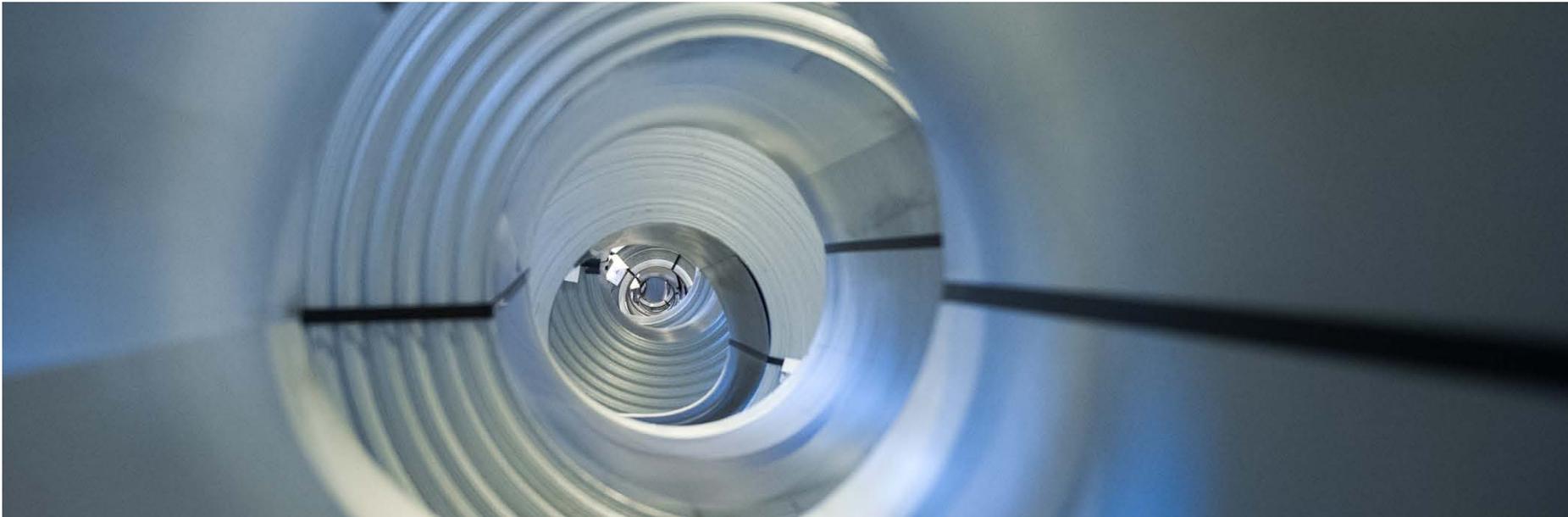


# Digital revolution - the human factor and inertia

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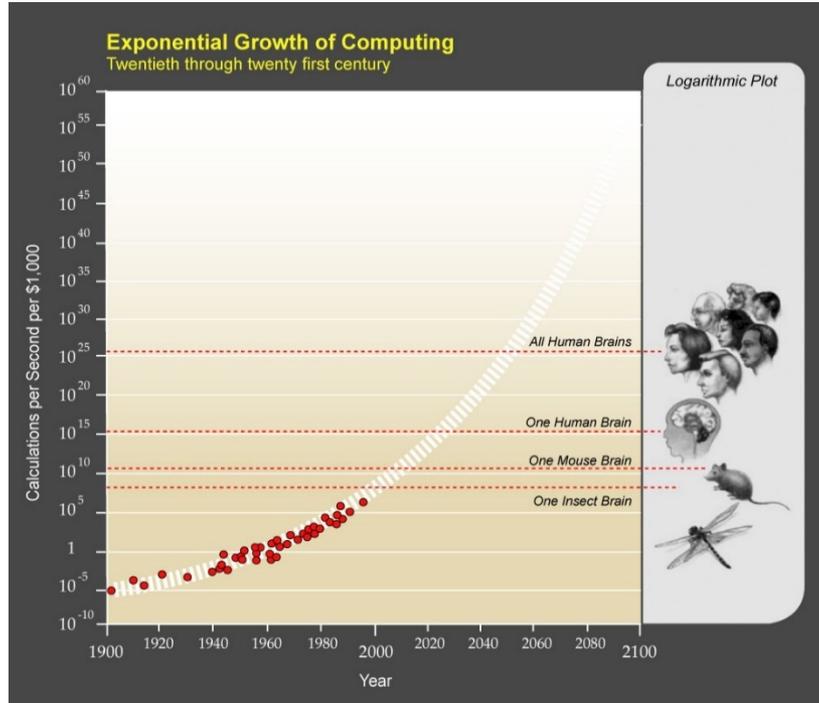
# Introduction

