DATA ANALYTICS AND BIG DATA

A HARD ENOUGH EXPLANATION FOR NON-TECHNICAL ROLES

PART 2

INSIDE THE ORGANIZATION

OR HOW TO LEAD A DATA-DRIVEN REVOLUTION
IN YOUR COMPANY BALANCING BETWEEN TECH,
BUSINESS AND DESIGN

By TECHBIZDESIGN.COM

Inside the organization we talk...

About Data-driven

The maturity levels, how data-driven are you…

About decisions

Decision making process, bias in decisions…

About Analytical principles

About Analytical value

Value propositions, value pyramid…

About Data governance

Definition, maturity and CDO Role in a Data oriented company

The Data-driven path

A Data-Driven organization is a kind of company who uses **Data Science as a core strategy** for its business

In these types of companies, data is part of the company culture, encouraging their employees curiosity and invite them to look for new ways to exploit the information available to the company.

Data Driven is committed to the **latest data analysis technology**. They're able to optimize their resources, detect market trends and make decisions much faster than a traditional company.

These companies **don't just follow the trends, they create them**

DATA DRIVEN MATURITY LEVELS

5

HIGH MATURITY LEVEL - DATA DRIVEN

Organization becomes Data-first. It's the STRATEGIC STAGE

4

MEDIUM HIGH MATURITY LEVEL - DATA SAVVY

Organization uses data in most production processes. It's the INSIGHT STAGE

3

MEDIUM MATURITY LEVEL - DATA GUIDED

Organization begins to use data in production. It's the ANALYSIS STAGE

2

MEDIUM LOW MATURITY LEVEL - DATA AWARE

Organization is data curious. It's the DATA STAGE

1

LOW MATURITY LEVEL - DATA RESISTANT

Organization actively resist change and data

Source: Gartner public info and Internet references

A Data RESISTANT company – The first level

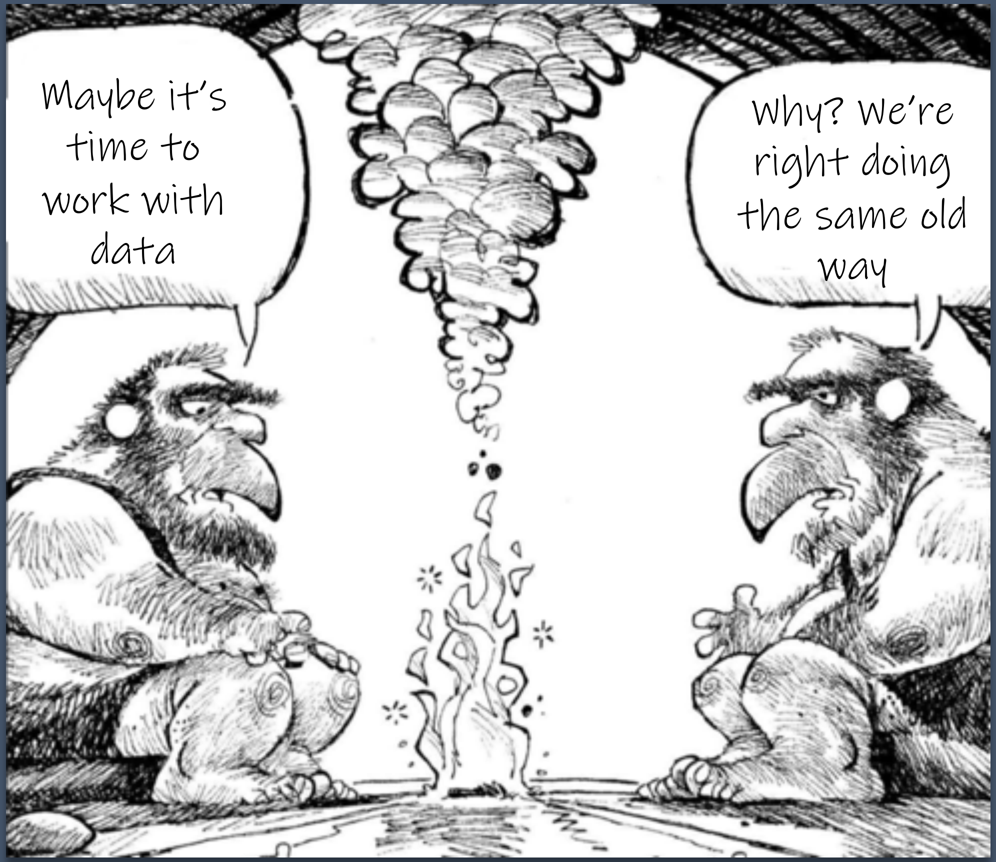
Vision and organizational model

No specific leadership

No organizational model defined

Investment and value generation

Their projects and initiatives are still in discussion



Culture and talent

No analytical profiles in company

The culture is based on **intuition and experience**

Infrastructure

On-premise models

Few **data internal** sources (transactional and CRM)

A Data AWARE company – Time to think on DATA

Vision and organizational model

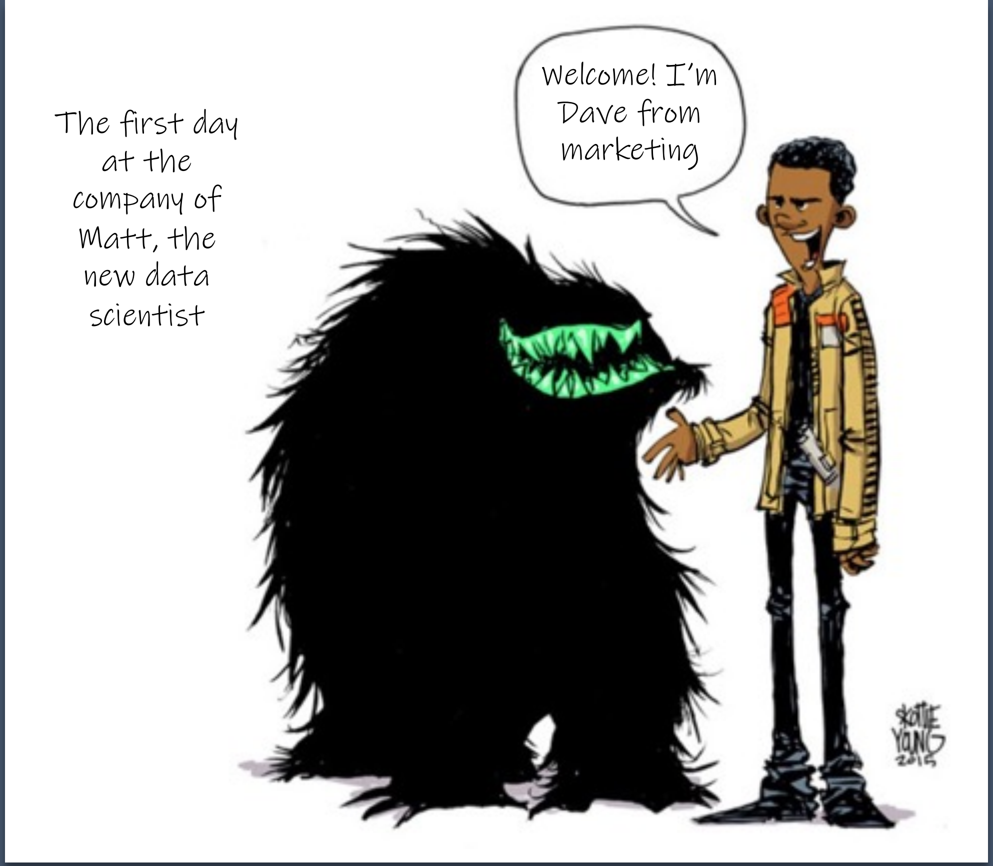
Leadership is **low consolidated** and absolutely focus on reporting.

Model not consolidated at all. It's decentralized or controlled by a specific unit

Investment and value generation

First **Proof of Concept** on going

The scope is focused on a specific Business Unit



Culture and talent

Maybe a **data scientist** in the organization. He's a **rara avis**

Basic analysis and visualization is what Data Analytics represent for the organization

Infrastructure

Mainly on-premise architectures

They deal with different internal data sources

The technological stack is concentrated on **statistical and data processing software**

A Data GUIDED company – Time to analyze the DATA

Vision and organizational model

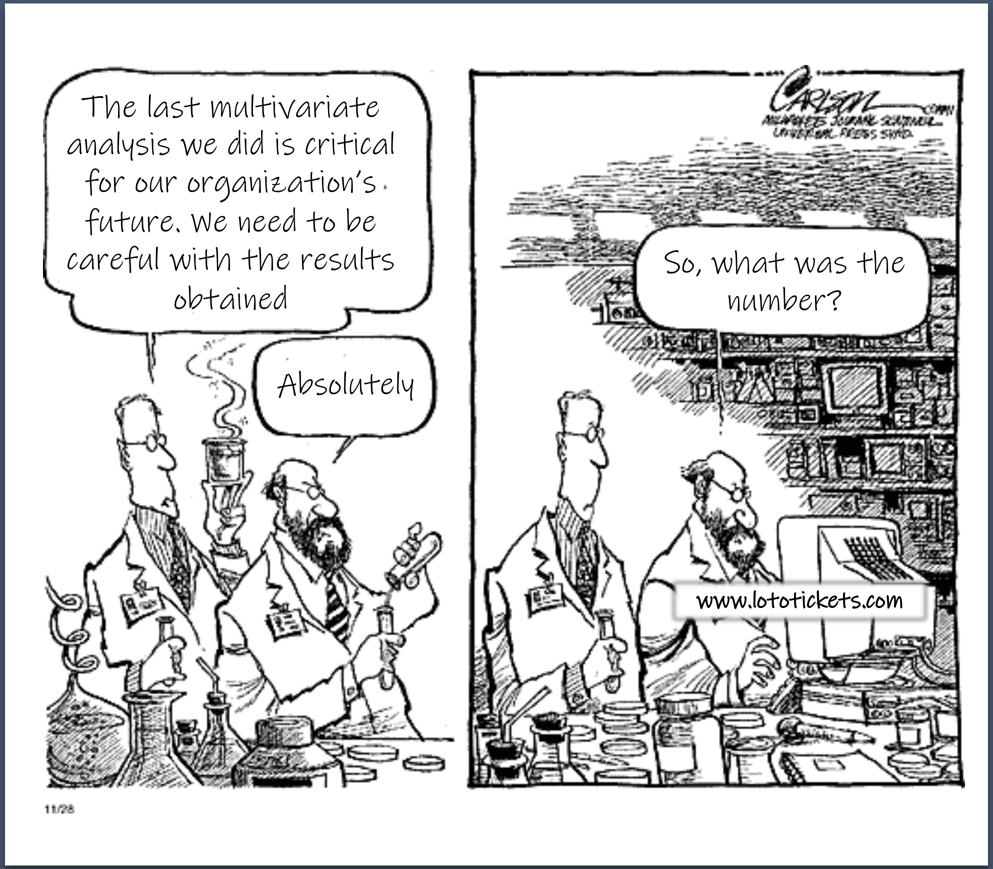
Leadership on consolidation process focus **based on data modelling**

