



# Introduction to Power BI

Sekou Tyler





# Introduction



Who Am I?

I aim to empower people to make better decisions  
by delightfully displaying data that matters.



# DATA NEVER SLEEPS 8.0

How much data is generated *every minute*?

In 2020, the world changed fundamentally—and so did the data that makes the world go round. As COVID-19 swept the globe, nearly every aspect of life—from work to working out—moved online, and people depended more and more on apps and the Internet to socialize, educate and entertain ourselves. Before quarantine, just 15% of Americans worked from home. Now over half do. And that's not the only big shift. In our 8th edition of Data Never Sleeps, we bring you the latest stats on how much data is being created in every digital minute—a trend that shows no sign of stopping.



The world's Internet population is growing significantly year over year. As of April 2020, the Internet reaches 59% of the world's population and now represents 4.57 billion people—a 6% increase from January 2019.



GLOBAL INTERNET POPULATION GROWTH 2014–2020  
(IN BILLIONS)

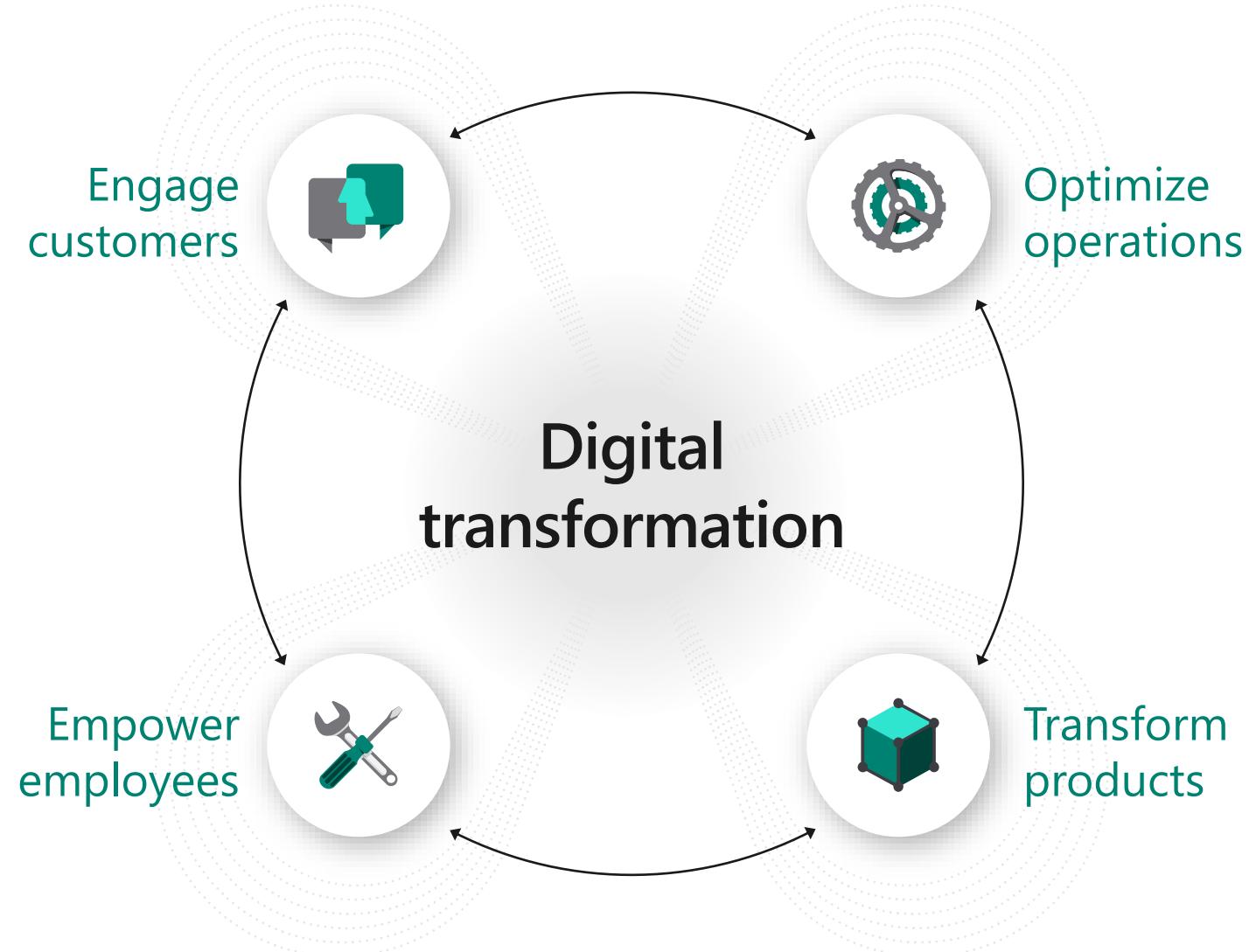
As the world changes, businesses need to change with the times—and that requires data. Every click, swipe, share or like tells you something about your customers and what they want, and Domo is here to help your business make sense of all of it. Domo gives you the power to make data-driven decisions at any moment, on any device, so you can make smart choices in a rapidly changing world.

Learn more at [domo.com](http://domo.com)

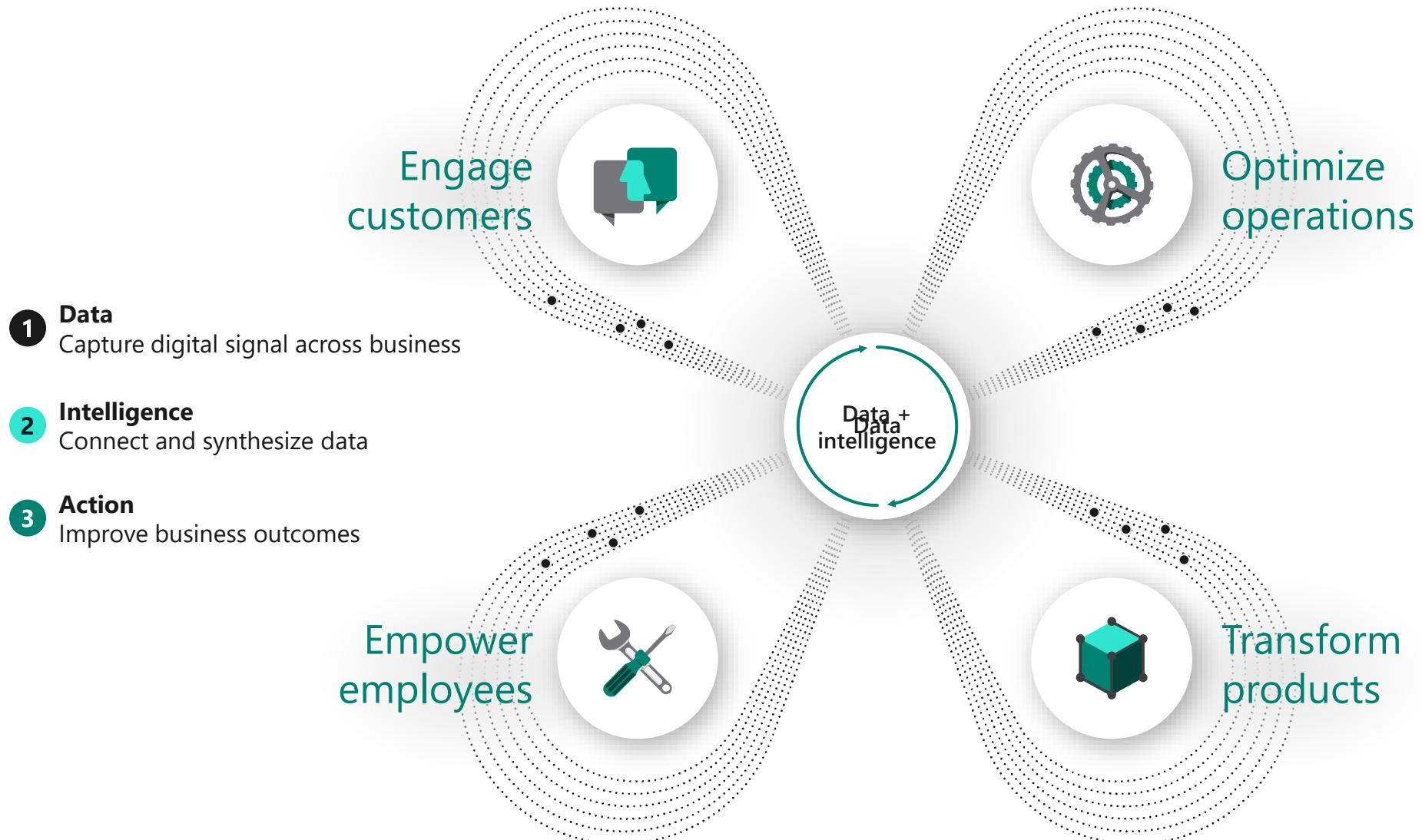
SOURCES: STATISTA, VISUAL CAPITALIST, BUSINESS INSIDER, GAMESPOT, TECHCRUNCH, OMNICORE AGENCY, DOORDASH, BUSINESS OF APPS, NEW YORK TIMES, MUSIC BUSINESS WORLDWIDE, INC., THE VERGE, INC., HOOTSUITE, DUSTIN STOUT, REDDIT, UBER, AMAZON, VOX



