Work, Professions and Organizations:
Tensions, Paths and Public Policies

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# INNOVATION, WORK & EMPLOYMENT: THE CHALLENGES OF DIGITALISATION AND ARTIFICIAL INTELLIGENCE

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# Agradecimentos

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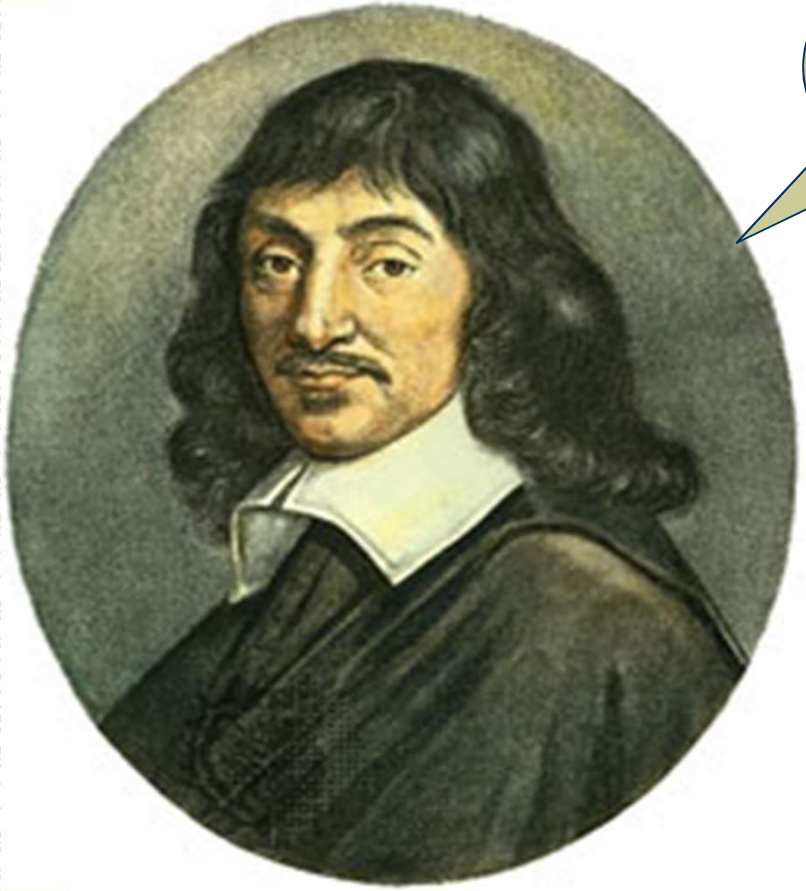
# Volkswagen to slash 30,000 jobs by 2021

(The Telegraph, 18 Nov. 2016)

# The Tale of the Philosopher and the Robot



*Cogito, Ergo Sum*

*Sum, Ergo Cogito*

# And a plain truth by another, less known, Philosopher…

# Agenda

1. Innovation: Concept and Challenges
2. The Developments in Digitalisation and Artificial Intelligence
3. Technological Unemployment: An Historical Retrospect
4. Perspectives on the Future Effects of Digitalisation and IA on Employment
5. What is the Future likely to bring?

# Innovation: The Concept

- Innovation is change!
- Innovation has different dimensions: technological, commercial, organisational, social
- Innovation may draw from scientific developments but it does not necessarily stems from Science
- **Innovation diffusion has technological dimensions but is chiefly a social process**
- Over the long term innovation has bem used to gain power, to improve life conditions, to earn money...
  ...**and to save labour**

