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Industry 4.0 Integration

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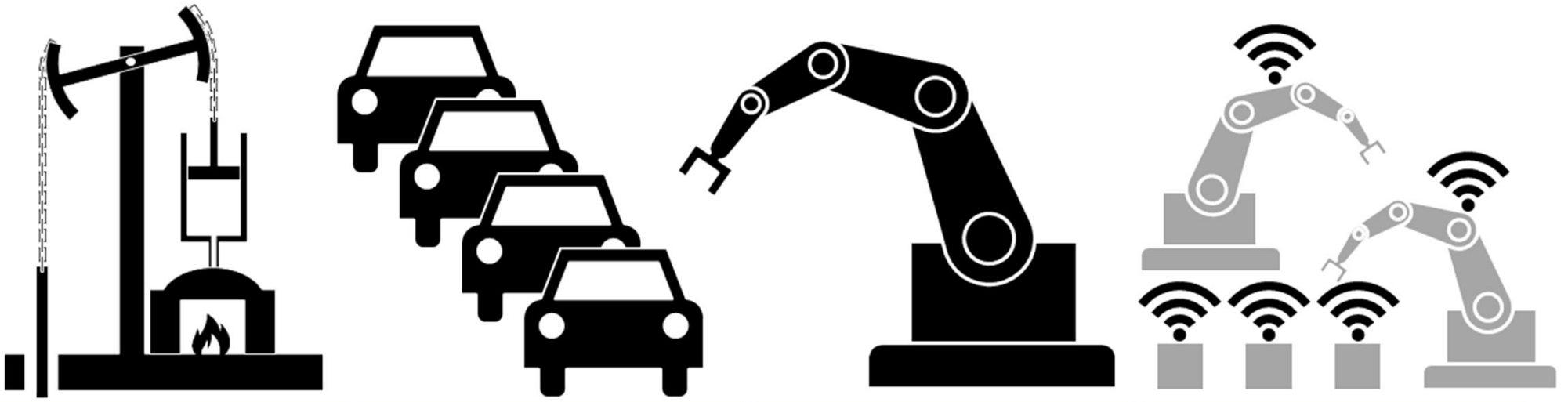
What is Industry 4.0?

- **Industry 4.0** is a new phase in the Industrial Revolution using interconnectivity, automation, and real-time data.
- Cyber-physical system are **connected** and **communicate** with one another
- Cyber-physical system **make decisions** without human involvement
- Industry 4.0 **optimizes** the computerization of Industry 3.0
- Production will become more **efficient** and **productive**

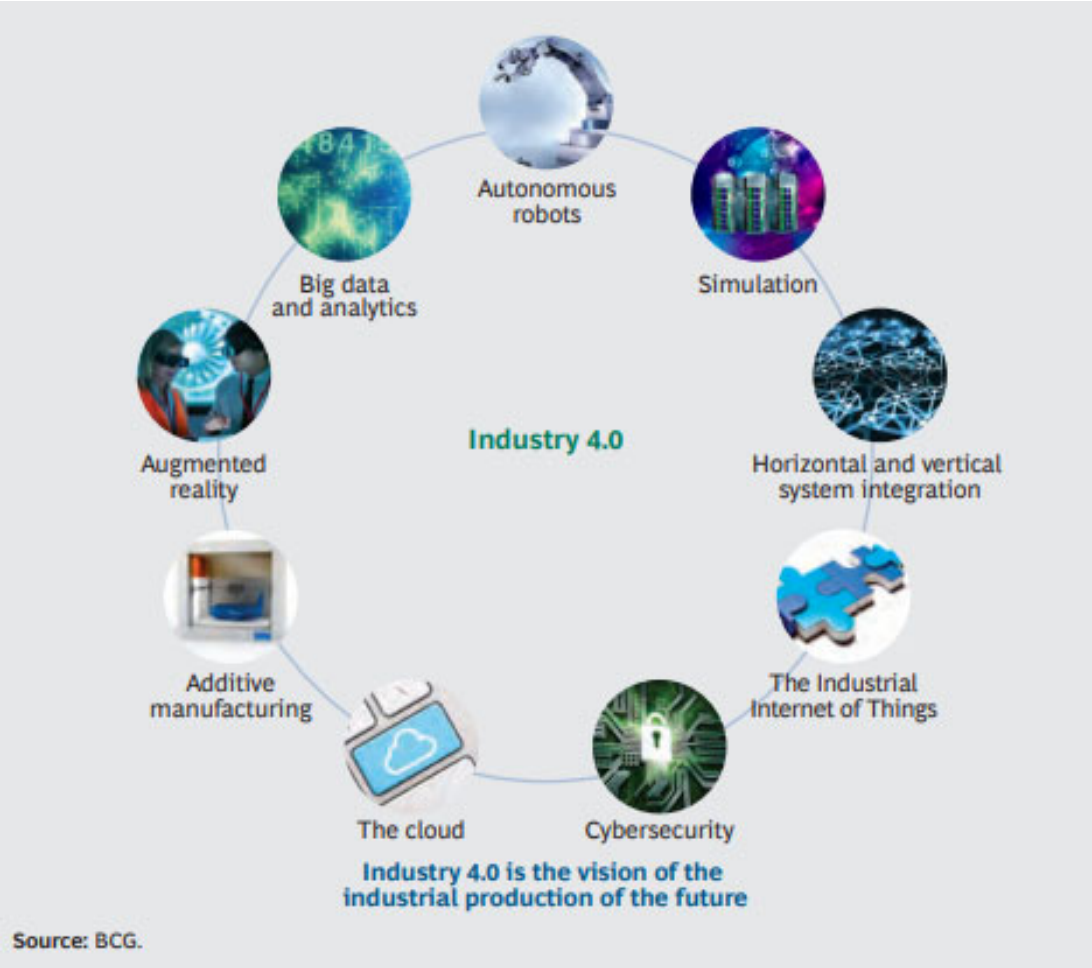
What is Industry 4.0?