But the model is still low consolidated. Not any defined structure

Investment and value generation

Cross organization projects on going but in a **few Business Units**

They've got first **preliminary results**



Culture and talent

Small **Database administration team** with data managers

They've reached basic analysis, reporting and any **multivariate model**

Infrastructure

Mainly **hybrid architecture** with a major weight on-premise

First external data sources

Statistical and data processing software combined with **Big Data integrated packages**

A Data SAVVY company – Looking desperately for INSIGHTS

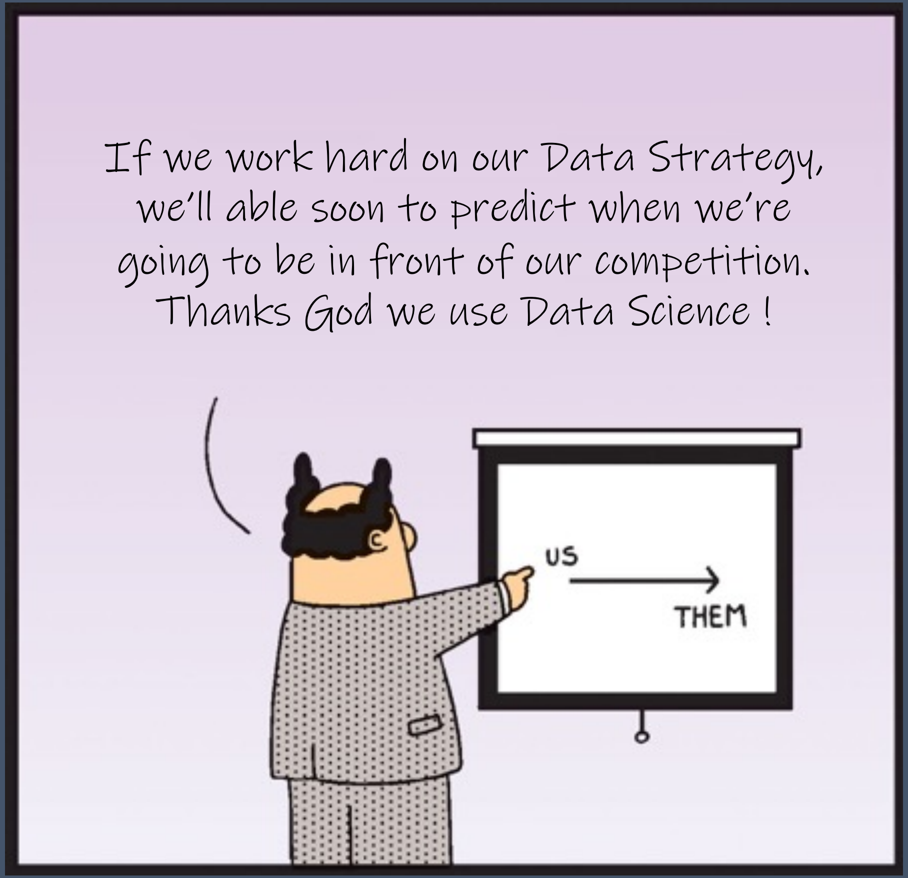
Vision and organizational model

They've got a **consolidated leadership** and a strong promotion of improvement and innovation initiatives

They've created **new Business lines** and the model is far consolidated

Investment and value generation

Consolidated projects with **tangible results**



Culture and talent

The analytical teams are involved in support to Business and decision-taking processes

They've implemented **advanced multivariate models** and dome **predictive models**

Infrastructure

Mainly **hybrid architecture** with a major weight cloud

Common use of **external data sources**

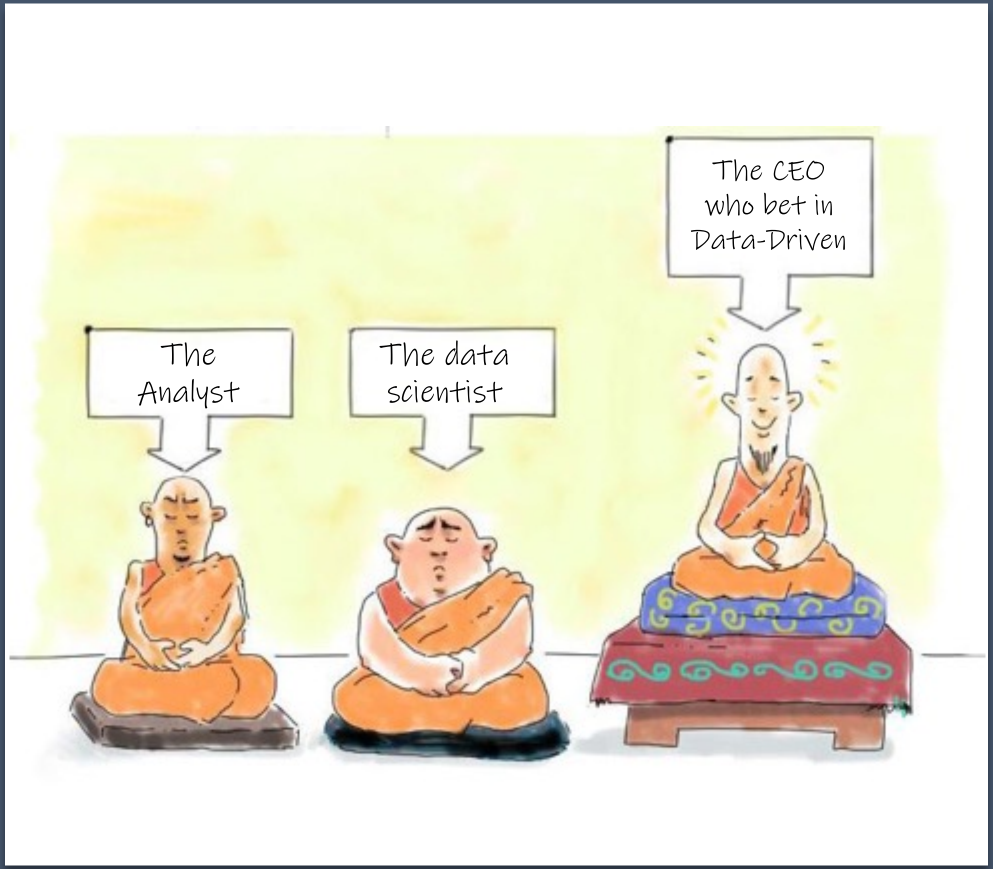
Data exploitation with script and programming languages

A Data DRIVEN company – When STRATEGY depends on Data

Vision and organizational model

They've got a consolidated leadership, **decisive in organization digital strategy and transformation**

Model fully consolidated



Culture and talent

The analytical teams are fully involved in the organization

They've reached **different business analytical stages**

Investment and value generation

Multiple consolidated projects and systems in real-time and automatize in production environment

Infrastructure

Hybrid architectures **mostly cloud**

The multiple external data sources are fully integrated

The organization has a **complete usage of technology** depends on analytical domain

So, what Data-driven level are you?

	Data RESISTANT	Data AWARE	Data GUIDED	Data SAVVY	Data DRIVEN
Vision and organizational model	No leadership No organizational model defined	Low consolidated Model not consolidated	Based on data modelling Model low consolidated	Consolidated leadership New Business lines	Decisive in organization digital strategy and transformation Model consolidated
Investment and value generation	Projects in discussion	Proofs of Concept	Few Business Units pushing Preliminary results	Tangible results	Multiple consolidated projects in production
Culture and talent	Intuition and experience	One data scientist as a rara avis	DBA team with data managers Multivariate model	Advanced multivariate models Predictive models	Multiple Business analytical stages reached
Infrastructure	On-premise Internal data	Mainly on-premise Statistical and data processing software	Hybrid architectures Big Data integrated packages	Hybrid architecture (cloud) External data sources	Mostly cloud Complete usage of technology

Are there many data-driven companies? Why do they want to be one of them?

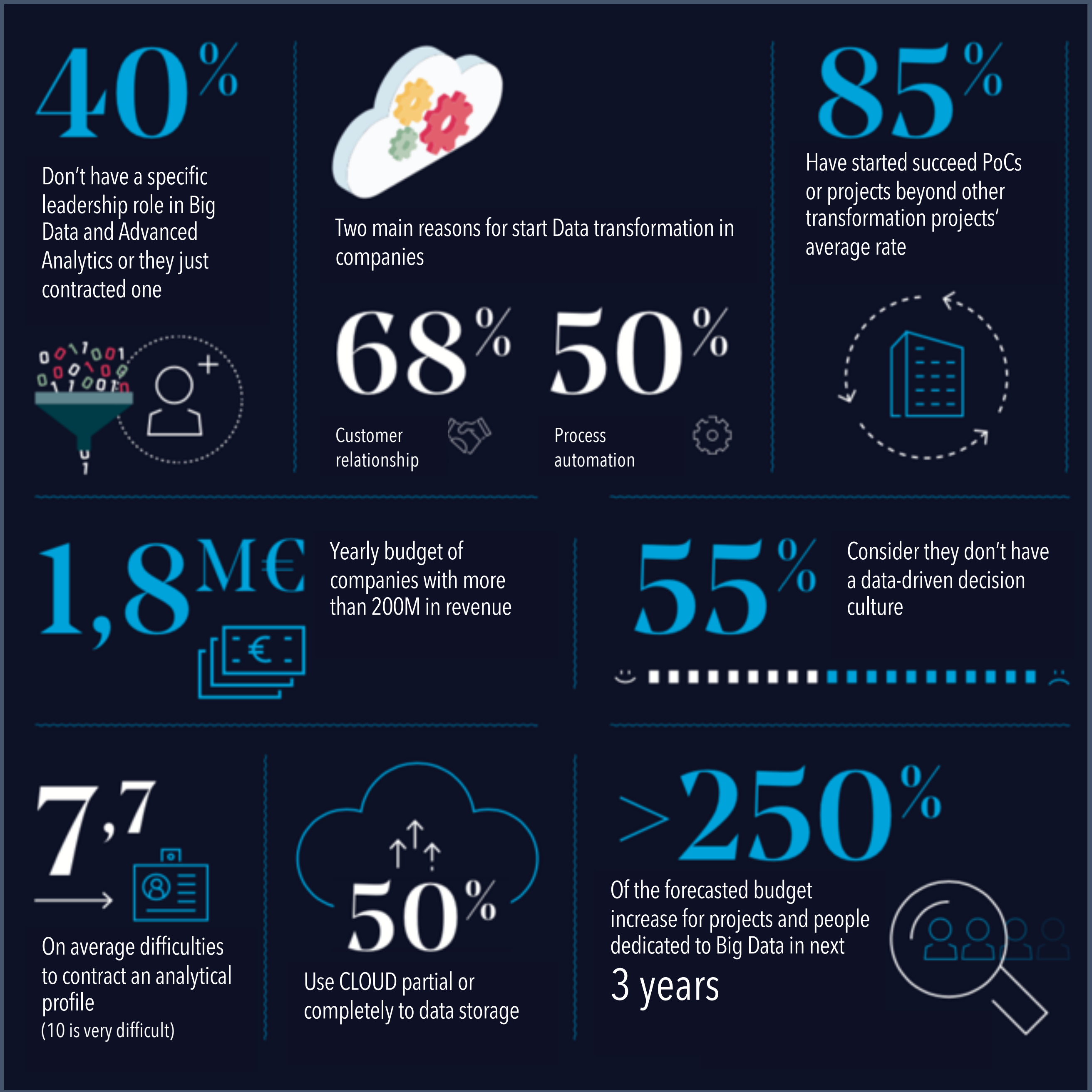
The Spanish case

Companies are aware of Data Analytics and Big Data potential. But they are **far from a fully adoption**.

