



## Power Training by Finext

Peter van den Bos  
Victor Vink

Wie ben ik?



Peter van den Bos  
BI & Analytics Consultant at Finext



Power BI

Microsoft®  
**SQL Server®**  
Analysis Services

Microsoft®  
**SQL Server®**

Microsoft  
Partner  
Silver Data Analytics  
 Microsoft



Power BI

Wie ben ik?



Victor Vink  
BI & Analytics Consultant at Finext

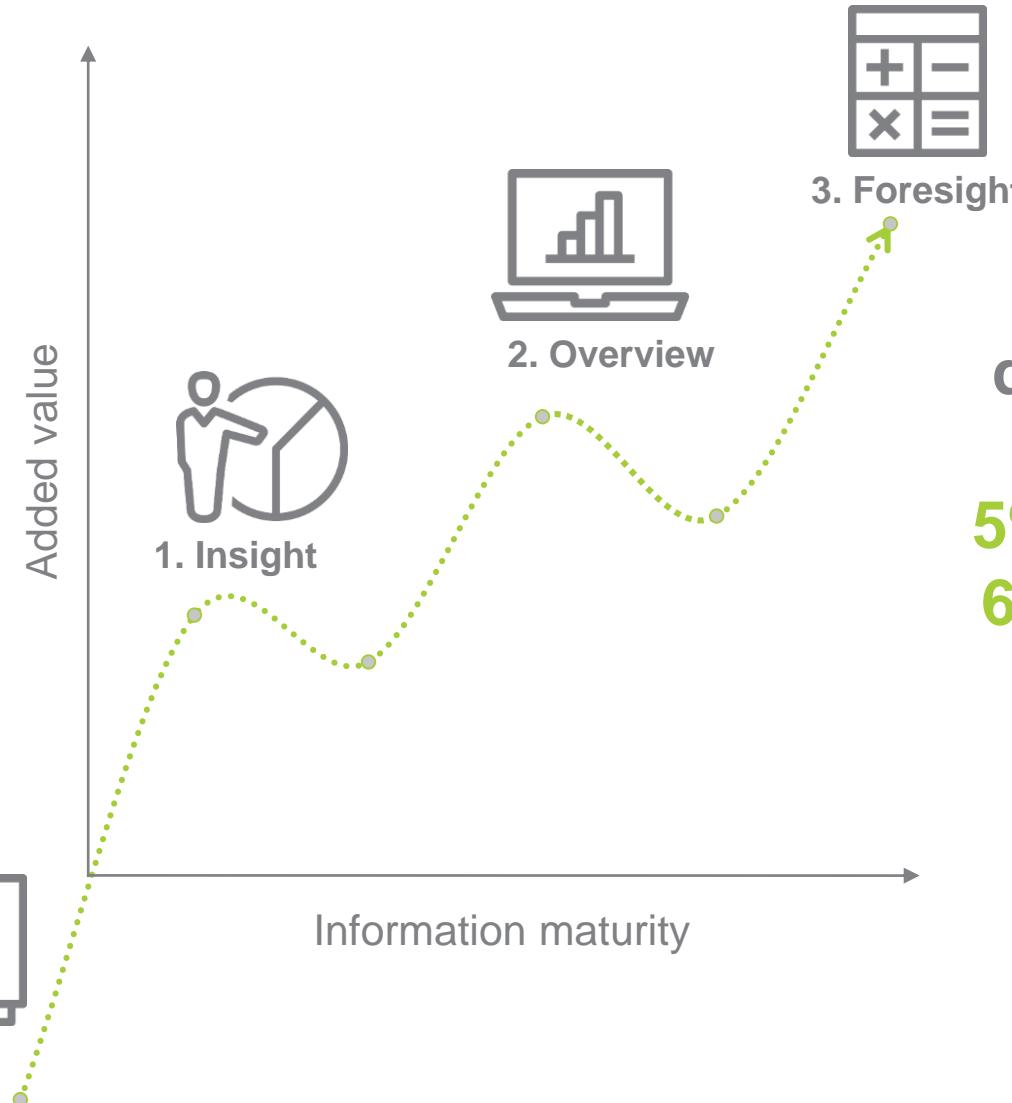


Power BI



alteryx

# Visie Business Intelligence & Analytics



**data-driven companies**  
are, on average,  
**5% more productive** and  
**6% more profitable** than  
their **competitors**



1999



158



8,2



REDUCE COMPLEXITY



REMOVE REDUNDANCY



EMPOWER CRAFTMANSHIP

**IMPACTFUL  
FINANCE  
FUNCTION**

# SECTOR

- ✓ Construction & Engineering
- ✓ Banking & Insurance
- ✓ Industry
- ✓ Retail & FMCG
- ✓ Telecom, Media & Tech
- ✓ Utilities

# EXPERTISE

- ✓ Consolidation & Reporting
- ✓ Planning, Budgeting, & Forecasting
- ✓ Project & Program Control
- ✓ Cost & Profitability Management
- ✓ Chain Process Optimization
- ✓ Governance, Risk & Compliance
- ✓ Analytics & Dashboarding

# TECHNOLOGY

Anaplan

ORACLE

board

Qlik

CCH® Tagetik

SAP®

cxoCOCKPIT

SigmaConso  
Make figures talk.

IBM

+ tableau

ONESTREAM  
GET BACK TO BUSINESS

Vena



ASM Pacific Technology

**ENDEMOL  
SHINE  
GROUP**



SOME CUSTOMERS



Magic Quadrant for Business Intelligence and Analytics Platforms



Source: Gartner (February 2018)



Figure 1. Magic Quadrant for Analytics and Business Intelligence Platforms



Source: Gartner (February 2019)



## Introductions : Please mention

- >Department
- >Your experience with Power Query, Power Pivot?
- >Your general programming / BI / Excel experience?
- >What do you want to take away from this training?



## Organization of this course

> Start: 09:00                  End: +/- 16:30

> Breaks

- Small Breaks    15 minutes
- Lunch            45 minutes

> Content can be downloaded from:

- <https://github.com/VictorVink/Finext-Training>
- Or copied from USB – Please return them

> Materials

- USB containing data + solutions .pbix files – please return them

Training Style:

- > Listen and Watch then ACTION
- > Feel free to ask at **ANY** moment

# Agenda



<b>Start</b>	<b>Eind</b>	<b>Duur</b>	<b>Onderwerp</b>
09:00	09:15	00:15	Introductie
09:15	10:30	01:15	Advanced Power Query
10:30	10:45	00:15	Break
10:45	12:00	01:15	Advanced Power Query pt 2
12:00	12:45	00:45	Lunch
12:45	14:30	01:45	Power Pivot & DAX
14:30	14:45	00:15	Break
14:45	15:45	01:00	Power Pivot & DAX pt 2
15:45	16:30	00:45	Power BI & PQ & PP
16:30	16:45	00:15	Afronden / Vragen



## >Power Query

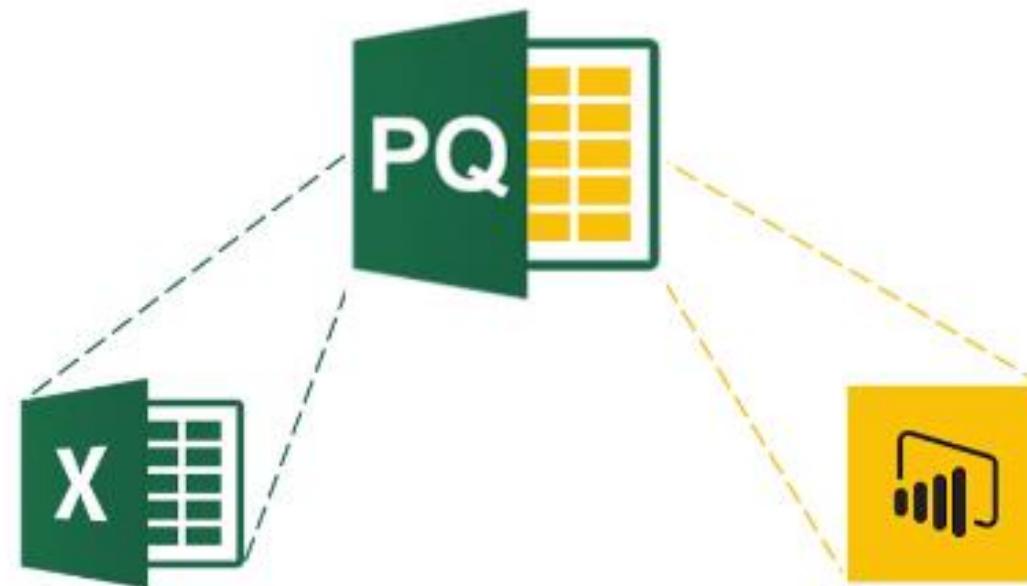
- SuperStore
  - Sales + Orders + Targets

