Disruptive technologies and their impacts

Prof. dr. ir. Joep Crompvoets

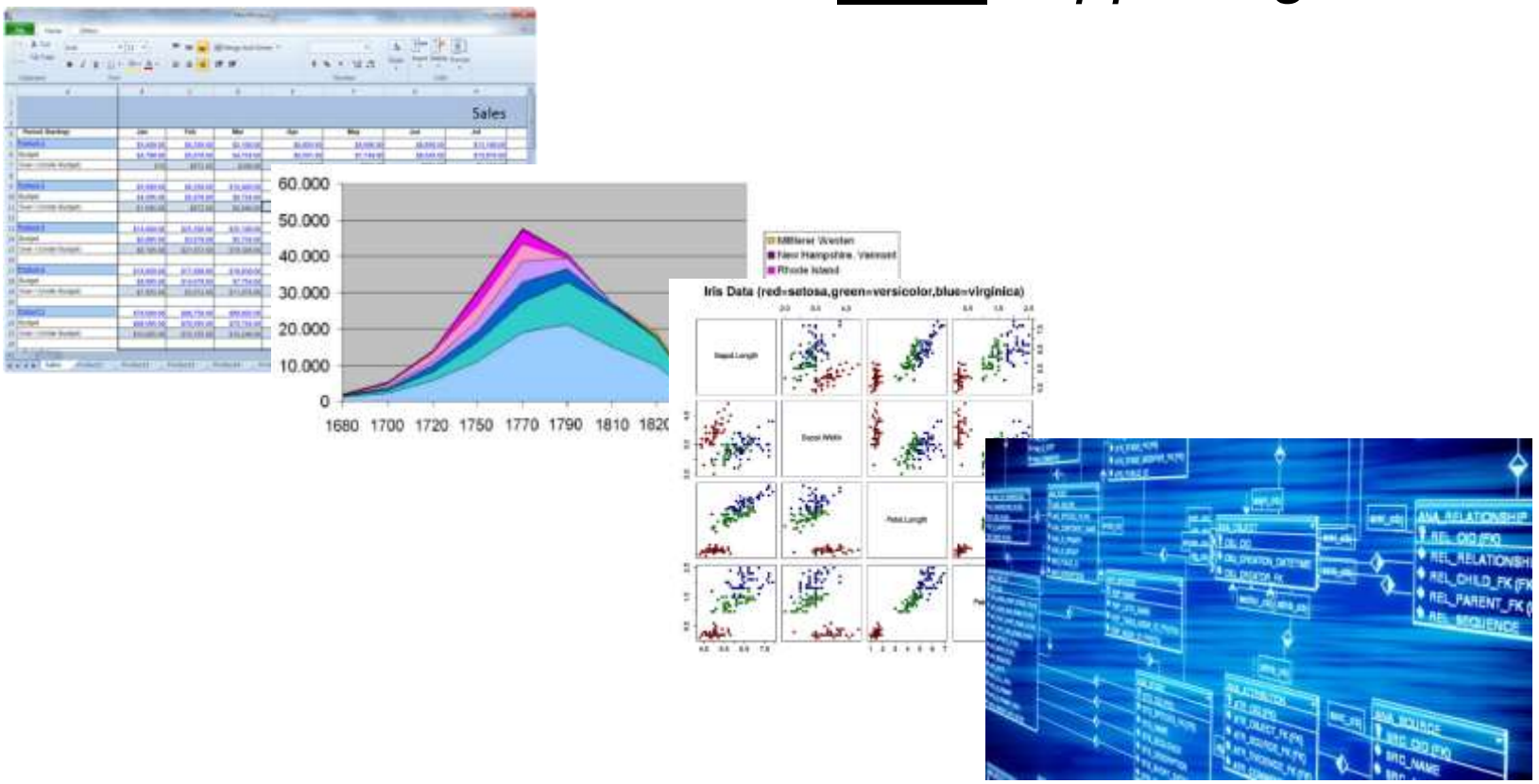
Zagreb 2018

Outline

- Data, Data, Data -> Data disruption
- What are disruptive technologies?
- What is the impact of disruptive technologies?
- Question & Propositions

Data, Data, Data

*What **WAS** happening with data?*



Data, Data, Data

*What **IS** happening with data?*

Data, Data, Data

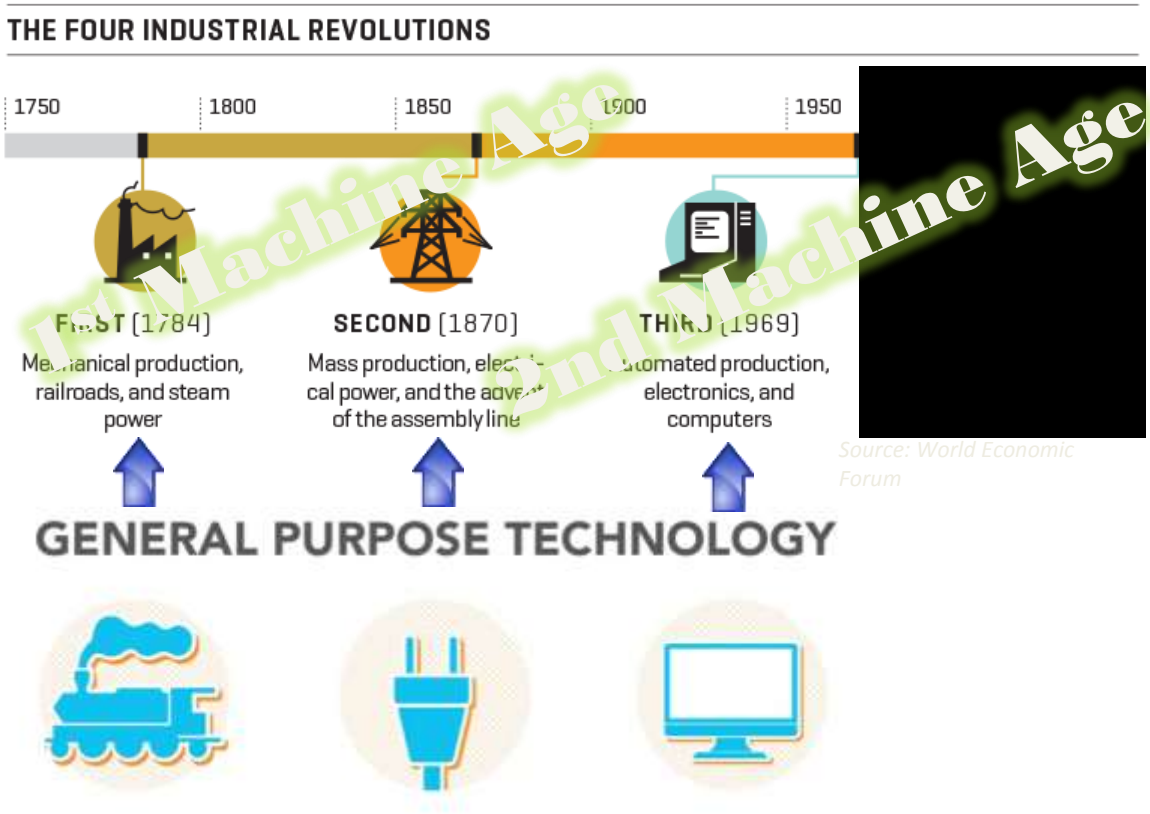
What will happen with data?