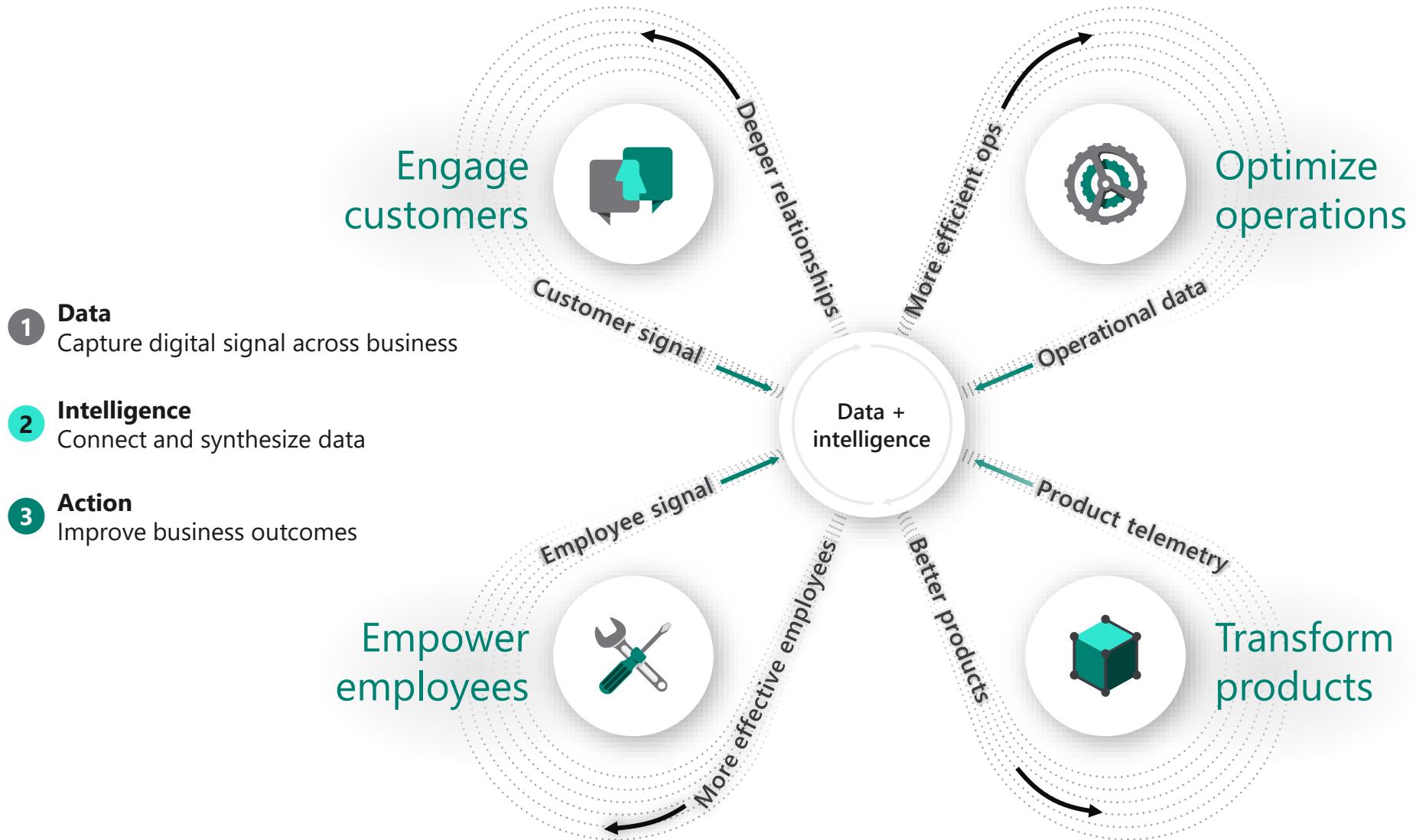




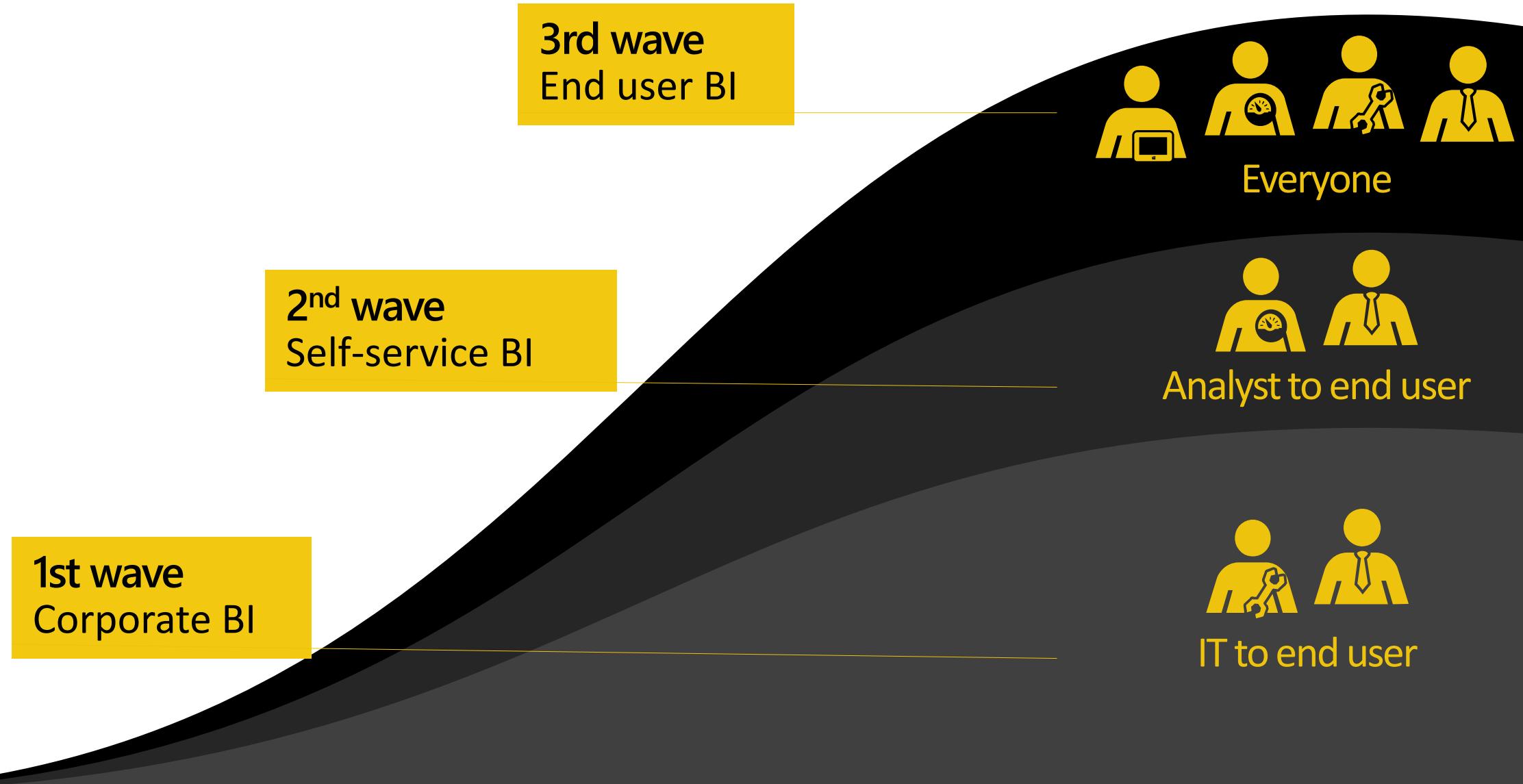
# DIGITAL FEEDBACK LOOP



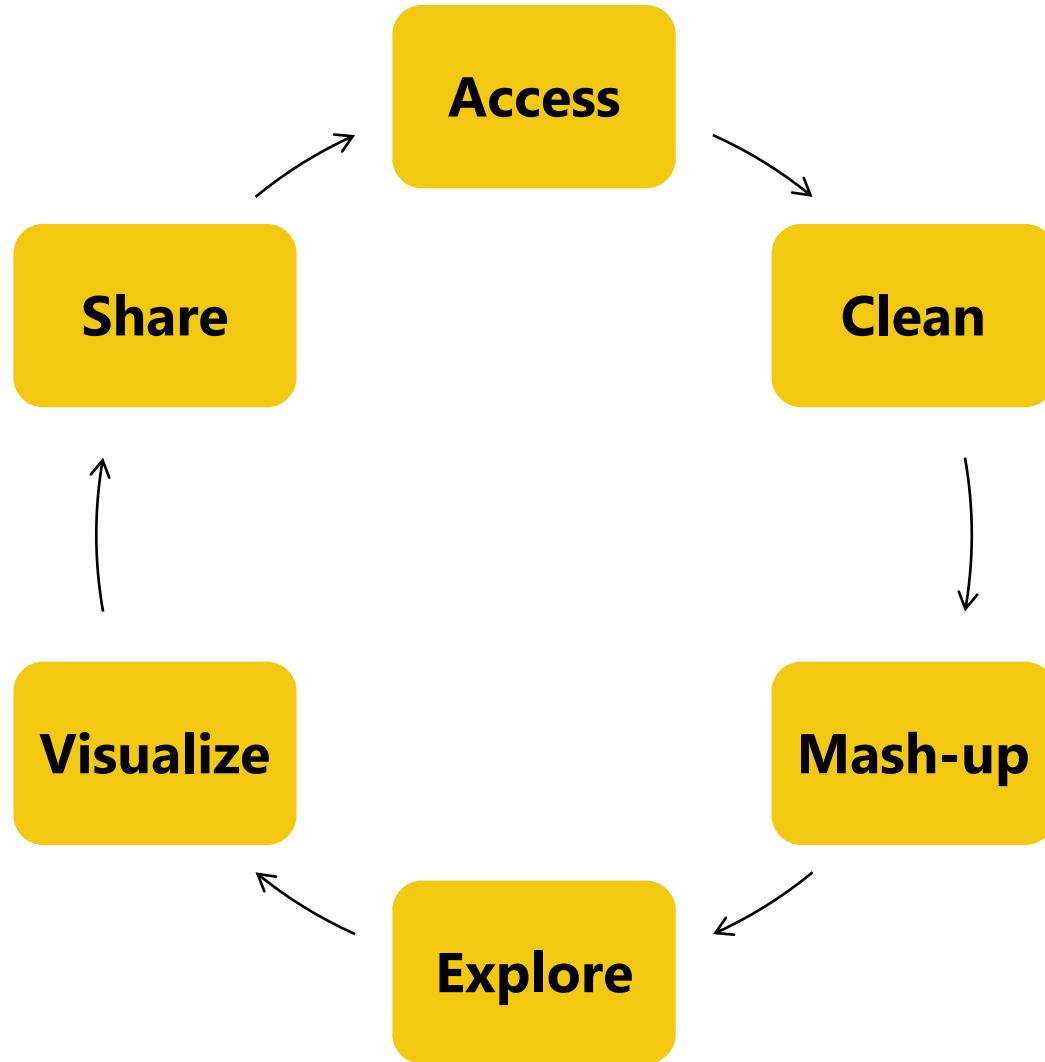
# DIGITAL FEEDBACK LOOP



# The Evolution of BI

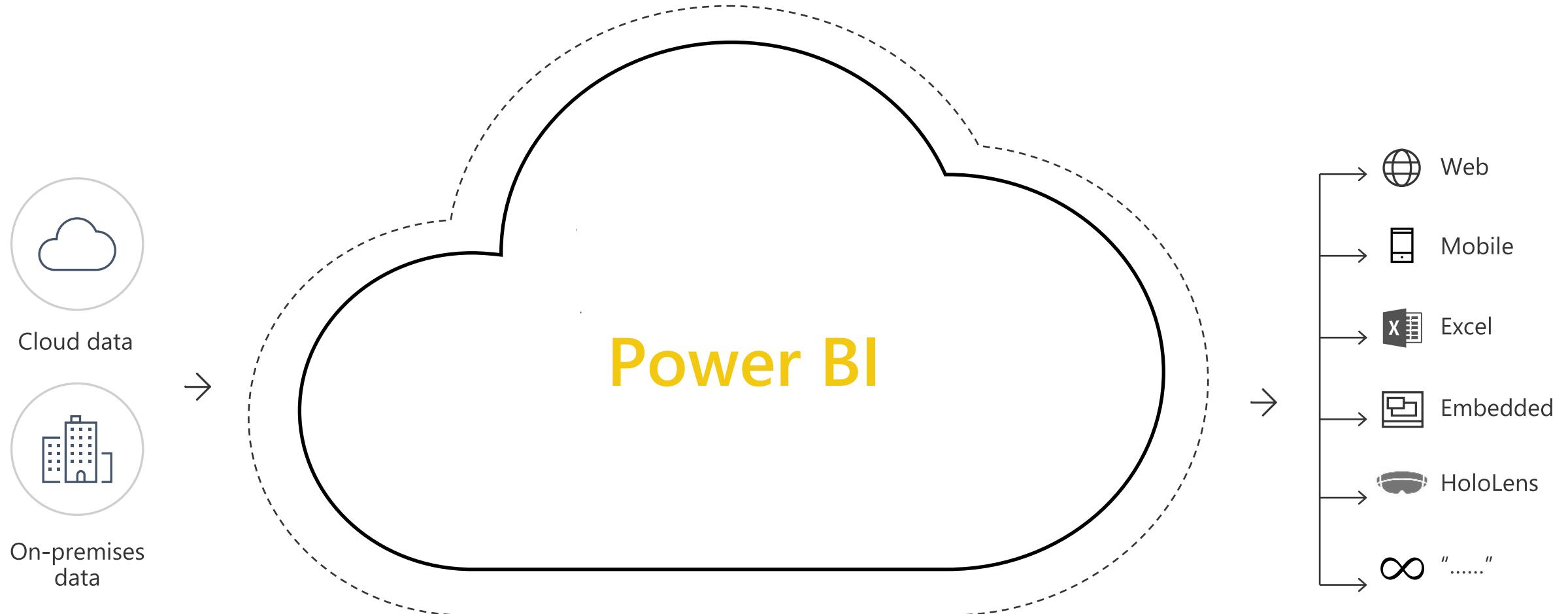


# End User Needs



# Power BI: experience your data

## Any data, any way, anywhere



# Data sources



## SaaS solutions

e.g. *Marketo, Salesforce, GitHub, Google Analytics*



## Organizational

*Corporate data sources or external data services*



## On-premises Data



## Azure services

*Azure SQL, Stream Analytics...*



## Excel files



## Power BI Desktop files

*Data from files, databases, Azure, and other sources*

Connect to 80+ data sources, both on-premises and cloud

- Data from Applications
  - SaaS services that you already use
- Data from your organization
  - Content published by others in your org (Datasets and Dataflows)
- Big data and more
  - Azure data services, e.g. HDI, ASA, AML etc.
  - On-premises data sources, e.g. Oracle & SSAS
- Data from files
  - Import data from Text, CSV, Excel and Power BI Desktop files

# Access all your DATA

**Get Data**

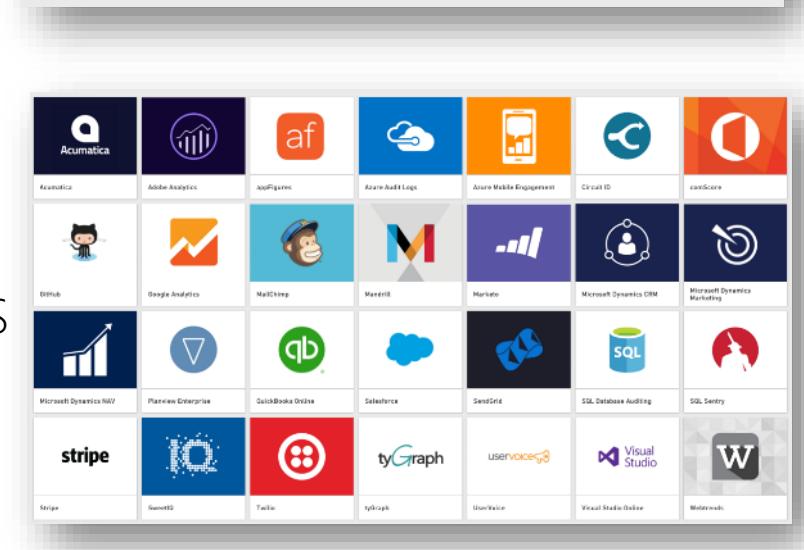
Need more guidance? [Try this tutorial](#) or [watch a video](#)

Discover content      Create new content

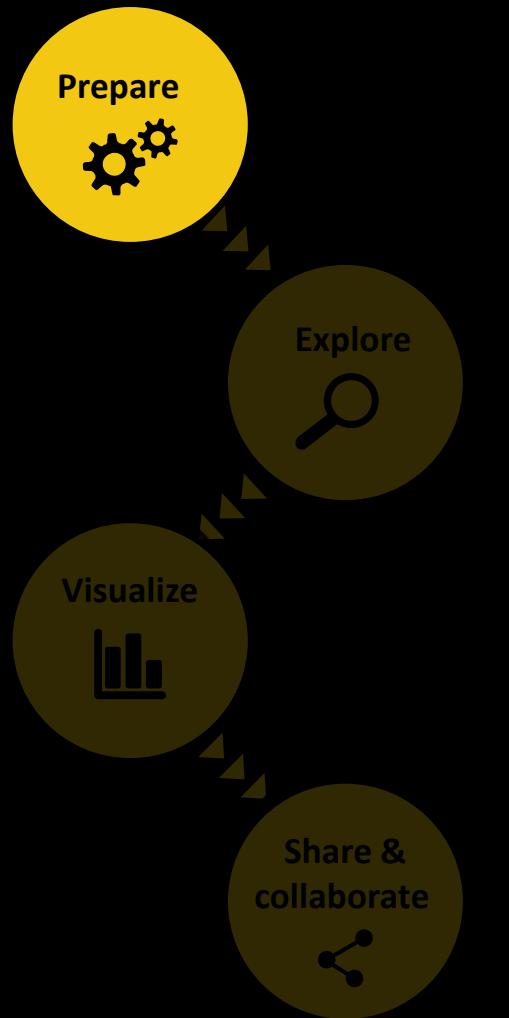
My organization	Services	Files	Databases
Discover apps published by other people in your organization.	Choose apps from online services that you use.	Bring in your reports, workbooks, or data from Excel, Power BI Desktop or CSV files.	Use Power BI Desktop to connect to data in Azure SQL Database and more.
<a href="#">Get</a>	<a href="#">Get</a>	<a href="#">Get</a>	<a href="#">Get</a>

More ways to create your own content

[Samples](#)      [Organizational Content Packs](#)  
[Partner Showcase](#)      [Service Content Packs](#)



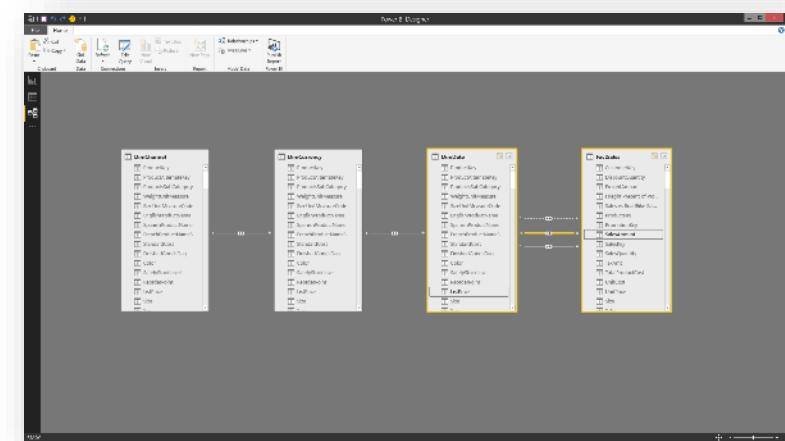
# Clean and mash-up your **DATA**



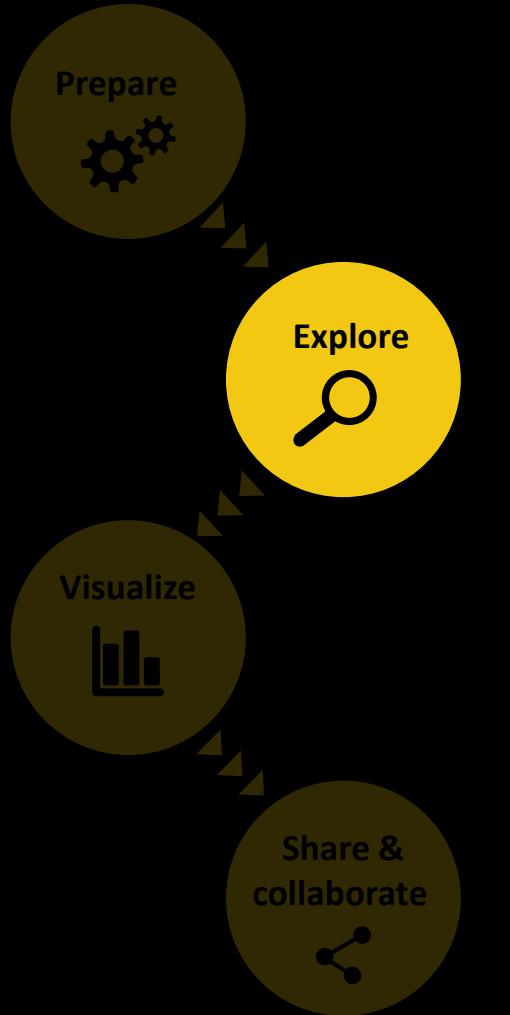
- Consolidate data from a broad range of sources
  - Merge or append queries to combine data from multiple queries into a single query
- Transform data to fit your needs using intuitive UI
  - Select data for inclusion
  - Cleanse data and remove errors
- Define calculations to generate new fields for use in reports
- Develop advanced analytics using a combination of measures and relationships
  - Uncover correlations, highlight exceptions and understand business outcomes

A screenshot of the Microsoft Power Query ribbon interface. The ribbon tabs include File, Home, Transform, Add Column, and View. Under the Transform tab, various data manipulation tools are listed: Transpose, Data Type (set to Whole Number), Replace Values, Pivot Column, Reverse Rows, Detect Data Type, Replace Errors, Unpivot Columns, Group By, Use First Row As Headers, Count Rows, Rename, Fill, Move, Split Column, Format, ABC Extract, Merge Columns, and Parse Text Column. Below the ribbon, a table titled "7 Queries" is displayed with columns: ProductID, Date, Zip, Units, Revenue, and Country. The table contains 6 rows of data, all from the "Sales" query. The data shows sales for various products across different dates and locations.