## >Power Pivot

- Contoso

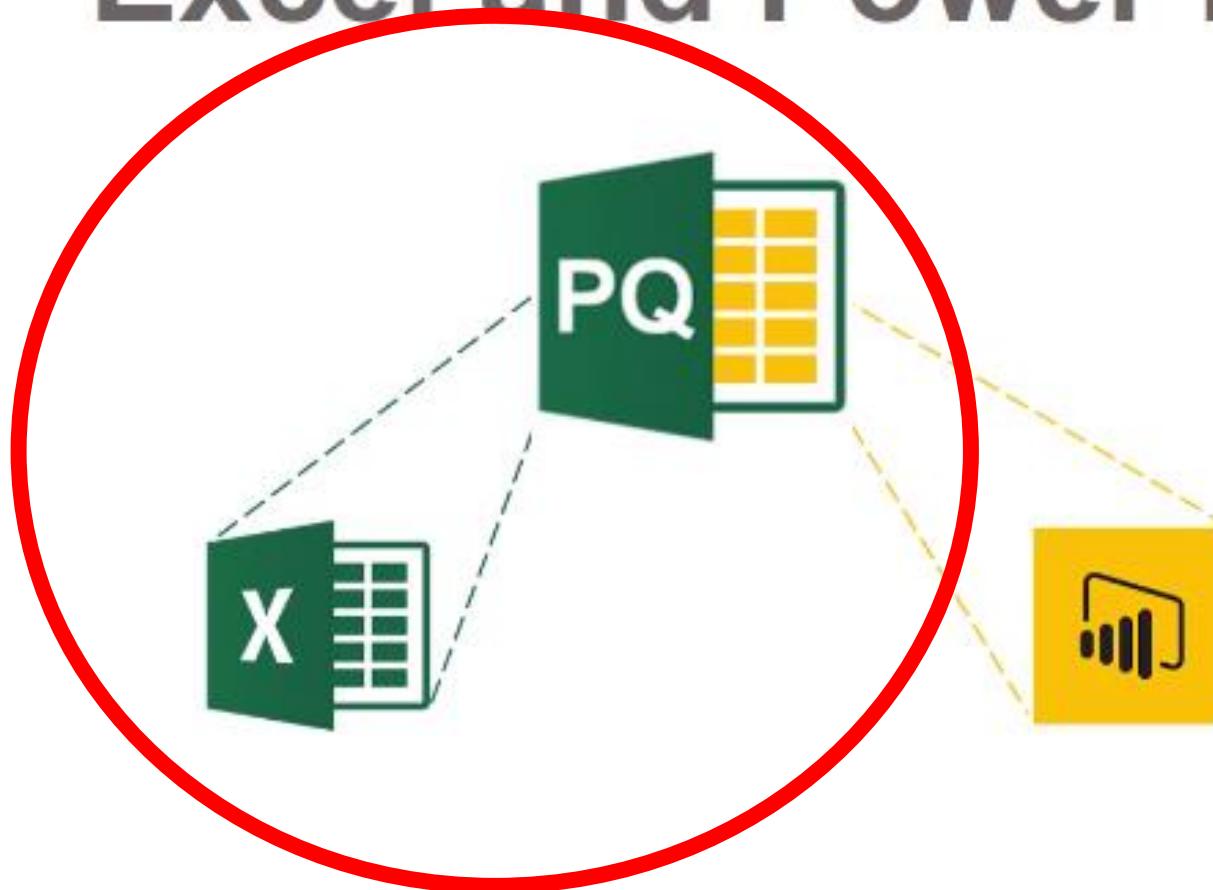


# Power Query for Excel and Power BI





# Power Query for Excel and Power BI





## Power Query Advanced – Content

- > Power Query – Basics
- > Language Structure
- > Advanced Editor
- > Pivot, Unpivot & Transpose
- > Adding columns
- > Summarizing tables
- > Merging tables
- > Text Cleaning
- > Parameters
- > Privacy Levels



## Power Query Advanced – Basics

- > Power Query is called M, short for Mashup.
- > Power Query caches data previews to make query editing more fluid.
  - It does not always show you the latest data in Power Query Editor.
  - You can refresh it in the ribbon.
- > Check the Query Dependencies view.
  - Here you can see all of your data sources and queries tied together when there is a connection between them.
- > Make use of the Formula Bar.
  - You can enable it by clicking on **View** -> Tick the **Formula Bar** box.
  - Makes it easier to modify the code.
- > Difference between Duplicate and Reference query.
  - Duplicate query function duplicates all the steps entirely, letting the query do all the work twice, but allows you to remove source query.
  - Reference query function uses the query as a source, if you change the initial query, it changes in the referenced query.
- > Friendly name your queries and Group them in folders.
  - In order to have clear names in your data model.
  - Make it more user-friendly for others to follow your query.
- > Work with the right Data Types.
  - If not, it might ruin your data model and relationships later.
  - In the ribbon go to Transform -> Select any Column-> Detect Data Type.
  - Or select it yourselves.
- > M is case sensitive.
- > Power Query is not available for all Data Source Types within PowerBI.

# Power Query Advanced – Why Power Query?



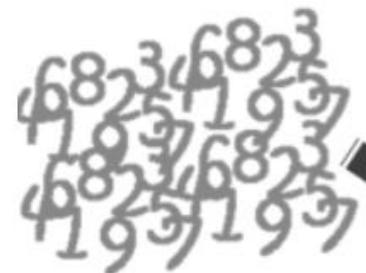
Transform the Data



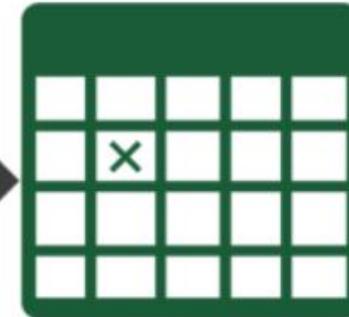
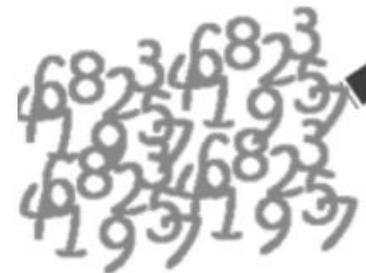
Enrich the Data



Append or Merge Data



**Raw data in many  
shapes & forms**  
(from one or multiple sources)



**The result of our hard work**  
a table ready for consumption or analysis



# Power Query Advanced – Data Flow vs. Power Query

## > Dataflow

- Running Power Query in the cloud

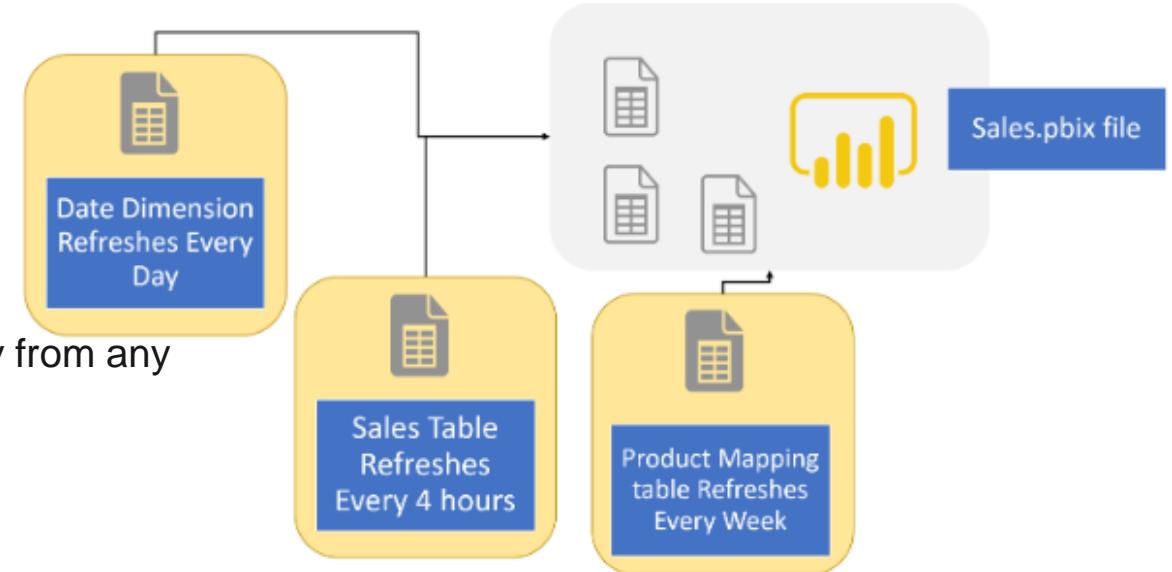
## > Power Query:

- Publish report and schedule the refresh
- Meaning: scheduling a Power Query script to refresh

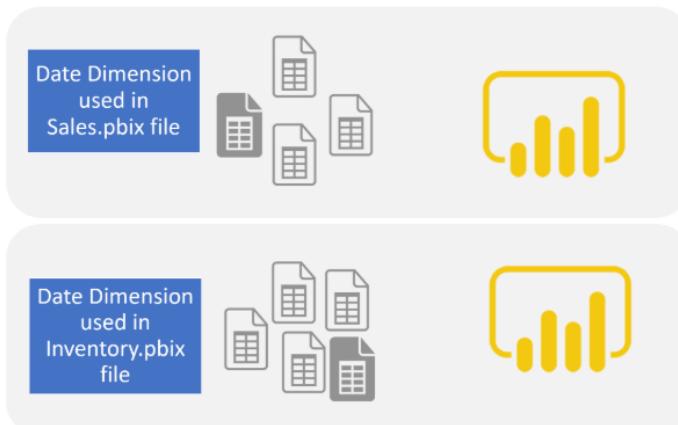
> Dataflow is not part of a single report, running independently from any Power BI reports

## > Advantage:

- Reusable tables or queries across multiple Power BI files
- Run ETL process on a different schedule for every query table



Power Query situation



Versus

Dataflow situation



## Power Query Advanced – Why coding yourself?



- > M is much more powerful than the GUI of Power Query
- > GUI changes every month with updates, but the language stays the same
  - New features in the GUI, does not mean that there is a change in M
- > Extend the existing code



# Power Query Advanced – Language structure

> Start your Query in the Query Editor.

- From the Ribbon -> Home -> Advanced Editor.

> A Mashup (M) query is composed of **variables** and **values** encapsulated by a **LET** expression.

> Start your variable with a variable name.

- It can be any name but if you have spaces the variable name must start with a hash (#) and be encapsulated in double quotes.
- Example 1: #”Promoted Headers”
- Example 2: PromotedHeaders
- Both work properly as variable names.

> Then enter the equal sign (=).

> Define a M function.

- For all the functions that are available, check following link.
- <https://msdn.microsoft.com/en-us/query-bi/m/power-query-m-function-reference>

> Each query formula step builds upon a previous step by referring to the previous step by its variable name.

> Follow the referenced step by the arguments of the expression.

> Mind the required brackets.

> End your variable/line with a comma.

- EXCEPT for the last one!

> Output a query using the **IN** statement.

- Then state the last variable name in the **IN** statement.

> Curly brackets denote a list in Power Query -> { } .

> Refer to other columns by enclosing them in square brackets -> [ ] .

The screenshot shows a Microsoft documentation page for 'Power Query M language specification'. At the top right, it says 'Owen Duncan | Last Updated: 4/19/2018 | 1 c'. Below that, it says 'The Power Query M formula language includes the following sections:'. A sidebar on the left lists 'In this section' with various function categories. The main content area has a heading 'Understanding Power Query M functions' with a list of functions. A red rectangular box highlights the first item in this list: 'Accessing data functions'. The list includes: Accessing data functions, Binary functions, Combiner functions, Comparer functions, Date functions, DateTime functions, DateTimeZone functions, Duration functions, Error handling, Expression functions, Function values, List functions, Lines functions, Logical functions, Number functions, Record functions, Replace functions, Split functions, Table functions, Text functions, Time functions, Type functions, Uri functions, and Value functions.



# Power Query Advanced – Advanced Editor

> Updated Advanced Editor allows you to use:

- M Intellisense;
- Row numbers and line spacing via Display Options in Advanced Editor.
  - (only in Power BI)
- This is making it easier to detect syntax errors.

```
1 let
2   Source = Excel.Workbook(File.Contents("C:\Users\VictorVink\OneDrive - Finext B.V\Sherlocks\PowerBI
  partnership\Power BI advanced\Data\Sample - Superstore.xlsx"), null, true),
3   Orders1 = Source{[Name="Orders"]}[Data],
4   #Promoted Headers = Table.PromoteHeaders(Orders1, [PromoteAllScalars=true]),
5   #Changed Type = Table.TransformColumnTypes(#"PromotedHeaders",{{"Row ID", Int64.Type}, {"Order ID", type
  text}, {"Order Date", Int64.Type}, {"Ship Date", Int64.Type}, {"Ship Mode", type text}, {"Customer ID", type text},
  {"Customer Name", type text}, {"Segment", type text}, {"Country", type text}, {"City", type text}, {"State", type
  text}, {"Postal Code", Int64.Type}, {"Region", type text}, {"Product ID", type text}, {"Category", type text},
  {"Sub-Category", type text}, {"Product Name", type text}, {"Sales", type number}, {"Quantity", Int64.Type},
  {"Discount", type number}, {"Profit", type number}}),
6   #Removed Other Columns = Table.SelectColumns #Changed Type{"Row ID", "Order ID"}
7   #Removed Other Columns
8   #Removed Other Columns
```



# Power Query Advanced – Pivot, Unpivot & Transpose

> Often tables are available in a suitable format, however sometimes this is not the case.

