Creating a Dashboard

Eduardo Hidalgo García

JUNIOR DATA CONSULTING.

NOVA IMS

eduardohidalgogarcia@gmail.com
eduardo.hidalgo@mastercard.com
eduardo.garcia@novasbe.pt

3 de outubro de 2021

Conteúdo

Conteúdo

What is Power BI

Power BI is a **visualization tool** created by **Microsoft**
Main functions or purposes:

- Transformation and extraction of valuable data (*insights*)
- Creating interactive *dashboards* with *business intelligence*
- Make analytics available on multiple platforms

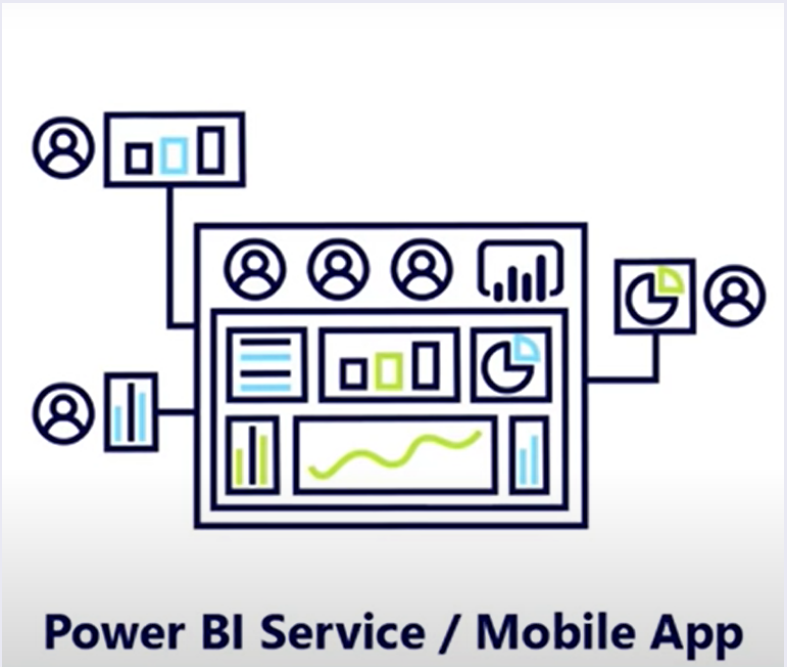
Power BI Desktop vs. Service

Power BI Desktop

Download and use on Windows PC (free)
Complete report creation (no account required)
Focus on personal use

Power BI Service / Mobile App

View report from any device (free)
Share and collaborate with other users (Pro account)
Pro account $ 10 USD/month per user



Considerations

Power BI account registration

- Currently you need a professional or academic account to use Power BI Service (which serves to view reports online from any device).
- To use the "Power BI Desktop" app you don't need an account.

Tip: Use the Power BI Desktop version in English

- Most of the information/documentation that can be consulted on the web is in English.
- Power BI is constantly updated and both updates and announcements are made in English.

Conteúdo

Case Study: Introduction to Power BI

In this session we will use data from The World Bank to build an interactive *dashboard*.

Our **objective** is to build an interactive *dashboard* that allows comparing member economies of OECD into categories like:

- Economy
- Public Policy
- Health

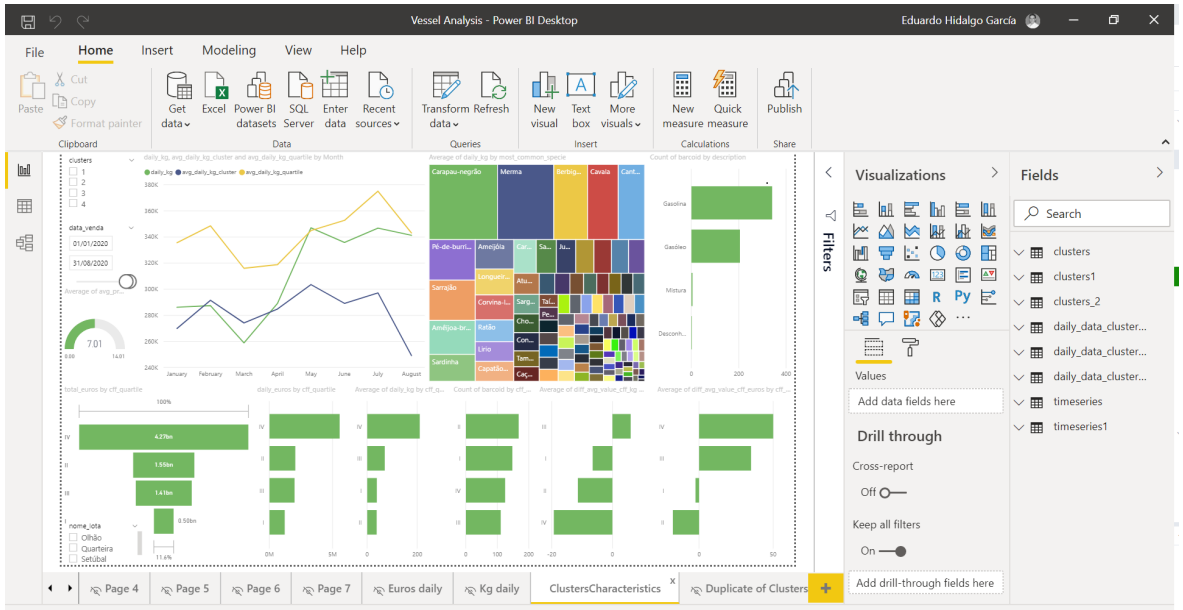
Databases can be found here: GitHub.com

Conteúdo

Much like other Microsoft packages

Main components:

- Toolbar;
- Reports, Data and Template;
- Report Sheets;
- Panels: Fields, Views and Filters.



Open Power BI and let's try it together!

Conteúdo

General Business Intelligence Steps

1. Get the Data (GD)

Some most used sources: Excel, CSV, Databases...

2. Prepare the Data (PD)

Based on imported *raw* tables - clean and organize data in *Query Editor*.

3. Modeling the Data (MD)

From imported data tables - Create structures (models) to relate them.

4. View Data (VB)

Representations of data in the form of graphs, matrices...

5. Report Data (RD)

Structure and format views.

General Business Intelligence Steps - Considerations

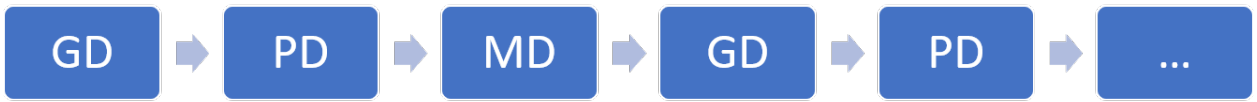
The different steps do not need to be used in every project

For example, a properly structured table may not require *Prepare Data* (PD) or *Model Data* (MD) steps.

BI steps

Phases are iterative

In any report we will need to switch from one phase to another, regardless of the order or frequency of use.



BI steps

Conteúdo

OD - Connect and Update Data

- It is the function we use at the beginning of each project.
- With it we integrate the data that will be used in our report.
- This function is not exclusive to project start. It is used whenever more data sources need to be integrated.
- After data has been retrieved or connected to Power BI, the sources or routes will be stored in the report. This allows Power BI to update new records to be viewed in the report.

Examples of Power BI Compatible Data Sources

OD - Considerations

- **Data source**: Any route or destination that has records. They can be from digital files (eg Excel), Websites, Databases/Servers, etc.
- Sometimes information sources contain **elements that are not part of the data table** that we want to import or contain inconsistencies that require modification. It is at this stage that we must correct these types of problems.
- **Data Update**: Since Power BI is connected to data sources, the update can be done directly from the Power BI interface.