Data, Data, Data

Data-driven Disruption

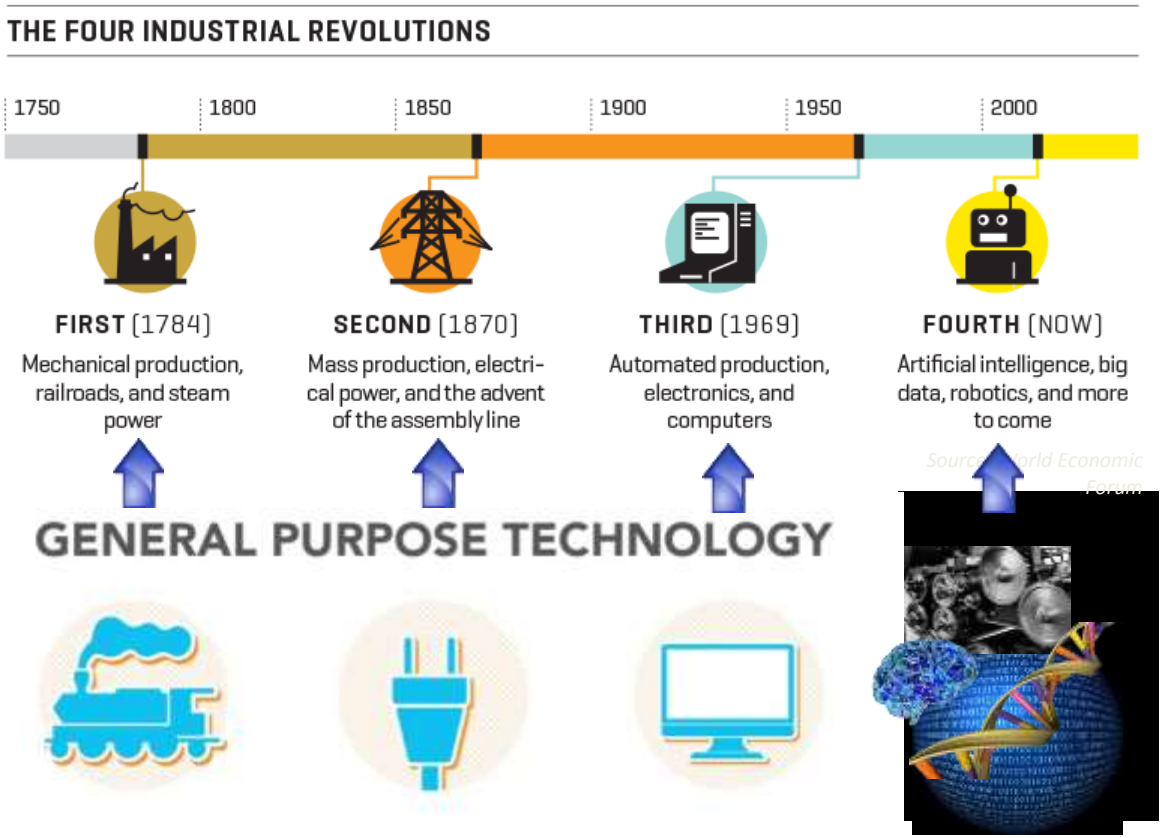
2014

Data, Data, Data



Source: World Economic Forum

Data, Data, Data



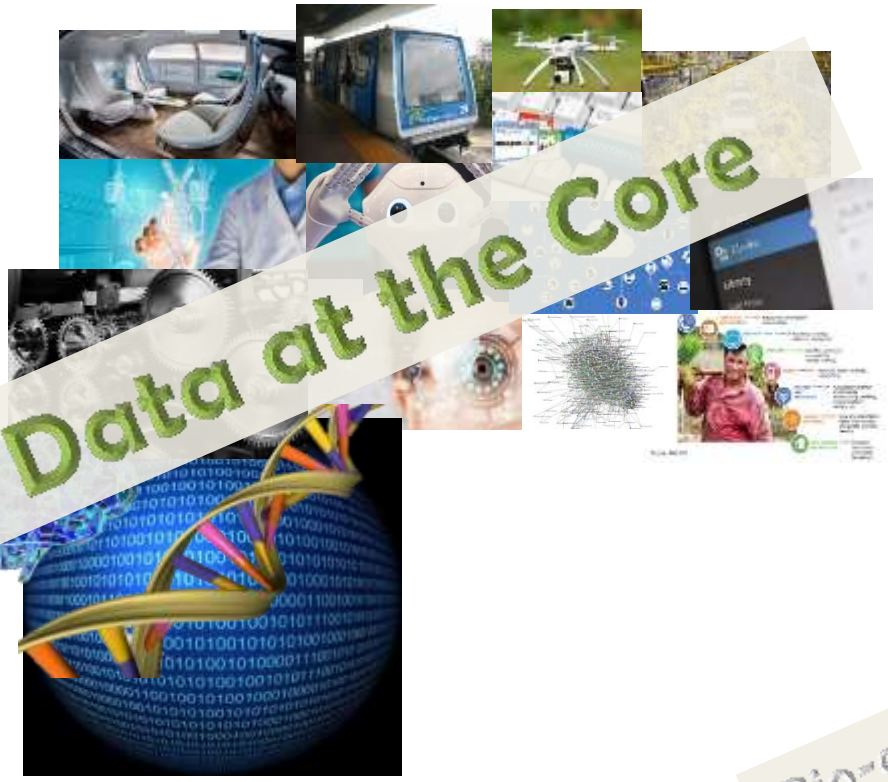
- *Previous industrial revolutions liberated humankind from animal power.*
- *4th Industrial Revolution: characterized by new technologies fusing physical, digital and biological worlds impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human.*

Data, Data, Data

- IT was laughable in lots of things for decades

- Suddenly it gets very good. How has this happened?
  - Things become data and they get weird and wonderful properties: they are subject to different economics, abundance versus scarcity
  - Things become “smart”: they produce and consume data, communicate and change their status and behavior following rules
  - All “things” are connected and a global data sphere is created
  - We apply intelligent technologies on this corpus of data
  - Things get intelligent themselves

Data, Data, Data



Augmenting Mental Power

Robotics

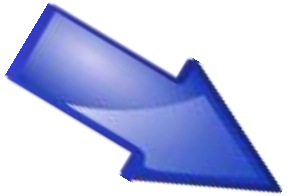
Bio-engineering

Brain-Machine Interface

Data, Data, Data

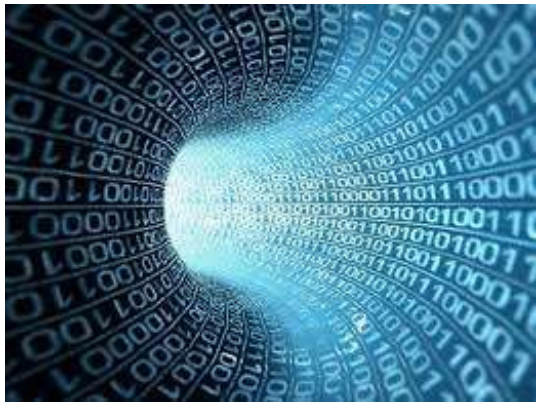
What will happen with data?

