Manu*FUTURE* 2030

VISION 2030 DOCUMENT

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Manu*FUTURE* 2030 Vision Document
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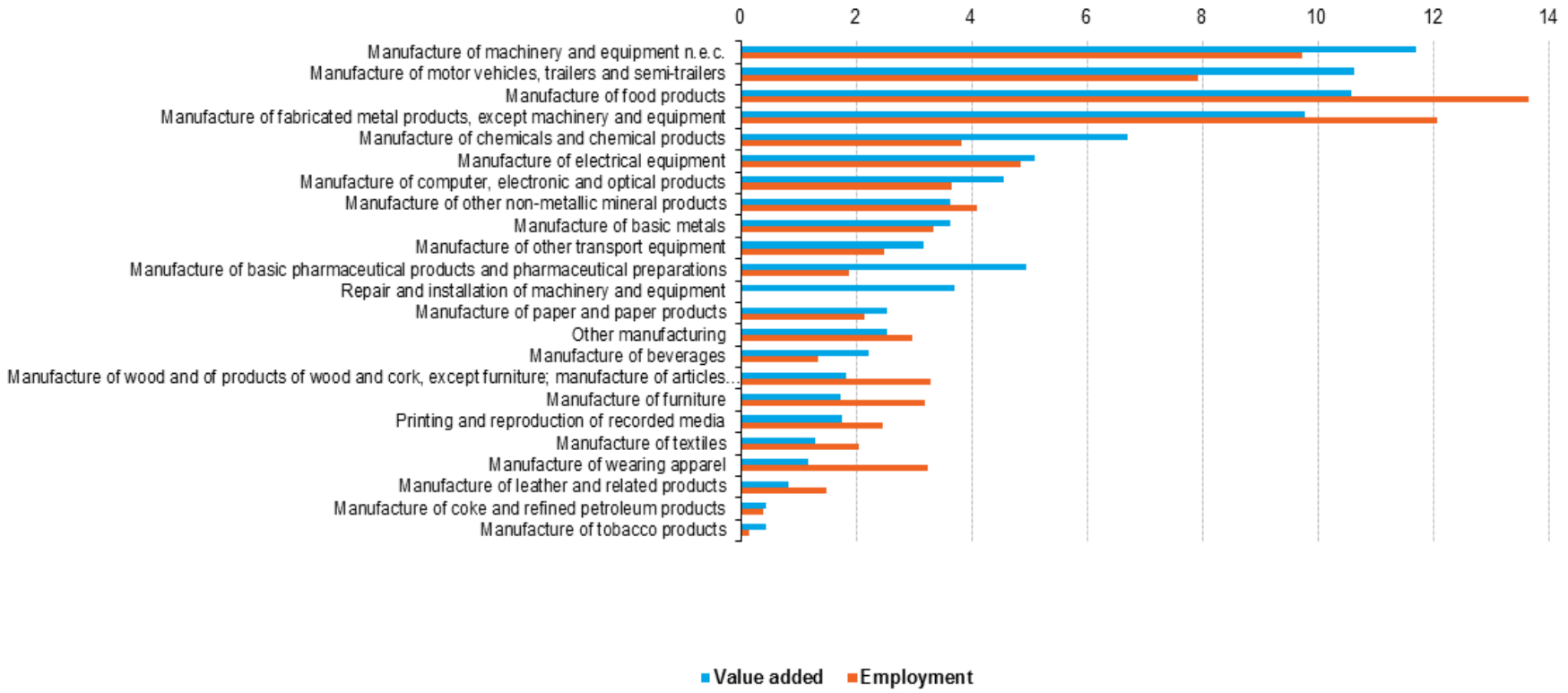
1. The Manufacturing Industry Today