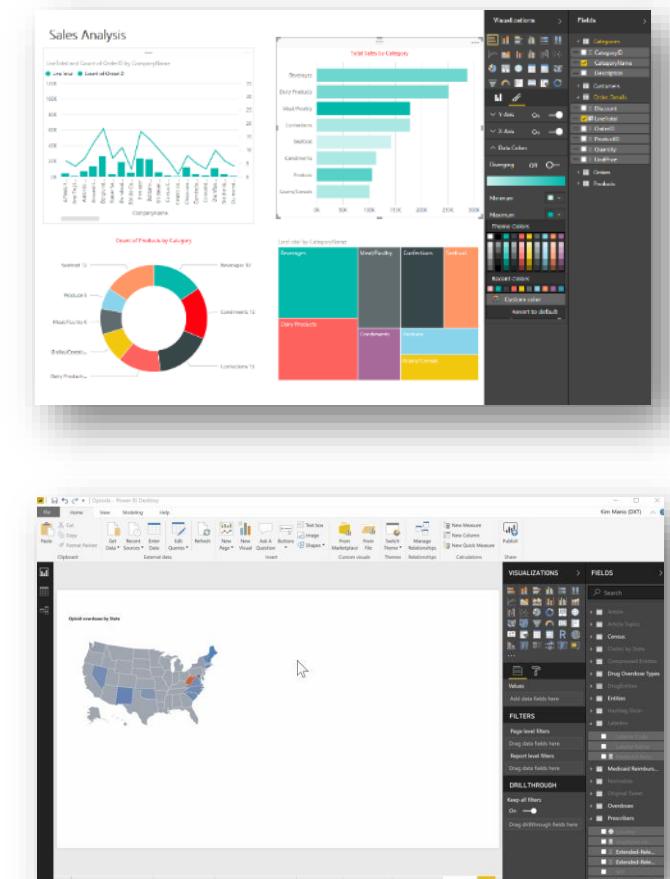
ProductID	Date	Zip	Units	Revenue	Country
1	833	1/15/1999 76108	1	797.9475	United States
2	837	1/15/1999 33436	1	813.6975	United States
3	837	1/15/1999 76531	1	813.6975	United States
4	838	1/15/1999 29526	1	934.4475	United States
5	838	1/15/1999 33584	1	944.9475	United States
6	838	1/15/1999 33947	1	944.9475	United States



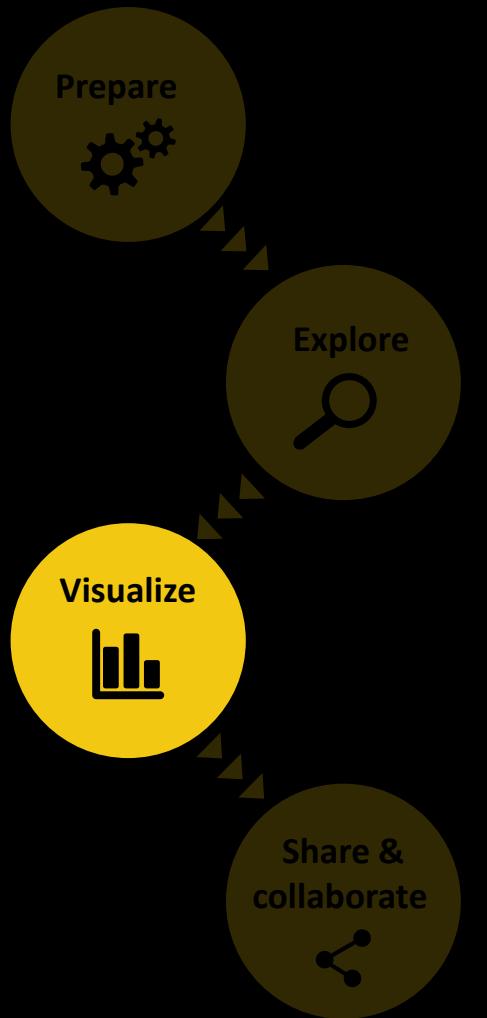
# Explore your DATA



- Explore data in a variety of ways and across multiple visualizations using drag and drop canvas
- Dig deeper into your reports
  - Drill-down in your hierarchical data
  - Filter, sort, hover over and highlight data
- Leverage Quick Insights to find insights in your data
- Ask questions of your data in natural language with Q&A
  - Type questions in plain language
  - Q&A intelligently filters, sorts, aggregates, groups and displays data based on the question



# Visualize your DATA



- Visualize data in a variety of ways
- Growing number of visualization types
  - Donuts, basic area, waterfall, filled maps, tree maps, funnel, gauges combo charts and more
  - Custom visuals available from Power BI Visuals Marketplace
  - Tools to develop, test, package new custom visuals
- Visualizations on report page are connected – select value in one visualization to change other visualizations
- Full screen pop out mode for report visuals to show additional details



Power BI Visuals

MARKETPLACE | MY ORGANIZATION

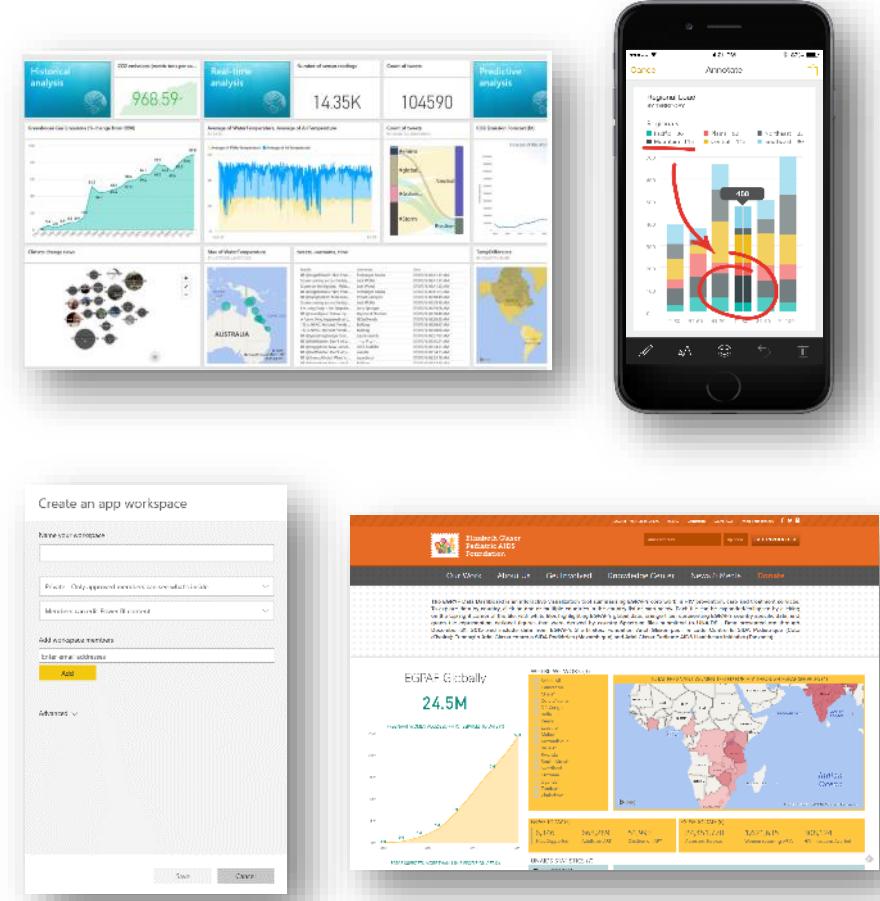
A screenshot of the Power BI Visuals Marketplace. It shows a search bar, a sidebar with categories like 'Advanced Analytics', 'Data Visualizations', 'Editor's Picks', 'Filters', 'Gauges', etc., and a main list of visual add-ins. Each item has a preview, a star rating, and an 'Add' button. The items listed are:

- Histogram Chart: Visualises the distribution of data over a continuous interval or certain time period. Rating: ★★★☆☆.
- Time series decomposition chart: Understand the time series components using "Seasonal and Trend decomposition using Loess". Rating: ★★★★☆.
- Association rules: Uncover relationships between seemingly unrelated data using if-then statements. Rating: ★★★★☆.
- KPI Column by MAQ Software: Line and Column chart that measures progress toward key performance indicator (KPI) targets. Rating: ★★★★★.

# Bring your story to life with **DATA**

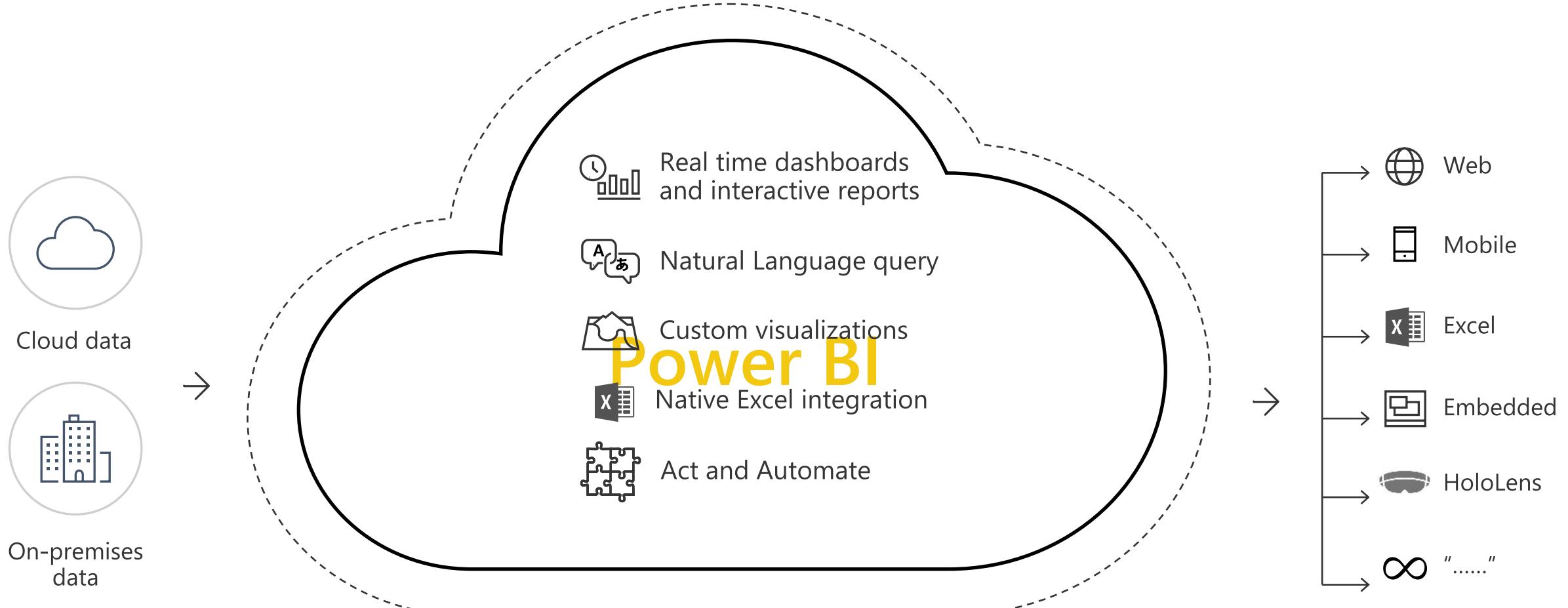


- Save Power BI Desktop report files and easily publish them to powerbi.com
- Access dashboards using native mobile apps for Windows, iOS and Android
- Share as appropriate with other Power BI users in your organization
- Package your reports in apps for easy consumption and control
- Easily embed interactive Power BI visualizations in blog posts, websites, through emails or social media With Power BI **Publish to web**