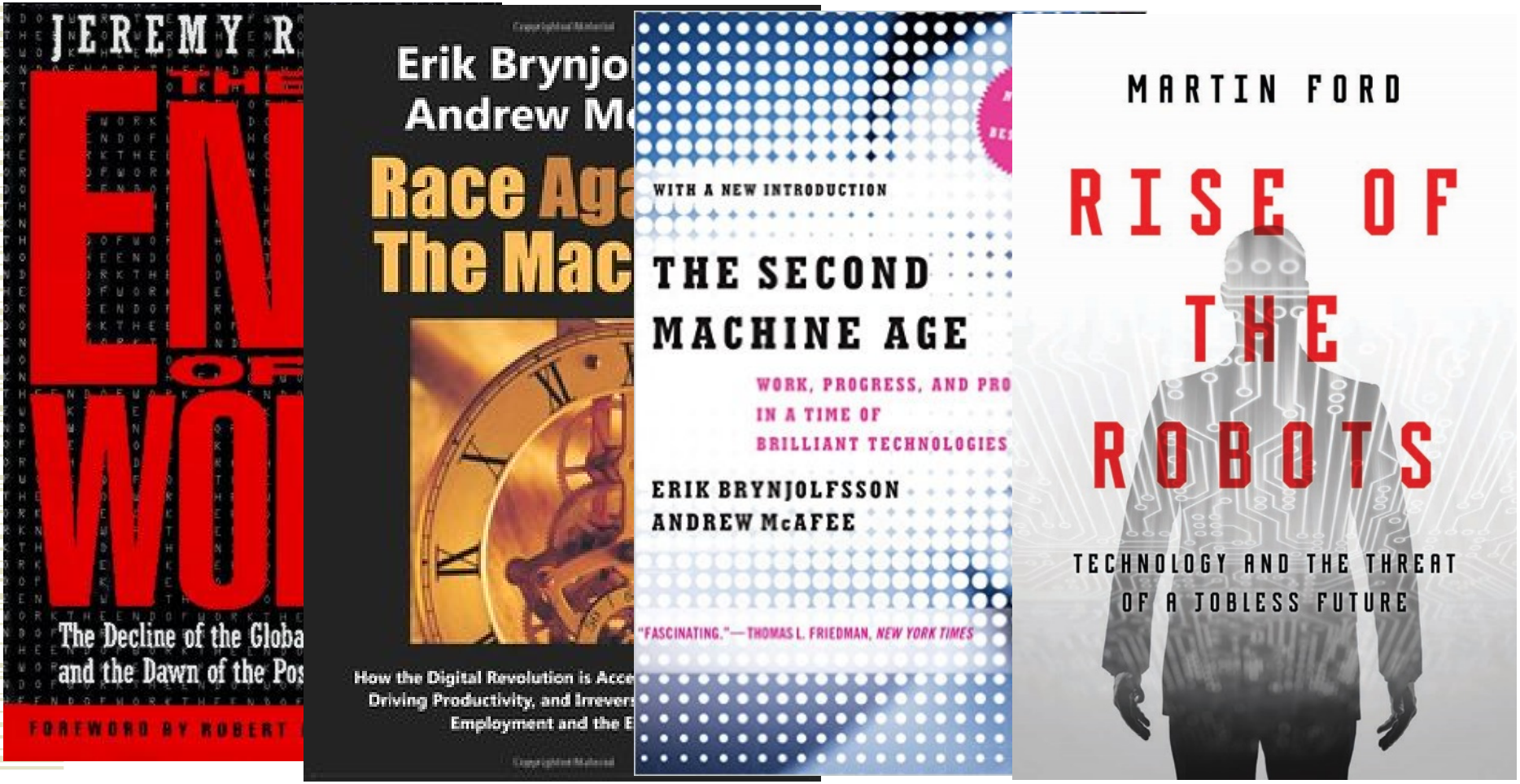
# Innovation: The Challenges

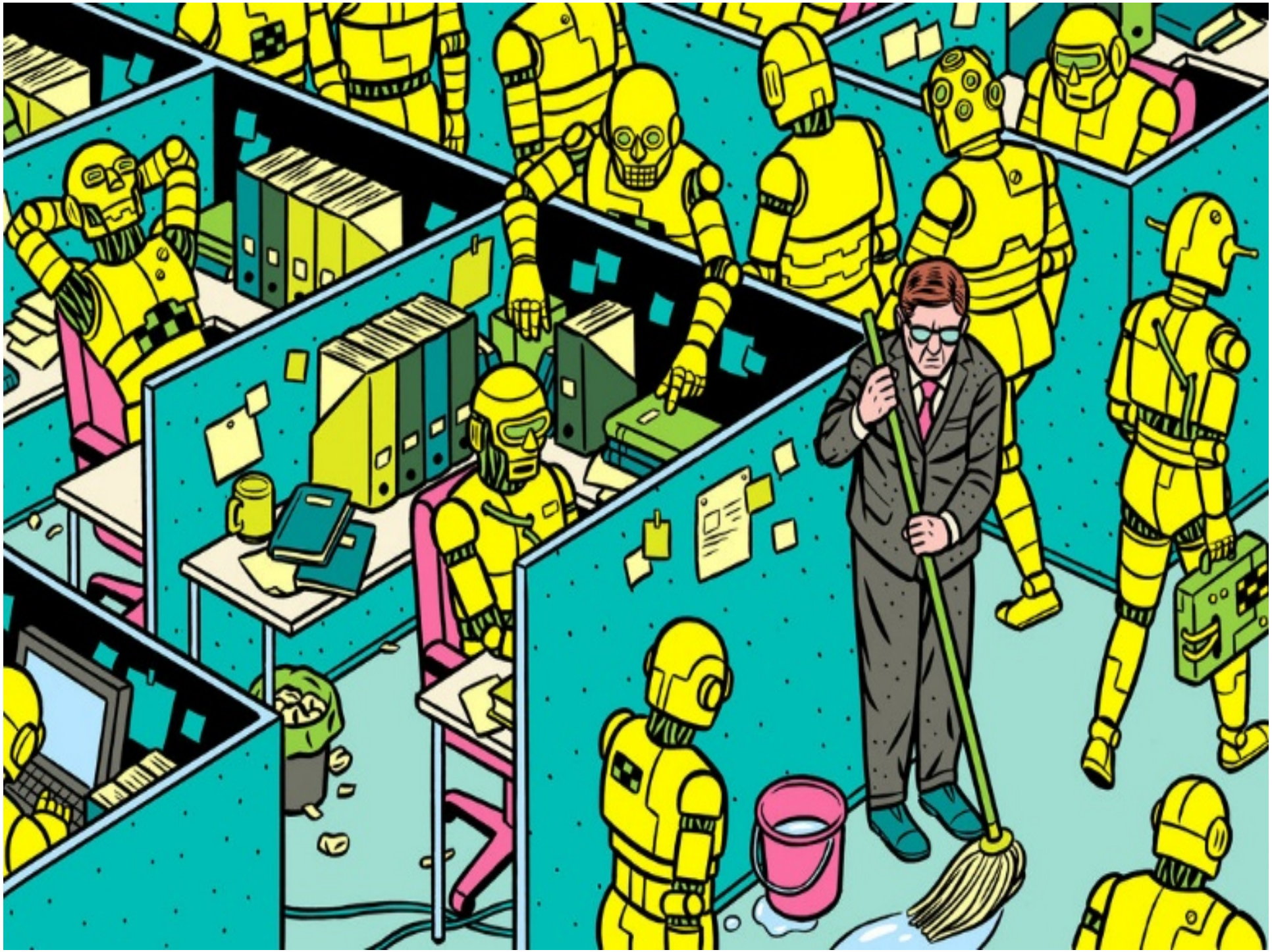
- Innovation is a process of **creative destruction**
- **Change is disturbing**: at least in the short term, not everybody profits from innovation
- The 'losers' often try to fight innovation
- The 'winners' often do not anticipate the negative consequences of innovation and their waves
- 'Winning' is in most cases temporary
- There is not a 'Best Solution': the solution adopted is a consequence of the interplay of managerial, technological, regulatory and social factors

# Innovation: The Adjacent Possible as Challenge and Opportunity

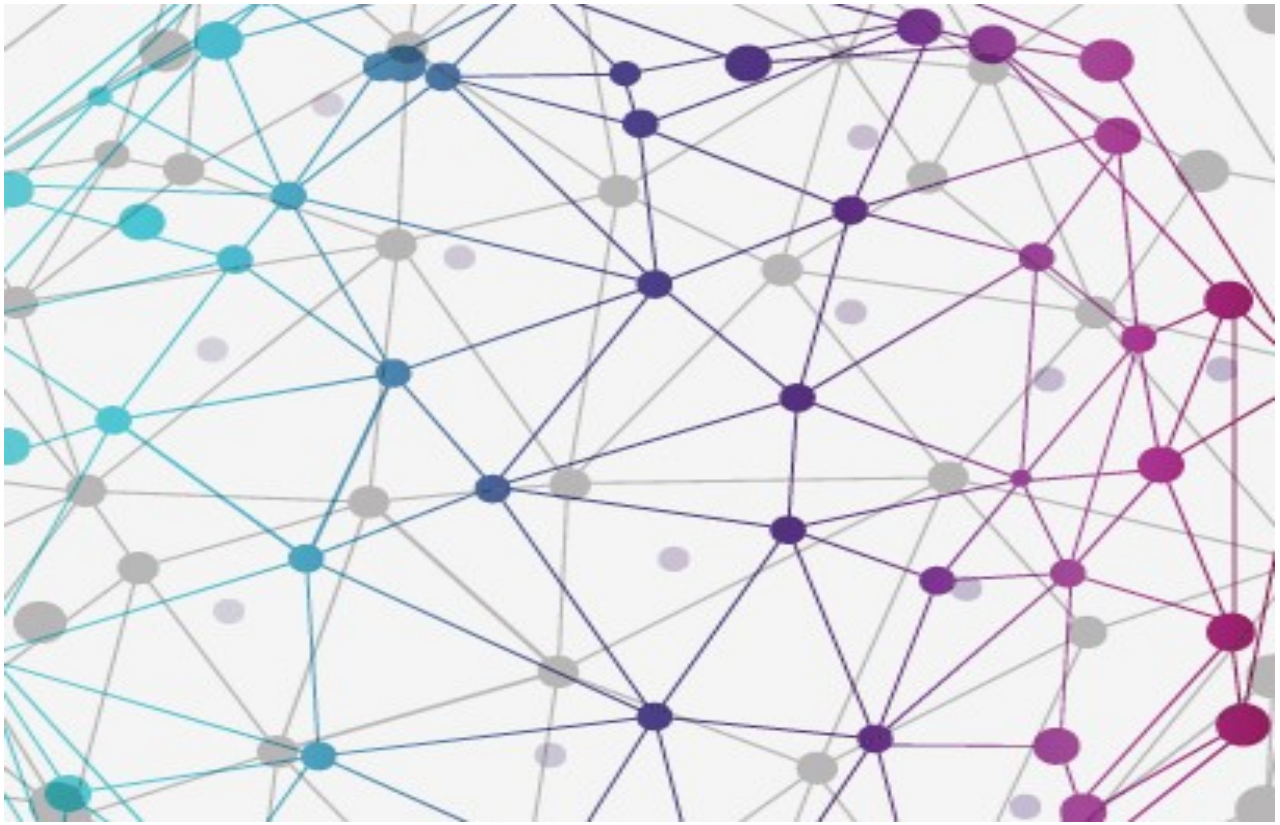
- The Concept (Stuart Kauffman): A set of opportunities whose consequences are never fully anticipated
- The application to innovation (Steven Johnson): Exploring the adjacent possible is the basis for innovation
- "Each new new combination pushes further new combinations towards the adjacent possible" (Johnson, 2010: 39)
- The relevance of networking as an instrument for exploring the Adjacent Possible