Manufacturing **is the backbone of the European economy**

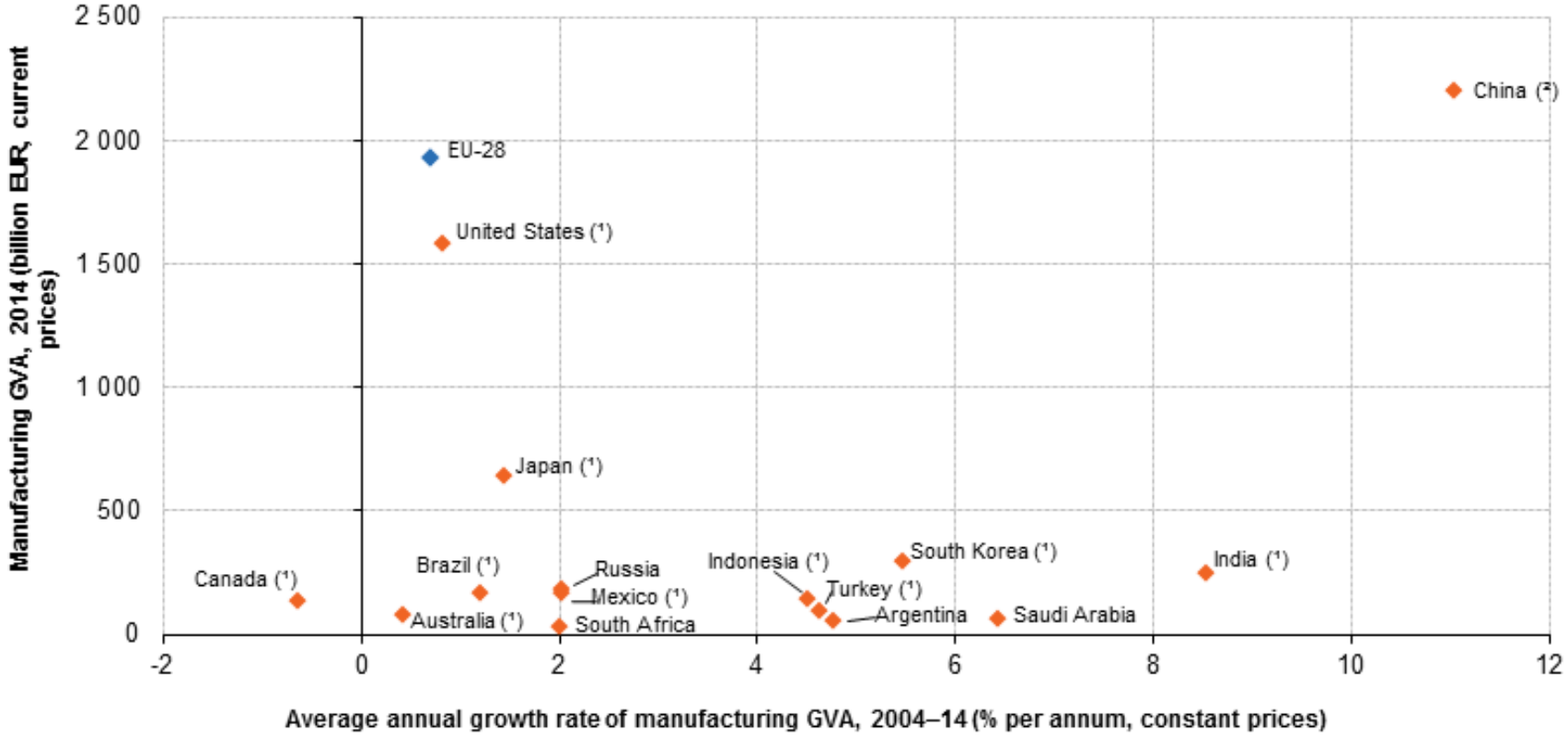
- European manufacturing **includes** 2.1 million companies, employing near 30 million persons and generating EURO 1 710 billion of value added.
- The **European Union is the world's biggest exporter of manufactured goods, and is a global market leader for high-quality products**.
- Machinery, transport equipment and chemicals are responsible for the highest share in European exports.

Manufacturing **is the backbone of the European economy**



Note: Ranked on value added.
Source: Eurostat (online data code: sbs_na_ind_r2)

European Manufacturing **has recovered the added value before the crisis, but has reduced its share** and lost the first place to China



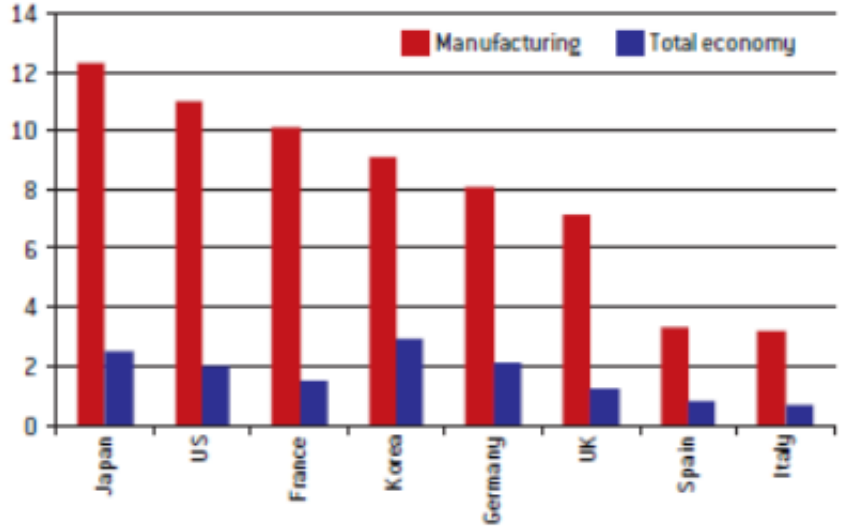
Note: the EU-28's annual average growth rate between 2004 and 2014 of GVA for manufacturing activities was 0.7 % (shown on the horizontal axis). The EU-28 GVA was EUR 1 932 billion in 2014 (shown on the vertical axis).
(¹) 'Manufacturing' excludes recycling and publishing activities.
(²) At producers' prices for current prices series. 2005 data for constant prices series instead of 2004.

