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ICT in the FoF Contractual PPP

European Commission

- ICT in FoF and the EU "digitisation of industry strategy"

- Role of Contractual PPPs

- ICT in FoF: Objectives and approach

- What have we done so far?

- Looking ahead

- How important is manufacturing?
- Manufacturing an essential part of the economy in Europe:
  - 20 % Direct jobs
  - 67 % Exports
  - 65 % Business R&D Expenditure
  - Manufacturing in Europe remains diverse

  - 15 % of GDP → 20% (EU goal)

- Importance of manufacturing recognised now by MSs

- ....but also by Europe's competitors

- Need to acelerate the development of more competitive & sustainable industry

- **"Digital inside": Innovations in all types of <u>products</u>**
  - Smart connected objects (or IoT) powered by e.g.
    - Sensors, wearables, embedded software, Connectivity, Big data, Cloud …
  - Large opportunities in all sectors (Non-tech, high-tech, SMEs, etc)

- **Digital transformations <u>of processes</u>**
  - From logistics and product design to shop floor automations and CRM
    - Increasing resource efficiency, productivity, ..
    - Built on IoT, digital design, robotics, laser technologies, big data,..

- **Radical/disruptive changes <u>in business models</u>**
  - Blurring the boundaries (products-services), reshuffling value chains
    - XaaS, 3D Printing & customisation, CRMs, maintenance, A Value services
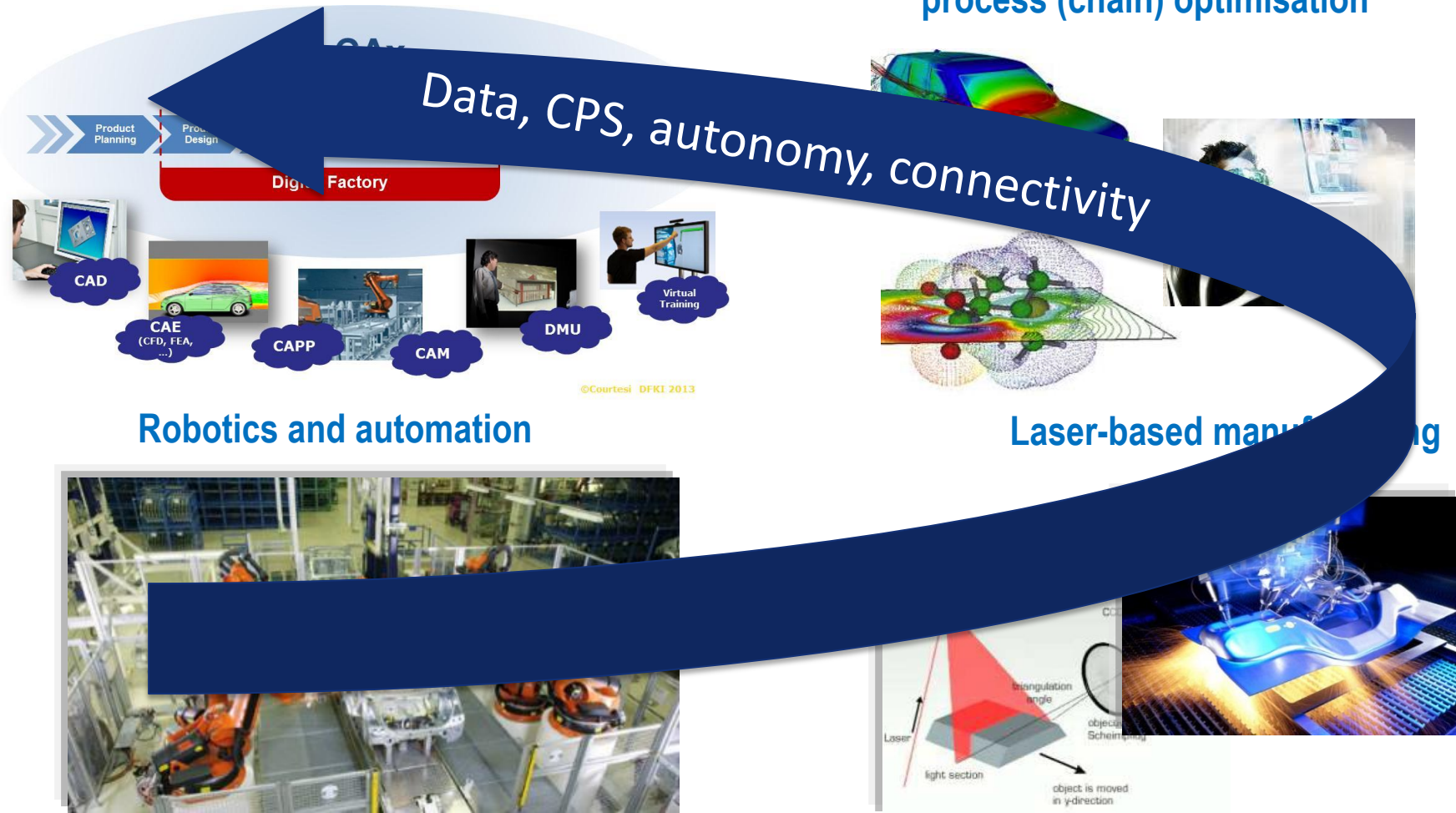   - Built on real time information, data analytics, etc..

