



Digital Technologies and Value Creation

Dr. Philippe Blaettchen
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www.bayes.city.ac.uk

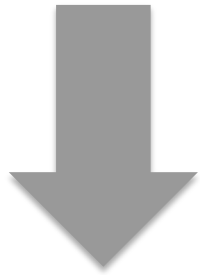
“Companies have to race to build AI or they will be made uncompetitive. Essentially, if your competitor is racing to build AI, they will crush you.”

ELON MUSK

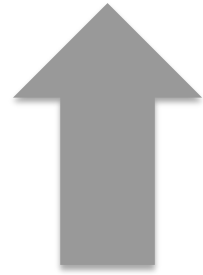


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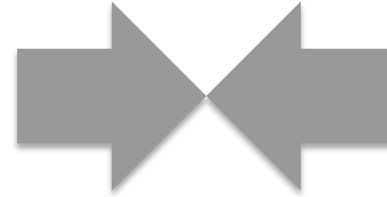
Analytics and organizations



COST



REVENUE



RISK



SCALE

Context: omni-channel fashion retailer uses analytics for stocking decisions for multiple partially substitutable items in a flexible supply chain with local and outsourced production

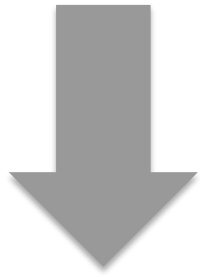
Less salvaging
and deep
markdowns

Higher in-stock

Less excess of
some items
and stock-out
of others

Same level of
sophistication
applied to all
items

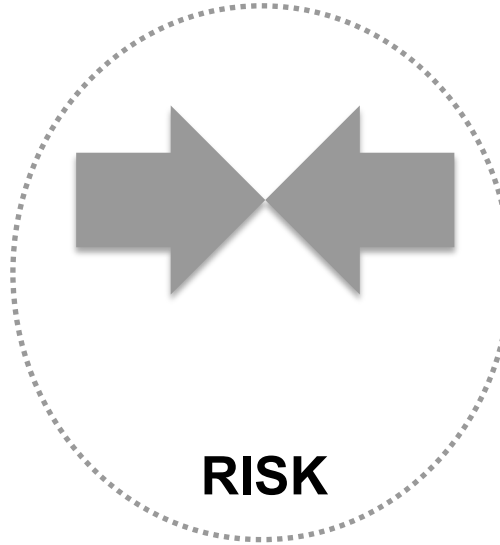
Analytics with an external focus



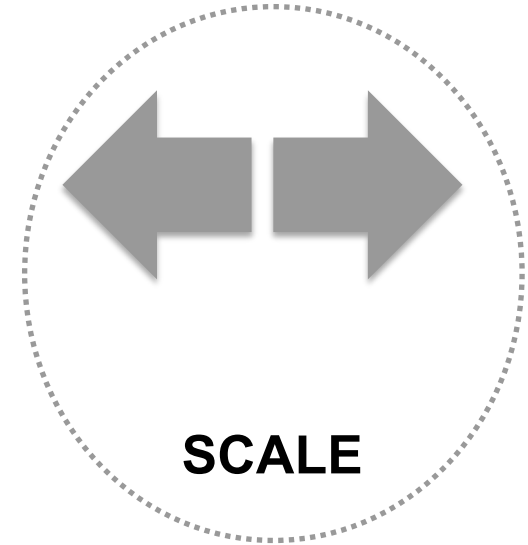
COST



REVENUE



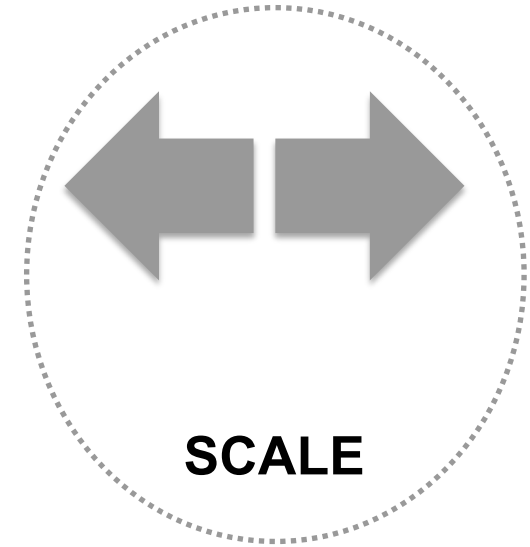
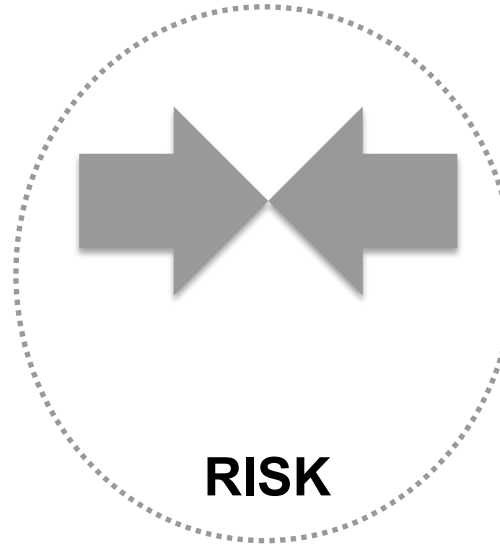
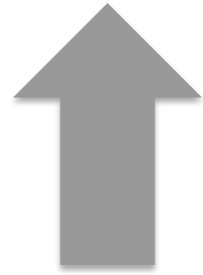
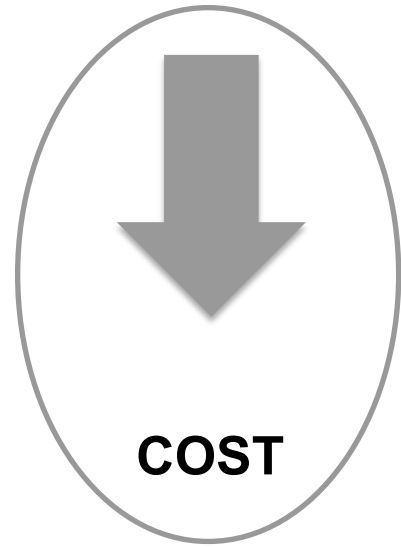
RISK



SCALE

Key example: Marketing analytics (“MTech”)

Analytics with an internal focus



Key example: Organizational design using analytics (“People Analytics”)

Why analytics now?

Ongoing research into Algorithms

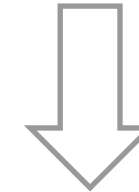
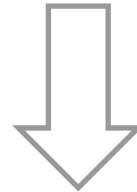
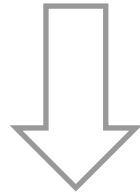
Page Rank for
Google Search, Deep
Learning Algorithms
(ANNs, CNNs),
Reinforcement
Learning, ADMM

Increasing access to Data

1991: Internet
1997: Google
2000s: Home PC
2004: Facebook
2005: YouTube
2007: Iphone
Etc.