Investment is arriving to Data initiatives. But generally people are working **on Proofs of Concept**.

Talent is rare and hard to obtain.

Predominance of **on-premise architectures**, but with a strong **cloud presence**. At the same time, usage of programming for analysis and tools for visualization



Source: Report "Adopción e impacto del Big Data y Advanced Analytics en España" – ESADE 2018

Improve customer experience is the first motivation to be a Data-driven company

	Improve customer experience	Cost reduction and process automation	Improve products and services innovation	Increase market penetration and sales	Develop a new innovative and data-driven culture	Consolidate information in organization and break silos	Diversify current business models	Commercialize new data products
TELECOM & MEDIA	●				●			
FINANCE & INSURANCES	●	●						
RETAIL	●			●				
MANUFACTURING & INDUSTRY	●			●				
HEALTH	●		●					
UTILITIES & ENERGY	●	●						
TOURISM & LOGISTICS	●			●				
REAL STATE & CONSTRUCTION		●	●					
PROFESSIONAL SERVICES		●	●					

Source: Report "Adopción e impacto del Big Data y Advanced Analytics en España" – ESADE 2018

Digital marketing is the most analytical demand from Business Units

	Direct and digital marketing	IT systems	Operations	Market analysis	Pricing	Product management	Customer care	Fraud and risk management	Human resources
TELECOM & MEDIA	●								
FINANCE & INSURANCES	●	●						●	
RETAIL	●				●				
MANUFACTURING & INDUSTRY	●		●						
HEALTH					●	●			
UTILITIES & ENERGY			●	●					
TOURISM & LOGISTICS	●				●				
REAL STATE & CONSTRUCTION		●		●					
PROFESSIONAL SERVICES		●	●						

Source: Report "Adopción e impacto del Big Data y Advanced Analytics en España" – ESADE 2018

How can I use Data to take the right decisions?

Data and emotion – The situations your company has to deal with

Simple

The relationship between cause and effect is **obvious and proven**. Best practices exist, and should be researched and applied.

For example, it's obvious that when healthcare providers in hospitals wash their hands frequently, this reduces the spread of disease

SENSE
CATEGORIZE
RESPOND

Complicated

The relationship between cause and effect **requires analysis or some other form of investigation** and/or the application of expert knowledge.

For example, web developers have to test various website designs to see which result in fewer abandoned shopping carts

SENSE
ANALYZE
RESPOND

Complex

The relationship between cause and effect is **unknown**. We can see it only in retrospect, not in advance.

For example, pharmaceutical research teams have to explore multiple compounds to determine their impact on disease conditions.

PROBE
SENSE
RESPOND

Chaotic

The relationship between cause and effect is **unknowable**. There is no discernible relationship between cause and effect, and there may never be.

This, for example, is the situation facing medical emergency or senior leadership teams experiencing an unanticipated disruption to their supply chain.

ACT
SENSE
RESPOND

Data and emotion – How to act in front of each situation

Simple	Complicated	Complex	Chaotic
Automate? Yes	Yes	Partially	No
Frequency: Every day	Frequent	Frequent	Frequent
Quantity: Many	Many	Many	Many
Relation between cause and effect: Known to all in advance	Requires analysis but can be known	Only known in retrospect	Not discernible
Approach: Sense, categorize and respond	Sense, analyze and respond	Probe, sense and respond	Act, sense and respond
Technique: Best practice	Good practice	Emergent practice	Novel practice, experimentation
Inputs & variables: Few	Start with lots, end with less	Many	Many and interacting
Algorithm or heuristics? Algorithm	Combination	Combination	Heuristics
Data or instinct? Data	Both	Both	Emotion
Who does it best? Machines	Machines plus human experts	Human experts	Human experts with emotional intelligence plus machines
Tactical, strategic or operational: Operational and tactical	Operational and tactical	Tactical or strategic	Strategic
Examples: Interest calculation, credit scoring	Predicting employment or academic success	Developing software	Responding to crises

Source: Gartner public info and Internet references

Data and emotion – Dealing with fear and anger

Daniel Khaneman's bestseller called "**Thinking, fast and slow**"

System 1 based on intuition – Fast, automatic, frequent, emotional, stereotypic, subconscious

System 2 based on reasoning – Slow, effortful, infrequent, logical, calculating, conscious

Applied to evidence-based business scenarios, system 1 means that **any interaction that conveys an implied criticism of a person's current work can lead to immediate resistance**. This is the source of employee's defensive and unresponsive attitudes

Data may be nonjudgmental and unemotional, but when people are put in the mix, the results are far from guaranteed

Source: Gartner public info and Internet references

Data and emotion – Cognitive bias and logical fallacies

Cognitive bias

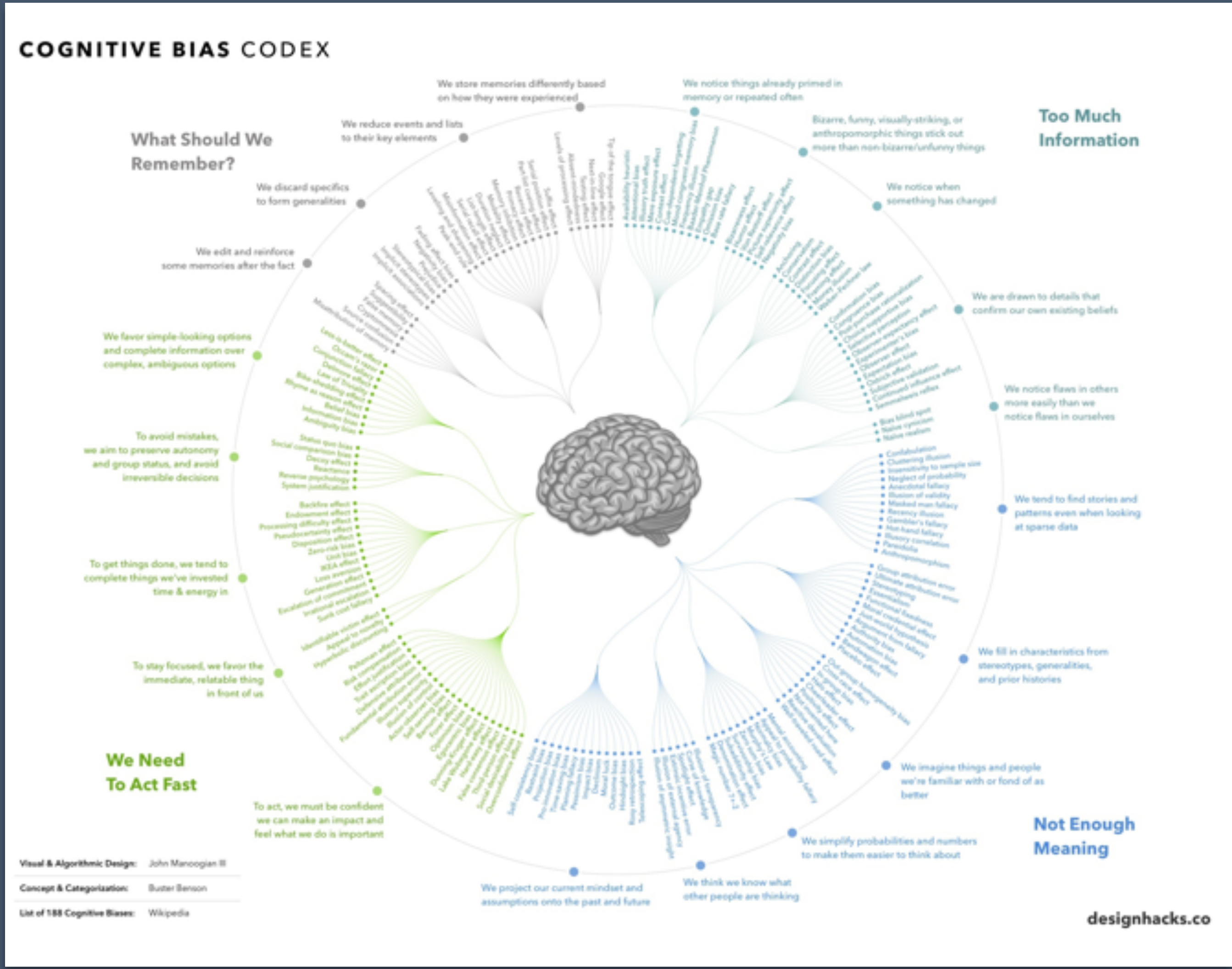
Cognitive biases are our default inclinations towards certain kind of thinking when we interpret and process information from the world around us. Everyone has biases and they affect greatly our behavior, decisions and judgements.

It's about **INTERPRETATION**

Logical fallacies

Logic fallacies are mistakes in arguments - done deliberately or by accident. These mistakes include misuse of evidence, misuse of language, erroneous line of reasoning and distortion of an issue. Logical fallacies are "nonsequiturs", meaning that the conclusion doesn't follow from what preceded it.

It's about **COMMUNICATION**



Source: https://www.visualcapitalist.com/every-single-cognitive-bias/

Data and emotion – Some famous and dangerous Bias

Overconfidence

Also called the **Dunning-Kruger effect**. The more ill-informed and incompetent someone is, the more confident they are of their position. In contrast, the more informed a person becomes, the less confident they tend to become.

Benjamin Franklin effect

People reason that they help others because they like them, even if they do not, because their minds struggle to **maintain logical consistency between their actions and perceptions**.

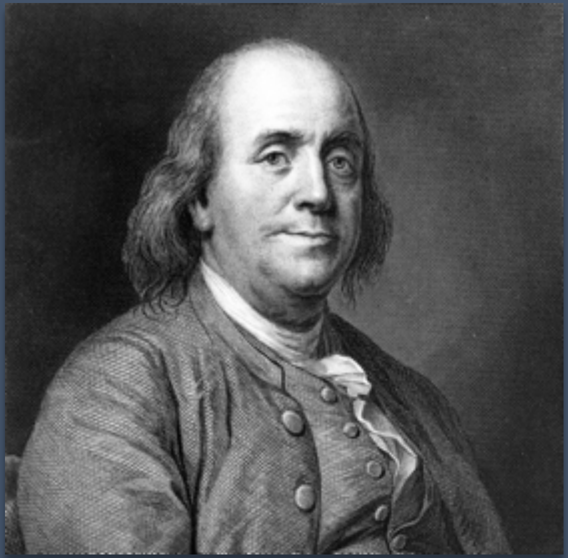
Validation by frequency effect

The more times you listen to a fact, even if it is a lie, the more predisposed it is to validate it.

