Industry4.0: Challenges &Business Opportunities

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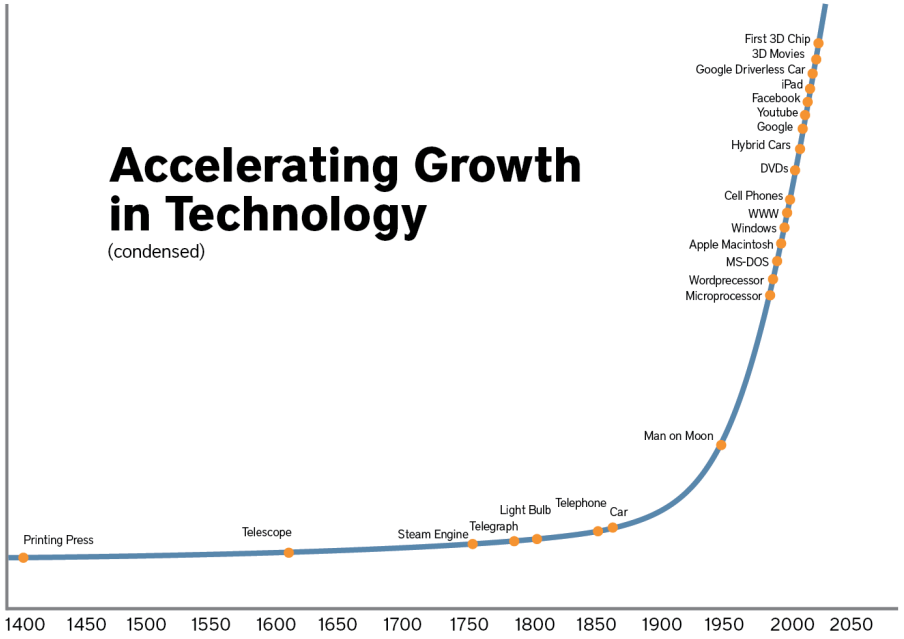
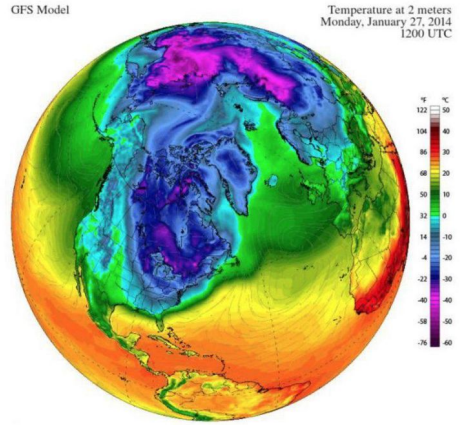
Major Trends of Our Time

1. Globalization
2. Technology Acceleration
3. Climate Change





Fourth Industrial Revolution (Industrie 4.0) – Role of IoT & Cyber-Physical Systems (CPS)