Better computing capabilities

More processors per
sq. inch (Moore's
law), cloud-based
services (storage and
computation)

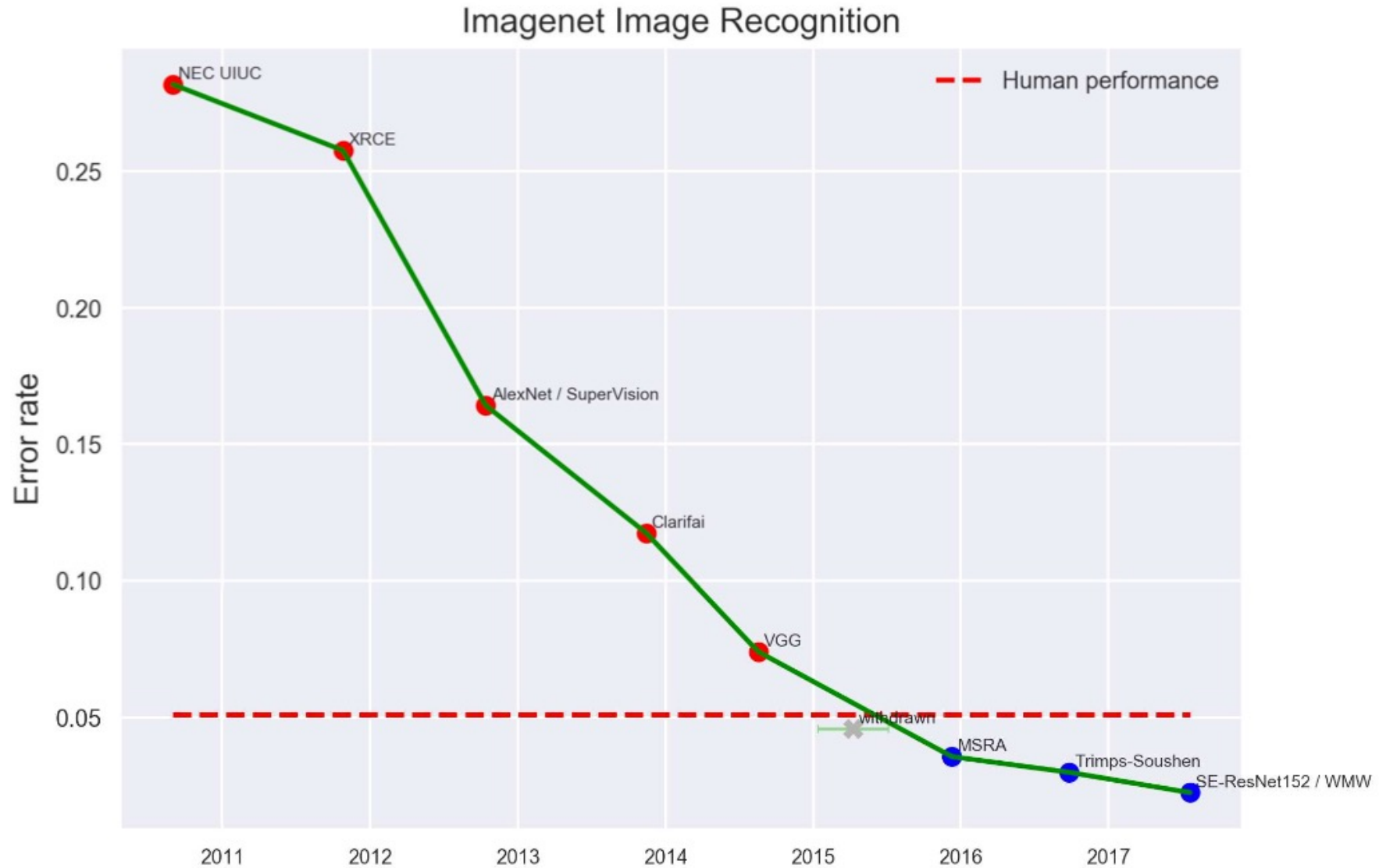


“Perfect storm” for Analytics



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Why analytics now?



Why analytics now?

Major opportunities for businesses:

- Personalized services to customers/enhanced customer experience
- Automation of tasks that were previously costly (Forbes, 2018: AI will generate \$2.9 trillion in business value and recover 6.2 billion hours of worker productivity by 2021)
- Increased efficiency of processes and tasks
→ **Has led to a lot of hype around the topic**

