



Grasping Challenges of the new industrial era: a policy view

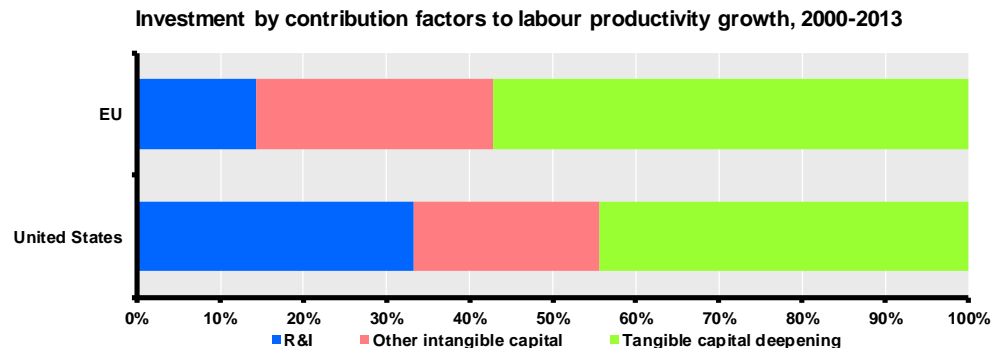
**2nd GLORIA workshop Corporate
Value Chains and innovation
networks**

17 May 2019

Prosperity needs R&I

R&I are undisputed drivers of growth and jobs ...

- 62% of EU economic growth 1995 – 2007
- R&I drives productivity growth



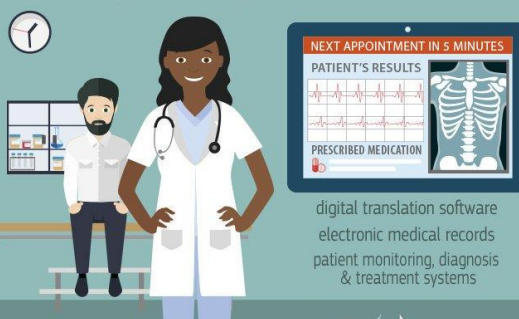
Source: EC, RTD, "[The economic rationale for public R&I funding and its impact](#)" (2017)

... and they are necessary to develop the science and technologies to tackle societal challenges

- Ebola outbreak 2014-16 most complex since 1976: 50% fatality
- EU investments: €160 m vaccine, €14m treatment/ diagnostics

DIGITISATION IS TRANSFORMING THE ECONOMY


Today's hospital doctors need digital skills



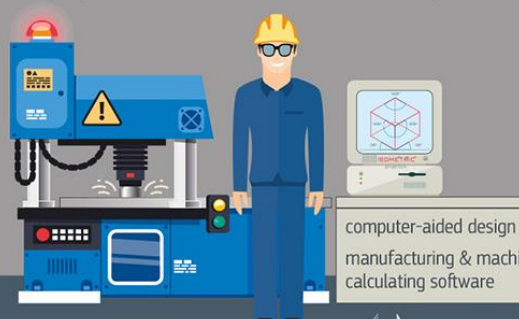
Benefits:

- facilitates communication between doctors & patients
- improves access to medical information
- allows doctors to save time and to treat more patients

digital translation software
electronic medical records
patient monitoring, diagnosis & treatment systems

 European Commission #EUSkillsAgenda


Today's industrial machine operators need digital skills




Benefits:

- faster manufacturing & reduced errors
- less hard, manual, repetitive tasks
- manufacturing processes more sustainable.

computer-aided design
manufacturing & machinist
calculating software

 European Commission #EUSkillsAgenda

Today's VET teachers need digital skills




Benefits:

- improved communication between teachers & students
- improved quality of learning
- increased safety

• Learning management systems
• Virtual learning platforms
• Digital simulation technologies

INTERACTIVE WHITE BOARD

 European Commission #EUSkillsAgenda

Today's farmers need digital skills

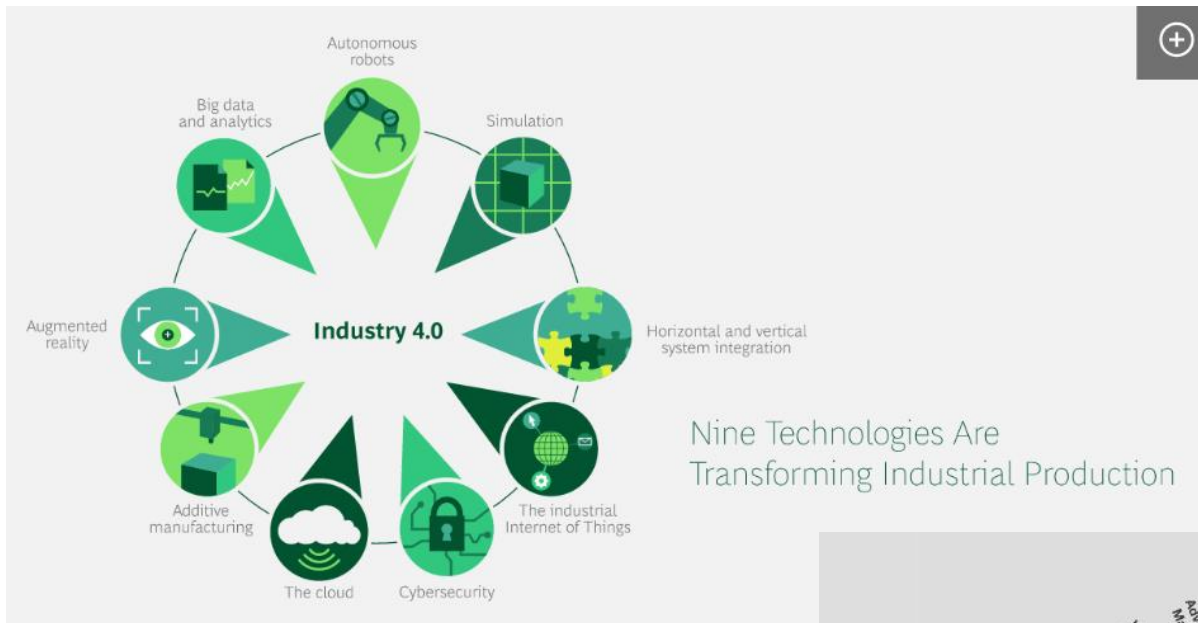


Benefits:

- improved decision making
- less repetitive & physically demanding tasks
- increased flexibility, productivity & animal health