New World Scenario – Global Competition and Cooperation

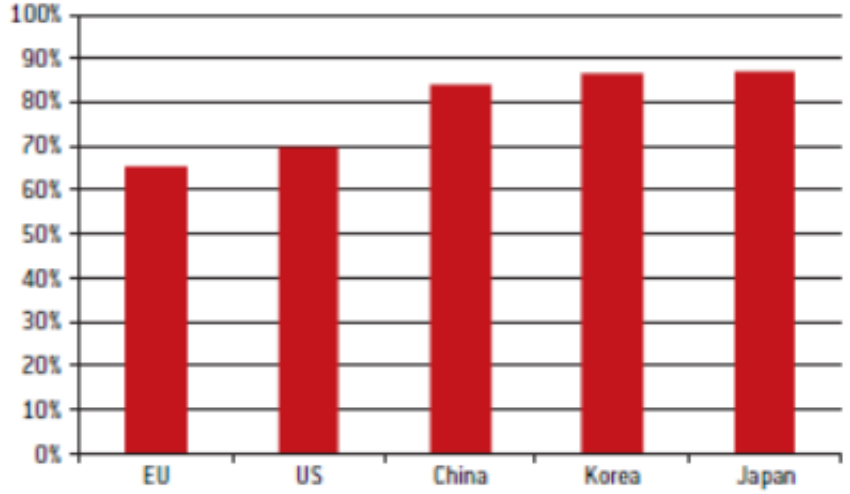
- The international landscape has changed due to the emergence and **growth of economies such as Korea, China, India, Brazil, Israel and South Africa**;
- **Although Europe, Japan and North America still dominate aggregate STI investment globally, their shares are declining**, and the international landscape is increasingly multipolar;
- **Competition has reached unprecedented levels globally** and the industrial structure is changing with important foreign investments, including those of emerging economies in Europe and the US;
- Competition is investing in R+D+I and is going up the value chain

Science, Technology and Innovation are the **drivers and enablers** of a **high added value, competitive** and **sustainable** manufacturing

- Europe should continue to build on its strengths in order to ensure future sustainable growth for Europe and its citizens



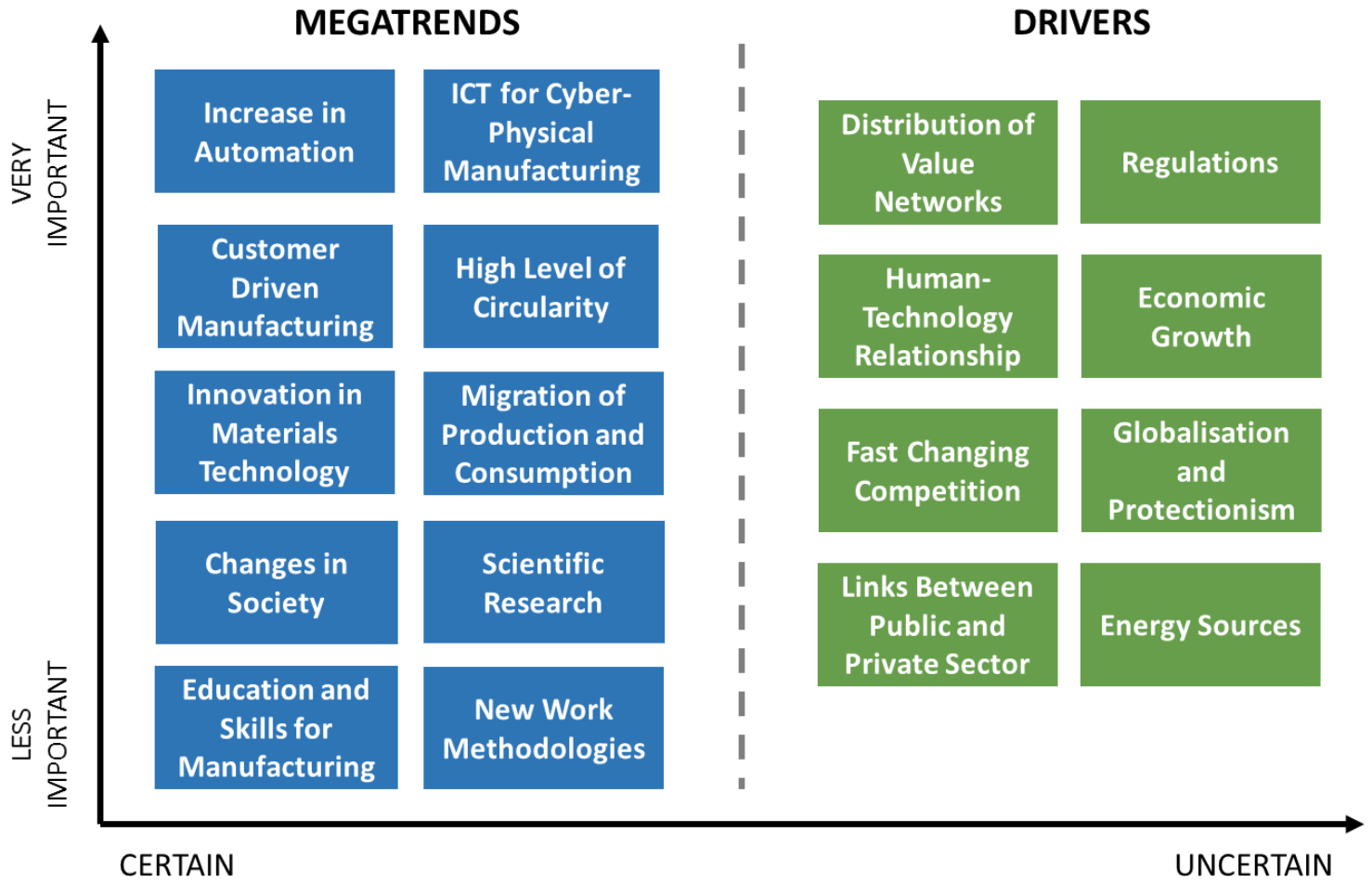
Source: OECD STAN. Note: 2009 or most recent year (US and Germany: 2008, France and UK: 2006). R&D intensity is the ratio of R&D expenditures to value added.