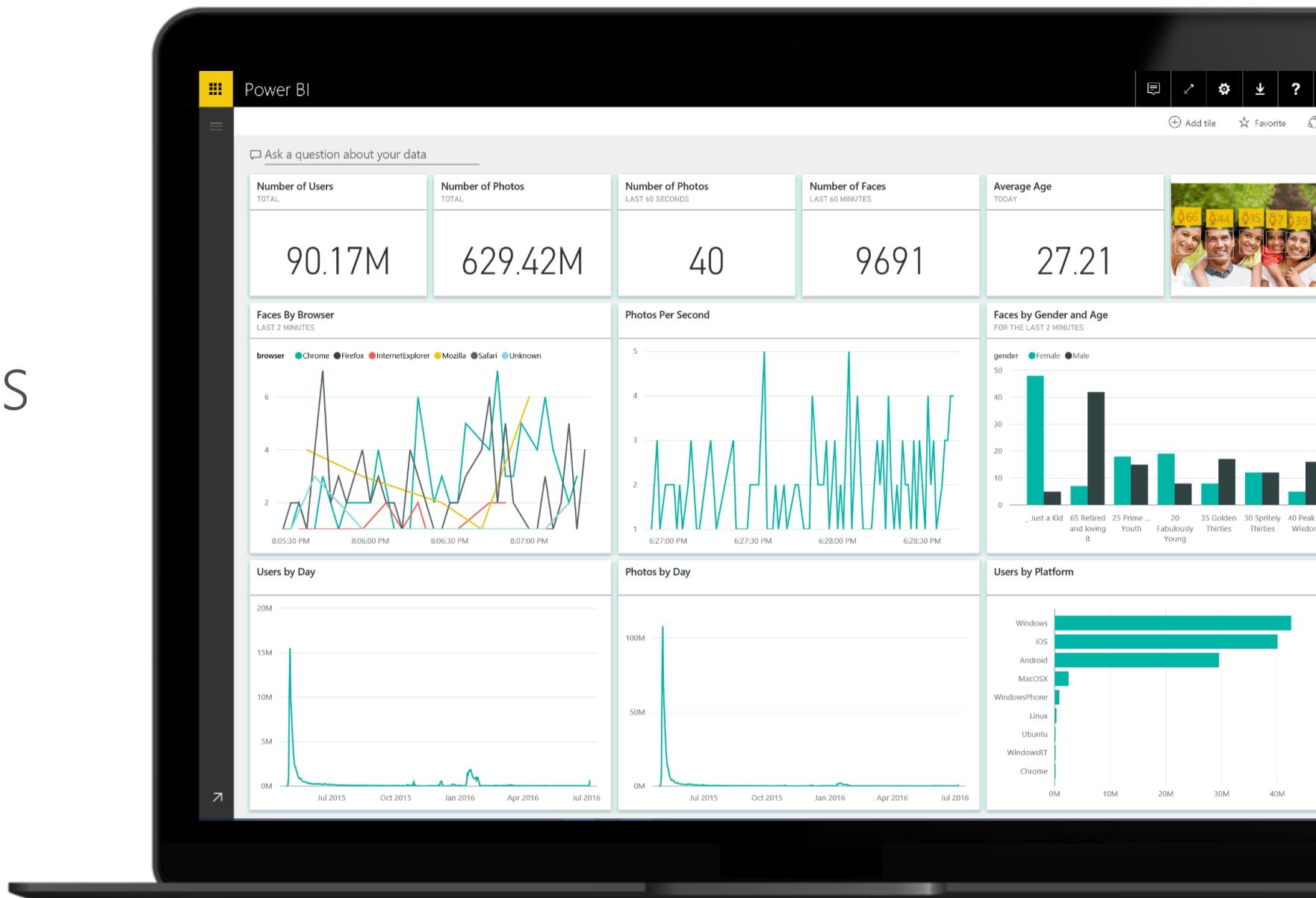


# Power BI: experience your data

Any data, any way, anywhere



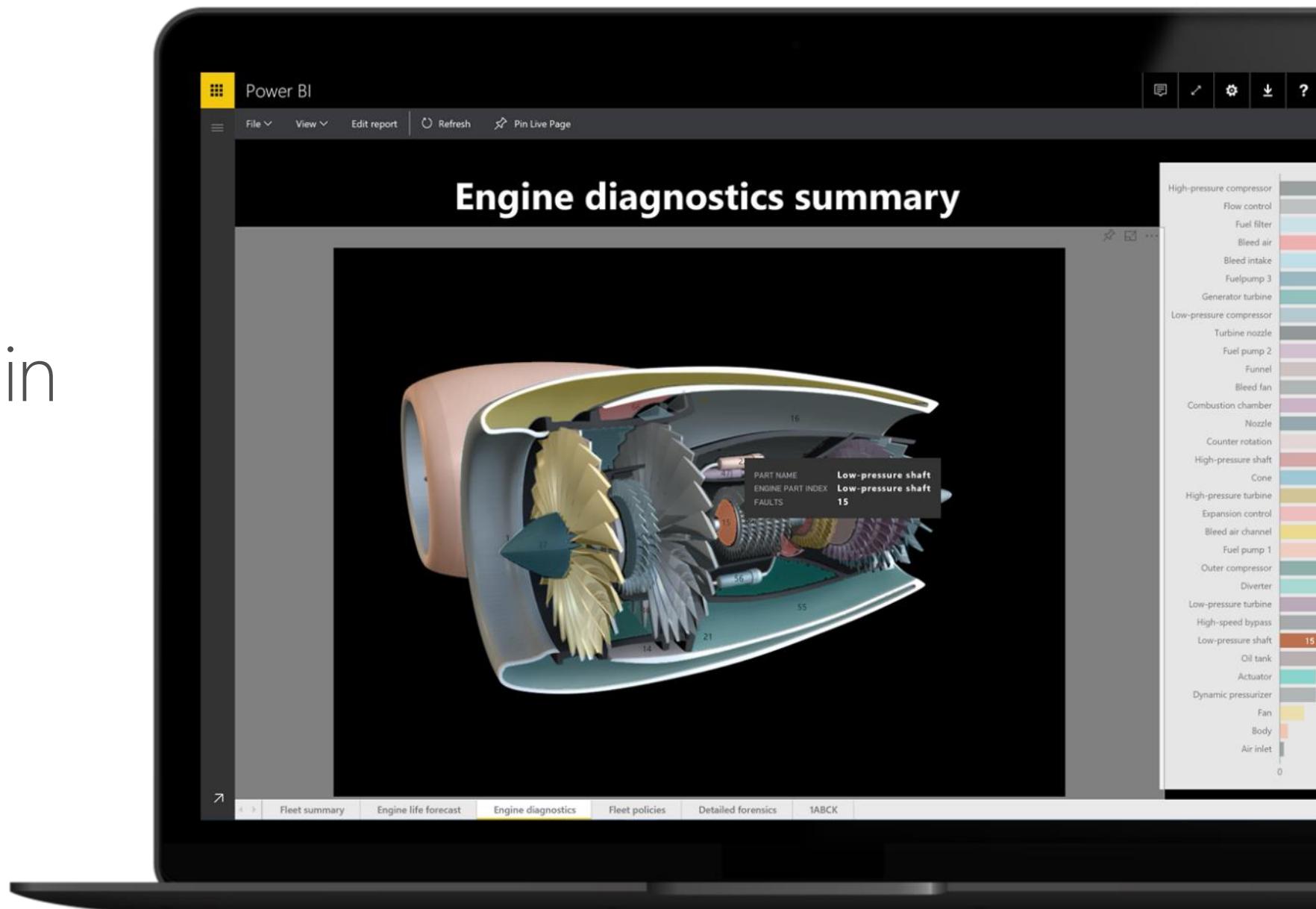
# Run your business in real time with live dashboards



# Ask questions of your data



Visualize insights in  
the context of  
your business



# Deliver insights through deep integration with Excel



Info

New

Open

Save

Save As

Print

Share

Export

Publish

Close

Account

Feedback

Options

## Publish

### Publish to Power BI

#### Power BI

Use Power BI to create and share rich visual reports and dashboards from your workbook. [Learn more](#)

You're signed in to Power BI as [tfarag@microsoft.com](#). [Use another account](#)

Select where you'd like to publish to in Power BI:

My Workspace

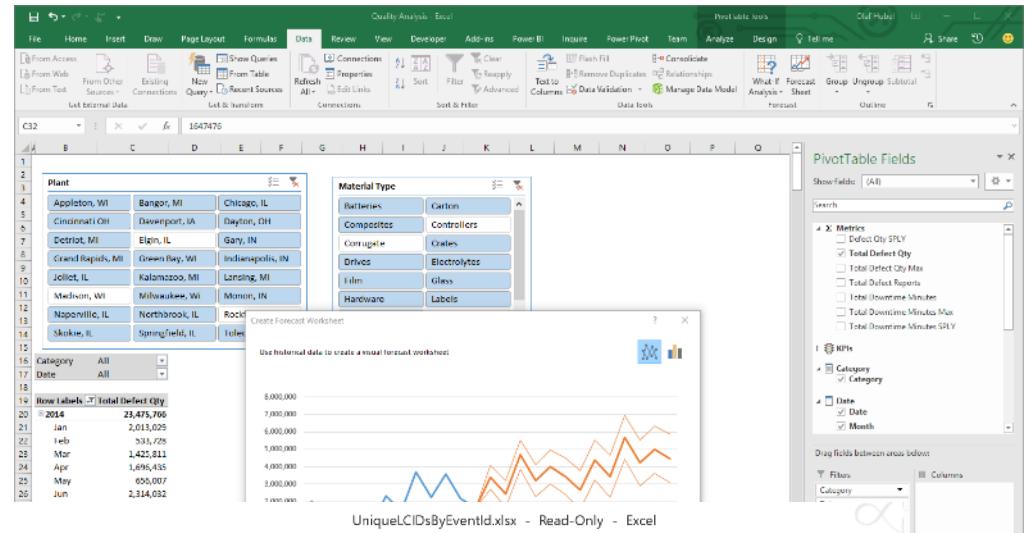
Refresh

### Upload your workbook to Power BI

- Interact with your Excel workbook just as you would in Excel Online.
- Pin selections from your workbook to Power BI dashboards.
- Share your workbook or selected elements through Power BI.

### Export workbook data to Power BI

- Export table data and data model into a Power BI dataset.
- Create Power BI reports and dashboards from your dataset.



# Get from insights to actions quickly

Power BI Belron > Fleet Check Performance

File View Edit report Explore Refresh Pin Live Page Reset to default Bookmarks Usage metrics View related Unfavorite Subscribe

AUTOGLASS Fleet Check Performance

Replacement Performance by Region

Region	Performance (%)
South	~25%
North	~15%
West	~10%
East	~5%

Repair Performance by Region

Region	Performance (%)
South	~25%
North	~15%
West	~10%
East	~5%

Repairs and Replacements by Location

Repairs and Replacements by Quarter

Quarter	Cost
Qtr 1	~218.40
Qtr 2	~187.20
Qtr 3	~202.67
Qtr 4	~209.33

Fleet Name: Main Campus

Sheet Name	Make	Model	Is Damaged	Needs Replacement
Advanta	BMW	Active Hybrid Sedan	No	No
Advanta	Nissan	Altima S Sedan	No	No
Advanta	Mercedes-Benz	GLS 454	No	No
Advanta	BMW	MD Sedan	No	No
Advanta	Toyota	Prius Hybrid 3 Hatchback	No	No
Brevem	BMW	Active Hybrid Sedan	No	No
Brevem	Nissan	Altima S Sedan	No	No
Brevem	Honda	Civic LX Coupe	No	No
Brevem	Mercedes-Benz	GLS 453	No	No
Brevem	BMW	MD Sedan	No	No
Brevem	Toyota	Prius Hybrid 3 Hatchback	No	No
Main Campus	BMW	Active Hybrid Sedan	No	No
Main Campus	Nissan	Altima S Sedan	No	Yes

BMW

Model: M3 Sedan, Year: 2015, Plate: RLD666Z

Date: 12/31/2001

Fleet: Redwest

Damage: On, Replacement: Off

Follow Up By: 10/17/2018

Argic No.: WSB1244ADFBLA

Confirm



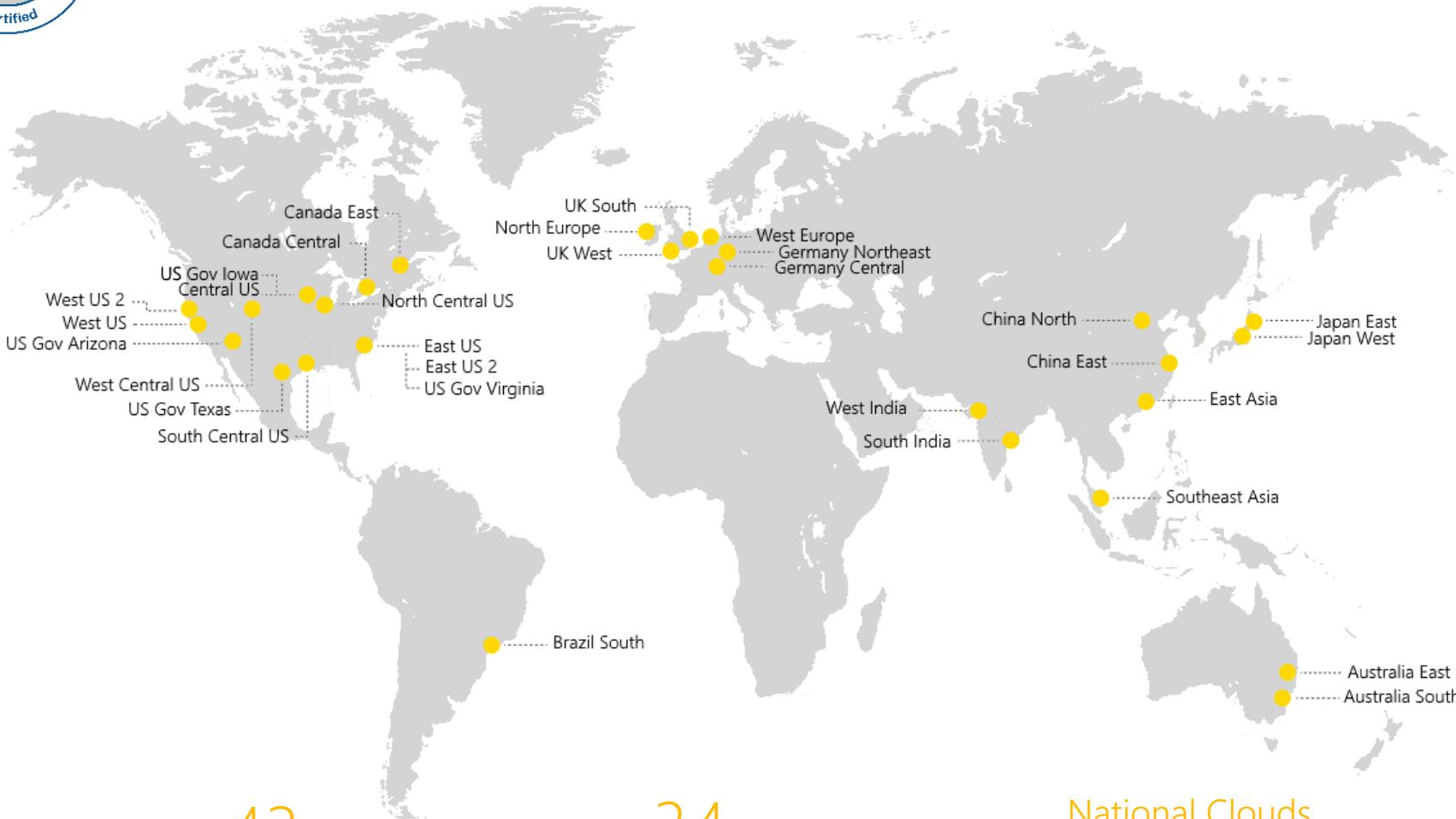
EU Model Clauses



China GB 18030

43  
Languages

# Largest Global Footprint



34  
Primary and backup  
datacenters worldwide

National Clouds  
US Government  
China  
Germany



Federal Office  
for Information Security



February 2019

# A Leader in Analytics & BI Platforms\*



Source: Gartner (February 2019)