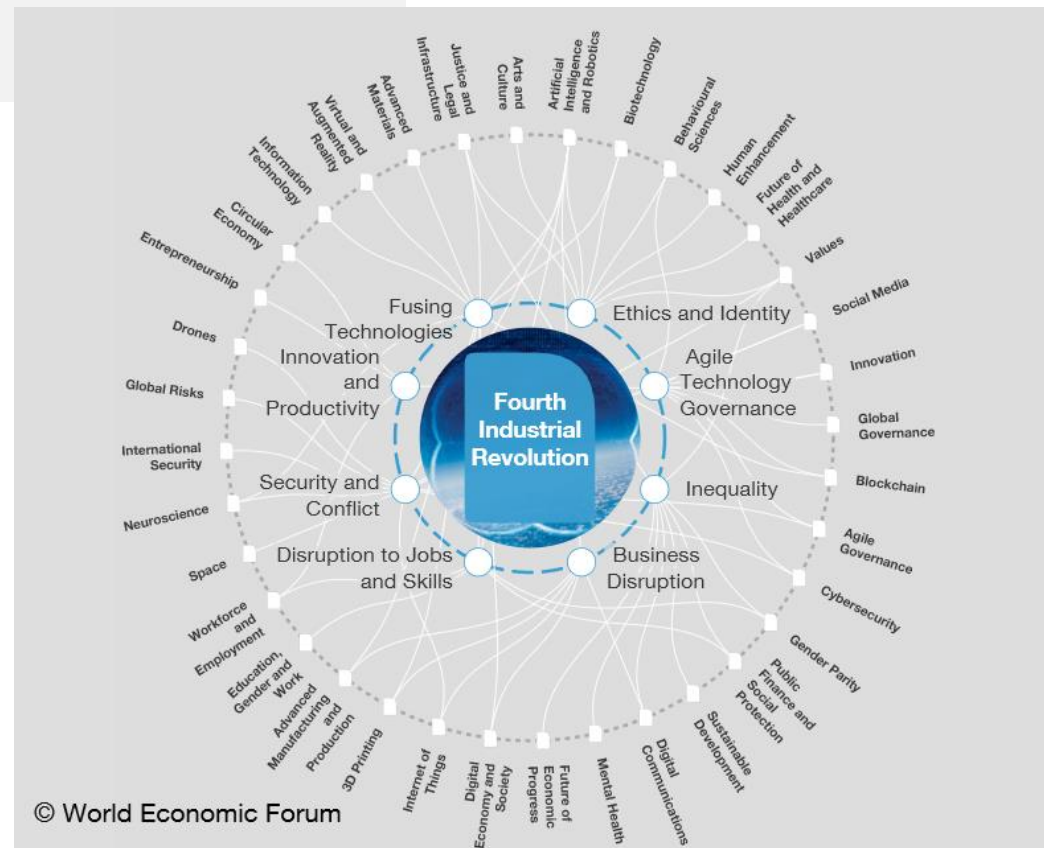
Herd vaccination
Crop monitoring
Automated irrigation
Farm management

