

A photograph of a woman with blonde hair and a man with short hair standing on an escalator. They are both looking down at a smartphone held by the man. The background shows other people on the escalator and a modern building with a wooden slat facade.

Mastering Composite Models—

Power BI for the Self-Service Developer

Presented by
David Kofod Hanna

twoday

David Kofod Hanna



Senior Advisor, Data Storytelling @ twoday

+200 courses as Academy Trainer and 10 years as consultant
Certified Tabular Editor 3 Trainer, DP-600, PL-300, CPUX-F



Passionate about guiding self-service Power BI

developers for more enterprise manageable concepts in a consumable and practical way



Born on beautiful “Sunshine island”: Bornholm

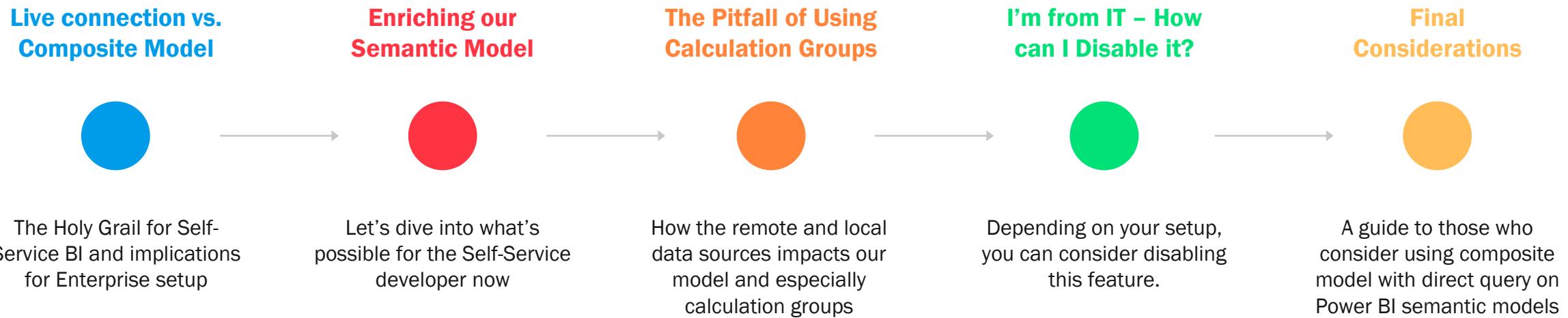
Lives in Silkeborg with wife and 3 kids
Love football and running half-marathons



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Mastering Composite Models –

Power BI for the Self-Service Developer

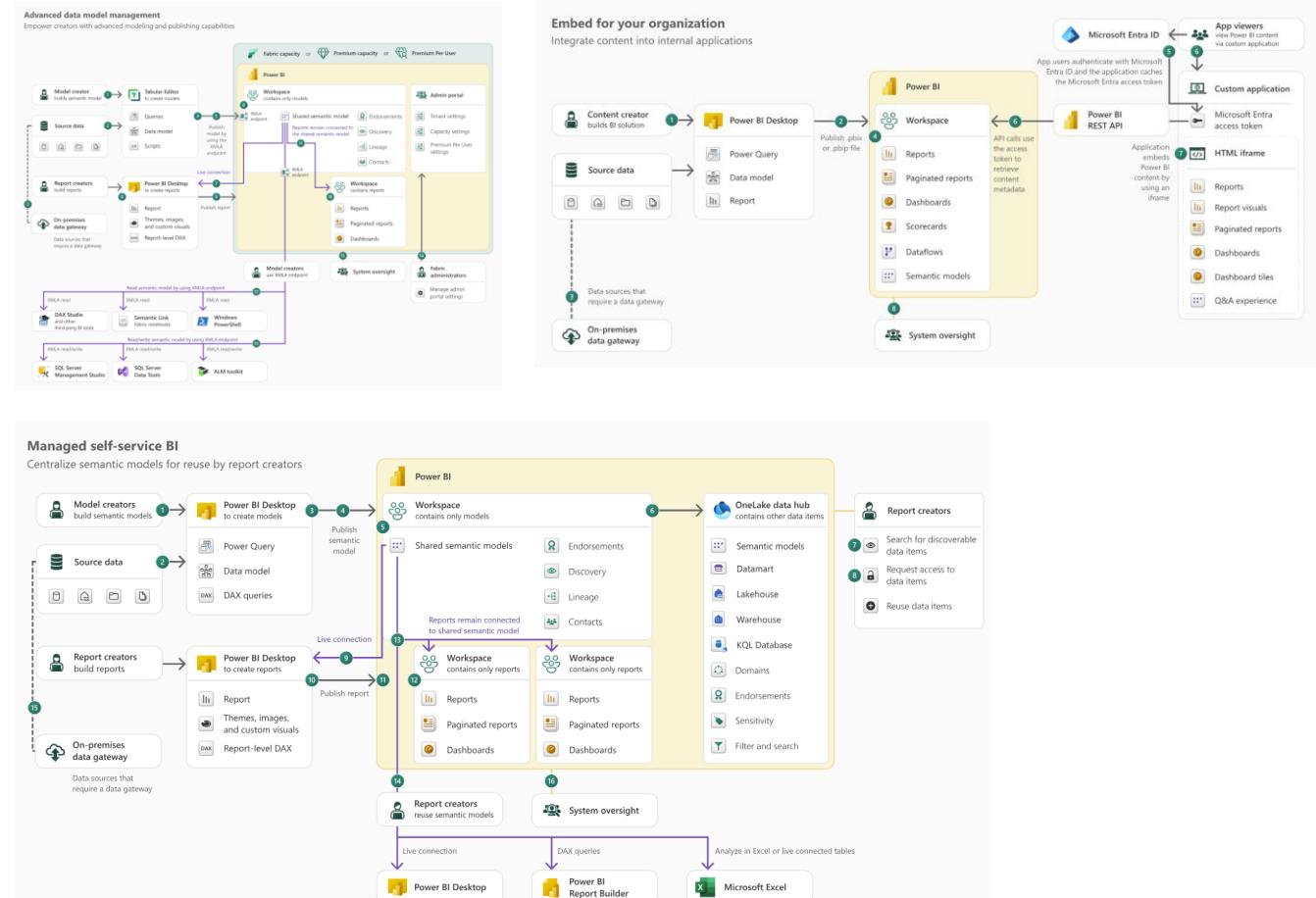


How many have explored
Composite Models with
Direct Query to Power BI Semantic
Model?