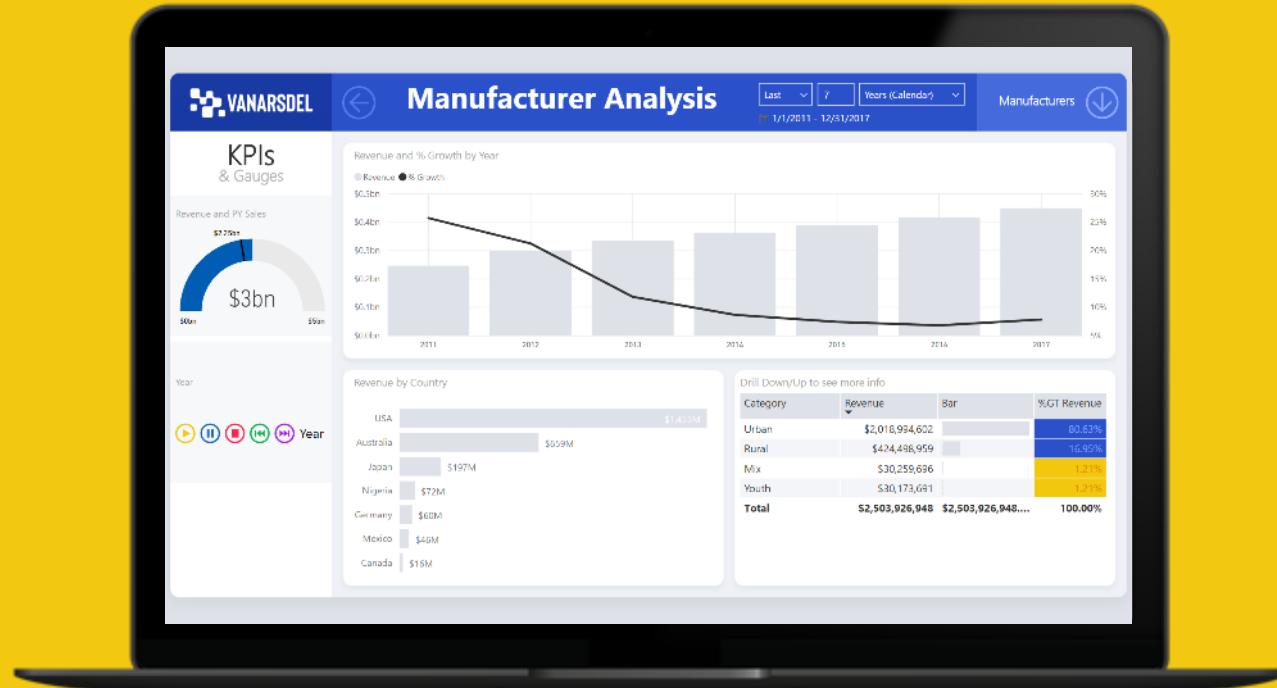
As of January 2019

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\*Gartner "Magic Quadrant for Analytics and Business Intelligence Platforms," by Cindi Howson, James Richardson, Rita Sallam, Austin Kronz, 11 February 2019

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# Business Intelligence Terminology



# Dimensions

Descriptive/ Qualitative Information

- Color
- Country
- Region
- State
- City
- Person
- Gender
- Age
- Dates

# Measures/Facts

Quantitative Information

- Expressed in numbers and can be counted and aggregated easily

# DAX Functions

## Data Analysis Expressions

- <https://docs.microsoft.com/en-us/dax/dax-function-reference>
- Examples:
  - SUM
  - AVERAGE
  - COUNT
  - DISTINCTCOUNT
  - SWITCH
  - TODAY

# Scenario 1

How many shoes were sold in Tennessee in 2017?

# Scenario 1

How many shoes were sold in Tennessee in 2017?

Dimension

Measure

# Scenario 2

How many kids under the age of 10 bought red Nikes in the USA in 2018?

# Scenario 2

How many kids under the age of 10 bought red Nikes in the USA in 2018?

Dimension

Measure

# Scenario 3

How many kids under the age of 10 bought red Nikes in the USA in 2018?

Dimension

What percentage of those shoes were returned within one month?

Measure

# Scenario 3

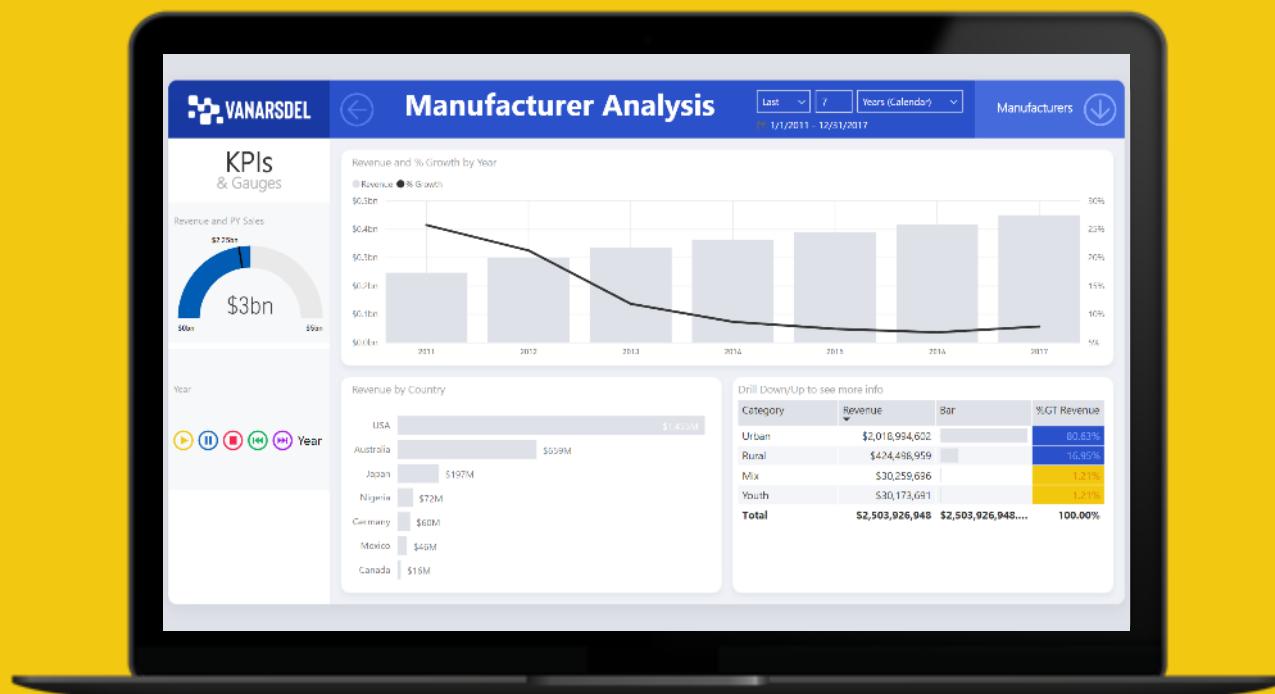
How many kids under the age of 10 bought red Nikes in the USA in 2018?

Dimension

What percentage of those shoes were returned within one month?

Measure

# Basic Data Modeling



# Flat File Database Structure

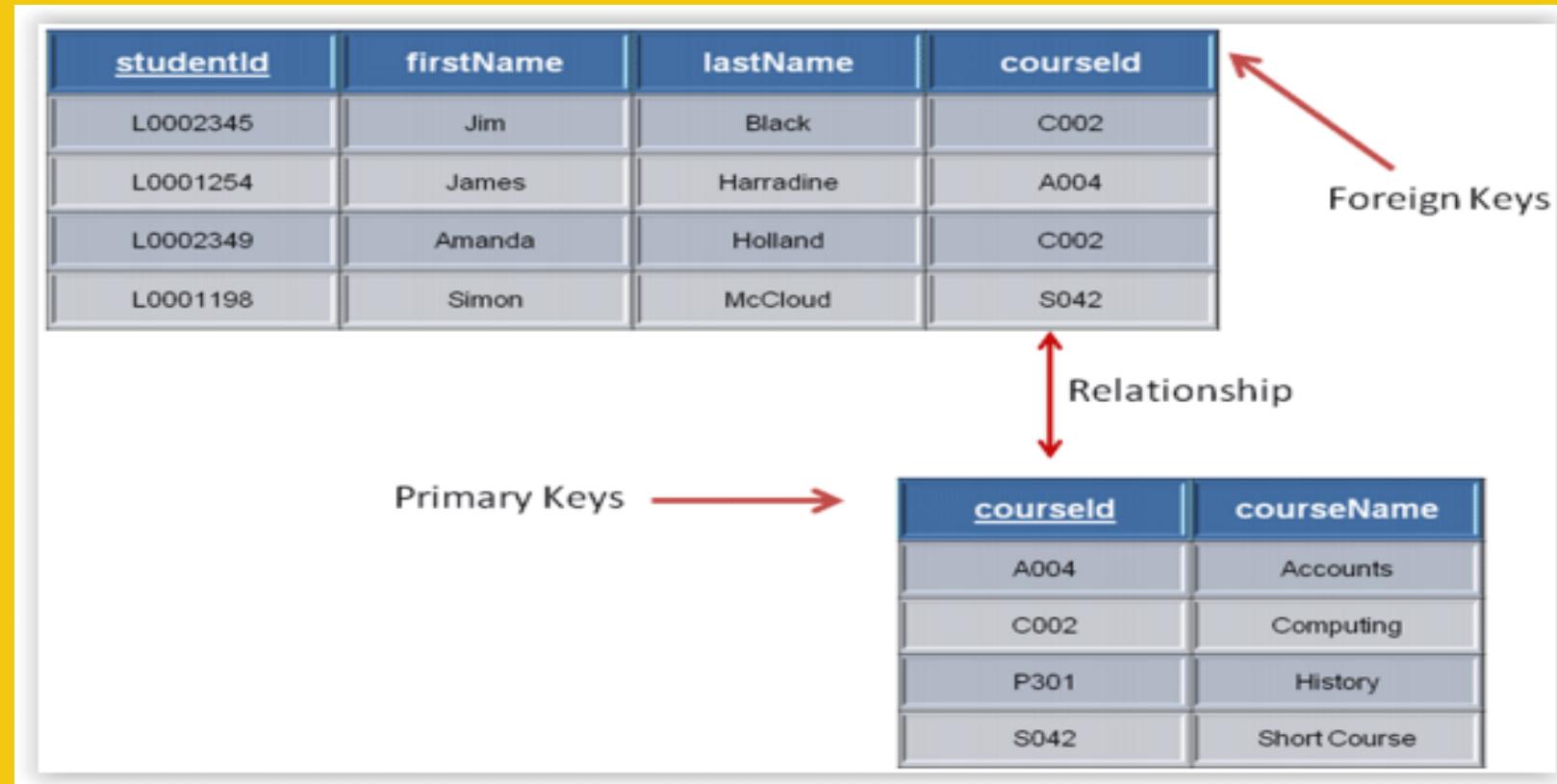
A flat-file database is a database stored in a file called a flat file. Records follow a uniform format, and there are no structures for indexing or recognizing relationships between records. The file is simple. A flat file can be a plain text file, or a binary file. Relationships can be inferred from the data in the database, but the database format itself does not make those relationships explicit

# Flat File Example

StudentId	firstName	lastName	courseld
L0002345	Jim	Black	C002
L0001254	James	Harradine	A004
L0002349	Amanda	Holland	C002
L0001198	Simon	McCloud	S042
L0023487	Peter	Murray	P301
L0018453	Anne	Norris	S042



# Relational Database Example



# Star Schema

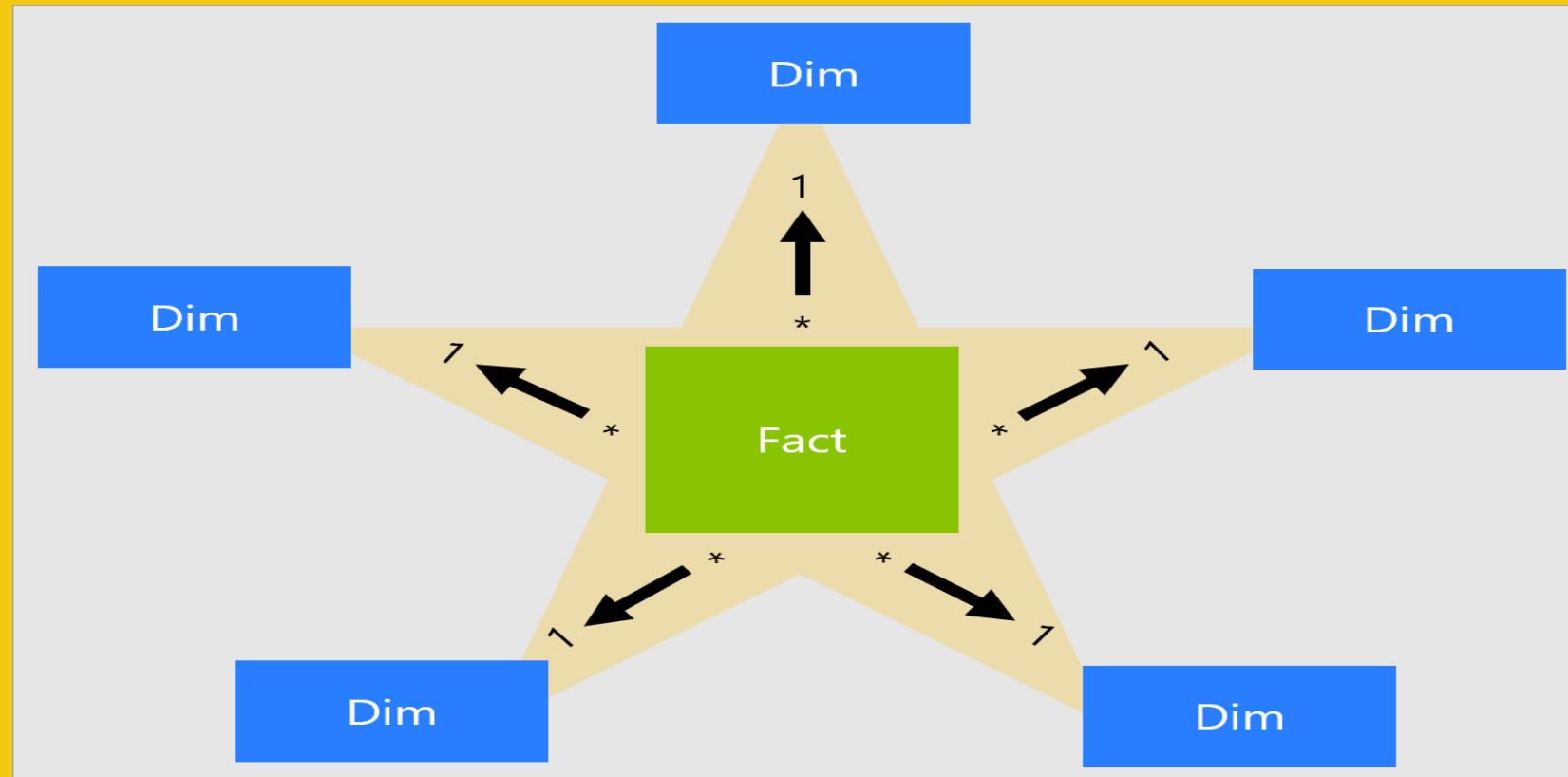
**Star schema** is a mature modeling approach widely adopted by relational data warehouses. It requires modelers to classify their model tables as either *dimension* or *fact*.

**Dimension tables** describe business entities—the *things* you model. Entities can include products, people, places, and concepts including time itself. A dimension table contains a key column (or columns) that acts as a unique identifier, and descriptive columns.

