



# New Industrial Paradigms: i4.0 & Sustainability

SIM4.0 WORKSHOPS

Évora, 15 March

## EU Efforts to Support Industrial Sustainability & Digitisation

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DG Research & Innovation

# Presentation Outline

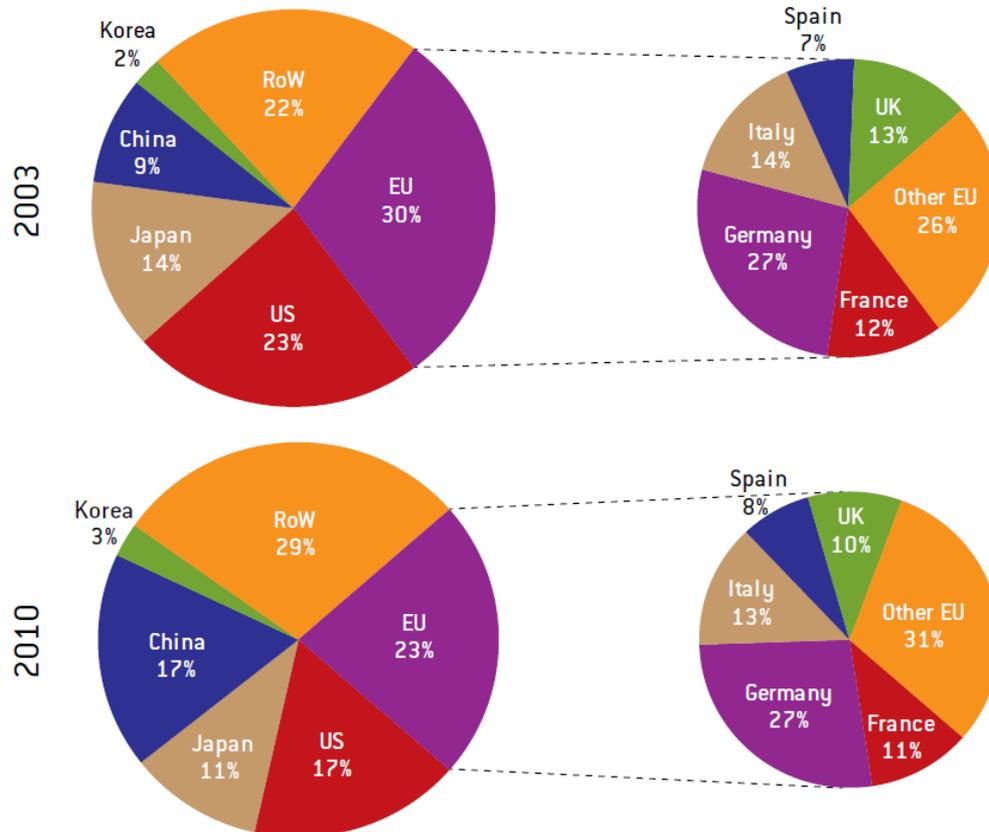
- Adding Value to Manufacturing in Europe
- Technological Innovation & ICT  
Driving Europe's Re-Industrialisation
- The 'Factories of the Future' PPP &  
Digitising European Industry Initiative
- Towards a Platform-driven Industry

# 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



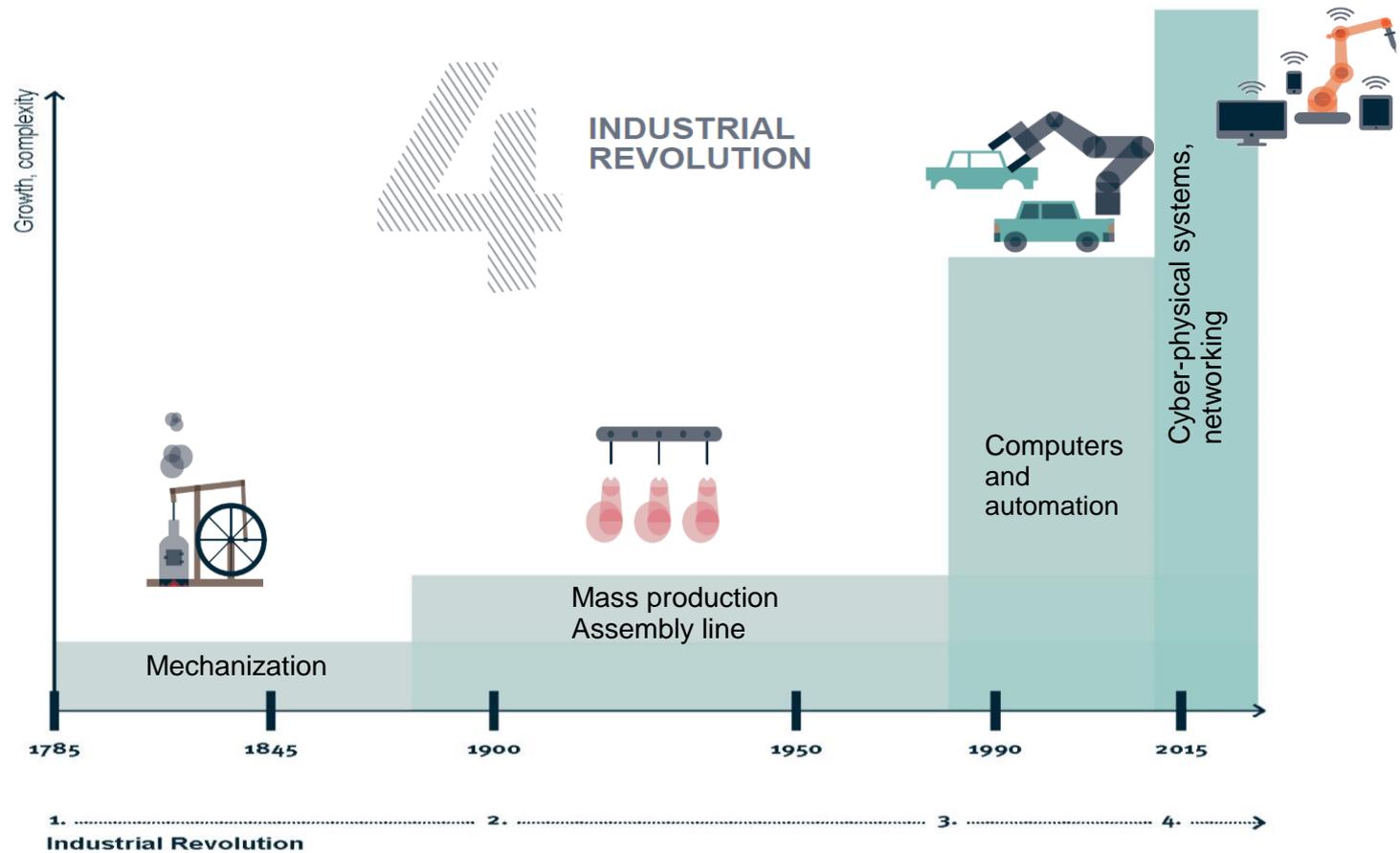
# Manufacturing: The Heartbeat of EU's Economy