1st	2nd	3rd	4th
Mechanization, water power, steam power	Mass production, assembly line, electricity	Computer and automation	Cyber Physical Systems

Nine technologies that are transforming Industrial Production

- Transition to **Industry 4.0** is based on the following technologies:



Nine technologies that are transforming Industrial Production

- The fourth Industrial Revolution began with the rise of new digital technologies
- **Big Data and Analytics** play a role in optimizing production quality, saving energy and improving equipment service
- **Autonoumous Robots** interact with one another and produce more complex goods
- **Simulation** – transition from 3-D simulation to real-time simulation using a virtual model
- **Horizontal and Vertical System Integration** – complex tasks between companies, suppliers and customers will be fully integrated

Nine technologies that are transforming Industrial Production

- **The Industrial Internet of Things** enables real-time responses, all devices comunicate and interact with one onther
- **Cybersecurity** is a challenging threat for industrial systems and manufacturing
- **The Cloud** perfomance will improve responses at milliseconds, enabling more data-driven services
- **Additive manufacturing** – produce small batches of customized products
- **Augmented Reality** - will play a role in training, reparing, decision making and work procedures. Workers may use augemented-reality glasses to see real-time information

Integration to Industry 4.0

- The **key** for a successful integration to Industry 4.0 is implementation of all the technologies
- Integrations to Industry 4.0: **vertical** and **horizontal** integration