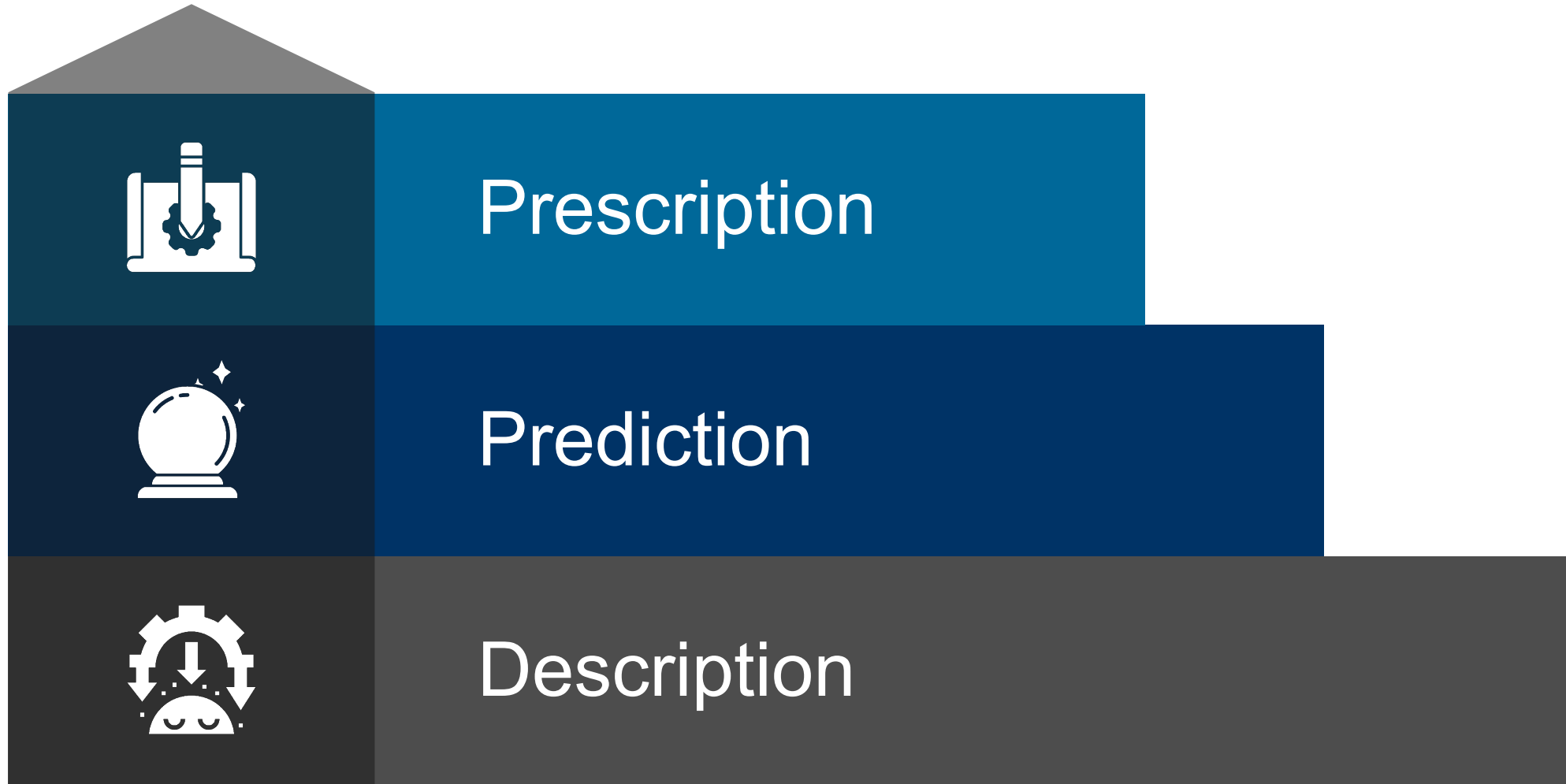


"Artificial intelligence is the future, not only for Russia, but for all humankind. It comes with colossal opportunities, but also threats that are difficult to predict. Whoever becomes the leader in this sphere will become the ruler of the world," Russian President Vladimir Putin said.



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Descriptive, predictive, or prescriptive – where is the value?



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Learning objectives of the module

<https://youtu.be/zs6YbzfMHWA?t=30>

Goals: Provide you with the knowledge to

- feel comfortable in any environment where analytics and coding is discussed
- interact with (“speak the same language”) as specialists and set you on the path to become one
- be aware of the tools and technologies that allow to extract value from analytics
- identify business opportunities which could use analytics, especially in organizational design and marketing
- know when you’re being taken for a ride

How will we do this?

- Hands-on approach to analytics tools and technologies
- Experiencing the whole analytics pipeline
- Coding and practice on various datasets



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Learning objectives of the module

Is this module going to be hard?

- For some of you, it may...
- But, if you work hard, it will also be one of the most rewarding and interesting modules you can take at Bayes:
 - Always** learn your lectures
 - Do** the homework regularly
 - Practice** Python
 - Come to office hours** if you are still struggling
- I will always find time to help you if you are putting in the effort on your side.



General modalities

Lectures:

- Video and exercise material to study **before** class (broken up into digestible bits), mostly to introduce new concepts and tools. I will release videos before the live class on Moodle and update you by email
- Two hours of face-to-face lecture every week during the term. This will be **very interactive**, and you will get plenty of chance to practice your coding and learn-by-doing. This also means that we need to follow a few norms:
 - Please arrive on time – or even a couple of mins ahead of schedule
 - Please only use your computers for the task at hand: no social media (except the one we analyze), no browsing
 - Come prepared to class: lecture learnt, homework done

Tutorials:

- Three tutorials throughout the term, two hours each
- Focused on repeating difficult parts of the previous lecture(s) and going into more depth



About me

- Philippe Blaettchen
philippe.blaettchen@city.ac.uk
- Lecturer in Management Analytics
- Research and consulting: Sustainability in Supply Chains (food, healthcare in developing countries), traceability and blockchain technology
- German, French
- PhD from INSEAD in Technology and Operations Management
- MS/BS in Industrial Engineering from Karlsruhe Institute of Technology, Germany



Office hours

- Once a week, two hours (details on Moodle)
- Strictly FCFS
- Feel free to stay around and listen to other students' questions. Also, helping each other out is strongly encouraged
- I expect you to have carefully revised the materials beforehand



Learning objectives of today

Goals: Understand the general outlay of the course

- What are the tools and technologies used to create value with business analytics?
- Where do we get our data from?
- How is business analytics used by firms in practice?

How will we do this?

- We start by characterizing business analytics activities and linking activities to technologies
- We then discuss the increasing availability of data and how we can harness it
- Finally, we introduce Organizational Analytics, MarTech, and Social Media Analytics as our playground for the rest of the class