Source: Bruegel based on OECD STAN. Note: EU aggregate (excluding Greece and Luxembourg) from Eurostat.

2. Megatrends and Drivers for Manufacturing

Megatrends and **drivers** (uncertainties) and their foreseen impact in **manufacturing systems** is a precondition to develop a **European strategy** to reinforce **competitivess** and **long-term sustainability**



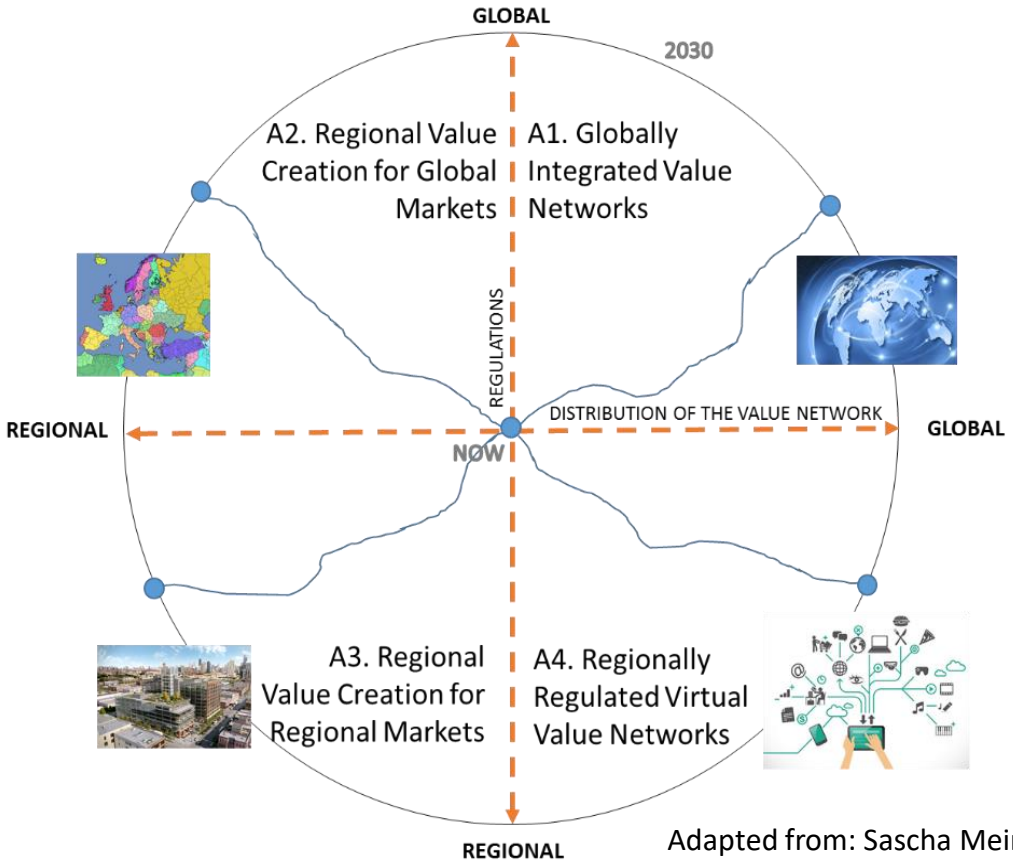
3. Scenarios for Future Manufacturing Models

Two Sets of **Scenarios** for **Future Manufacturing Models** from different perspectives, enabling the antecipation of the near future

- **Set A: Structure and Governance of Value Networks**

4 scenarios generated by **2 drivers**: **Regulations** and **Distribution of the Value Network**