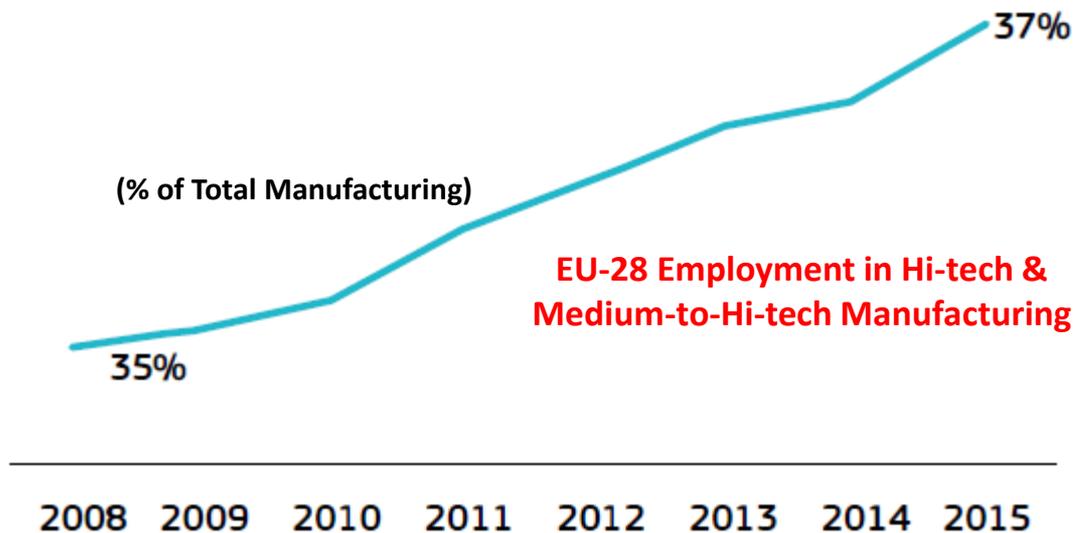
- EU: world leader in many industrial domains
  - *e.g. mechanical engineering: 37% of global market share*
- 28% of final energy consumption
- R&D intensive, drives innovation

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

# The Revolution Context



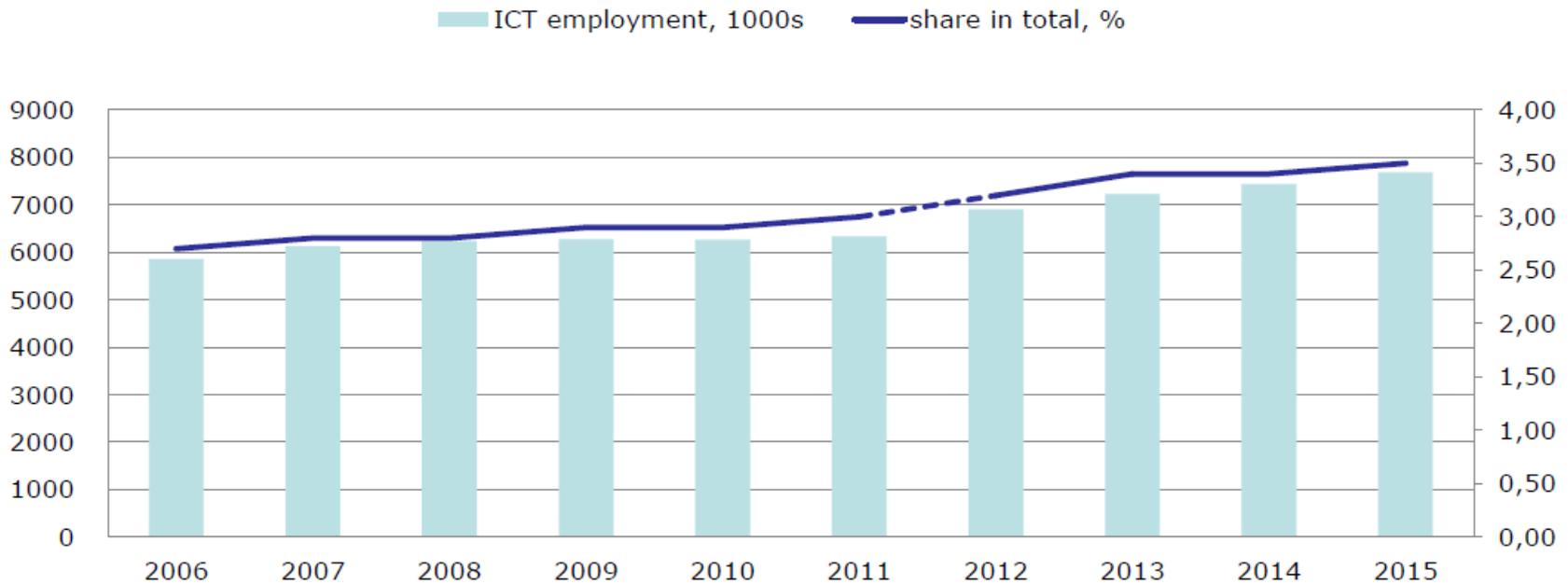
## EU-28 Manufacturing Moving Up ...