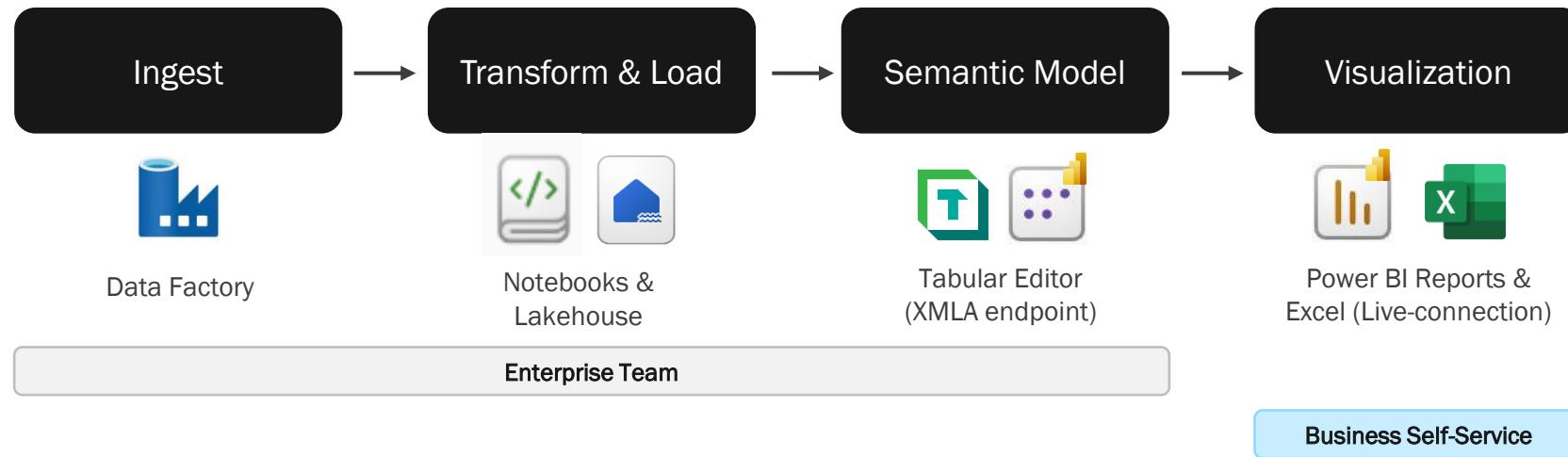


One Size Fits All?

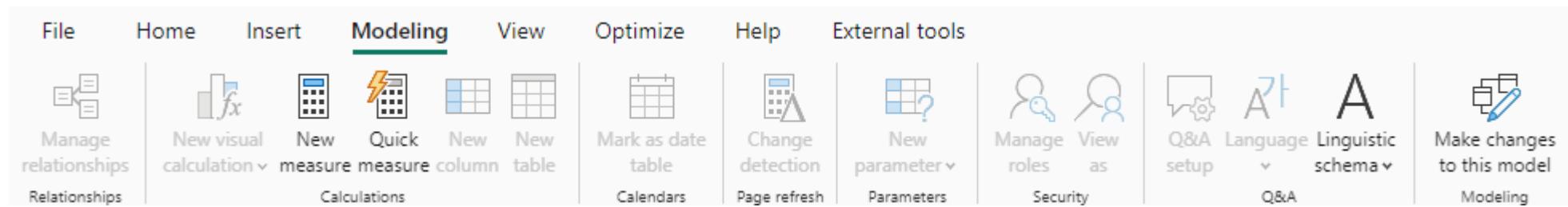
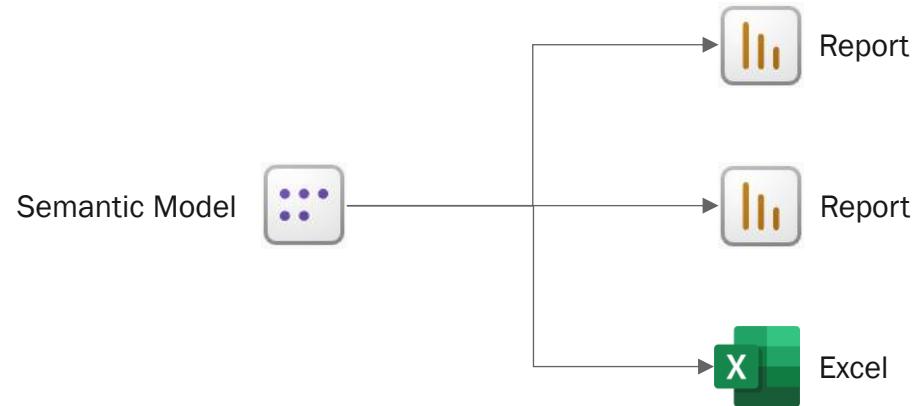
1. Advanced data model management
2. Advanced data preparation
3. Customizable managed self-service BI
4. Departmental BI
5. Embed for your customers
6. Embed for your organization
7. Enterprise BI
8. Enterprise content publishing
9. Managed self-service BI
10. On-premises reporting
11. Personal BI
12. Prototyping and sharing
13. Self-service content publishing
14. Self-service data preparation
15. Self-service real-time analytics
16. Team BI



Scenario



I Love Live-Connection, but ...



Demo

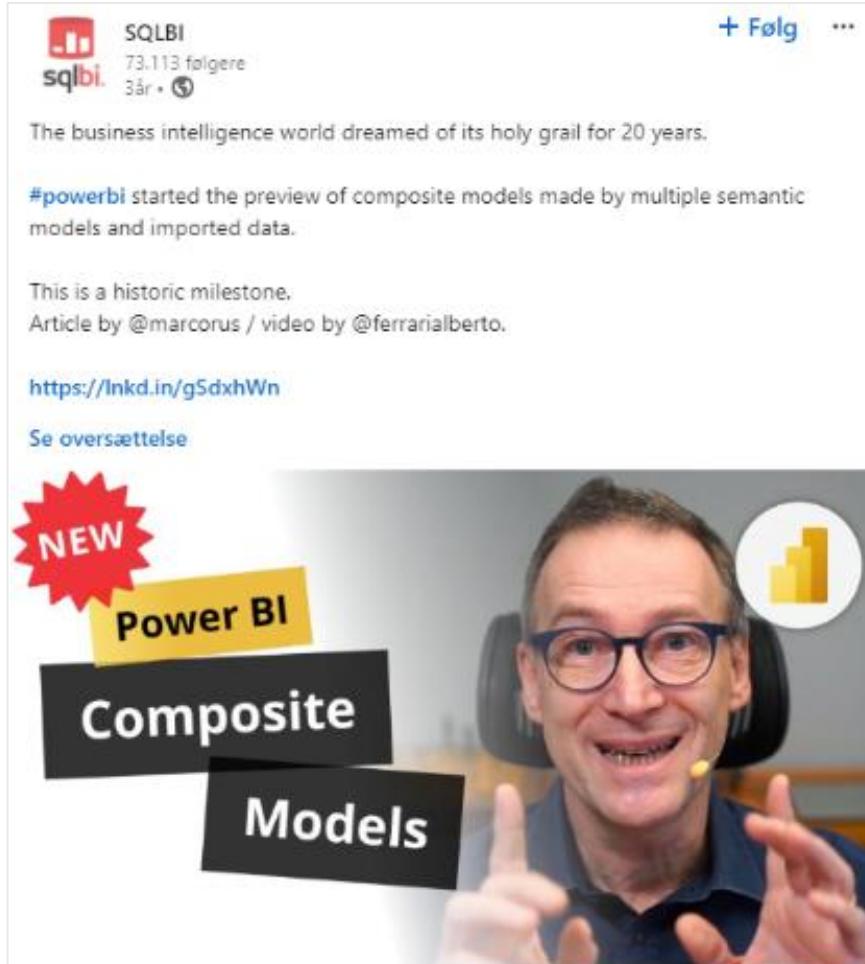
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Roche's Maxim of Data Transformation:

Data should be transformed
as far upstream as possible, and
as far downstream as necessary.

The Holy Grail for self-service BI

Public Preview in Dec 2020 and General Available in Apr 2023



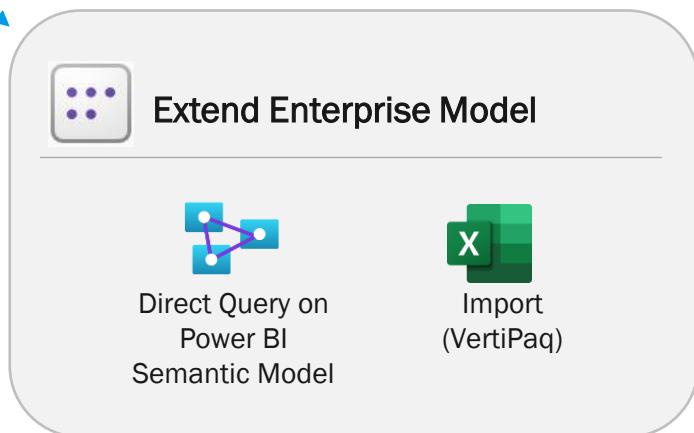
<https://www.sqlbi.com/articles/new-composite-models-in-power-bi-a-milestone-in-business-intelligence/>

twoday academy

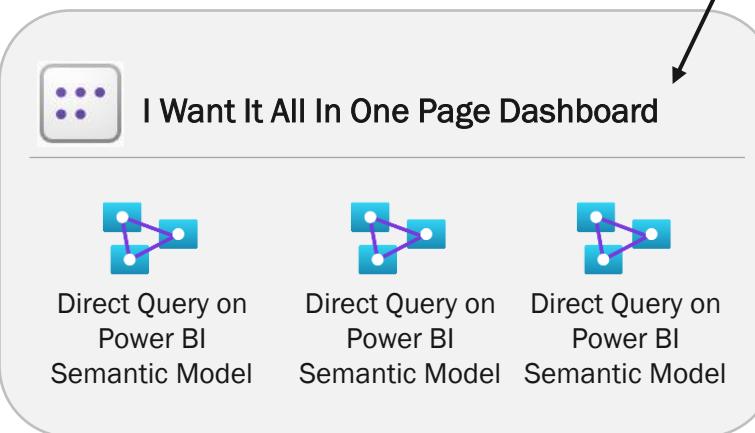
Composite Model (“Mixed storage mode”)



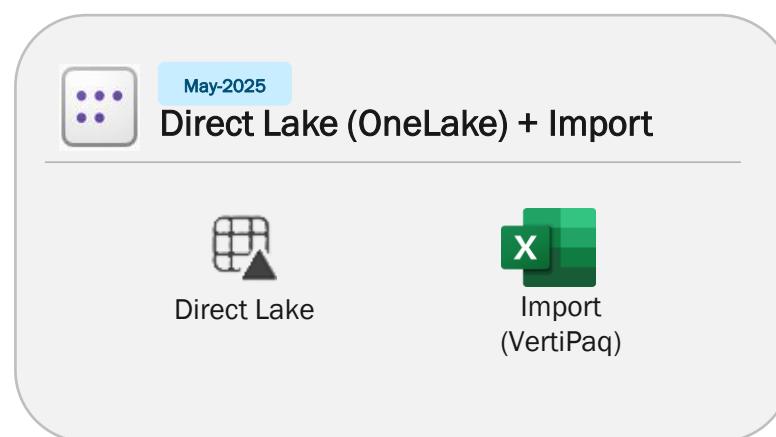
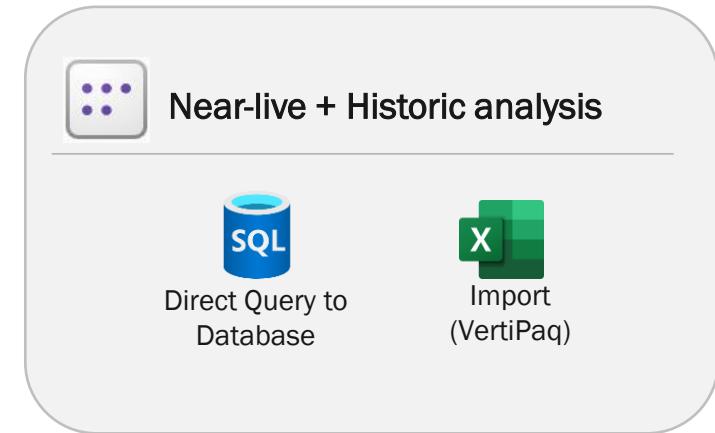
Is that you Fabric Metrics Set?