Industry 4.0 Integration

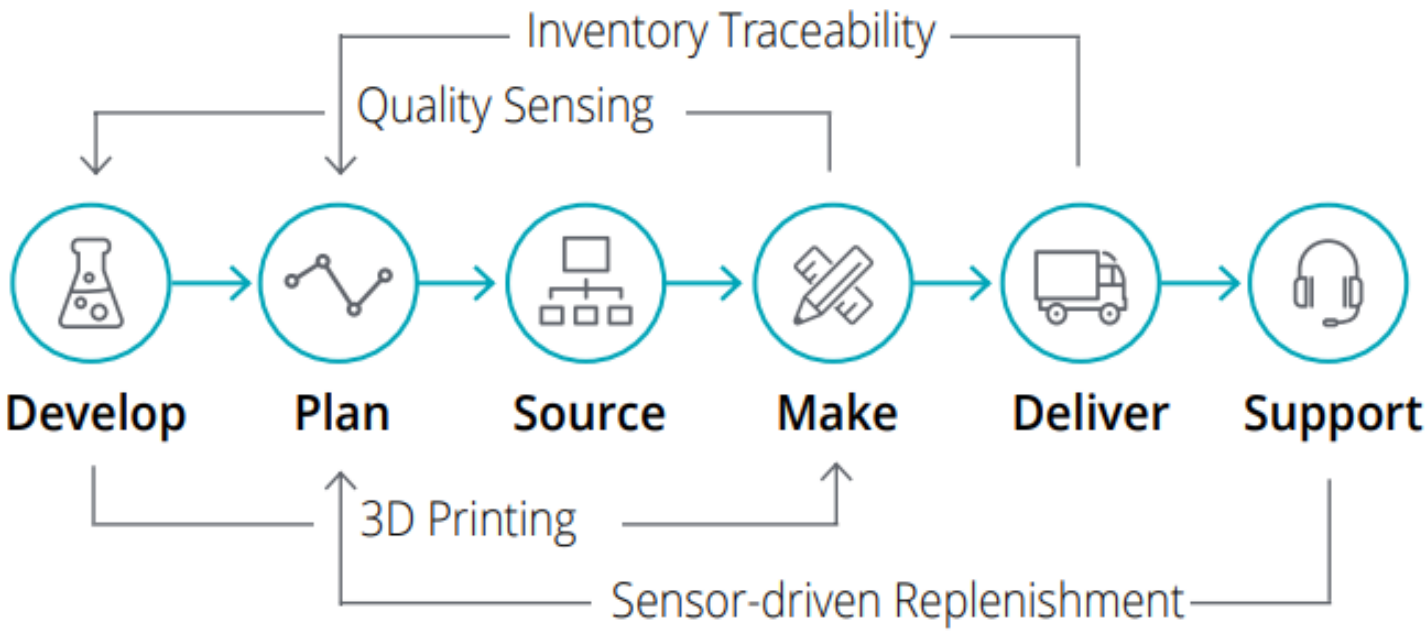
Vertical and horizontal integration

- In **vertical integration** all the systems in the traditional automation pyramid are affected, which means the traditional automation pyramid view will disappear. The ERP systems are replaced by applications with IoT platforms where business applications and functionalities are integrated into.

- The **horizontal integration** is an end-to-end value chain: from supplier, information flows and IT systems in the product development and production stage to logistics, distribution and, ultimately, the customer. The modules are integrated into a single platform, independent of the hardware and operating systems.

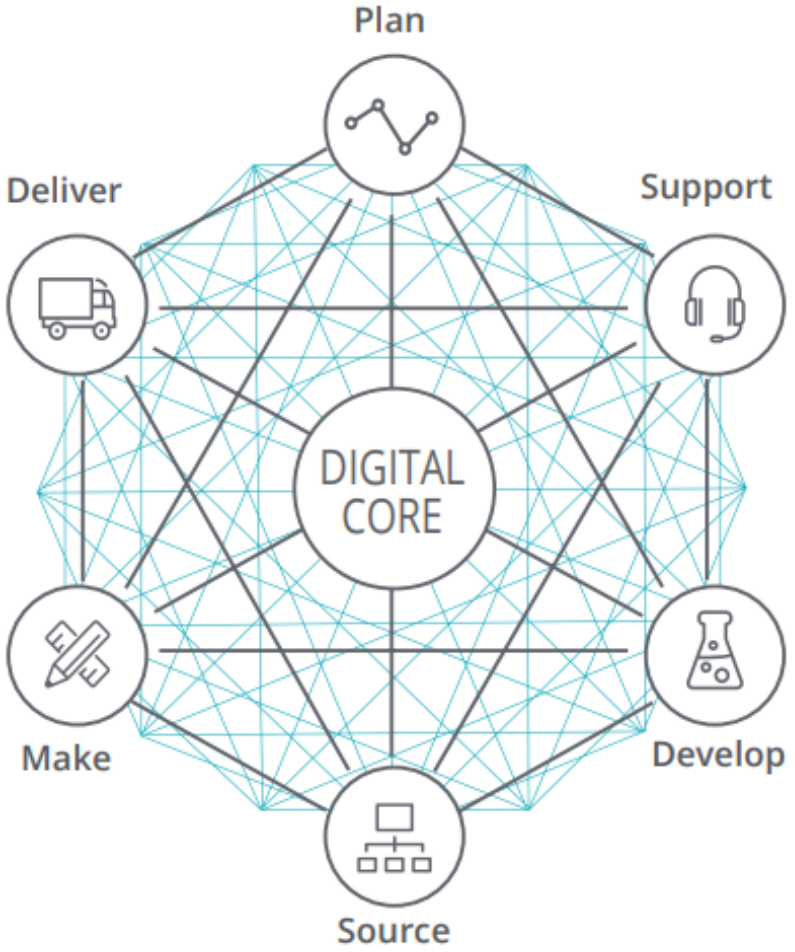
The Traditional Supply Chain

- The traditional supply chain is an integrated manufacturing process where **nodes** lead into a set of dynamic networks. The flow of information is **linear**.



