



New Industrial Paradigms: i4.0 & Sustainability

SIM4.0 WORKSHOPS

Évora, 15 March

EU Efforts to Support Industrial Sustainability & Digitisation

Erastos Filos, PhD

Directorate « Industrial Technologies »

DG Research & Innovation

Presentation Outline

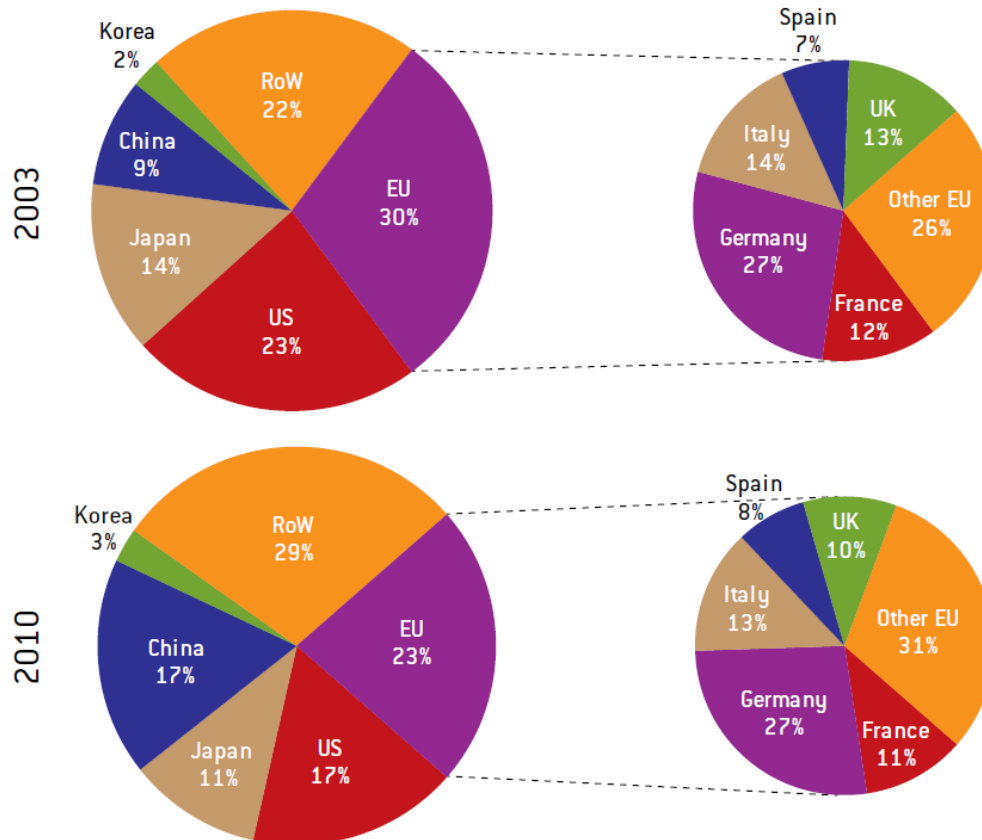
- Adding Value to Manufacturing in Europe
- Technological Innovation & ICT
Driving Europe's Re-Industrialisation
- The 'Factories of the Future' PPP &
Digitising European Industry Initiative
- Towards a Platform-driven Industry

Manufacturing Matters

- 16% of EU GDP
- 20% of direct jobs and twice as many indirect jobs
- 66% of private EU R+D+I investments
- Part of a complex global economic system



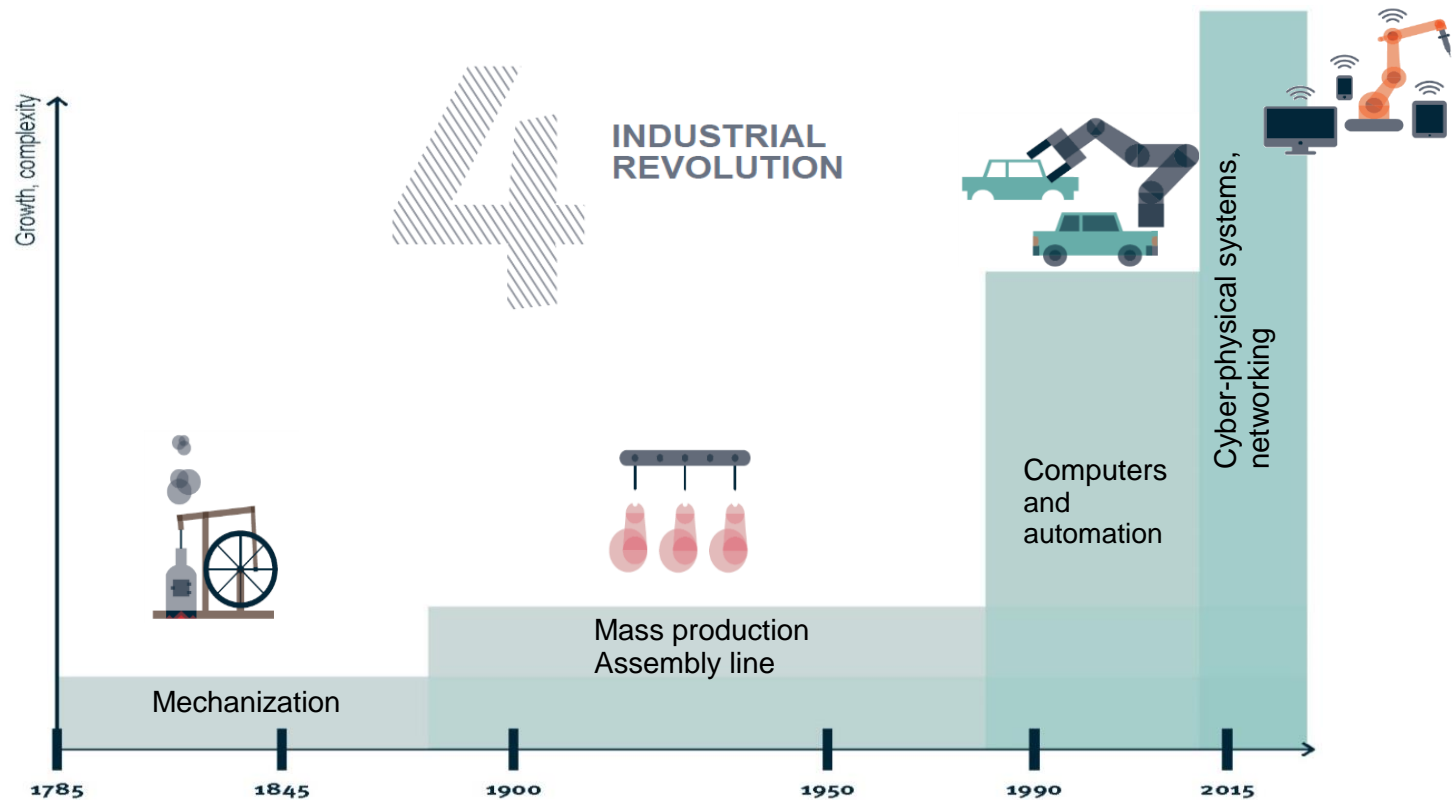
Manufacturing: The Heartbeat of EU's Economy