Impact on organisations



Data, Data, Data

The Data Sphere



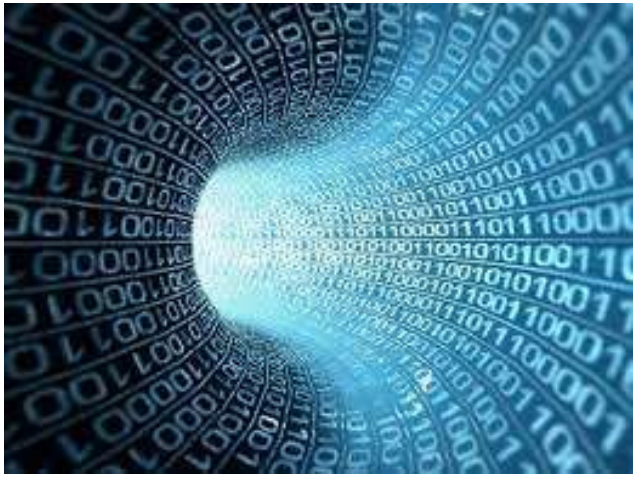
- Scale = Zettabytes 10^{21}, billion trillions
- Every 2 days we create as much information as we did from the beginning of time until 2003
- The number of Bits of information stored in the digital universe is thought to have exceeded the number of stars in the physical universe

Data, Data, Data

From where all this data come from?

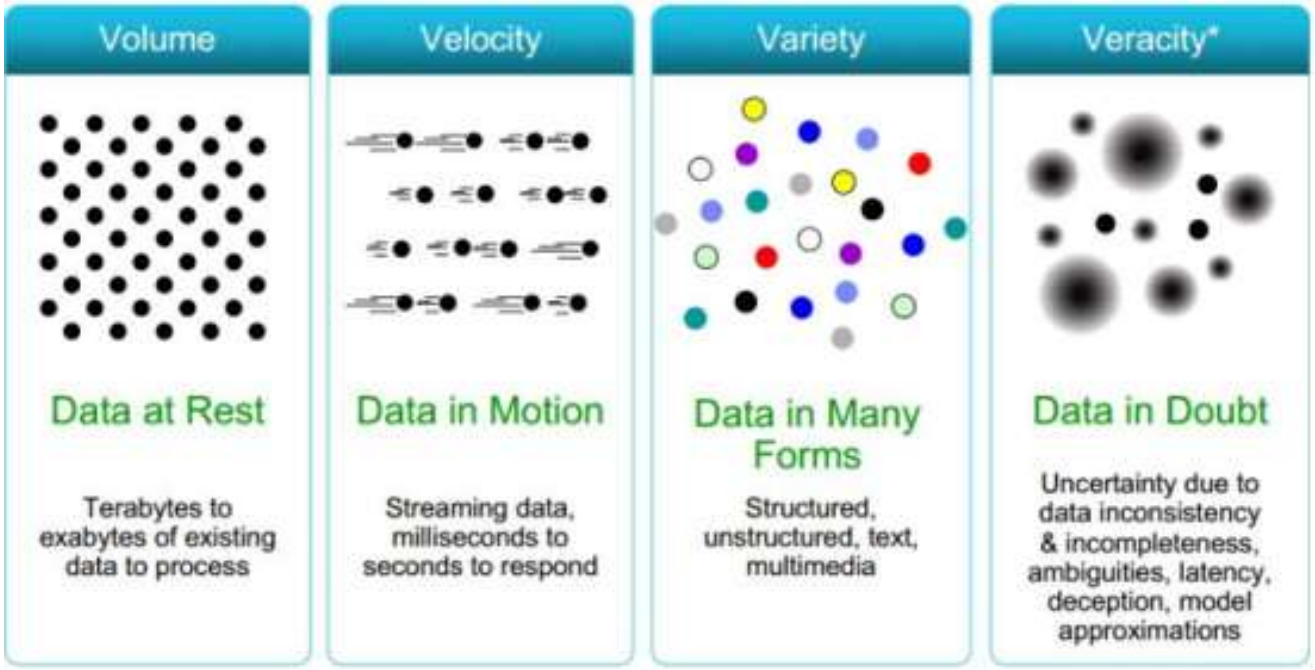
Sources:

- Internal enterprise DB&ERP, CRM, SCM systems
- Archives
- Websites
- Transactions
- eCommerce platforms and portals
- Social networks and platforms
- GPS signals
- IoT
  - ✓ Machinery
  - ✓ Electric/home devices
  - ✓ Vehicles
  - ✓ All types of sensors
- Mobile phones
- Open public data
- Human body
- Content generation e.g. music, films, video, photos, papers
- Digital personal trail



Data, Data, Data

Current Data characteristics: 4 Vs



Data, Data, Data

Important trends related to Data Management:

I. Rapid growth of new types of unstructured data (Social Media, Location data, Sensors data, Web data, Customers data)

II. The rise of cloud computing infrastructure makes the potential of (big) data increasingly accessible to more and more businesses -> Democratization of data capabilities

III. Rapid development of new capabilities for managing and making sense of data (e.g. computing power)

IV. From raw data… to Artificial Intelligence (AI)

- Shift from data production to data analysis
- Big Data + Cloud + Data Analytics = Raw material for AI

V. The use of disruptive technologies

Outline

- Data, Data, Data -> Data disruption
- What are disruptive technologies?
- What is the impact of disruptive technologies?
- Question & Propositions

WHAT ARE DISRUPTIVE TECHNOLOGIES?

DISRUPTIVE TECHNOLOGIES

Originally defined by Prof. Clayton M. Christensen

“A new technology that unexpectedly displaces an established technology” (1995)

Ground-breaking product, service or technology that makes the existing ones obsolete