Note: Changing the structure of data sources or the route name may affect the retrieval process.

Tip: Arrange an effective structure, for example: assign consistent names and routes that do not change over time.

Conteúdo

PD Introduction to textit Query Editor

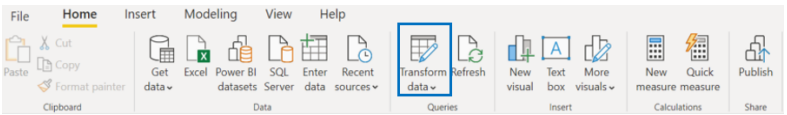
The *Query Editor*, is the resource we use to make the corresponding adjustments to tables and their records.

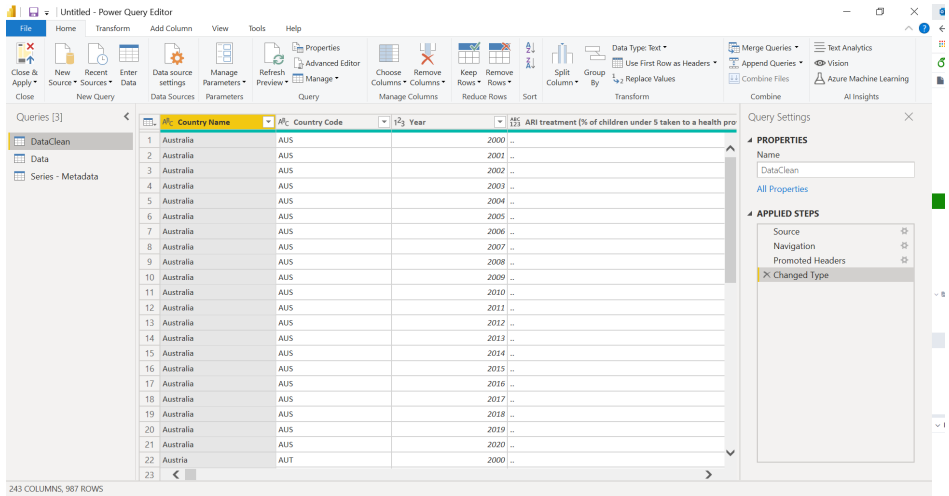
This tool is generally used for correcting and cleaning data, not for performing calculations or operations.

How to get to *Query Editor*?

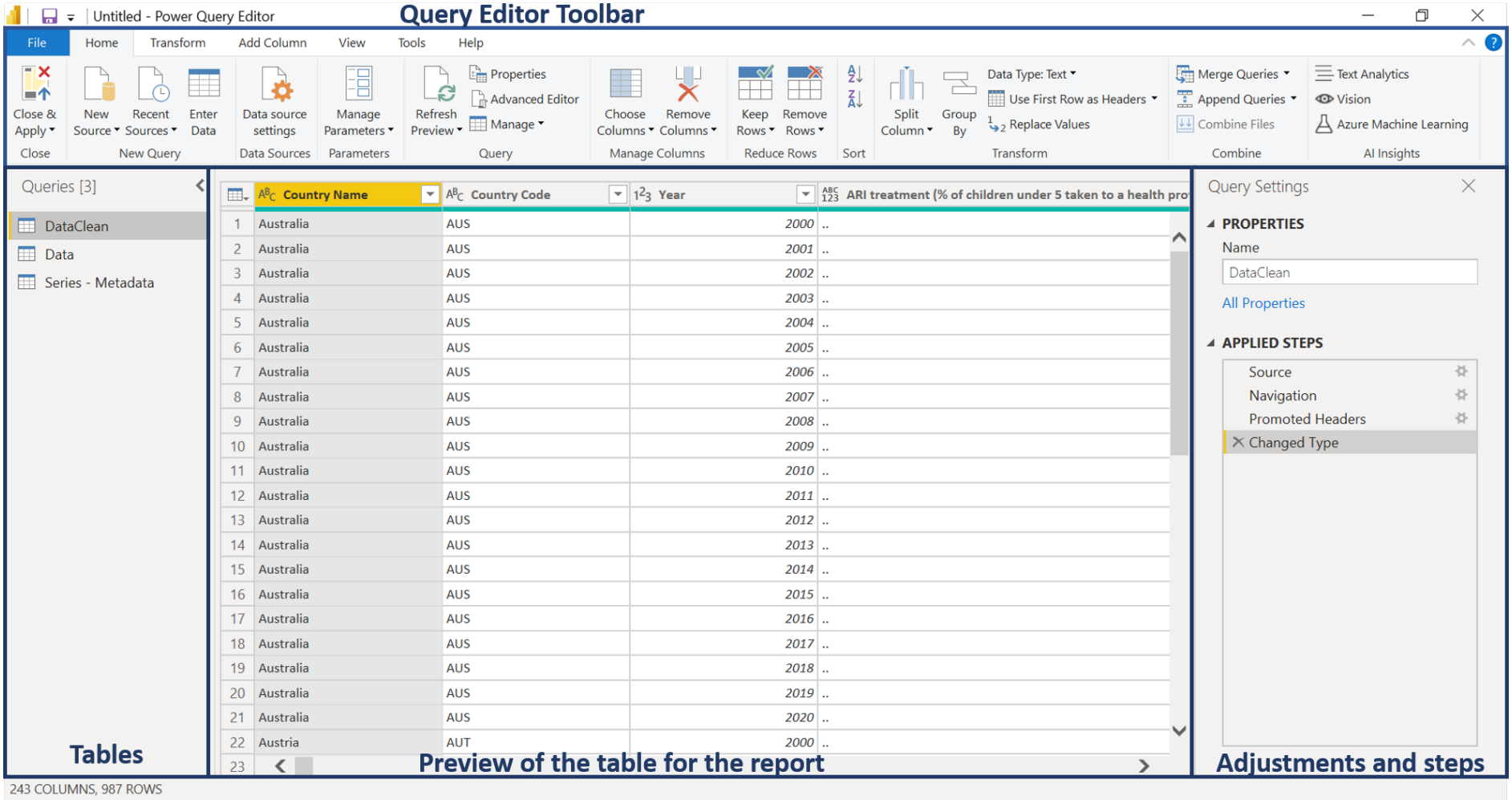
To open the *Query Editor*:

- Click *Transform Data* from *Home*.
- A new Power BI window opens.





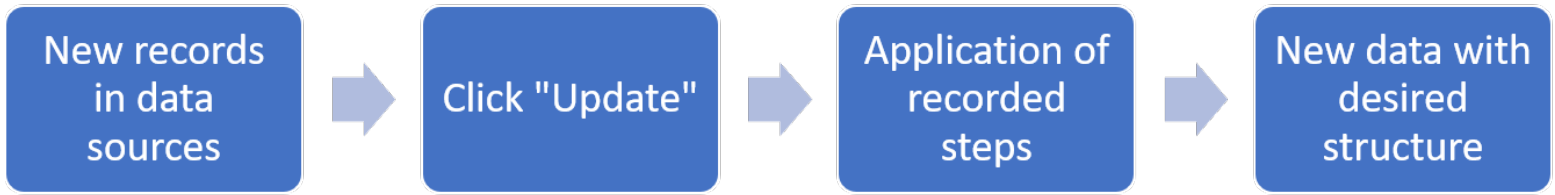
PD - Elements of the *Query Editor*



Download the excel file here and let's go to Power BI!

PD - Considerations (I)

- **Data type**: It is important to review to ensure that each field has the correct data type. Usually Power BI assigns automatically, but sometimes it may not do it correctly.
- **Steps performed**: Each change is registered and saved in the *Query Editor* and each of these steps is performed in the same order when updating the report.