- EU: world leader in many industrial domains
 - *e.g. mechanical engineering: 37% of global market share*
- 28% of final energy consumption
- R&D intensive, drives innovation

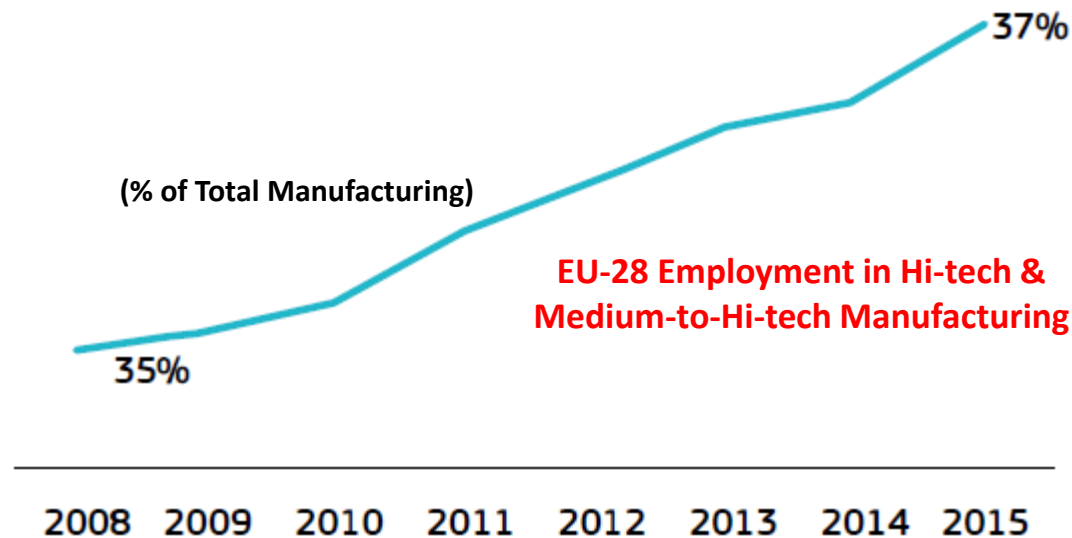
Source: R. Veugelers (2013): Manufacturing Europe's Future, Bruegel