The basis of the current trend of **FAKE NEWS**

Peltzman effect

Better to lower a small risk to zero than larger profit assuming risk or the the tendency to take **greater risks** when perceived **safety increases.**



Data and emotion – Other cognitive bias or the things you probably do

1. Anchoring Bias

People are **over-reliant on the first piece of information** they hear.

In a salary negotiation, whoever makes the first offer establishes a range of reasonable possibilities in each person's mind

2. Availability heuristic

People **overestimate the importance of information is available** to them.

A person might argue that smoking is not unhealthy because they know someone who lived 100 and smocked three packs a day

3. Bandwagon effect

The probability of one person **adopting a belief increases** based on the number of people who hold that belief.

This is a powerful form of groupthink and is reason why meetings are often unproductive

4. Blind-spot

Failing to **recognize your own cognitive biases** is a bias itself.

People notice cognitive and motivational biases much more in others than themselves

5. Choice-supportive

When you choose something, you tend to **feel positive about** it, even it that choice flaws.

Like how you thing your dog is awesome, even it bites people every once in a while

6. Clustering illusion

This is the tendency to **see patterns in random events**. It's key to various gambling fallacies.

Like the idea that red is more likely to turn up on a roulette table after a string of reds

7. Confirmation

We tend to **listen only to information that confirm our preconceptions**.

One of the many reasons it's so hard to have an intelligent conversation about climate change

8. Conservation

Where people **favor prior evidence over new evidence** or information that has emerged.

People were slope to accept that the Earth was round because they maintained their early understanding

9. Information

The tendency to **seek information when it doesn't affect action**. More information is not always better.

With less information, people can often make more accurate predictions

10. Ostrich effect

The decision to ignore dangerous or negative information by burying one's head in the sand, like and ostrich.

Research suggests that investors check the value of their holdings significantly less often during bad markets

Source: https://www.visualcapitalist.com/every-single-cognitive-bias/

Data and emotion – Other cognitive bias or the things you probably do

11. Outcome

Judging a decision **based on the outcome** rather than how exactly the decision was made in the moment .

Just because you won a lot of money in Vegas doesn't mean gambling your money was a good decision

12. Zero – risk

Sociologists have found that **we love certainty** even it is counterproductive.

Eliminating risk entirely means there is no chance of harm being caused.

13. Placebo effect

When **simply believing** that something will have a certain effect on you causes it to have that effect.

In medicine, people given fake pills often experienced the same physiological effects s people given the real pills.

14. Pro-innovation

When a proponent of an innovation tends to **overvalue its usefulness** and undervalue its limitations.

Sounds familiar Silicon Valley?

15. Recency

The tendency to weight the **latest information more heavily** than older data.

Investors think the market will always look the way it looks today and make unwise decisions.

16. Salience

Our tendency to focus on the **most easily recognizable features** of a person or concept.

When you thing about dying, you might worry about being mauled by a lion, s opposed to what is statistically ore likely, like dying in a car accident.

17. Selective perception

Allowing our expectations to influence **how we perceive the world**.

An experiment involving a football game between students from two universities owed that one team saw the opposing team omit more infractions.

18. Stereotyping

Expecting a group or a person to have **certain qualities without having real information** about the person.

It allows us to quickly Identify strangers s friends or enemies, but people tends to overuse and abuse it.

19. Survivorship

A error that comes from **focusing only on surviving examples**, causing us to misjudge a situation.

For instance, we might think that being an entrepreneur is easy because we haven't heard of all those who failed.

20. Barnum effect

People accept general and vague information when they are led to believe that the **information has been specifically tailored** to be about them.

Source: https://www.visualcapitalist.com/every-single-cognitive-bias/

Data and emotion – Some relevant logical fallacies

1. Argument from incredulity

This is basing **an argument on personal disbelief**.

This provokes that a decision cannot go forward because it contradicts the point of view of the misinformed individual.

2. Correlating proven causation

This is a faulty assumption that a correlation between two variables implies that **one causes the other**.

So, the action is taken based on a mistaken premise.

3. Base rate fallacy

This is making a probability judgment **based on conditional relationships**, without taking into account the effect of prior status.

The starting conditions are misjudged, leading to unreasonable or invalid expectations.

4. False authority

This is **using an expert of dubious credentials**, or using only one opinion to sell a product or idea.

Wrong solutions are adopted for the wrong problems because they were recommended by an "authority."

5. Anecdotal fallacy

People **use a personal experience** or an isolated example, instead of reasoning or compelling evidence. An anecdote is not data.

This extrapolates from a small set of anecdotes

6. False dichotomy

Two alternative statements are held to be the only possible options, when in reality, there may be other options.

Leaders force a decision without looking at other alternatives..

Which are the rules or principles to go in the right direction? How can I get the value from Data?

Mantras for a Data-driven organization

Data driven

Adopt an experimental mindset

1. Challenge data-decision making
2. Anticipate unintended consequences of metrics
3. Experiment with new data and analytical models

Privacy

Be the guide an guardian of your customer's data

1. Privacy, as we known, it no longer exist
2. Leverage transparency to create trust
3. Treat customers' data as they want it to be treated

Artificial Intelligence

Automate the manual | Promote the creative

1. Algorithmic decision making is inevitable
2. Focus on augmentation, not replacement
3. Play to the respective strengths of AI and humans

Source: Gartner public info and Internet references

Connecting Data and Analytics to Business value

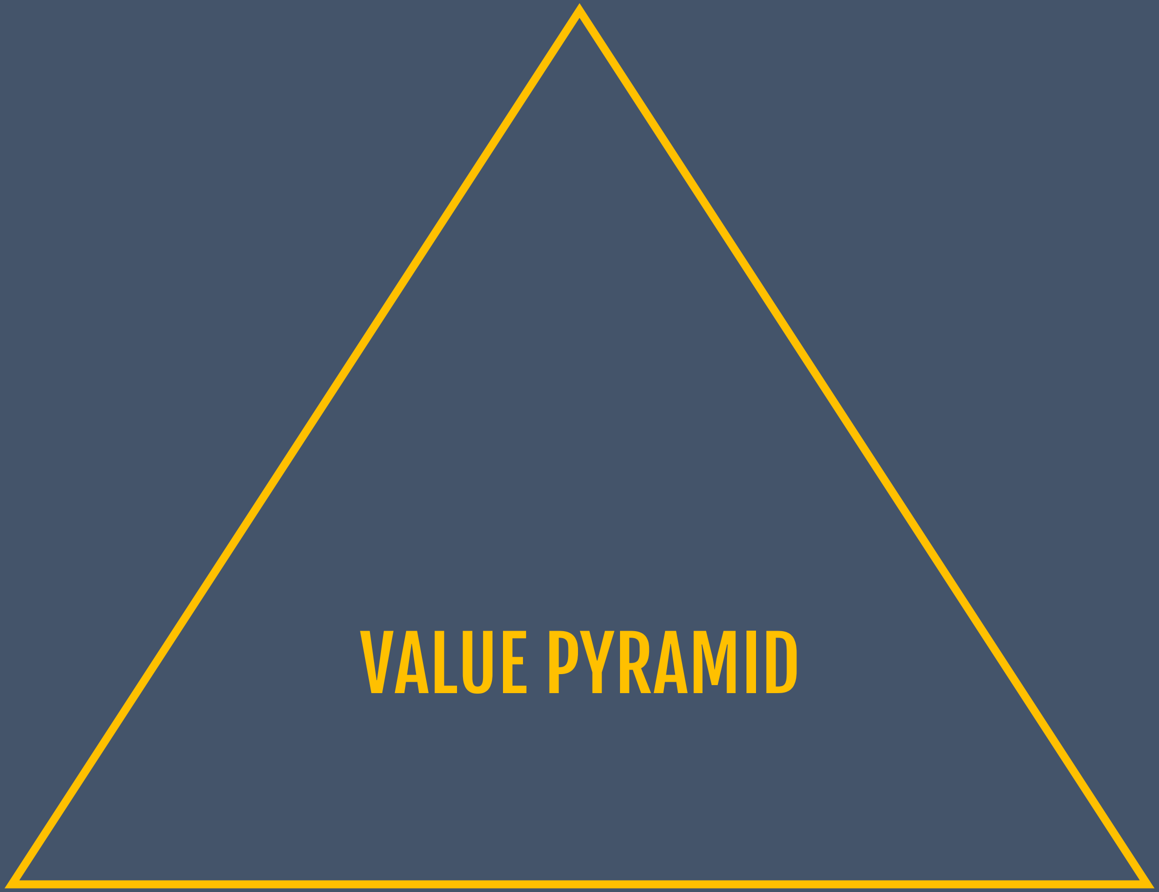
Bringing business value from Data Analytics is not an easy thing. Hundreds of small problems can occur and provoke a misalignment between technology and business.

We need to draw a consistent path then.

First, we should start **identifying the needs and problems** are impacting most in our business co-creating with our stakeholders (Regulators, investors, suppliers/partners, community, consumer, employees…)

Second, we need to recognize the key elements of any use case identified. We need to recognize **value** (What is the question, business problem or target outcome? How is value realized?). We need to recognize **information** (What data or data sources e involved?). And we need to do the same with **analytics** (What analytical or data science methods are applied to the data)