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



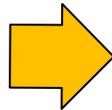
Source: Eurostat 2016

# Workplace Trends



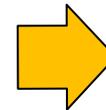
## The 2020 Workplace

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



## Crucial Requirements

- Adaptability
- Multi-disciplinarity
- Creativity



## Skills in 2020

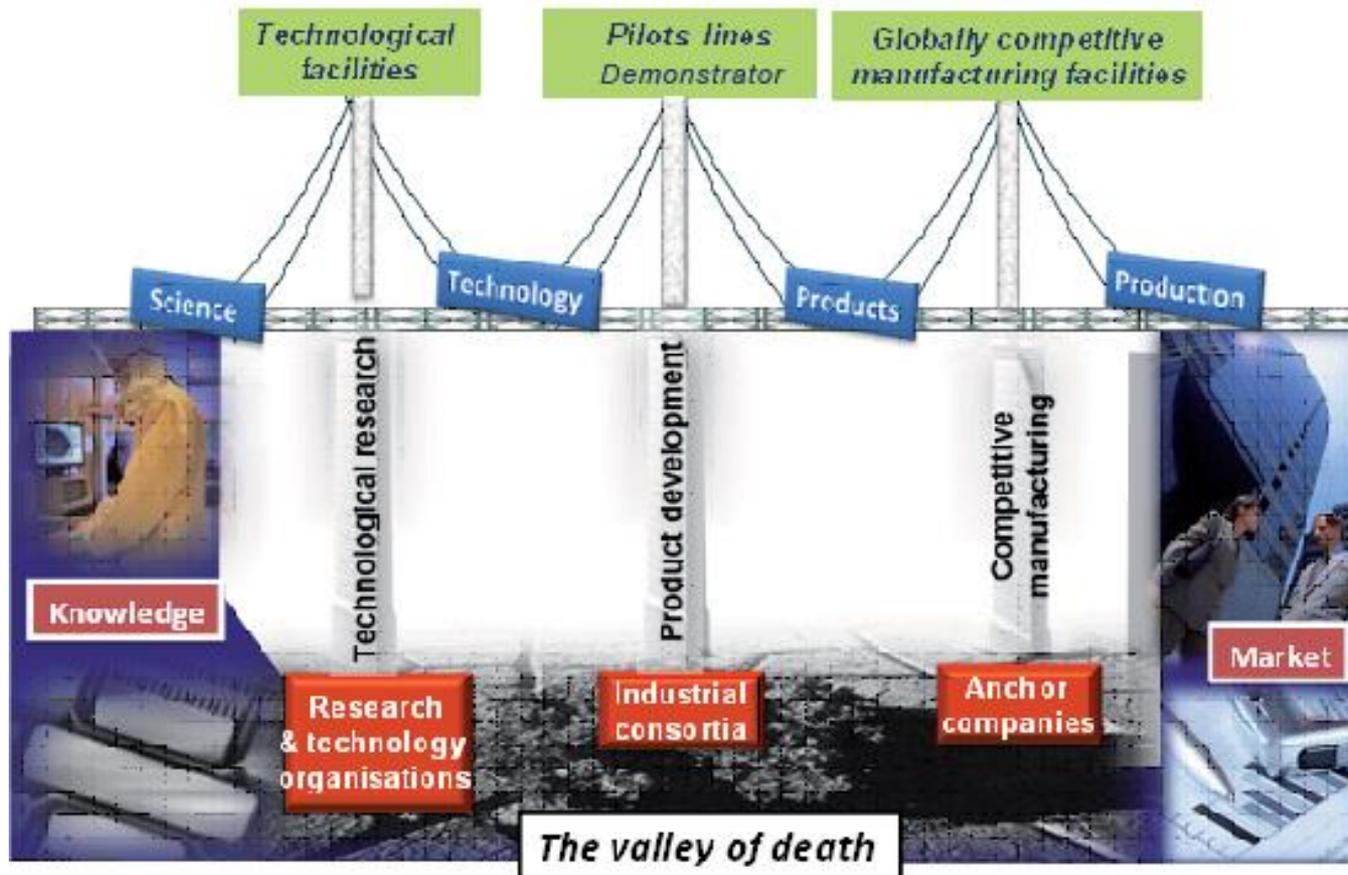
- ICT competency
- Critical thinking
- Problem solving
- Social skills



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# 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