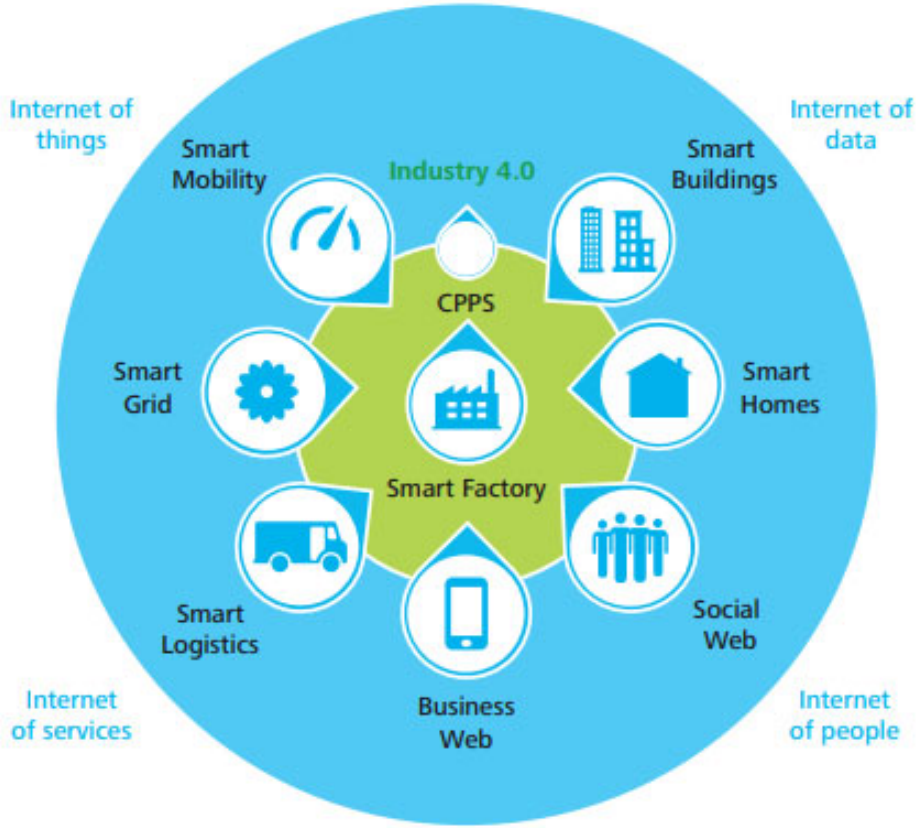
Digital Supply Networks

- **Digital Supply Networks** have helped organisations achieve improvements in operational performance.
- Innovative and disruptive **technologies** can enable supply chains to **transform** into digital supply networks.
- These networks can enable information sharing, goods, and services through physical and digital channels.



The Industry 4.0 enviroment

- Business web has a key role in the digital **transformation** to Industry 4.0. CCPSs creates a smart network of machines, ICT systems, smart products and individuals across entire **value chains** and product life cycles.