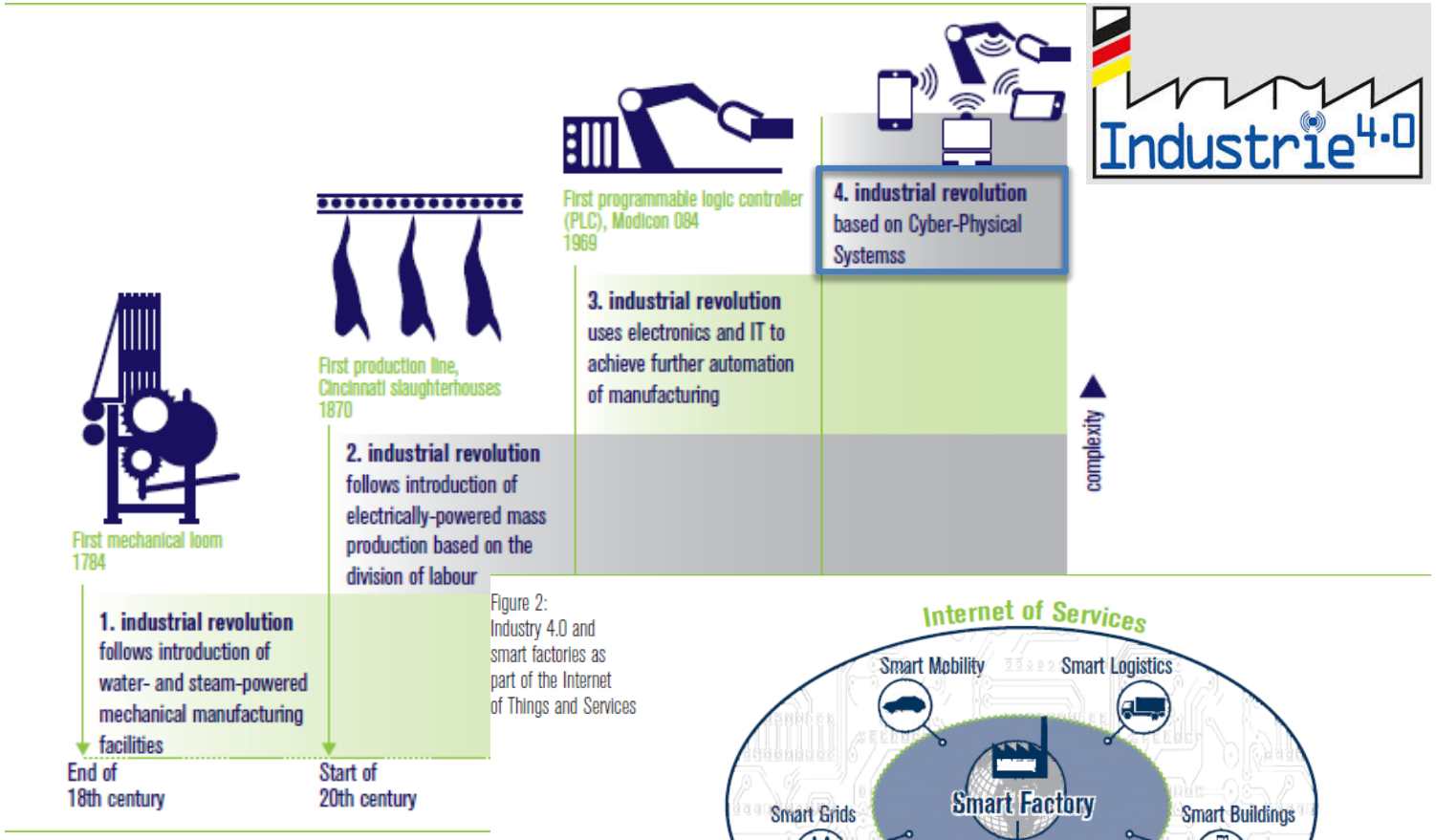


Figure 2: Industry 4.0 and smart factories as part of the Internet of Things and Services

Source: *Recommendations for implementing the strategic initiative INDUSTRIE 4.0 by The Industry-Science Research Alliance & Sponsored by the German Federal Ministry of Education and Research*

IoT

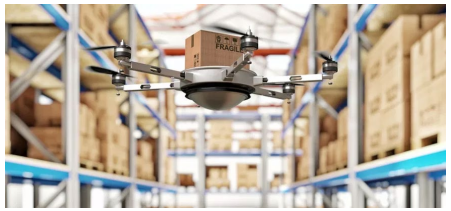
- Sensing of the physical world
- Internet connectivity
- Better term in terms of "Marketing"

CPS

- Control of combined organizational and physical processes
- Tight Human Machine Interaction
- Used in Industry 4.0

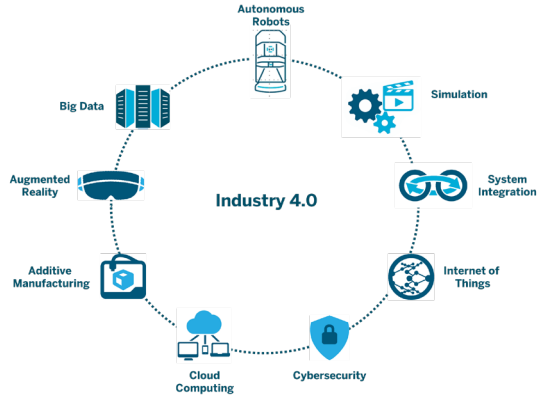
Industry4.0 Cyber Physical Systems and Smart Objects

- Prominent examples of CPS:
  - Adaptive Workbenches
  - Smart Wearables
  - Industrial Robots
  - Autonomous Guided Vehicles
  - Drones / Unmanned Aerial Vehicles
- Use Cases:
  - Predictive Maintenance
  - Zero Defect Manufacturing
  - Logistics & Supply Chain Automation
  - Industrial Automation
  - Worker Safety