# The Developments in Digitalisation and Artificial Intelligence





# The Developments in Digitalisation and Artificial Intelligence: The Platform Economy [1]

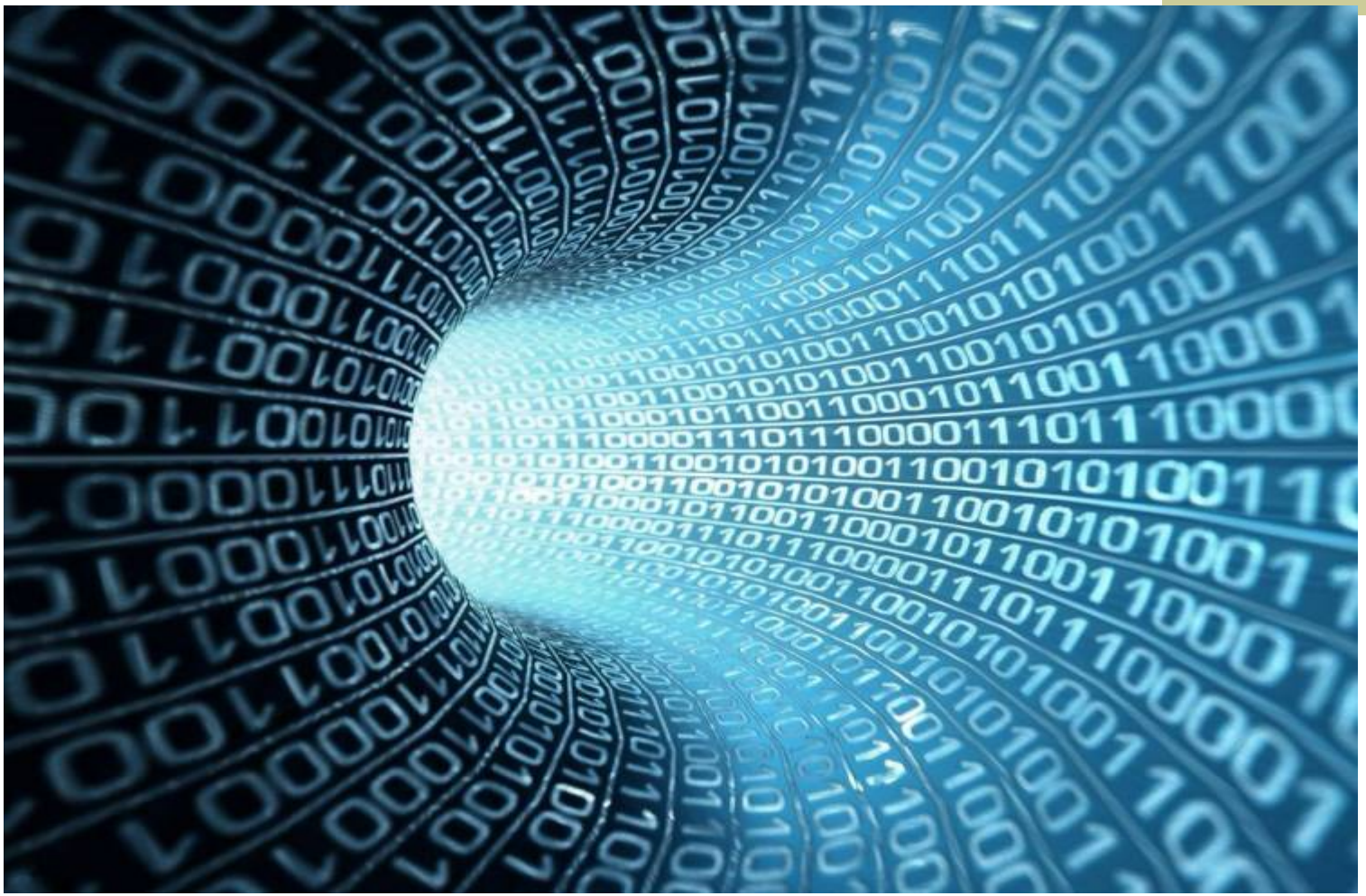


http://thecge.net/category/research/the-emerging-platform-economy/

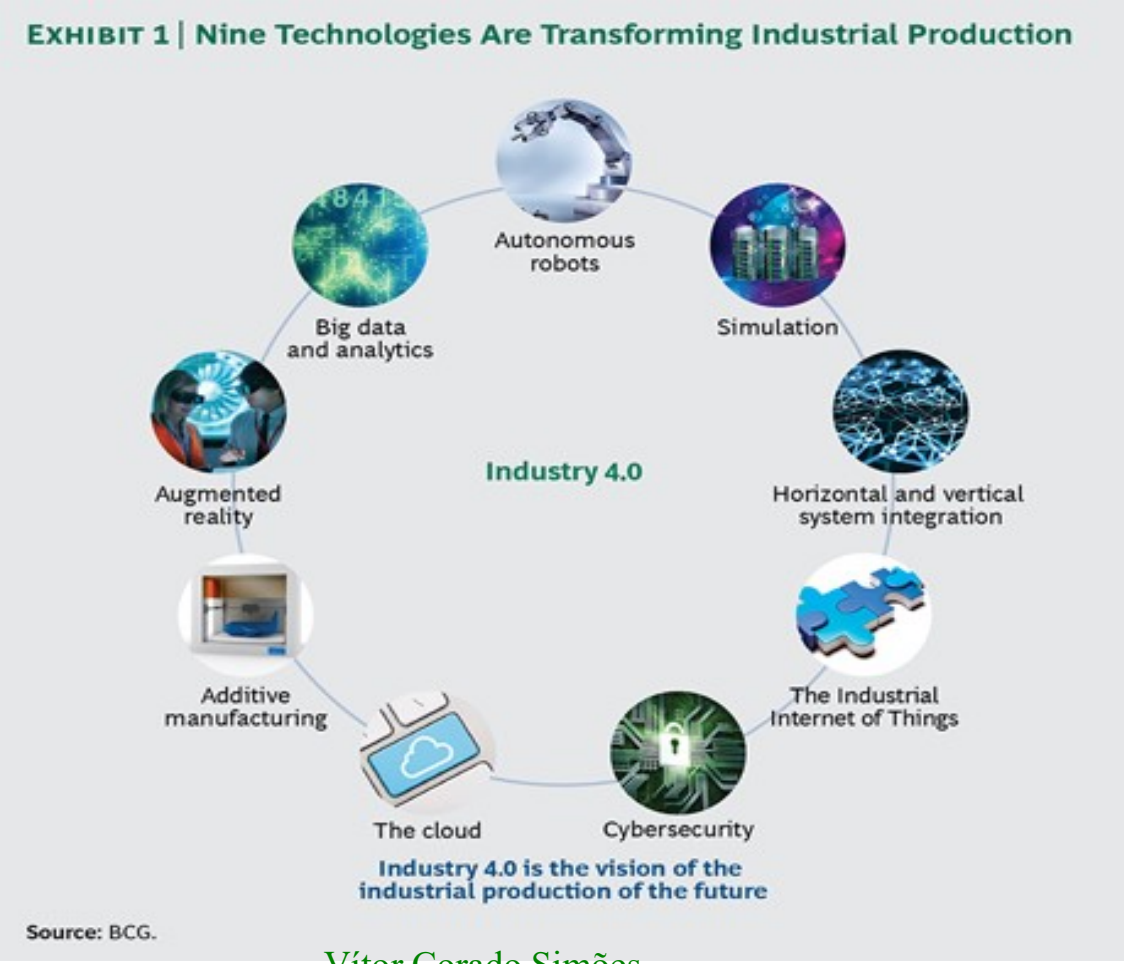
# The Developments in Digitalisation and Artificial Intelligence: The Platform Economy [2]

- Technology-enabled Worldwide platforms leveraging opportunities for sharing and participation