The Revolution Context



1. Industrial Revolution 2. 3. 4. →

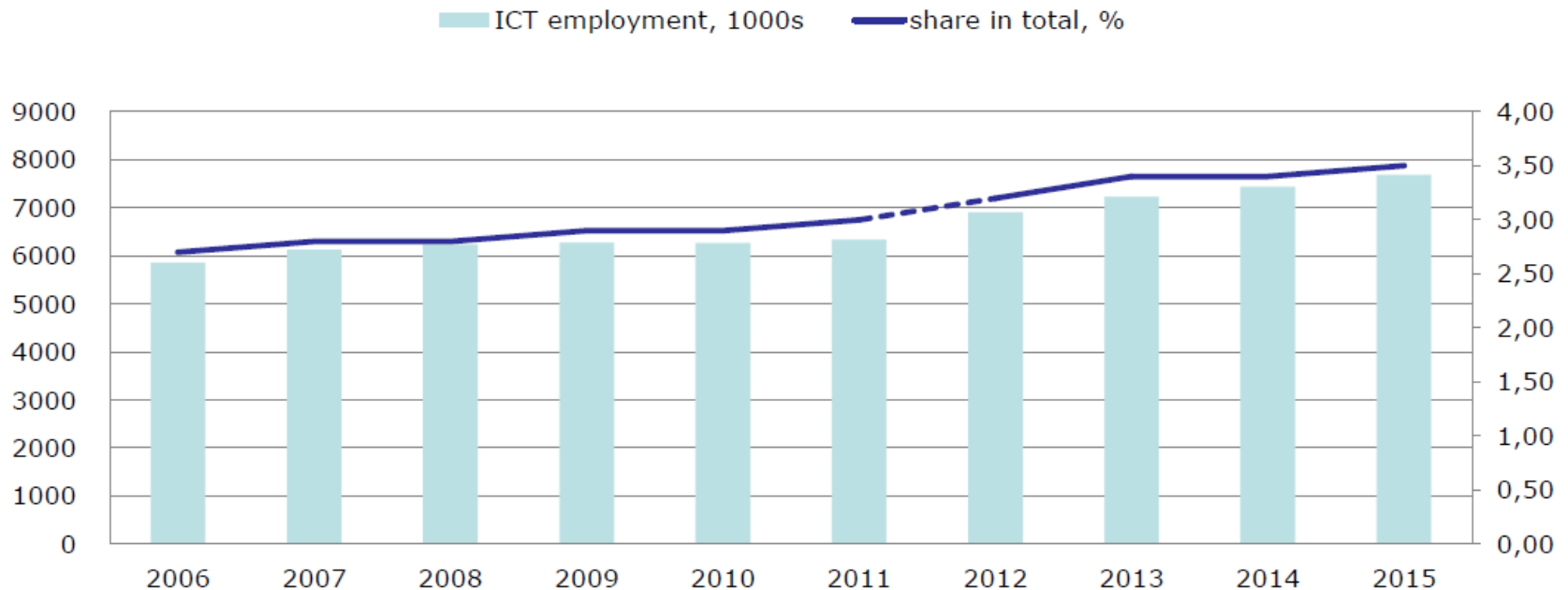
EU-28 Manufacturing Moving Up ...



Source: Eurostat

... due to R&D and Innovation

Employment of ICT specialists in the EU in absolute terms and as a share of total employment, 2006-2015



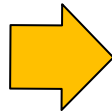
Source: Eurostat 2016

Workplace Trends



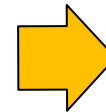
The 2020 Workplace

- Complex, networked
- Open, flexible
- Innovative, virtual



Crucial Requirements

- Adaptability
- Multi-disciplinarity
- Creativity

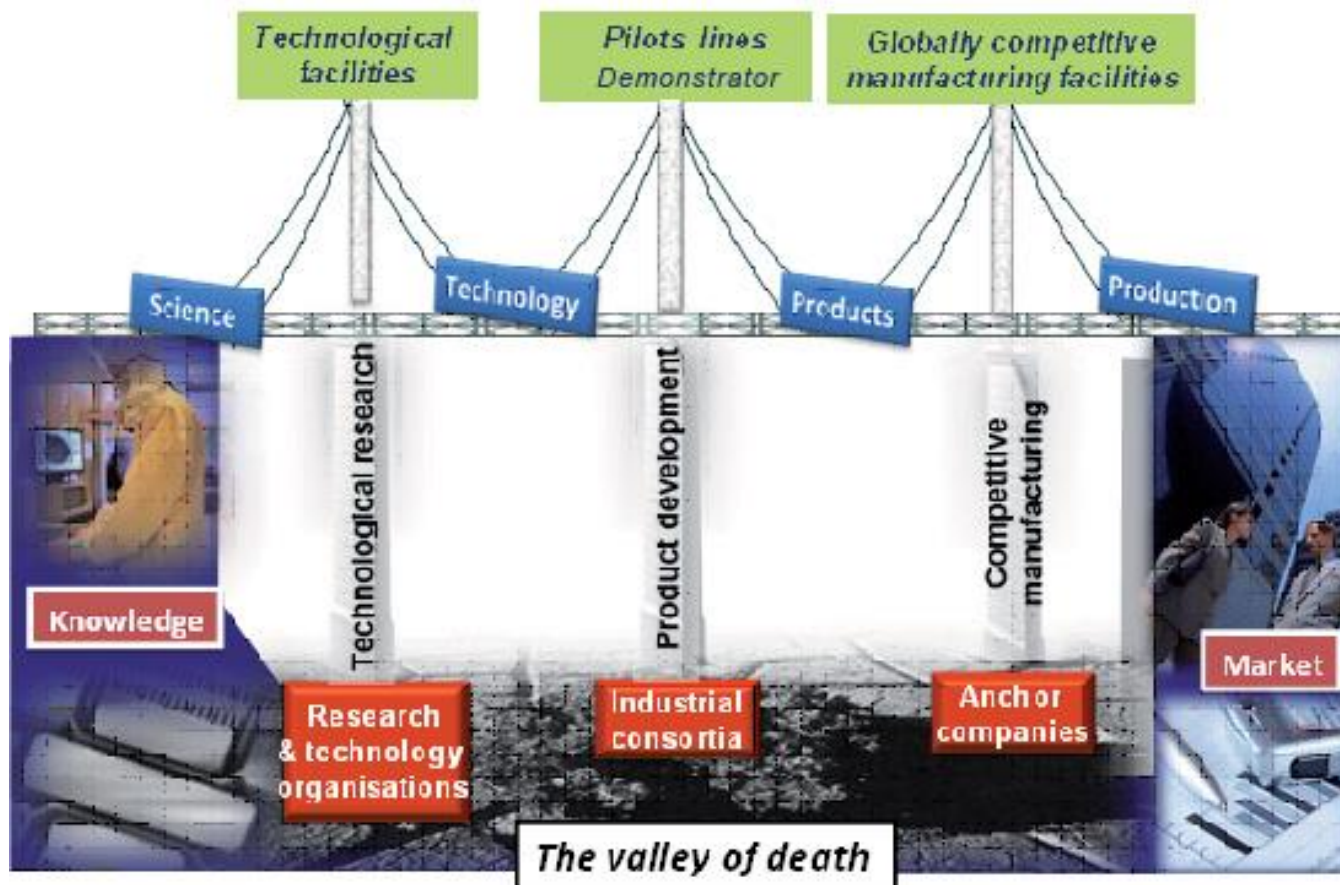


Skills in 2020

- ICT competency
- Critical thinking
- Problem solving
- Social skills

How to Advance Industry?