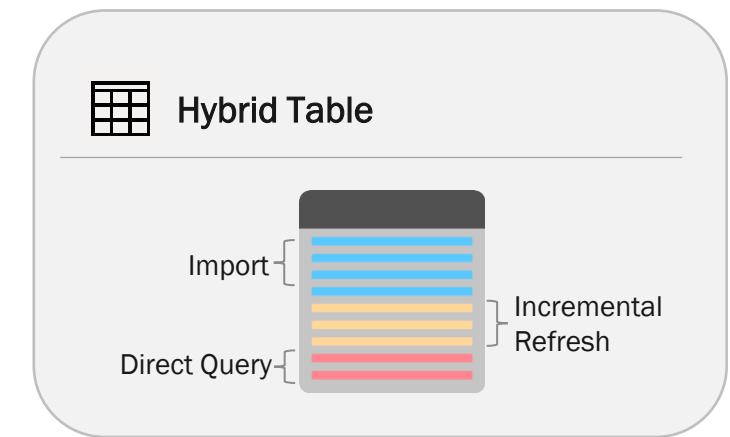
Using composite models with Power BI semantic models and Analysis Services, you can build a composite model using a Direct Query connection to connect to Power BI semantic models, Azure Analysis Services (AAS), and SQL Server 2022 Analysis Services



Bernat Agulló Roselló: <https://www.esbrina-ba.com/i-want-it-all-in-one-page/>



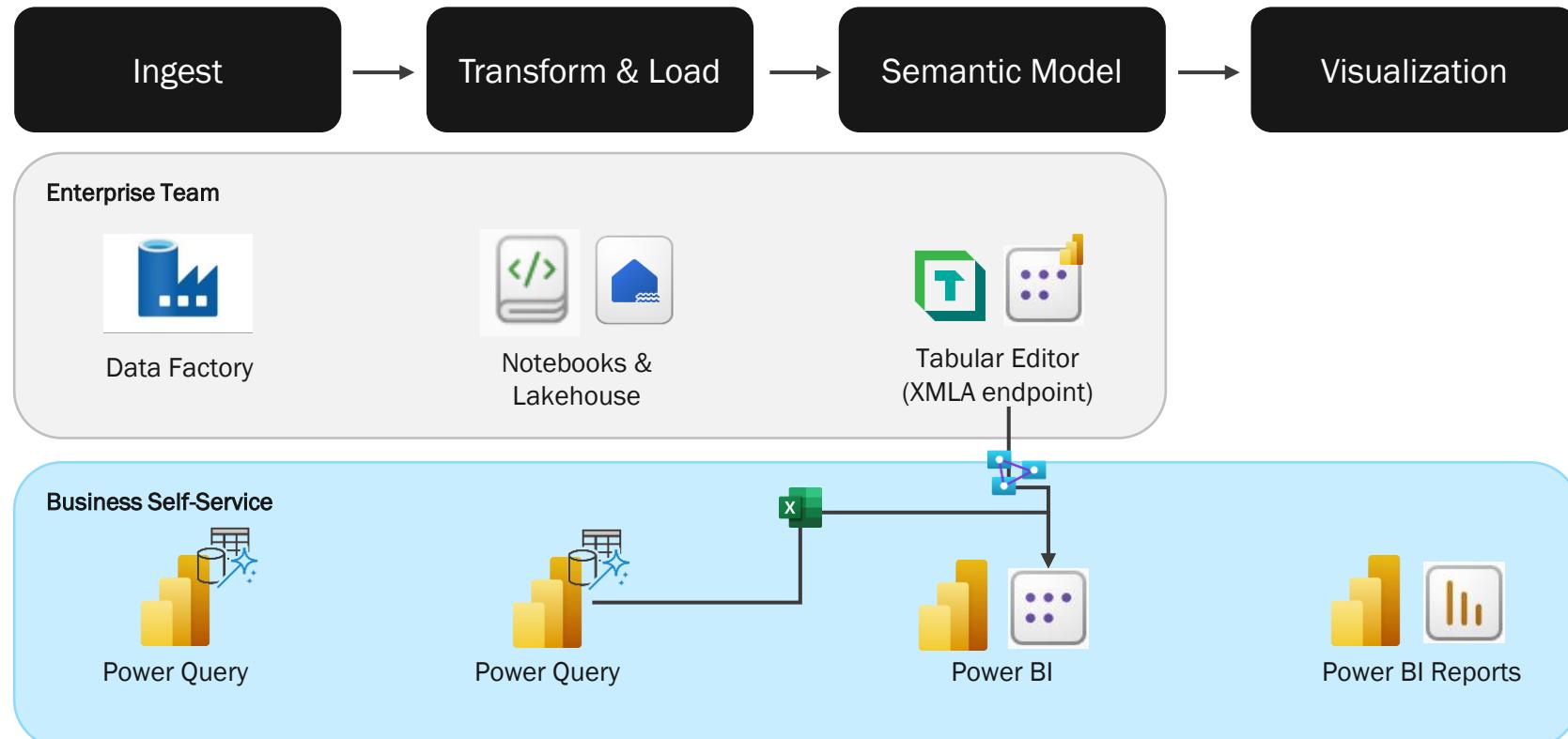
Zoe Douglas LinkedIn Post



There is also Hybrid tables that within one table have import, incremental refresh and Direct Query.

Customizable managed self-service BI

*discipline at the core and **flexibility** at the edge*



Microsoft Usage Scenario: <https://learn.microsoft.com/en-us/power-bi/guidance/powerbi-implementation-planning-usage-scenario-customizable-managed-self-service-bi>