- Industry 4.0 offers enormous opportunities for businesses
  - The level of adaptation varies across and within the industries
- There are 'First-Movers' aiming at strategic advantage through rapid uptake
- 'Would-be' followers need to understand risks of missing out on opportunities & losing customers to more agile competitors & new entrants

# Introduction

- Characteristics of the 4<sup>th</sup> Industrial Revolution
  - Technology driven disruptive change
  - Swiftly blurring boundaries between the physical, digital, and biological spheres
  - Rapid transformation of established value chains and business models

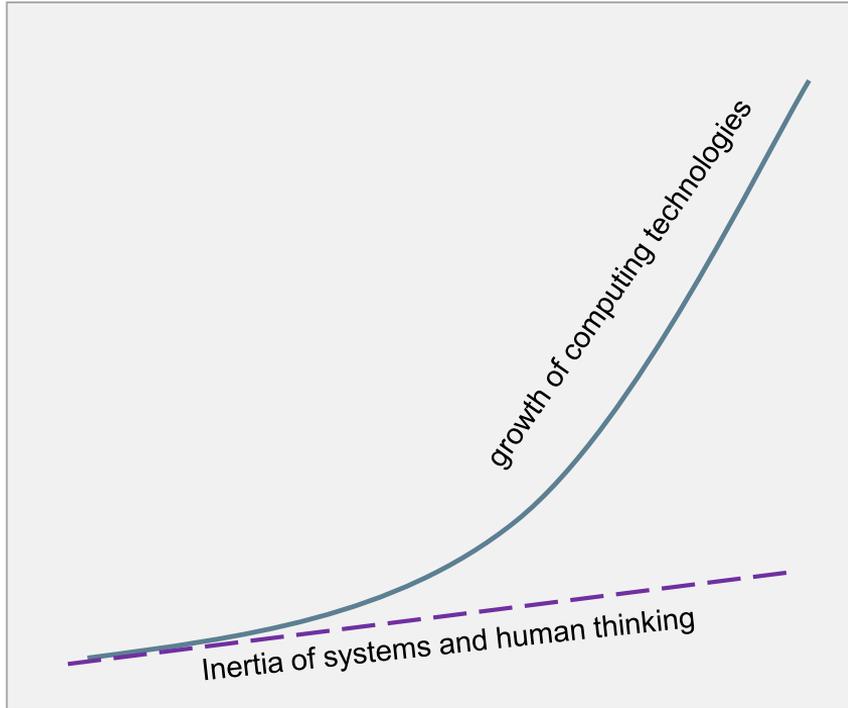
# Introduction



*The Age of Spiritual Machines, Ray Kurzweil*

- Company cultures are often conservative when it comes to innovation
- 'Industry 4.0' or 'IoT' can make strategists uncomfortable about risks
  - How do you distinguish hype from reality?
  - Claims of profound productivity increase and profit margins could sound too good to be true
  - There are plenty of lessons to be learnt from past experiences (e.g. .com bubble)
- One reason for this reluctance may lie in what researchers refer to as organisational inertia.

# Technology & Human



- Divide of technological change & human inertia – exponential vs linear change
  - *“This is just more automation; we’ve been doing that for some time”*
  - *“We can adapt in time – it’s not yet upon us”*
- Risk of complacency
  - As with every new technology, changes are barely perceptible for a long time, until there is a massive change
  - Michael Faraday demonstrating electromagnetism & electric motors to government dignitaries:
    - Q: *“This is all very interesting, but of what possible use are these toys?”*
    - A: *I cannot say what use they may be, but I can confidently predict that one day you will be able to tax them“*
- Accelerating penetration of technology
  - Ray Kurzweil’s law of accelerating returns: *“we won’t experience 100 years of progress in the 21st century — it will be more like 20,000 years of progress at today’s rate.*



# Inertia

- Natural reluctance to change is something that most people exhibit in varying degrees at various times for a variety of reasons
  - Consequence: things that are bound to change don't do so very quickly
  - Humans fear change for all sorts of reasons: loss of control, uncertainty, breaking long established habits etc.
- Sudden changes are generally resisted
  - Especially with no time to get used to the idea
  - Changes made without consultation and announced all at one time.