- The role of  Social Media
- Worldwide platforms as triggers for Collaborative Innovation
- Worldwide platforms as Business Models (Amazon, AirBnb, Alibaba, Booking.com, Uber)
- The parax of sharing *versus* appropriation
- The need for Worldwide regulation

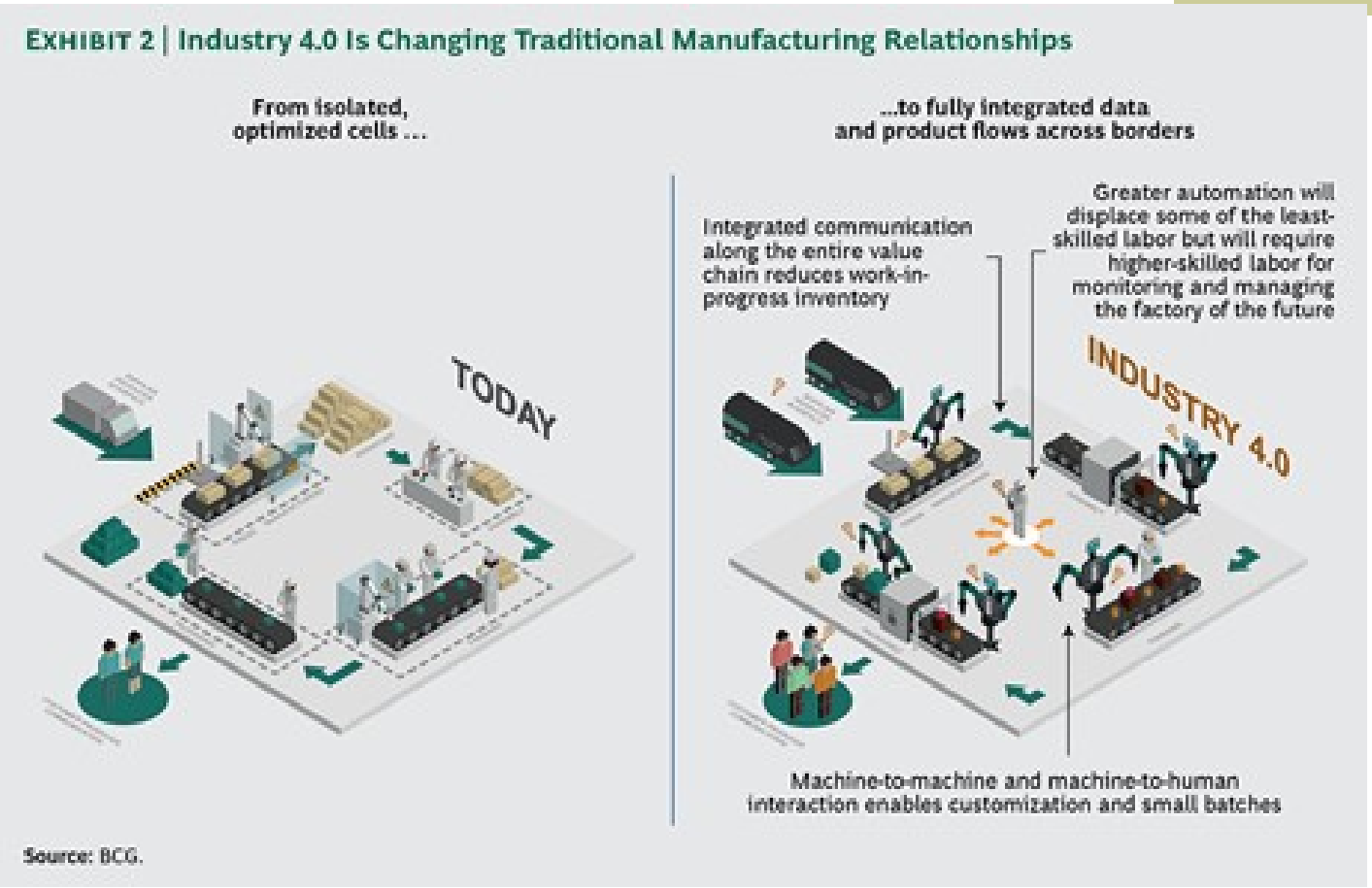
# The Developments in Digitalisation and Artificial Intelligence: Big Data