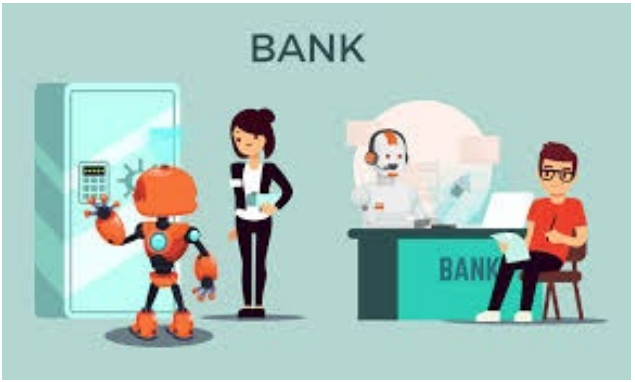
Industry4.0 Derivatives: Healthcare 4.0

- Healthcare 4.0:
  - Transformation of healthcare based on interconnected cyber-physical systems
  - Connected patients, institutions and other stakeholders through IoT/CPS devices including wearables
  - Every data point of patients is getting recorded no matter where they are based on mobile technologies
  - Combination of Artificial Intelligence, Internet of Things (IoT), Genomics and Big Data
- Revolutionizing prognosis, diagnosis, management and treatment of diseases regardless of time & location

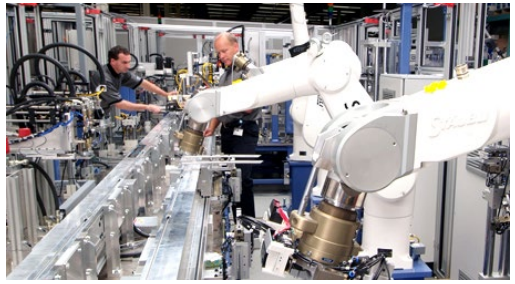


Industry4.0 Derivatives: Finance 4.0

- Finance 4.0:
  - Transformation of Digital Finance sector based on technologies like Robotics Process Automation (RPA), Artificial Intelligence (AI), and the internet of things (IoT)
  - Several FinTech, InsurTech and RegTech innovations fall in the scope of this transformation
  - From batch processing to real-time per transaction processing
- Relevant Applications:
  - Chatbots
  - Robo-advisors
  - Machine Learning and Deep Learning for risk assessment, fraud detection etc.



Main IoT Use Cases in Manufacturing & Industry



Flexibility in Automation

- Flexibly Configurable Production Lines
- Configuration at IT rather than OT (Operational Technology) timescales

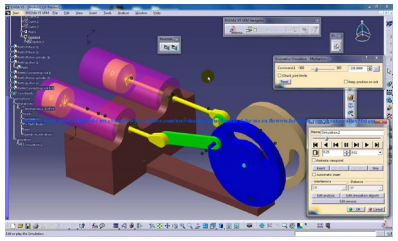
Predictive Maintenance

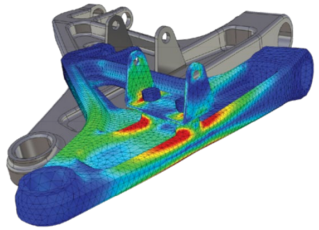
- Schedule Maintenance at the best point in time – Optimal Overall Equipment Efficiency (OEE)
- Reduce Unplanned Downtime – Optimize OEE & Worker Safety

Zero Defect Manufacturing

- Collect data from the line and proactively mitigate any sources of defects
- Holistic approach to Zero Defects combining knowledge about the process, maintenance, supply chain management

Main IoT Use Cases in Manufacturing & Industry



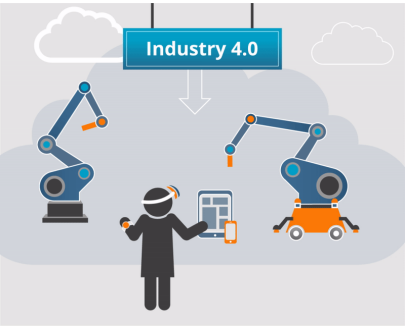


Digital Simulation & Digital Twins

- Simulate industrial process in terms of what-if scenarios using their digital (twin) model
- Optimize operations & decisions – Test without disrupting the production