Critical Value chains

~25%

~25%

of Added Value

Electronic Components

ICTdevices

~40%

~33%

of Added Value

R&D investments in ICT by non ICT sectors

	R&D spending B€	% on ICT
Aerospace and defence	150	37
Automotive	700	38
Electrical equipment	160	75
Healthcare equipment/services	65	55
Industrial manufacturing	240	55

Modelling, Simulation, Analytics and big data

Cyber-physical systems for process (chain) optimisation

Data, CPS, autonomy, connectivity

Robotics and automation

Laser-based manufacturing

©Courtesi DFKI 2013

Trends in business models

– "Reintegration" across the value chain
– XaaS, Expansion to services
– Expansion to "systems of systems"
– "Sharing" economy
– Des-intermediation

Blurring of boundaries in value creation

Products

Services

ICT sector
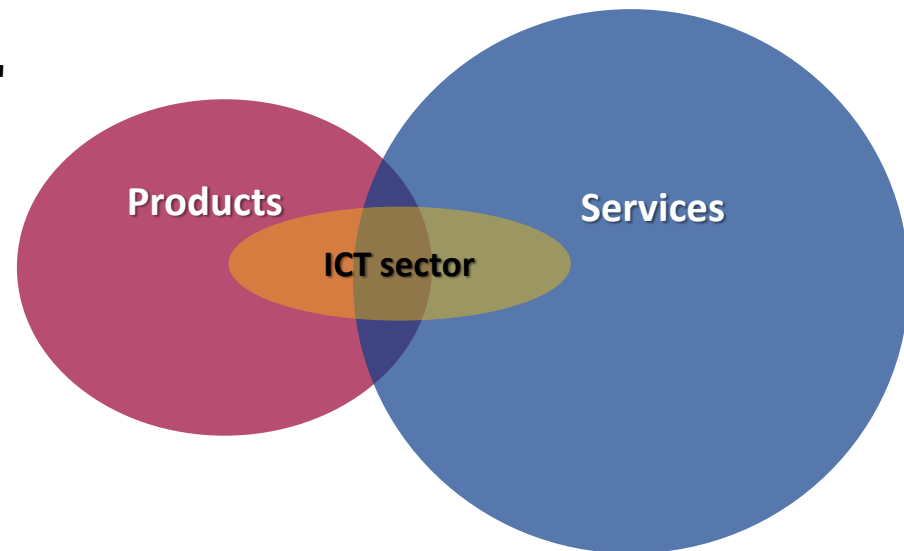
Technology

- Sensors, μcontrollers, low power μprocessors, μactuators, MEMS,..
- Embedded Operating systems, embedded applications software, control software
- Networking (local, Internet,..)
- Applications on the Cloud (Data analytics, CRM on Clouds, Maintenance software,..)

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- Main converging innovation tracks

  - Big Data and Cloud

  - Cyber Physical Systems, Smart connected objects and IoT

  - Hyper connectivity, BB and wireless

  - Robotics, Autonomous systems and automation

  - Laser based manufacturing, additive manuf. (3D printing)

- Areas of business opportunities

  - High growth "Smart X" and IoT markets

    - smart homes, smart cities, wearables, health, energy, etc..

  - High growth of vertical markets!!

    - Automotive, energy, security, etc.