Demo



Wholesale



Retail

discipline at the core and **flexibility** at the edge

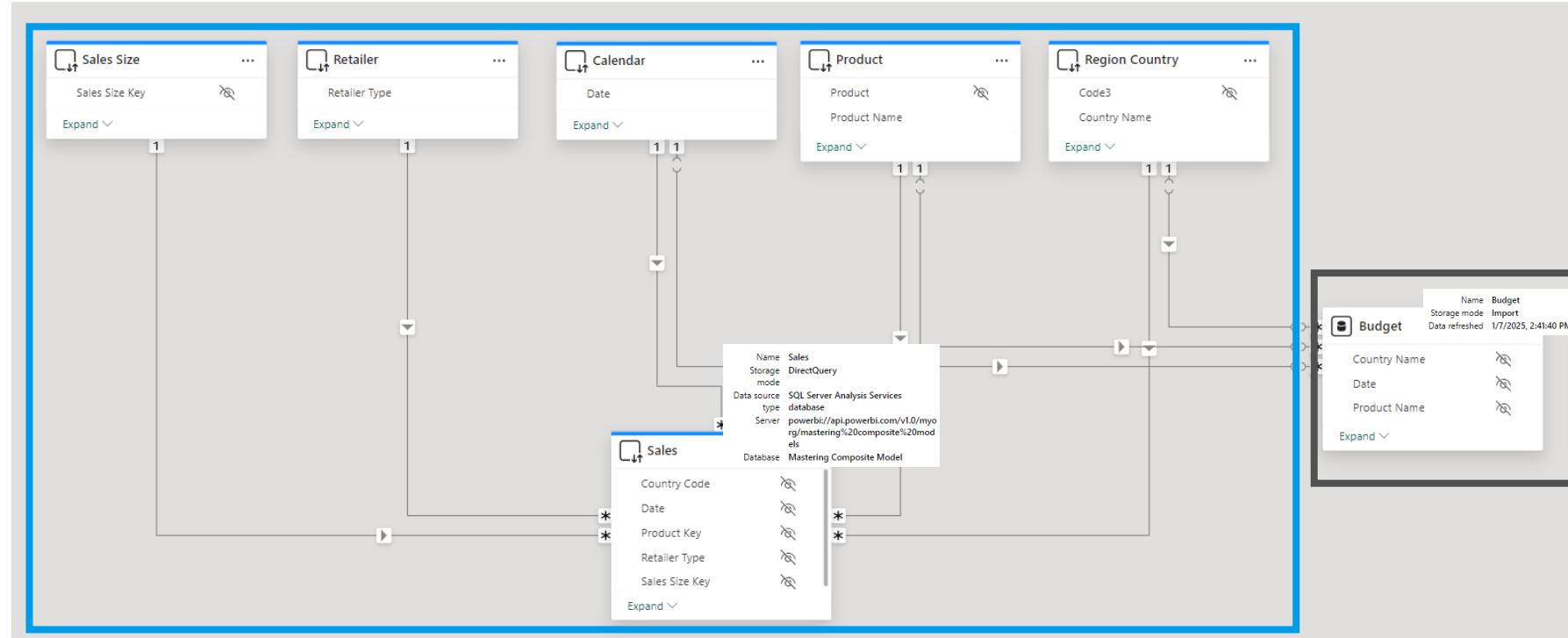


Wholesale
(Remote)
Enterprise Team



Retail
(Local)
Self-Service Business
Dev

Remote & Local



Who loves to include a
calculation group in their
semantic model?



Calculation Group 101

SELECTEDMEASURE()

Reuseable calculation items based on measures in the report canvas

- Time Intelligence (*MTD, QTD, YTD, LY, YOY %*)
- Unit conversion (*show figures in abs, in k, in m*)
- Format String Expressions (*like dynamic format string for measures*)
- Handling Multiple Dates (*USERELATIONSHIP to switch between order and invoice date*)
- Custom Date or Week Periods as slicer in report
- My vs. All stats
- And more ...

The screenshot shows a Power BI report titled "Calculation Groups to the Rescue". On the left, there is a date slicer with options: Last 30 Days, Last 3 Months, Last 6 Months, Current Year, Last Year, All, and Custom. Below the slicer, a measure displays "12.0M Revenue" for the period "4/22/2025 - 5/21/2025". To the right of the measure is a smiling emoji wearing sunglasses. The report also includes a sidebar titled "Date Slicer" with various time period options like "Last 30 Days" and "All". At the bottom of the report, there is a section titled "Dynamic Calculation Groups" with a note about the UX of the date slicer. On the far right, there is a large block of DAX code for creating dynamic calculation groups for "Last 30 Days" and "Last 3 Months".

```
-- Calculation Group: "Date Slicer"
CALCULATIONGROUP 'Date Slicer'[Date slicer column]
CALCULATIONITEM "Last 30 Days" =
    VAR _IsdatesFiltered = ISFILTERED('Date'[Date])
    VAR Day = 30
    VAR _Result =
        IF(
            _IsdatesFiltered,
            SELECTEDMEASURE(),
            CALCULATE(
                SELECTEDMEASURE(),
                KEEPFILTERS(
                    DATESINPERIOD('Date'[Date], TODAY(), -_Day, DAY)
                )
            )
        )
    RETURN _Result
Ordinal = 0

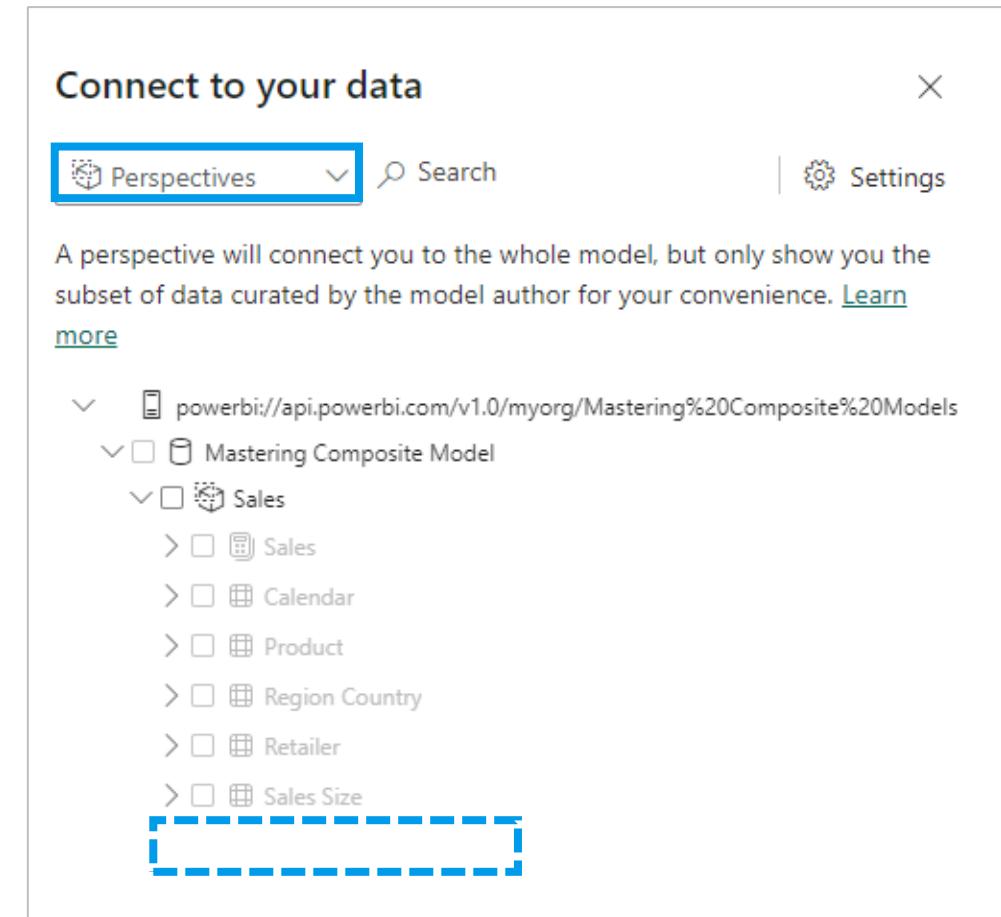
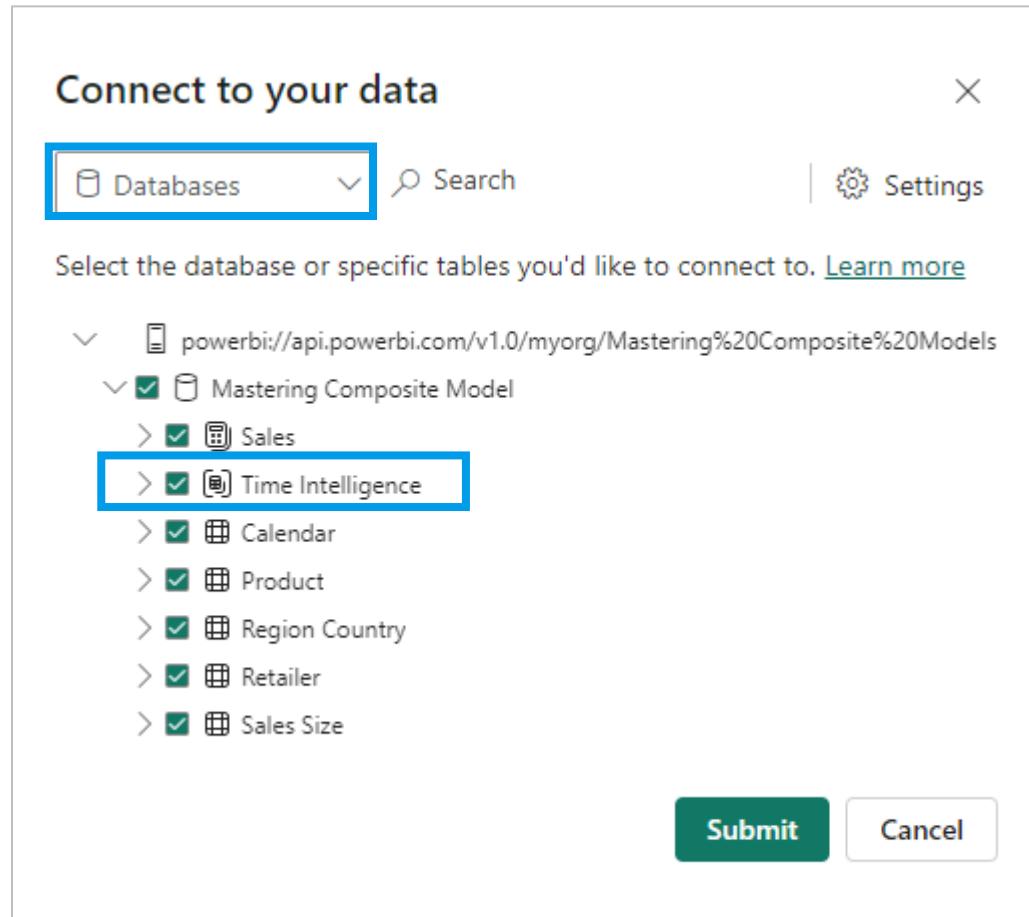
CALCULATIONITEM "Last 3 Months" =
    VAR _IsdatesFiltered = ISFILTERED('Date'[Date])
    VAR Day = 90
    VAR _Result =
        IF(
            _IsdatesFiltered,
            SELECTEDMEASURE(),
            CALCULATE(
                SELECTEDMEASURE(),
                KEEPFILTERS(
                    DATESINPERIOD('Date'[Date], TODAY(), -_Day, DAY)
                )
            )
        )
    RETURN _Result
Ordinal = 1
```