High and growing level of the **circular economy** principles

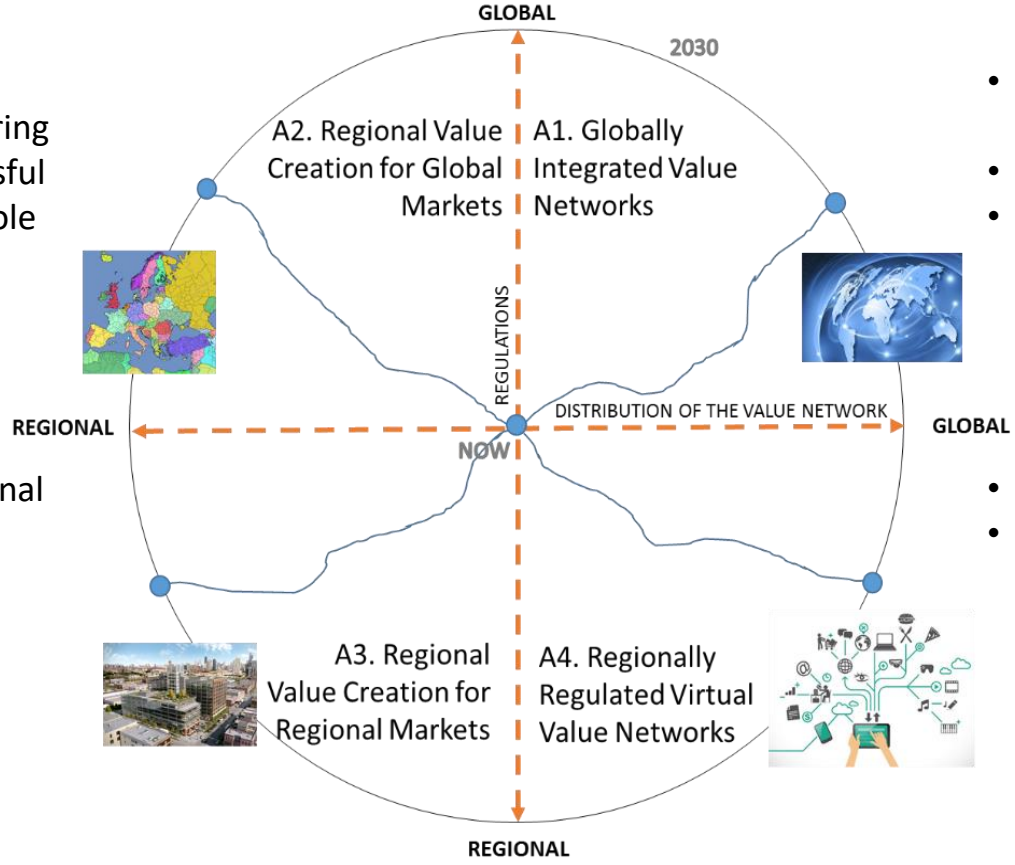


Adapted from: Sascha Meinert, 2014, Scenario building - Field manual. European Trade Union Institute

Two Sets of **Scenarios** for **Future Manufacturing Models** from different perspectives, enabling the antecipation of the near future

- **Set A: Structure and Governance of Value Networks**

- Global markets;
- Regional networks of manufacturing companies specialized on successful products deliver them to the whole world.



- High and real-time integration of physical and virtual worlds;
- Globally harmonised regulation;
- Global networks of manufacturing companies.

- Regional manufacturing for regional customers;
- Realisation of manufacturing in urban areas;
- Example: Urban Manufacturing.

- Decentralised value networks;
- Platform based ad-hoc value networks emerge spontaneously for the production of specific lots of products in specific locations.

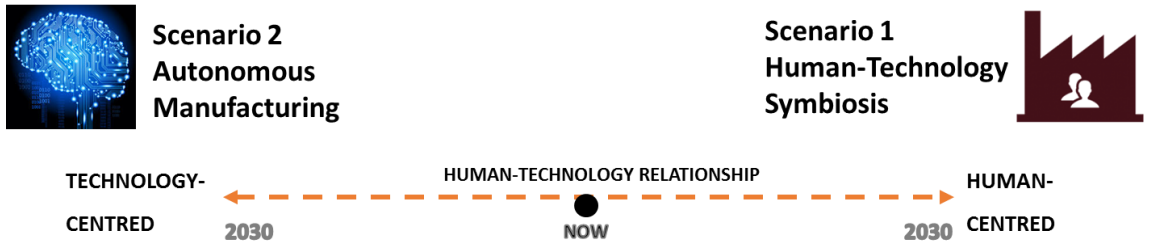
Adapted from: Sascha Meinert, 2014, Scenario building - Field manual. European Trade Union Institute

Two Sets of **Scenarios** for **Future Manufacturing Models** from different perspectives, enabling the antecipation of the near future

- **Set B: Human-Technology Relationship**

Adapted from: Sascha Meinert, 2014, Scenario building - Field manual. European Trade Union Institute

2 scenarios generated by **1 driver**: **Human-Technology Relationship**



High and growing level of the **circular economy** principles

- High degree of automation (self monitoring, autonomous decision-making capabilities);
- Zero-defect manufacturing;
- Investment in ICT skills.

- Balance between tasks executed by humans and tasks executed by machines;
- Optimised socio-technical systems;
- Continuous improvement of manufacuturing skills.