> How to solve this:

- Power Query Advanced Transformations!!

> Pivot Column

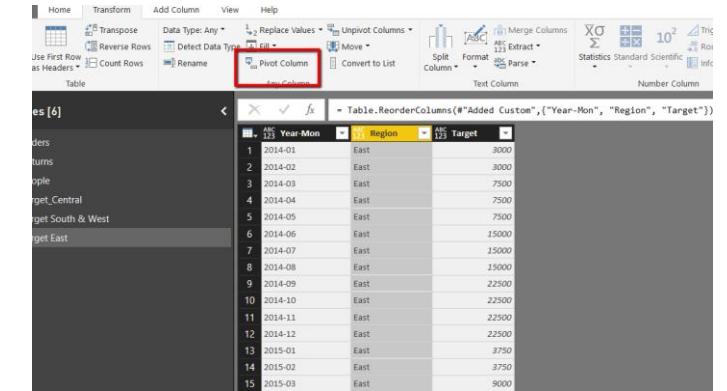
- Is a column transformation.
- Use the column as headers and determine your values.

> Unpivot Columns, two options:

- Unpivot Selected Columns;
- Unpivot Other Columns.

> Transpose

- A table transformation;
- The entire table is flipped from columns to rows.

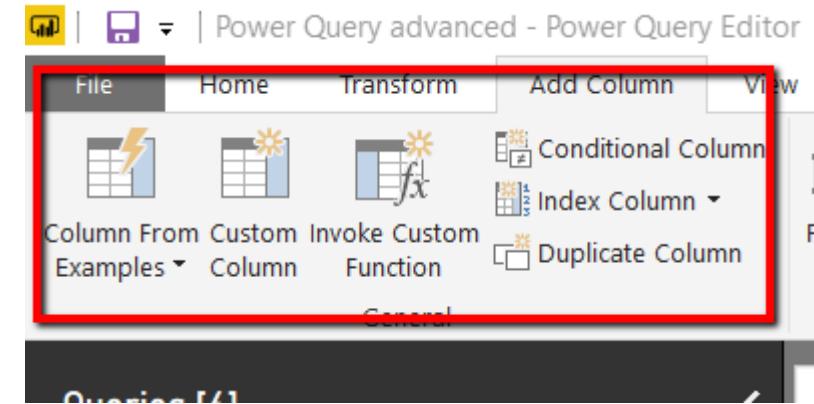


Year-Month	Region	Target
2014-01	East	3000
2014-02	East	3000
2014-03	East	7500
2014-04	East	7500
2014-05	East	7500
2014-06	East	15000
2014-07	East	15000
2014-08	East	15000
2014-09	East	22500
2014-10	East	22500
2014-11	East	22500
2014-12	East	22500
2015-01	East	3750
2015-02	East	3750
2015-03	East	9000



## Power Query Advanced – Adding columns

- >Column from examples.
- >Custom Column.
- >Invoke Custom Function.
  - Apply a custom function to each row of a table.
- >Conditional.
  - If This Then That.
- >Index Column:
  - 1
  - 2
  - 3
- >Duplicate:
  - Duplicate
  - Duplicate





## Power Query Advanced – Summarize

>Summarize your data by using the Group By function.

- To do so: In the ribbon go to Home -> Transform -> Group By or Transform -> Table -> Group By.

- Different kind of Aggregations:

- Sum
- Average
- Median
- Min
- Max
- Count Rows
- Count Distinct Rows
- All Rows

- Creating a new table on the specific level of aggregation

The screenshot shows the 'Group By' dialog box in Power Query. The 'Advanced' mode is selected. The 'Group by' section includes 'Year' and 'Segment'. The 'New column name' section shows 'Sum Sales' with 'Sum' as the operation on the 'Sales' column. Another row shows 'Sum Profit' with 'Sum' as the operation on the 'Profit' column. The 'Add aggregation' button is visible. The formula bar at the top displays the M code: `= Table.Group(#"Inserted Year", {"Year", "Segment"}, {"Sum Sales": each List.Sum([Sales]), type number}, {"Sum Profit": each List.Sum([Profit]), type number})`. The 'OK' and 'Cancel' buttons are at the bottom right.

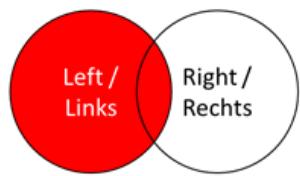


# Power Query Advanced – Merge

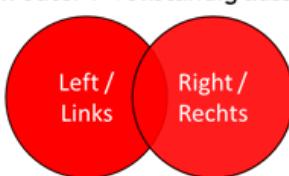
## >Merging Queries

- Use a key to **Join** two queries together
- **Merge Queries as new** vs. **Merge queries**
- Go to Home -> Merge Queries -> select the matching columns -> Select jc
  - Join kinds (see picture below)
- Aggregate
- Expand
- Original column as prefix

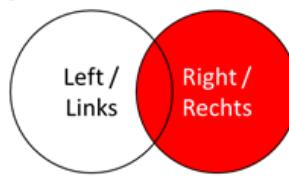
Left outer / linker äusserer



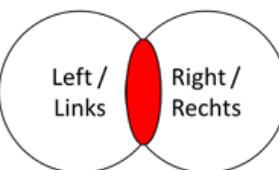
Full outer / vollständig äusserer



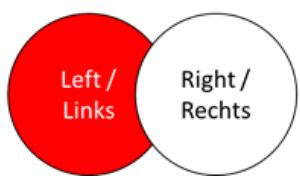
Right outer / rechter äusserer



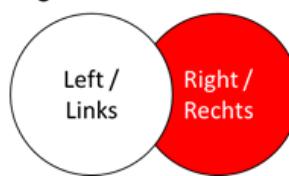
Inner / innerer



Left Anti / Linker Anti



Right Anti / Rechter Anti



## Merge

Select a table and matching columns to create a merged table.

Orders

Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name	Segment
1	CA-2016-152156	8-11-2016	11-11-2016	Second Class	CG-12520	Claire Gute	Consumer
2	CA-2016-152156	8-11-2016	11-11-2016	Second Class	CG-12520	Claire Gute	Consumer
3	CA-2016-138688	12-6-2016	16-6-2016	Second Class	DV-13045	Darrin Van Huff	Corporate
4	US-2015-108966	11-10-2015	18-10-2015	Standard Class	SO-20335	Sean O'Donnell	Consumer
5	US-2015-108966	11-10-2015	18-10-2015	Standard Class	SO-20335	Sean O'Donnell	Consumer

Returns

Returned	Order ID
Yes	CA-2017-153822
Yes	CA-2017-129707
Yes	CA-2014-152345
Yes	CA-2015-156440
Yes	US-2017-155999

Join Kind

Left Outer (all from first, matching from second)

The selection has matched 800 out of the first 9994 rows.

OK

Cancel



# Power Query Advanced – Merge examples

## >Merging Queries Join Kinds

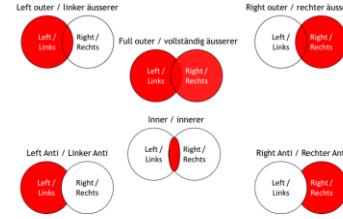
- Left Outer
  - All from first, matching from second
- Right Outer
  - All from second, matching from first
- Full Outer
  - All rows from both
- Inner
  - Only matching rows
- Left Anti
  - Rows only in first
- Right Anti
  - Rows only in second

Film	Revenue
The Shawshank Redemption	100M
The Godfather	50M
The Dark Knight	150M
Pulp Fiction	80M

Film	Revenue	Budget
The Shawshank Redemption	100M	null
Pulp Fiction	80M	30M
The Godfather	50M	60M
The Dark Knight	150M	null

Film	Revenue	Budget
The Godfather	50M	60M
Pulp Fiction	80M	30M
The Shawshank Redemption	100M	null
The Dark Knight	150M	null
Fight Club	null	25M
Forrest Gump	null	20M

Film	Revenue	Budget
Fight Club	25M	null
Forrest Gump	20M	null



Film	Budget
Fight Club	25M
Pulp Fiction	30M
The Godfather	60M
Forrest Gump	20M

Film	Revenue	Budget
Fight Club	null	25M
Pulp Fiction	80M	30M
The Godfather	50M	60M
Forrest Gump	null	20M

Film	Revenue	Budget
The Godfather	50M	60M
Pulp Fiction	80M	30M

Film	Revenue	Budget
The Shawshank Redemption	100M	null
The Dark Knight	150M	null



# Power Query Advanced – Text cleaning

- >lowercase
- >UPPERCASE
- >Capitalize Each Word
- >Trim
- >Clean
- >Add Prefix
- >Add Suffix
  
- >Length
- >First Characters
- >Last Characters
- >Range
- >Text Before Delimiter
- >Text After Delimiter
- >Text Between Delimiters

The screenshot shows the Power Query Editor interface. A context menu is open over a 'Revenue' column, specifically at the cell containing '100M'. The menu path 'Format' > 'Text' is selected. The 'Text' submenu is open, showing options: lowercase, UPPERCASE, Capitalize Each Word, Trim, Clean, Add Prefix, and Add Suffix. The 'lowercase' option is highlighted.

Film	Revenue
The Godfather	50M
Pulp Fiction	80M
The Shawshank Redemption	100M
The Dark Knight	150M

The screenshot shows the Power Query Editor interface. A context menu is open over a 'Revenue' column, specifically at the cell containing '100M'. The menu path 'Text' is selected. The 'Text' submenu is open, showing options: Length, First Characters, Last Characters, Range, Text Before Delimiter, Text After Delimiter, and Text Between Delimiters. The 'Text Before Delimiter' option is highlighted.

Film	Revenue	
The Godfather	50M	60M
Pulp Fiction	80M	30M
The Shawshank Redemption	100M	null
The Dark Knight	150M	null



## Power Query Advanced – Parameters

### > Parameter

- A query that returns a single value, which may have a specified data type.

> Create a new parameter by clicking Home -> Parameters -> Manage Parameters -> New Parameter.