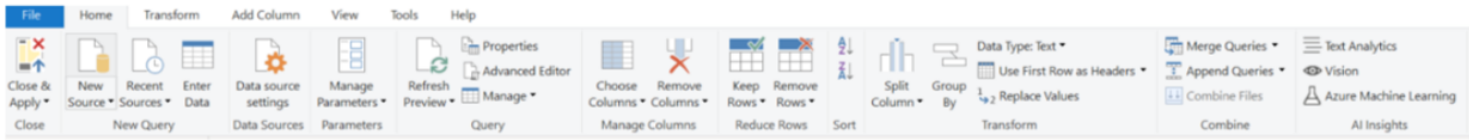
Note: The *Query Editor* changes the structure used in Power BI, but **does not affect the structure of data sources**.

Conteúdo

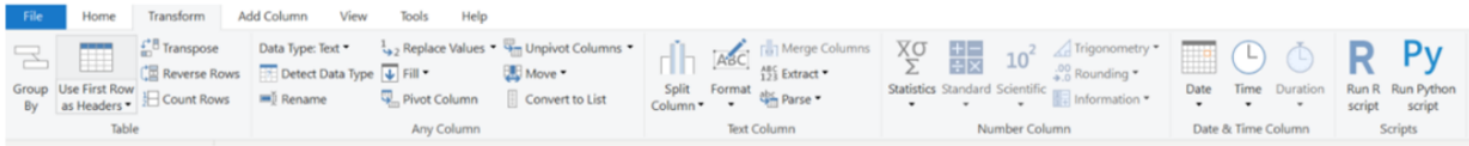
PD - *Query Editor* Tools

In *Query Editor* we can make changes to data tables.
To make changes and adjustments, we can use the three toolbar windows.

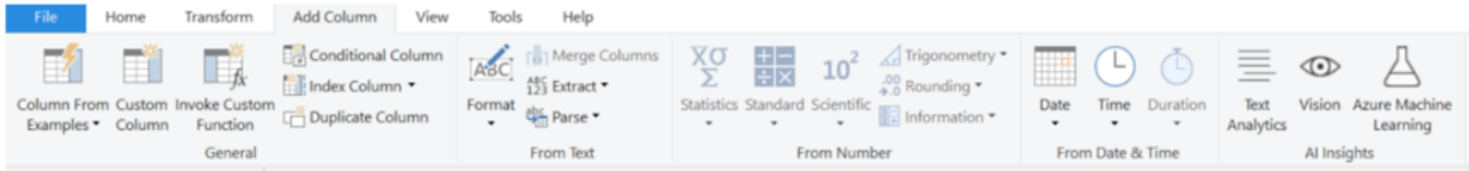
Home: folha principal onde é possível fazer ajustes gerais e transformações comuns (mudar fontes de dados, remover linhas ou colunas, combinar tabelas, etc.)



Transform: os ajustes feitos desde esta folha ficam refletidos nas colunas selecionadas (substituir valores, extrair caracteres, pivot/unpivot, etc.)



Add a Column: para agregar novas colunas no geral com referência aos dados de uma outra coluna (índices, extrair mês/ ano, condições, etc.)



PD - Considerations (II)

Difference between Transform and Add Column

- *Transform*: It is generally used to modify the data or to eliminate the data that is not needed from a given column.
- *Add column*: Allows you to extract data from a column, or view the data in a column from another perspective.

Steps between steps performed

The *Query Editor* allows you to make new intermediate steps between steps that have been performed. It is important to remember that the order of steps is very relevant, as it is in this order that the steps will be taken again when the data is updated in the future.

Tip: Look for efficiency in the application of steps.

Conteúdo

MD - Relações entre tabelas

Na **Modelação dos Dados** uma das principais tarefas é a criação de relações entre tabelas ou, de forma mais específica, entre os campos de cada uma delas.
Há muitas formas de relacionar e propósitos para o fazer.
Um exemplo comum poderá ser:

Vendas

Produto	Quantidade	Valor
Maçã	5	10
Laranja	4	16
Banana	7	28
Ananás	6	12
Cenoura	6	12
Alho	9	36
Alface	3	6
Cebola	3	3
Manga	10	10
Total	53	133

Inventários

Produto	Categoria
Maçã	Fruta
Laranja	Fruta
Banana	Fruta
Ananás	Fruta
Cenoura	Legume
Alho	Legume
Alface	Legume
Cebola	Legume
Manga	Fruta

Relação das tabelas

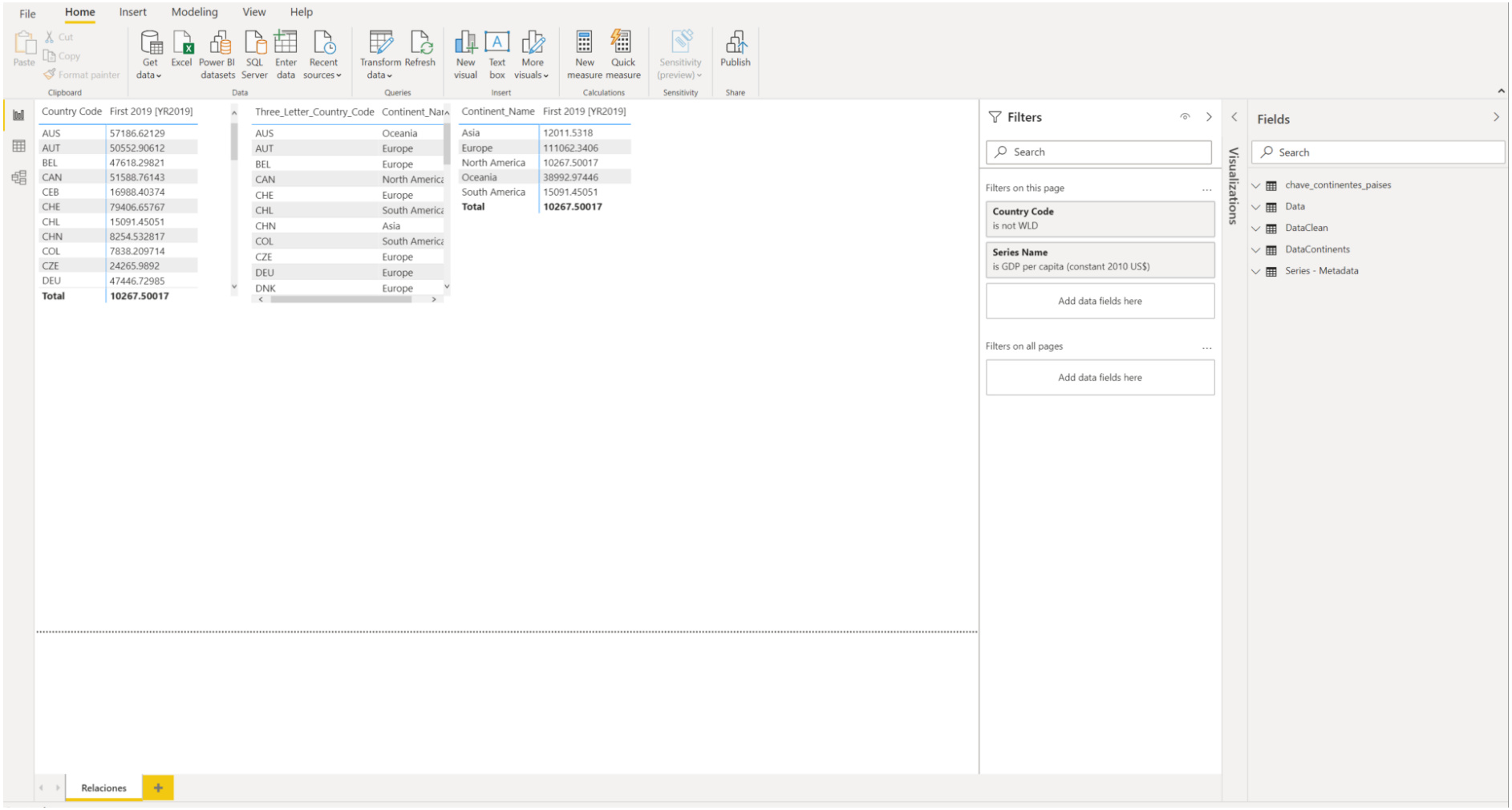
Categoria	Quantidade	Valor
Fruta	32	76
Legume	21	57
Total	53	133

As duas tabelas têm uma coluna comum

Após relacionar as tabelas, podemos ver os resultados resumidos por Categoria.