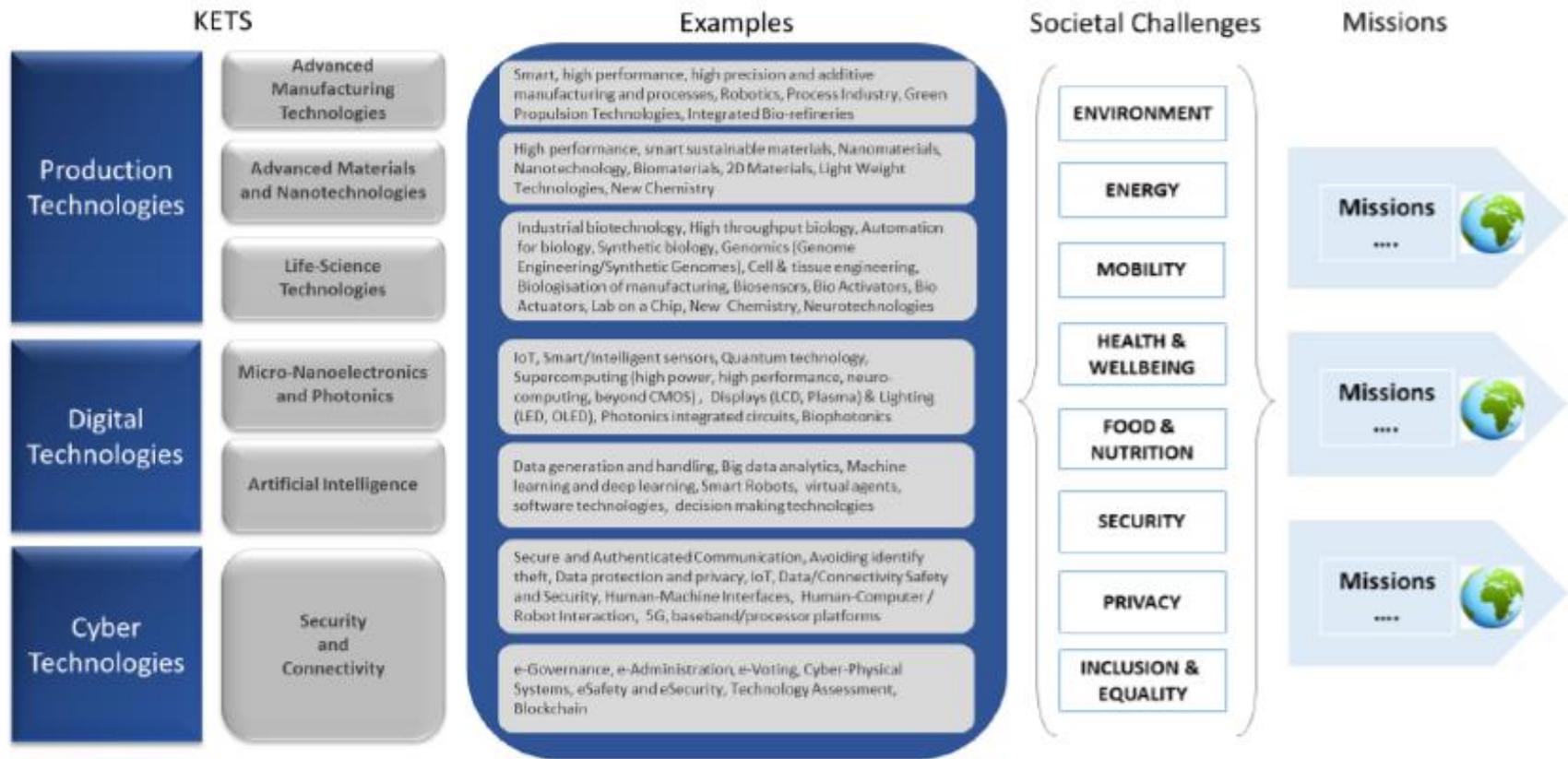


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# A Renewed KETs Concept

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



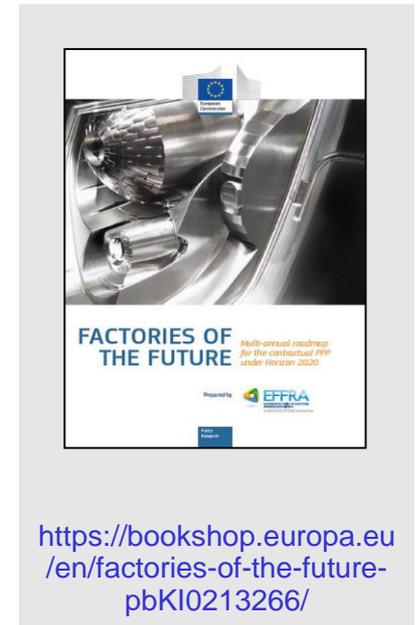
[www.effra.eu](http://www.effra.eu)