2003: Disruptive innovation

DISRUPTIVE TECHNOLOGIES

EXAMPLES

Personal Computer

E-mail

Cell phones

Social Media

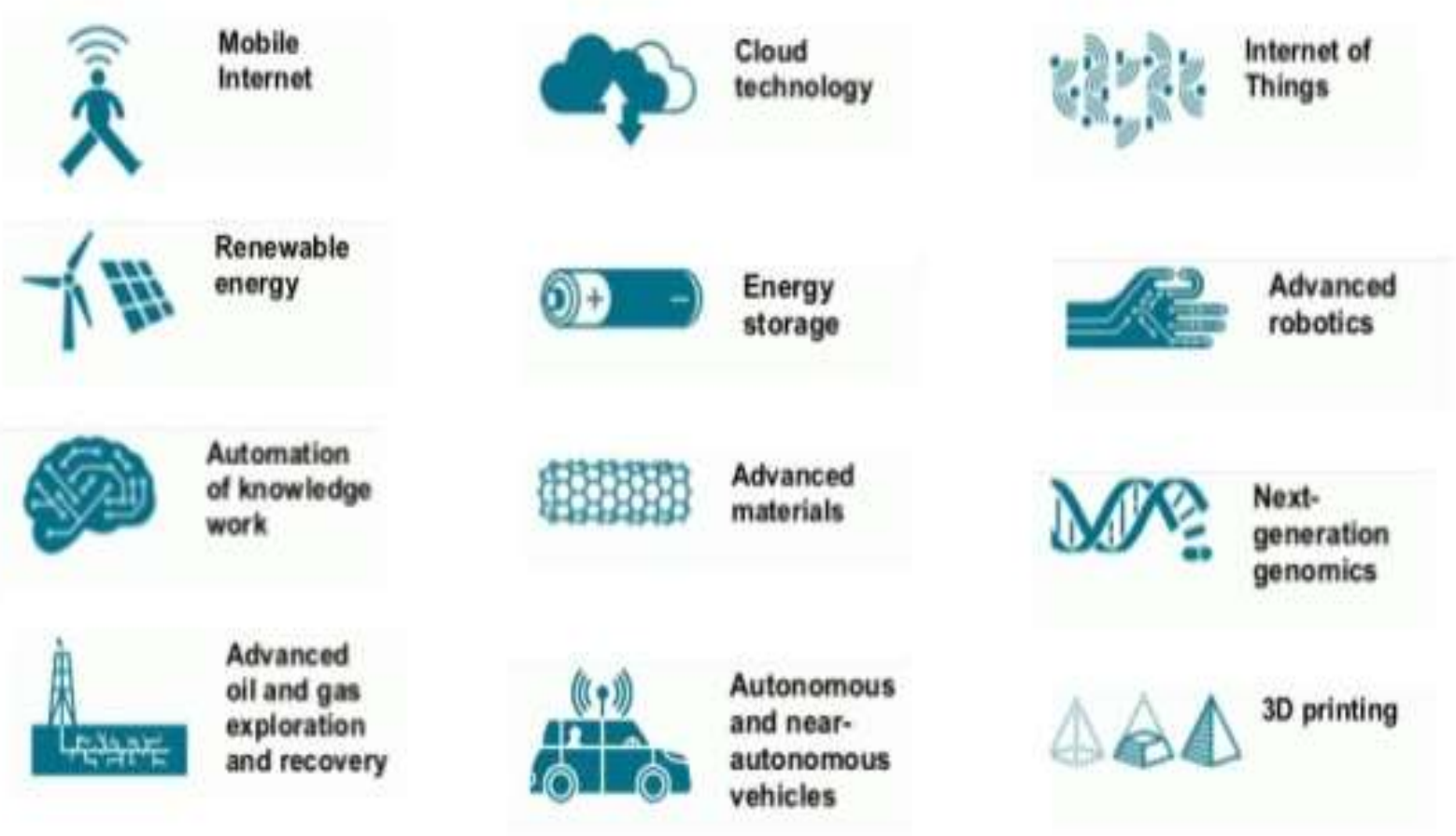
DISRUPTIVE TECHNOLOGY

Are typically

- Cheaper
- Smaller
- Simpler, and
- More convenient to use
- Accessible to new users

DISRUPTIVE TECHNOLOGIES

2018



Outline

- Data, Data, Data -> Data disruption
- What are disruptive technologies?
- What is the impact of disruptive technologies?
- Question & Propositions

WHAT IS THE IMPACT OF DISRUPTIVE TECHNOLOGIES?

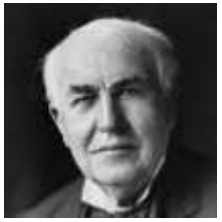
An Important Question…

Hey, this is new and exciting

Yeah, seen this all before

Two Predictions…

"Books will soon be obsolete in the public schools. Scholars will be instructed through the eye. … Our school system will be completely changed inside of ten years."

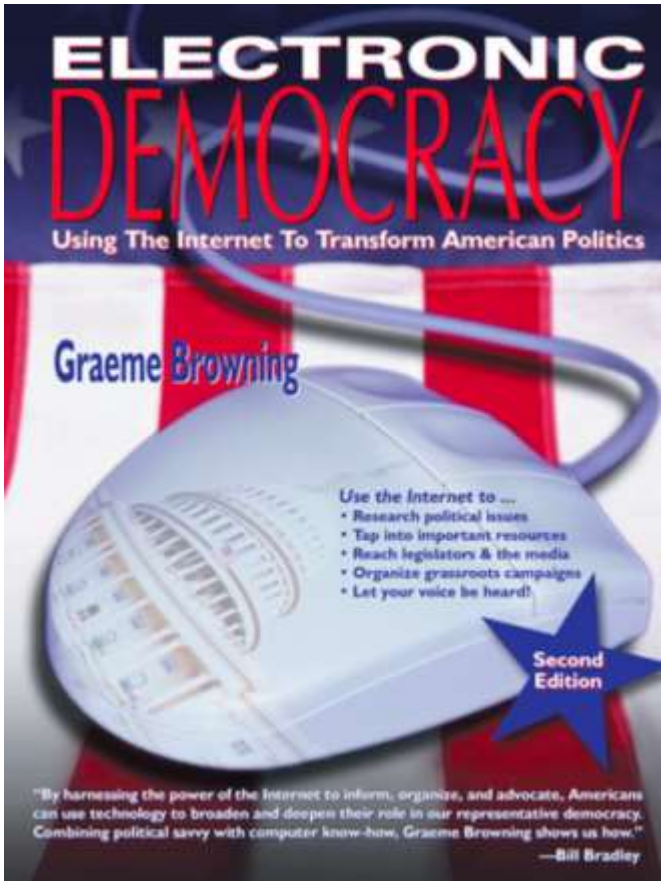


Thomas Edison - 1913

"In from three to eight years we will have a machine with the general intelligence of an average human being. I mean a machine that will be able to read Shakespeare, grease a car, play office politics, tell a joke, have a fight. At that point the machine will begin to educate itself with fantastic speed. In a few months it will be at genius level and a few months after that its powers will be incalculable."