- Or right click on the blank query pane and select New Parameter,

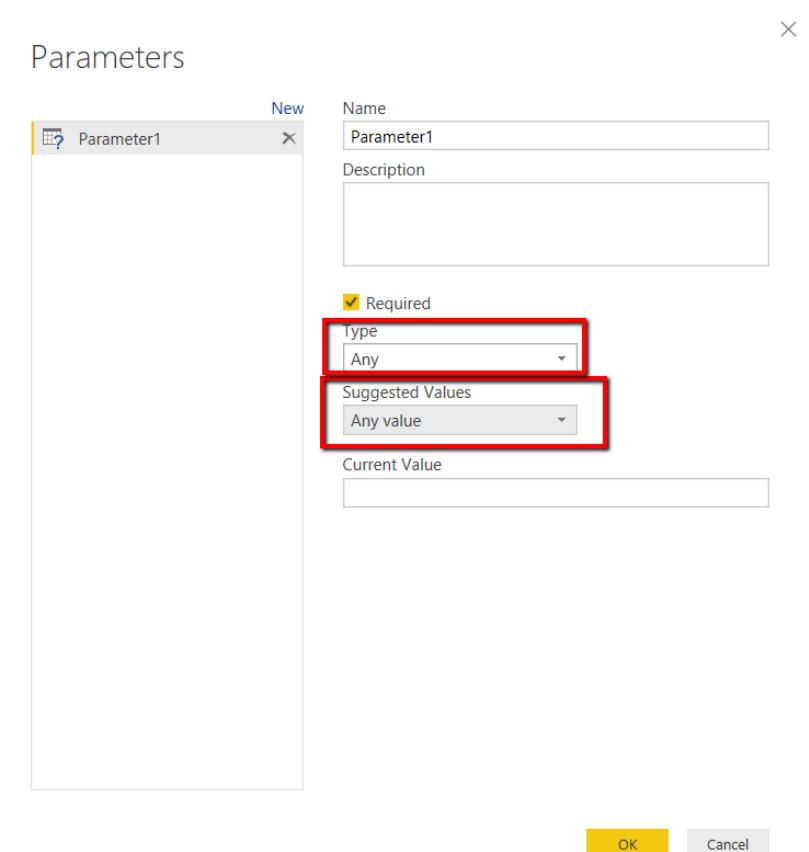
> Name is the name of the parameter

> Type is the Data Type of the Parameter

> Suggested Value

- Drop-down list:

- Any Value: enter any value.
- List of Values: lets you pre-define a list of parameter values, translating in a drop-down list.
- Query: reference an other query that returns a list.





## Power Query Advanced – Privacy levels

> Privacy level is **important** because:

- It might affect the performance of queries.
- It might not execute the queries if it is not permitted by privacy levels.
- Change the privacy levels as following: Home -> Data Sources -> Data Source Settings.
  - Here is a list of the data sources used in the current file.

> **Public**

- This option should be used for **publicly accessible** sources (Wikipedia pages)

> **Organizational**

- This can be used for data sources accessible to **others** within your network, such as a corporate database. **Isolated** from the **public** data sources, but visible to other organizational sources.

> **Private**

- Should be used for confidential or **sensitive** information, such as payroll information. This privacy level is completely **isolated** from all data sources, including other data sources marked as **private**

## Power Query challenge:



### The Challenge:

Our business challenge here is that we are in the process of working out how to reward customers that buy memberships in multiple business areas across our organization. You've been asked to generate a list of all the transactions pertaining to customers who have purchased from multiple business units.

### Notes:

- > 1. Susan and Bob are the only people in this list who bought memberships to multiple business units.
- > 2. Susan bought multiple Golf Course memberships (one for her and one for her spouse). We need to keep both those transactions - even though they are in the same division - as she also bought a Marina and Fitness Club membership.
- > 3. Claire also bought two Golf Course memberships. While she bought multiple products, they are from the same business area, so we want to ignore them.

Customer ID	Date	Customer	Membership	Price
1	12-3-2019	Susan	Golf Course	2500
2	9-3-2019	Bob	Marina	3500
3	5-3-2019	Joe	Fitness Club	780
4	10-3-2019	Claire	Golf Course	2500
5	16-3-2019	Jim	Marina	3000
2	16-3-2019	Bob	Golf Course	2500
1	21-3-2019	Susan	Marina	4000
1	21-3-2019	Susan	Fitness Club	780
4	16-3-2019	Claire	Golf Course	2500
1	14-3-2019	Susan	Golf Course	2500



Customer ID	Date	Customer	Membership	Price
1	43536	Susan	Golf Course	2500
1	43538	Susan	Golf Course	2500
1	43545	Susan	Marina	4000
1	43545	Susan	Fitness Club	780
2	43533	Bob	Marina	3500
2	43540	Bob	Golf Course	2500



# Power Query Advanced – Tips

- > Difference between Table.RemoveColumns and Table.SelectColumns.
- > Table.RemoveColumns lists all the columns which makes it **unreadable**.
- > Table.SelectColumns only lets you **select** the proper columns, making it more readable
  - In the ribbon go to Home -> Choose Columns -> Choose Columns
  - OR Select columns you want to keep by holding shift and left-click on those columns, and Remove Other Columns

The screenshot shows the Power Query Editor interface. A step named 'Table.RemoveColumns' is applied to the 'Orders' query. The 'APPLIED STEPS' pane on the right shows the step has been applied. The preview pane displays a table with two columns: 'Row ID' and 'Order ID'. The data consists of 25 rows, each containing a unique identifier for a row and its corresponding order ID.

## > Set your filters at the beginning!

- > Name your variables (steps), queries and folders properly.
  - Filtered Rows
  - Filtered Rows1
  - Is unclear!!

The screenshot shows the Power Query Editor interface. A step named 'Table.SelectColumns' is applied to the 'Orders' query. The 'APPLIED STEPS' pane on the right shows the step has been applied. The preview pane displays a table with two columns: 'Row ID' and 'Order ID'. The data consists of 25 rows, each containing a unique identifier for a row and its corresponding order ID.



## Power Query Advanced – Recap

> Summarize using the Group By function.

- Take in mind the aggregation level.

> For joins, look them up on the internet ;).

> A table is not always in a suitable format to load it in the data model.

- Use advanced transformations.

> Text is not always stored in a proper way.

- Use one of the text cleaning option to get the desired result.

> Extract certain parts of fields using the extract function.

> Take in mind the different privacy levels.

> Try to write your code as clean as possible, to make it readable.



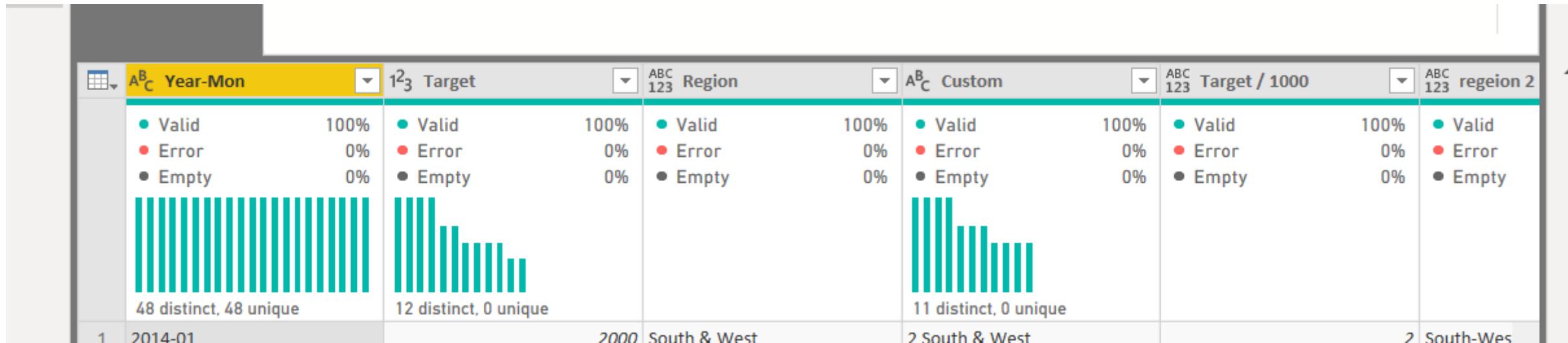
# Power Query for Excel and Power BI





# Advantages Power Query in Power BI

## >Data profiling



- >Set line numbers in advanced editor
- >Set intellisense in advanced editor
- >Set colors in advanced editor



# Power Pivot & DAX



- Wat is DAX
- Datamodel
- Calculated columns
- Measures
- Aggregate functions
- The X aggregation
- Table functions
- Calculate
- Evaluation contexts
- Time intelligence



- DAX staat voor Data Analysis Expressions
- DAX is de programmataal voor
  - Power BI
  - Analysis Service (SSAS)
  - Power Pivot
- DAX heeft veel overeenkomsten met de “formuletaal” in Excel
- Maar: andere denkwijze over de toepassing van formules
  - Excelformules zijn gebaseerd op cellen, bijvoorbeeld CEL a \* b = UITKOMST
  - DAX is gebaseerd op op rijen en kolommen, bijvoorbeeld KOLOM A \* B = UITKOMST



- DAX haalt informatie uit tabellen uit het datamodel in Power BI, SSAS en Power Pivot
  - De opbouw van het datamodel is van essentieel belang voor DAX-query's
  - Hoe complexer het model, hoe complexer de query's
  - Een verkeerd opgebouwd datamodel heeft effect op de performance
- Gebruik altijd een ster- of sneeuwvlokmodel
- Scheid feiten en dimensies
  - Feiten zijn zaken die kunnen veranderen, bijvoorbeeld de verkoop van een dag
  - Dimensies veranderen (meestal) niet, zoals een geboortedatum of productcode



## Calculated columns

- *Calculated columns* worden toegevoegd aan een tabel in het datamodel
- De berekening van *calculated columns* wordt per rij uitgevoerd
- De kolommen worden berekend terwijl het model wordt geladen, dit kost RAM-geheugen
- De DAX *expressive* in *calculated columns* gebruikt de context van de rij of van de tabel

The screenshot shows a dark-themed interface for the DAX Formatter tool. On the left, there's a logo for 'DAX FORMATTER' with a red 'F' icon. To the right of the logo, there are two numbered lines of DAX code:

```
1 | Profit =  
2 | Sales[Unit Price] - Sales[Unit Cost]
```

# Measures



- Een *measure* wordt gebruikt om waarden van rijen te aggereren
- Een *measure* berekent niet rij voor rij in het datamodel
- Een *measure* wordt alleen geactiveerd als je hem gebruikt
  - Voordeel: gebruikt geen RAM-geheugen als ze niet in gebruik zijn

- Een *measure* volgt de context van de rijen

```
DAX FORMATTER
1 | Profit_Measure =
2 | SUM ( Sales[Unit Price] )
3 | - SUM ( Sales[Unit Cost] )
```