MD - Exercício prático - relações entre tabelas

Abra o Power BI! Nesta secção vamos a fazer um exercício para entender a importância das relações entre tabelas.



Conteúdo

DAX: Data Analysis Expressions

We can understand DAX as the process equivalent to writing formulas in an Excel file. DAX are expressions that allow you to do from simple arithmetic operations to more complex calculations.

Note: It will not always be necessary to perform DAX, as Power BI generates operations or measurements in an automated way. In Power BI there are two types of measures:

- **Implicit Measures**: They are generated simply by dragging the column in the view (it only generates basic arithmetic operations).
- **Explicit Measures**: Generated by the user using DAX expressions.

To create a DAX it is important to know the difference between using the functions of:

- New measure
- New column

MD - New Measure *vs* New Column

Produto	Vendas	Inventário	Vendido
Maçã	4	10	6
Maçã	10	17	7
Maçã	3	7	4
Total	17	34	?

Queremos conhecer o número de maçãs restantes. O total restante pode ser feito de duas formas: 1) Somar o restante por linha ou 2) Calcular o restante dos totais por colunas

DAX Nova Coluna

Total	17	34	6+7+4=17

Realiza a operação por linha e depois o representa num somatório (implícita)

DAX Nova Medida

Total	17	34	34-17=17

Realiza a operação após ter feito o somatório de todas as linhas

MD - New Measure *vs* New Column (ex. 2)

Produto	Vendas	Inventário	Vendido
Maçã	4	10	40%
Maçã	10	17	59%
Maçã	3	7	43%
Total	17	34	?

Queremos conhecer o número de maçãs restantes. O total restante pode ser feito de duas formas: 1) Somar o restante por linha ou 2) Calcular o restante dos totais por colunas

DAX Nova Coluna

Total	17	34	40%+59%+43%=142%

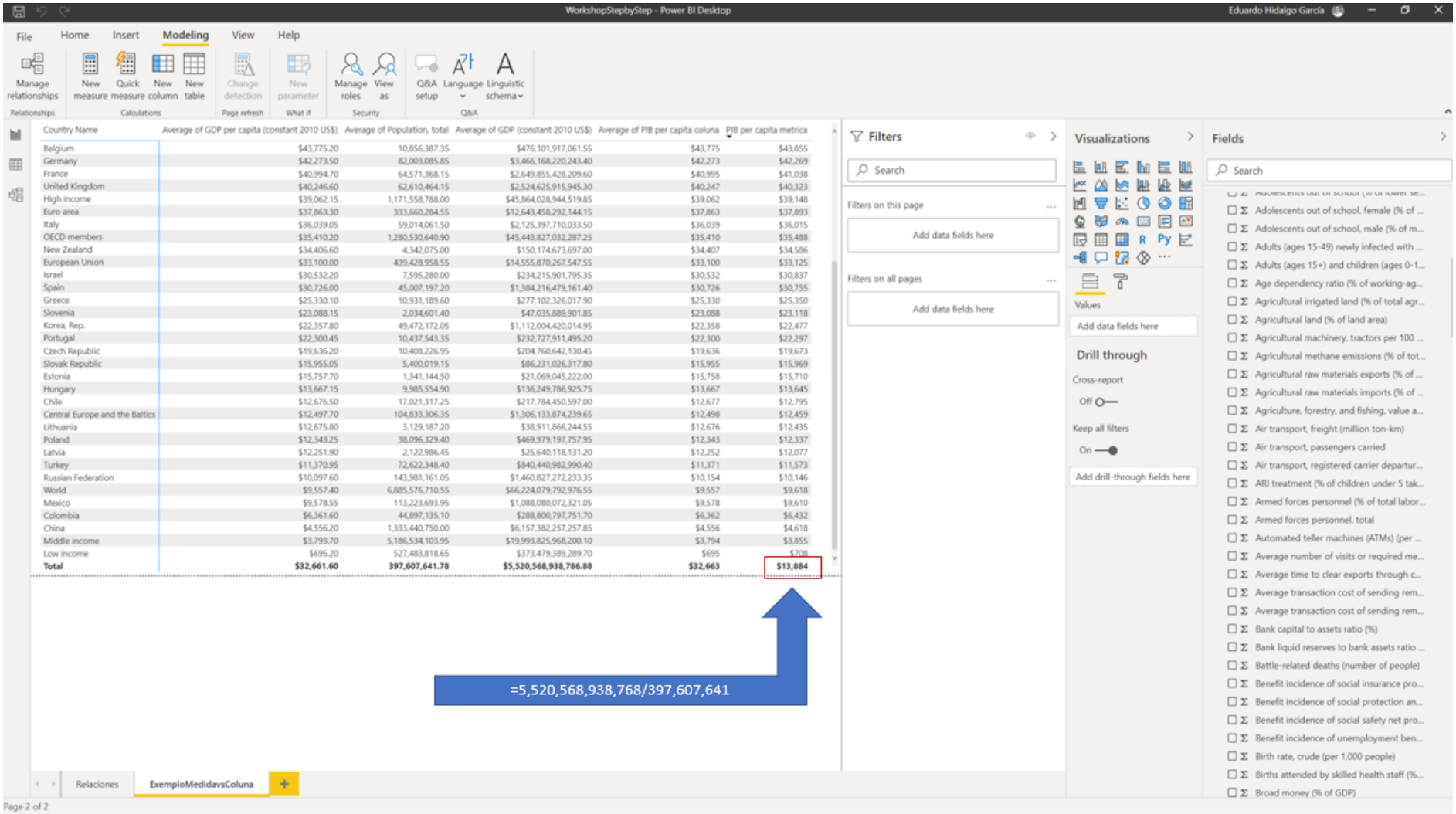
Realiza a operação por linha e depois o representa num somatório (implícita)

DAX Nova Medida

Total	17	34	17/34=50%

Realiza a operação após ter feito o somatório de todas as linhas

MD - New Measure *vs* New Column (ex. 3)