Supply Chain Optimization

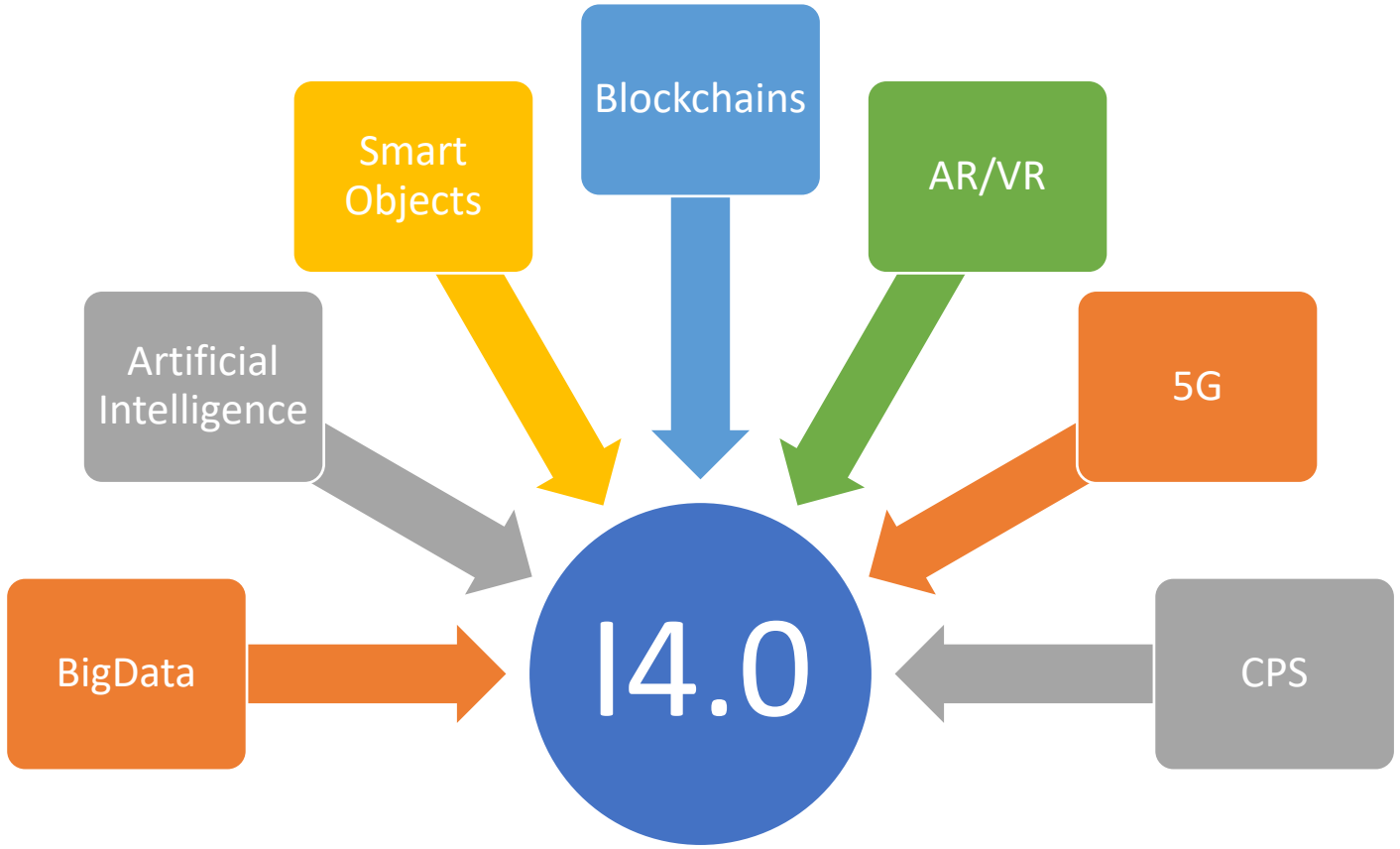
- Created Interconnected and Informed Plants
- Rapidly exchange timely & accurate information across all stakeholders

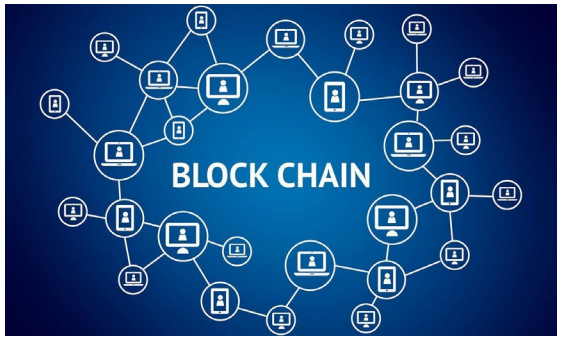


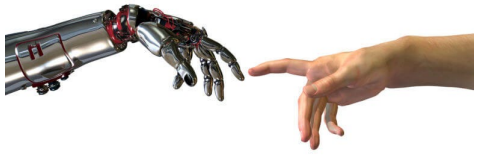
Worker Safety

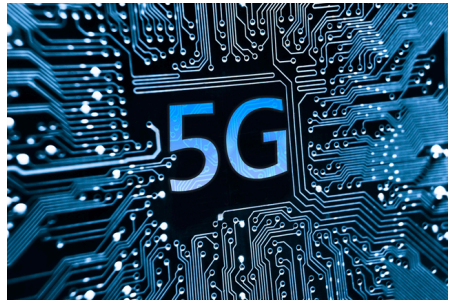
- Interact with cyber-representations instead of with harsh environments
- Track workers' status with wearables and boost their collaboration