4. MANUFUTURE High Level Vision and Strategy for 2030

We are now facing a new paradigm shift

- A **new generation (the millennials and beyond)**:
  - **always connected** and **aware** of the potential **of new technologies**
  - **Highly demanding** about the products and services they consume
    - **looking for Personalised** and unique products
    - **Looking for a service** to solve a problem more than buying a product
  - A generation **much more educated** than previous ones and, hence, more “demanding” in terms of expectations, aspirations and needs.
- The world population:
  - Is **expected to increase**, **especially in areas already suffering over population**
  - Increased concentration of people in **urban areas**
  - Growing **aging population**,
  - **Continued migration streams**
  - A significant reduction in the level of poverty and a **growing “middle class”** at global level

We are now facing a new paradigm shift

- **Climate change is affecting severely all societies**
- **An increased environmental awareness**, more strict regulation and the scarcity of raw materials and fossil fuels ➔ **resource efficiency as a key competitive factor**
- Increased level of **implementation of a circular economy** especially in Europe
- **Unprecedented increase in the speed of development in science and technology**
- **Fast diffusion of knowledge and global access to the Internet**
- **Stronger competition at global level:**
  - **Even in high quality and technology segments**
  - **Competitors are investing more in R+D+I**
  - **Competition is going up the value chain**
- **Industry 4.0, where Europe is leading, is an opportunity**
- **Manufacturing digitalisation and automation, leads to increased levels of efficiency, quality, zero-defect, higher integration, adaptability and flexibility**

We are now facing a new paradigm shift

- There is a need for:
  - **More intelligent and customized products, services and value chains**
  - **More environmental sustainability**
  - **More investment in R+D+I**
  - **More impact of R+D+I investments**
  - **More flexibility and resilience**
  - **Better balance and integration of activities between humans and machines**

Europe **needs to increase its investment in manufacturing** and **reinforce leadership in key areas**