Country Name	Average of GDP per capita (constant 2010 US$)	Average of Population, total	Average of GDP (constant 2010 US$)	Average of PIB per capita coluna	PIB per capita metrica
Belgium	$43,775.20	10,856,387.35	$476,101,917,061.55	$43,775	$43,855
Germany	$42,273.50	82,003,085.85	$3,466,168,220,243.40	$42,273	$42,269
France	$40,994.70	64,571,368.15	$2,649,855,428,209.60	$40,995	$41,038
United Kingdom	$40,246.60	62,610,464.15	$2,524,625,915,945.30	$40,247	$40,323
High income	$39,062.15	1,171,558,788.00	$45,864,028,944,519.85	$39,062	$39,148
Euro area	$37,863.30	333,660,284.55	$12,643,458,292,144.15	$37,863	$37,893
Italy	$36,039.05	59,014,061.50	$2,125,397,710,033.50	$36,039	$36,015
OECD members	$35,410.20	1,280,530,640.90	$45,443,827,032,287.25	$35,410	$35,488
New Zealand	$34,406.60	4,342,075.00	$150,174,673,697.00	$34,407	$34,586
European Union	$33,100.00	439,428,958.55	$14,555,870,267,547.55	$33,100	$33,125
Israel	$30,532.20	7,595,280.00	$234,215,901,795.35	$30,532	$30,837
Spain	$30,726.00	45,007,197.20	$1,384,216,479,161.40	$30,726	$30,755
Greece	$25,330.10	10,931,189.60	$277,102,326,017.90	$25,330	$25,350
Slovenia	$23,088.15	2,034,601.40	$47,035,889,901.85	$23,088	$23,118
Korea, Rep.	$22,357.80	49,472,172.05	$1,112,004,420,014.95	$22,358	$22,477
Portugal	$22,300.45	10,437,543.35	$232,727,911,495.20	$22,300	$22,297
Czech Republic	$19,636.20	10,408,226.95	$204,760,642,130.45	$19,636	$19,673
Slovak Republic	$15,955.05	5,400,019.15	$86,231,026,317.80	$15,955	$15,969
Estonia	$15,757.70	1,341,144.50	$21,069,045,222.00	$15,758	$15,710
Hungary	$13,667.15	9,985,554.90	$136,249,786,925.75	$13,667	$13,645
Chile	$12,676.50	17,021,317.25	$217,784,450,597.00	$12,677	$12,795
Central Europe and the Baltics	$12,497.70	104,833,306.35	$1,306,133,874,239.65	$12,498	$12,459
Lithuania	$12,675.80	3,129,187.20	$38,911,866,244.55	$12,676	$12,435
Poland	$12,343.25	38,096,329.40	$469,979,197,757.95	$12,343	$12,337
Latvia	$12,251.90	2,122,986.45	$25,640,118,131.20	$12,252	$12,077
Turkey	$11,370.95	72,622,348.40	$840,440,982,990.40	$11,371	$11,573
Russian Federation	$10,097.60	143,981,161.05	$1,460,827,272,233.35	$10,154	$10,146
World	$9,557.40	6,885,576,710.55	$66,224,079,792,976.55	$9,557	$9,618
Mexico	$9,578.55	113,223,693.95	$1,088,080,072,321.05	$9,578	$9,610
Colombia	$6,361.60	44,897,135.10	$288,800,797,751.70	$6,362	$6,432
China	$4,556.20	1,333,440,750.00	$6,157,382,257,257.85	$4,556	$4,618
Middle income	$3,793.70	5,186,534,103.95	$19,993,825,968,200.10	$3,794	$3,855
Low income	$695.20	527,483,818.65	$373,479,389,289.70	$695	$708
Total	**$32,661.60**	**397,607,641.78**	**$5,520,568,938,786.88**	**$32,663**	**$13,884**

MD - Considerations

Difference between New Columns and New Measures

- **New Columns**: In most cases, creating a new column to perform a calculation is not recommended. New columns are generally used to aggregate static data or a category based on a series of conditions from other columns.
- **New Measures**: It is recommended for operations or calculations that can be analyzed from the values field in the visualizations. There may also be other complex purposes where it is better to consider measures rather than new columns.
- **Relate Tables**: Allows you to filter based on the value of a column in another table in the views area.

Conteúdo

DV Create Views

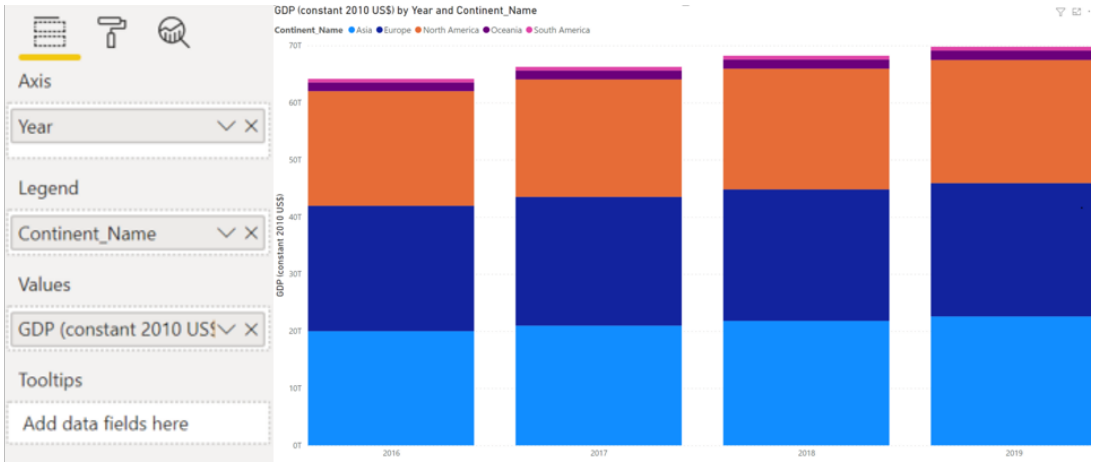
Visualization: It is all the data representation in the form of a graph, diagram, matrix or table.
Create visualization in Power BI: A basic visualization consists of a value that we can segment by category or categories of different columns. In general, views have the following fields:

Segment by axis field (Axis).
For example location, category, details, etc...

Legend to differentiate the colors of the different categories of the placed field

Field of values to represent with an operation (sum, count, etc.)

It serves to display more information by placing the mouse cursor

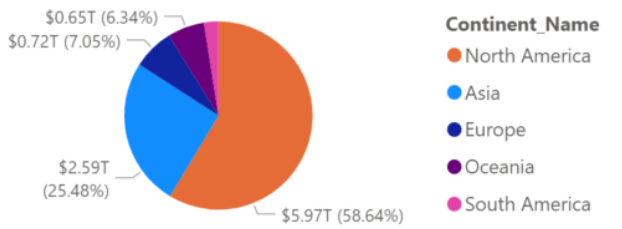


DV Create Views

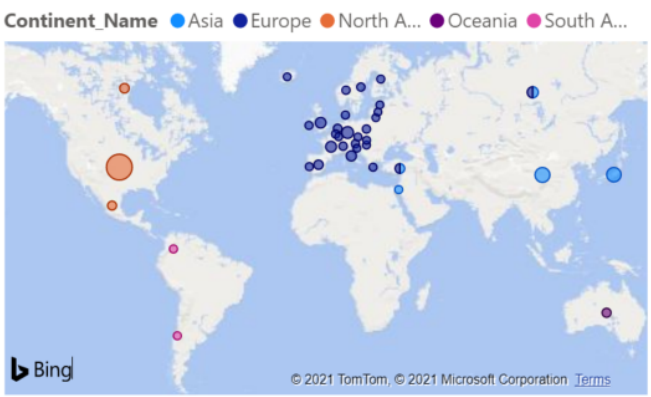
Open Power BI! In this section we will create the following views:

Continent_Name	Average of GDP (constant 2010 US$)	Average of Gross savings (% of GDP)	Average of Military expenditure (% of GDP)	Average of Mineral rents (% of GDP)	Average of Tax revenue (% of GDP)
⊞ North America	$5,968,589,344,306.37	20.75	1.65	0.33	11.50
⊞ Asia	$2,594,030,504,508.18	30.37	2.90	0.30	16.05
⊞ Europe	$717,738,219,225.45	23.48	1.45	0.05	21.04
⊞ Oceania	$645,049,185,186.30	20.74	1.55	2.13	25.59
⊞ South America	$253,292,624,174.35	19.48	2.75	6.95	15.82
Total	$5,520,568,938,786.88	23.87	1.72	0.53	19.51