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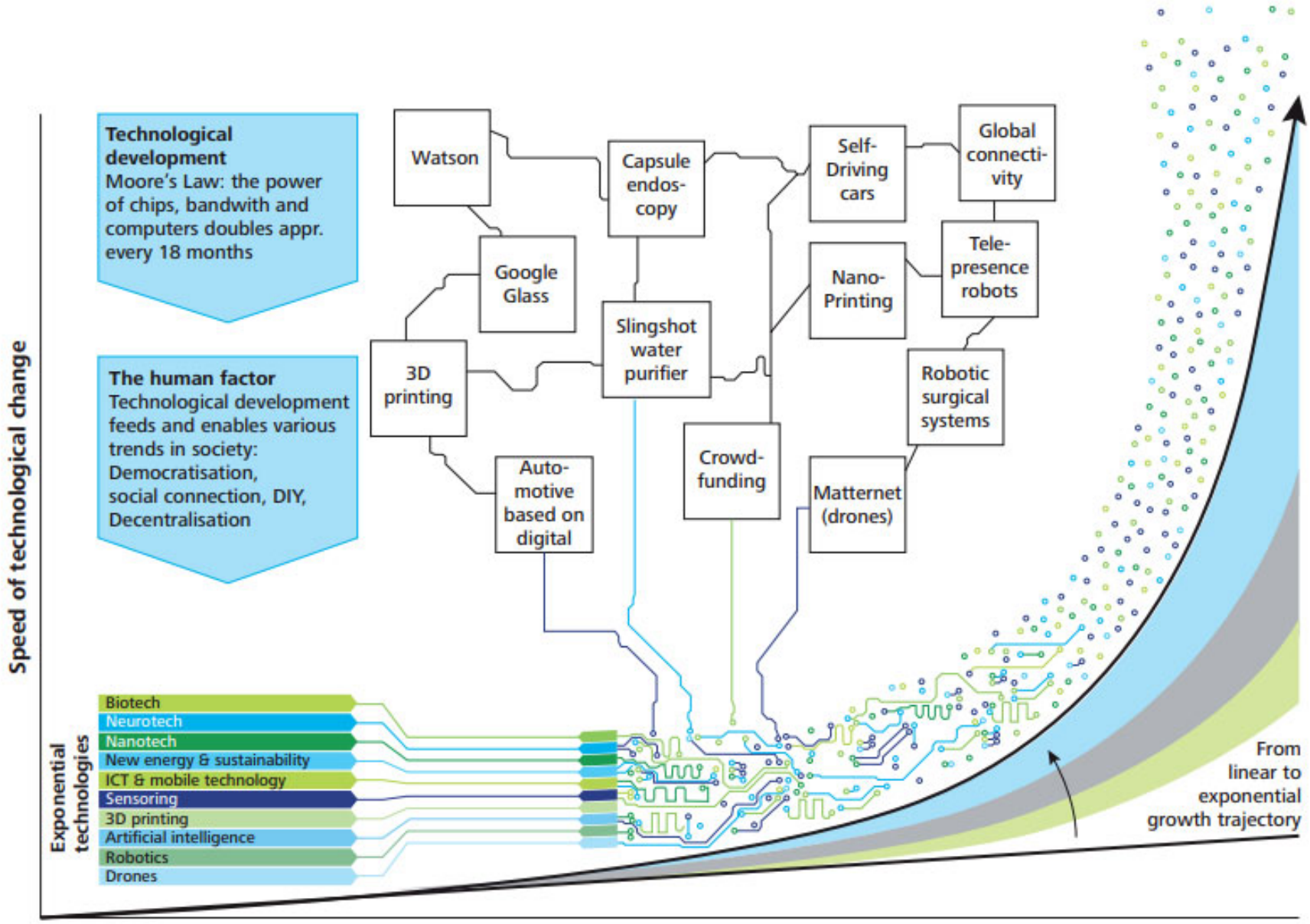
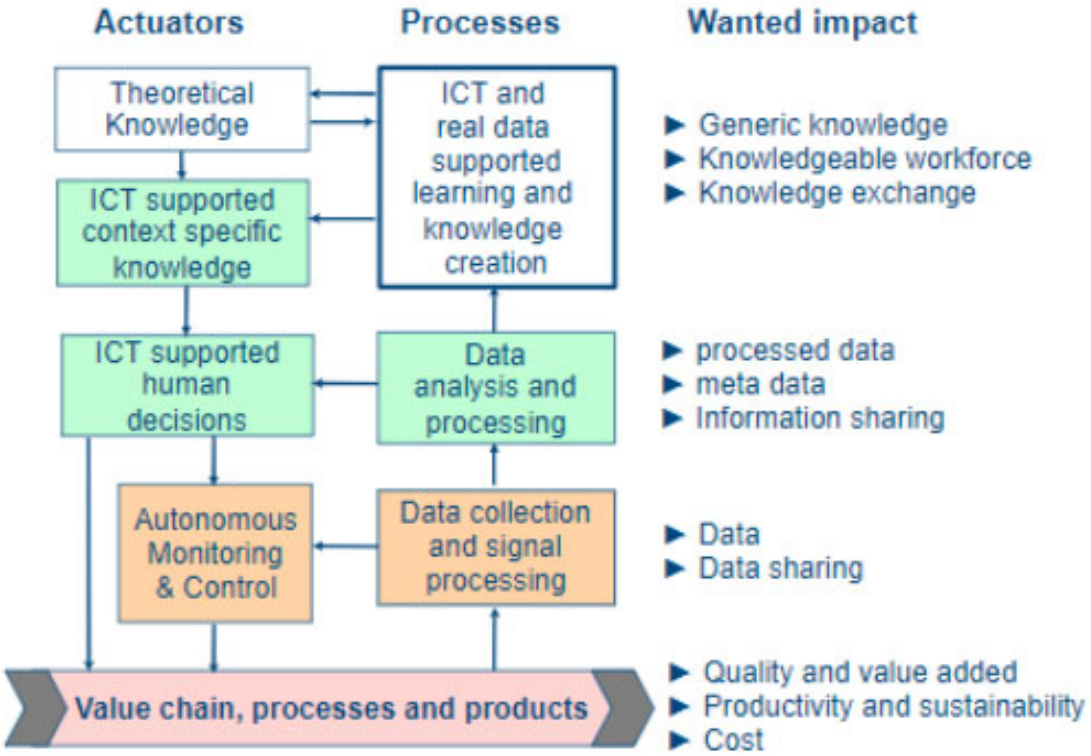
Exponential Technologies