Once we've done that, it's time to move along the **value pyramid**…



Connecting Data and Analytics to Business value – Top down approach

Identify a stakeholder and select an outcome

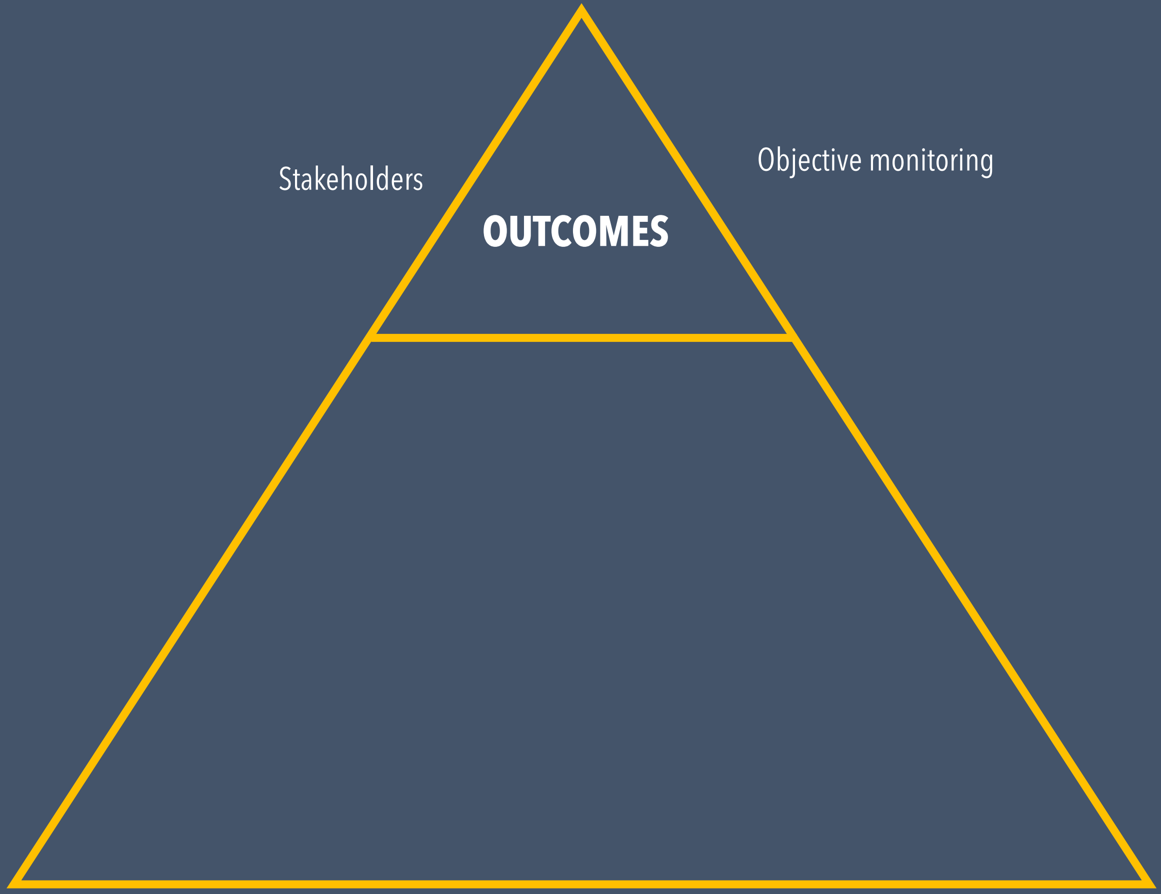
Examples:

. Reduction in production-line stop occurrences by 50% and increased production volume by 12%.

. Evolved workforce mentality from "fit it and restart" to "observe and prevent"

. Determine financial results

STEP 1



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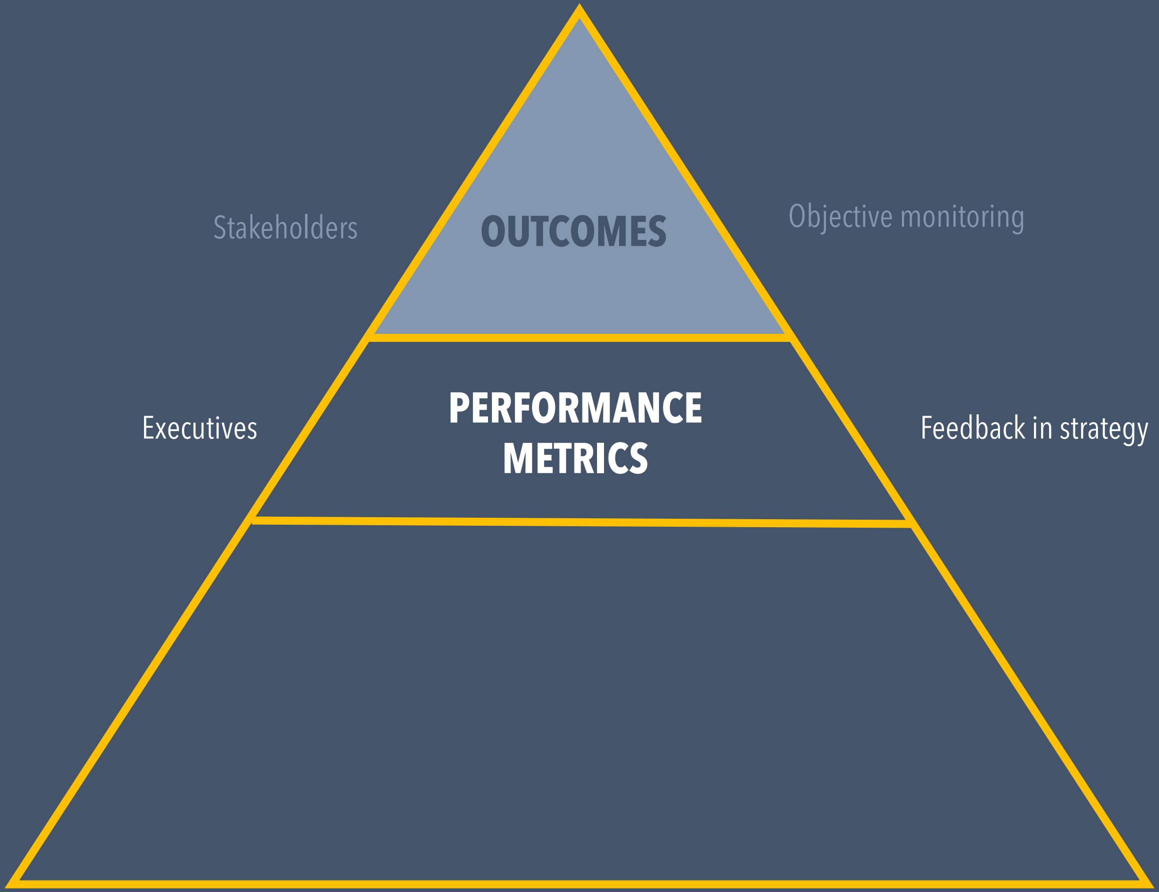
STEP 2

Determine the proper performance metrics (indicators) to address the needed change to achieve the outcome



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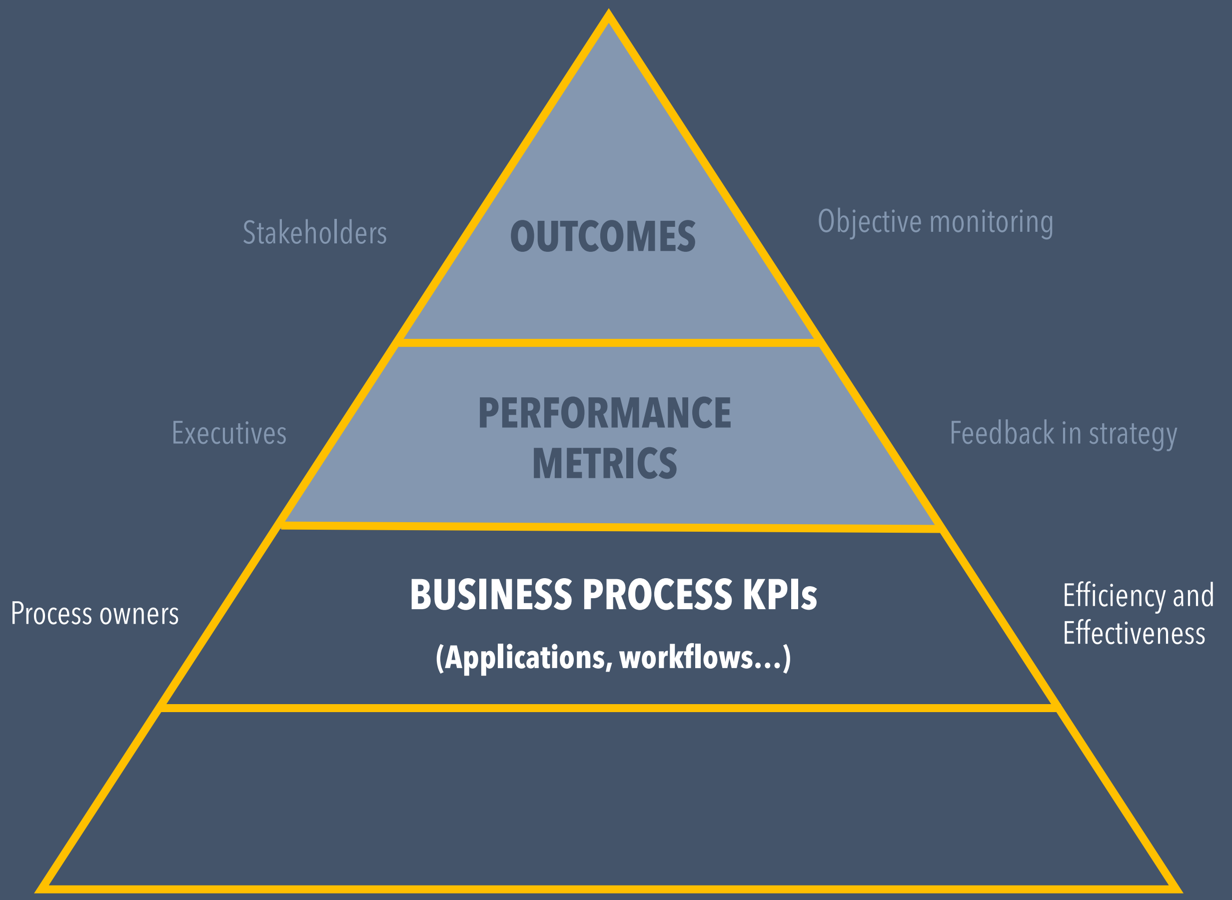