 European Commission #EUSkillsAgenda

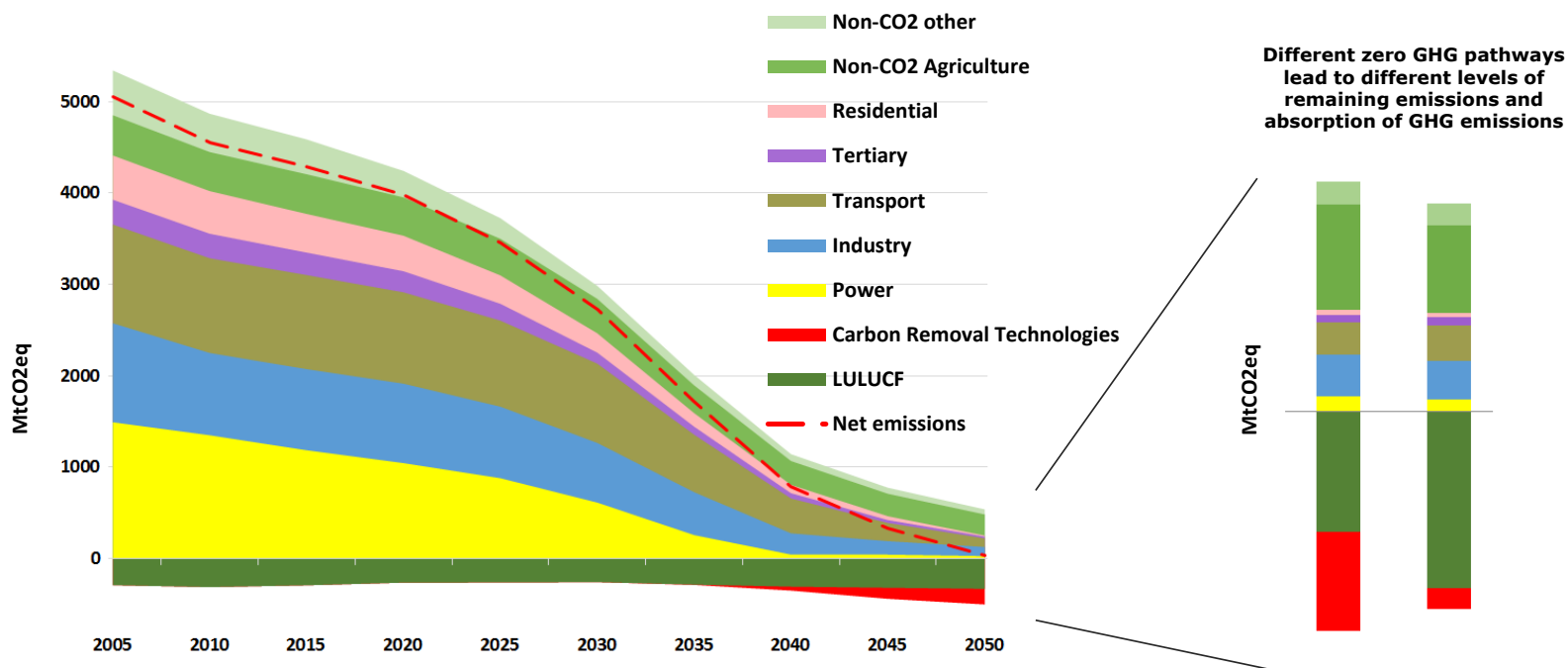


Source: Boston Consulting Group

Industry 4.0 versus 4th Industrial Revolution



Industry: contributing to the challenge – essential for solutions



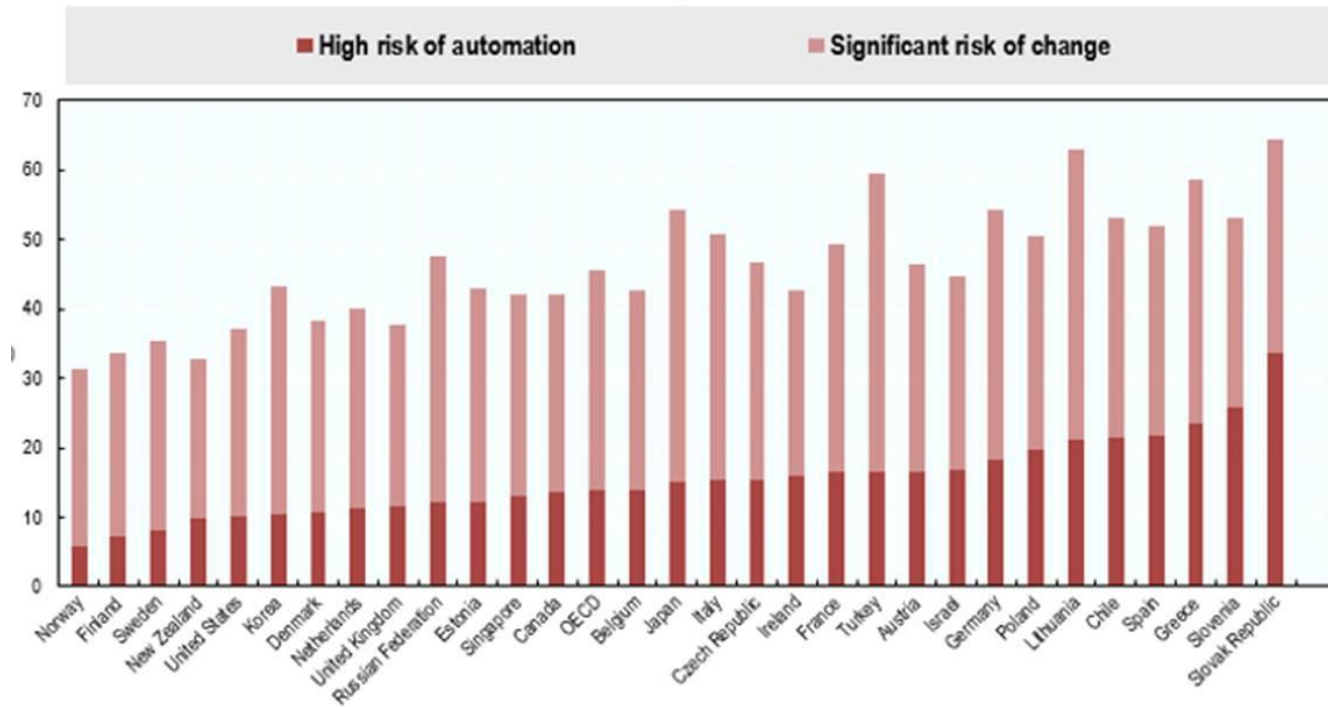
Greenhouse gas emissions – estimated reductions 2050

People are worried

Future of work and large scale job displacement

Polarisation of
labour market

Inequality,
geography of
discontent
(Brexit, gilets
jaunes)



Source: Nedelkoska and Quintini (2018), OECD (2018)

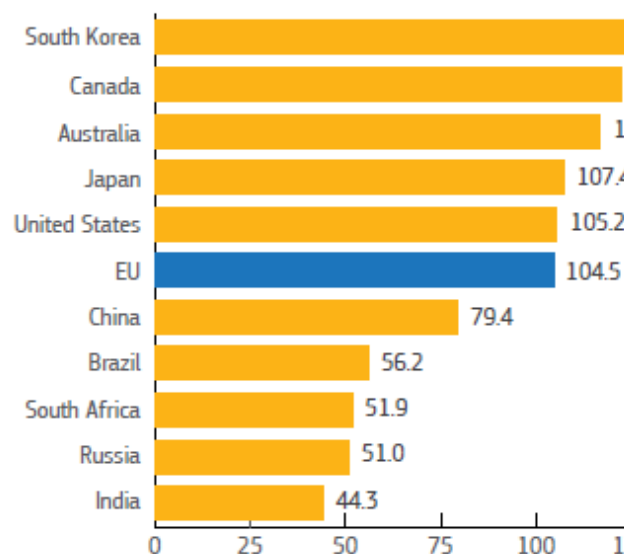
Societal challenges ever more pressing and society getting engaged (climate strikes)