1# Innovation



How to Advance Industry?

2# Deployment of Advanced Technologies

Global CEO survey: Ranking of future importance of advanced manufacturing technologies by executives

Advanced Manufacturing Technologies	US	China	Europe
Predictive analytics	1	1	4
Smart, connected products (IoT)	2	7	2
Advanced materials	3	4	5
Smart factories (IoT)	4	2	1
Digital design, simulation, and integration	5	5	3
High performance computing	6	3	7
Advanced robotics	7	8	6
Additive manufacturing (3D printing)	8	11	9
Open-source design/Direct customer input	9	10	10
Augmented reality (to improve quality, training, expert knowledge)	10	6	8
Augmented reality (to increase customer service & experience)	11	9	11

Source: Deloitte Touche Tohmatsu Limited and US Council on Competitiveness, 2016 Global Manufacturing Competitiveness Index

Industrial Deployment of Key Enabling Technologies



Source: Manifesto KETs HLG (2014)

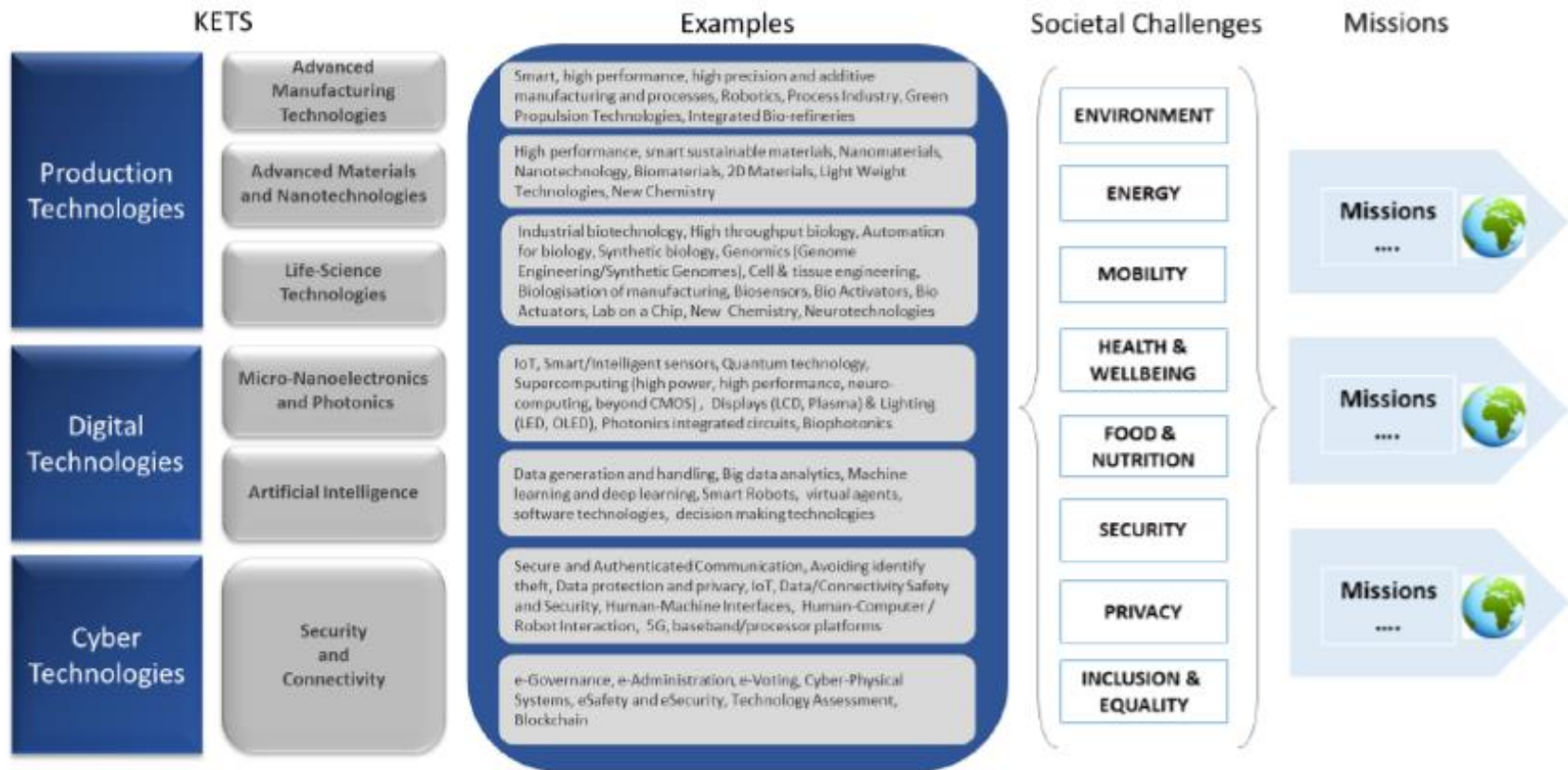


European
Commission

A Renewed KETs Concept

Drivers: Globalisation – Digitisation – Knowledge Society

Rational: Global Excellence, Systemic Relevance, European Sovereignty, Sustainability, Multi-purpose



EU-Driven Policies Impacting Industry



30+ Years of Industrial R&D in Europe

- 1984: Framework Programme I – Esprit/BRITE
 - *Bringing together suppliers + users of manufacturing technologies*
- 1993: Advanced Information Technology (AIT)
 - *Automotive & aerospace industries*
- 2003: Manufuture Technology Platform
- 2008: Factories of the Future (FoF)
- 2014: FoF, SPIRE, SPARC, Photonics, etc.