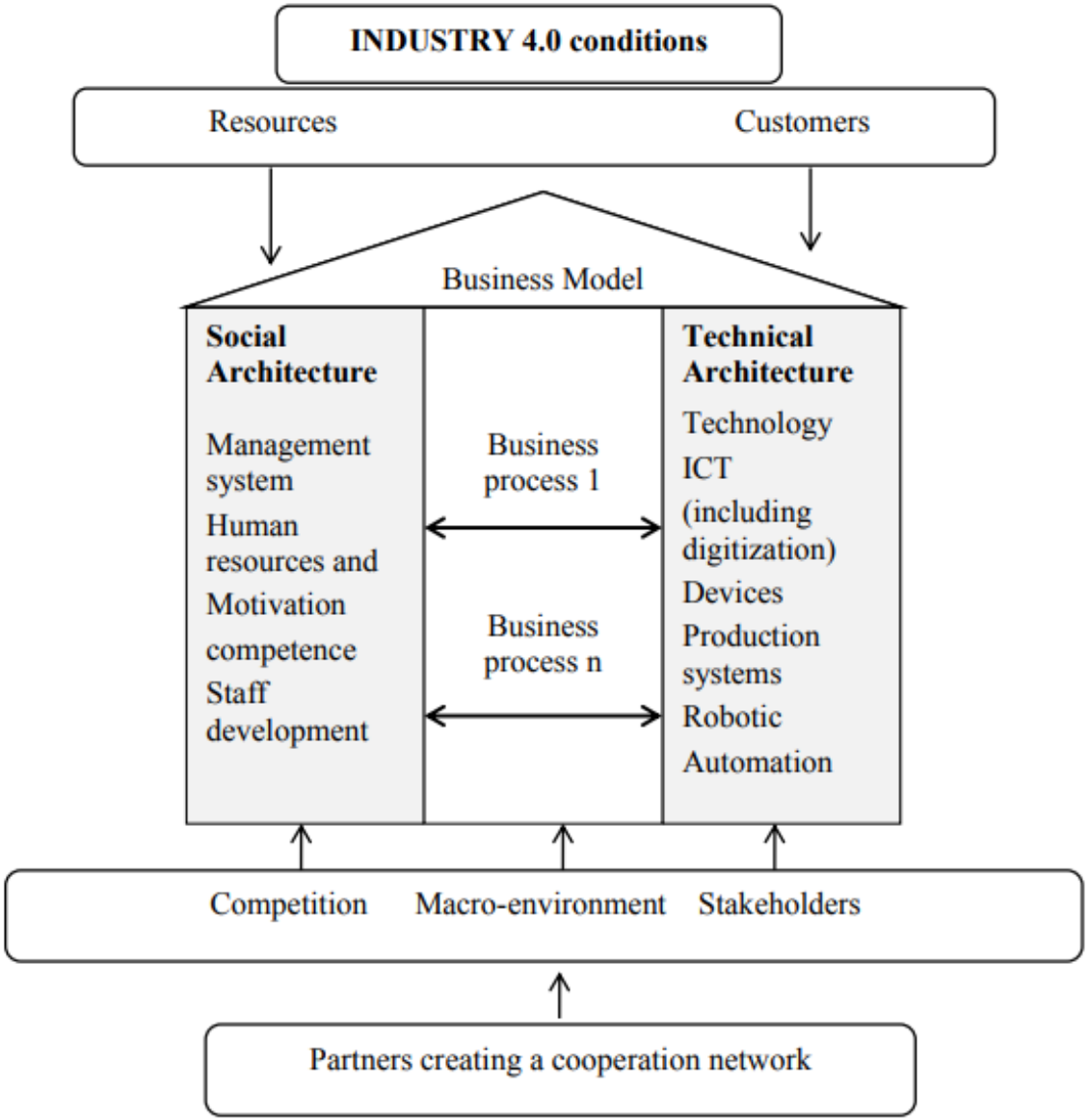
Integration of digital learning in industry 4.0

- The **learning modules** contain all the necessary elements for learning. Knowledge, human decision and autonomous control are "actuators" while data collection, processing and learning are "processes".