Risks associated with emerging technologies

Geo-political shifts; Europe's sovereignty

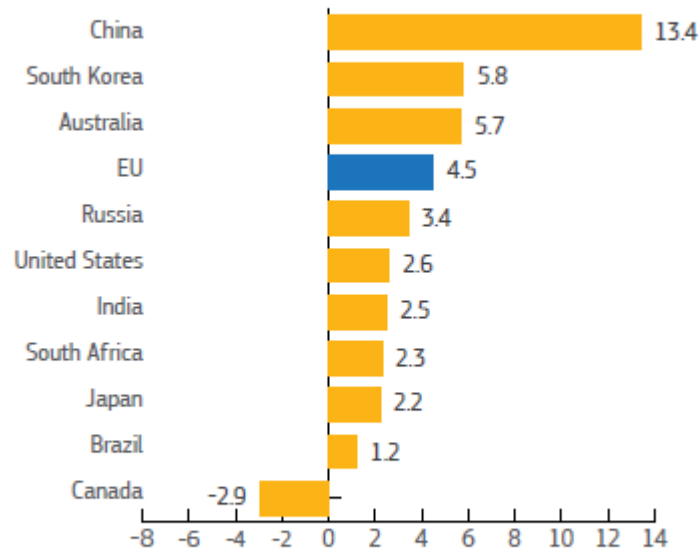
Global innovation gap

Figure 13: Global performance



Bars show countries' performance in 2017 relative to that of the EU in 2010

Figure 14: Change in global performance

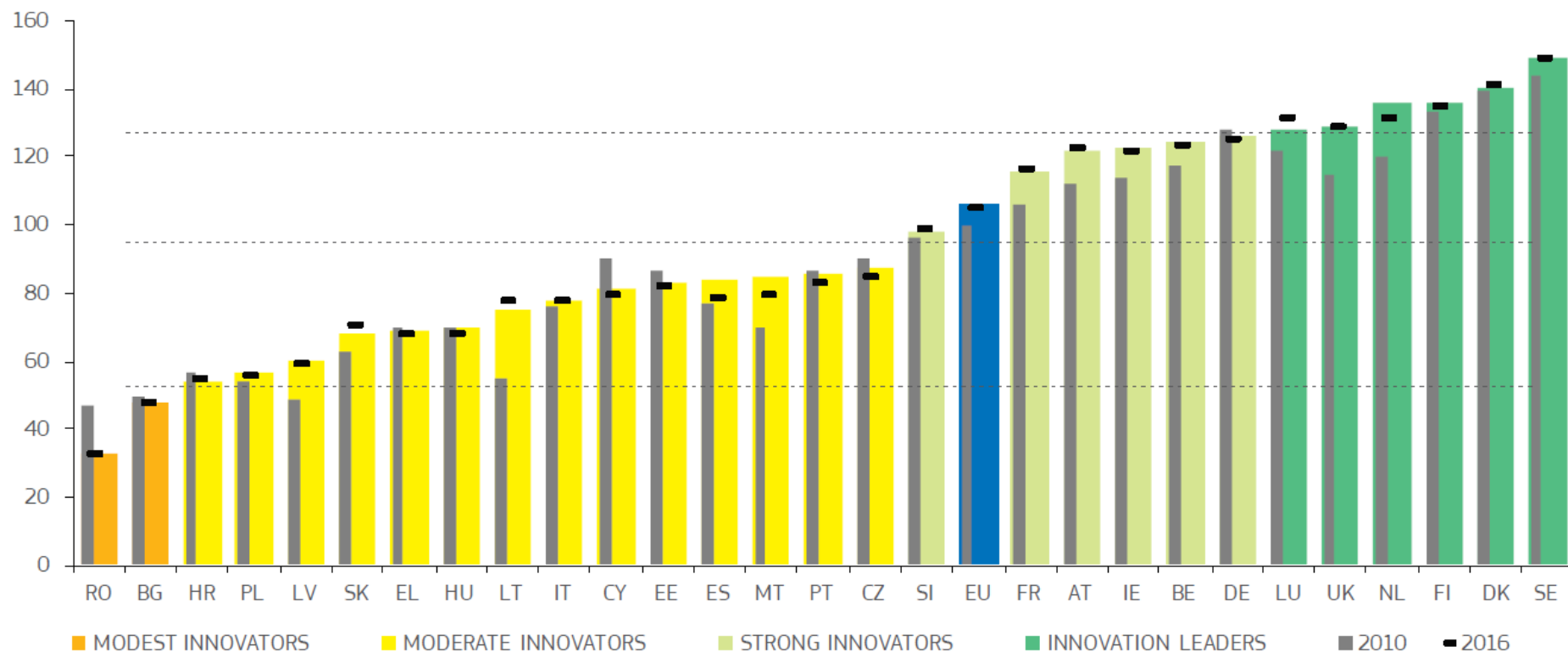


Change in performance is measured as the difference between the performance in 2017 relative to the EU in 2010 and the performance in 2010 relative to the EU in 2010.

Source: European Innovation Scoreboard 2018

European Innovation Scoreboard 2018

Summary Innovation Index



Digital technology integration by businesses

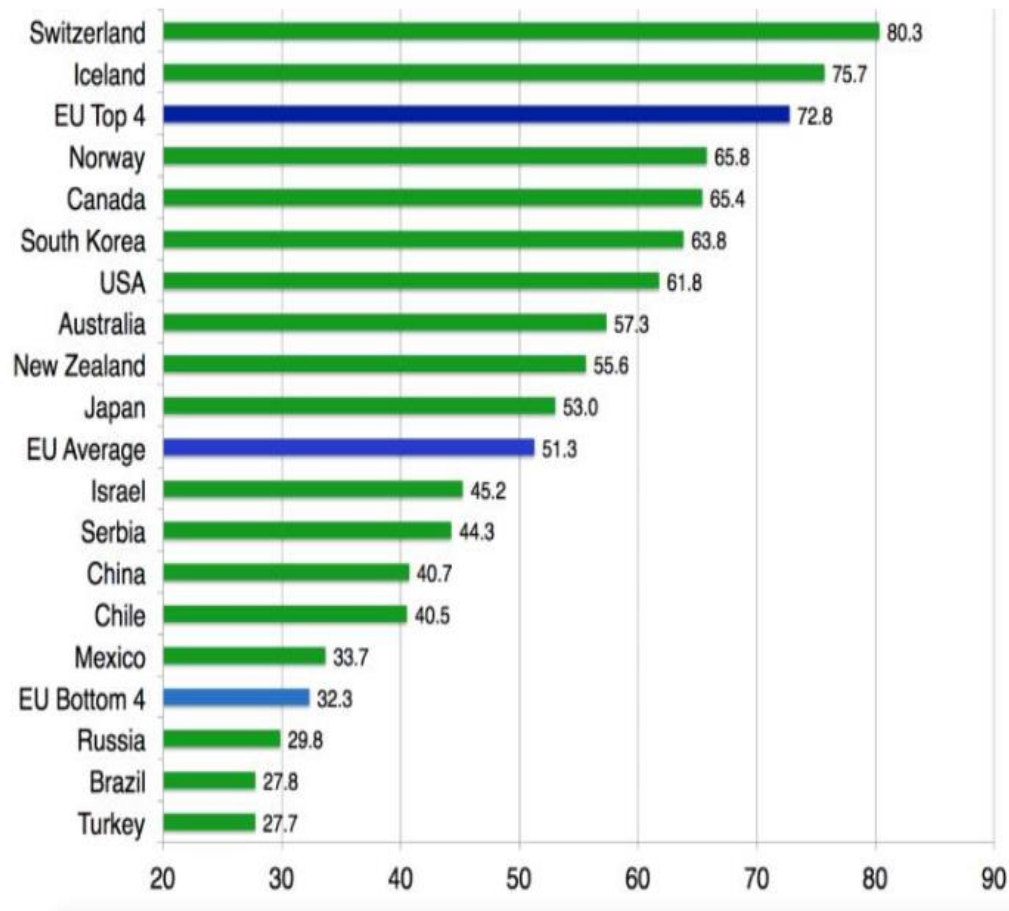


Figure 6: Normalised country scores for the business technology integration dimension in 2016

Source: International Digital Economy and Society Index (I-DESI)