Leadership in science and engineering

Leadership in digitalisation and manufacturing technology

MANUFUTURE 2030

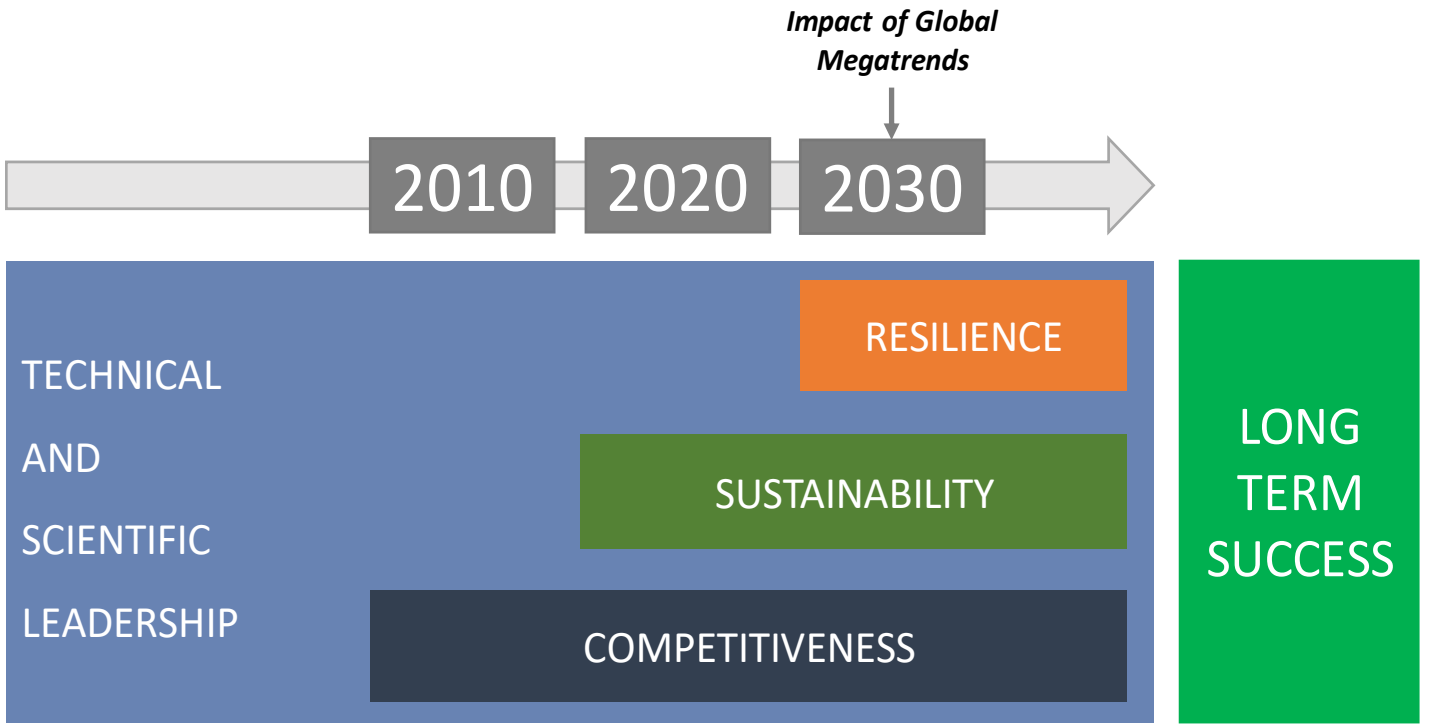
Vison and Strategy

Leadership in resource efficiency and sustainable development

Leadership in resilient and adaptive manufacturing

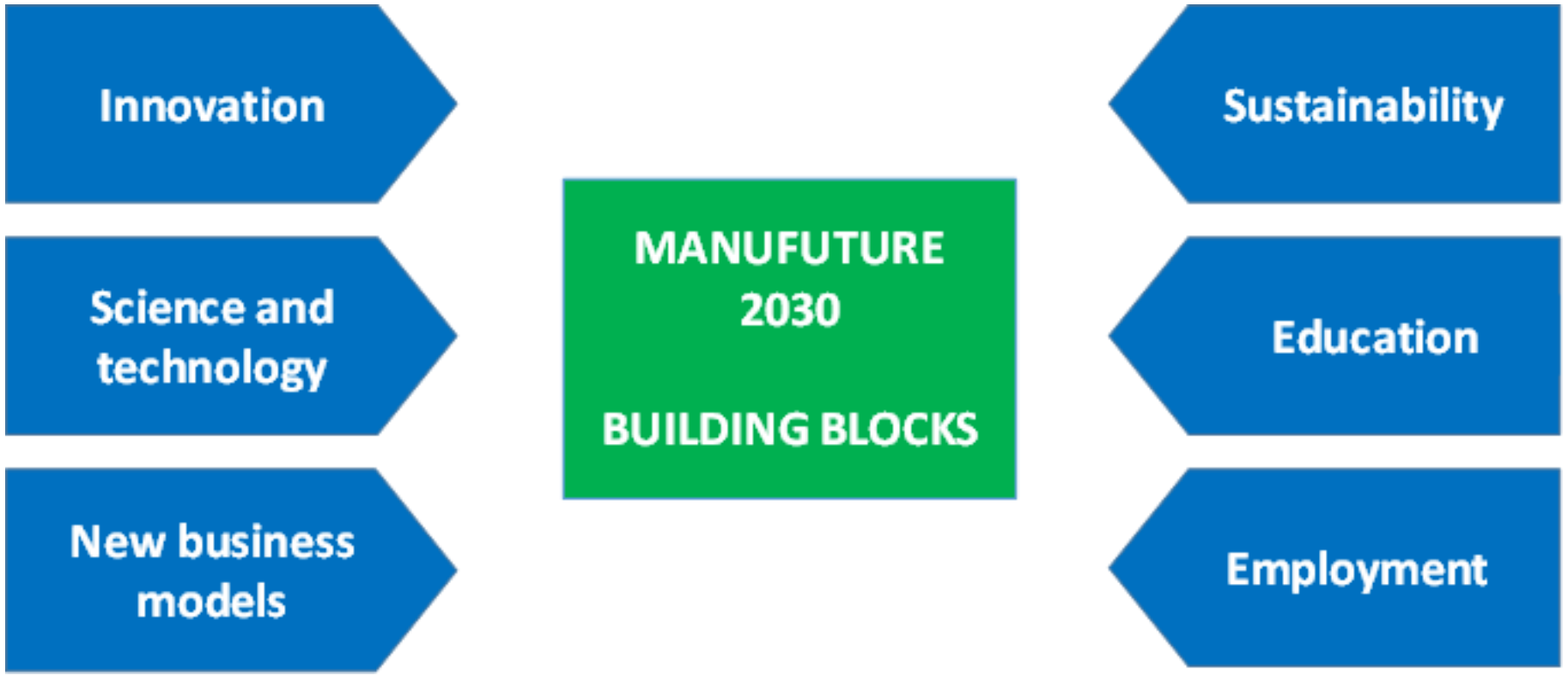
Leading Innovation Ecosystem

MANUFUTURE vision: the need for a **resilient** and **adaptative manufacturing ecosystem**