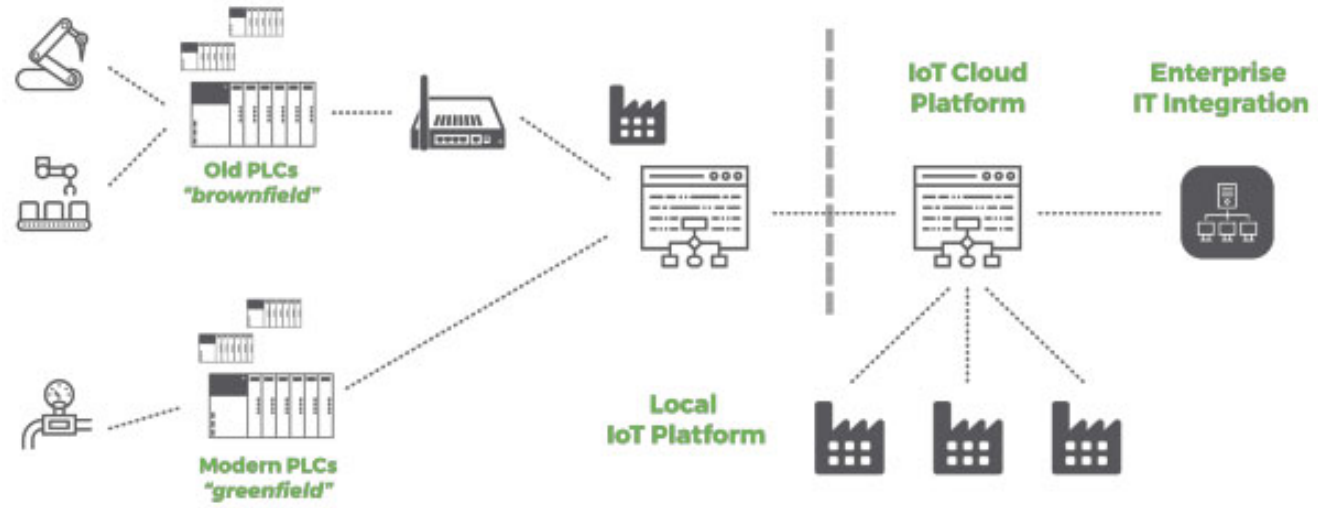
Business model concept Industry 4.0

- **Transformation** is highly dependent on human resources
- Business processes must be associated with the **relevant** qualifications, attitudes and orientations of managers



Software Implementation for Industry 4.0

- An **architecture IoT** for software implementation has the following components: Constrained devices, Smart devices/gateways and IoT platforms.
- To have a **level of integration** the software implementation for Industry 4.0 will need to be integrated with existing **systems** such as SCM, PLM, MES and/or ERP.



Industry 4.0 Integration

Open Source Software for Industry 4.0

- **Open source** software has a history in the industry because it offers flexibility, cost reduction and safety.

- Open source community has a contribution in updating every **security** issues. Security Software for Industry 4.0 can adopt: Code signing, Device Authentication and Access Control.

How can the business benefit from Industry 4.0?

- **Increases productivity** – Optimizing equipment effectiveness, prediction and preventing downtime will increase the productivity inside a smart factory. For example, sensors transmit information about how many items are produced, how many items are defective and the time of production.
- **Lower operating costs** – Using 3-D printers to achieve faster prototyping, higher automation to save labour costs, real-time production monitoring to reduce waste and rework and predictive maintenance to prevent costly repairs.

How can the business benefit from Industry 4.0?

- **Improve product quality** – Real-time quality control, retrieval of data at every point of production, monitoring the changing conditions and a clear view of product quality.
- **Become more innovative** – New business models are created using smart products and new advanced technologies.
- **Gain a competitive advantage** – The automation of the entire business process will reduce the workload, improve customer satisfaction and increase business competitiveness in the market.