  - Next digital champions may come from "non-digital" industries

    - And vice versa!!

- **Strengths**
  - **Professional and vertical markets (products and services)**
    - Components, software, systems (robotics, engineering), networking
  - **World class R&D hubs**
  - **Good infrastructure**
  - **Size of EU market (~27% of world ICT market)**

- **Weaknesses**
  - **Consumer markets, Internet and web products and services**
    - From components to applications, Data platforms' ownership
  - **Structural weaknesses**
    - <u>No DSM yet </u>(substantial impact on attractiveness to investment including VCs, BAs, etc..)
    - Lagging in investment in R&D

- Europe -- a world-leader in industrial robotics and industrial automation (30% world market share),
  - Undisputed leadership in machinery and automation equipment

- Europe – a leading expertise in embedded digital systems, enterprise and design software (33% world market share)
  - CAD tools, safety critical software, low power computing, enterprise software

- Europe – market leader in 3D- and laser-based manufacturing (25-40 % world market share).

- Industry landscape structured around a set of large enterprises
  - Wealth and growth driven by large number of SMEs – hidden champions
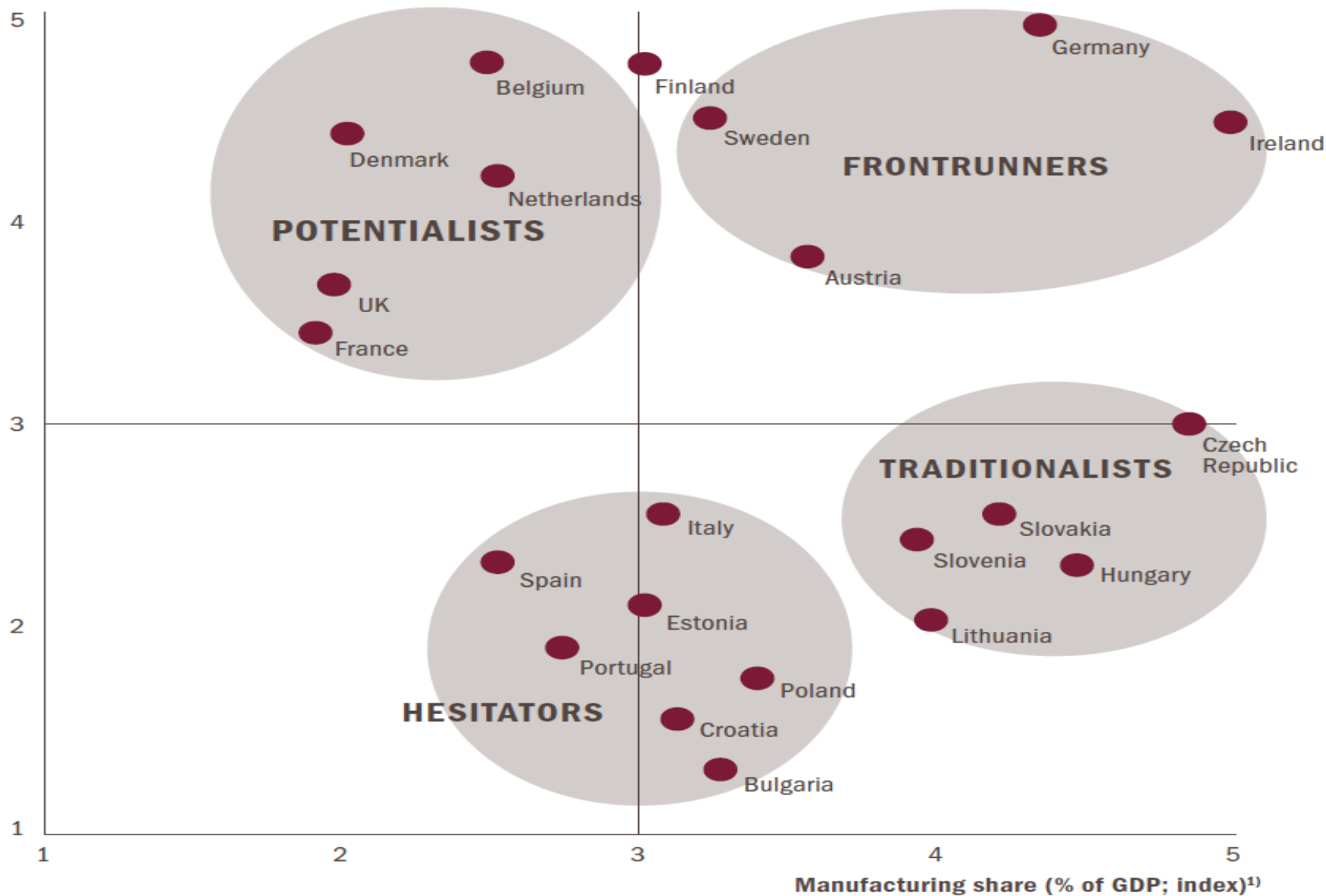 - regional concentration of actors along value chains