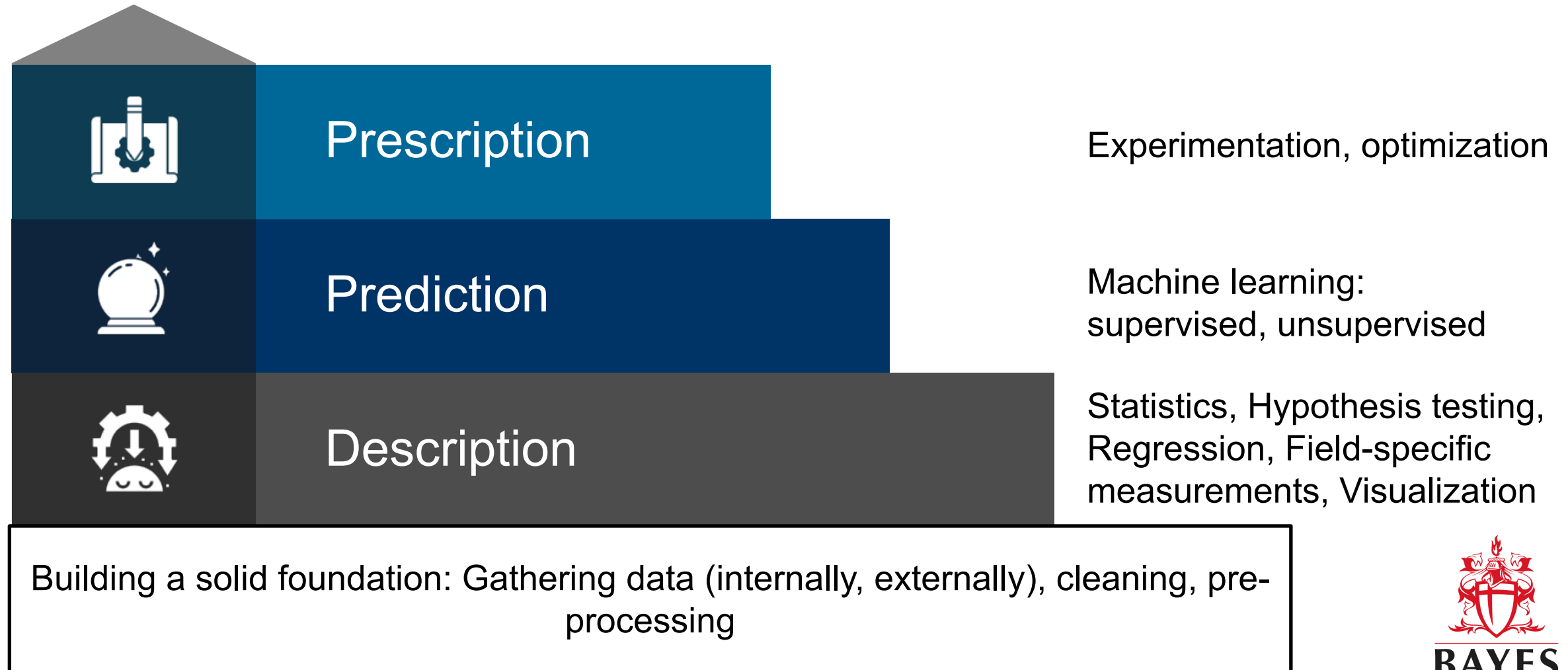


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Digital technologies for analytics

The tools for analytics in practice



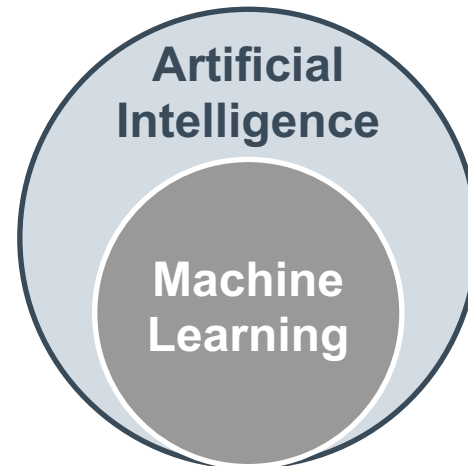
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Machine Learning (ML):

Well-defined concept. Set of algorithms (i.e., procedures) that take data as an input and learn patterns or predictions from this data without being told explicitly how to build these patterns or predictions.

Artificial Intelligence (AI):

Not as clear. Typically set of tasks performed by a computer that are commonly associated with intelligent beings (includes interaction with environment and making decisions to maximize goals)

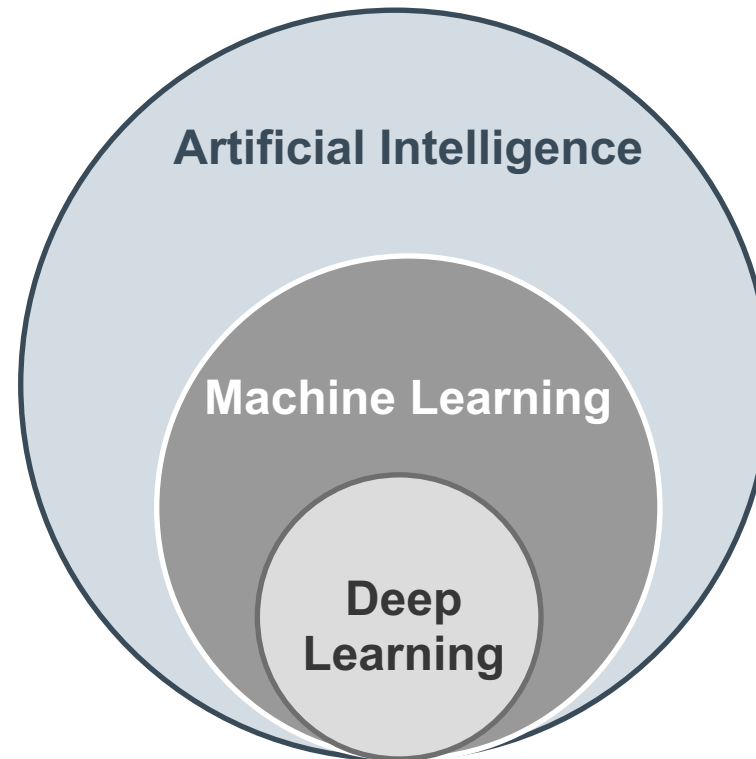


And what about Deep Learning?

Deep Learning:

Set of techniques for supervised machine learning. Involves fitting neural networks to input data to predict an output variable.

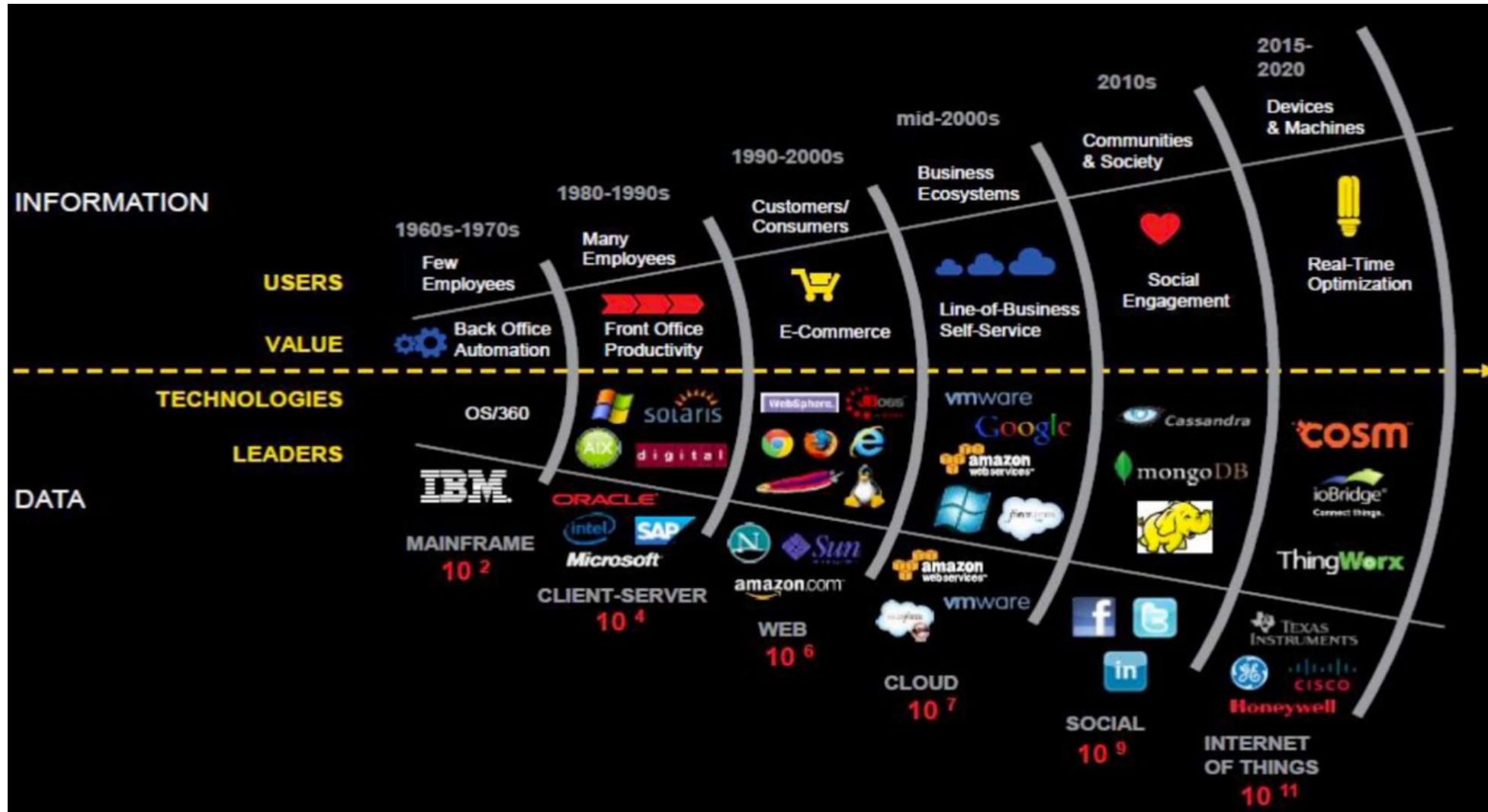
[See Term 2]