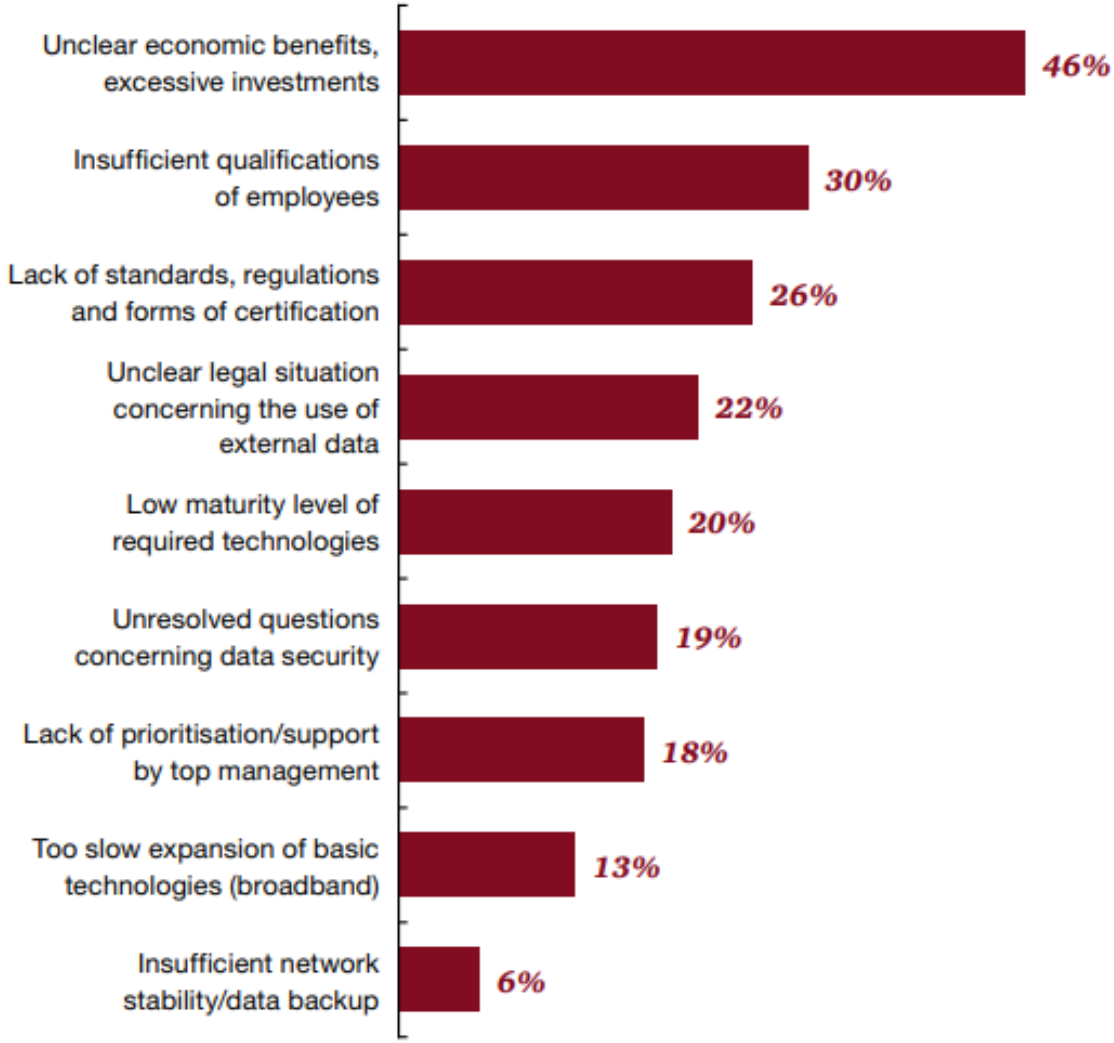
Do multinational and small and medium-sized companies have equal opportunities?

- MNEs and SMEs **do not have equal opportunities** in the area of Industry 4.0;
- MNEs have **higher driving forces** and **lower barriers** than SMEs across nearly every aspect;
- MNEs' **manufacturing** systems are more **flexible;**
- SMEs have lower **profitability** expectations;
- **Organizational** factors are less complex in SMEs. It is easier to implement Industry 4.0 technologies because processes and management innovations are less complex;

Challeges for the successful implementation of Industry 4.0

- Based on PWC survey, a company has the following **challenges** for a successful implementation

- In the coming years there will be a demand for **jobs** for software developers and data analysts



5G integration in Industry 4.0

- The integration of **5G** in **Industrial Internet of Things** (IIoT) systems is a game changer for Industry 4.0. The main benefits are: high-speed, low-latency and large-volume data transfers.
- 5G-enabled IIoT devices **reduce** the **complexity** of supply chain networks and warehouse management. That will increase organization **responses** in a dynamic business environment.
- High connectivity will improve the optimisation process and increase automation.

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