- 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*

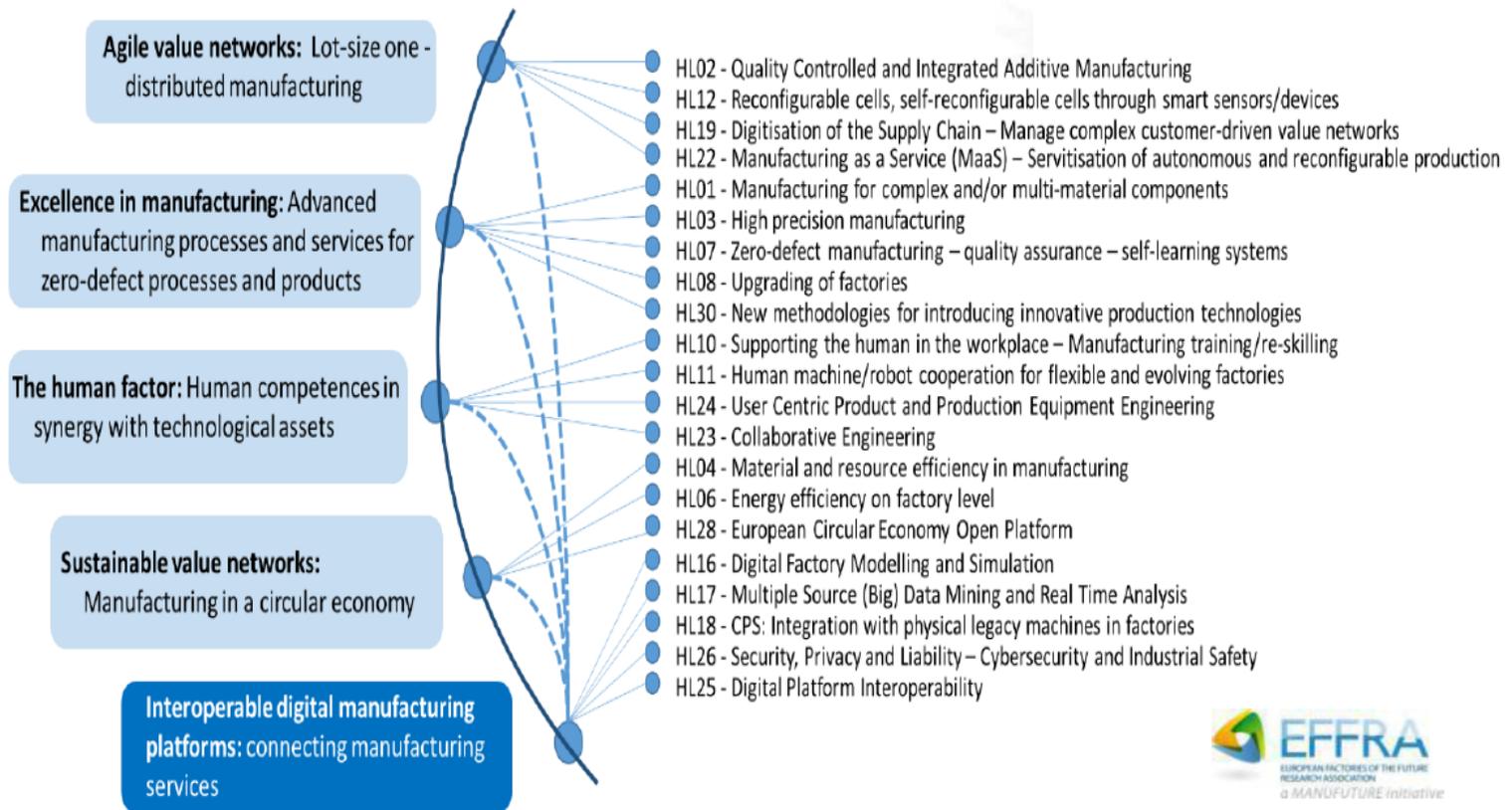


# Factories of the Future: Going Forward

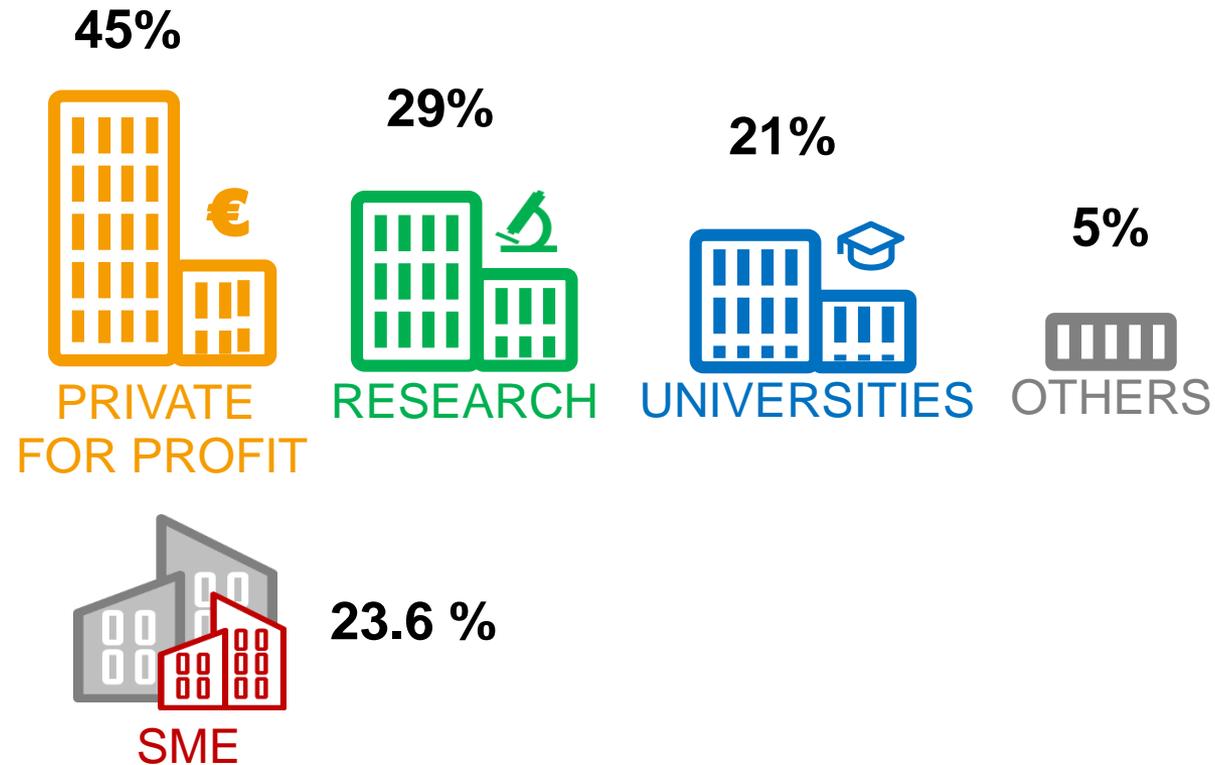
## Factories 4.0 & Beyond

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 <sub>2</sub>	20% on average
Contribution of the PPP projects to the reduction of waste and material use	15% on average