Profit	Profit_Measure
1,724,060.77	1,724,060.77
<b>Total</b>	<b>1,724,060.77</b>

Manufacturer	Profit	Profit_Measure
Contoso, Ltd	361,548.54	361,548.54
Fabrikam, Inc.	274,662.97	274,662.97
Litware, Inc.	219,266.92	219,266.92
Adventure Works	196,597.68	196,597.68
Proseware, Inc.	148,516.78	148,516.78
Wide World Importers	140,850.81	140,850.81
A. Datum Corporation	131,794.23	131,794.23
Southridge Video	84,217.97	84,217.97
Northwind Traders	79,368.52	79,368.52
The Phone Company	73,096.79	73,096.79
Tailspin Toys	14,139.56	14,139.56
<b>Total</b>	<b>1,724,060.77</b>	<b>1,724,060.77</b>



# Aggregate functions

- De meest gebruikte *measures* zijn:

- SUM()
- COUNT()
- COUNTROWS()
- MIN()
- MAX()
- COUNTBLANK()
- DIVIDE()

# X aggregations



- De X aggregations worden ook wel *iterators* genoemd
- Te herkennen aan de X in de naam, bijvoorbeeld:
  - SUMX()
  - AVERAGEX()
  - MINX()
  - MAXX()

 DAX FORMATTER

```
1 | Syntax =  
2 | SUMX (  
3 |     Table,  
4 |     Expression  
5 | )
```

- X aggregations maken DAX query's een stuk korter

 DAX FORMATTER

```
1 | Profit_Measure =  
2 | SUM ( Sales[Unit Price] )  
3 | - SUM ( Sales[Unit Cost] )
```

 DAX FORMATTER

```
1 | Profit_Measure_X :=  
2 | SUMX (  
3 |     Sales,  
4 |     Sales[Unit Price] - Sales[Unit Cost]  
5 | )
```

# Variables



- Gebruikt zodat *measures* in complexe DAX query's niet herschreven moeten worden
- *Variables* bestaan alleen in de DAX query waar ze worden aangemaakt



```
1  SUM_X_VAR =
2  VAR Variabele_SUM_X =
3    SUMX (
4      Sales,
5      Sales[Quantity] * Sales[Unit Price]
6    )
7  RETURN
8  IF (
9    Variabele_SUM_X > 1000,
10   "Groot",
11   "Klein"
12 )
```



# Table functions

- Basisfuncties die werken op een tabel, zijn:
  - FILTER
  - ALL
  - VALUES
  - DISTINCT
  - RELATEDTABLE
- De snelheid van een query wordt verbeterd door eerst een tabel te filteren, bijvoorbeeld door alleen de rode kleuren te selecteren

DAX FORMATTER

```
1 Profit_Measure_X_Filter =
2 SUMX (
3     FILTER (
4         Sales,
5         YEAR ( Sales[Order Date] ) = 2008
6     ),
7     Sales[Unit Price] - Sales[Unit Cost]
8 )
```

Manufacturer	Profit	Profit_Measure	Profit_Measure_X_Filter
Contoso, Ltd	361,548.54	361,548.54	84,943.24
Fabrikam, Inc.	274,662.97	274,662.97	101,330.11
Litware, Inc.	219,266.92	219,266.92	97,474.71
Adventure Works	196,597.68	196,597.68	38,417.97
Proseware, Inc.	148,516.78	148,516.78	38,040.00
Wide World Importers	140,850.81	140,850.81	69,880.87
A. Datum Corporation	131,794.23	131,794.23	22,925.58
Southridge Video	84,217.97	84,217.97	16,314.60
Northwind Traders	79,368.52	79,368.52	8,258.50
The Phone Company	73,096.79	73,096.79	25,828.83
Tailspin Toys	14,139.56	14,139.56	3,323.98
Total	1,724,060.77	1,724,060.77	506,738.39

# Calculate



- De functie CALCULATE() past de filtercontext aan
- Laat toe om data te manipuleren om bijvoorbeeld een waarde te delen door de totale waarde



```
1  SalesPct =  
2  DIVIDE (  
3      [TotalSales],  
4      CALCULATE (  
5          [TotalSales],  
6          ALL ( 'Product'  
7      )  
8  )
```



## Evaluation contexts

Evaluatie context bestaat uit twee aspecten/contexten:

- Filter context

Filter Context bestaat uit filters. De vraag die je moet stellen is welke filters hebben betrekking op de measure.

- Row context

Kunnen Iterators zijn maar zijn rijen die actief zijn in de filter context. Echter, kunnen deze ook leeg zijn.

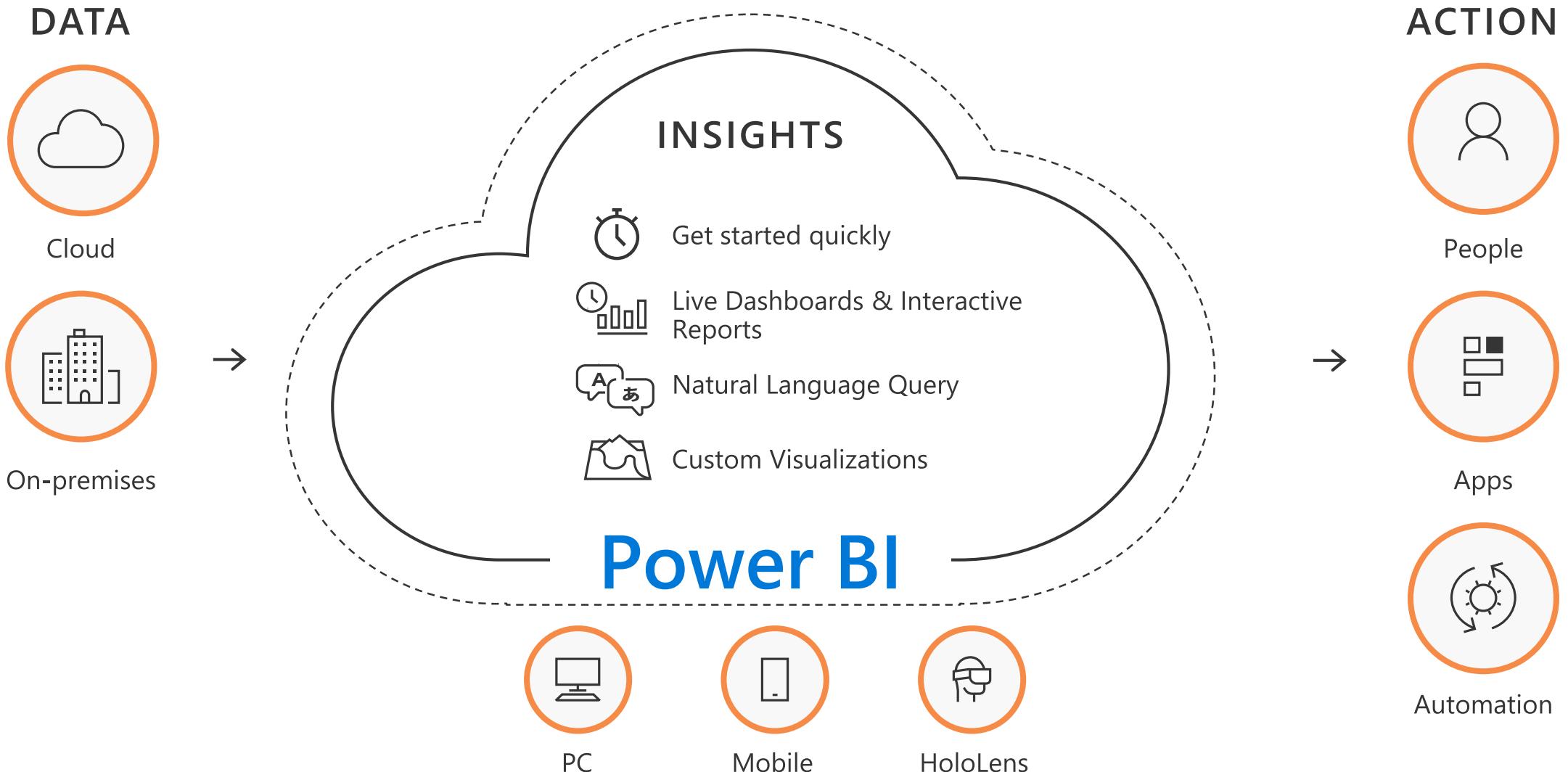
# Time intelligence



- Werken alleen als de data een volledig jaar omvatten (1 januari tot en met 31 december)
- Door *time intelligence*-functies kunnen verschillende tijdsperioden gemakkelijk vergeleken worden
- De *time intelligence*-functies zijn:
  - DATESYTD()
  - TOTALMTD()
  - DATESBETWEEN()
  - DATESINPERIOD()
  - SAMEPERIODLASTYEAR()

# Power BI: experience your data

Any data, any way, anywhere



# Get dashboards in minutes



# Natural language query



Power BI

Climate Change demo

< Exit Q&A

Electricity from coal, nuclear, gas per year in USA

Visualizations

Axis

Year

Legend

Drag data fields here

Value

- Coal (% of total)
- Nuclear (% of total)
- Natural Gas (% of total)