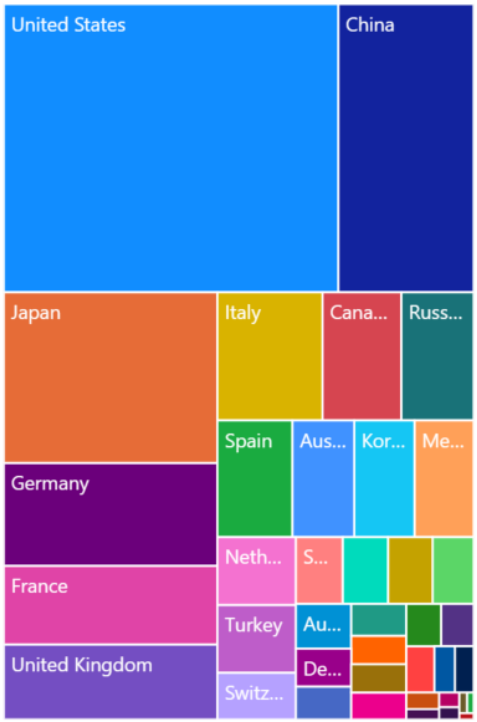
Average of GDP (constant 2010 US$) by Continent_Name



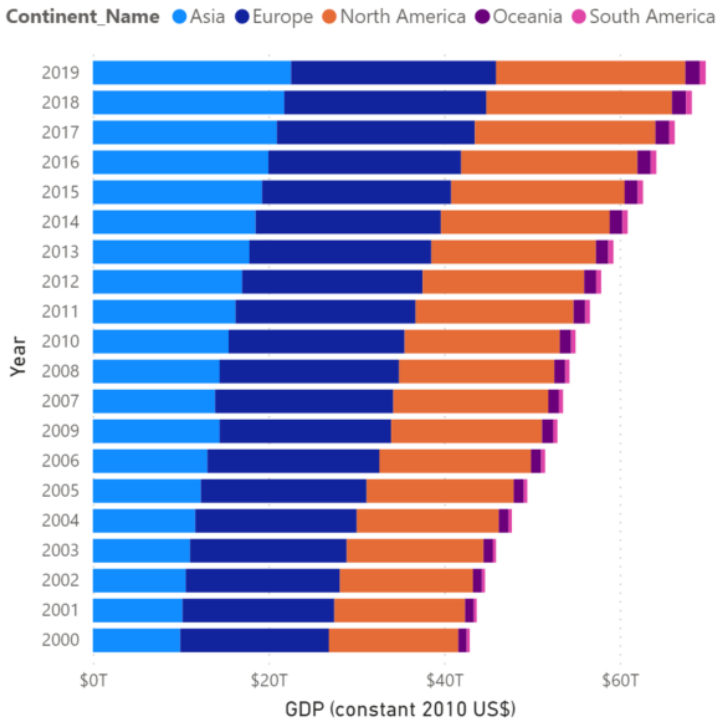
Average of GDP (constant 2010 US$), Average of Air transport, passengers carried and Average of Air transport, freight (million ton-km) by Country Name and ...



Average of GDP (constant 2010 US$) and Population, total by Country Name



GDP (constant 2010 US$) and Avg. Central government debt, (% of GDP) by Year and Continent_Name

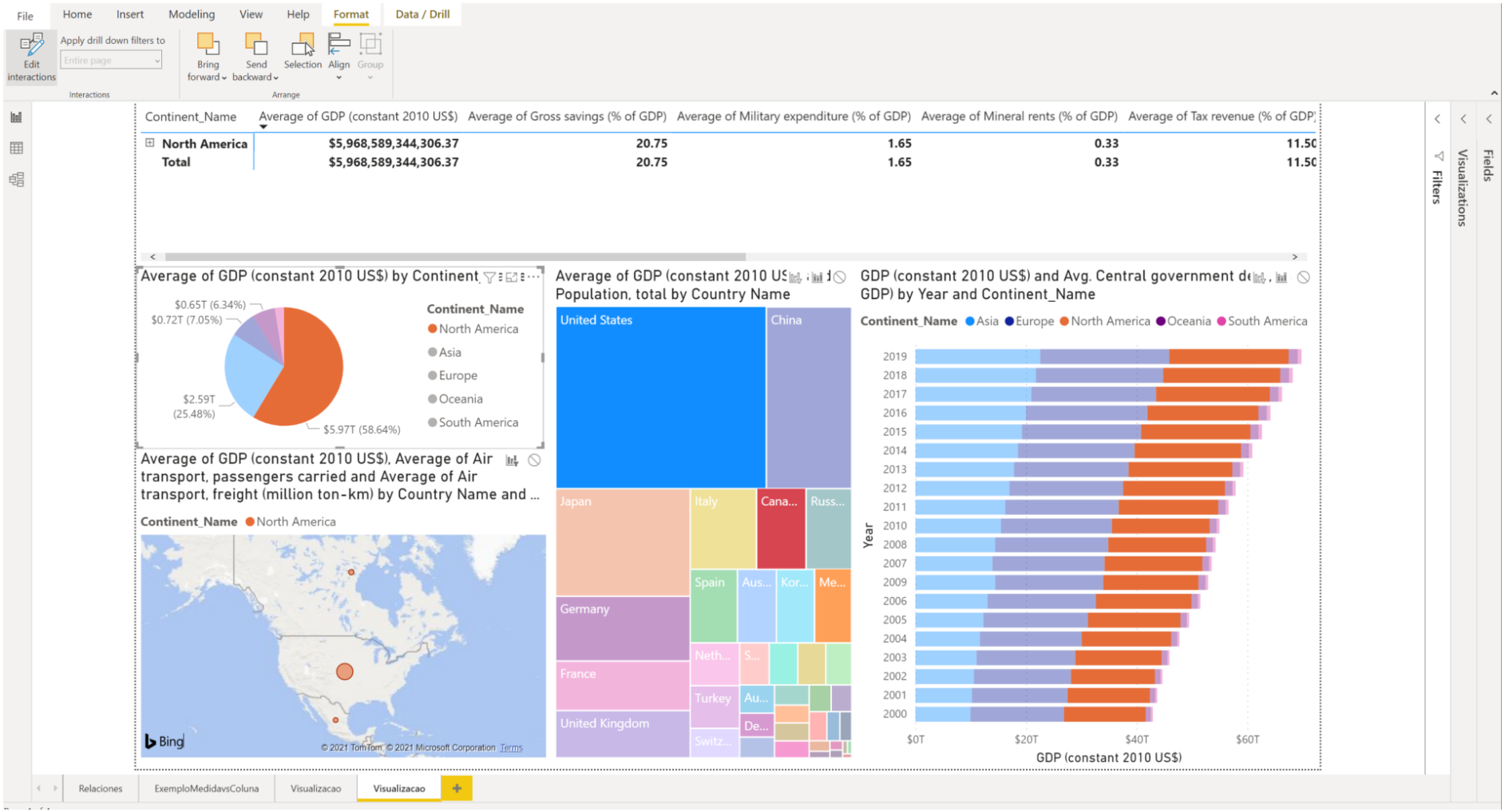


Conteúdo

DV - Interactions and Filtering

In Power BI there are three types of filters (or interactions between views):

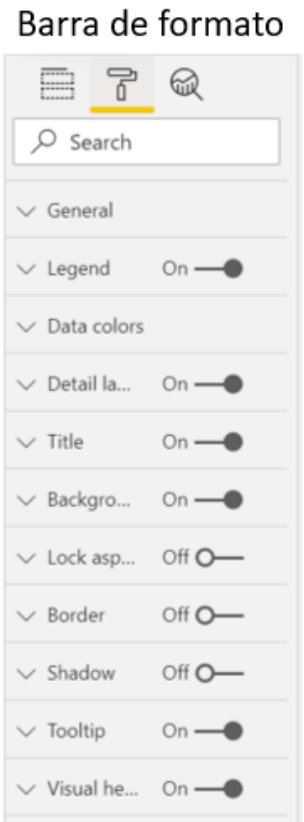
- **Filter**: Displays only the data for the selected element.
- **Highlight**: Displays the data for the selected element in proportion to all the data.
- **None**: No interactions.