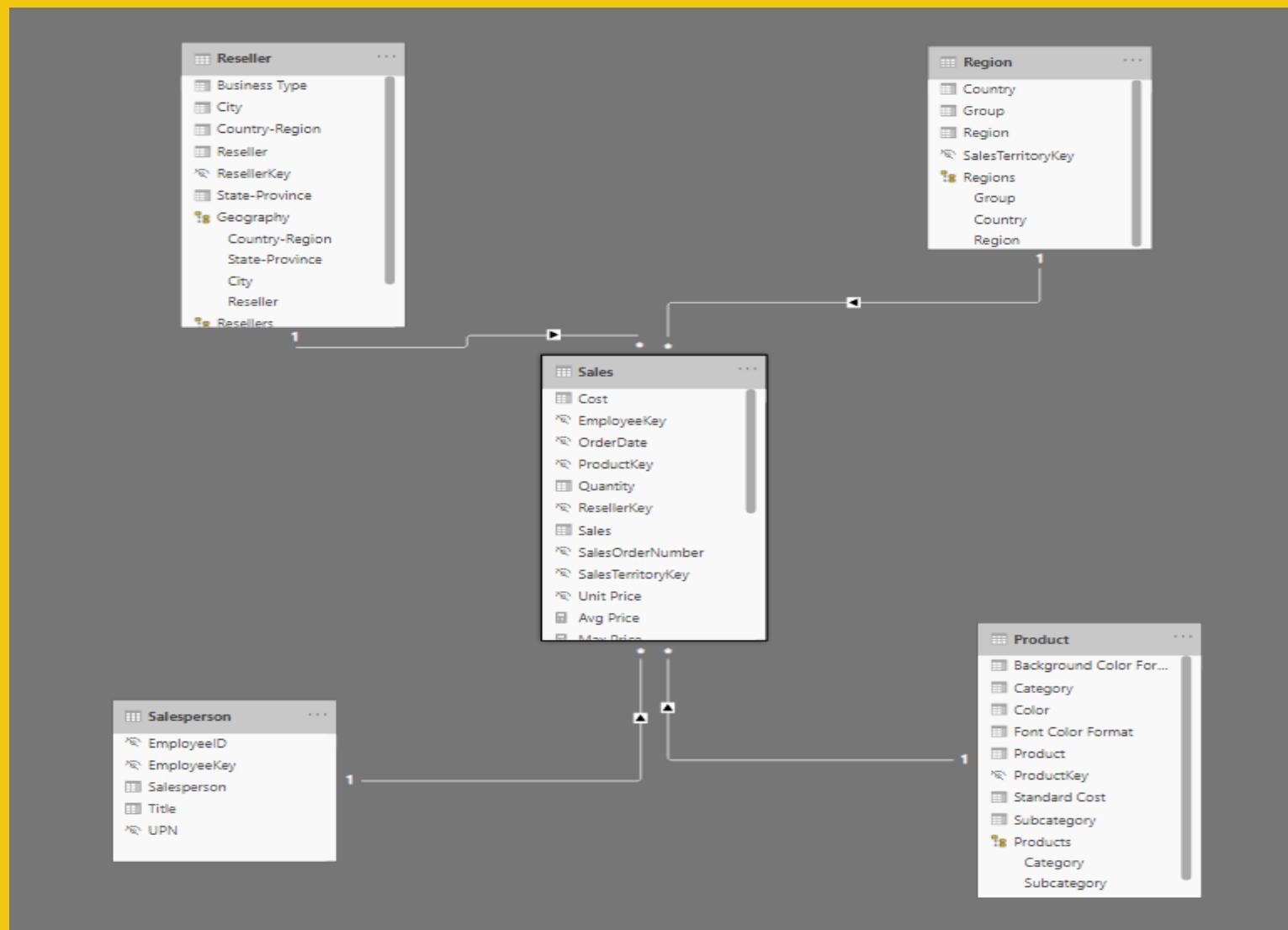
**Fact tables** store observations or events, and can be sales orders, stock balances, exchange rates, temperatures, etc. A fact table contains dimension key columns that relate to dimension tables, and numeric measure columns.

Generally, dimension tables contain a relatively small number of rows. Fact tables, on the other hand, can contain a very large number of rows and continue to grow over time.

# Star Schema Example

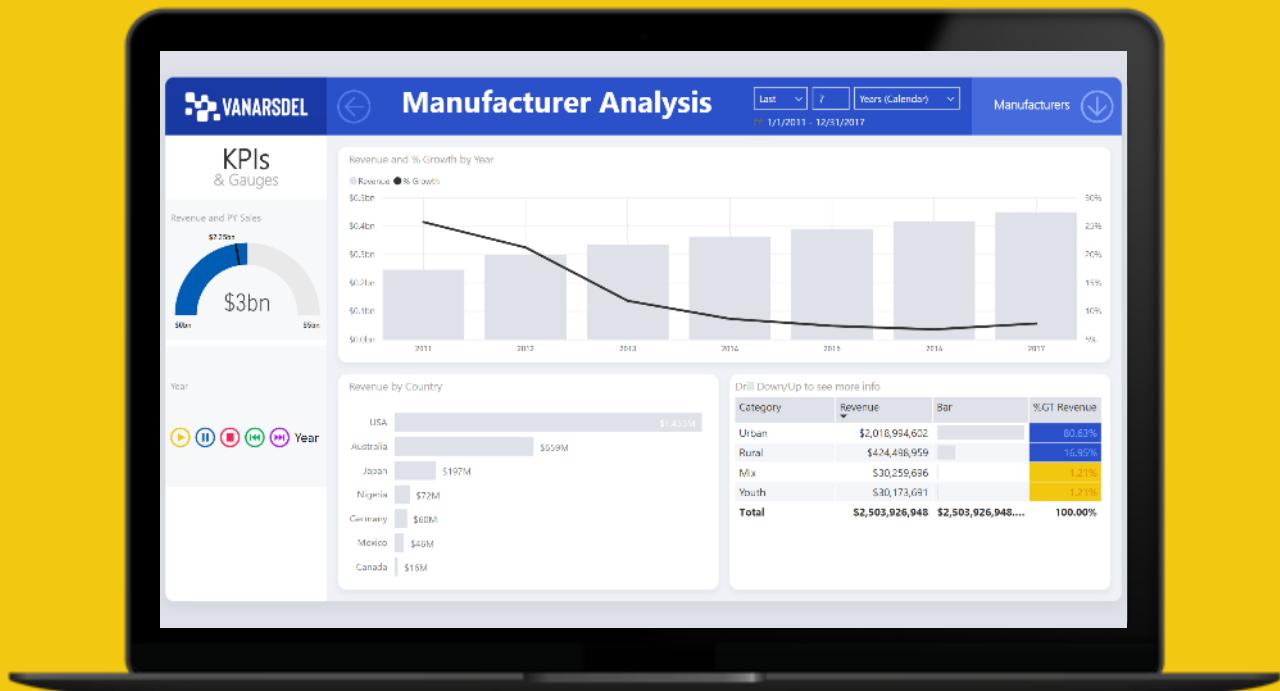


# Star Schema Example



# Power BI

## Demo



# Request from a stakeholder

I would like to know the total sales amount (\$) broken out by year. I would also like to know the number of sales quantity broken out by year. I would like to know what product categories had the highest sales amount (\$). I would also like to know what are our top 5 highest selling products. I would like to know the total sales amount and quantity for USA only.

# Example 1

Create a bar chart showing sales broken out by year

Create a line chart showing quantity broken out by year

Create a chart of sales by category

Create a chart showing top 5 products

Create 2 cards of total sales and quantity

# Example 2

Create a card of total sales for Germany

Create a card of total quantity for Canada

Create a bar chart of sales by 2019 only. Broken out by month

Create a line chart of quantity for 2019 only. Show this month

Create a chart that shows total sales by SalesPerson Title

Create a chart displaying the top 5 Salesperson with the highest dollar amount of sales

# Power BI Tips and Tricks

Maps

Quick Measures

Measures

# How To Tell A Story With Data

# Storyboarding

Problem

- What are we trying to solve

Who

- Audience
- You

What

- Action

Mechanism

- PowerPoint?
- Power BI?
- Excel?
- Tableau

Tone

- Success/Failure?

How

- Possible types of graph/chart

# Two main types of data visualization

- Exploration
- Explanation

# Exploration

- Discover new areas of interest
- Pose new questions
- Discover new stories

# Explanation

- Answer a question
- Support a decision
- Convey information
- Increase efficiency

# The need to visualize data

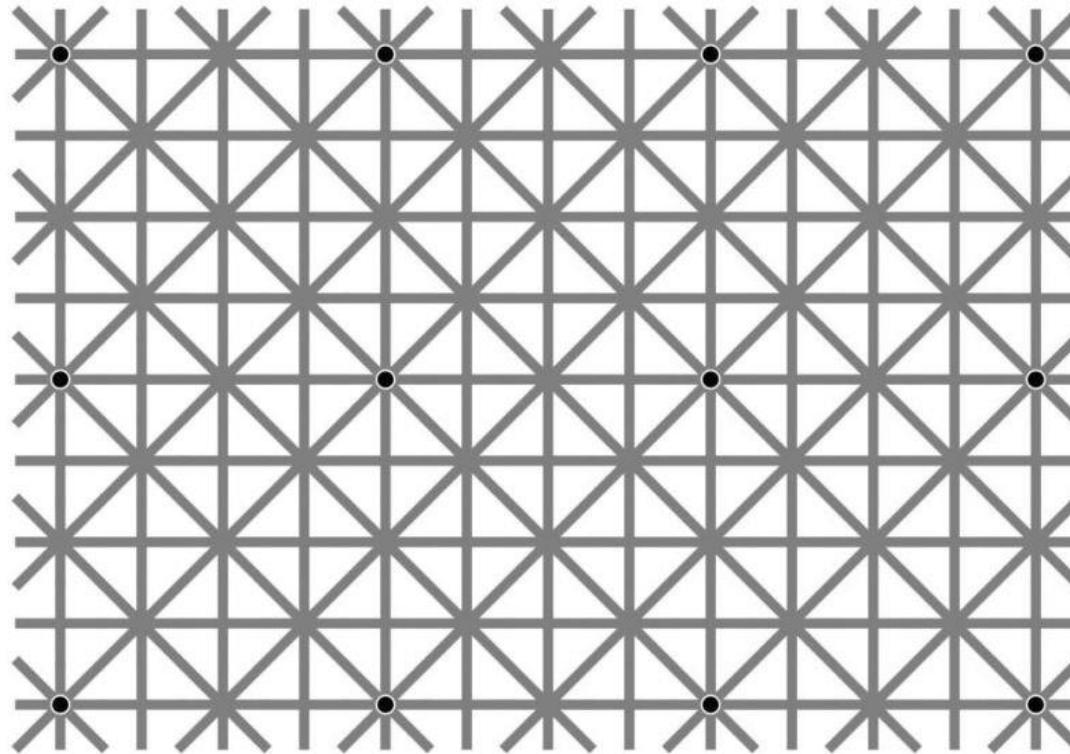
- Human brain processes images 60,000x faster than text.

-Persuasion and the Role of Visual Presentation Support: The UM/3M Study, 1986

- 90 percent of the information transmitted to the brain is visual.

-MIT News, January 16, 2014

How many dots do you see at once?



Ninio's Extension Illusion

# How many dots do you see?

- There are 12 dots. It is difficult to see all of the dots because the grid prevents us from seeing the whole picture. If we removed the grid we could see all 12 dots, but when presented on a grid, our perception changes entirely.
- “Our visual system is lazy. Regular patterns are tempting because you can look at a small portion and think you have the whole thing figured out”- Martinez-Conde

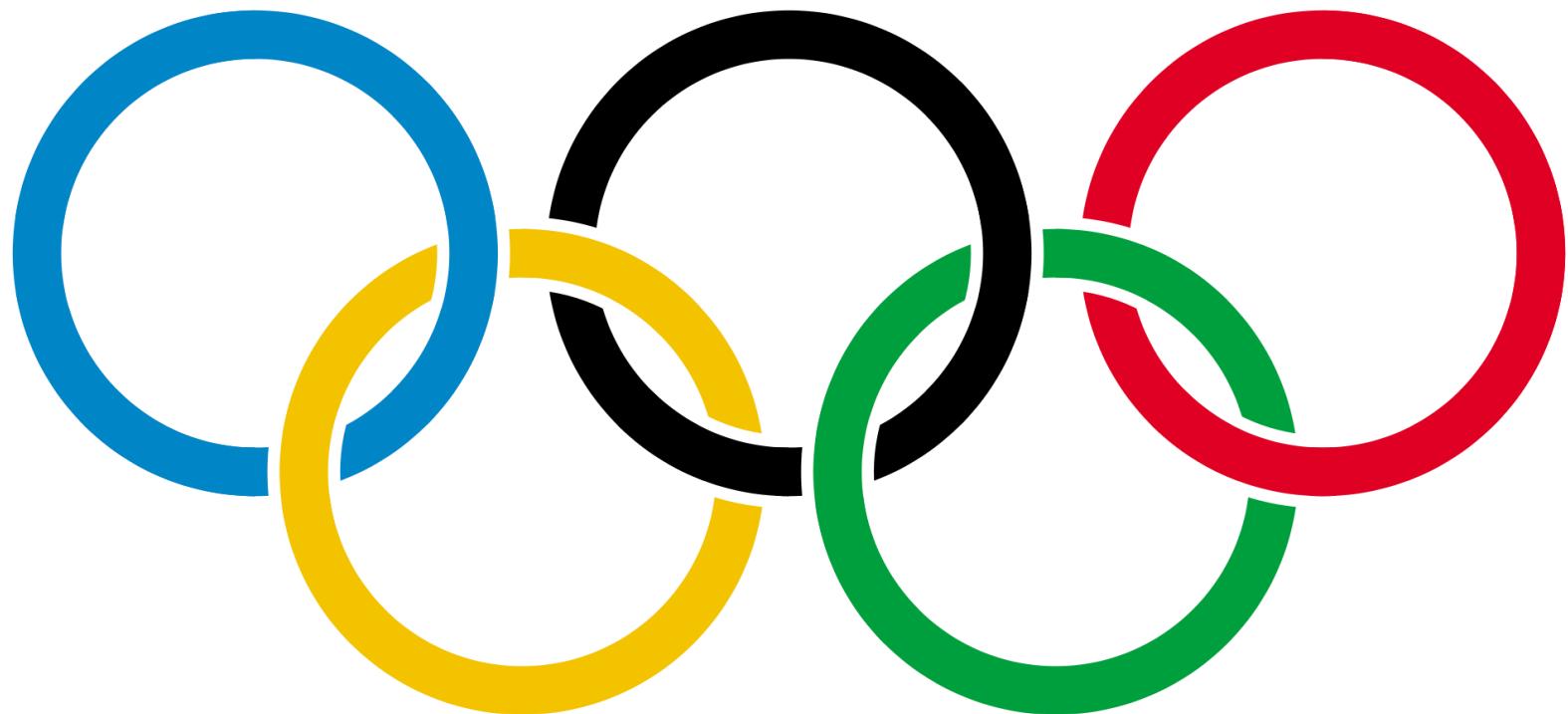
Ninio’s Extension Illusion

# The Gestalt Principles

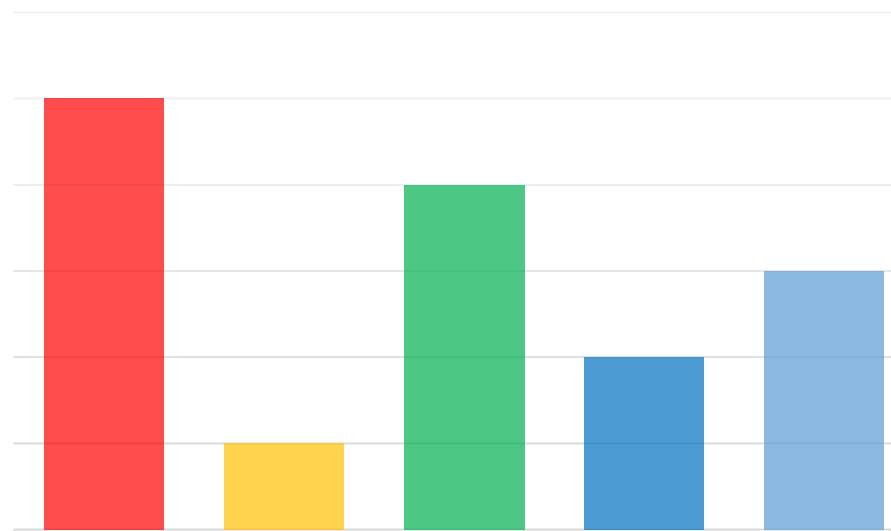
# Gestalt

- Introduced by Christian von Ehrenfels
- Psychological term meaning unified whole
  - The whole is different (not greater) than the sum
- Gestalt Effect –
  - Ability of the mind to generate whole images from a collection of parts