Color saturation

Drag data fields here

Tooltips

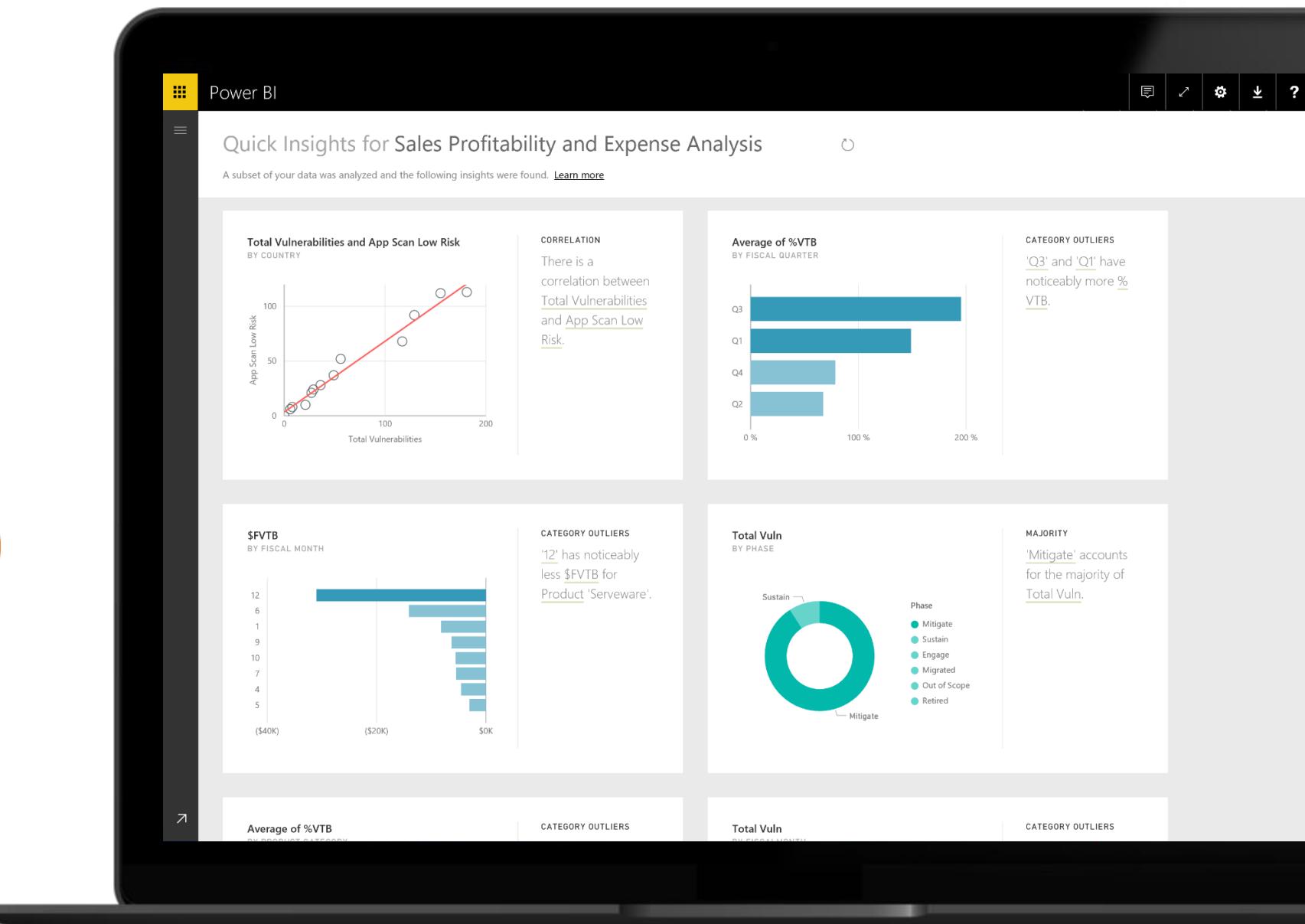
Drag data fields here

Filters

Visual level filters

- Coal (% of total)(A)
- Country Code is USA
- Natural Gas (% of total)
- Nuclear (% of total)
- Year(All)

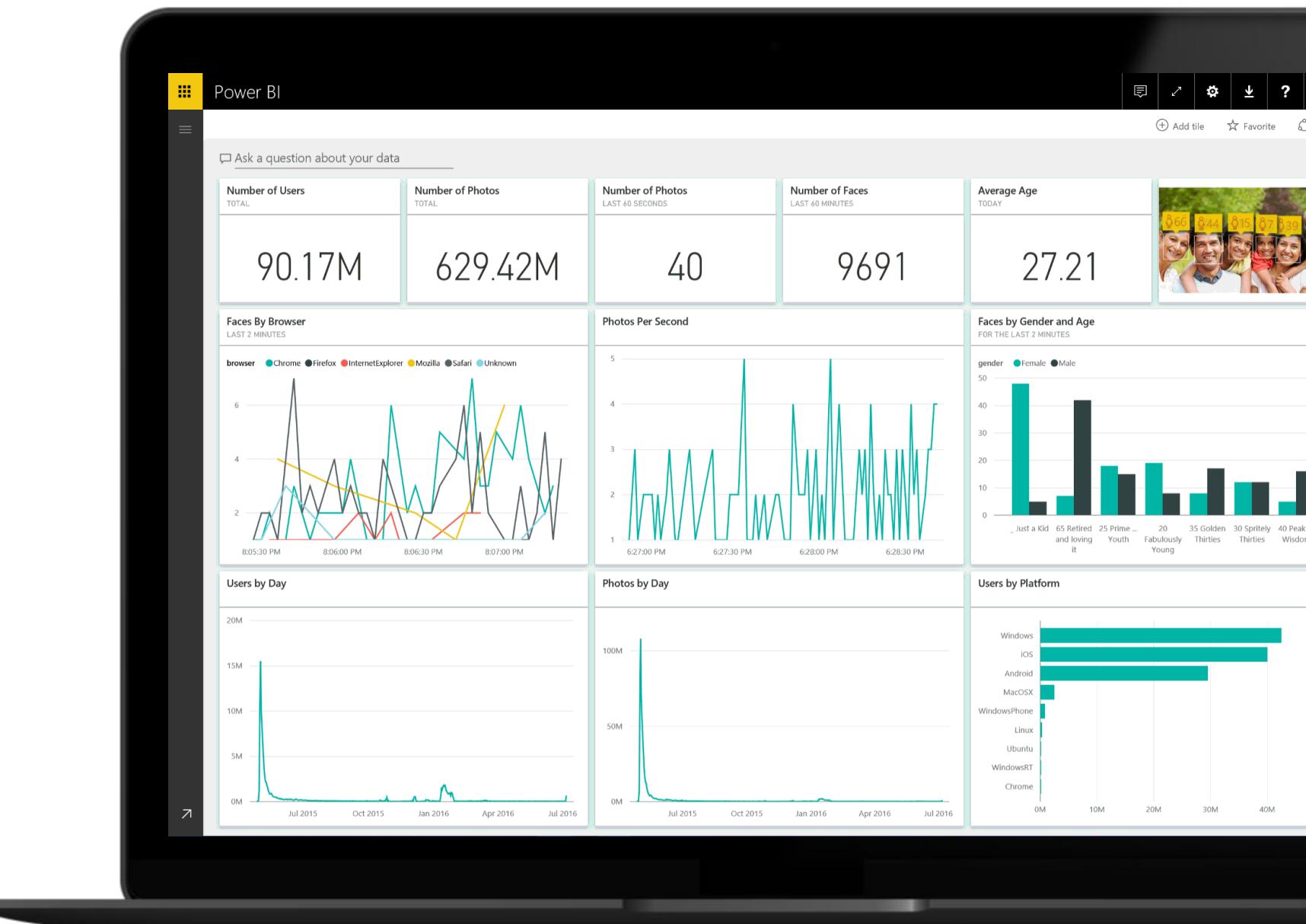
# Quick Insights



# Cortana integration



# Live dashboards



# Custom visualizations



Power BI interface showing a report titled "Engine diagnostics summary".

The report displays a 3D cutaway diagram of an engine. A callout box highlights the "Low-pressure shaft" with the number "15". The callout includes the following information:

Part Name	Engine Part Index	Faults
Low-pressure shaft	Low-pressure shaft	15

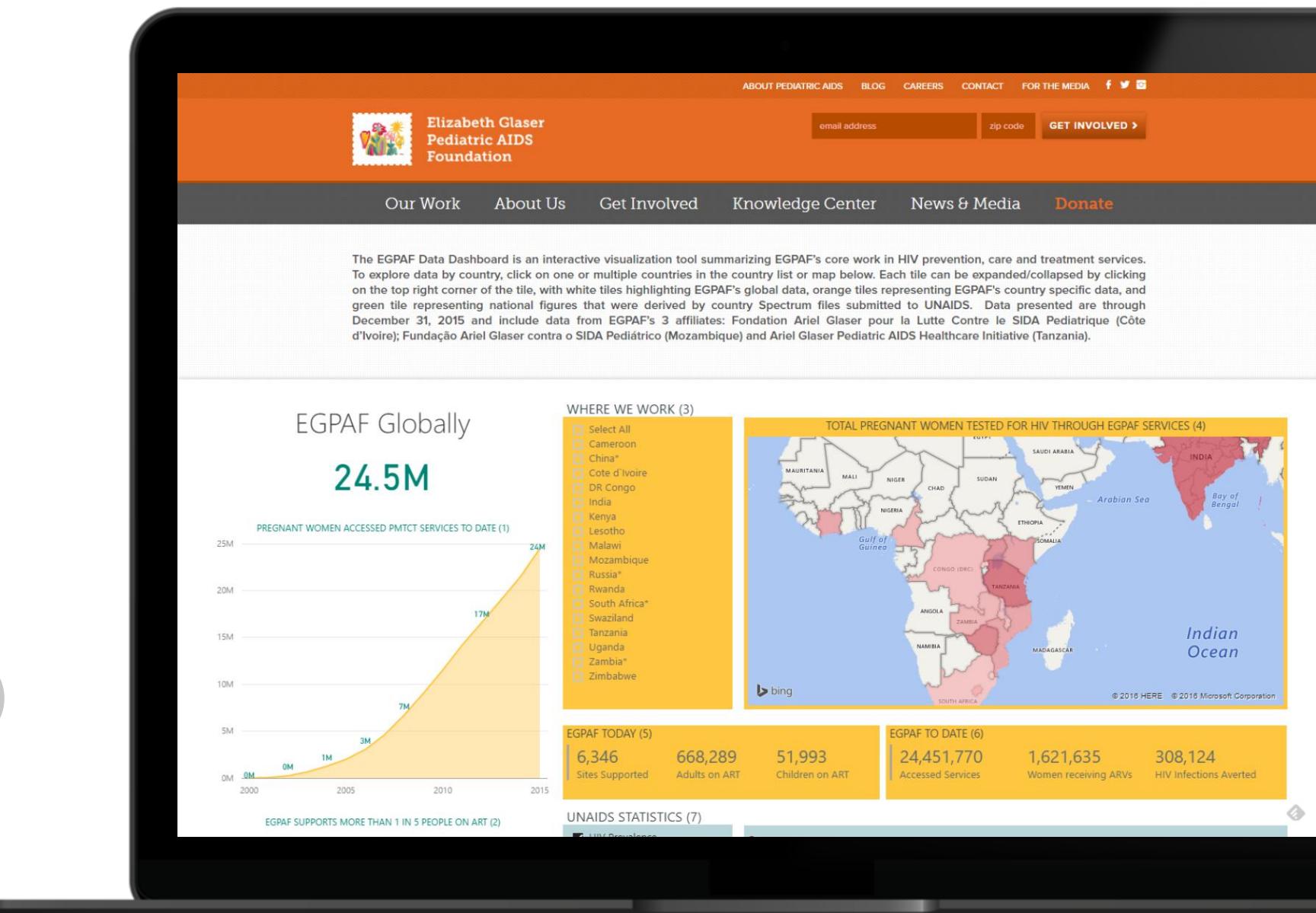
The report has a navigation bar at the bottom with tabs: Fleet summary, Engine life forecast, Engine diagnostics, Fleet policies, Detailed forensics, and 1ABCK. The "Engine diagnostics" tab is selected.

On the right side of the report, there is a legend listing various engine components and their corresponding colors:

- High-pressure compressor
- Flow control
- Fuel filter
- Bleed air
- Bleed intake
- Fuel pump 3
- Generator turbine
- Low-pressure compressor
- Turbine nozzle
- Fuel pump 2
- Funnel
- Bleed fan
- Combustion chamber
- Nozzle
- Counter rotation
- High-pressure shaft
- Cone
- High-pressure turbine
- Expansion control
- Bleed air channel
- Fuel pump 1
- Outer compressor
- Diverter
- Low-pressure turbine
- High-speed bypass
- Low-pressure shaft
- Oil tank
- Actuator
- Dynamic pressurizer
- Fan
- Body
- Air inlet

The legend also includes a numerical scale from 0 to 15, where "Low-pressure shaft" is highlighted in orange.