Manufacturing is important in Europe



32 million manufacturing jobs in more than 2 million enterprises

3.7% of total employment are ICT jobs

37% or 93 million in the labour force do not have basic digital skills

40% of enterprises report hard to find ICT specialists



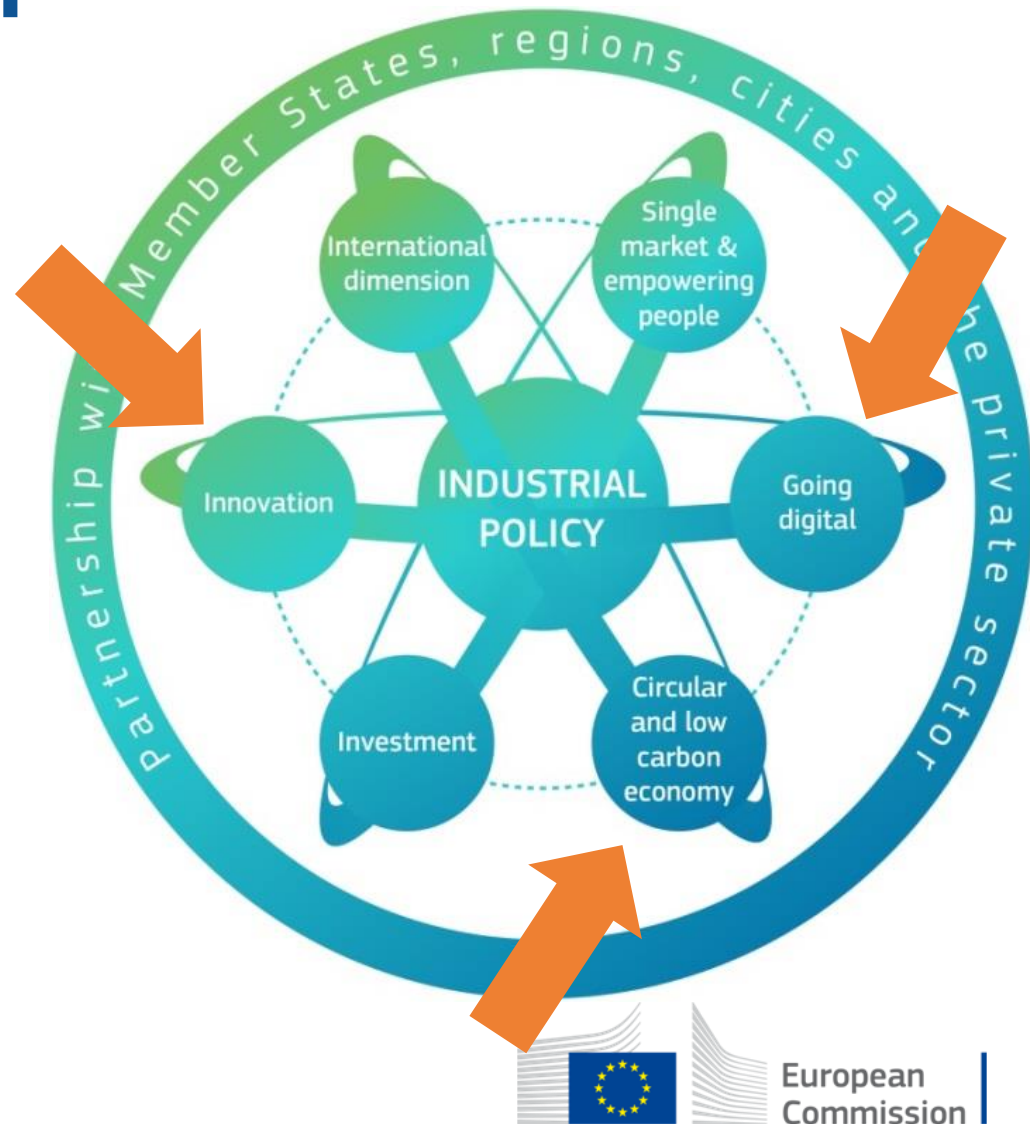
Currently more than 350,000 vacancies for ICT specialists in the EU

EU: Renewed Industrial Policy Strategy - making Europe's industry stronger

- Investing in a smart, innovative and sustainable Industry

Commission Communication „A renewed European industrial policy strategy“ - 13/09/2017

Work starting now – 2030 perspective (High-Level Industrial Forum)



KEY ENABLING TECHNOLOGIES (KETs) AT THE HEART OF EUROPEAN COMPETITIVENESS



High-Level Strategy
Group on Industrial
Technologies (2018)

Updated criteria for KETs

- Enabling: multiple cross sectoral, society, environment, circular economy, green growth
- Key capacity – impact on people, society, safety & security, connectivity
- Relevant – research, development, production, underpinning societal participation and democratic engagement, European sovereignty

Updated list of KETs: "Old" KETs are still relevant, but

- Merge Nanotechnologies and Advanced Materials
- Merge Photonics and Micro/nanoelectronics
- Widen scope of Biotechnology to Life-Science Technologies

Two new KETs:

- Artificial Intelligence
- Security and connectivity technologies¹²

Drivers: Globalisation – Digitisation – Knowledge Society
Rational: Global Excellence, Systemic Relevance, European Sovereignty, Sustainability, Multi-purpose

KETS

**Advanced
Manufacturing
Technologies**

**Advanced Materials
and Nanotechnologies**

**Life-Science
Technologies**

**Micro-Nanoelectronics
and Photonics**

Artificial Intelligence

**Security
and
Connectivity**

**Production
Technologies**

**Digital
Technologies**

**Cyber
Technologies**

Examples

Smart, high performance, high precision and additive manufacturing and processes, Robotics, Process Industry, Green Propulsion Technologies, Integrated Bio-refineries

High performance, smart sustainable materials, Nanomaterials, Nanotechnology, Biomaterials, 2D Materials, Light Weight Technologies, New Chemistry

Industrial biotechnology, High throughput biology, Automation for biology, Synthetic biology, Genomics (Genome Engineering/Synthetic Genomes), Cell & tissue engineering, Biologisation of manufacturing, Biosensors, Bio Activators, Bio Actuators, Lab on a Chip, New Chemistry, Neurotechnologies

IoT, Smart/Intelligent sensors, Quantum technology, Supercomputing (high power, high performance, neuro-computing, beyond CMOS), Displays (LCD, Plasma) & Lighting (LED, OLED), Photonics integrated circuits, Biophotonics

Data generation and handling, Big data analytics, Machine learning and deep learning, Smart Robots, virtual agents, software technologies, decision making technologies

Secure and Authenticated Communication, Avoiding identify theft, Data protection and privacy, IoT, Data/Connectivity Safety and Security, Human-Machine Interfaces, Human-Computer / Robot Interaction, 5G, baseband/processor platforms

e-Governance, e-Administration, e-Voting, Cyber-Physical Systems, eSafety and eSecurity, Technology Assessment, Blockchain

Societal Challenges

ENVIRONMENT

ENERGY

MOBILITY

**HEALTH &
WELLBEING**

**FOOD &
NUTRITION**

SECURITY

PRIVACY

**INCLUSION &
EQUALITY**

Missions

Missions
....



Missions
....



Missions
....



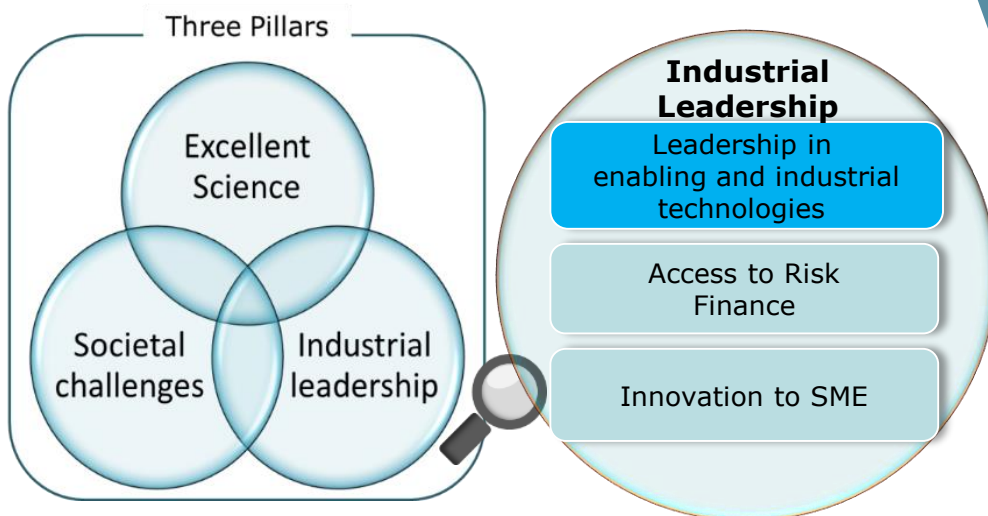
Horizon 2020 Leadership in Enabling and Industrial Technologies (LEIT)