Conteúdo

DV - Views Format

The **view formats** are all the elements that we can modify, remove or add to the views (element colors, titles, backgrounds...)



Tips for formatting views:

- Simplicity - Ideally, a visualization should be easily understood, ie it shouldn't take more than a few seconds to realize the content and its purpose.
- Consistency - Fonts in same style and size, colors/captions according to categories, outlines, borders. The goal is to maintain a consistent look for any user.
- Not focusing on interactions - One of the main functions of a *dashboard* is to allow the visualization of the necessary information instantly. Features like filtering and searching with multiple interactions should take a back seat.

Open Power BI and let's try it together!

DV - Views Format

Let's do the following exercise:

Continente	PIB (2010 US$)	Poupança bruta (% PIB)	Gasto militar (%PIB)	Aluguel de minerais (%PIB)	Receita fiscal (%PIB)	Exp. de bens e serviços (%PIB)	Cor
⊞ Oceania	$803,151,791,639.00	21.50	1.50	2.50	25.50	25.00	
⊞ Europe	$821,772,011,948.25	24.82	1.46	0.04	20.89	63.39	
⊞ South America	$332,571,374,062.00	17.50	2.50	6.00	16.50	22.50	
⊞ Asia	$3,632,471,578,733.33	31.67	3.00	0.17	15.20	28.67	
Total	$6,716,756,489,912.51	24.80	1.64	0.51	19.31	50.83	

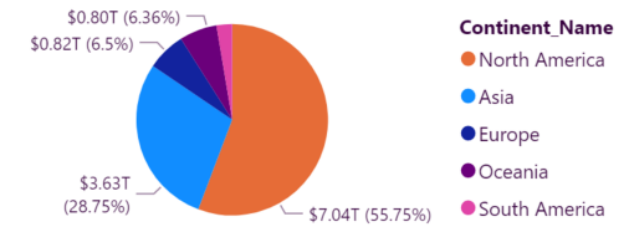
Ano

2018

2.98

Crec. PIB (%)