# Organisational inertia

- Companies often take too long to respond due to organisational inertia
  - A culture of constant innovation and value creation is a prerequisite – it has to be nurtured and gradually developed
  - If staff do not understand the purpose of change, priorities and employer's strategic orientation, then inertia can result in slow consensus building, decision making, and change management
- A company's successful entry into Industry 4.0 depends on its ability to overcome inertia and have:
  - A culture of product and process innovation as well as value creation
  - Welcoming approach to new ideas and develop them further into products, processes, services or business models
  - Have a clear innovation strategy which is well understood by all staff.

## **Organisational inertia – issues and causes**

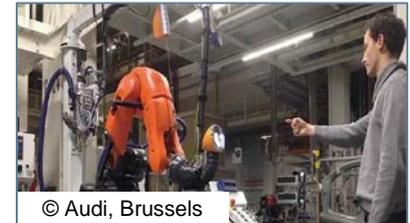


# Supply Chain

- **Collaboration:** cultural issues within supply chain – customers and suppliers sharing data more openly
  - Data is value. There is a slim chance of delivering value and customised products with little visibility
- **Security:** exposure to the internet, use of mobile devices
  - Potential risk for competitors and hackers with malicious intent
- **Standardisation:** an invisible road block – inertia to change for the way businesses are run
  - The total cost of ownership from implementation to managing and upgrading processes will be much higher if standardisation is not adopted.

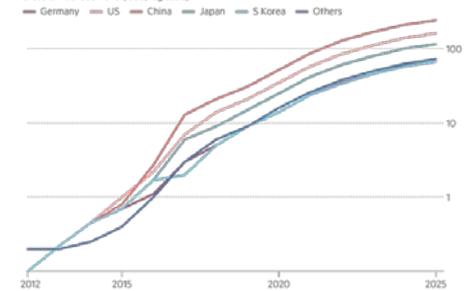
# A new workplace

- **Productivity:** technologies such as AI and machine learning can boost productivity, however:
  - Human-Machine Interaction (HMI) is a new form of industrial organisation, and the socio-economic phenomena of this needs to be taken into consideration
  - Humans may be working with robots literally as colleagues sometimes even taking instructions from them – full safety and psychological reviews are therefore needed
  - Productivity gains often accrue only to the employer's balance sheet and don't correspond to any perceptible rise in wages.



Global co-bot high-growth phase will last until at least 2025

Gross annual additions ('000, log scale)



Source: Barclays Research estimates

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# New workplace

- **Flexibility:** not all jobs can be performed remotely
  - Reduction of innovation facilitated by face-to-face interaction among co-workers and teams
- **Cultural transformation:** for a successful adoption of Industry 4.0
  - Sometimes knowledge, skills and practices become obsolete and hinder new things and ideas
  - “Unlearning” is a key step to implement and leverage the benefits offered by Industry 4.0
- **Inertia of workforce:**
  - Product designers may be keen to innovate, but reluctant to rely on software and algorithms
  - Greater transparency that comes with bulks of performance related data can be unnerving.

# Management

- **What is it?**
  - There is still some lack of clarity on what exactly digitalization is and what it means for businesses
  - Concepts like 'digital twin' and its benefits are not yet clear for all stake holders
- **Developing a digital culture** – not just doing business digitally
  - Holistic view on how data can be translated into insights and business models that can generate revenue
- **Sharing decision making** – across the hierarchy
  - Humans use tacit knowledge to take decisions and will not want to give up this to machines
  - Human intervention will be required only in rare situations which a machine cannot handle:
    - Starting/stopping equipment & operation
    - Managing inventory of consumables & spares
    - Maintenance & quality control
- **Risk or Opportunity?**
  - Deciding if and where to invest in the face of uncertainty
  - Choice of technology & partners in piloting and full scale implementation