NMBP: Nanotechnologies, Advanced Materials, Biotechnology

Manufacturing and Processing

ICT: Nano- and micro-electronics, Photonics

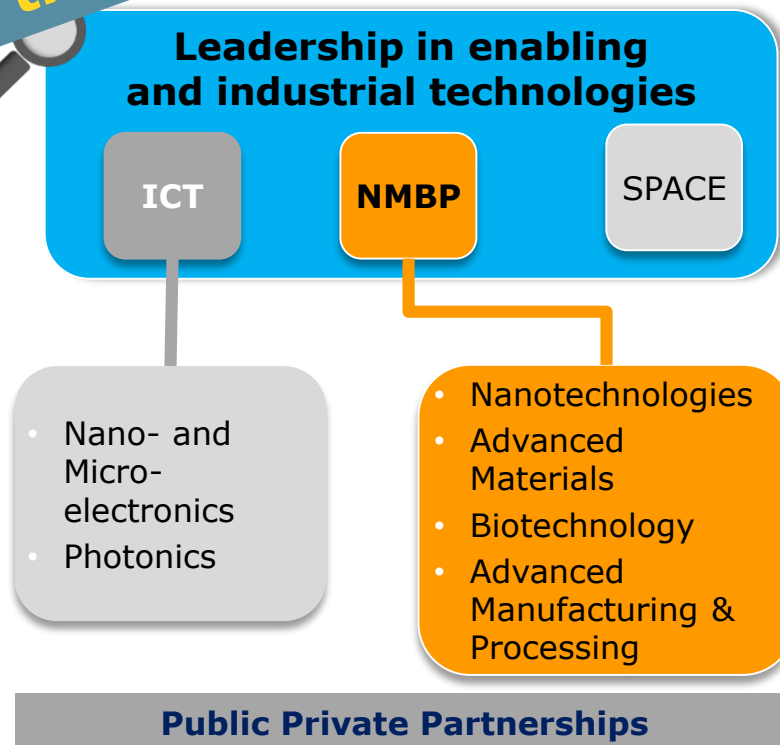
2018-20: Digitisation and industrial transformation, €1,6b



Indicative budget:
75 billion € *

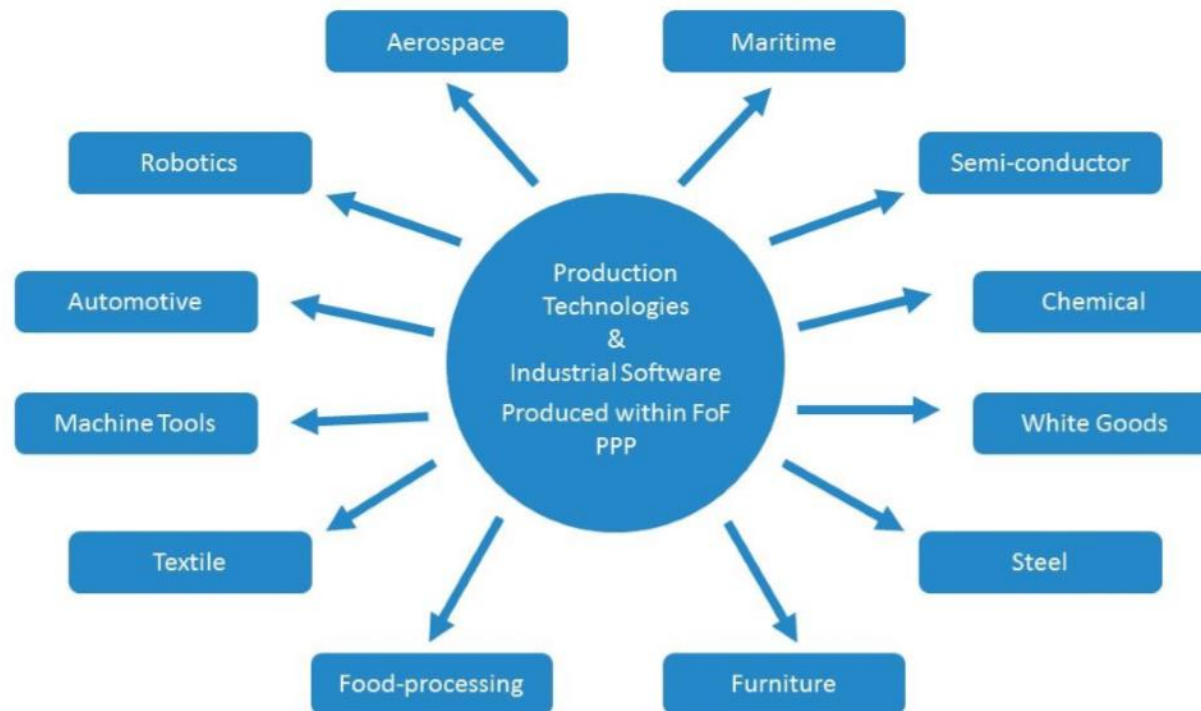
Indicative Budget:
16.5 billion € *

Out of it for NMBP:
3.8 billion € *



* July 2015 – includes EIT, JRC, "Science with and for Society", "Spreading Excellence / Widening Participation", in addition to three priorities above

Advanced manufacturing: Sectors Benefitting from Factories of the future R&D



Factories of the Future: Impact in a Nutshell



The Human in the centre – European policies and actions

- The future of work and jobs – Research and Innovation
 - **New technologies, processes; changes to expect in industry and society, new job profiles (e.g. Factories of the Future PPP, SPIRE)**
 - **Human centred workplace design and work organisation, human-robot collaboration (eg Factories of the Future PPP)**
- Promoting uptake
 - **Digitising European Industry - Digital Innovation Hubs**
 - **Acceptance by workers, by public**
- Skills development – for digitisation, new jobs, entrepreneurship, interdisciplinary cooperation
 - **European Skills Agenda, Digital Skills Coalition, Erasmus+ Sectoral Blueprints, Horizon 2020**
 - **Digital technologies to support learning, also in factories; role of hubs**
- Artificial Intelligence: Communication of 25 April 2018, Joint Action Plan of 7 December 2018
 - **Calls for ethical framework; promoting uptake; regulatory review; European AI Alliance**
 - **AI Ethics Guidelines, April 2019**