# The Developments in Digitalisation and Artificial Intelligence: Industry 4.0

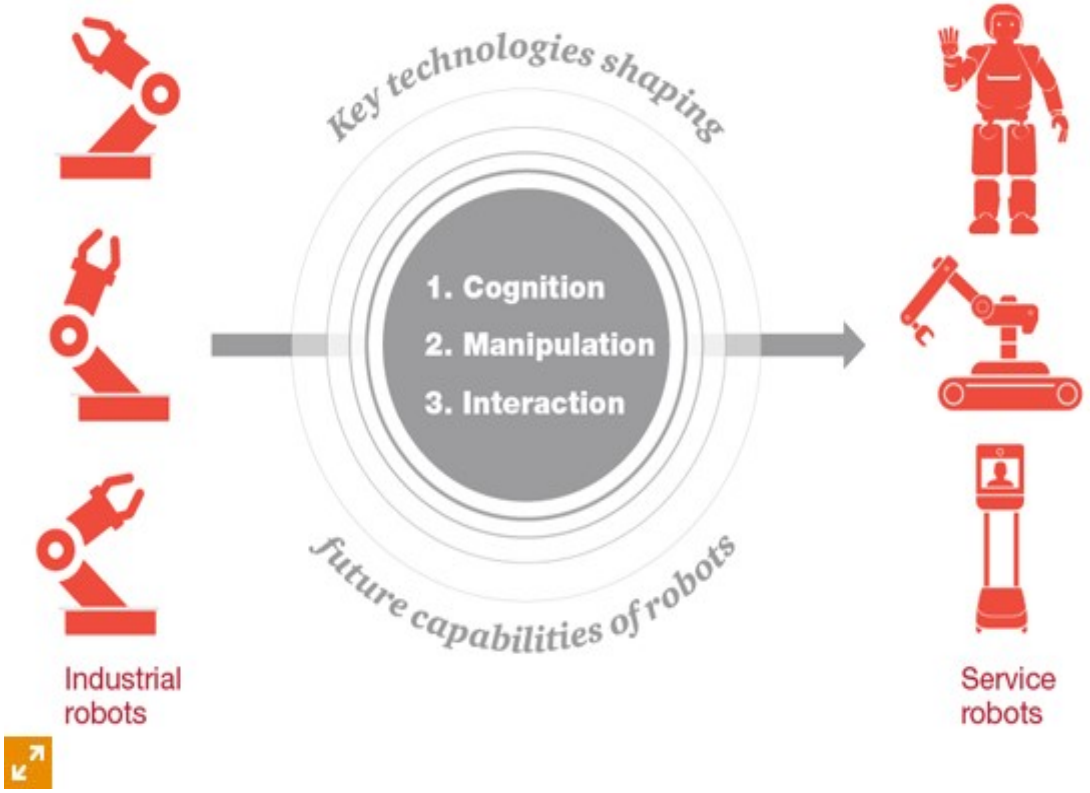


# The Developments in Digitalisation and Artificial Intelligence: The Connected Plant



# The Developments in Digitalisation and Artificial Intelligence: The Rise of the Robots

*Figure 1: Technological progress in three emerging domains is moving the robotics industry toward service robots.*



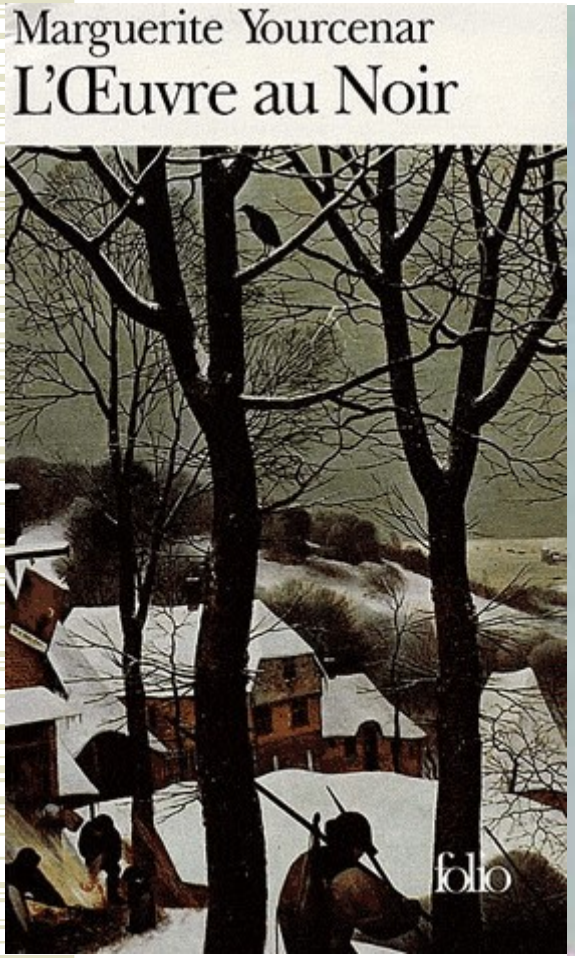
# The Developments in Digitalisation and Artificial Intelligence: Policy Intentions

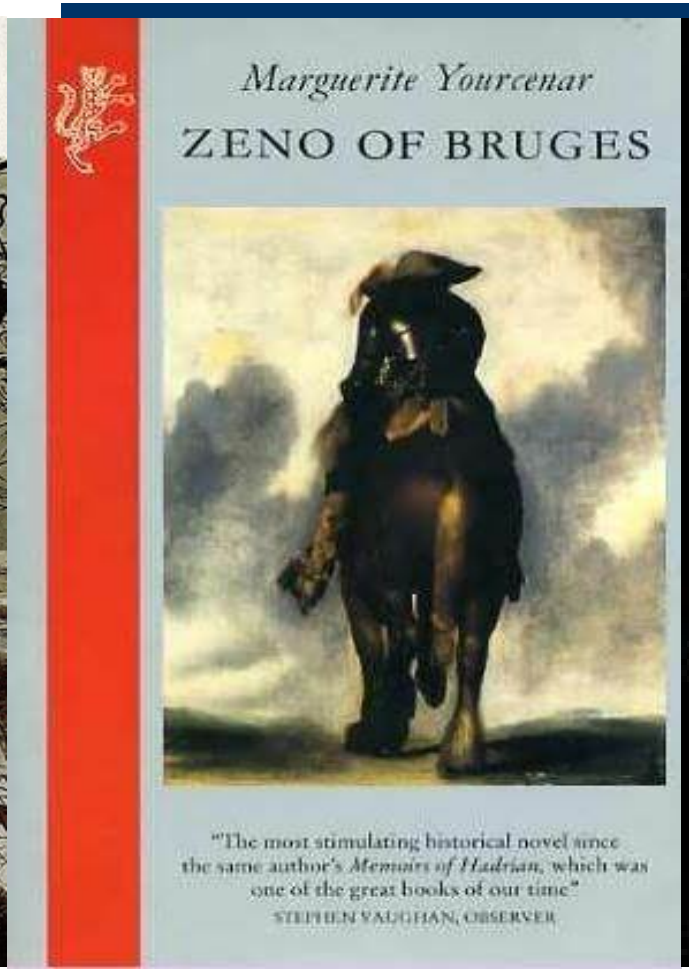
# Technological Unemployment: An Historical Retrospect