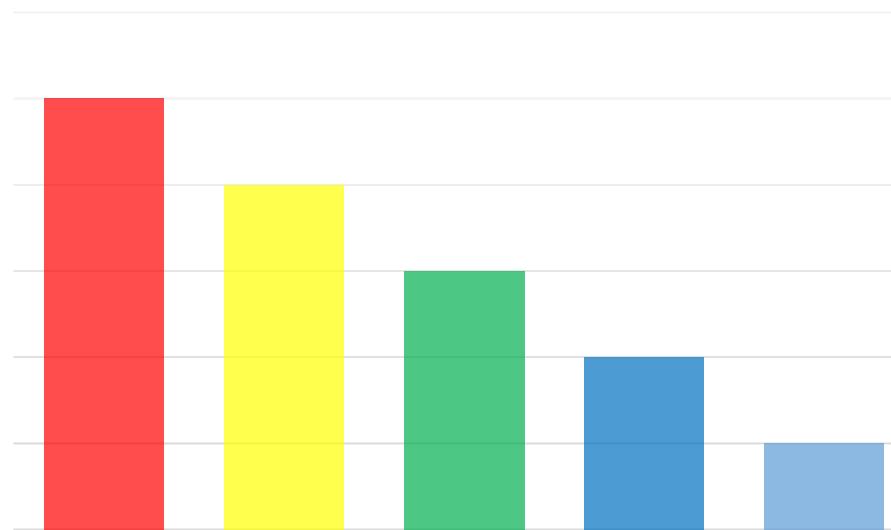
# Law of Pragnanz



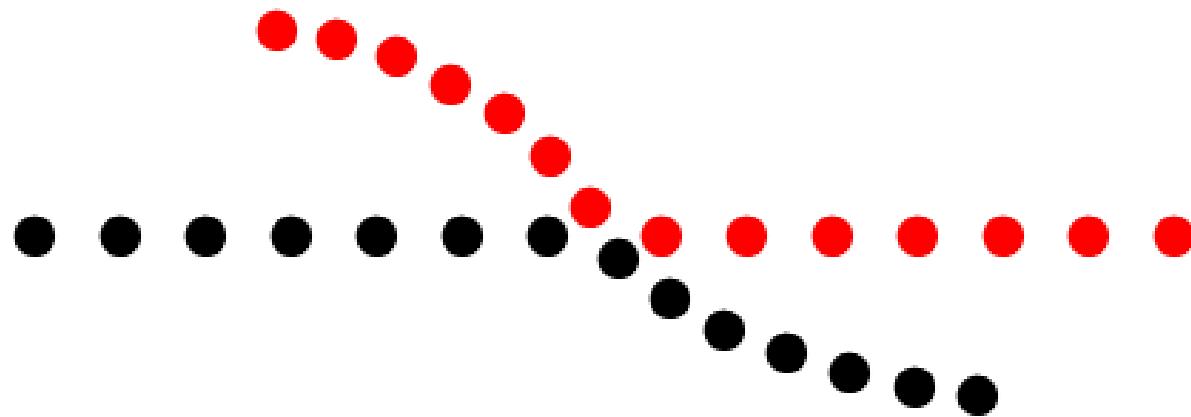
# Law of Pragnanz



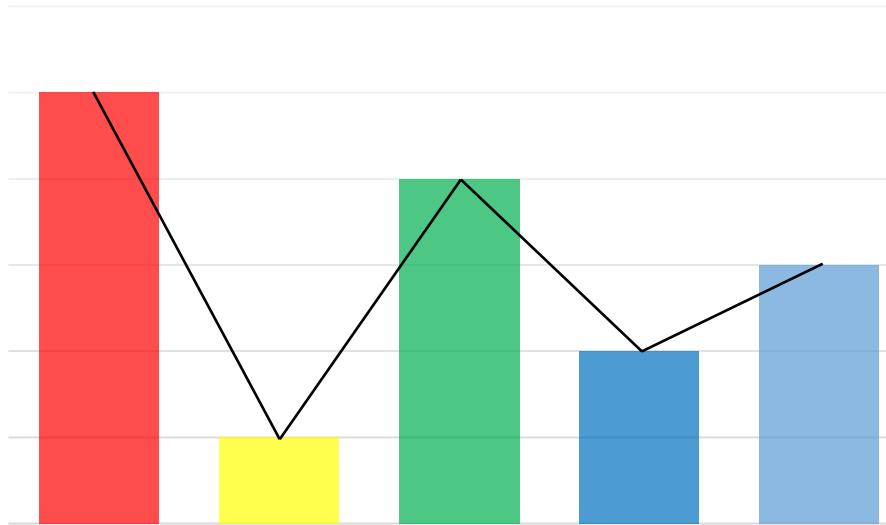
# Law of Pragnanz



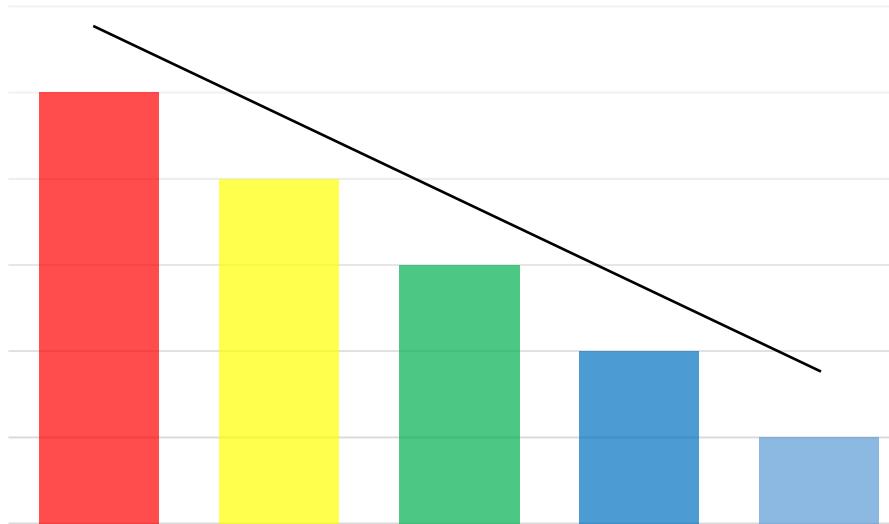
# Law of Continuity



# Law of Continuity



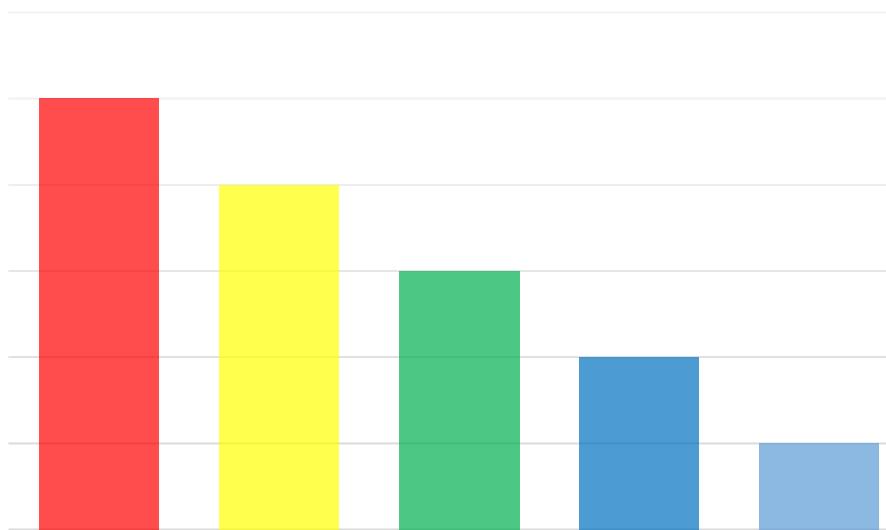
# Law of Continuity



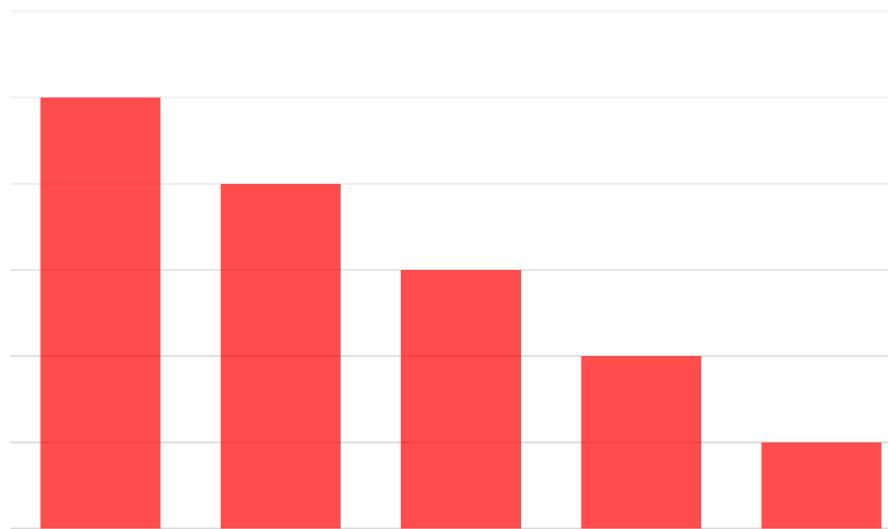
# Law of Similarity



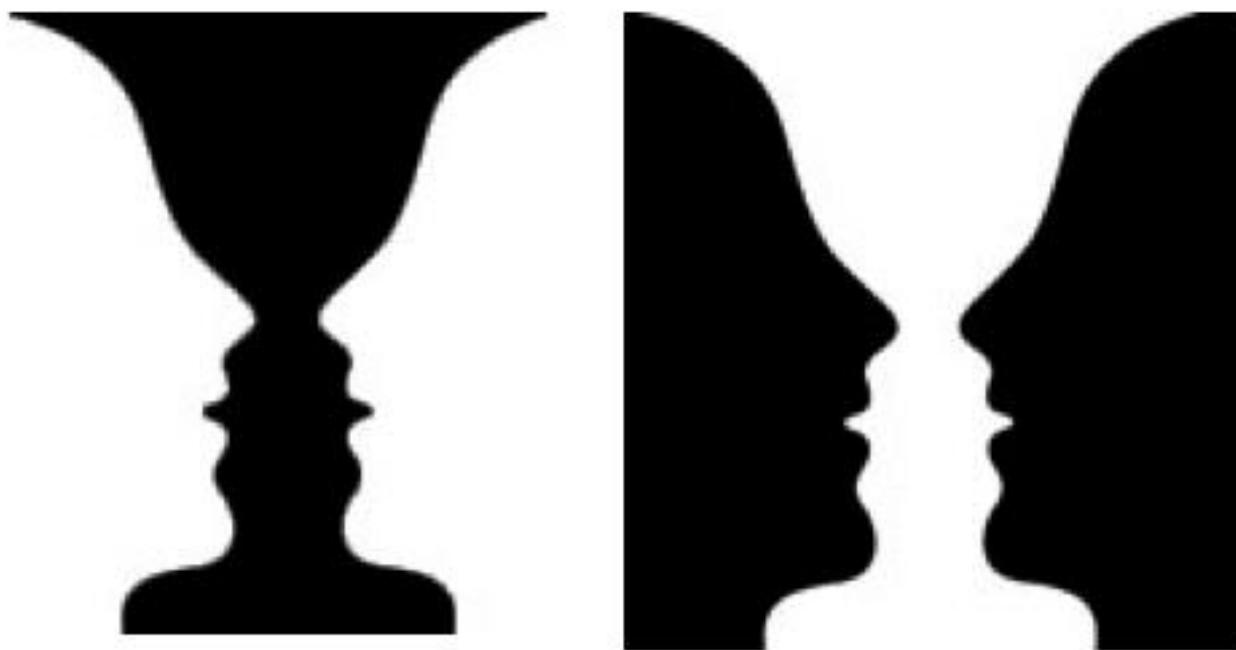
# Law of Similarity



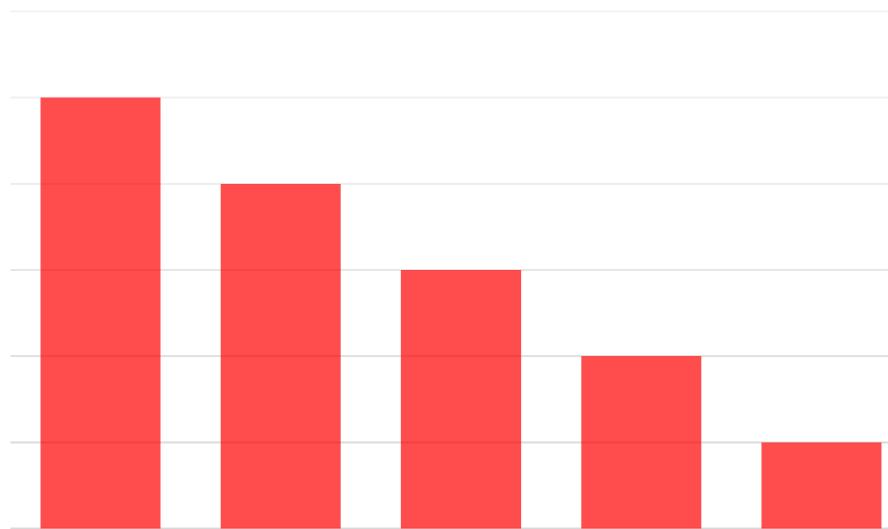
# Law of Similarity



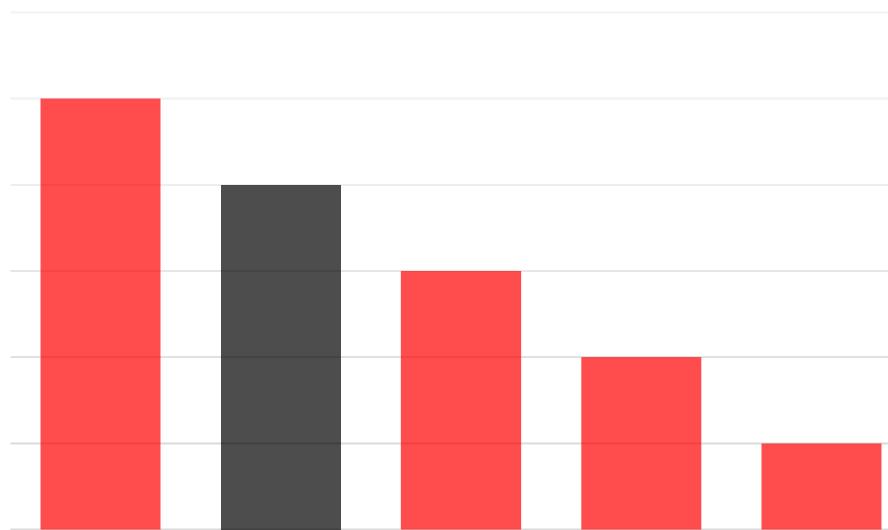
# Law of Focal Point



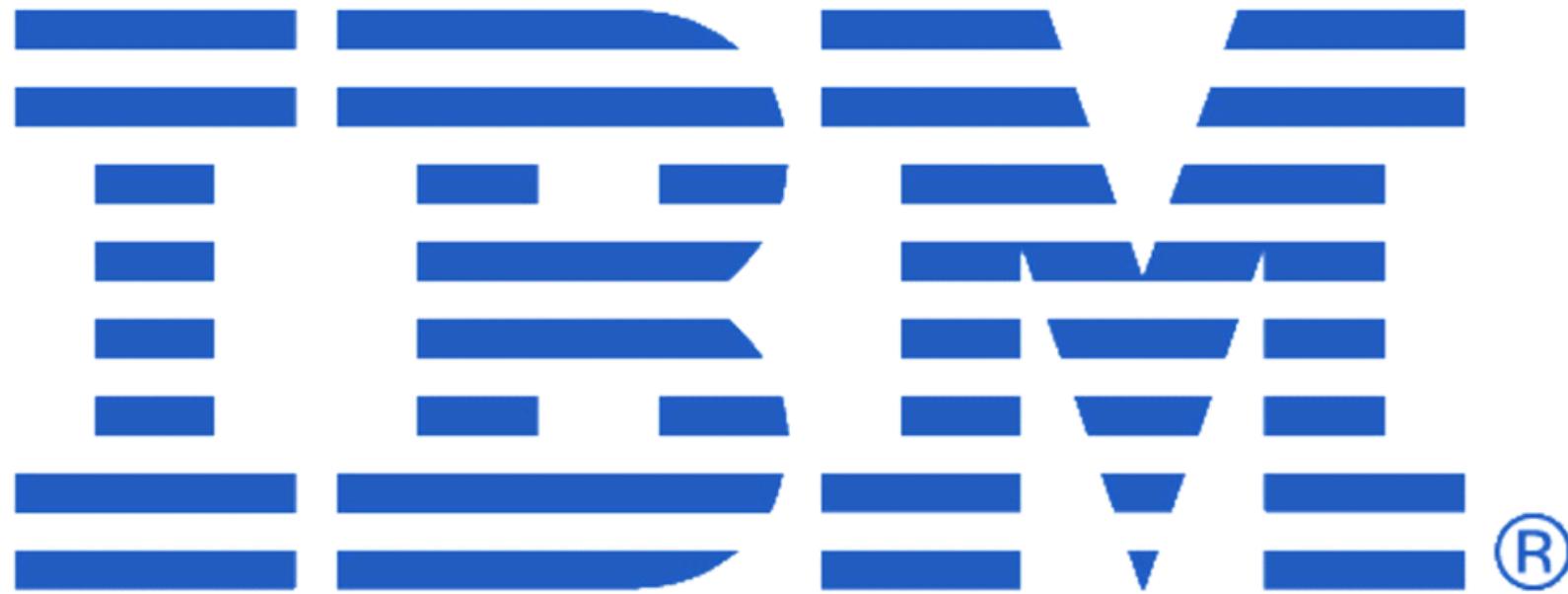
# Law of Focal Point



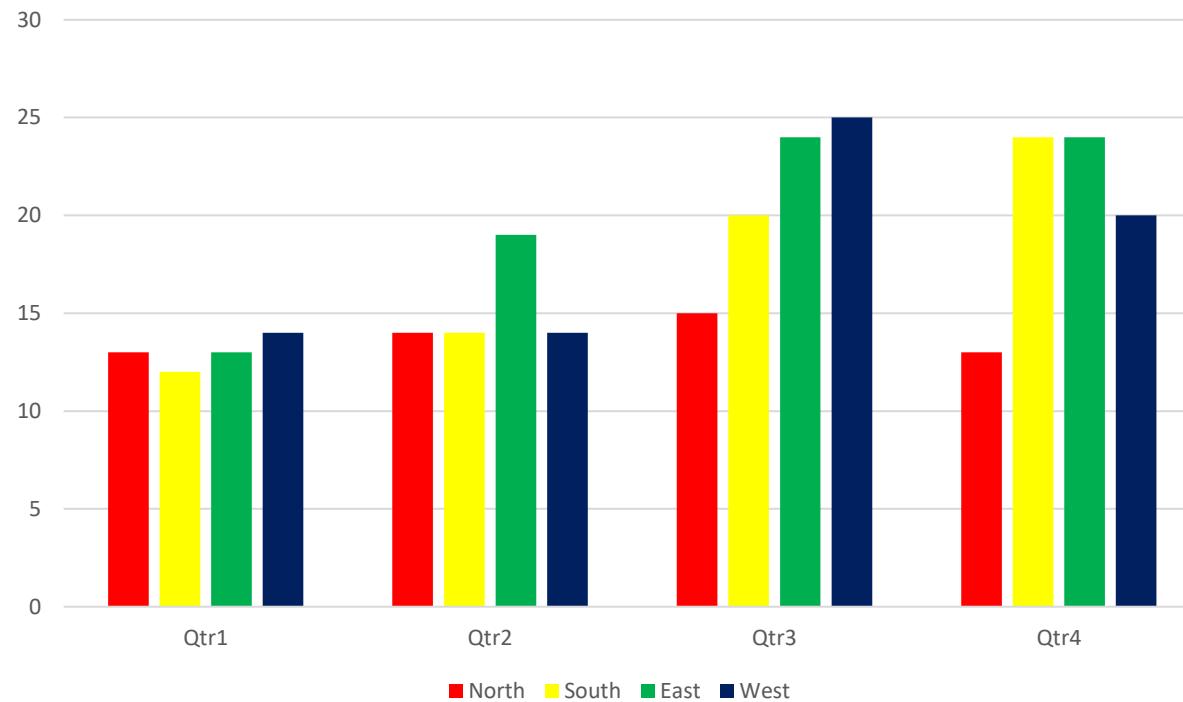
# Law of Focal Point



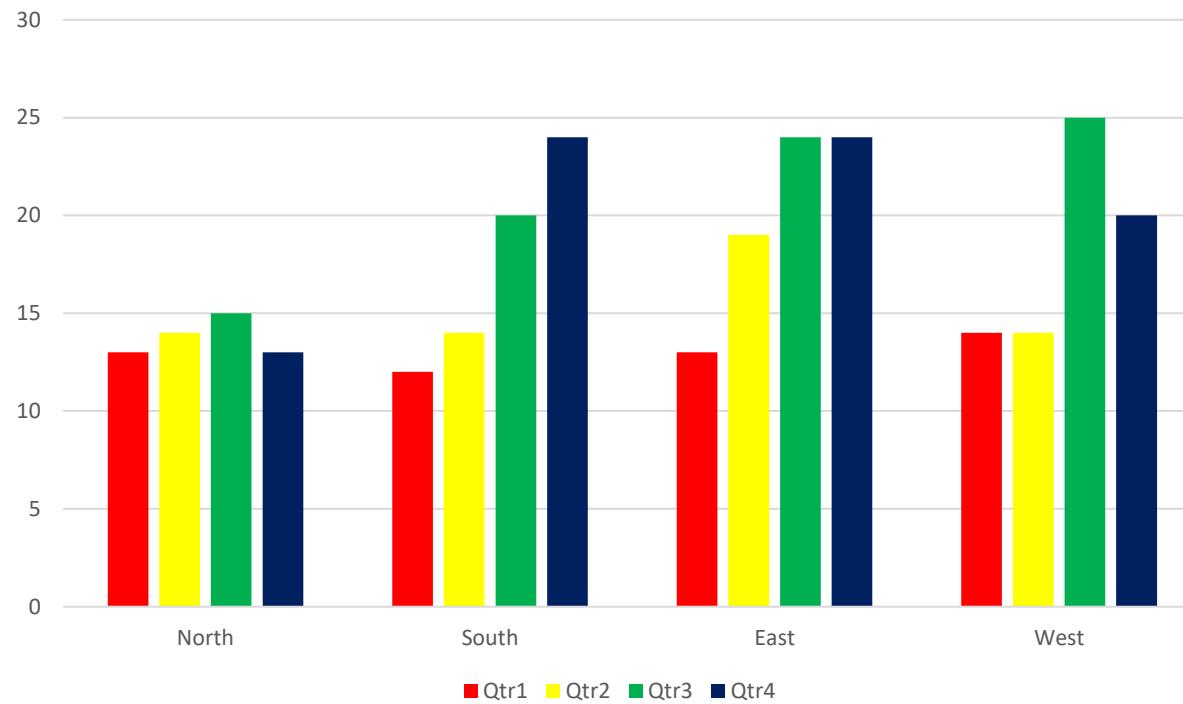
# Law of Proximity



# Law of Proximity



# Law of Proximity



# Resources

- Gestalt Psychology – [http://en.wikipedia.org/wiki/Gestalt\\_psychology](http://en.wikipedia.org/wiki/Gestalt_psychology)
- Color Matters – <http://www.colormatters.com>
- CVD Color Lab - <http://colorlab.wickline.org/colorblind/colorlab/>
- Coblis - <http://www.color-blindness.com/coblis-color-blindness-simulator/>
- Data Visualization Catalogue - <https://datavizcatalogue.com/search.html>

DATA



SORTED



ARRANGED



PRESENTED  
VISUALLY





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COMMUNITY**

**850K** Active Community  
Members

**100K+** Users touched in-person at  
Microsoft sponsored events

**USER VOICE:** **103,431** Users

**16,432** Ideas Submitted

**3,162** Active Ideas



**ENGAGE WITH A  
USER GROUP**



**222**

Independent Power BI User  
Groups World Wide

**49,685**

User Groups Members in  
over 60 countries

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[pbiusergroup.com](http://pbiusergroup.com)

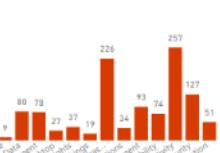