Marvin Minsky - 1970

The Problem of Hyperbole

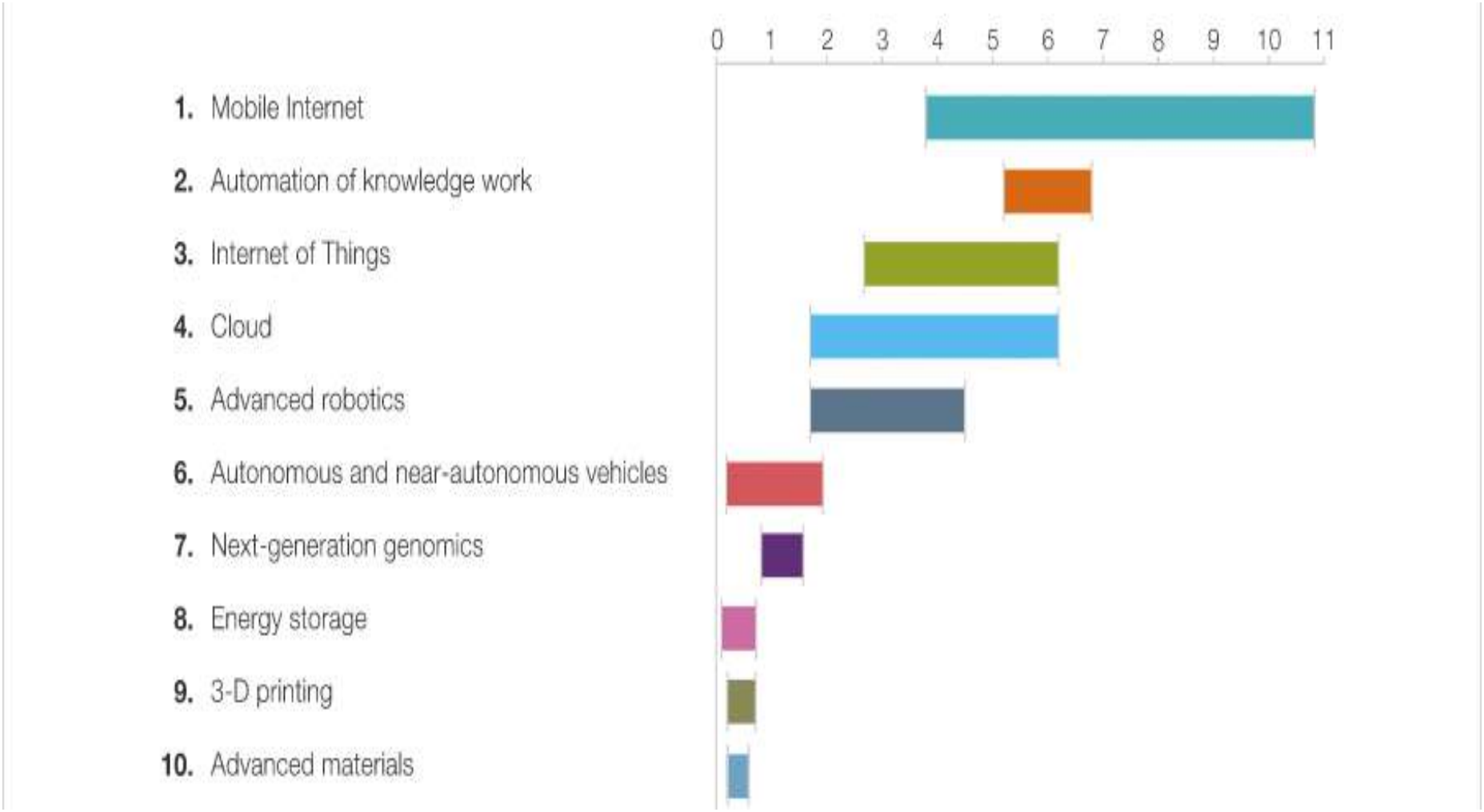


The mechanics of hyperbole in four easy steps:

1. ***Pick a technology***
2. ***Make a world-changing/ disrupting prediction***
3. ***Cherry pick some case studies to 'prove' your point***
4. ***Write a book.***

In particular - Disruptive technologies are no exception

Estimated potential economic impact of technologies across sized applications in 2025, $ trillion, annual

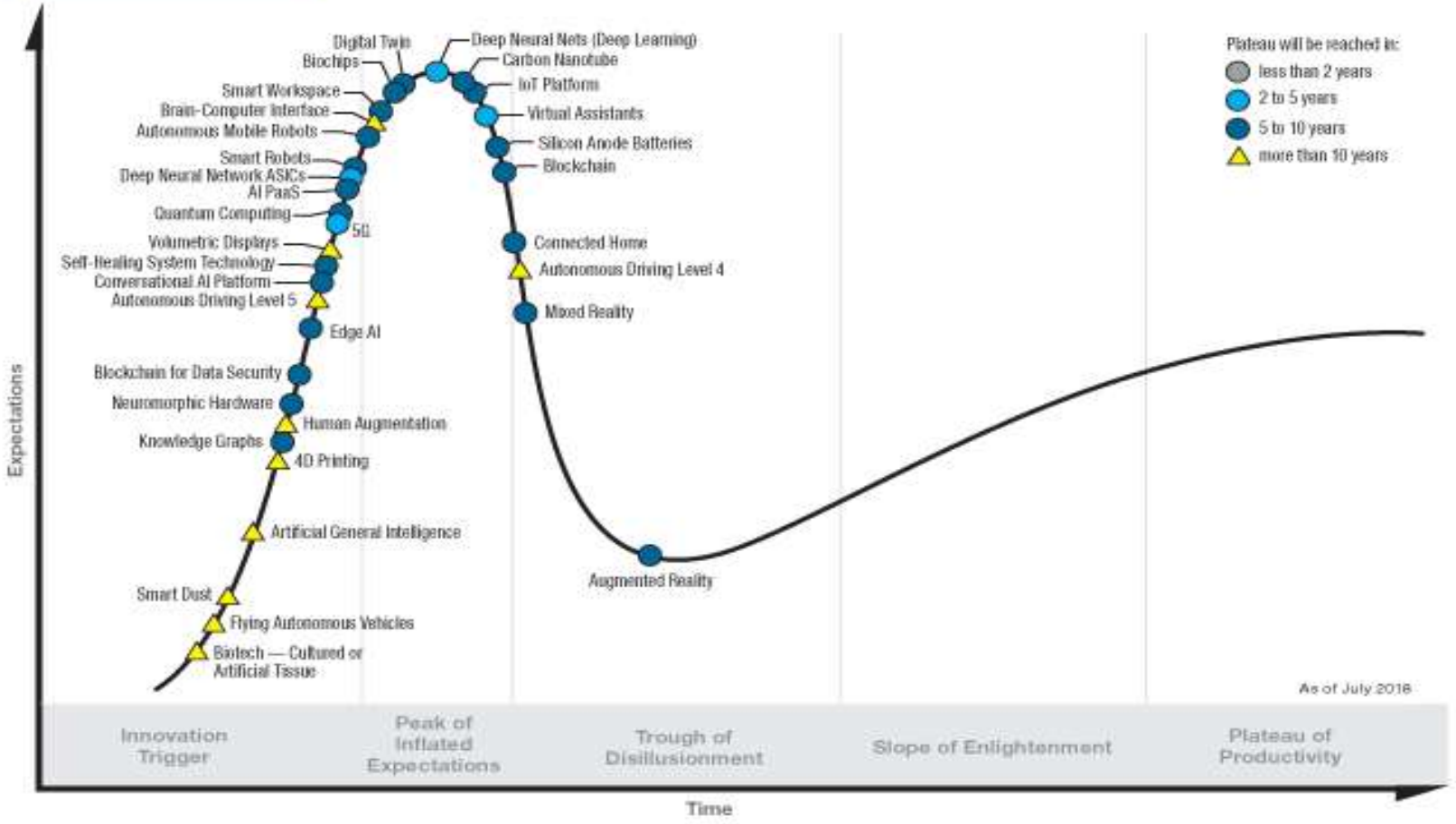


McKinsey Global Institute

IMPACTS OF DISRUPTIVE TECHNOLOGIES

- **Implications for individuals and societies**
- **Implications for organisations**
  - Creates new products and services
  - Shifts surplus from producers to consumers!
  - Changes in organizational structures
- **Implications for Economies and Governments**
  - Poses new regulatory and legal challenges

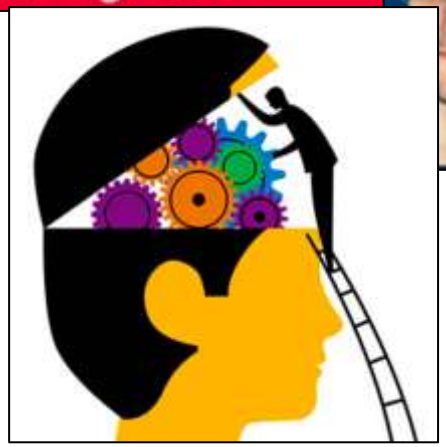
Hype Cycle for Emerging Technologies, 2018



gartner.com/SmarterWithGartner

Gartner.