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Data, data, data

What makes data “Big”? 3Vs: Volume, Variety, Velocity



Big Data vs. Smart Data

Smart data is:

- Data that is right for the decision → **data engineering**
- Supports (and is supported by) analytics, expertise, and machines → **data analytics**
- Hits your key business drivers: customer acquisition, loyalty, growth, risk optimization, etc. → **business expertise**



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Potential data sources are endless...

From within the organization

- Sensors in factories and offices
- Bookkeeping and accounting
- Slack, Emails
- Website traffic
- Customer data
- ...

From outside the organization

- Competitive intelligence: reports, statements
- Social media: Google, Twitter, Instagram, Facebook, Glassdoor, LinkedIn, ...
- Consumer studies
- ...



And once we collected the data?

“Data scientists spend 80% of their time cleaning a dataset and only 20% of their time analyzing it.”



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People Analytics and Org 2.0

The universal problem of organizing



Source: Puranam & Clement (2020)

Organization Design & Development Issues



Individual Level

- ✓ Executive assessment
- ✓ Executive Search
- ✓ Executive Pay
- ✓ Employer Branding
- ✓ Onboarding
- ✓ Talent Acquisition
- ✓ Employee engagement
- ✓ Talent Management
- ✓ Leadership Development
- ✓ Compensation Design
- ✓ Communication Management



Group Level

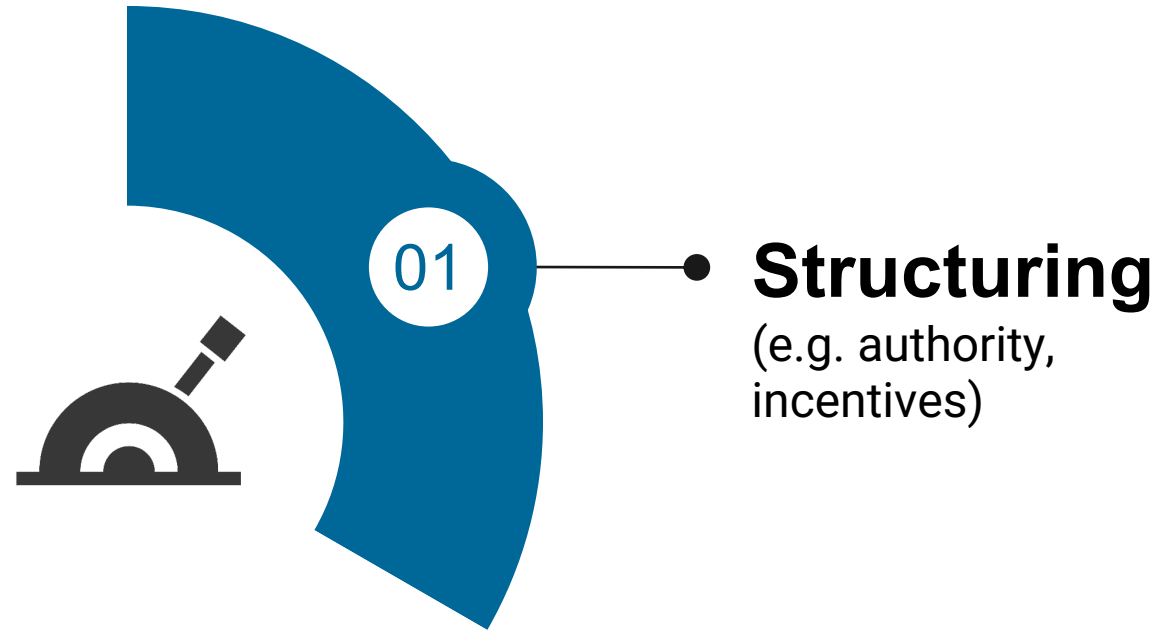
- ✓ Organization Design
- ✓ Measures and Incentive systems
- ✓ Design Effectiveness
- ✓ Organization Diagnostics
- ✓ Performance Improvement
- ✓ Change management
- ✓ Strategy Execution
- ✓ Culture Management
- ✓ Post-Merger and Acquisition