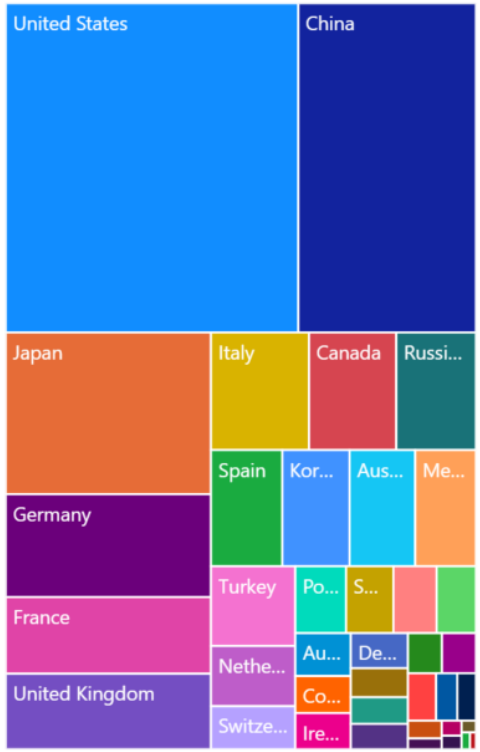
PIB (constante 2010 US$) por continente



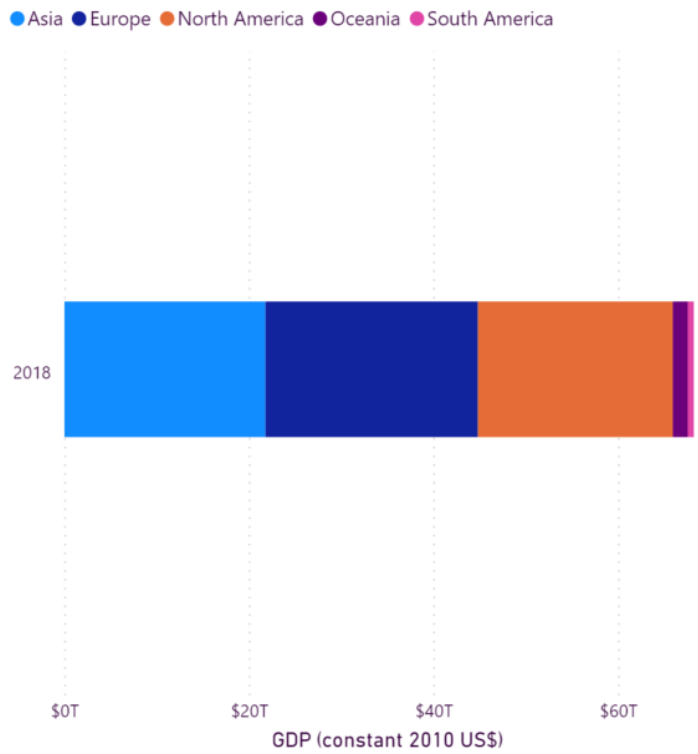
Paises da OCDE + Brazil, Russia e China

Asia Europe North America Oceania South America

PIB (constante 2010 US$) por pais



PIB (constante 2010 US$) por pais e continente

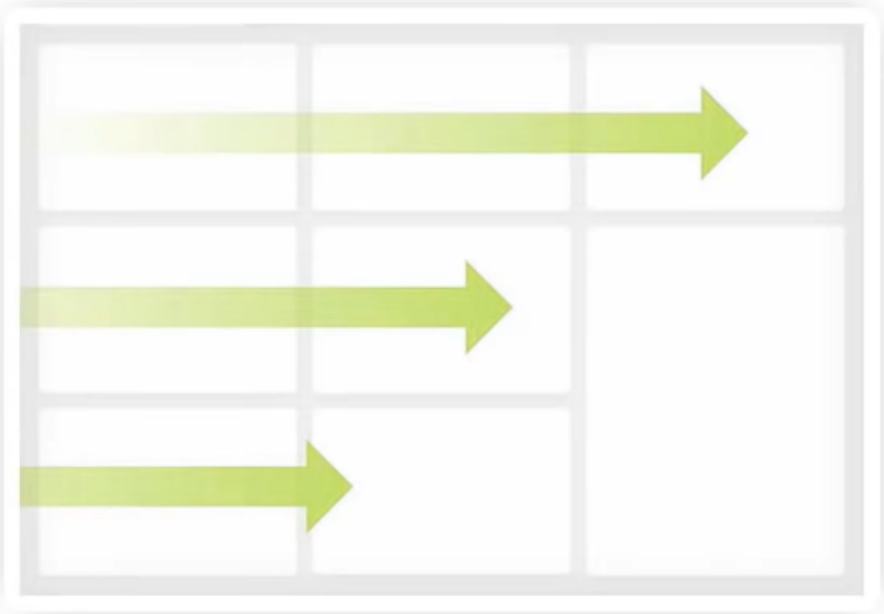


Conteúdo

RD - Report Format

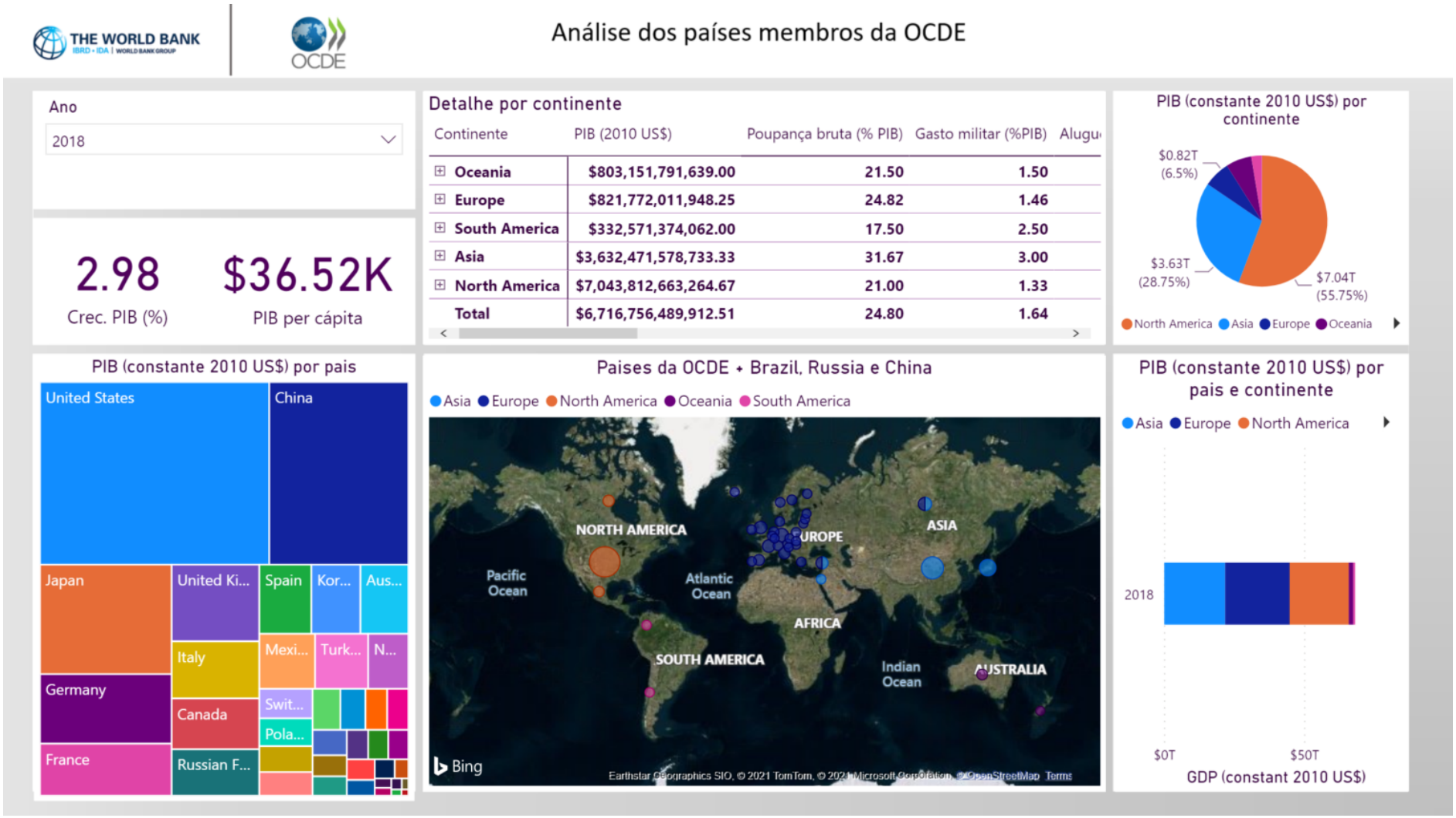
The format of the report is linked to the format of the views, but is focused on the general structure: Organization of views, buttons and elements that help the user navigate through the document. **Tips on report format**

- **Report interface**: Clean and simple. With colors related to the organization's logo or the theme of the categories. Use titles or tags to guide the user to navigate through the document. Use consistent margins and element distribution.
- **Reading the report**: From general to specific. Try to use the sense of presentation of the information in the way we read it (from right to left, from top to bottom). Put key indicators in the upper left quadrant and from there, break down to lower levels.



RD - Report Format

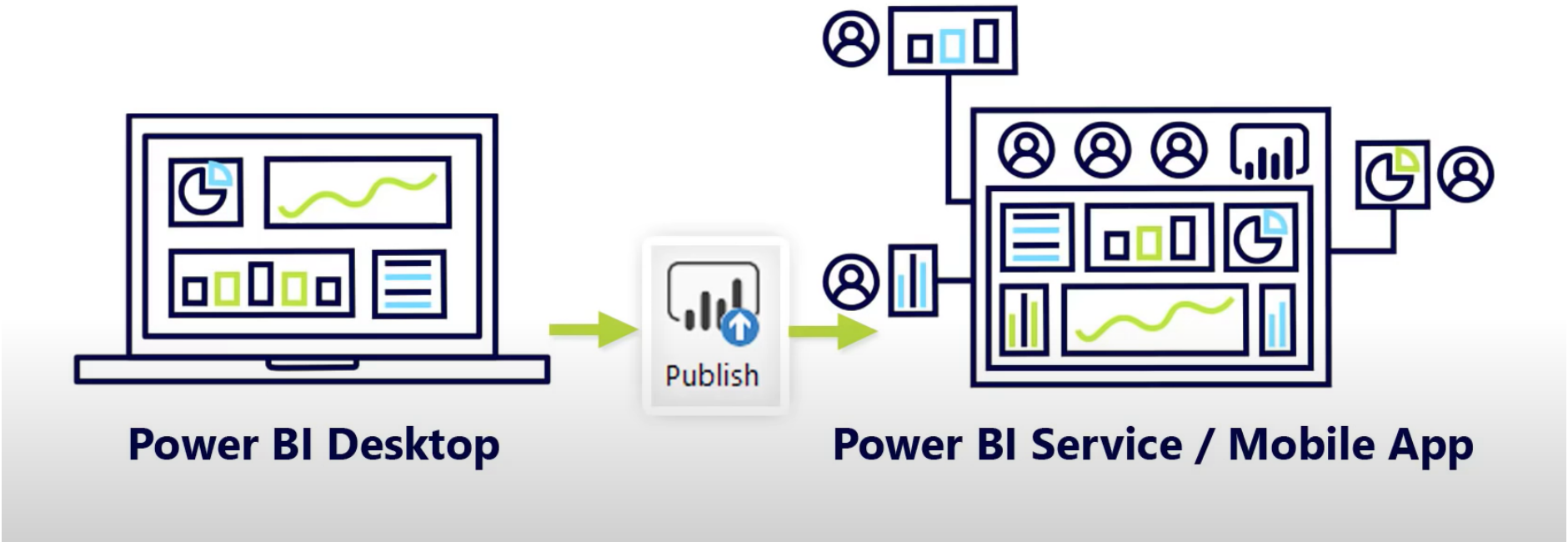
Let's do the following exercise:



Conteúdo

RD - Publish the Report

Publish online: This feature will allow the report created in *Powe BI Desktop* to be accessed online on any device. The report is published on *Power BI Service* and generates a public access link.



References I

datdata (2020).
Tutorial power bi (2020) - creación de dashboard en 3 horas.
https://www.youtube.com/watch?v=hKe7bHPiSPU&t=6089s.
Fonte principal.

Lab, T. O. (2019).
How to create beautiful dashboard background and tile design.
https://www.youtube.com/watch?v=NfEqCdf123k&t=300s.
Formato do relatóriol.

Creating a Dashboard

Eduardo Hidalgo García

JUNIOR DATA CONSULTING.
NOVA IMS

eduardohidalgogarcia@gmail.com
eduardo.hidalgo@mastercard.com
eduardo.garcia@novasbe.pt

3 de outubro de 2021