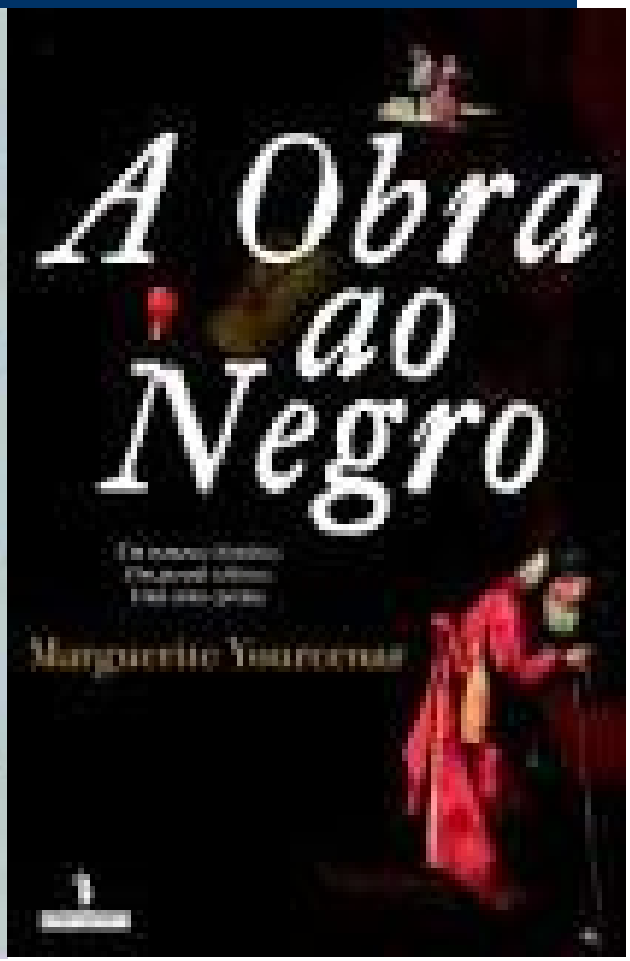
- Textile Guilds against first mechanical looms (Bruges, 16th century)
- The Luddites (1811-16)
- As Máquinas e a Alienação do Trabalho (Adam Smith, Marx)
- "Evils of the Factory System: Demonstrated by Parliamentary Evidence" (British Parliament, 1837)
- The 1964 US 'Blue Ribbon National Commission on Technology, Automation and Economic Progress'
- Nowadays, Taxi drivers against Uber

Source (in part): Mokyr et al. (2015)

# Textile Guilds and Mechanical Looms



# THE OUTLOOK FOR TECHNOLOGICAL CHANGE AND EMPLOYMENT

**ppendix Volume I**
**ECHNOLOGY AND THE AMERICAN ECONOMY,**
**he Report of the Commission**

**udies prepared for the National Commission on Technology, Automation, and Economic Progress • February 1966**

For sale by the Superintendent of Documents, U.S. Government Printing Office Washington, D.C., 20402 - Price $2.25


3067 HND
SP

# Technological Unemployment: An Historical Retrospect

## Two Economists' Accounts

J. M. Keynes (1930): Economic Possibilities for our Grandchildren
15 working hours per week to counterveil the risk of technological unemployment

Herbert Simon (1960): The Corporation: Will it be Managed by Machines? The role of cognitive comparative advantage

# Perspectives on the future effects of Digitalisation and IA on Employment

## Two Contrasting Approaches

1. **The Pessimists** (Brynjolfsson & McAffee, 2011, 2014; Ford, 2015; Frey & Osborne, 2013; Bowles, 2015): The labour substitution effect will be huge due to exponential diffusion levels
2. **The 'Optimists'** (Arntz et al., 2016; Autor, 2015; BCG, 2015; Denning, 2015; Langlois, 2002): The counterveiling effects of oportunities for complementarity and cognitive comparative advantage

# Brynjolfsson & McAfee (2014: 11)

"Rapid and accelerating digitization is likely to bring economic rather than environmental disruption, stemming from the fact that as computers get more powerful, companies have less need for some kinds of workers. Technological progress is going to leave behind some people, perhaps even a lot of people, as it races ahead. As we'll demonstrate, there's never been a better time to be a worker with special skills or the right education, because these people can use technology to create and capture value. However, there's never been a worse time to be a worker with only 'ordinary' skills and abilities to offer, because computers, robots, and other digital technologies are acquiring these skills and abilities at an extraordinary rate".

# Diverging Findings in Empirical Research

- Frey & Osborne (2013): “About 47% of total US employment is at risk” (No time window defined)
- Bowles (2014): More than 51% of jobs in Germany are, in the long term, at risk of being replaced due to computerisation
- Rüssmann, Lorenz, Gerbert, Waldner, Justus, Engel & Harnisch (BCG, 2015): Over ten years, the implementation of Industry 4.0 in Germany will “create as many as 390,000 jobs”
- Bonin, Gregory & Zierahn (2015): 12% of jobs at risk in Germany
- Arntz, Gregory & Ziehrhn (OECD, 2016): “On average, accross the 21 OECD countries, 9% of jobs are automatable”

# Assessing the different approaches [1]

**Main problems with the 'Pessimists' approach:**

- Technological determinism
- Assumption of an exponential growth in automation
- Lack of a clear time window (v.g. Frey & Osborne, 2013)
- Underassessment of opportunities for complementarity
- Underassessment of social constraints
- Underassessment of the value of human tacit knowledge (Autor, 2015; Pfeiffer, 2016)
- Insufficient consideration of organisational inertia

# Assessing the different approaches [2]

**Main problems with the 'Optimists' approach:**

- The risks of looking at the future with the 'glasses of the past'
- The confidence in the application of a Creative Competitive Advantage reasoning
- The insufficient awareness about the cumulative effects of the intertwinning of different digitalisation and IA forces

# Assessing the different approaches [3]

- Hirsch-Kreinsen (2016) provides a balanced prospect
- The special issue of *Societies* (B. Moniz & Krings, 2016)
- The difficulty to anticipate how things will unfold: back to João Pinto's predictions
- Reality is different from personal perceptions
- The relevance of exploring diverse adjacent possible options

# What is the Future likely to bring?

**Starting point:** the difficulty in making predictions about how the Future will unveil…

"Airplanes are interesting toys but of no military value (French General Ferdinand Foch)

"There is no reason anyone would want a computer in their home" (Ken Olsen, Co-founder, DEC)

"640 K [of RAM] ought to be enough for anybody" (Bill Gates, Co-founder of Microsoft)

# Another prediction: Herbert Simon, Nobel Prize in Economics

"Within the near future – much less than twenty-five years- we shall have the technical capability of substituting machines for any and all human functions in organizations. Within the same period, we shall have acquired na extensive and empirically tested theory of human cognitive processes and their interaction with human emotions, attitudes, and values".