# Publish to the web



# Integration with Microsoft apps & services



Business analy...

**Publish**

Publish to Power BI

**Publish to Power BI**

Use Power BI to create, share, and organize rich visual reports and dashboards of data that automatically refresh with updates to your workbook.

[Go to Power BI](#)

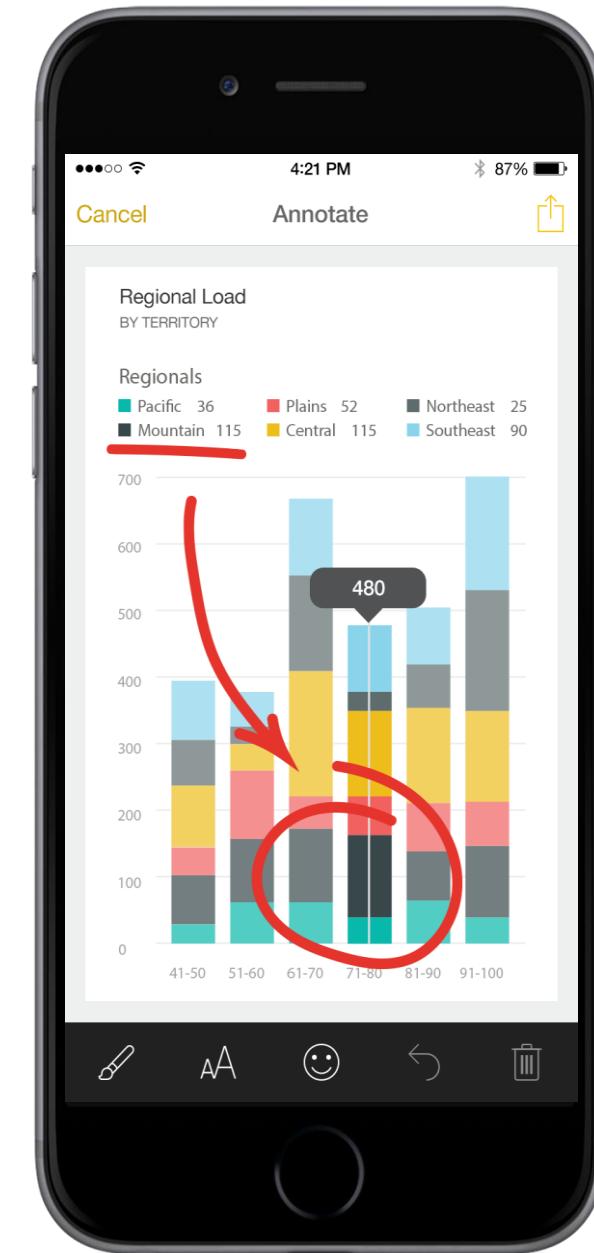
[Learn more](#)

■ Step 1: Save your document to OneDrive for Business.  
■ Step 2: Publish your document to Power BI.

Save to Cloud

A screenshot of a computer interface showing a context menu with the "Publish" option highlighted. The "Publish to Power BI" button is prominently displayed in a green box. To the right, there is a summary of the "Publish to Power BI" feature and a "Save to Cloud" button.

# Power BI Mobile



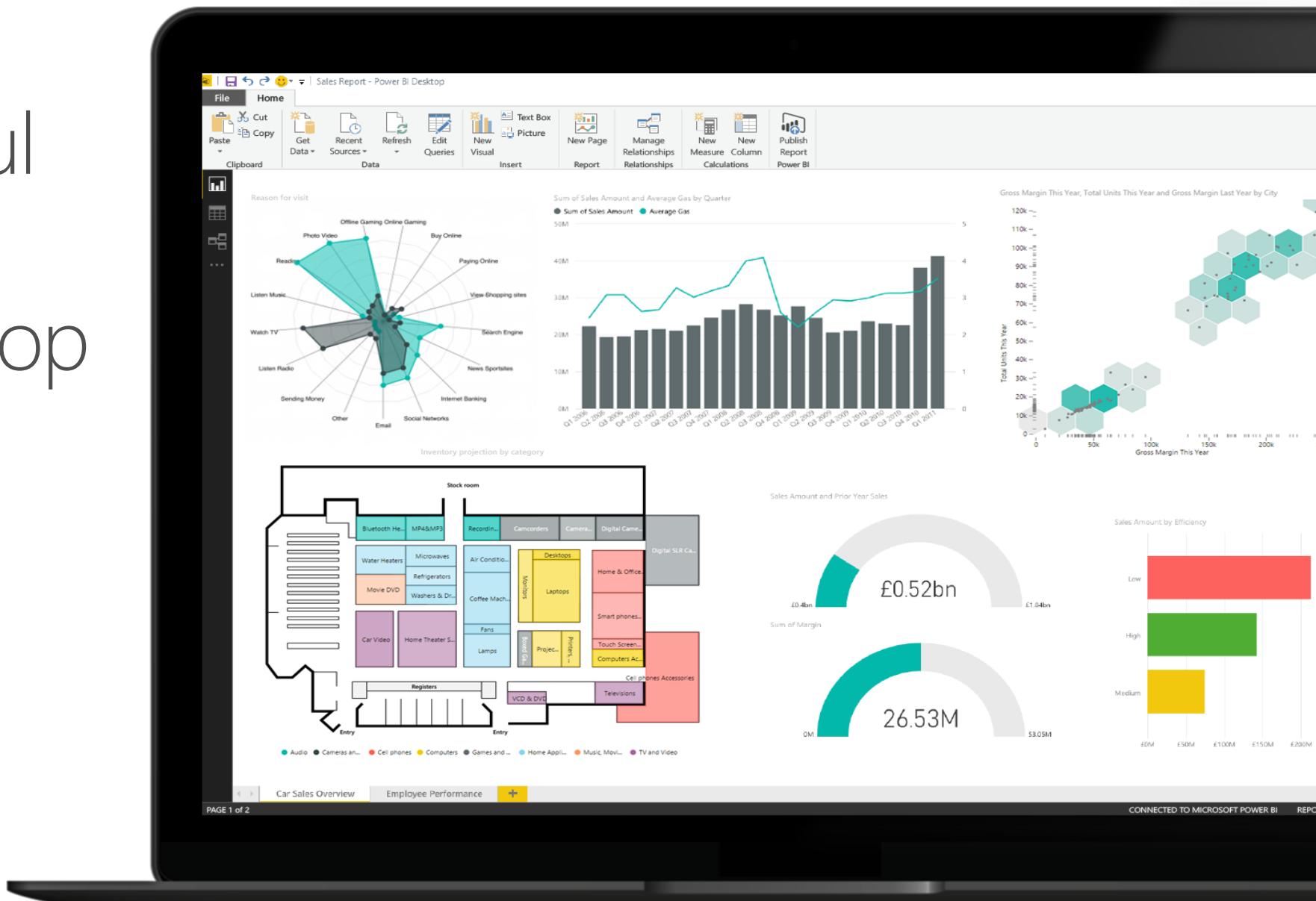
# Create powerful reports with Power BI Desktop

Discovery & exploration

Easy report authoring

Custom visualizations

R integration



# Connect to all the data around you

Connect to data in the cloud and on-premises

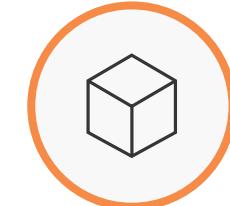
Shape, transform, and clean data for analysis

Join and model data from multiple sources/types

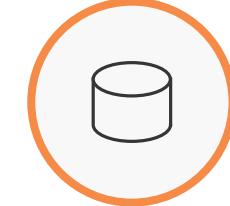
Extend with advanced analytics technologies like R