## Project Examples (1/2)

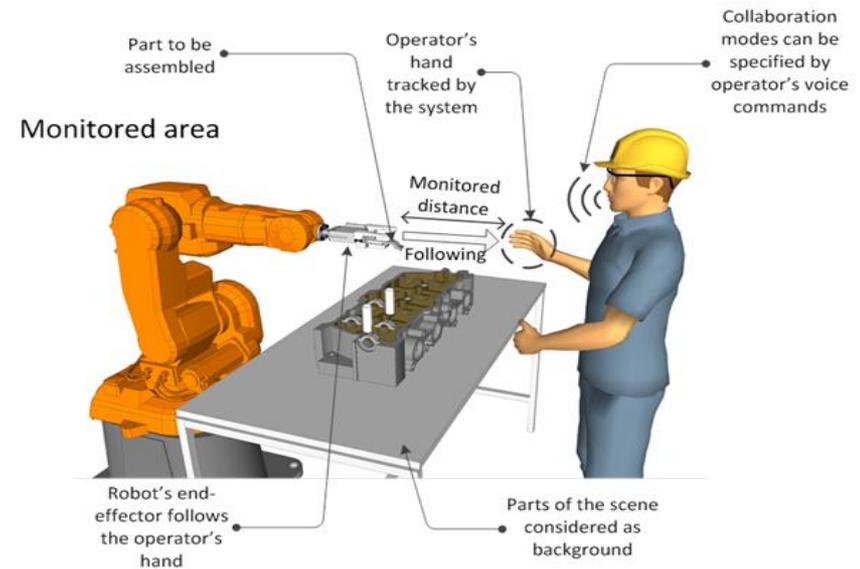
### Symbiotic Human-Robot Collaborative Assembly: Technologies, Innovations & Competitiveness

€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 CO<sub>2</sub>



€8.6 million in EC funding

Start: Dec 2014

End: Nov 2018

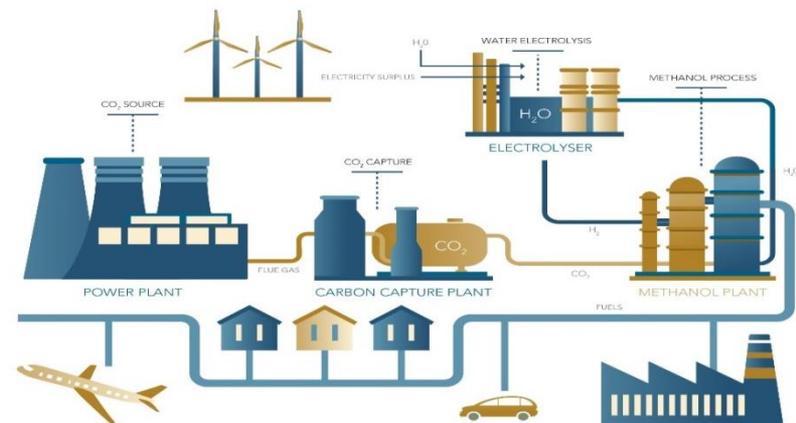


#### Expected impacts:

- CO<sub>2</sub> 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/>

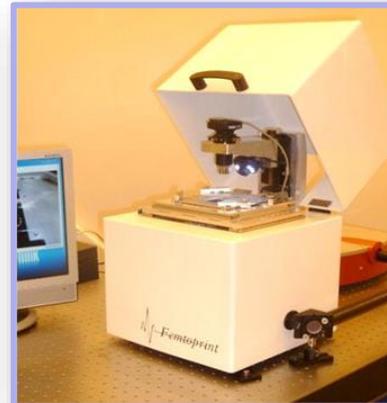


# Delivering Progress: Start-Ups

## 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**

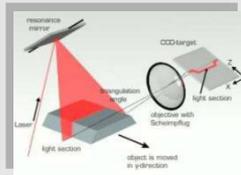


#DigitiseEU

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

# From Digitising Factories to Digitising Industry

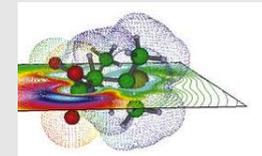
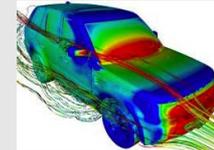
## Laser-based manufacturing