Industry 4.0: Digital Enablers









Prerequisites & Preparatory Steps

Cyber-Physical Systems	Digital Skills	Testing Facilities	Strategy & Roadmap
Enabling Machinery for I4.0	Strong digital team required	Lab or Pilot Line	Specification of Business goals
Especially for legacy Machines	Workers, but also technical and R&D partners	Simulation & Testing Infrastructure	Use Cases to be implemented

Implementation Steps

Process Reengineering	• As-is → To-Be
Solution Architecture	• RAMI4.0, Industrial Internet Consortium RA, OpenFog RA
Digital Modeling	• AutomationML, COLLADA, B2MML..
Field Connectivity	• OPC-UA, MQTT, DDS..
Data Analytics	• Data Mining & Machine Learning, Deep Neural Networks & Deep Learning
Cybersecurity	• Industrial Internet Security Framework, IT & OT Security Convergence
Pilot Testing & Deployment	• Pilot Lines, Testbeds, Simulation…

Industry 4.0 Activities in Europe

	Launch date	Target audience	Budget	Funding approach
	2015	Industry & production base, SMEs & mid-caps	Approx. €10 billion	Mixed
	2011	Manufacturers / producers, SMEs & policy-makers	€200 million	Mixed
	2012	Large companies, SMEs, universities, research centres	€45 million	Public
	2014	General business community	€25 million	Mixed
	2016	Industry, above all SMEs & micro-enterprises	€97.5 million	Public
	2013	Research, academia & industrial & service SMEs	€50 million	Mixed
	2012	Business, industry & research organisations	€164 million	Mixed
	2016	Industry & service sector companies, trade unions	Not yet defined	Public

Source: *European Commission, Key lessons from national industry 4.0 policy initiatives in Europe*

PRODUKTION2030

INDUSTRIE DU FUTUR

fabbrica intelligente

CATAPULT High Value Manufacturing

Plattform INDUSTRIE 4.0

INDUSTRIA CONECTADA 4.0

PRODUTECH

Policy Making Areas

- R&D Investments
- Close Collaboration between Academia & Industry
- Life Long Learning
- Boosting Innovation & Entrepreneurship
- New Social Contracts

Five “Actionable” Proposals for Greece

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Construct & Establish Big Data Databases

- Central Government: Healthcare, Finance,…
- Municipalities & Regions: Data Portals & Data Stores
- Businesses: Knowledge Bases

Digital Innovation Hubs

- Already Established, but more efforts is Required, including active engagement of Businesses
- Public-Private Partnerships

Create & Attract Talent

- Revised School & University Curricula
- Give Incentives to International Talent

Engage the Society

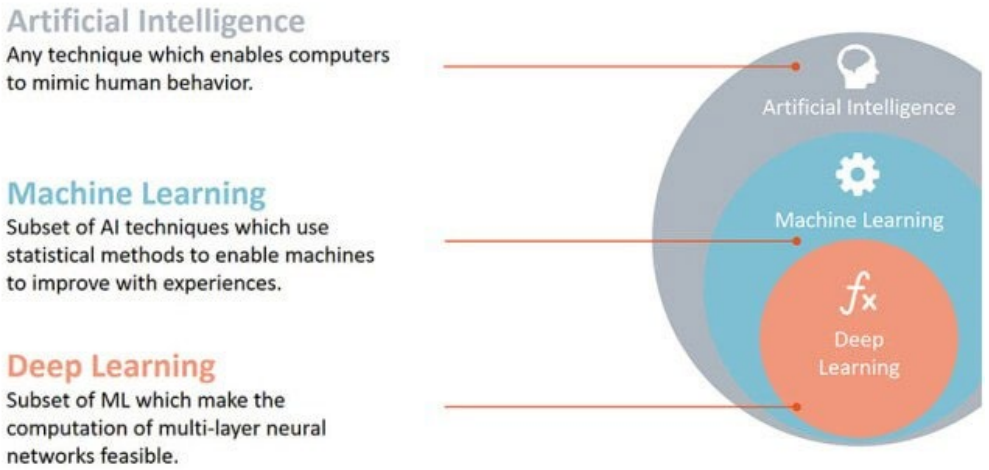
- Increase Awareness
- Lifelong Learning & New Social Contracts