<https://www.linkedin.com/feed/update/urn:li:activity:7331027969357824000/>

Demo

Consideration ...

Create perspectives to exclude calculation group when create composite



“Have you tried Visual Calculations?”



STOP Using Measures in Po...
m.youtube.com

YouTube Åbn app

Kommentarer 14

@charliemather3368 for 6 timer siden
Discovered the benefit of using a visual calc when using measures dependent on two separate data islands in a composite model. It allowed me to perform a difference calculation with ease!

4 1 ::

@dutchdatadude for 4 timer siden
Awesome!



Visual Calculations

- Defined on a visual
- “Visible context”
- Computed at query execution
- Can refer to visual structure

```
// DAX Query
DEFINE
    COLUMN '__SQDSOVisualCalcs'[Diff] =
        /* USER DAX BEGIN */
        [Revenue ACT] - [Budget ACT]
        /* USER DAX END */
```

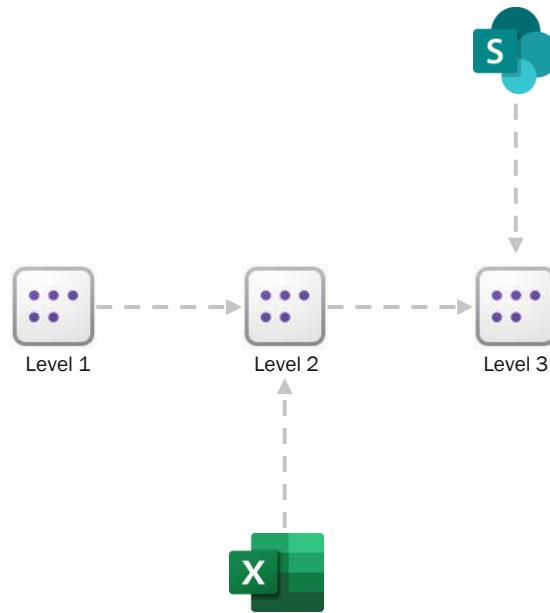
```
37  VAR __SQDSOVisualCalcsInput =
38      SELECTCOLUMNS(
39          KEEPFILTERS(
40              SELECTCOLUMNS(
41                  SQDSOcore,
42                  "Name", "Time Intelligence'[Name],
43                  "Ordinal", "Time Intelligence'[Ordinal],
44                  "IsSQDSOGrandTotalRowTotal", [IsSQDSOGrandTotalRowTotal],
45                  "Revenue_ACT", [Revenue_ACT],
46                  "Budget_ACT", [Budget_ACT]
47              )
48          ),
49          "Name",
50          "Ordinal",
51          "IsSQDSOGrandTotalRowTotal",
52          "Revenue_ACT", [Revenue_ACT],
53          "Budget_ACT", [Budget_ACT]
54      )
55
56  TABLE __SQDSOVisualCalcs =
57      SQDSOVisualCalcsInput
58      WITH VISUAL SHAPE
59      AXIS rows
60      GROUP
61          [Name],
62          [Ordinal]
63          TOTAL [IsSQDSOGrandTotalRowTotal]
64      ORDER BY
65          [Ordinal] ASC,
66          [Name] ASC
67          DENSIFY 'IsDensifiedRow'
68
69  VAR __DSOremoveEmptyDensified =
70      FILTER(
71          KEEPFILTERS('__SQDSOVisualCalcs'),
72          OR(
73              NOT '__SQDSOVisualCalcs'[IsDensifiedRow],
74              NOT ISBLANK('__SQDSOVisualCalcs[Diff]')
75          )
76      )
77
78  VAR __DSOcore =
79      SELECTCOLUMNS(
80          KEEPFILTERS(
81              FILTER(
82                  '__SQDSOremoveEmptyDensified',
83                  '__SQDSOVisualCalcs'[IsSQDSOGrandTotalRowTotal] = FALSE
84              )
85          ),
86          '__SQDSOvisualCalcs'[Name], '__SQDSOvisualCalcs'[Revenue ACT],
87          '__SQDSOvisualCalcs'[Budget ACT], '__SQDSOvisualCalcs'[Budget ACT],
88          '__SQDSOvisualCalcs[Diff]', '__SQDSOvisualCalcs[Diff]',
89          '__SQDSOvisualCalcs[Ordinal]', '__SQDSOvisualCalcs[Ordinal]
90
91  VAR __DSOPrimaryWindowed =
92      TOPN(501, __DSOcore, '__SQDSOVisualCalcs'[Ordinal], 1, '__SQDSOVisualCalcs'[Name], 1)
93
94  EVALUATE
95      __DSOPrimaryWindowed
96
97  ORDER BY
98      __SQDSOvisualCalcs[Ordinal], '__SQDSOvisualCalcs[Name]
99
00
```