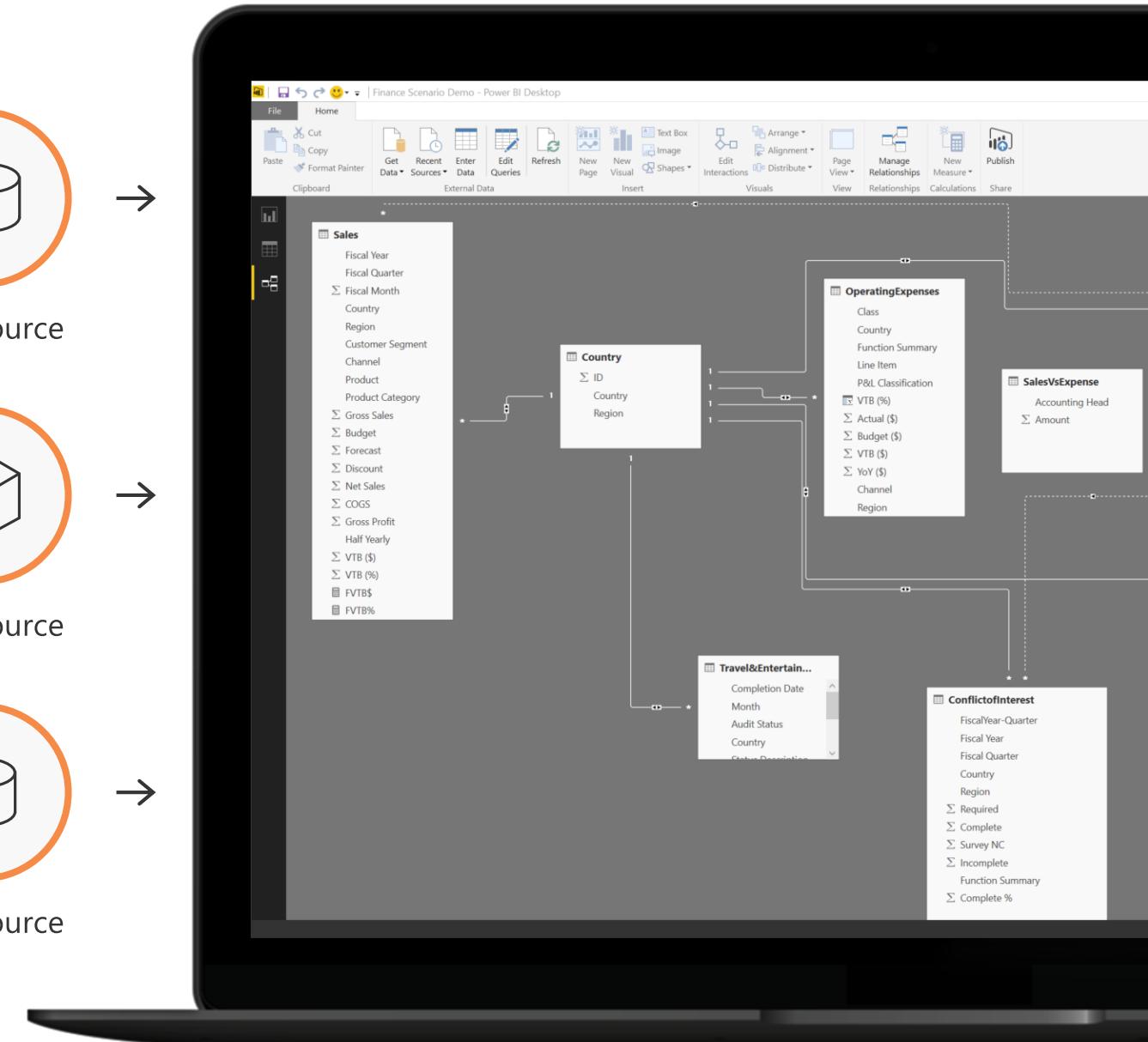
Data source



Data source



Data source



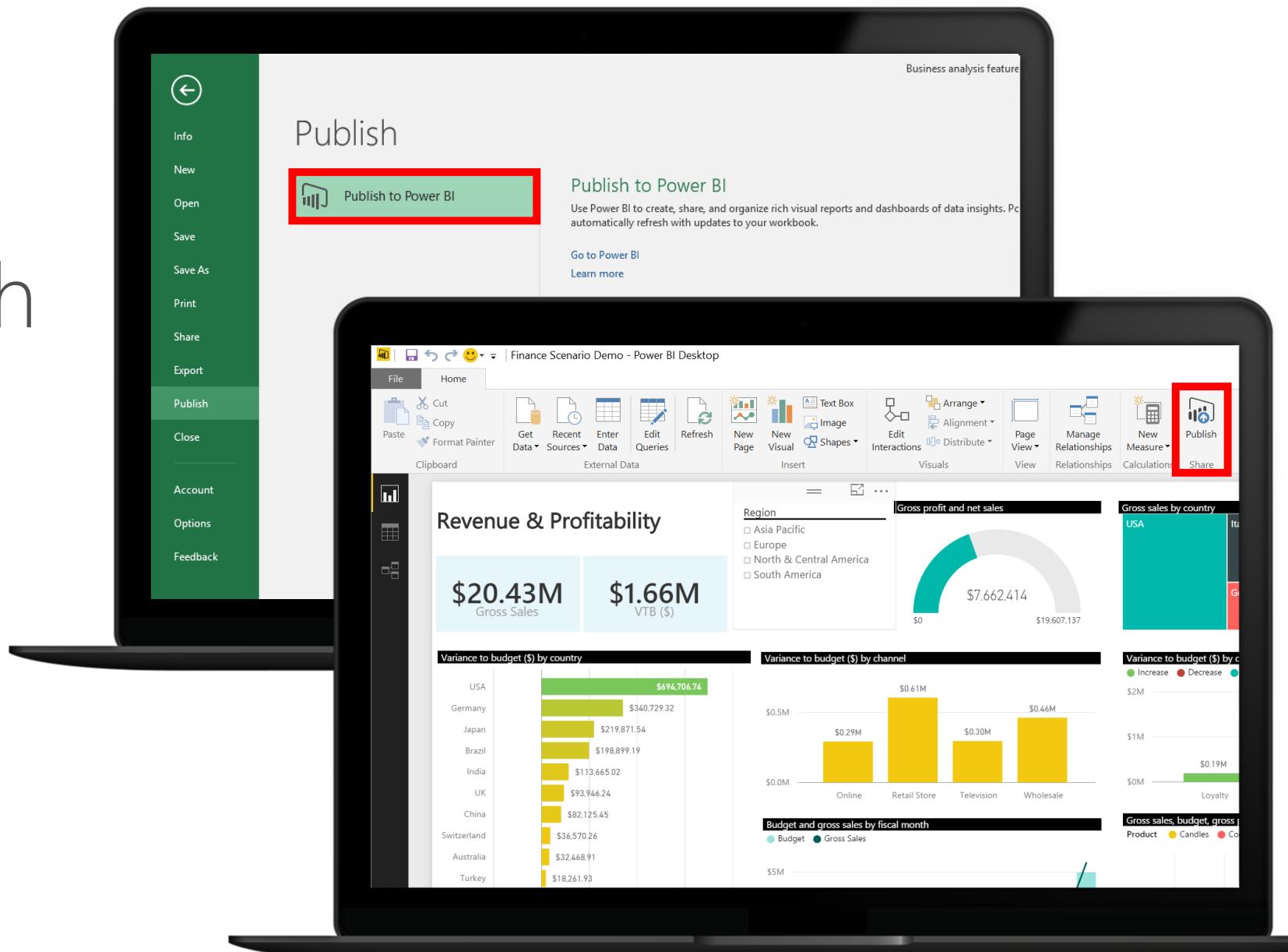
# One-click publish to Power BI

## Power BI Desktop

Publish button on the ribbon

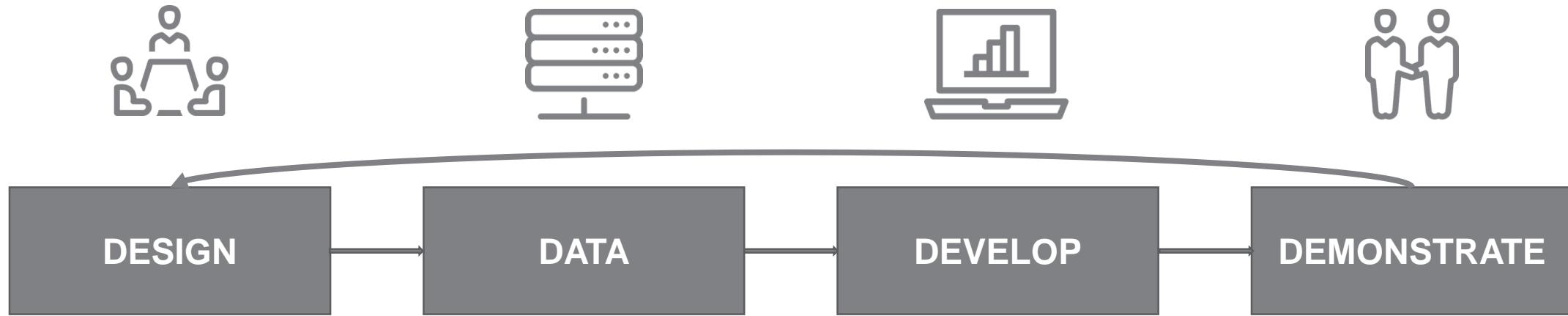
## Excel

Publish to Power BI button





## Finext implementation steps



- Door Finext ontwikkeld BI canvas
- Roadmap voor alle stakeholders
- Solide datamodel
- Datakwaliteit verbeteringen
- Dashboard volgens IBCS
- Co-Build om kennis over te dragen
- Gebruikers adoptie
- Training & coaching

Business Intelligence Canvas	
Organisatiebedoel/strategie	Dashgroup / Use Case
Informatiebehoefte	Welke dashgroup is het dashboard voor? Of welke dashboard groep moet het dashboard voorstellen?
KPI's	Welke KPI's moet er met dit dashboard op getoond worden?
Requirements	Welke visualisaties moet er op het dashboard worden weergegeven? Of is er een specifieke informatie die moet worden weergegeven? KPI's en requirements moeten worden vermeld.
Bronnen	Welke bronnen zijn nodig om de data in het dashboard te halen? Of welke bronnen moet er gebruik van worden om de data in het dashboard aan te leveren?
Verantwoordelijkheden	Waar is er verantwoordelijk voor de data in het dashboard? Wie is er verantwoordelijk voor de bronnen die worden gebruikt om de data in het dashboard aan te leveren? Wie is er verantwoordelijk voor de security aspecten met betrekking tot de gegevens die worden gehouden in het dashboard?





# Business Intelligence Canvas

		<b>Doelgroep / Use Case</b>	Welke doelgroep is het dashboard voor? Of voor welke Use Case moet het dashboard antwoord bieden?
<b>Organisatiedoel/strategie</b>			<i>Wat is het doel van de organisatie en welke strategie hoort hierbij? Hoe sluit het dashboard daar op aan?</i>
<b>Informatiebehoefte</b>	<b>KPI's</b>	<b>Visualisaties</b>	
<i>Wat is de informatiebehoefte van de doelgroep of wat is de informatiebehoefte voor de Use Case? Hoog over omschrijving</i>	<i>Welke 4-5 KPI's moet er met dit dashboard op gestuurd worden?</i>	<i>Welke visualisaties moeten er op het dashboard worden weergegeven? Dit is een praktische uitwerking van de informatiebehoefte, KPI's en requirements. Dit kan dus bijvoorbeeld zijn: een trendgrafiek met omzet over de tijd.</i>	
<b>Requirements</b>			
<i>Lijst van requirements voor het dashboard. Dit is een totale lijst van zowel de technische, functionele als overige requirements.</i>			
<b>Bronnen</b>	<b>Verantwoordelijkheden</b>		
<i>Welke bronnen zijn er nodig om de data in het dashboard te krijgen? Dit kunnen zowel systemen zijn als Excels. Als de data uit systemen komt is het ook handig aan te geven uit welke tabellen de data moet komen.</i>	<i>Wie is er verantwoordelijk voor de data in het dashboard? Wie is er verantwoordelijk voor het onderhoud als het dashboard staat? Welke andere security aspecten moet rekening mee worden gehouden in het dashboard?</i>		



- > De internationale standaard voor ontwikkelen van dashboards voor effectieve communicatie
- > Effectieve communicatie los van wie het dashboard ontwikkeld
- > Finext is 1 van de 2 partijen in Nederland die officieel gecertificeerde IBCS consultants hebben



## Contacts



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## Links, Tips, Blogs, Help & Fun Stuff

1. <https://docs.microsoft.com/en-us/power-bi/guided-learning/> - Beginner level guided learning
2. <https://www.daxpatterns.com/> - Frequent DAX calculations
3. <http://www.daxformatter.com/> - Formatting DAX calculations
4. <https://powerbi.microsoft.com/en-us/blog/> - Power BI Blog (latest updates on Power BI)
5. <https://community.powerbi.com/> - Power BI community (connect, learn, discuss with Power BI peers)
6. <http://www.dutchdatadude.com/> - Info on BI & analytics with microsoft
7. <https://www.sqlbi.com/tools/dax-studio/> - DAX studio (helps you write, execute and analyze DAX queries)
8. <https://msdn.microsoft.com/en-us/query-bi/m/power-query-m-function-reference> - all M functions
9. <https://msdn.microsoft.com/en-us/query-bi/dax/dax-function-reference> - all DAX functions
10. <https://www.thebiccountant.com/> - Finance & Accounting with MS BI stack
11. [https://www.youtube.com/channel/UCzNT7kBvlgc\\_BI4VxVd\\_w](https://www.youtube.com/channel/UCzNT7kBvlgc_BI4VxVd_w) – Vlogs by Finext