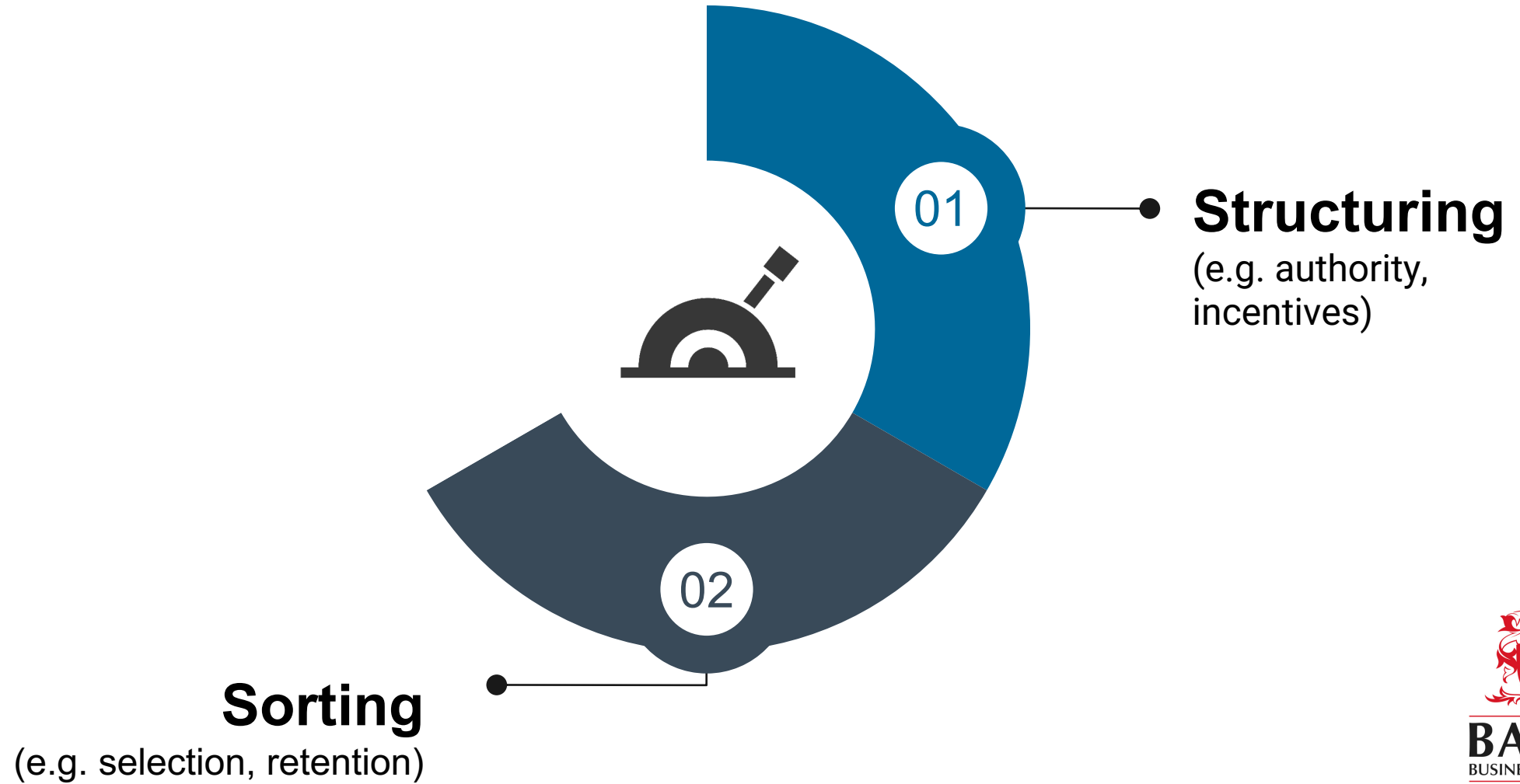
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Source: Puranam & Clement (2020)