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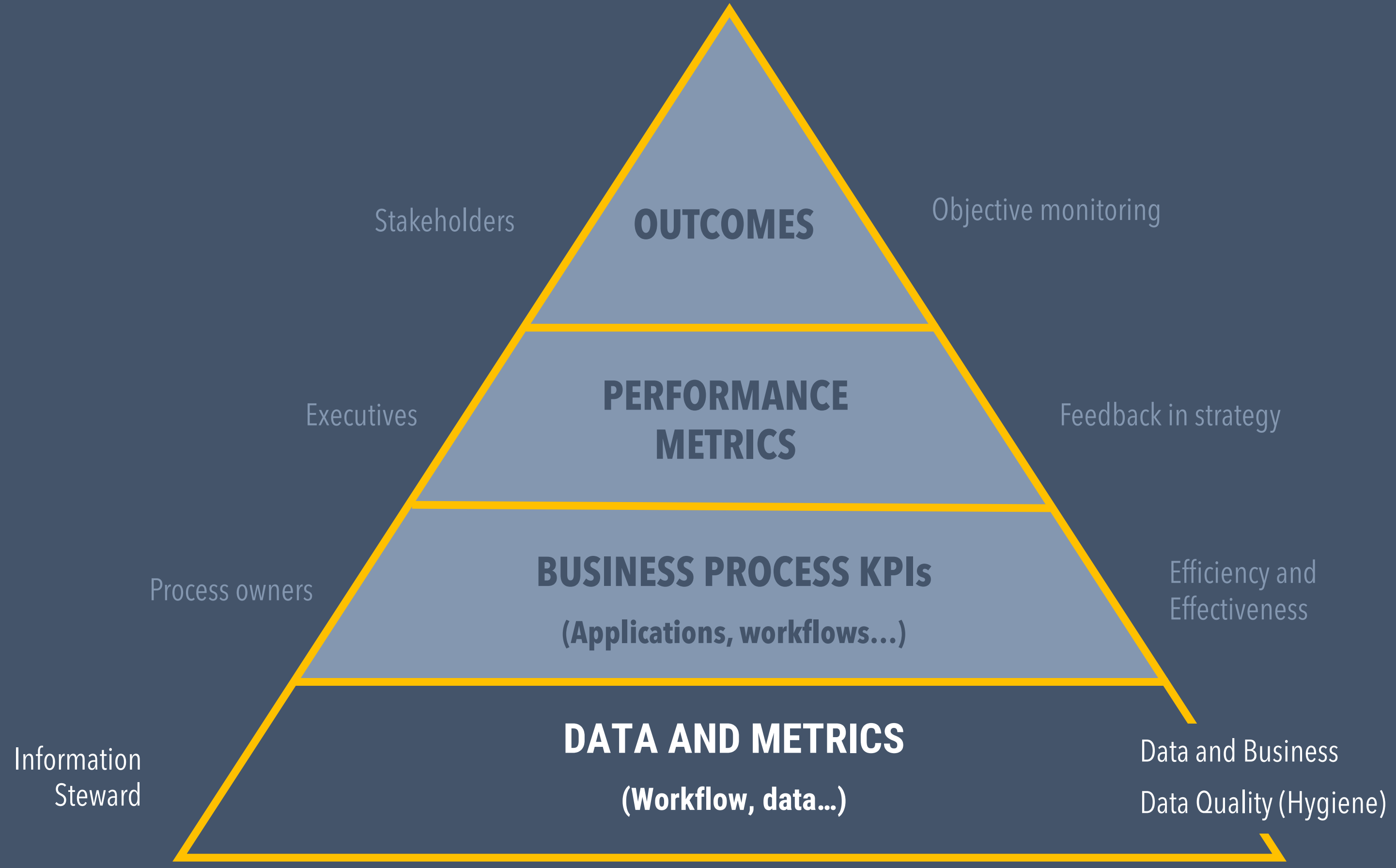
STEP 4

Identify the data needed to support identified business applications and add necessary metrics around data integrity



Source: Gartner public info and Internet references

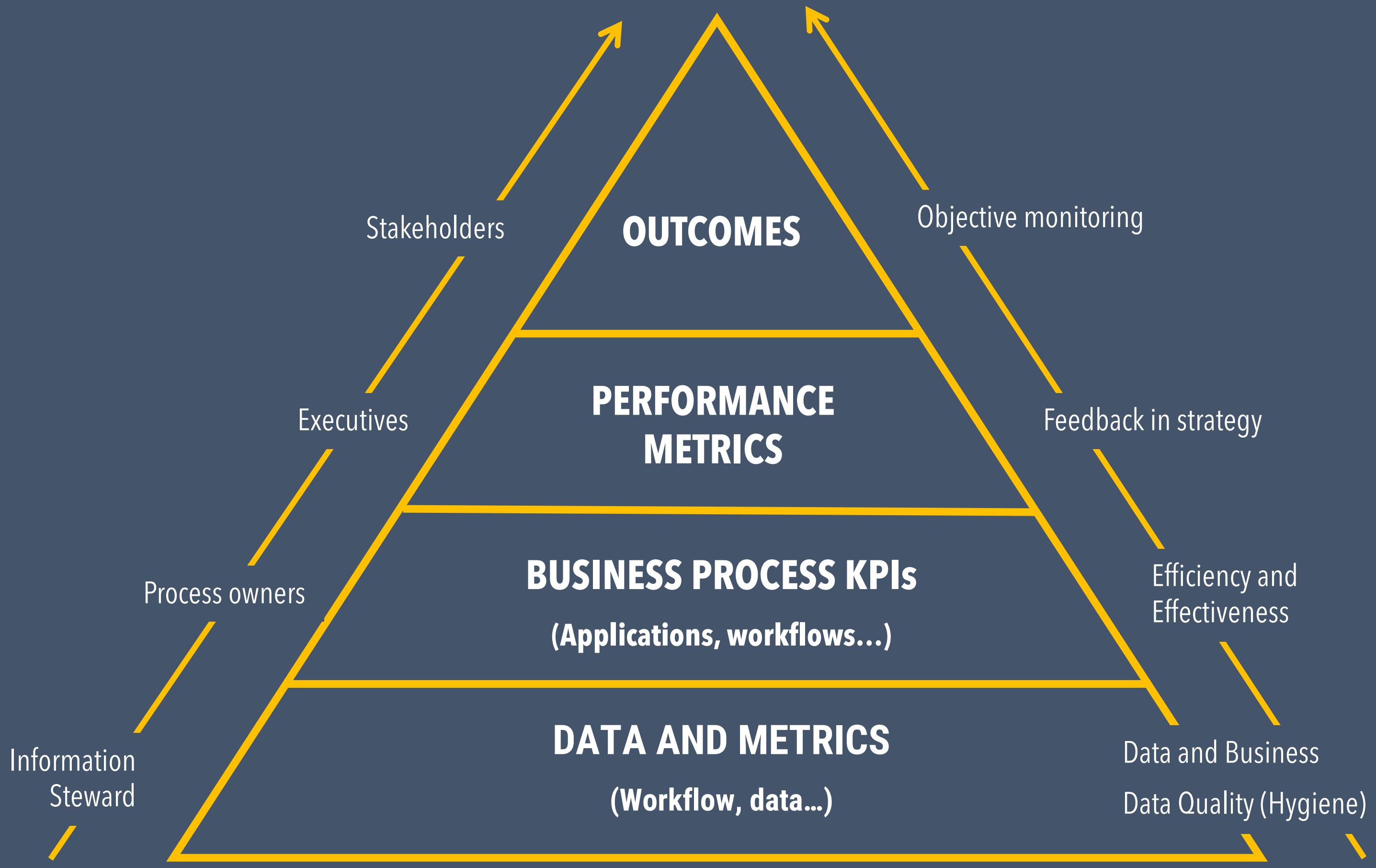
Connecting Data and Analytics to Business value – Bottom Up feedback

They redefine **STRATEGIC GOALS** from Business outcomes impact — **4**

They redefine **OPERATIONAL TARGETS** from performance changes measured — **3**

They concentrate **TACTICAL EFFORTS** from organization change indicators — **2**

They provide **EARLY WARNING** from data — **1**



Source: Gartner public info and Internet references

All this stuff seems quite complicated to manage. Is it easy to drive and control?

Sounds familiar?

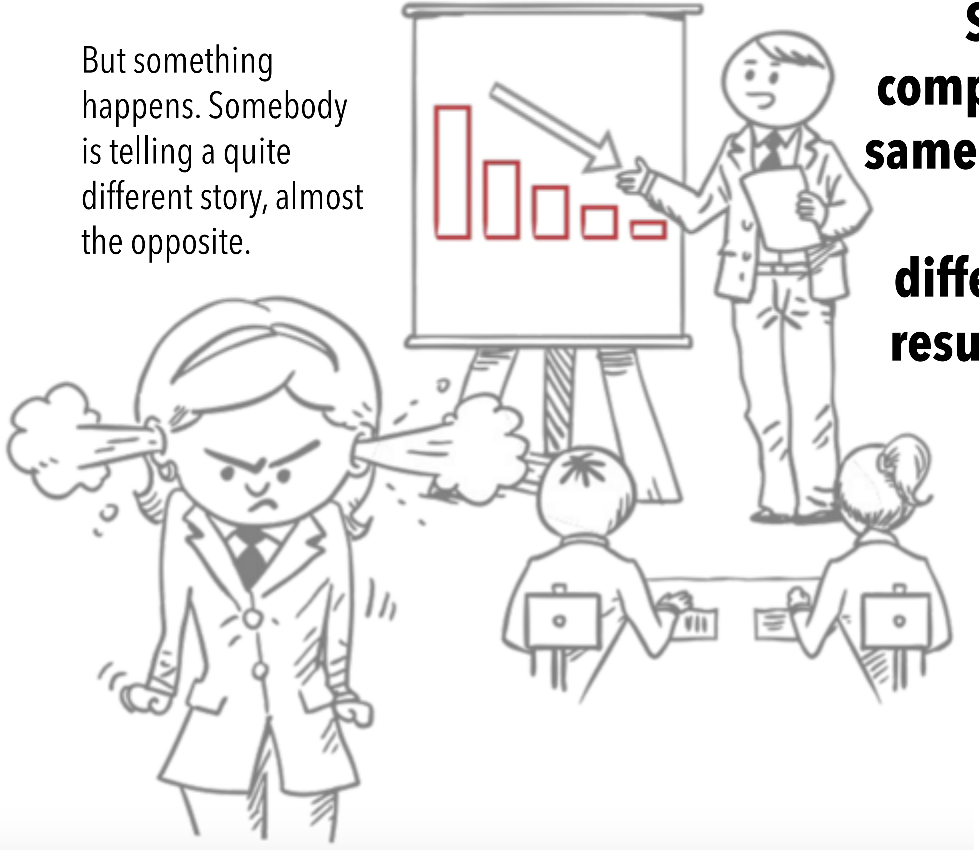
Hours and hours spent preparing for the meeting

So much time collecting data from finance, IT and the data lake

You did your homework. You made the proper analysis. You prepared relevant insights and wrote some recommendations

You're ready to go

But something happens. Somebody is telling a quite different story, almost the opposite.



Same company, same data but different results...

Other consequences of a bad Data Governance

Your meetings dissolve into **data brawls**

Your decisions are primarily made by associated staff who owns the IT systems.