Horizon 2020: Integrating R&D + Innovation

- A single programme:
 - *Bringing together 3 programmes/initiatives that were separated before: FP7 – CIP – EIT*
 - *Budget: ~ € 80 bn (2014-2020)*
- A coupling of research to innovation:
 - *From the lab to the market*
- Focus on challenges facing society in Europe:
 - *e.g. health, clean energy, efficient transport*
- Simplified access ...
 - *... for companies, universities, institutes in all EU countries*

Public Private Partnerships

Example: The European Factories of the Future Research Association



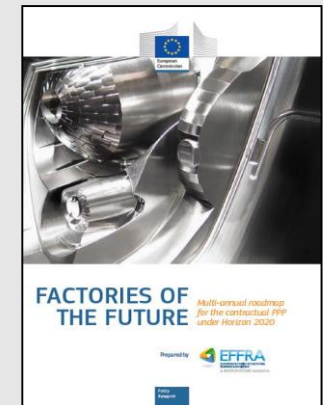
www.effra.eu

- Represents the private side of PPP 'Factories of the Future'
- Scope:
 - ✓ Multi-sector activities
 - ✓ Covering whole supply chain
 - ✓ Pre-competitive R&I projects to strengthen advanced manufacturing in Europe
- EFFRA works closely with European Commission



Why A Factories of the Future PPP

- Manufacturing is a key contributor to the EU's economic prosperity:
 - *Employment & wealth creation*
 - *Exports*
 - *Technological competence & market leadership*
- Complex R&D-intensive activity, requiring long term horizon:
 - *R&D costs & risks with high & long RoI (market failure)*
 - *R&I needs public support, as e.g. USA, China, Korea, Japan*
- Tech capabilities & supply chains dispersed across EU:
 - *Need critical mass of stakeholders & leadership at EU level*
 - *Contractual PPP effort for timely deployment of new technologies, across sectors & also in SMEs*



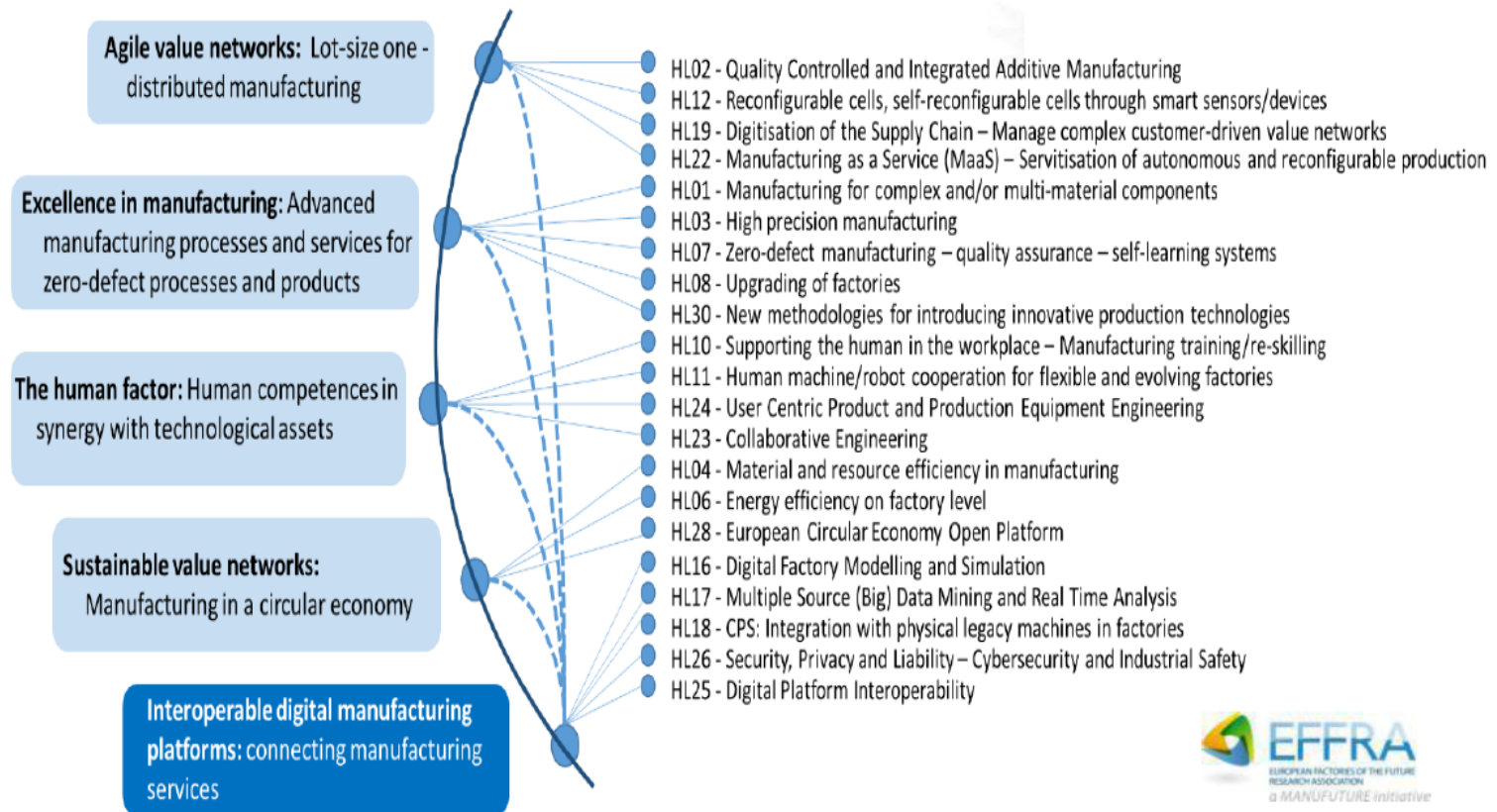
<https://bookshop.europa.eu/en/factories-of-the-future-pbKI0213266/>