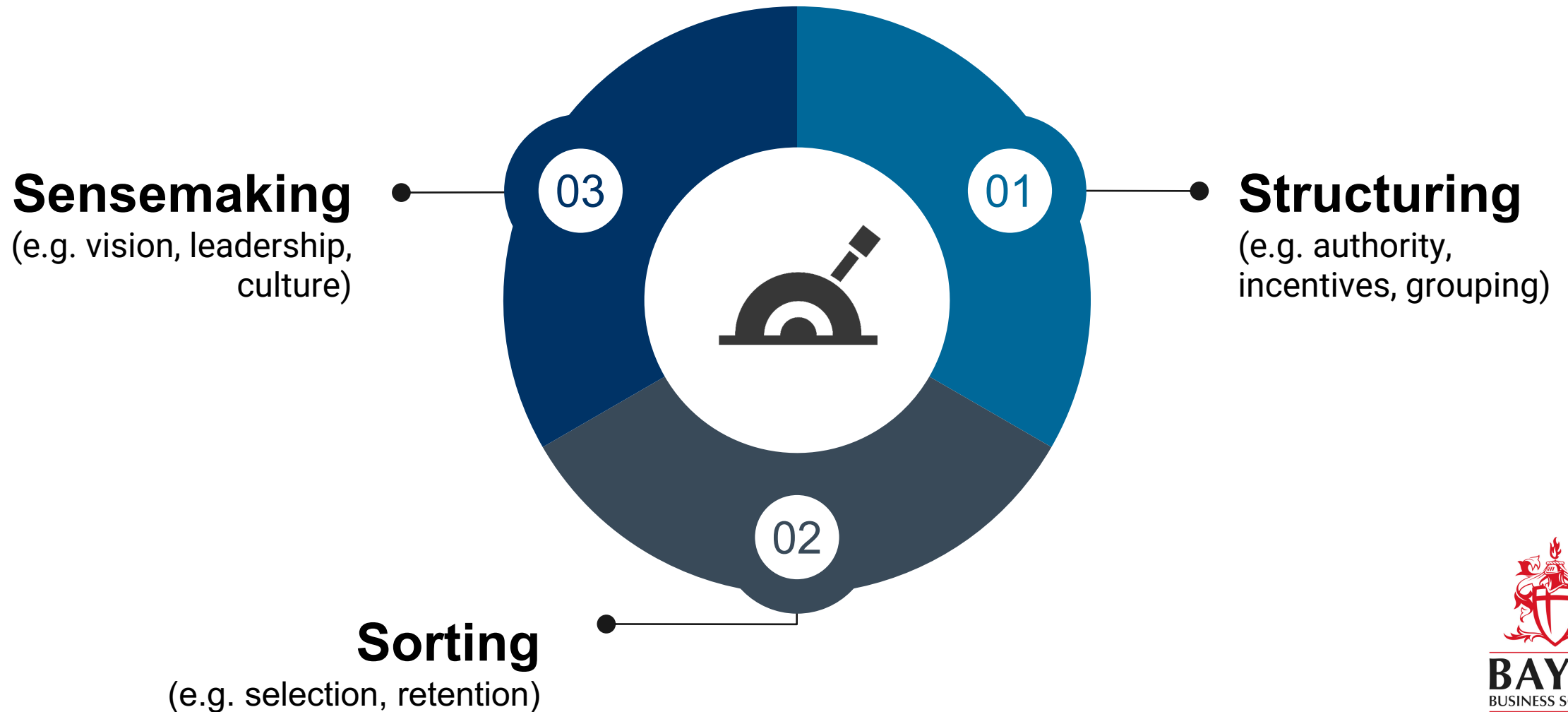
Three levers of organization design



Three levers of organization design



Three levers of organization design





Analytics in Marketing / MarTech

Marketing: sometimes difficult to define

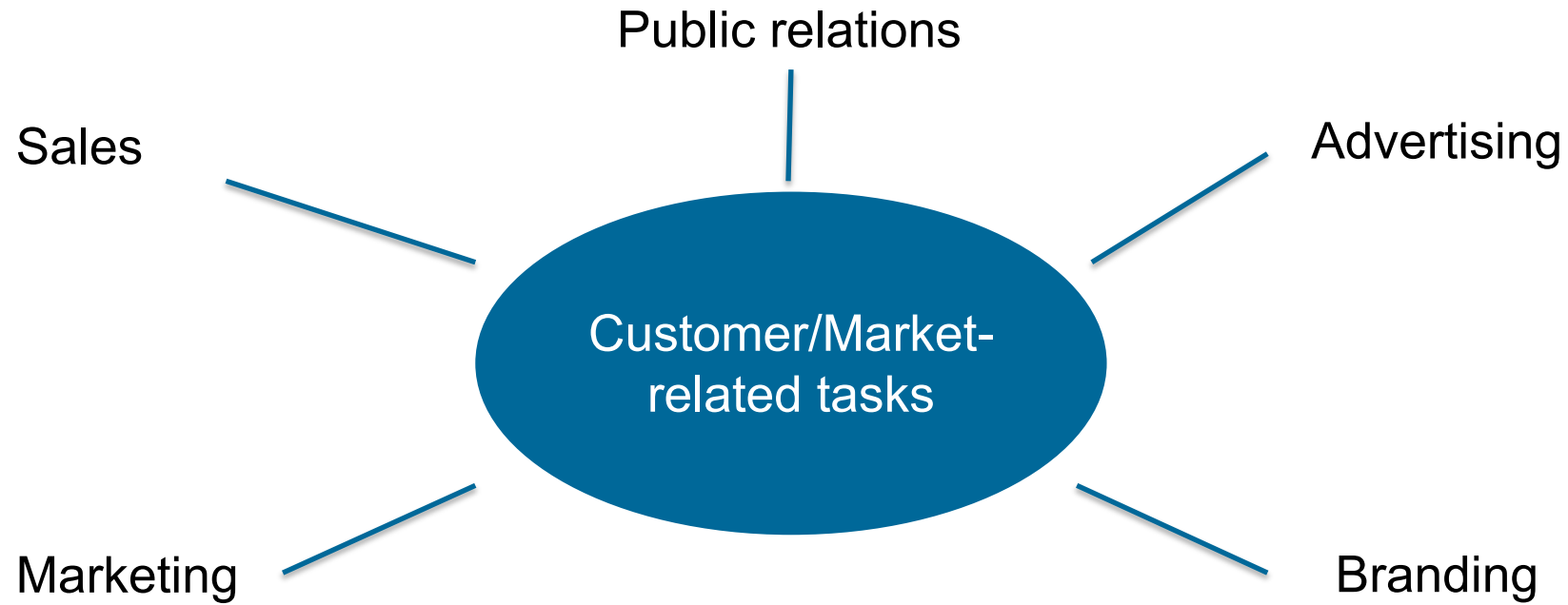


© marketoonist.com



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Marketing: sometimes difficult to define



But: as the focus is more and more on data and quantitative analysis, these distinctions are becoming less important!



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Marketing: a more global definition

“The art and science of capturing the value
created by our products and services”



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So, what is marketing analytics?

“Building models of seller and buyer preferences to make predictions about future marketplace behaviors, and to use these predictions to optimize a firm’s offering”



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So, what is marketing analytics?

“Building models of **seller and buyer preferences** to make predictions about future marketplace behaviors, and to use these predictions to optimize a firm’s offering”



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So, what is marketing analytics?



Source: Dilbert (2000)

So, what is marketing analytics?

“Building models of seller and buyer preferences to make predictions about future marketplace behaviors, and to use these predictions to **optimize a firm’s offering**”



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A fundamental measurement issue

“Building models of seller and **buyer preferences** to make predictions about future marketplace behaviors, and to use these predictions to optimize a firm’s offering”

→ How do we measure preferences?

The old world

- Customer surveys (live, phone, mail, online, etc.)
- Choice experiments



The new world

- Revealed preferences observed in (big) data
- Low-cost field experiments on websites
- Social media information



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Finally, marketing technology (MarTech)



© marketoonist.com

What is MarTech (sometimes also MTech)?

Technology (esp. software) solutions that focus on

- **Marketing analytics**
- Customer experience
- Marketing attribution
- Content and content management
- Email marketing
- Marketing management



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Social Media Analytics

What is Social Media Analytics?

“The art and science of extracting **valuable hidden insights** from vast amounts of semistructured and unstructured **social media data** to enable **informed and insightful decision making**”



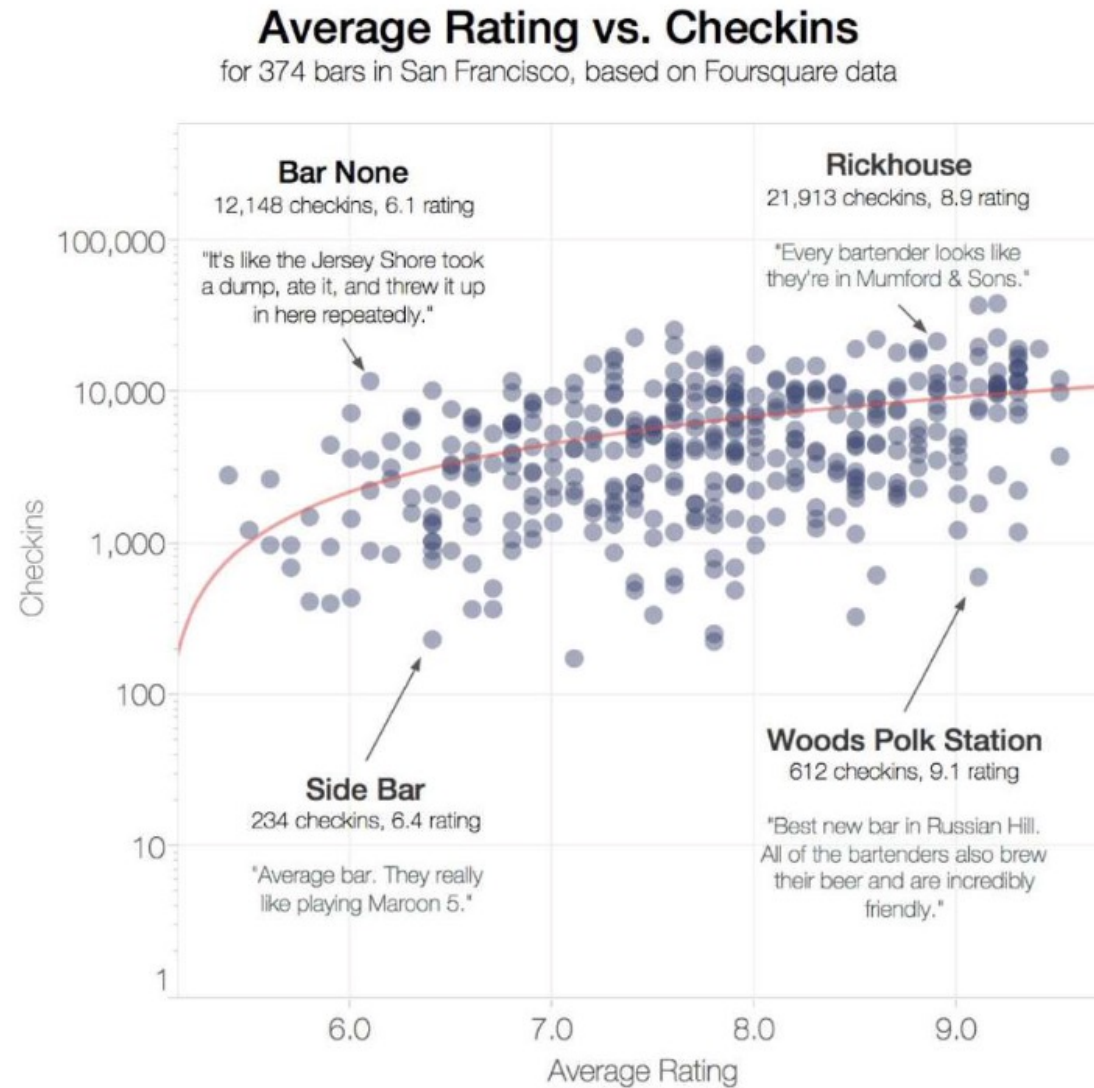
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CUTTING OUT THE MIDDLEMAN