Policy responsibility with regard to cohesion and inclusiveness

National Initiatives on Digitising Industry

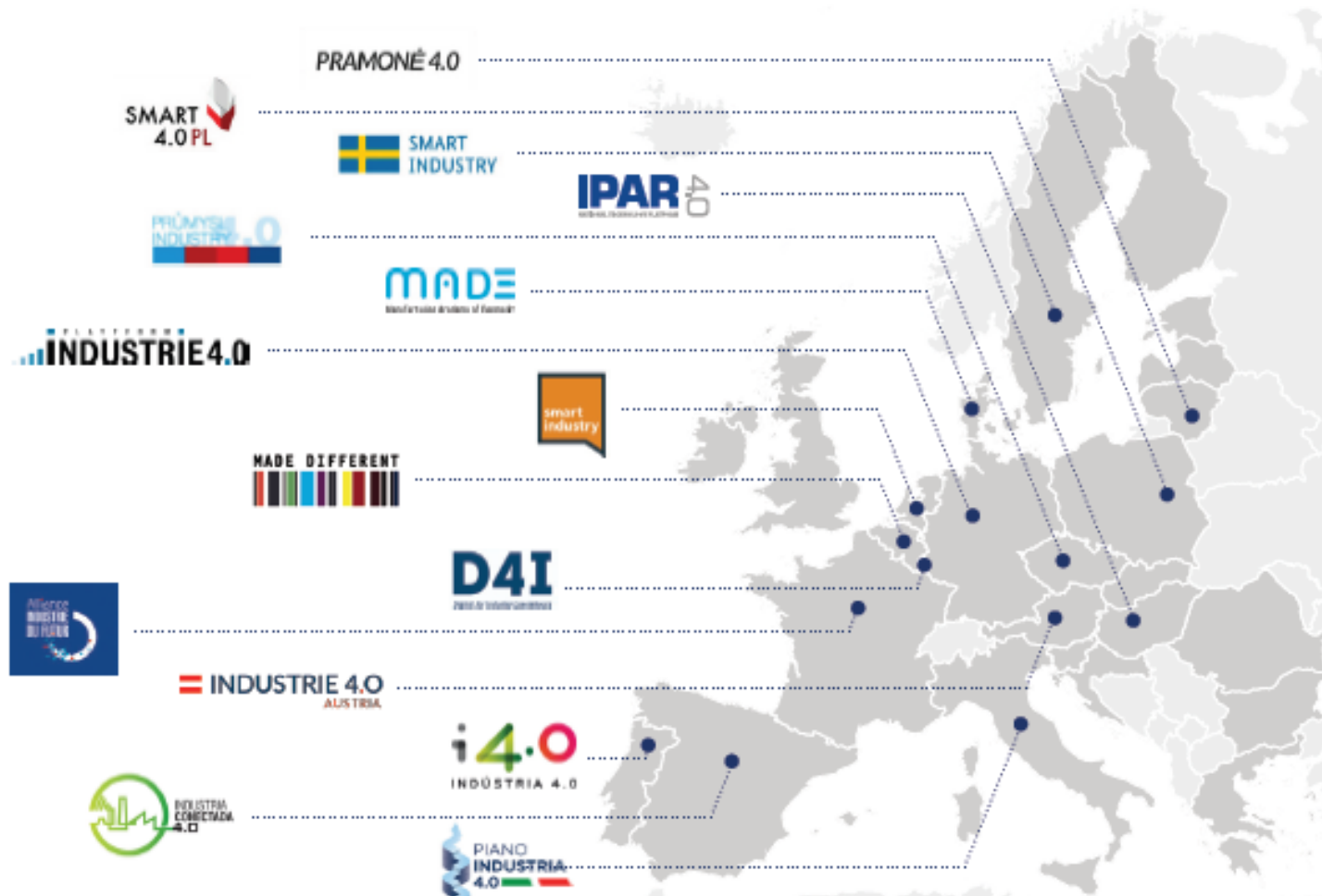
European
Commission

EU-level initiative:

**Digitising European
Industry**

COM(2016)180

April 2016



Analysis of National Initiatives on Digitising Industry

<https://ec.europa.eu/futurium/en/implementing-digitising-european-industry-actions/national-initiatives-digitising-industry>

CHALLENGES AND FUTURE TRENDS

The Future Workplace



Networked
Flexible
Integrated
Open
Innovative
Digital

Critical skills for the workforce



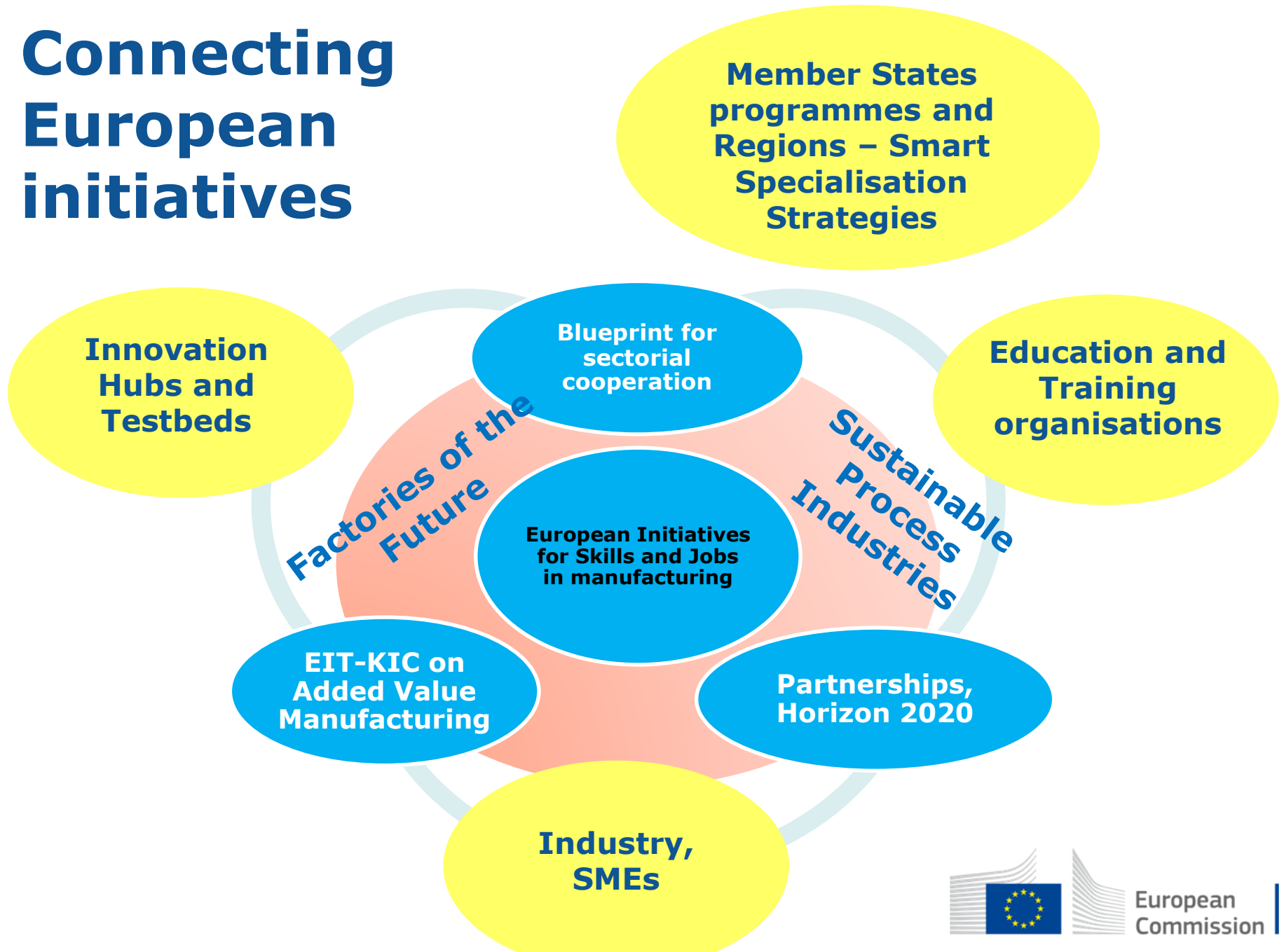
Social Intelligence
Novel and adaptive thinking
Cross-cultural competency
Computational thinking
Transdisciplinary
Virtual collaboration