A Dream in a Dream in A Dream



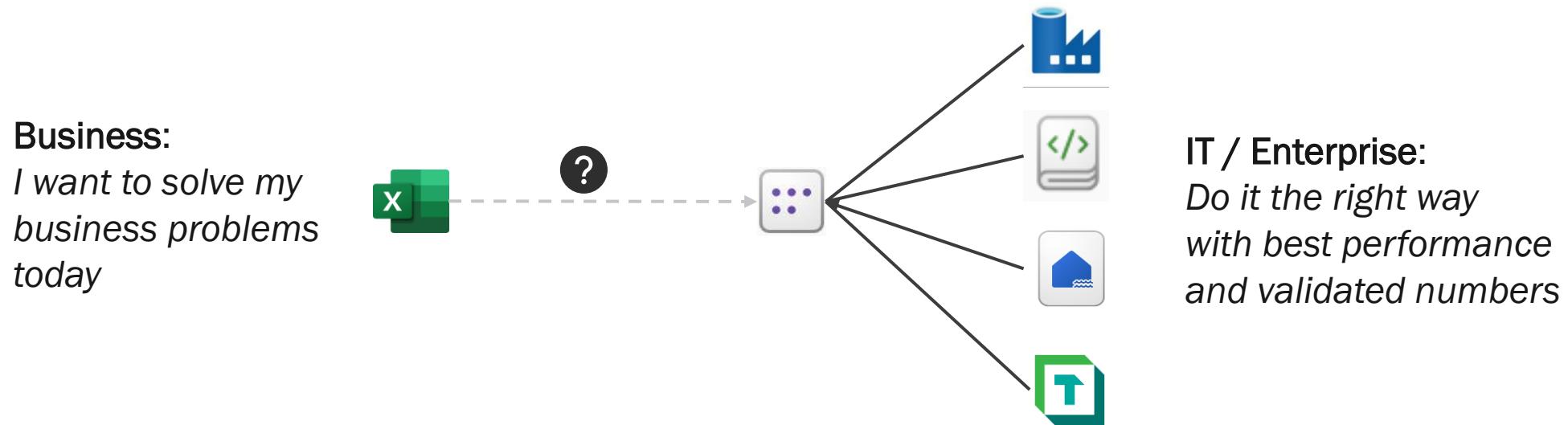
The maximum length of a chain of models is three.

Extending beyond the chain length of three isn't supported and results in errors.

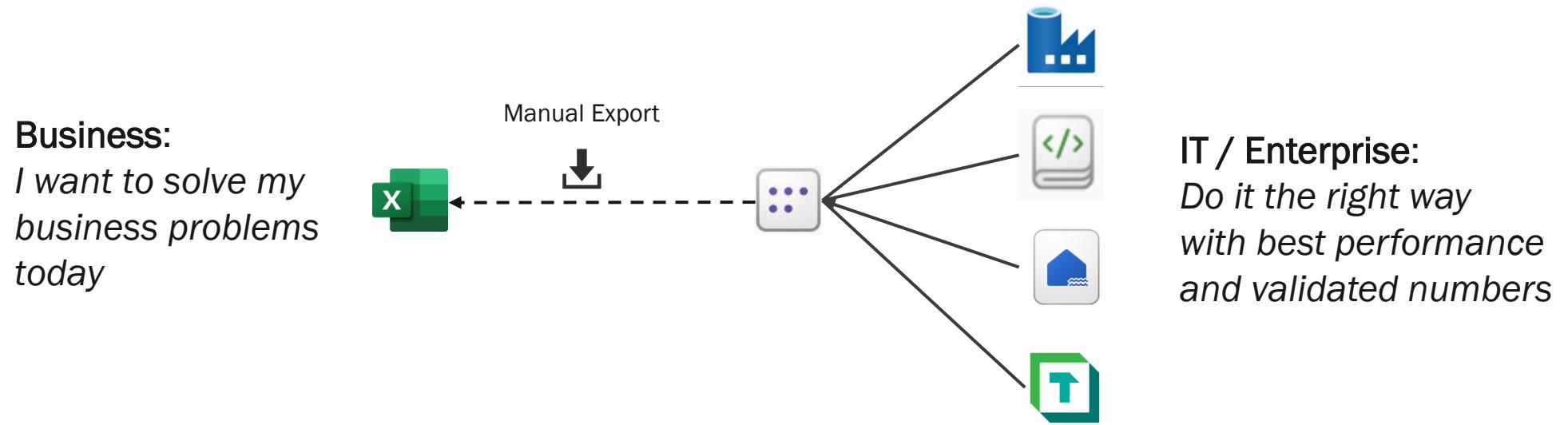


Who owns the data?