# Explore and share your data stories

Data Stories Gallery : Microsoft Ignite Session Browser

## Microsoft Ignite

### Session Browser

by topic



by format



### Session Browser

1,266 Sessions

1019 Speakers

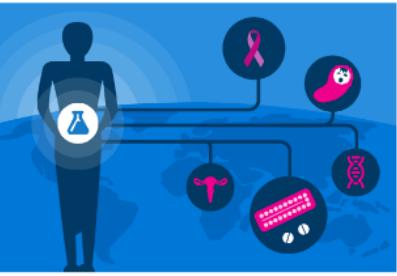
by level



tyGraph

Location

Select All
(Blank)
A1
A302
A305
A311 - A312
A313 - A314
A315 - A316
A402 - A403
A404 - A405
A411 - A412
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Ion Kleopas  
Winner

87.713%  
Winner Score

25,063  
Views

493  
Participants

2,392  
Submissions

CORTANA INTELLIGENCE COMPETITION  
Women's Health Risk Assessment  
[Visit Competition page for more details](#)

\$5,000 prizes in total  
Ended 10/1/2016, 7:59:59 AM (GMT Daylight Time)

#### Summary

Based on the World Health Organization (WHO) report in 2011, about 820,000 women and men aged 15-24 were newly infected with HIV in developing countries. Among these newly infected, more than 60% were women.

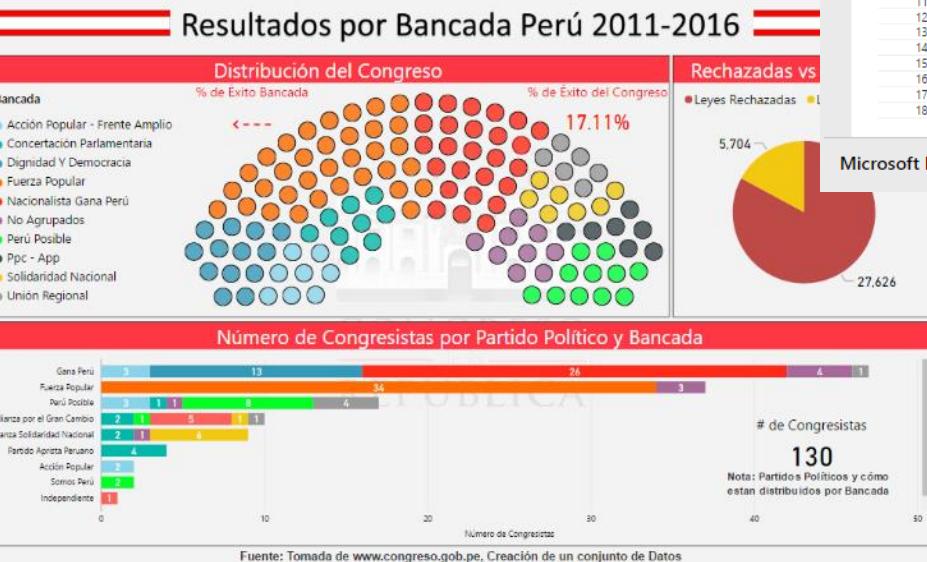
Developing countries face serious reproductive health problems such as sexually transmitted infections (STIs), unintended pregnancies, and complications from childbirth. Emphasize prevention and provision of information about STIs and other reproductive tract infections (RTIs) was listed as one of the top priorities for policymakers, researchers, and health care providers.

To help achieve the goal of improving women's reproductive health outcomes in underdeveloped regions, [this competition calls for optimized machine learning solutions](#) so that a patient can be accurately categorized into different health risk segments and subgroups.

Please see [this video](#) and [this blog post](#).

WHR Competition Power BI Companion by DevScope.

1 of 7



Microsoft Power BI

2 of 4

In the [Data Stories Gallery](#)





# Q&A