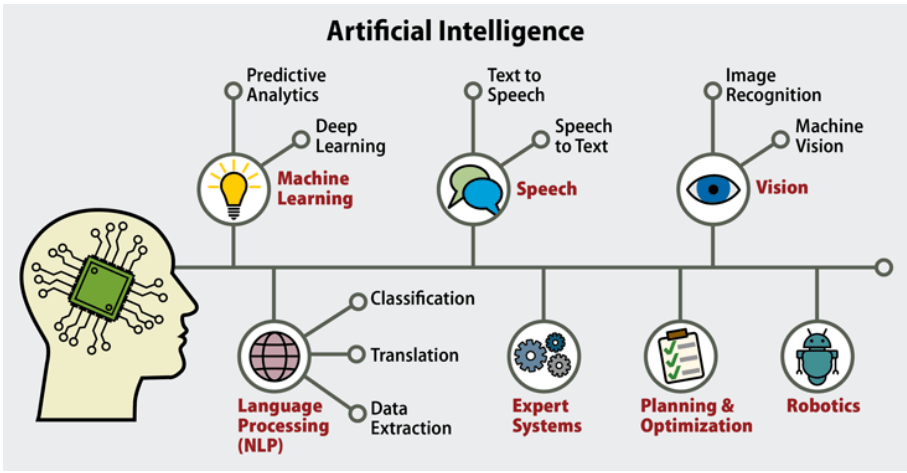
National Strategy for AI

- Major Impact on Fiscal, Educational, Social, Healthcare etc. Policies

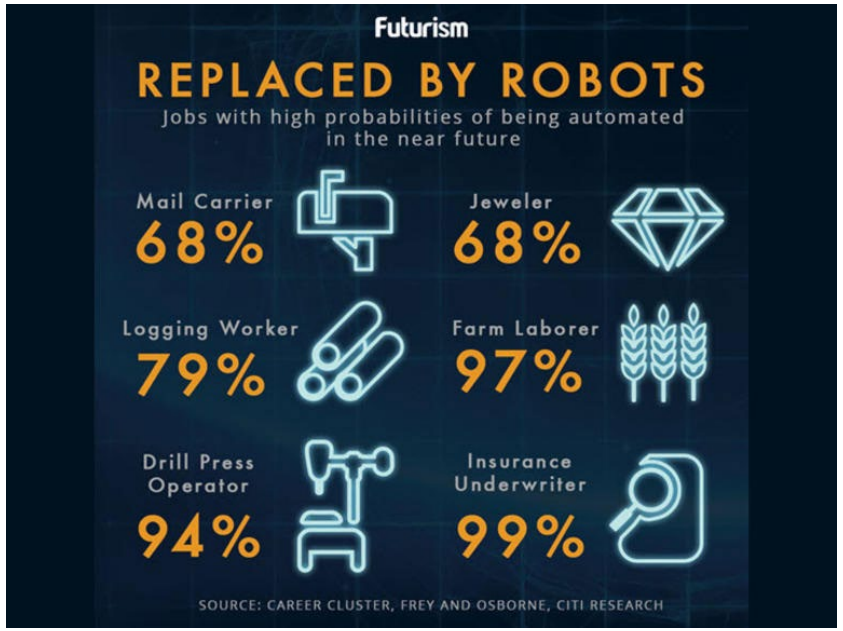
Artificial Intelligence

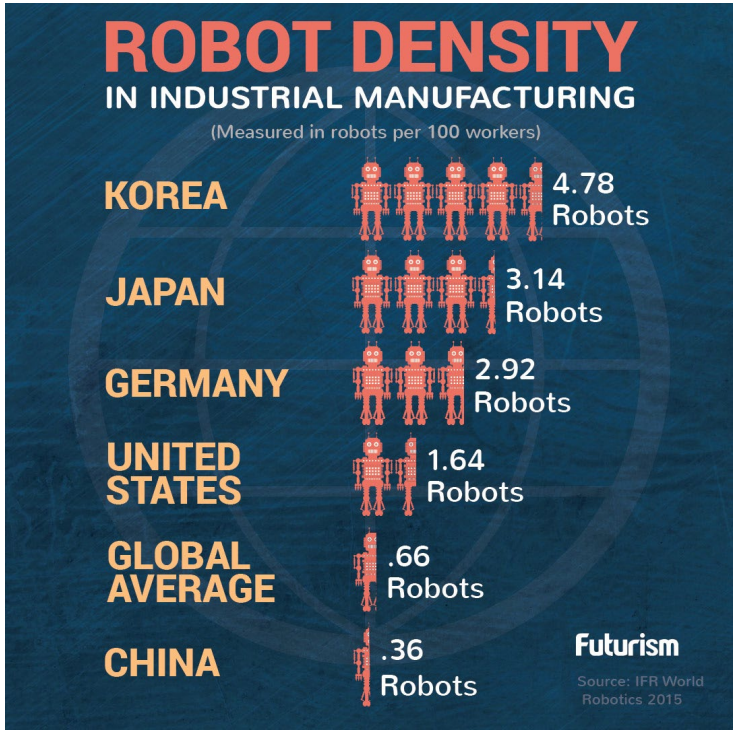
- Modelling intelligent behaviour with minimal human intervention
- Machines & computer programs become capable of problem solving and learning, like a human brain
- E.g., Natural Language Processing (“NLP”) and translation, Pattern recognition, Visual perception and Decision making.
- Machine Learning (“ML”): Automatically make sense of data
- AI Programs:
  - Can retain information
  - Becomes smarter over time
  - Not susceptible to Sleep deprivation, distractions, information overload and short-term memory loss