The Dark Side



The Dark Side

Threats/risks include:

- Wrong investments
- Market loss
- De-anonymisation
- Unethical usage
- Citizens' privacy
- Discrimination
- Exclusion
- Illegal usage
- Misplaced trust

and not least…

- Misguided public policies

Take control of disruptive technology risks

EDUCATE

yourself about disruptive technology, terminology, innovations, and relevance to your company.

EXPAND

your network and foster collaboration through cross-functional teams and relationships and with outside experts.

PUSH

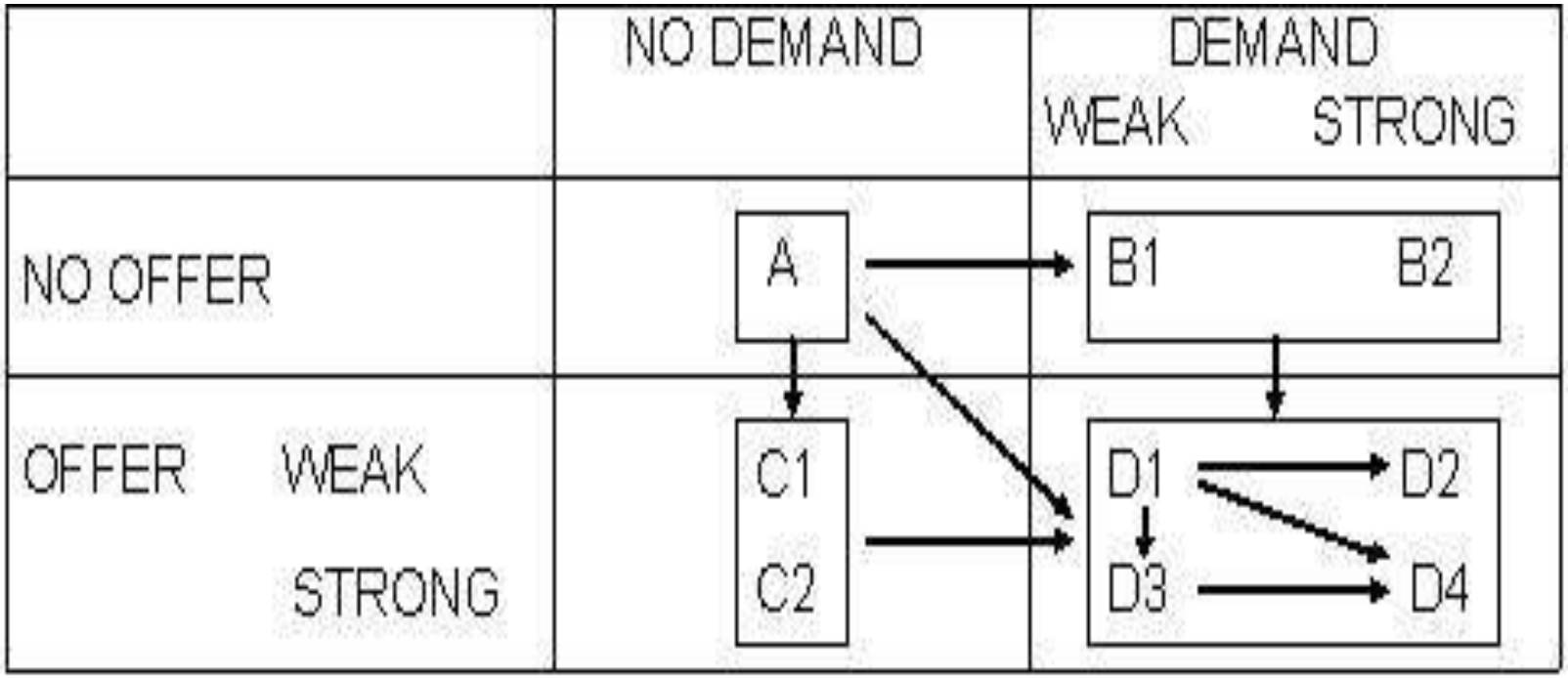
for investments in relevant data and analytics tools and skilled people to use them.

CONSIDER

the wider impacts — beyond cybersecurity — of distruptive technology on your company's risk profile.

Melissa Gale, 2017

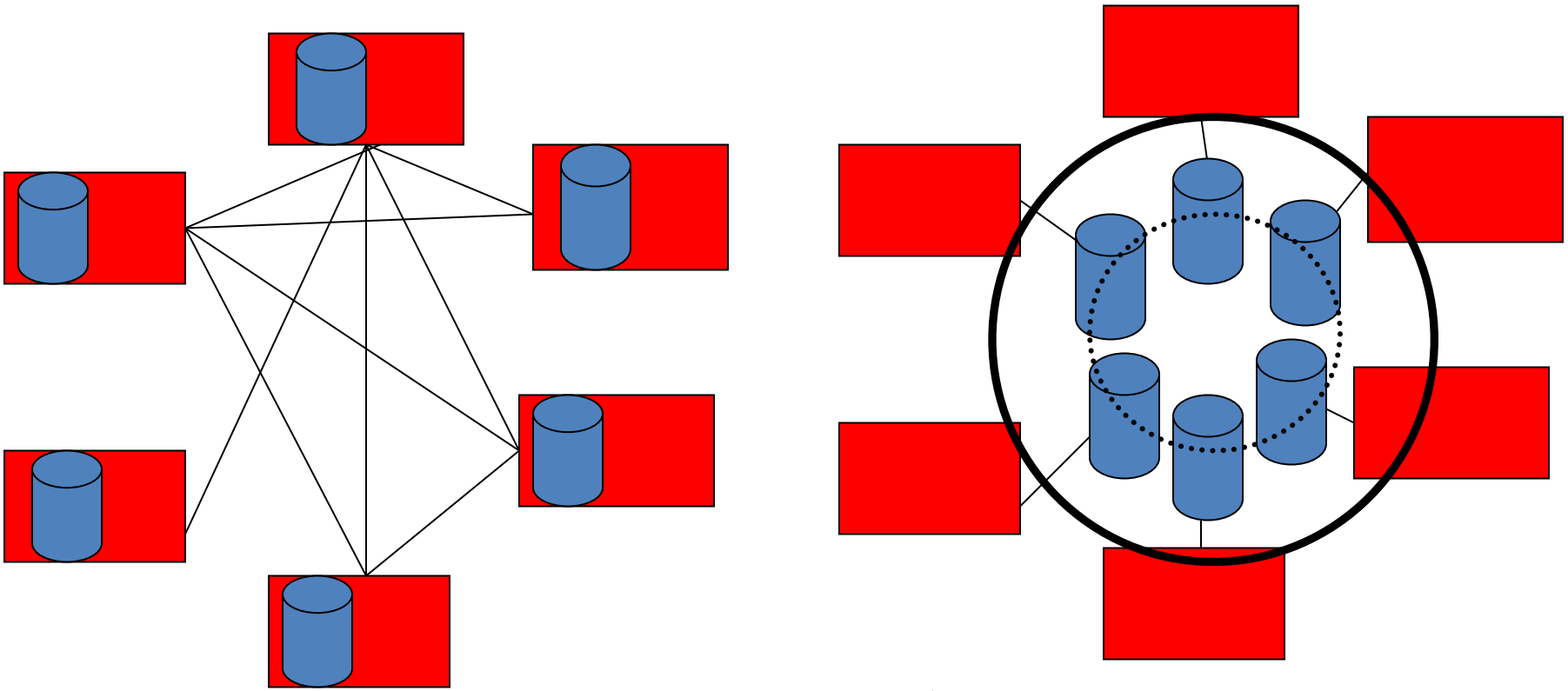
Recommendation:
Demand driven approach to Supply