Factories of the Future: Going Forward

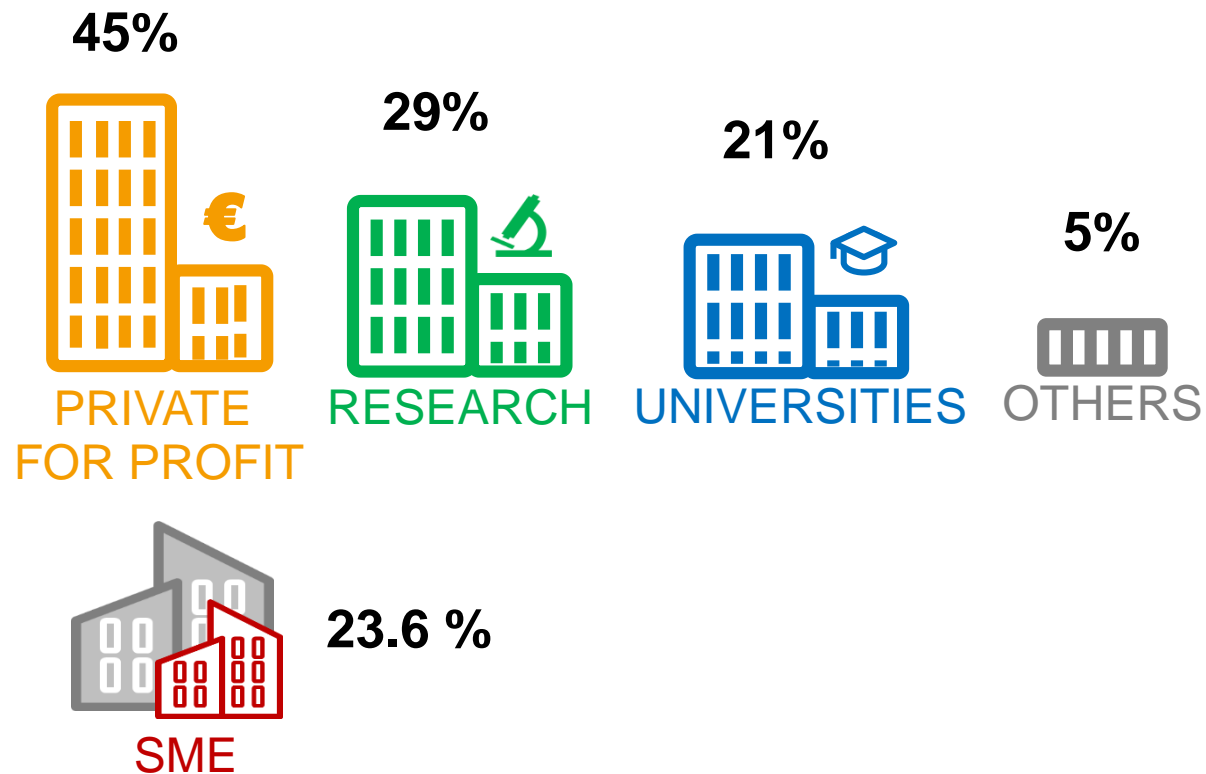
Factories 4.0 & Beyond

Key priorities for FoF 18-19-20

Research headlines for FoF 18-19-20



Profile of Beneficiaries in PPP R&D



Factories of the Future: Progress in Figures

- 200+ projects (2009-2018)
- 1,300+ organisations participating
- 60% industrial participation

Indicator	Initial Figures
Number of patent applications	30
Standardisation inputs	50
Number of developed systems & technologies	364
Estimation of private investments related to the projects and the FoF PPP Roadmap	2.5 – fold leverage of investments
Contribution of the PPP projects to the reduction of energy use and CO ₂	20% on average
Contribution of the PPP projects to the reduction of waste and material use	15% on average

Project Examples (1/2)

Symbiotic Human-Robot Collaborative Assembly: Technologies, Innovations & Competitiveness