5. The MANUFUTURE Vision Building Blocks

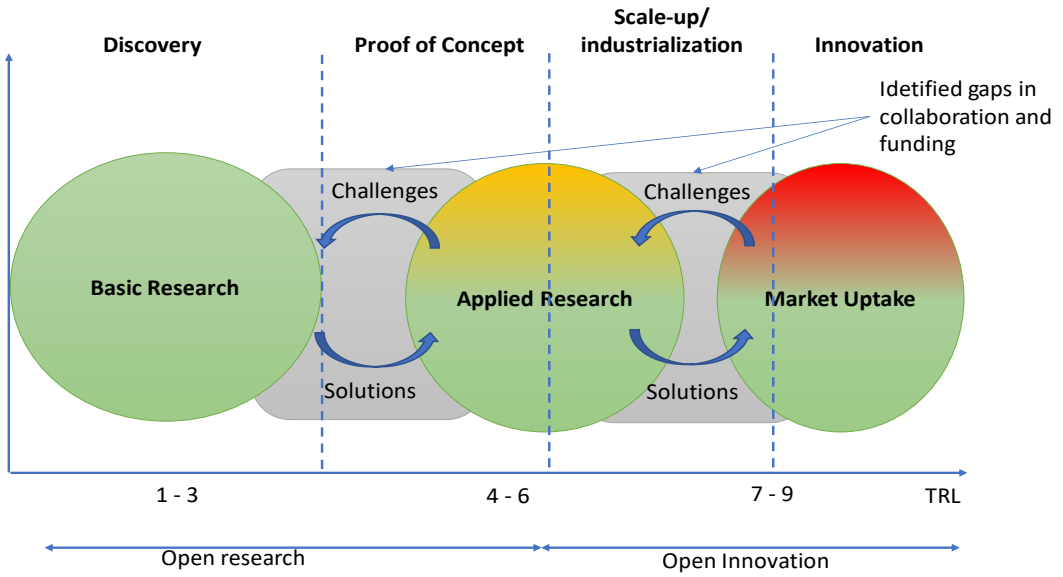
Five Building Blocks to reach MANUFUTURE 2030 Vision and Strategy



A **dynamic** and **globally competitive research and innovation ecosystem** will be key for European Manufacturing future competitiveness

Innovation

- Complementary partnerships
- Collaborative RTD projects and platforms
- Basic research and applied research mix
- **Demonstrators, experiments and pilot lines**
- Need for **long term and integrated R+R+I strategy**



Increase **competitiveness** and **innovativeness** of manufacturing by combining strong scientific and technological skills with attractive work environments

- Contribution from **Engineering and Technology**, with special focus on **Manufacturing Science and Technology**
  - Production technologies;
  - Product design engineering;
  - Digitalisation of industry by the means of CPPS, cloud and edge manufacturing, mechatronics, …;
  - Materials engineering.
- Contribution from **Basic Science**
  - The future of manufacturing will rely on interdisciplinary scientific discoveries;
  - Establishment of communities or ecossytems.
- Contribution from **Social Sciences and Humanities**
- **Global Cooperation** in Science and Technology

Need to devise **new business models** for **fully digitalised** products and manufacturing activities

Examples:

- Remanufacturing business models
  - Encouraged through regulations
- Sharing economy
- Outcome economy
- Circular economy

Enabled by disruptive technologies

Life-cycle oriented and **sustainable** manufacturing strategy and ecossystem

MANU*FUTURE* 2030's five actions for Sustainability and Manufacturing:

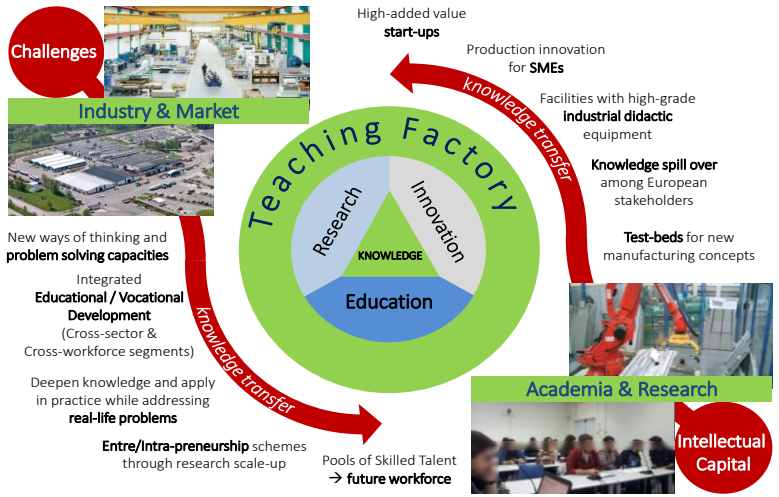
1. **Manufacturing for the Environment**
2. **Manufacturing in a Circular Economy**
3. **Re-manufacturing Revolution**
4. **Europe as a Re-Manufacturing Ecosystem**
5. **Manufacturing for the Sharing Economy**

It is People that make the difference

MANU*FUTURE* 2030's three actions for Education and Training:

1. **Policy for knowledge diffusion in manufacturing**
2. **Enabling Technologies for re-shaping manufacturing education in Europe**
3. **Emerging manufacturing education paradigms – The Teaching/ Learning Factory**

Education



Employment in future manufacturing ecossystem

- **Changes in employment structure in manufacturing, eg:**
  - Advanced manufacturing technologies (incl. CPSs)
  - More skilled workers and engineers (knowledge and service jobs)
- **New Trends in manufacturing and employment in 2030**
  - Higher diversity of workforce
  - Urban manufacturing
  - Human-oriented manufacturing
  - Seamless connection between manufacturing and related services in a circular manufacturing perspective
  - New manufacturing paradigms driven by personalization and individualisation