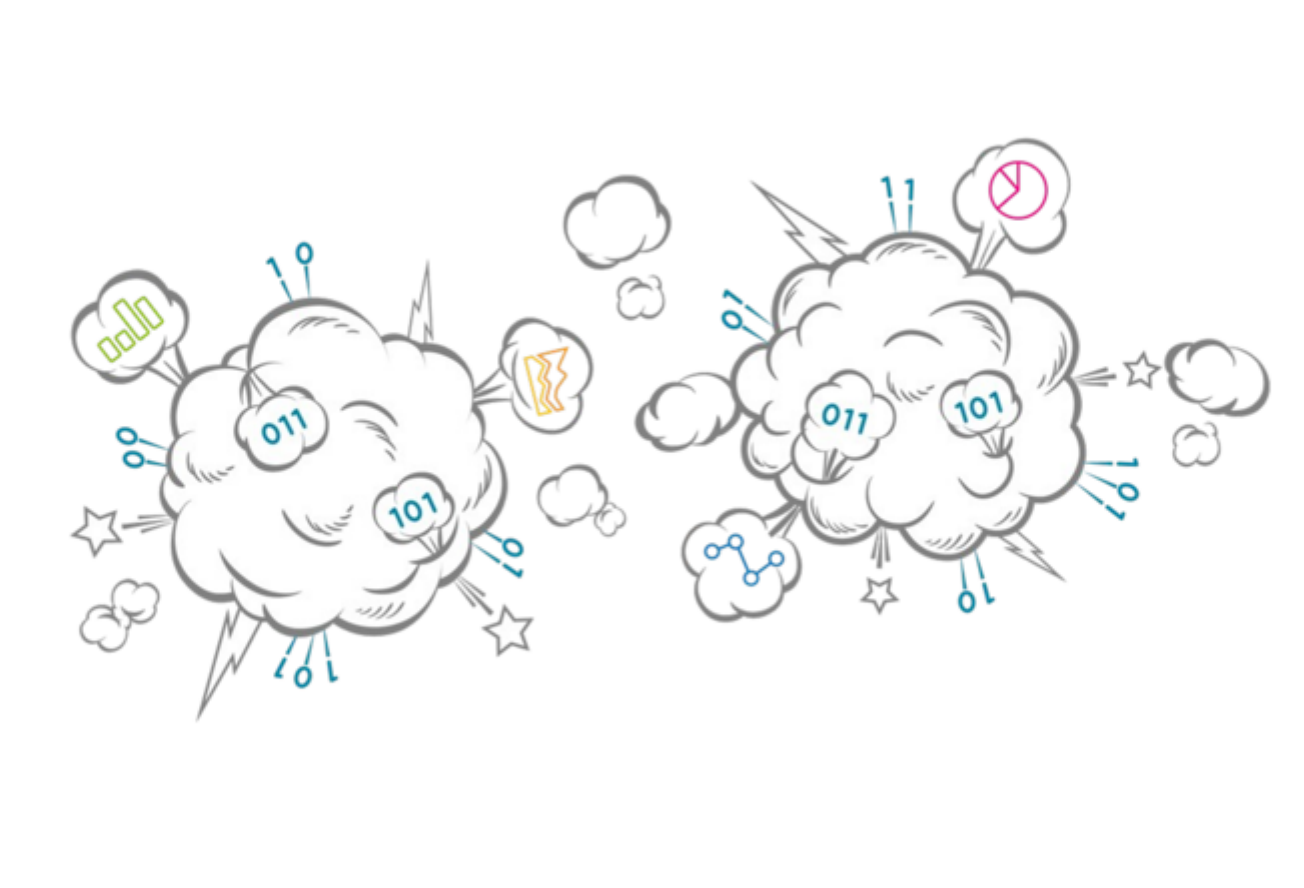
Your data availability and collection are **inconsistent**. It depends on third parties' good deeds.

Your data usability and quality are **not guaranteed**. You never know that's the most accurate or current.

Your data integrity is **inconsistent**. Maybe you're using a local duplicate and old dataset because there's no unique data policy.

And so forth…

So, a trustworthy data, a common understanding, a complete traceability, and a transparent data ownership is needed



Data governance inside the organization is...

DATA MODELLING → scopes & helps and prioritize → **DATA QUALITY**

A process for translating business rules and definitions to the technical data systems and structures that support them

Data that is demonstrably fit for business purposes

drivers the need for

DATA GOVERNANCE

provide the means to deliver

A continuous process of managing and improving data for the benefit of all stakeholders

Data governance for users is…

A system of record for Data assets that should be the authoritative source of information for any given data asset used by/valuable for the organization

FIND | Know where the data comes from

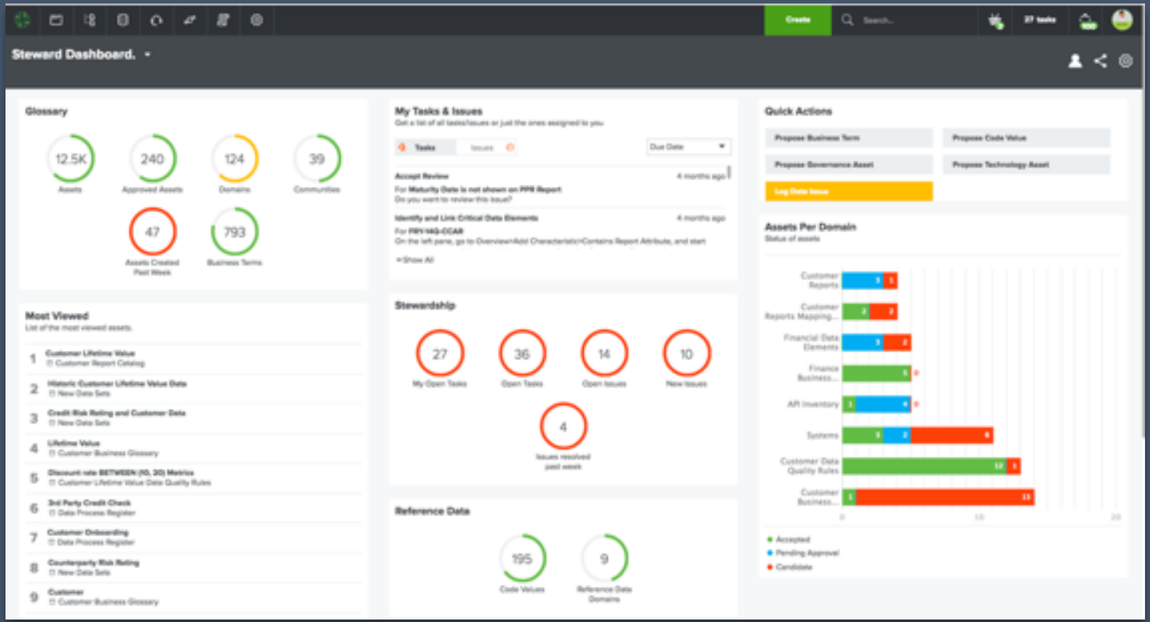
1. Catalog
2. Data dictionary

UNDERSTAND | Know what the data means

1. Business glosary
2. Reference data

TRUST | Know that the data is right

1. Policy manager
2. Data helpdesk
3. Stewardship



Collibra customers achieve 510% ROI with their data governance and catalog initiatives

Source: https://www.collibra.com/blog/4-data-governance-best-practices

The Data governance path

There are several approaches to face a Data Governance maturity model. Gartner, IBM, CMM, EDM… but most of them put the emphasis on same things.

. Process and the nature of the outcomes with each achieved process state

. Adoption by People, Process and Technology

. Implementation of capabilities along with Risk and related Benefits

. Perceived data value from non-monetization to monetization data

. Data being traversed from being a transactional asset to an enterprise asset

. Implementation of Org structure, Policy, Lineage, Metadata, Funding, and Culture Change

. Effectiveness of Accountability, Formalization, Principles of managing and governing data

DATA GOVERNANCE MATURITY LEVELS

	GARTNER	IBM	EDM	DATA FLUX	DATTANZA
6	Not applicable	Not applicable	Enhanced	Optimized	Not applicable
5	Optimized	Optimized	Achieved	Governed	Optimized
4	Managed	Quantitatively managed	Defined	Proactive	Actively measured
3	Defined	Defined	Developmental		Defined
2	Repeatable	Managed	Conceptual	Reactive	Conceptual
1	Aware	Initial	Not initiated	Undisciplined	Initial

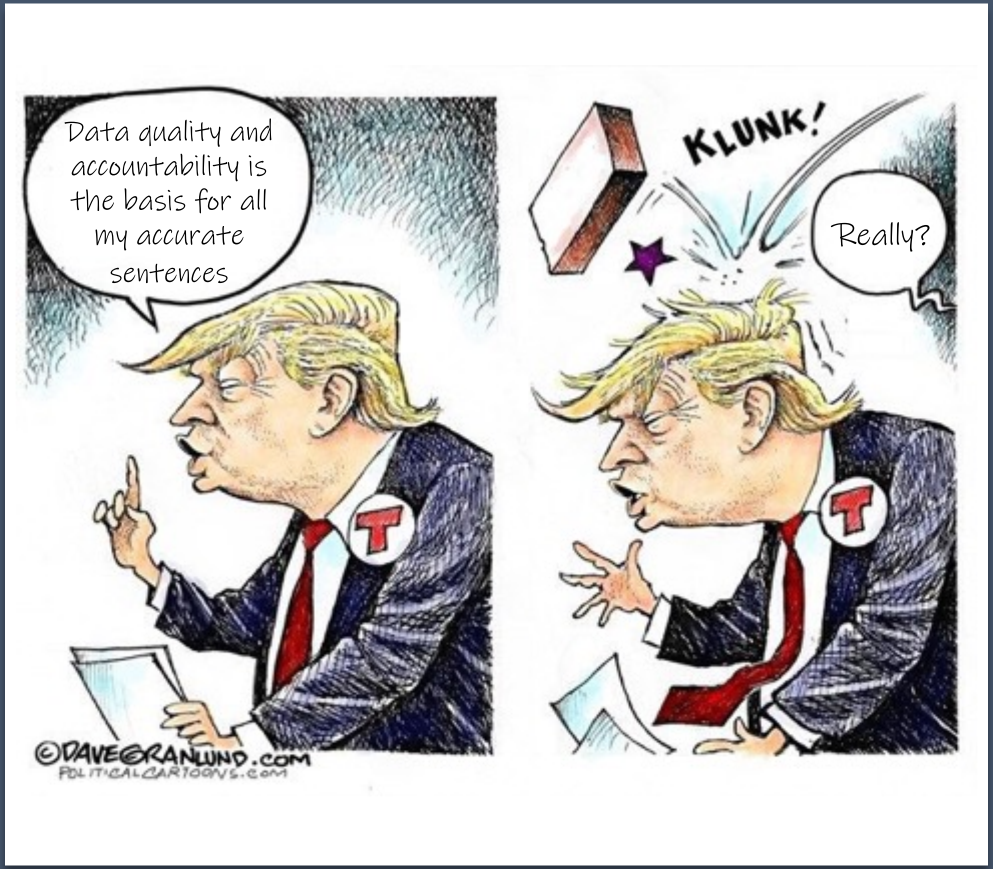
Data Governance first level - AWARE

Accountability

Executive level accountability is not defined. Scope of System Owners (stewards / owners) are not defined or named.

Quality

Profiling or data quality measures of data elements are not in place or data quality standards are not published.



Metadata

System characteristics are not defined or documented. Business, technical and operational metadata is not effectively cataloged.

Provisioning

Data is distributed on a reactive basis with little to no enterprise planning, control or governance.