€6.5 million in EC funding
Start: April 2015
End: March 2019

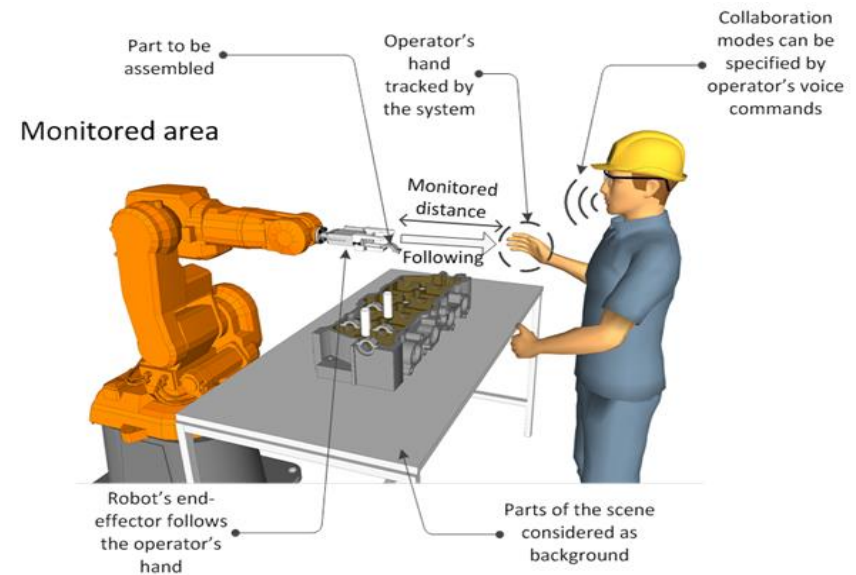


Expected Impacts:

- No-fence safe Human-Robot collaboration
- Increased use of affordable robots by SMEs
- Improvement of productivity by task redistribution
- Re-shoring of industrial activities to Europe



<http://www.symbio-tic.eu/>



Project Examples (2/2)

Synthesis of methanol from CO₂



€8.6 million in EC funding
Start: Dec 2014
End: Nov 2018

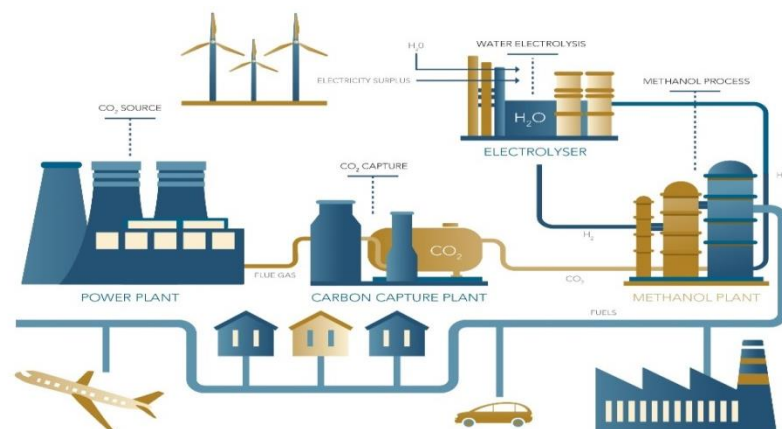


Expected impacts:

- CO₂ emissions reduction in C-leakage sensitive industries, e.g. steel, cement
- Support target of 10% use of renewable energy in transportation
- Reduce Europe's dependency on methanol imports



<http://www.mefco2.eu/>

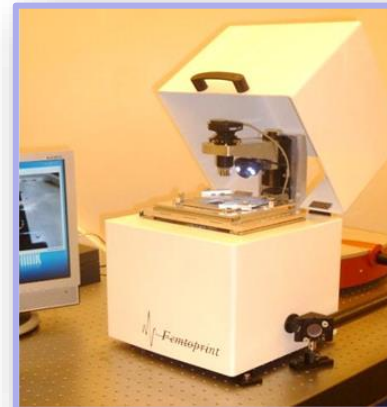


Delivering Progress: Start-Ups

Uptake of project results has led to spin-offs and business start-ups

FEMTOprint SA

Spin-off from Femtoprint project:
Commercialised project result =
Femtoprinter (3D printing for glass
micro-devices)



Sentio

Spin-off from VISTRA project:
Commercialised project result =
Training system for complex assembly

Cognibotics

Spin-off from COMET project: Unique
system to monitor & compensate
robot wear

Digitising European Industry

Adapting regulations

Data flow, ownership
& use, trust, security,
liability

Preparing the workforce

Training, skills, work
environment

Mainstreaming digital innovations

across all industrial
sectors

Strengthening competitiveness in key parts of digital value chains

**A coordination framework
for EU and national initiatives**

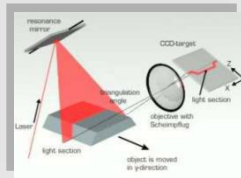
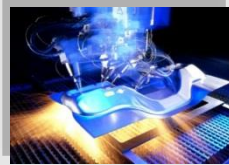


#DigitiseEU

<https://ec.europa.eu/digital-single-market/en/policies/digitising-european-industry>

From Digitising Factories to Digitising Industry

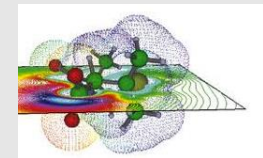
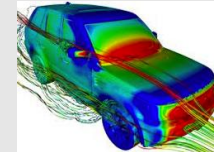
Laser-based manufacturing



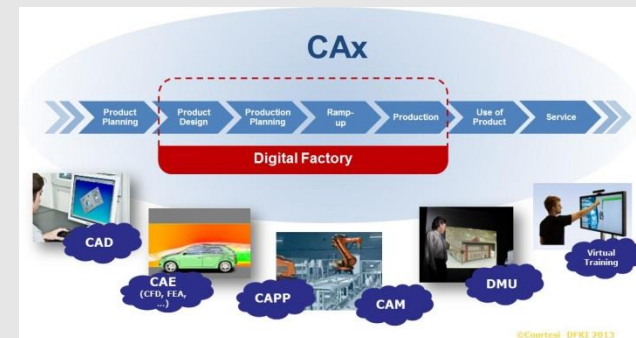
Robotics



Cyber-physical systems for process (chain) optimisation



Modelling, Simulation, Analytics



Digitising European Industry



Platforms-Based Factory Environments?