## **Human factor**



# Economies

- Industry 4.0 will have profound impacts on:
  - Society at macro and micro levels
  - Advanced, developing and economies in transition
- Industrial policies across the world often pursue the same objectives, but
  - The means of achieving these objectives vary according to the strength of their industries
- Important challenges for developing countries:
  - Labour cost differentials will play diminishing role
  - Reshoring of jobs to developed economies and reversal of FDI flows
  - Widening gaps in technology, knowledge, skills, rising inequalities
- Developing countries such as China and India are already preparing strategies for the change
  - These economies have demonstrated remarkable agility in adapting to automation of production
  - World Economic Forum argues that some more advanced developing countries could leapfrog into Industry 4.0 – possibly closing the gap within a generation

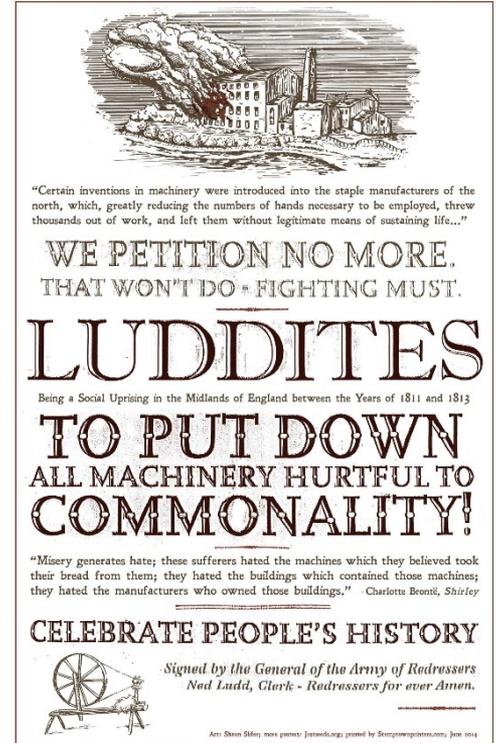
# Current industrial model

- Current industrial model is based on lower unit cost through volume of production
- This paradigm is in question; because there is only so far it can go
  - Increasing diversity of customers and their expectations requires mass customization instead of mass production
  - It requires dynamically adapting to make "on demand" with less inventory
  - Lack of flexibility in the manufacturing base & under-use lead to inflationary trend in capital employed
  - It is not volumes, the scale effect or the labour cost, but product customisation and reduction of capital employed to achieve this.



# Industrial revolutions

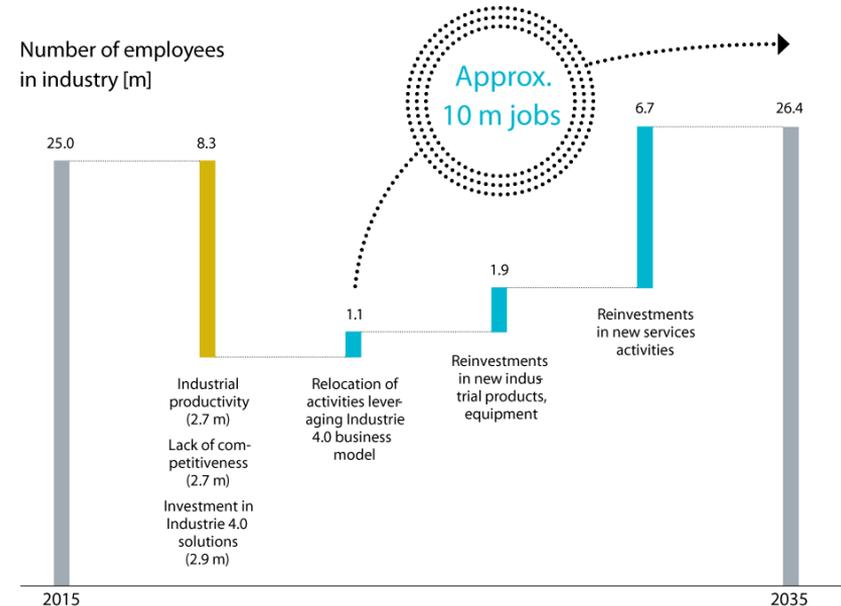
- Previous industrial revolutions did not reduce overall employment
  - Although the number of manufacturing jobs decreased, new jobs emerged and the demand for new skills grew
  - However, the impact on economic development and work organisation took several decades rather than just a few years for their full effect to be felt
- The questions are critical to business leaders and policy makers
  - Will the 4<sup>th</sup> industrial revolution create or destroy jobs?
  - What sort of jobs will be available and what skills will be in demand?