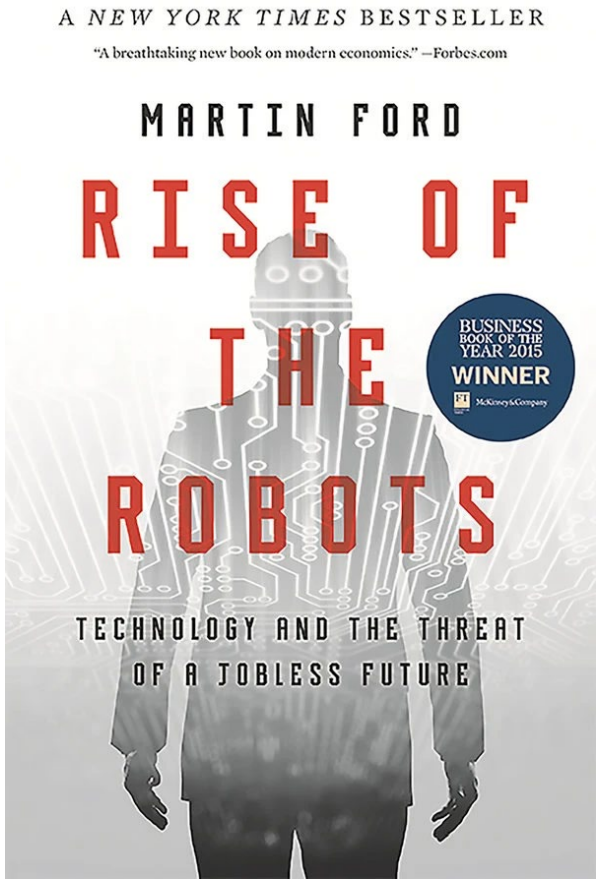




AI replaces or leads to loss of Jobs





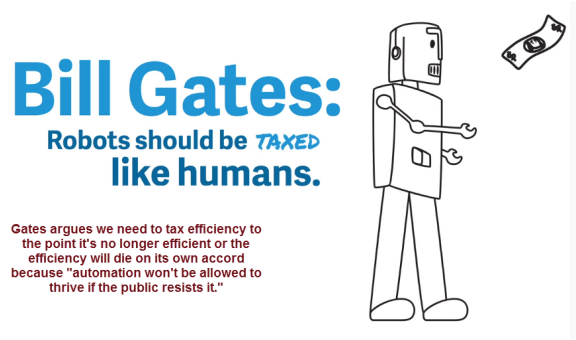


How many jobs will be lost or replaced?

- Various reports with different methodologies & timeframes, for example:
  - 2018 report used a dataset compiled by the OECD projecting loss of up to 30% jobs in the UK- Looks in detail at the tasks involved in the jobs of over 200,000 workers across 29 countries.
  - Another OECD study, covering 32 countries, calculated that close to 50% of jobs is likely to be "significantly affected' by 'automation"
  - 2017 report examining the global labour market covering 46 countries and considering multiple factors: About half of all work activities globally have the technical potential to be 'automated' by 2030 through "robotics & AI – in practice an average of 30% could be replaced
- There is evidence against an 'end of work' hypothesis:
  - AI is likely to resemble previous waves of change
  - Will change and create jobs, while rendering others obsolete.

New Policies and Social Contracts

- Digital Skills and Lifelong Learning:
  - Workers of the future must be equipped with the education and skills they will need be ‘digital citizens’
  - Meeting the likely demand for re-training for displaced workers through new approaches to training and development; and
- Share the benefits of AI across communities, including by supporting economic growth
  - Taxing Robots?
  - Universal Basic Income?
- Deal with the implications of the nature of working life, for example with respect to income security and the gig economy
- Tackling potential biases from algorithmic systems at work