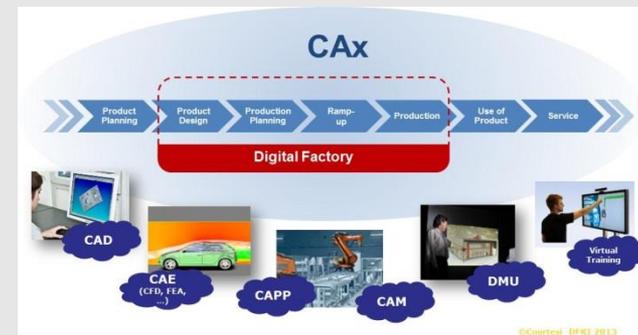
## Robotics



## Cyber-physical systems for process (chain) optimisation



## Modelling, Simulation, Analytics





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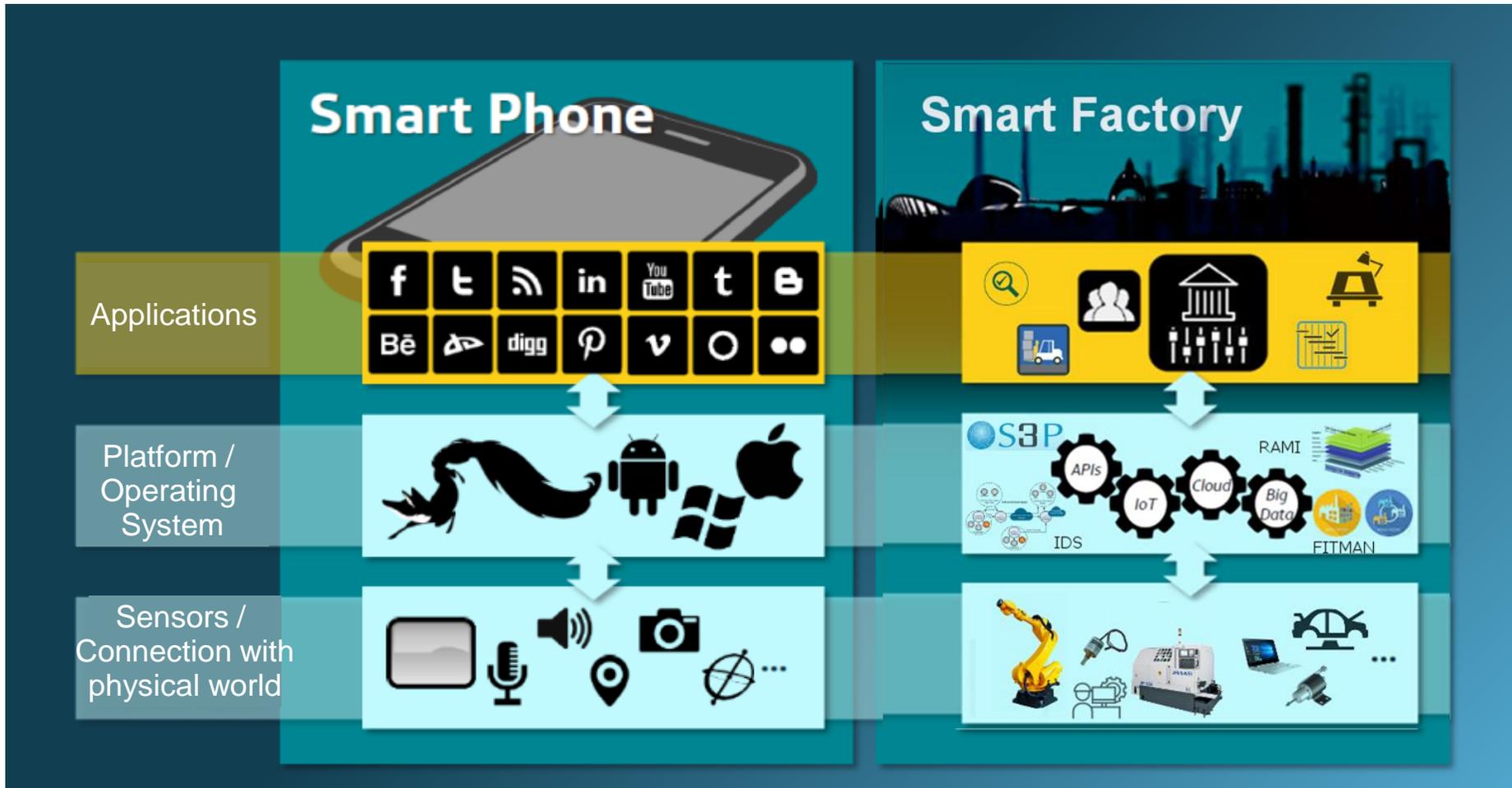
# Digitising European Industry





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# Platforms-Based Factory Environments?



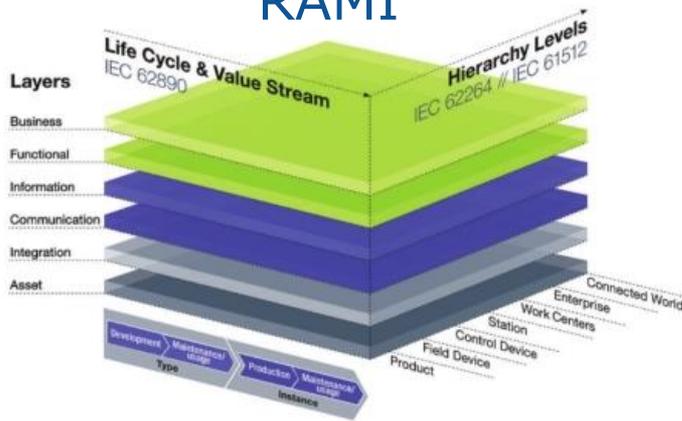


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# Examples of Open Platforms

## Community-led, sector-specific (vertical)

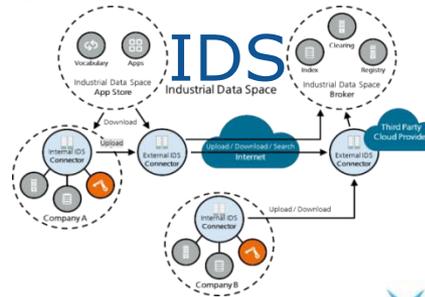
### RAMI



## Community-led, cross-sector (horizontal)



SMART, SAFE & SECURE PLATFORM

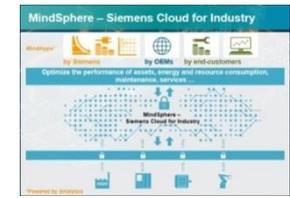


### AIOTI



## Proprietary, with open interfaces

### SIEMENS



- 3D
- V.R
- 3D Modeling apps
- Real time 3DEXPERIENCE Platform
- Social and Collaborative apps
- Information Intelligence apps
- Content and Simulation apps