(Simon, 1960: 22 *in* Langlois, 2002)

# There are however trends which one needs to consider…

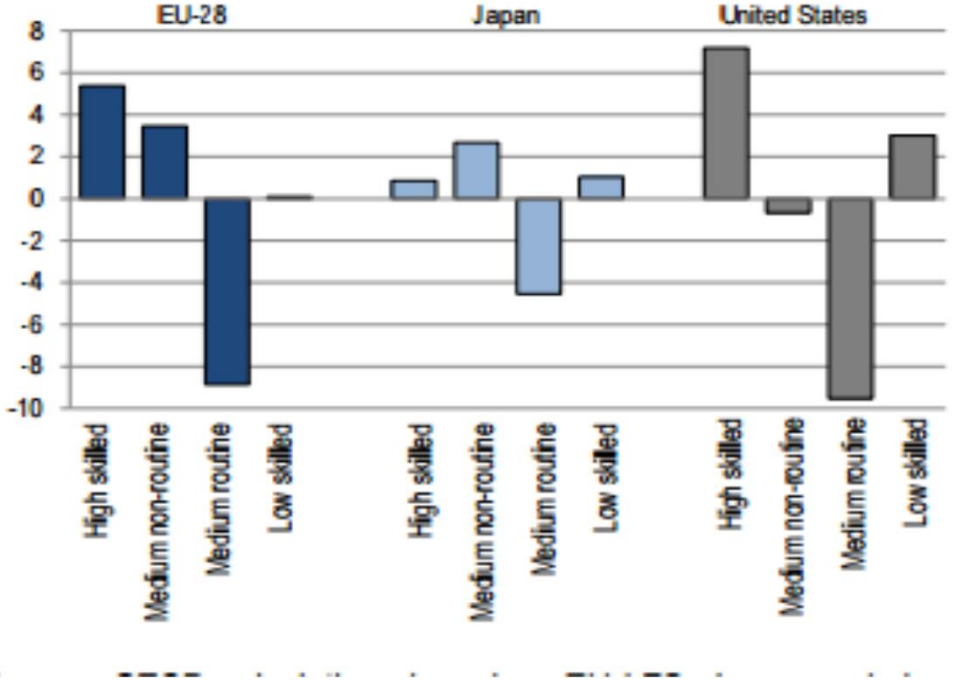
**6. Productivity and real hourly compensation, manufacturing sector, first quarter 1949–third quarter 2010**


NOTE: The shaded bars denote National Bureau of Economic Research (NBER)-designated recessions.

# There are however trends which one needs to consider…

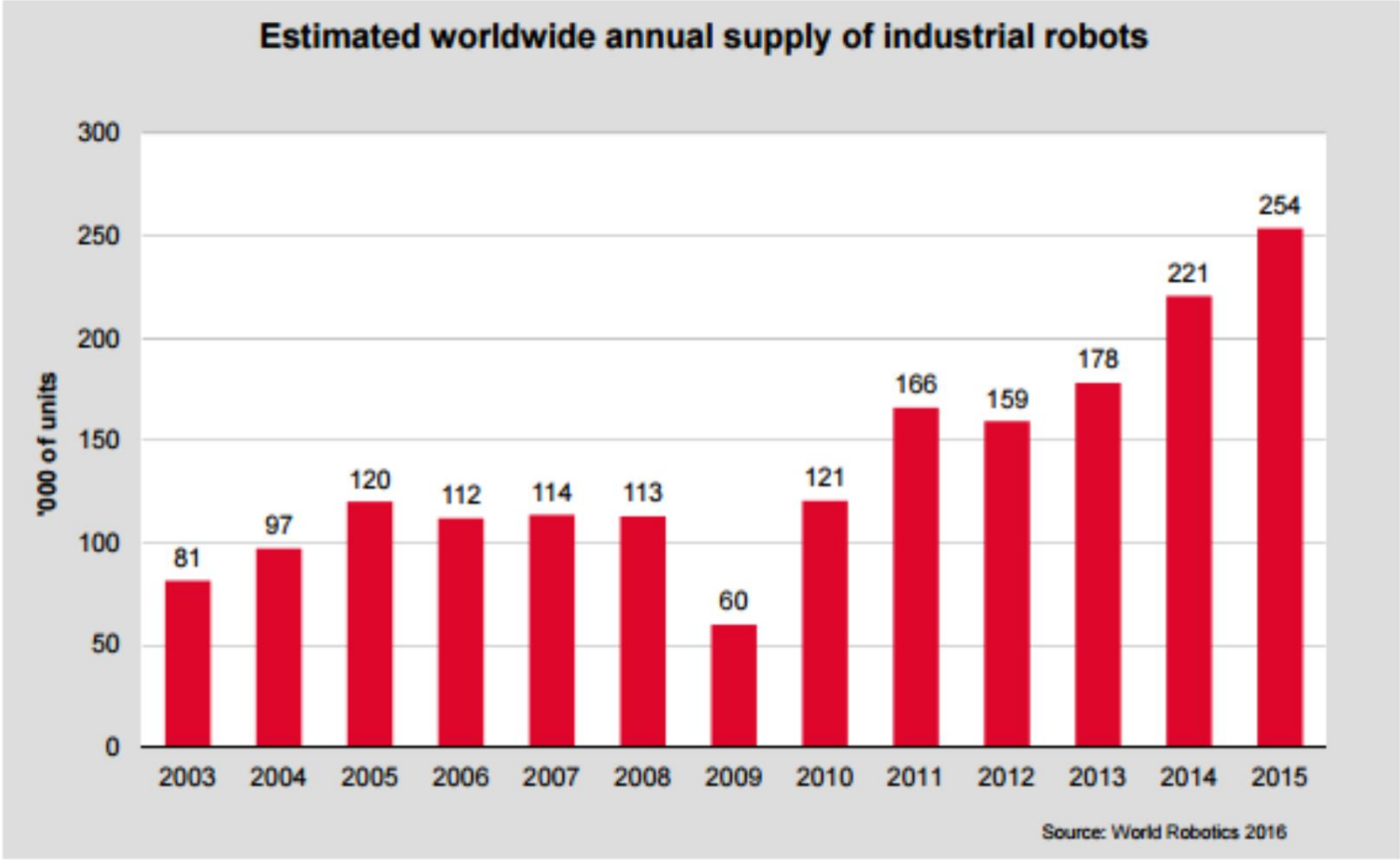
**Figure 1. Job polarisation in the European Union, Japan and the United States**