Education Policies for the era of AI & Automation

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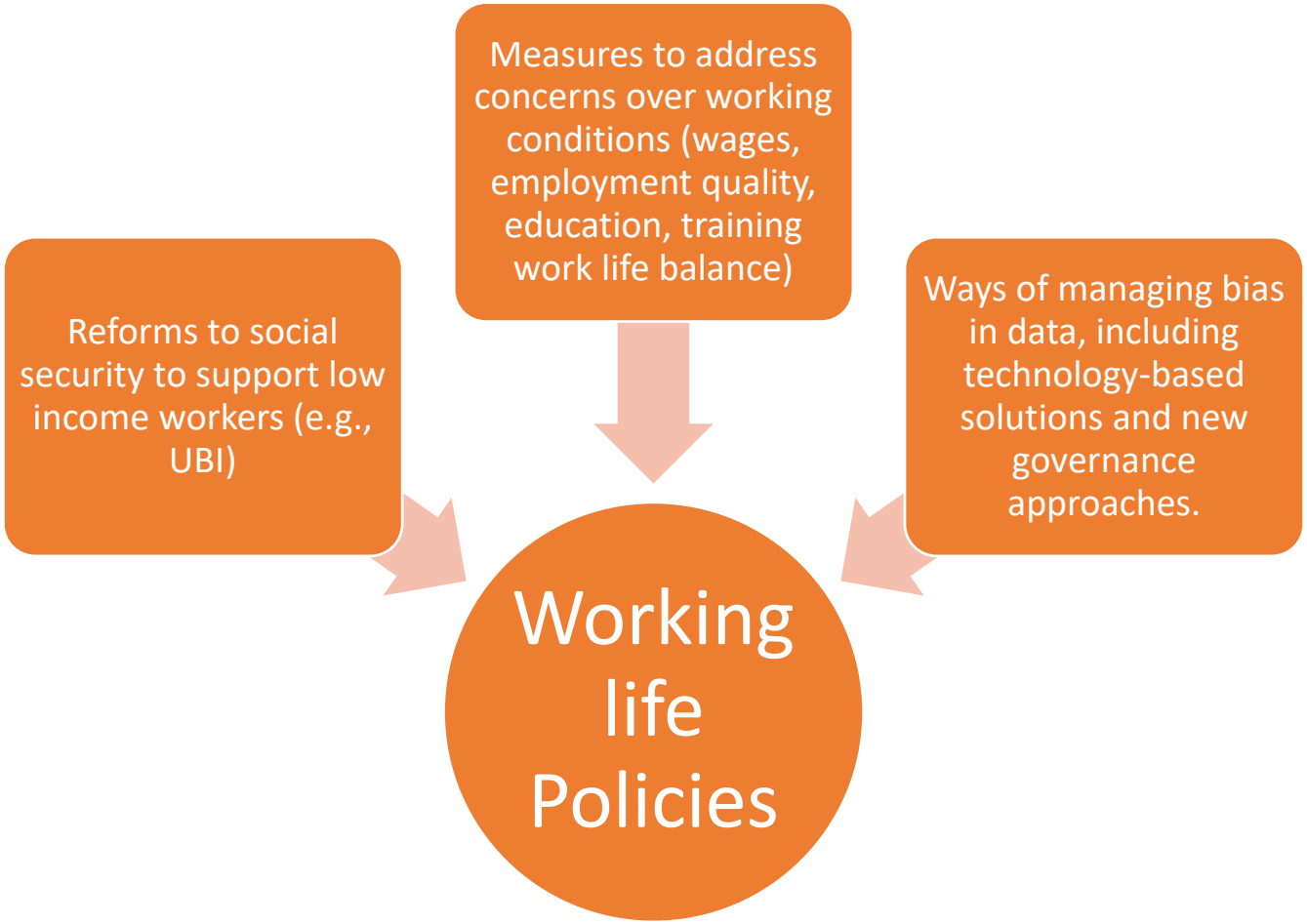
Education

- Driving AI adoption
- Combating inequality
- Equipping workers to be 'digital citizens'
- Training in skills to take on new jobs
- Developing the advanced specialists to work in the AI industry
- Creating a pool of informed users to engage with the specialists

Relevant Policies

- Teaching key concepts in AI and their ethical implications
- Ensuring access to a broad curriculum throughout compulsory education, giving all students the opportunity to study mathematics, physics, chemistry and computing, social sciences, creative arts, humanities and languages and developing skills such as communication, research, and independent thinking etc.
- Investing in higher education and research funding to increase numbers of AI specialists.
- Retraining for displaced groups and opportunities for lifelong learning.

Working life Policies for the era of AI & Automation



Local Growth Policies for the era of AI & Automation

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Local Growth Policies

- Advice and support to businesses of all sizes to use AI technologies (e.g., Network of Local Enterprise Partnerships and Growth Hubs).
- Using industrial strategy to drive AI adoption across sectors.
- Supporting local growth and economic development (e.g., skills developments at a local level).
- Business-university collaborations and talent sharing in AI

More Information

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