# Fate of jobs

- Employment figures in previous industrial revolutions have always been positive - very time some jobs disappear, others crop up in their place
- While the manufacturing jobs will significantly decrease, profitability and ROCE rise will create new investment opportunities & as a consequence, new jobs
- New sectors will emerge, such as manufacturing of smart drones, robots, digital medicine, precision agriculture data scientists etc.

Model assumptions: an adoption rate of 50% for Industrie 4.0 solutions until 2035 in Western Europe



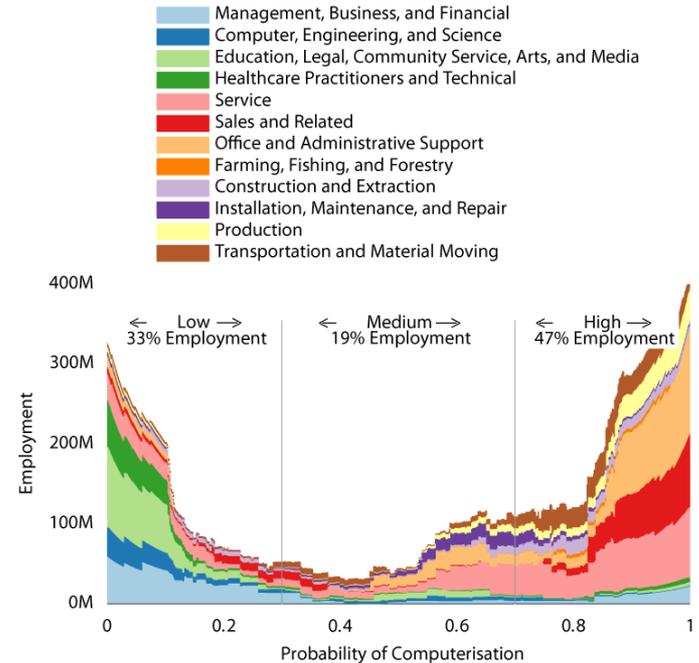
Source: Roland Berger

# Challenges

- The consequences of Industry 4.0 on employment, wealth creation and distribution, are not fully understood
  - The society will need time to adjust
  - The big challenge is people; it requires a new generation of graduates with new skills
  - Education system needs to be reformed to have the right skills for the new workplace
  - Businesses would require reskilling existing workforce in order to coexist with intelligent machines
  - Policymakers would need to address the structural transformation as well as social and organizational challenges
- Shake-off Inertia - Employees will have to:
  - Be more open to change, possess greater flexibility to adapt to new roles
  - Possess multiple skills be open continual interdisciplinary learning.

# Education and skills

- There will be a shift towards higher quality jobs
  - As a consequence, most of the lower skilled jobs would be replaced through technology
  - The remaining human jobs becoming more complex and comprehensive
  - These jobs will require interdisciplinary skills such as engineering, computer science, machine learning, and artificial intelligence etc.
- IT literacy will be the key prerequisite in the ecosystems of innovation and innovation management



The distribution of occupational employment over the probability of Computerisation based on US Employment Data

Frey, C. & Osborne, M. (2013). *The Future of Employment: How Susceptible are Jobs to Computerisation?*.

# Concluding remarks

- Human needs to be at the heart of the 4<sup>th</sup> Industrial Revolution
  - Overcoming the inertia of workforce and organisations is a key towards successful implementation
- Job redundancies for low-skilled jobs and shift towards more high-skilled complex jobs requires continuous learning and education
- Implications of Industry 4.0 technologies need to be analysed both microeconomic as well as macroeconomic level
- Technological advances are largely predictable, their social impacts are less so
  - Social welfare systems will need review to tackle inequality
- Though Industry 4.0 aims to create new wealth and further improve living standards, it requires:
  - Major efforts to train and educate people
  - Ensure digital inclusion & move from competition to connection and collaboration
  - Exploit the potential of Industry 4.0 to address climate change and conserve the environment

Thank you for your attention.

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