Source: Nguyen (nd)

How to find the perfect Happy Hour spot with data?



Source: <https://www.linkedin.com/pulse/how-find-perfect-happy-hour-spot-data-sohan-murthy>



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How would you predict the success of a new movie with data?

| Features | Adjusted R ² | p-Value |
|---|-------------------------|----------|
| Average weekly tweet-rate | 0.80 | 3.65e-09 |
| Average daily tweet-rate | 0.93 | 5.27e-09 |
| Average daily tweet-rate + theaters count | 0.97 | 9.14e-12 |



What is Social Media Analytics?

“The art and science of extracting valuable hidden insights from vast amounts of semistructured and **unstructured** social media data to enable informed and insightful decision making”



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Healthcare meets Analytics

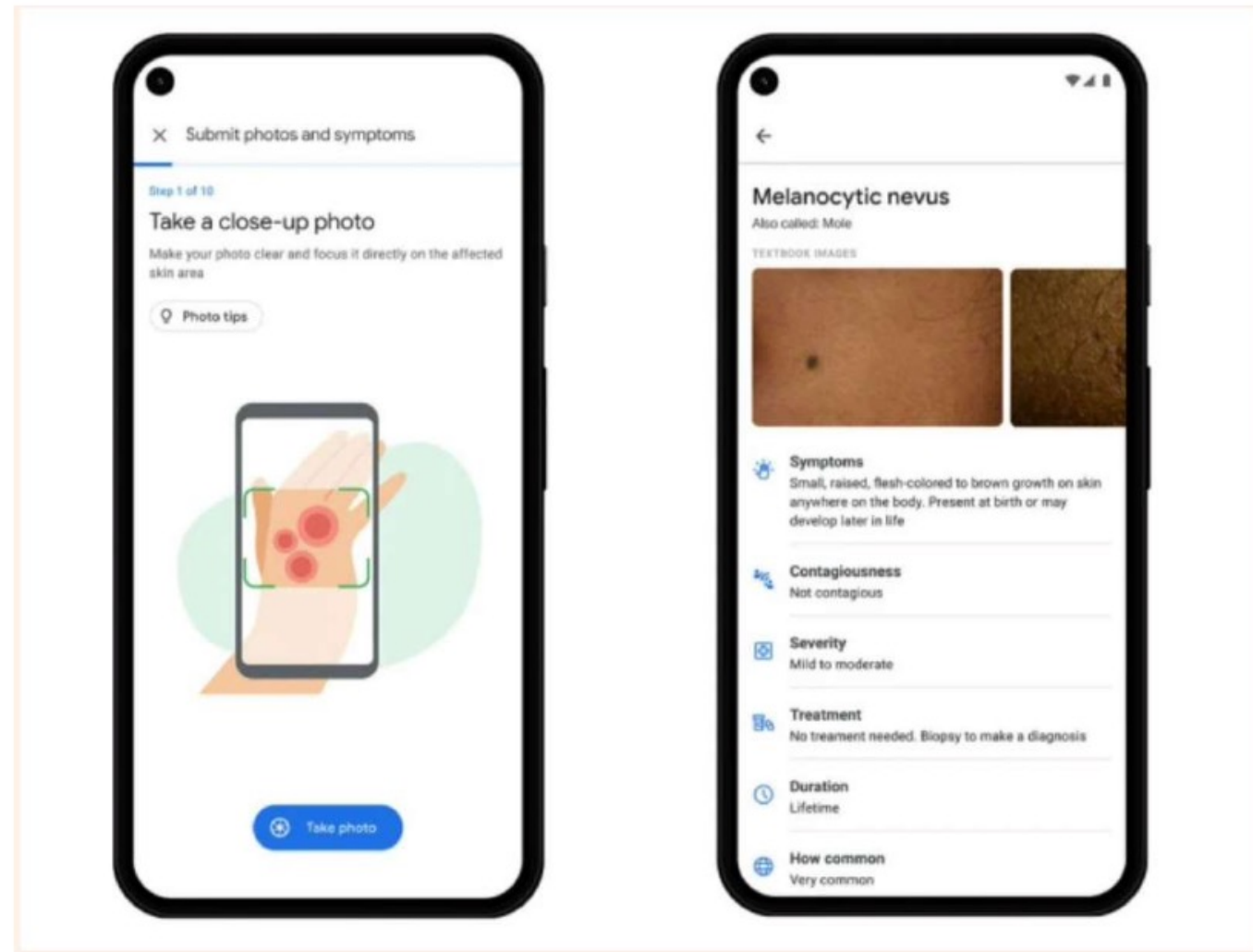


X-Ray



Coughing sound

Google – Derm Assist



Source: <https://www.ft.com/content/6d4cd446-2243-43f4-befd-565b4e880811>



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Harnessing unstructured data – a supporting function





See you in class!