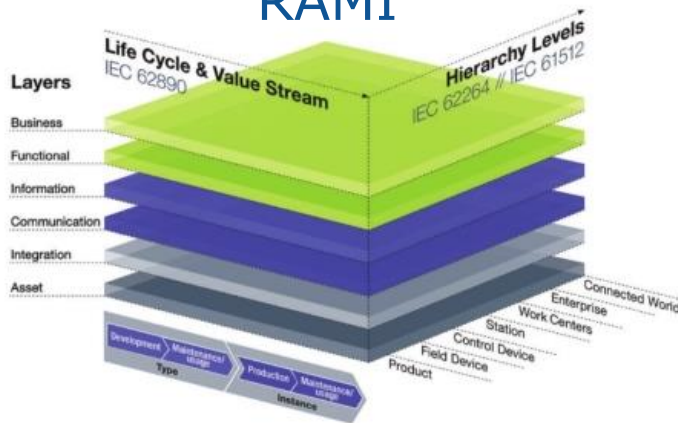


European
Commission

Examples of Open Platforms

Community-led, sector-specific (vertical)

RAMI



Community-led, cross-sector (horizontal)

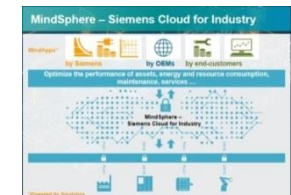


AIOTI

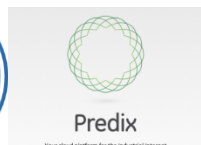


Proprietary, with open interfaces

SIEMENS



for Supply Chain and Manufacturing



Research and
Innovation

Framework of DEI Activities



Digital Innovation Hubs (DIH) Calls

WHAT DOES A DIGITAL INNOVATION HUB OFFER

A place where companies can get help to improve their business through digital innovations

GOAL: ensure that every company, small or large, high-tech or not, can fully benefit from digital opportunities



**EXPERIMENT WITH
ICT TECHNOLOGY**



**SUPPORT TO FIND
FINANCE & FOLLOW-
UP INVESTMENTS**



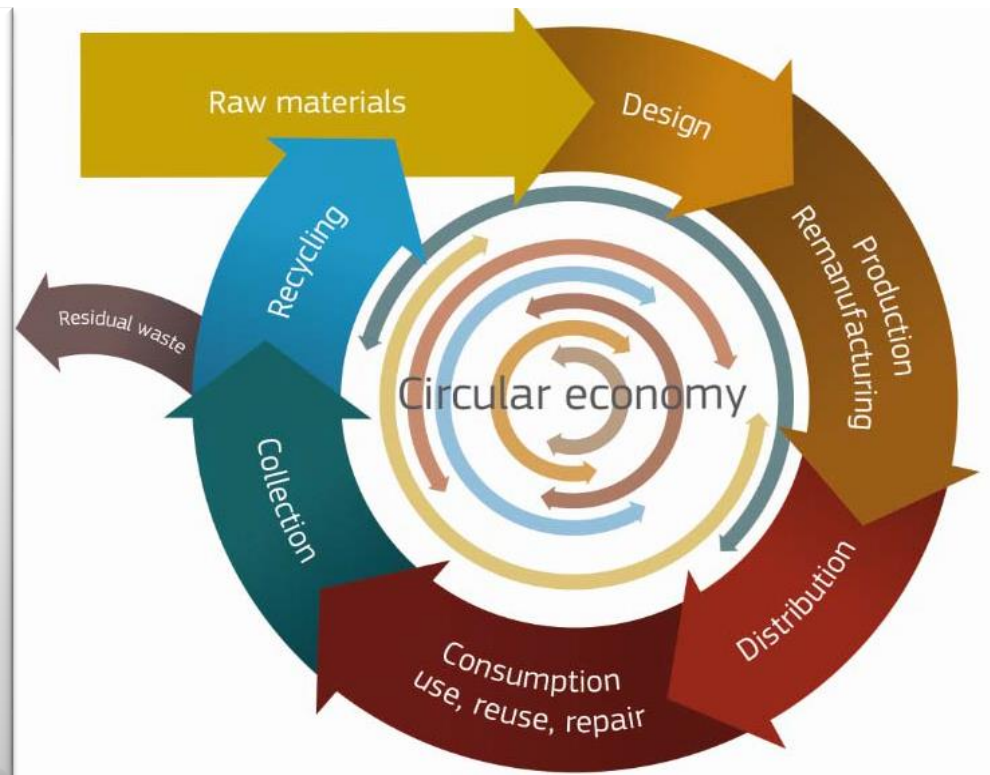
**DIGITAL SKILLS-
TRAINING**



**INNOVATION
ECOSYSTEM**

Supporting a Circular Economy

- No longer linear
- Extended life times
- Cross-sector
- Multi-stakeholder
- Innovation in all forms
- Design strategies
- New business models
- Demand-side measures



Further Information

- Contact:
erastos.filos@ec.europa.eu
- Horizon 2020 Research Themes & Calls:
ec.europa.eu/research/participants/portal
- Information on PPPs:
ec.europa.eu/research/industrial_technologies/
- Digitising European Industry Page:
<https://ec.europa.eu/digital-single-market/en/policies/digitising-european-industry>



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