### for Supply Chain and Manufacturing

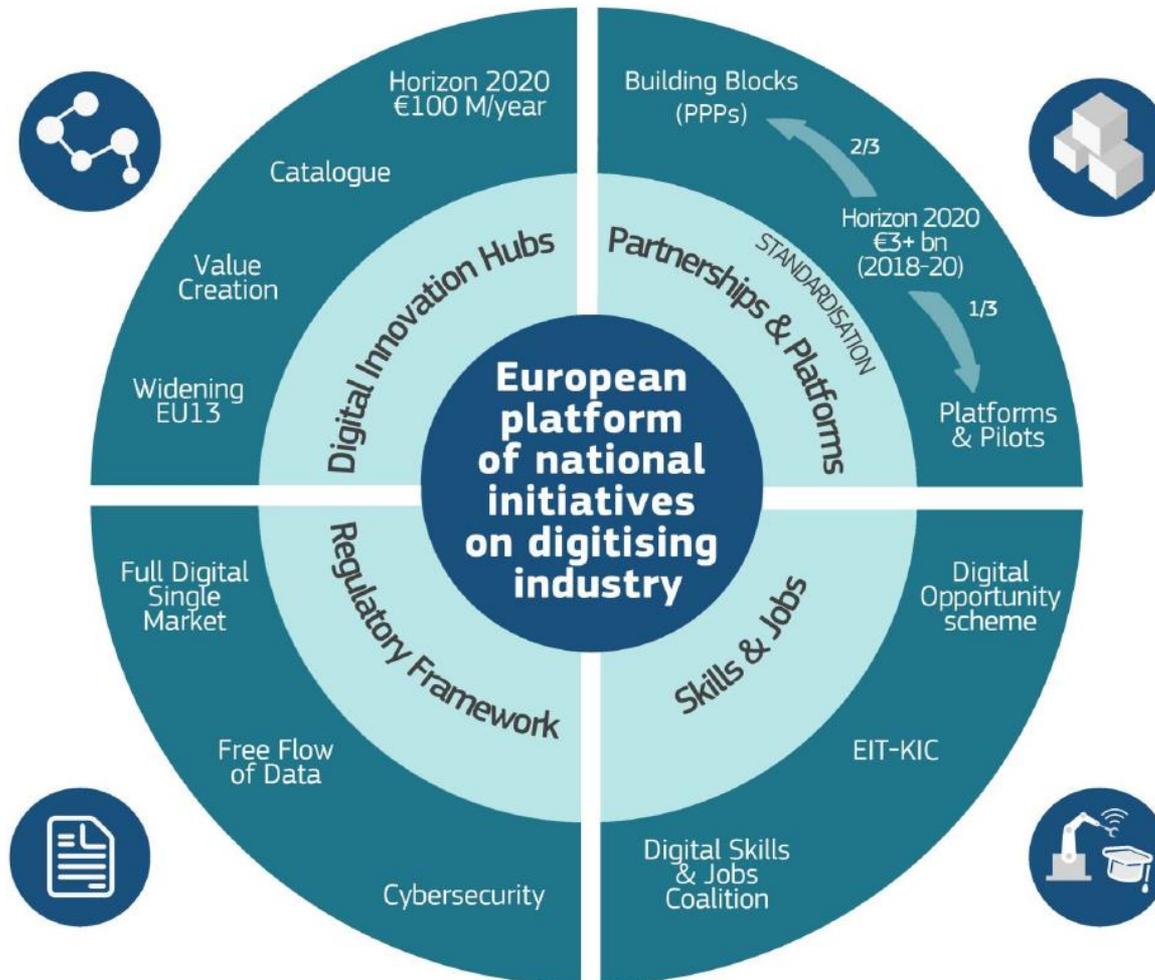


Research and Innovation



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# Framework of DEI Activities



Research and  
Innovation



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# 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**



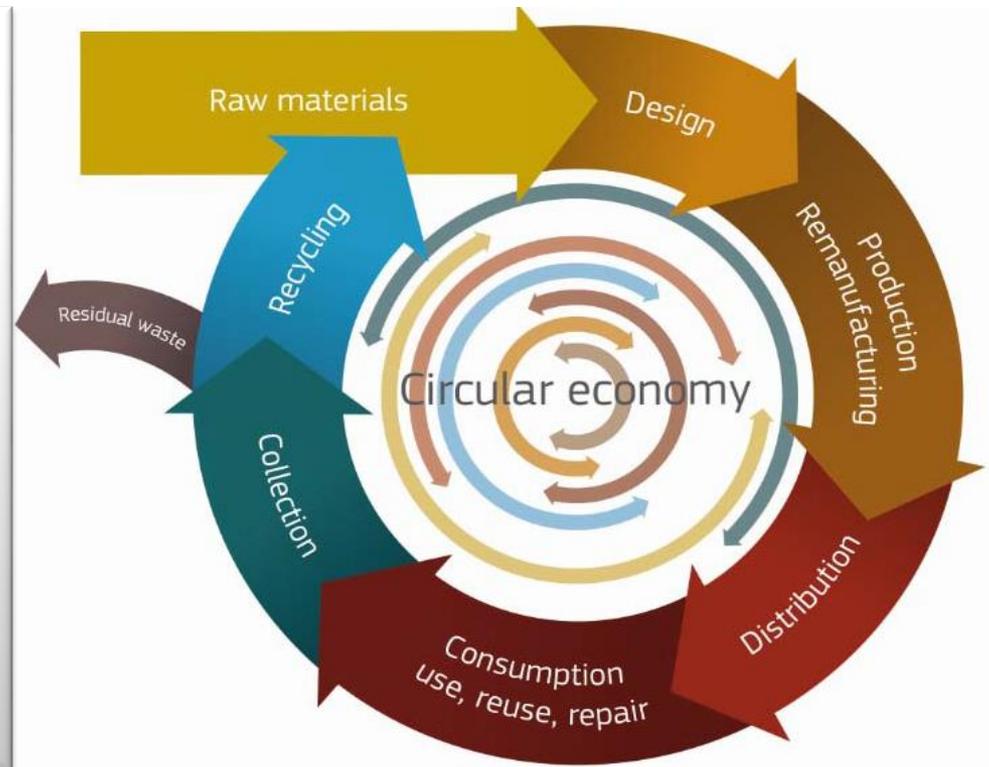
**INNOVATION  
ECOSYSTEM**



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# 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](mailto:erastos.filos@ec.europa.eu)
- **Horizon 2020 Research Themes & Calls:**  
[ec.europa.eu/research/participants/portal](https://ec.europa.eu/research/participants/portal)
- **Information on PPPs:**  
[ec.europa.eu/research/industrial\\_technologies/](https://ec.europa.eu/research/industrial_technologies/)
- **Digitising European Industry Page:**  
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