- Who owns the semantic model?
- Who supports it?
- Do you have an agreed data contract?
- Would enterprise modelers even accept integrating an important Excel-file into an enterprise setup?



Well then – I will **Export your Enterprise data to Excel** and continue my work to solve my business problems



I'm from IT or Enterprise team: How can I **disable** this?



[Individual model]

Power BI Desktop settings before publishing

CURRENT FILE

Data Load

Regional Settings

Privacy

Auto recovery

Published semantic model settings

Query reduction

Report settings

DirectQuery connections to this semantic model

This prevents users from creating DirectQuery connections to this semantic model in Power BI Desktop. If you change this setting, you'll need to republish your report to save it.

Discourage DirectQuery connections [Learn more](#)



[Tenant]

Admin Portal in Tenant Settings

Export and sharing settings

Allow **DirectQuery** connections to Power BI semantic models

Enabled for the entire organization

DirectQuery connections allow users to make changes to existing semantic models or use them to build new ones. [Learn More](#)

 Enabled

What about sharing semantic models to **external** partners?

OneLake data hub

Discover data from your org and beyond and use it to create reports

All My data Endorsed in your org External data

Filter by keyword Filter(1)



Find data beyond your org

When someone from another company shares data with you, you'll be able to find and access it here. [Learn more about external data](#)

Connect Cancel

This screenshot shows the OneLake data hub interface. It features a large placeholder image for external data. Below the image, there's a section titled "Find data beyond your org" with a descriptive text and a link to learn more about external data. At the bottom right, there are "Connect" and "Cancel" buttons.

Export and sharing settings

- Guest users can work with **shared semantic** models in their own tenants
Enabled for the entire organization

Authorized guest users can discover semantic models shared with them in the OneLake data hub (in Power BI Desktop), and then work with these semantic models in their own Power BI tenants.



Enabled

! This setting applies to the entire organization

Apply

Cancel

- Allow specific users to turn on external data sharing
Enabled for the entire organization

Turn off this setting to prevent all users from turning on external data sharing. If this setting is on, all or specific users can turn on the external data sharing option, allowing them to share data with authorized guest users. Authorized guest users can then discover, connect to, and work with these **shared semantic** models in their own Power BI tenants.



Enabled

! If this setting is on, users can allow authorized guest users to work with shared semantic models in their own Power BI tenants and your data might be moved to a different region.

Connect to external semantic models shared with me

Summary of Considerations for Composite Models

- ⚠ Choose the right storage mode for your need and whenever possible add to existing shared model and create live-connection*
- Composite models are NOT for the enterprise team to create and deliver large models with relationships
- Composite models are for the business self-service developers to provide flexibility at the edge (explore, ad-hoc, Pilot, POC, let's go fast and solve business problems today)
- Be aware of implications of composite models when using calculation groups and calculating measures between remote and local data source groups
- Calculation group with format string expression or measures with dynamic format string works only for model measures in remote – even in live connection
- Be aware of security implications of a query sent to remote model can include data values from local model
- Be aware of performance as composite models will not benefit from visual caches across reports as with live-connection, assume referentially integrity and multiple query types
- You should not use composite models with relationships that have 10,000 unique values or more. For example, create relationship on year or month instead of date
- Be aware of ownership (read access to semantic model in Power BI workspace app vs. Org App in Fabric) and avoid creating chain-on-chain-on-chain models
- Shared expressions (parameters in Power Query), Translations and RLS are not imported from the remote model nor possible to add for remote model objects
- Consumers of a composite model see the results of the OLS rules that were applicable to the author of the composite model when they created the model
- Potential break connection to composite model if renaming semantic model or workspace (hard coded for name and not ID)
- For “I Want It All In One Page Dashboard” check Metric Sets for a more reuseable assets
- As default enabled, but based on your scenario you can disable it on individual semantic models or at tenant level (and in addition investigate external semantic models)
- Naming convention “Local” if duplicates and Enterprise team semantic model owner can utilize Perspectives to share subsets of model excl. remote calculation groups
- As with Live-connection, add model documentation with INFO.VIEW functions or measure expression as description field for self-service developers

*Tools for migrating report-level objects:

 Notebooks in Fabric (Michael Kovalsky's Semantic Link Labs)

 Tabular Editor (C# Scripts and copy M code from local model)

 ALM Toolkit (Compare and merge .bim)

”

Roche's Maxim of Data Transformation:

Data should be transformed
as far upstream as possible, and
as far downstream as necessary.

Credit and resources

- Microsoft Learn Guidance Composite Model: <https://learn.microsoft.com/en-us/power-bi/guidance/composite-model-guidance>
- Microsoft Learn Composite Model: <https://learn.microsoft.com/en-us/power-bi/transform-model/desktop-composite-models#working-with-a-composite-model-based-on-a-semantic-model>
- Microsoft Learn Lifecycle Semantic Model: <https://learn.microsoft.com/en-us/power-bi/connect-data/desktop-report-lifecycle-datasets>
- Microsoft Learn Usage Scenario: <https://learn.microsoft.com/en-us/power-bi/guidance/powerbi-implementation-planning-usage-scenario-customizable-managed-self-service-bi>
- Data Modelling for Expert by Jeroen ter Heerd and Marc Lelijveld: <https://www.youtube.com/watch?v=3EWmkEdaA2U>
- Milestone in BI by SQLBI: <https://www.sqlbi.com/articles/new-composite-models-in-power-bi-a-milestone-in-business-intelligence/>
- Retail & Wholesale in Composite Models by SQLBI: <https://www.sqlbi.com/articles/introducing-wholesale-and-retail-execution-in-composite-models/>
- Direct Lake vs Import article by SQLBI: <https://www.sqlbi.com/blog/marco/2025/05/13/direct-lake-vs-import-vs-direct-lakeimport-fabric-semantic-models-may-2025/>
- Introducing Composite Models in Power BI SQL Day 2023 by Alberto Ferrari: <https://www.youtube.com/watch?v=6Ixiywm0sio>
- External Semantic Model Sharing – Jon Vöge: <https://medium.com/microsoft-power-bi/how-to-share-fabric-power-bi-semantic-models-with-external-users-16ab8bf8e14e>
- Roche's Maxim of Data Transformation: <https://www.youtube.com/watch?v=OAlys79i810>



David Kofod Hanna



LinkedIn Newsletter: <https://www.linkedin.com/newsletters/7237000963331420162/>



LinkedIn: <https://www.linkedin.com/in/davidkofod/>



GitHub: <https://github.com/DKH-DK/Self-Service-Power-BI-Fabric>