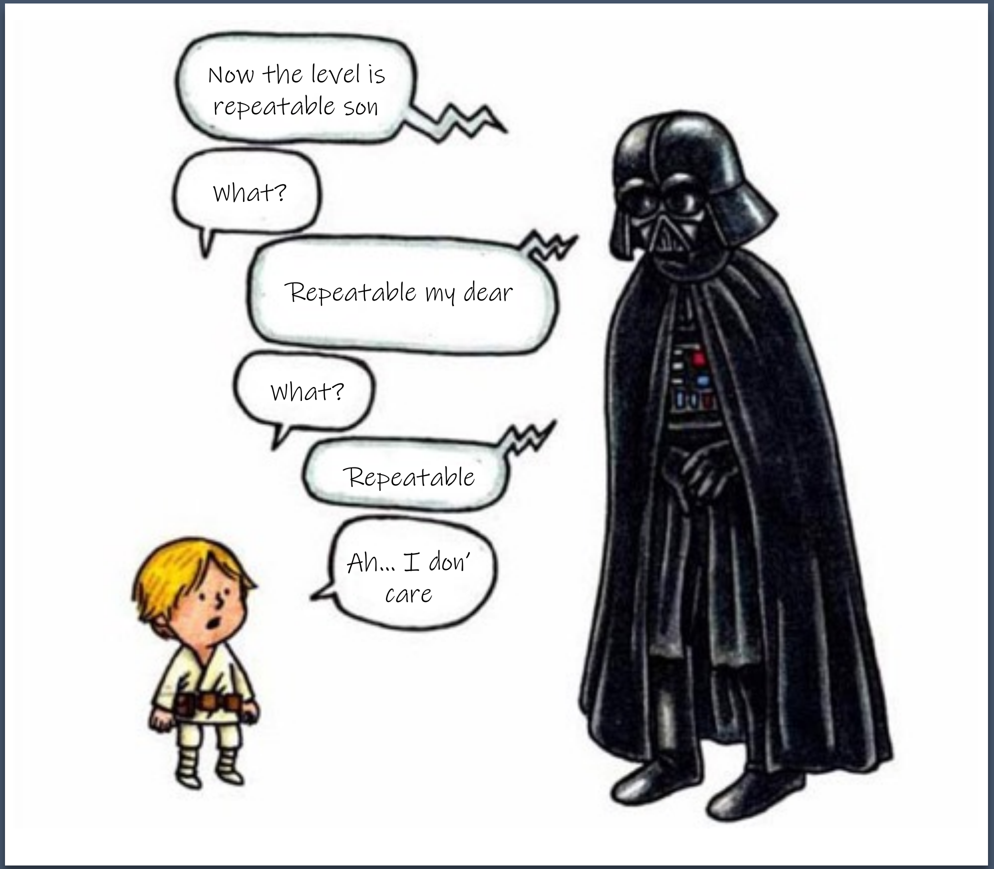
Data Governance second level – REPETEABLE

Accountability

Scope of **System Owners is defined**, and stewards / owners are named.

Quality

Key business elements are identified and **data quality standards** are created for them based on analysis of **profiling** or data **quality measurement** results.



Metadata

Baseline documentation for data stores, data flows, and data element definitions are available.

Provisioning

Registration as a data provider is complete. All of the system's business domains and provisioning roles are documented. The **data provider assessment information** is complete.

Data Governance third level - DEFINED

Accountability

Executive level accountability is defined by **Enterprise Governance**.

Quality

Key business elements are measured against **data quality standards** and data quality **reports** are published on an established **measurement schedule**.

Metadata

Documentation for data lineage, data stores and data element definitions are maintained and available to the enterprise.

Provisioning

SLAs with data consumers are in place; all **data flows** into and out of system are documented. Projects comply with enterprise **Data Provisioning Strategy Framework and Guidelines.**

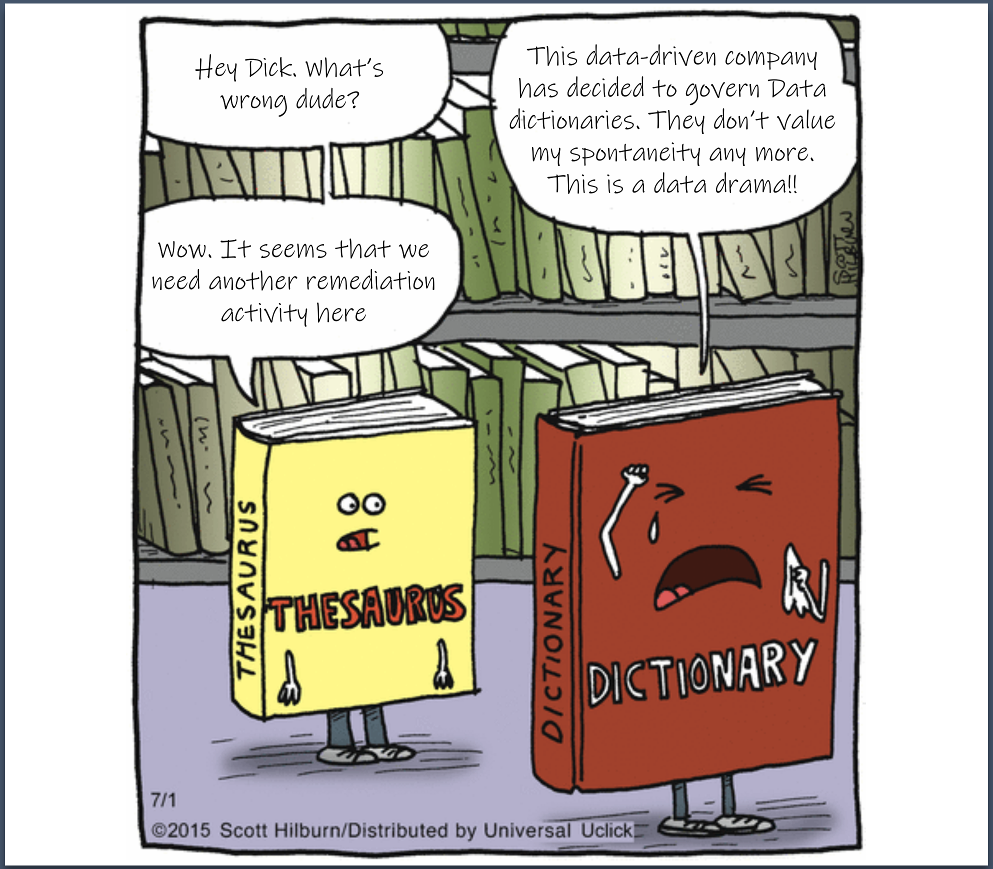
Data Governance fourth level – MANAGED

Accountability

Local Data Governance bodies are chartered and routines are in place.

Quality

Data quality goals are in place and drive **remediation** activities.



Metadata

Data Dictionaries are governed. A **Business Domain Language** is governed and mapped to data elements.

Provisioning

Data lineage is documented for all prioritized data flows involving the system. **Target provisioning points** are designated and a **domain provisioning roadmap** is in place.

Data Governance fifth level – OPTIMIZED

Accountability

Enterprise and Local Data Governance sustainability routines are in place.

Quality

A data **quality response plan** with defined **thresholds** for key business elements and data **quality self-monitoring activities** are defined and followed.

Metadata

Metadata is easily accessible across domains. The BDL is mapped to the CBL.

Provisioning

Data provisioning and consumption occurs according to the **domain roadmap**. **Provisioning governance** is in place and drives ongoing funding and execution decisions.

A shift in Data Governance is happening – From hierarchies to networks

HIERARCHICAL DATA GOVERNANCE (SYSTEM OF RECORD)

. CDO as a Coordinator: Inward-oriented / Traditional Data / Service

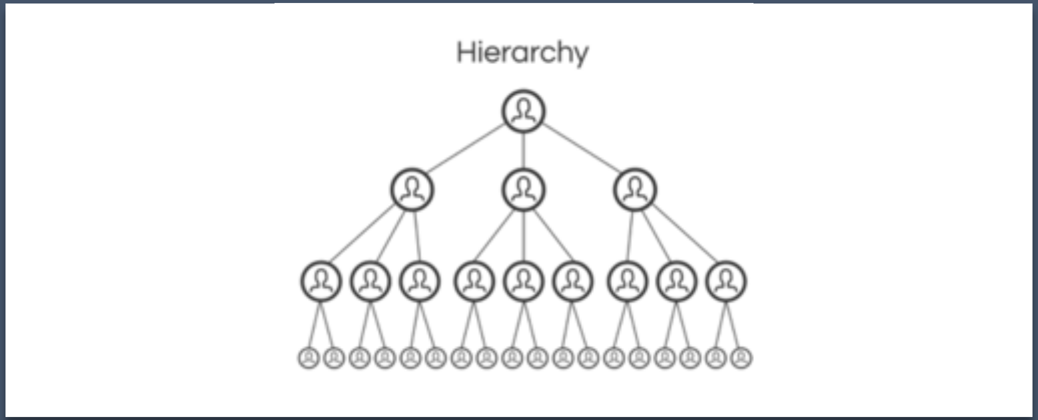
. Defensive: Risk-driven

. Scarcity: Few consumers, few producers

. Compromises on old obsolete cost assumptions of digital power

. Use of digital optimizes to some extent

. Not scalable for big data by larger 'data scientist' populations



NETWORKED DATA GOVERNANCE (SYSTEMS OF ENGAGEMENT)

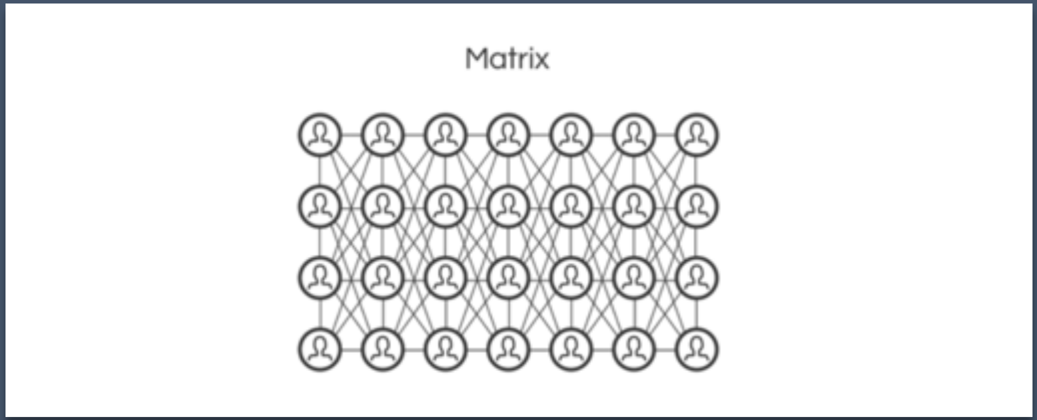
. CDO as an Experimenter: Outward / Big Data / Strategy

. Offensive: Value-driven

. Abundance

. Many Producers - Data Democratization | Eliminate Breadlines | Consumerization of BI and cheap digital power | Many serve many | Supports customer

. Many Consumers - Data Amazonification | Access, SLA, Trust, Secure Cloud…



Who's the CDO?

It's the abbreviation of **Chief Data Officer**

He/she takes care of Analytics excellence, Information management excellence and leads change for impact

He/she defines strategy, applies best methods, embraces cutting-edge technologies and moves organization forward in data-driven maturity levels

Her responsibilities are:

. Enterprise Data Strategy

. Data Governance and Management

. Data Analytics

. Data Architecture

. Data Culture

That's all Folks!

Coming soon

DATA ANALYTICS AND BIG DATA – INSIDE THE ORGANIZATION