Right answers to wrong questions:

- Supply driven approach to Demand

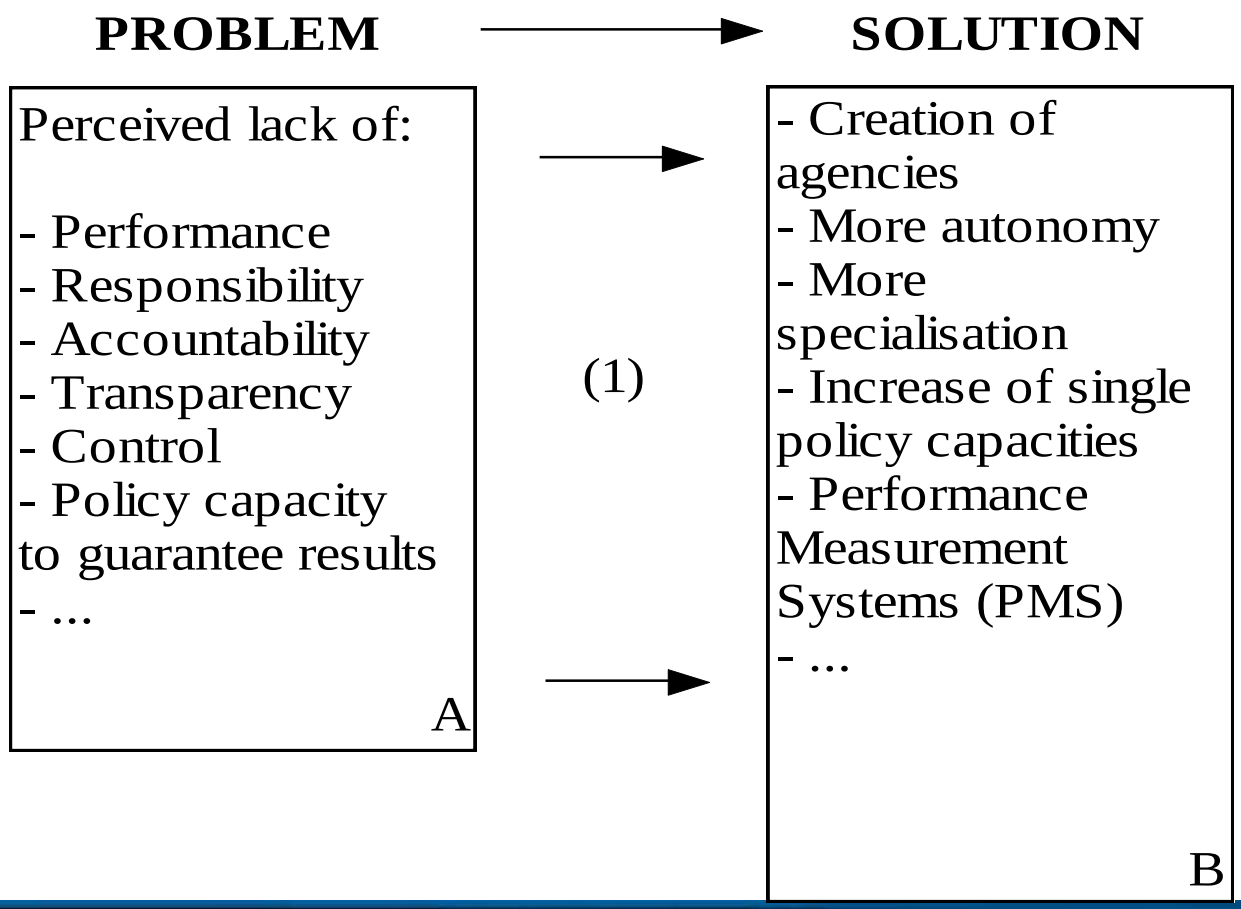
Recommendation:
Managing datasets with organisations