Skills demand in 2020



Complex problem solving
Critical thinking/Creativity
People management/ Teamwork
Emotional intelligence
Judgment and decision-making
Service orientation
Negotiation

Connecting European initiatives



Challenges

- *Disruptive impact of new and converging technologies, business models*
- *Massive investments and market growth „elsewhere“*
- *Global challenges, sustainability*
 - **Environment, climate change, planetary boundaries**
 - **Social, inequalities, inclusiveness**
 - **Economic, prosperity**

Ingredients for sustainability

- *Autonomy in key technologies*
- *Strong strategic value chains*
- *Transformation*
 - **Carbon-neutral and circular industries / economy**
 - **Digitisation, innovation capacity**
- *Knowledge base*
- *Creativity through start-ups and scaling them up*
- *Assure finance and access – public and private*
- *Open Innovation*
- *Skills*
- *Inclusiveness*
- *Develop policies at all levels – not only framework but direction setting*
- *Partnerships*
- *Global level playing fields*

Horizon Europe



- The vision:
" a Europe that protects,
a Europe that empowers,
a Europe that defends"
Jean-Claude Juncker
- Tackling **climate change**
(35 % budgetary target)
- Helping to achieve **Sustainable Development Goals**
- Boosting the Union's
competitiveness and growth



to strengthen the EU's
scientific and technological
bases



to boost Europe's innovation
capacity, competitiveness
and jobs

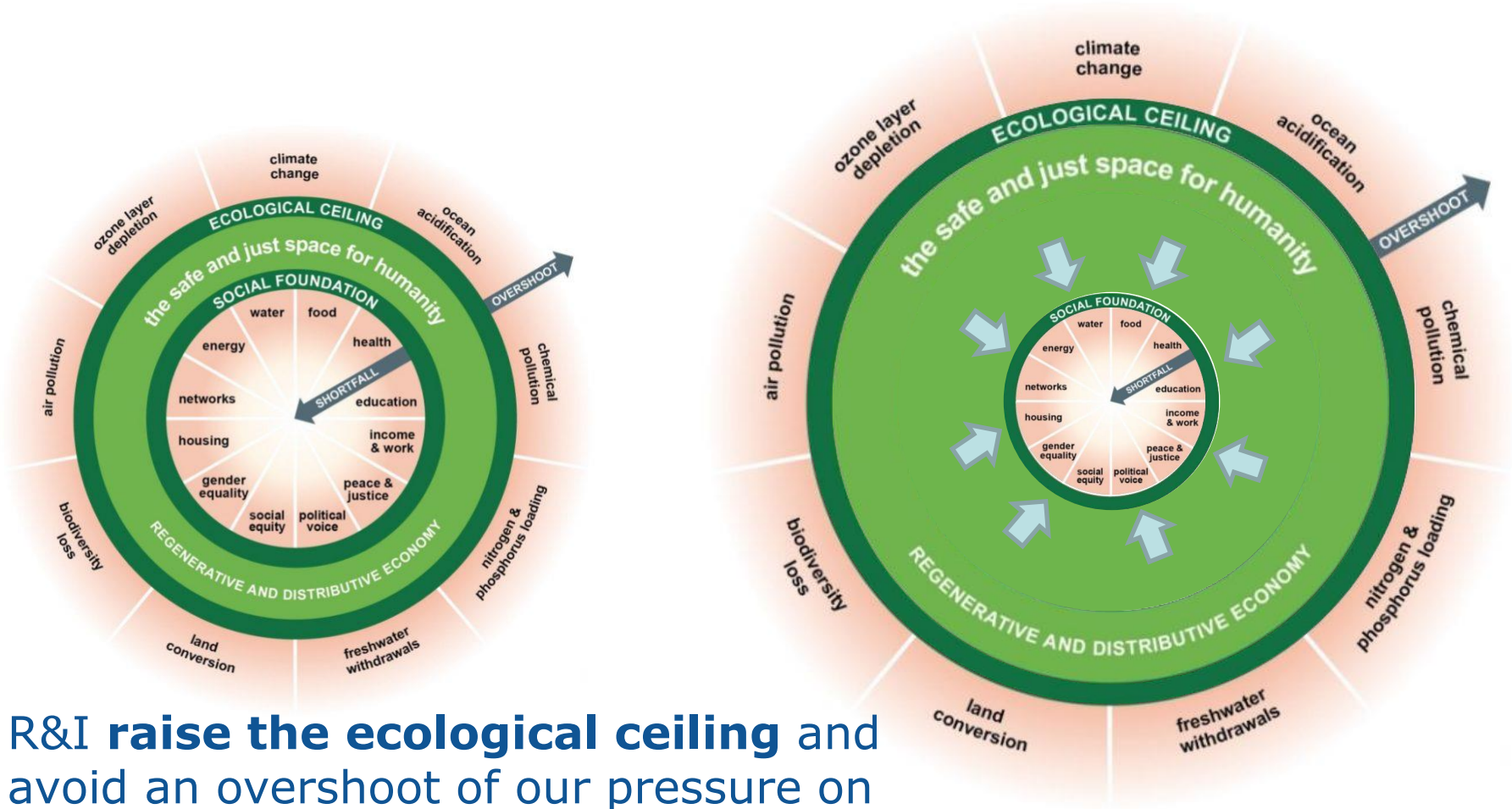


to deliver on citizens'
priorities and sustain our
socio-economic model and
values



European
Commission

Teaser - Kate Raworth's doughnut



R&I **raise the ecological ceiling** and avoid an overshoot of our pressure on the planet

R&I **reduce social shortfalls** and raise overall standards so that nobody misses out on life's essentials from health to food to energy

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