Percentage-point change in employment shares by occupation category, 2002-2014

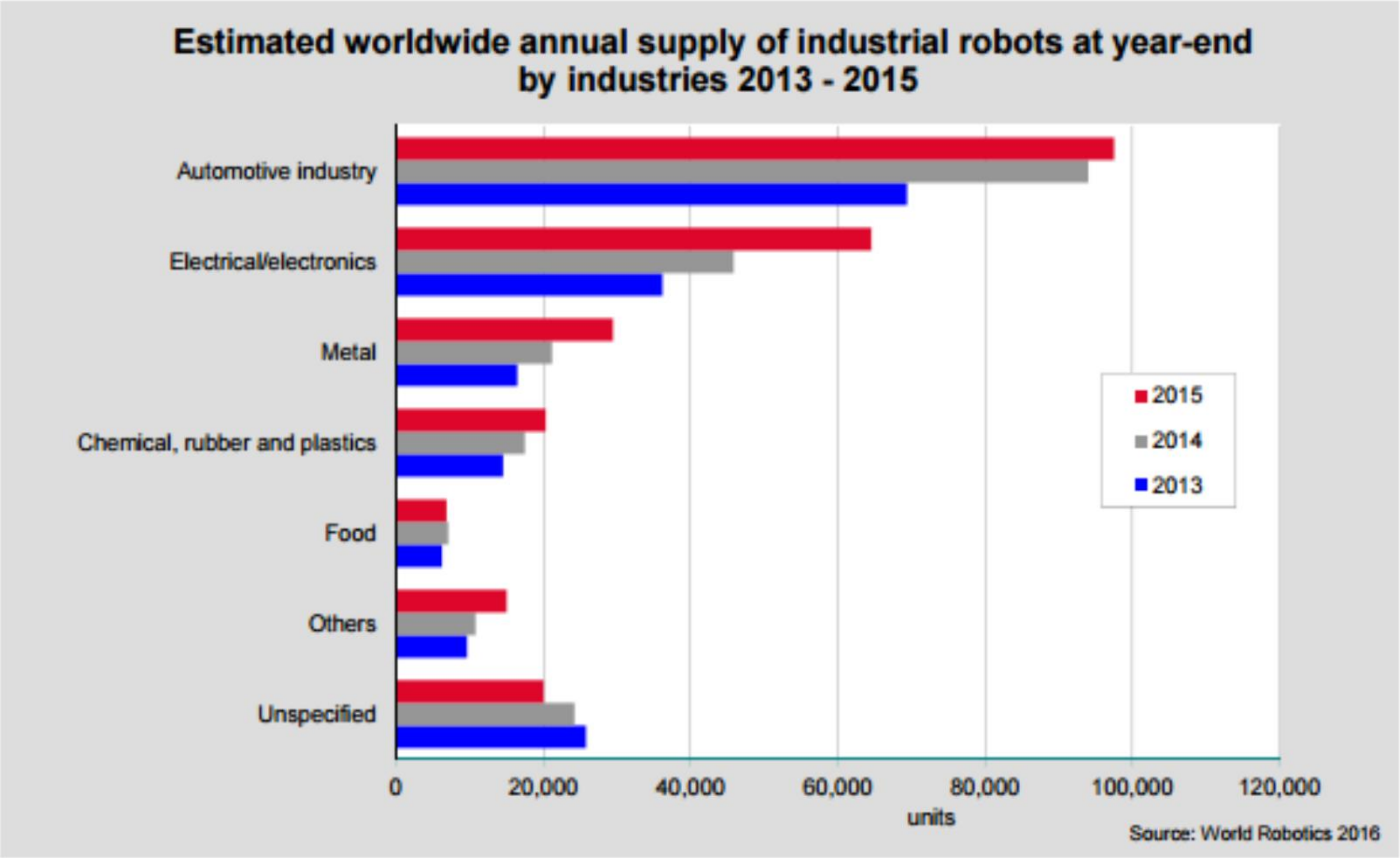



Source: OECD

# There are however trends which one needs to consider…



# There are however trends which one needs to consider…



# Which are the Activities less likely to be invaded by Robotisation?

**The Matrix of Autor, Levy & Murnane (2003)**

| | |
|---|---|
| **Manual Routine** | **Manual Non-Routine** |
| **Cognitive Routine** | **Cognitive Non-Routine** |

# Which are the activities less likely to be 'invaded' by robotisation?

- ✓Creative activities
- ✓Human interaction activities
- ✓Persuasion
- ✓Intuition
- ✓Artistic activities (can a computer play Tchekov?)
- ✓Decision-making in uncertain settings

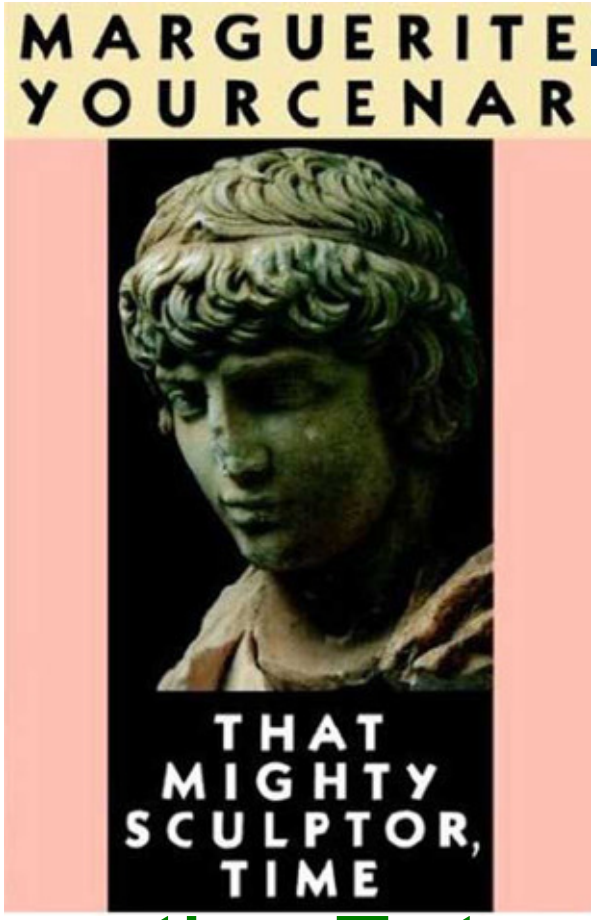
The Key Question: Can Big Data and Artificial Intelligence overcome Polanyi's Paradox?

# What is the Future likely to bring? Concluding ideas

1. A more mixed work environment, with increased Human-machine interaction
2. Increasing need for Humans to develop tacit capabilities
3. A wider diversity of employment forms, making the traditional labour contract more the exception than the norm (see the WTO Centenary Initiative)
4. The need for an increased adaptability towards change
5. The combination of new organisational structures (inc. platform organisations) with globalisation
6. New challenges for Democratic Governments (1) to regulate the labour market, enabling a 'fair' sharing of value added and (2) to reshape education systems to fight the risks of exclusion.

# How to increase the opportunities for complementarity?

# Coming back to Margueritte Yourcenar…




will tell us how the Future will unveil…

# Many thanks for your attention!

Muito Obrigado pela Atenção!