Organisations with Databases

Databases with Organisations

Recommendation:
Focus on solutions to solutions

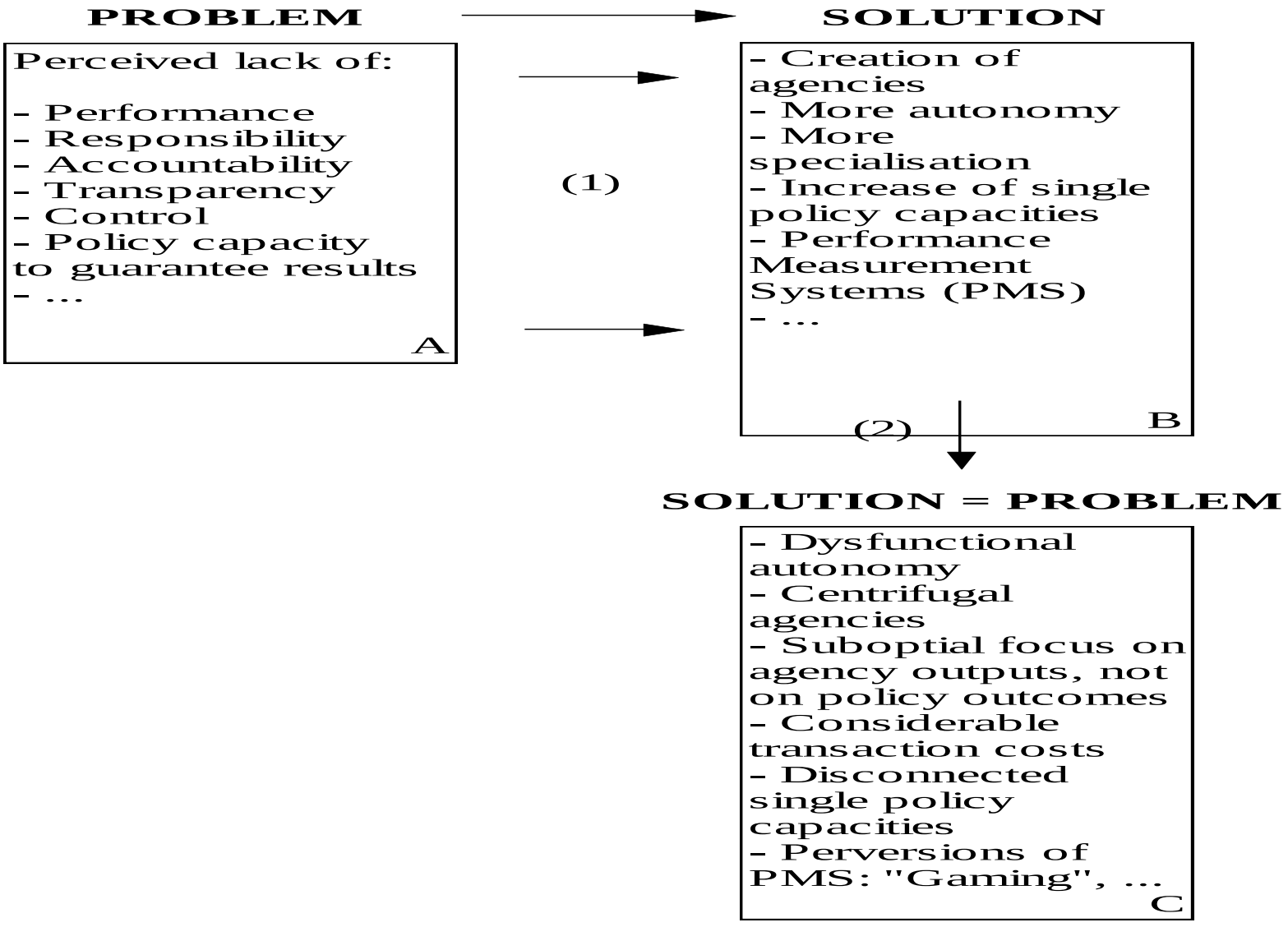


Recommendation:
Focus on solutions to solutions

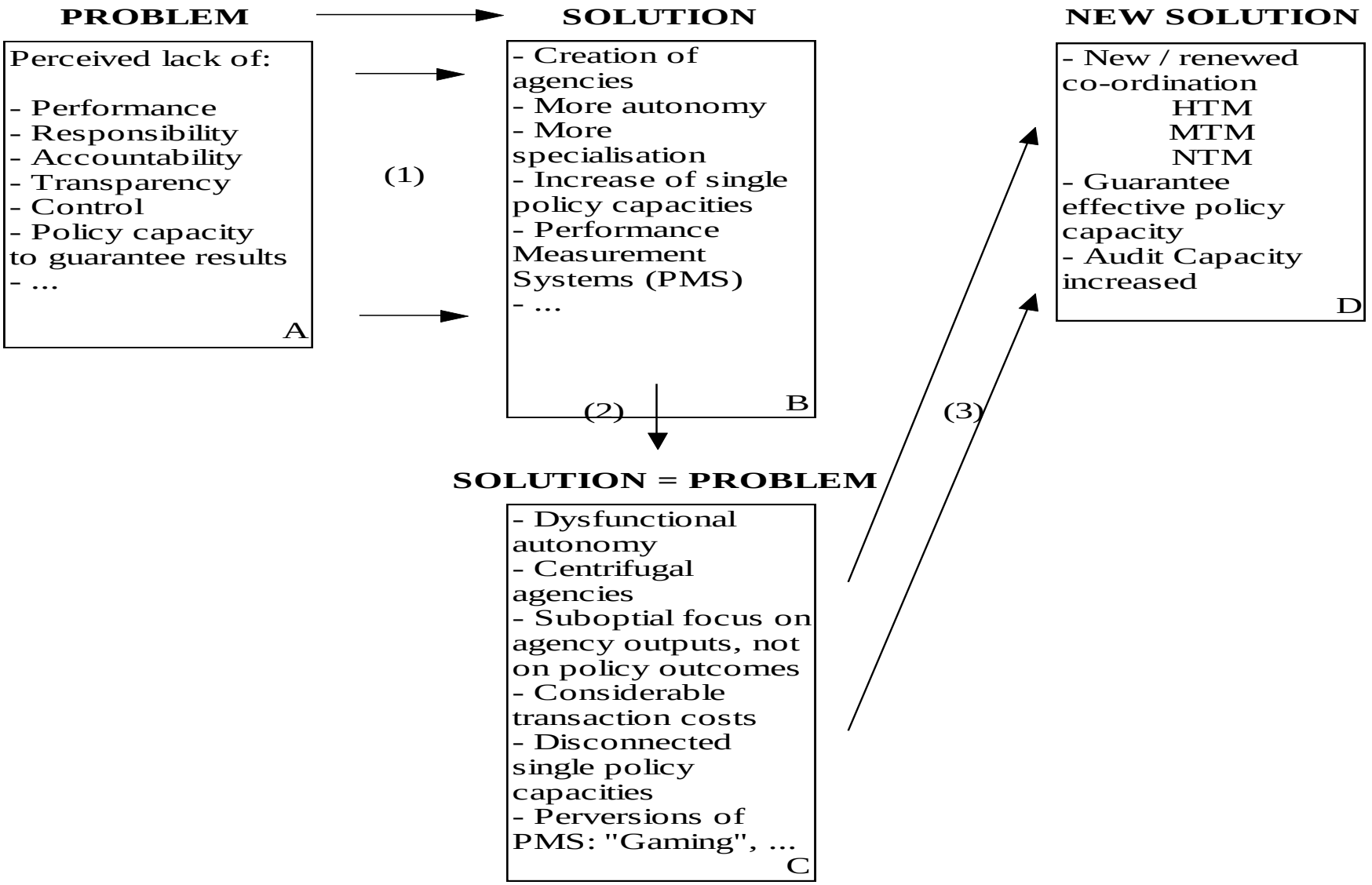
Solutions create new problems:

1. Wrong solutions for right problems
2. Right solutions but bad implementation
3. Right solutions, correct implementation, but solutions disconnect from problems

Recommendation:
Focus on solutions to solutions



Recommendation:
Focus on solutions to solutions



Recommendation:
Focus on solutions to solutions

- Focus from solutions to solutions
- Be aware of the Problem -> Solution -> Problem –> Solution process
- Focus on the right and relevant solutions together with stakeholders
- Focus on the correct implementation

Recommendation:
Invest in Interdisciplinarity

- Establish multidisciplinary task force(s)
- Operate simultaneously, complementary and not sequentially

Recommendation:
Build competent capacity

- Identify the future needs!
- Provide the right knowledge, skills and attitude
- Set up strong programs

Concluding Reflections

Yes, disruptive technologies are new and yes, they may turn out to be valuable

It would be wise not to expect miracles and radical changes

Need to think carefully about how you use a specific disruptive technology

One part of a much larger and more complex set of (data) issues

If you torture technologies long enough they will confess to anything

Strategy: How to deal with disruptive technologies?

Outline

- Data, Data, Data -> Data disruption
- What are disruptive technologies?
- What is the impact of disruptive technologies?
- Question & Propositions

Question

- Which technology will be the most disruptive for geoinformation and cartography?

The main beneficiary of disruptive technology is:

1. PUBLIC ADMINISTRATIONS
2. PRIVATE COMPANIES
3. ACADEMIA
4. NGOs
5. CITIZENS

Other important sector(s)?

What is the main benefit of disruptive technologies for public administrations?

1. MORE SDI-EXPERTISE
2. COST AND TIME SAVINGS
3. BETTER SERVICE DELIVERY
4. MORE EFFECTIVE POLICY-MAKING
5. INCREASED COLLABORATION

Other Benefit(s) for public administrations?

What is the main benefit of disruptive technologies for private companies?

1. COST AND TIME SAVINGS
2. INCREASED BUSINESSES
3. BETTER SERVICE DELIVERY
4. DELIVERY OF NEW SERVICES AND PRODUCTS

Other important benefit(s) for private companies?

What is the main benefit of disruptive technologies for Citizens?

1. BETTER QUALITY OF LIFE
2. ENHANCED PERSONAL PERFORMANCE
3. HIGHER CITIZENS ENGAGEMENT
4. ECONOMIC DEVELOPMENT
5. TIME SAVINGS

Other important benefit(s) for citizens?

The main bottleneck for disruptive technologies is:

1. TECHNOLOGICAL
2. POLITICAL
3. LEGAL
4. FINANCIAL
5. CULTURAL
6. HUMAN RESOURCES

Other important bottleneck(s)?

Thanks for your attention

Joep.Crompvoets@kuleuven.be