$105,750	$48,845	$159,600	$314,195	$218,115
VIC	$2,244,635.00	$349,005	$211,475	$501,260	$1,061,740	$1,182,895
WA	$1,150,870.00	$200,130	$109,700	$257,720	$567,550	$583,320
Total	**$10,987,675.00**	**$1,874,865**	**$1,030,600**	**$2,688,490**	**$5,593,955**	**$5,393,720**

39

Activity - Calculated Columns

1. Add the following calculated column to the FactSchedule table

   Gross Margin Pct 1 = [Gross Margin] / [Total Revenue]

2. Format it as a percentage.
3. What is it showing us?

4. Create the following matrix:

State	Total Revenue	Gross Margin	Gross Margin Pct1
ACT	$621,680	$330,480	5581.04%
NSW	$3,684,325	$1,910,795	29330.71%
NT	$561,835	$275,470	5403.15%
QLD	$1,548,775	$605,185	10105.23%
SA	$643,245	$287,460	4402.88%
TAS	$532,310	$218,115	3789.32%
VIC	$2,244,635	$1,182,895	18276.81%
WA	$1,150,870	$583,320	9773.38%
Total	**$10,987,675**	**$5,393,720**	**86662.53%**

5. Does this look correct? What is happening here?

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What's the deal with "Gross Margin Pct 1" ?

Using a measure

Using calculated columns

Section	Score	Questions	Ratio	%
1	28	50	0.56	56%
2	85	100	0.85	85%
3	60	75	0.8	80%
Total	**173**	**225**	**2.21**	**221%**

SUM(Score) / SUM(Questions)
173 / 225
= 0.769 = 76.9%

SUM(Score/Question)

AVERAGE(Score/Question)
= 0.737 = 73.7%

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Measures

- Don't 'belong' to a table. They 'stand apart' and can use values from multiple tables.

- They recalculate on every page open and change in filters.

- They must calculate to a single (scalar) value.

- The measure value is calculated separately for every value in the visual
  - This includes the totals
  - Total calculations: 9 x 4 = 36

- Only able to be seen as part of a visual

Mystery Iterator				
State	2018	2019	2020	Total
ACT	12	6	4	22
NSW	54	47	50	151
NT	5	8	8	21
QLD	35	29	32	96
SA	10	9	6	25
TAS	9	4	10	23
VIC	38	18	31	87
WA	20	16	26	62
Total	183	137	167	487

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Simple measure: Total Gross Margin

- Let's look at the following DAX formula:

  FactSchedule[Gross Margin]

- In a *column formula* this means: the value in the Gross Margin column in the *current row* of the FactSchedule table.

- Measures are different because they don't have a 'current row'.

- In *a measure*, this means the whole Gross Margin column in the FactSchedule table!

- Since a measure must return a single value, we have to use an aggregator function like: SUM, AVERAGE, MAX, MIN, etc:

  SUM(FactSchedule[Gross Margin])

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Let's revisit Gross Margin Pct

We can now fix the Gross Margin Pct column with a measure:

Section	Score	Questions	Ratio	%
1	28	50	0.56	56%
2	85	100	0.85	85%
3	60	75	0.8	80%
Total	173	225	2.21	221%

Correct Answer

$$\frac{173}{225} = 0.77 = 77\%$$

$$\sum_{k=0}^{n} \left[\begin{array}{c} \text{GrossMargin} \\ \text{Revenue} \end{array} \right] \neq \frac{\textbf{SUM}(\text{FactSchedule[GrossMargin]})}{\textbf{SUM}(\text{FactSchedule[IncTotal]})}$$

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Activity – Gross Margin Pct

1. Let's add the following measure to the FactSchedule table and format it as a percentage.

   Gross Margin Pct 2 = **SUM**(FactSchedule[GrossMargin]) / **SUM**(FactSchedule[IncTotal])

2. Now add it to the State matrix from the earlier exercise:

State	Total Revenue	Gross Margin	Gross Margin Pct 1	Gross Margin Pct 2
ACT	$621,680	$330,480	5581.04%	53.16%
NSW	$3,684,325	$1,910,795	29330.71%	51.86%
NT	$561,835	$275,470	5403.15%	49.03%
QLD	$1,548,775	$605,185	10105.23%	39.08%
SA	$643,245	$287,460	4402.88%	44.69%
TAS	$532,310	$218,115	3789.32%	40.98%
VIC	$2,244,635	$1,182,895	18276.81%	52.70%
WA	$1,150,870	$583,320	9773.38%	50.69%
Total	$10,987,675	$5,393,720	86662.53%	49.09%

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Course Wrap Up

Thanks for paying attention

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Power BI Courses

Power BI Essentials (2 days)

Creating Reports	Power Query Transformations Basic DAX Modelling

Advanced (1 day)

Modelling & Transformations
- More Power Query transformations
- Adding calculations in PQ
- Introduction to the 'M' language
- Best practices for a good Analysis Model
- Normalising tables using PQ
- Adding a data source at a different granularity

Advanced (2 days)

DAX Performance Measures
- Revision for table / column calculations
- Introductions to DAX Measures
- Recreating core calculation using measures
- Understanding Row and Filter contexts
- Iterator functions, Table functions
- The CALCULATE function
- Creating Time intelligence measures

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