- Strong digitisation in high tech industries and in some MSs.
- But:
  - Slowness and disparities in adopting digital solutions across industries and regions
    - Mainly SMEs and non tech sectors lagging behind
    - Less than 2% of SMEs use advanced digital technologies

  - New competition from non-EU digital platform owners
    - E.g. OS, Web and Data platform owners

  - Lack of standards and interoperable solutions

  - Skills and re-skilling of work force

  - Legislative and regulatory gaps

  - Fragmentation of effort in Europe

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Digitisation readiness: disparities in Europe

RB Industry 4.0 Readiness Index[1)2)]

POTENTIALISTS
- Belgium
- Denmark
- Netherlands
- UK
- France

FRONTRUNNERS
- Germany
- Sweden
- Ireland
- Austria

HESITATORS
- Italy
- Spain
- Estonia
- Portugal
- Poland
- Croatia
- Bulgaria

TRADITIONALISTS
- Czech Republic
- Slovakia
- Slovenia
- Hungary
- Lithuania

Manufacturing share (% of GDP; index)[1)]

Speech of Commissioner Oettinger
at Hannover Fair 14 April 2015

Objective: Making sure that any industry in Europe, wherever it is located, can make the best use of digital technologies while adapting our workforce to the change

1. Wide-spread adoption: access to technology and knowledge
2. Leadership in digital platforms for industry
3. Closing the digital skills gap
4. Smart regulation for smart industry

An EU wide strategy for digitisation can ensure "scale", mobilise actors with value chains spreading across Europe and support interoperability and standardisation.

http://europa.eu/rapid/press-release_SPEECH-15-4772_en.htm

- Wide-spread adoption and best use of digital technologies
  - In **all** industrial sectors
  - Focus on key digital technologies ("The musts")
    - Components, CPS and IoT, robotics, 3D printing, data analytics

- Leadership in digital platforms for industry
  - Platforms on which value is created
    - E.g. embedded OSs, Cloud platforms, data, security
    - Openness, Interoperability, security

- Filling the skills gap and preparing the workforce for change
    - Essential!

- Providing the best framework conditions
  - Regulation: DSM, Data protection, Liability, safety
  - Access to finance: EIB, EIF, etc..

- ICT in FoF and the EU "digitisation of industry strategy"
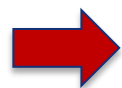
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- Looking ahead

From the H2020 decision

- *Horizon 2020 may be implemented through PPPs where all the partners concerned commit to support the development and implementation of R&I activities of strategic importance to the Union..*

- Involvement of the Union may take one of the two forms:
  - Institutional e.g. using Art 187 of the treaty…. (JTIs)
  - Entering a contractual arrangement between partners
    - Objectives, Commitments of partners, KPIs, Outputs to be delivered, R&I activities that require support from H2020

- ## Basic principle of the cPPP
  - Private sector partners advise the Commission on R&I priorities of the Horizon 2020 work programmes
  - Implementation via 'normal' programme for R&I using H2020 Rules for Participation and with comitology

- ## Contractual arrangement includes:
  - Vision and Strategic Objectives,
  - commitments,
  - impacts,
  - Governance and opening
  - key performance indicators, monitoring of PPP performance
  - means for termination

- **WHAT DOES CHANGE?**

  - Long-term commitment from Commission to support the field

  - Long-term commitment by industry to invest, with a need to demonstrate its fulfilment (monitoring)

  - Close interaction to reach agreement on content of calls. Greater focus on impact on growth and job creation

  - Evidence based & monitoring of performance ➔ KPIs & monitoring

  - Large potential to leverage financing from other sources
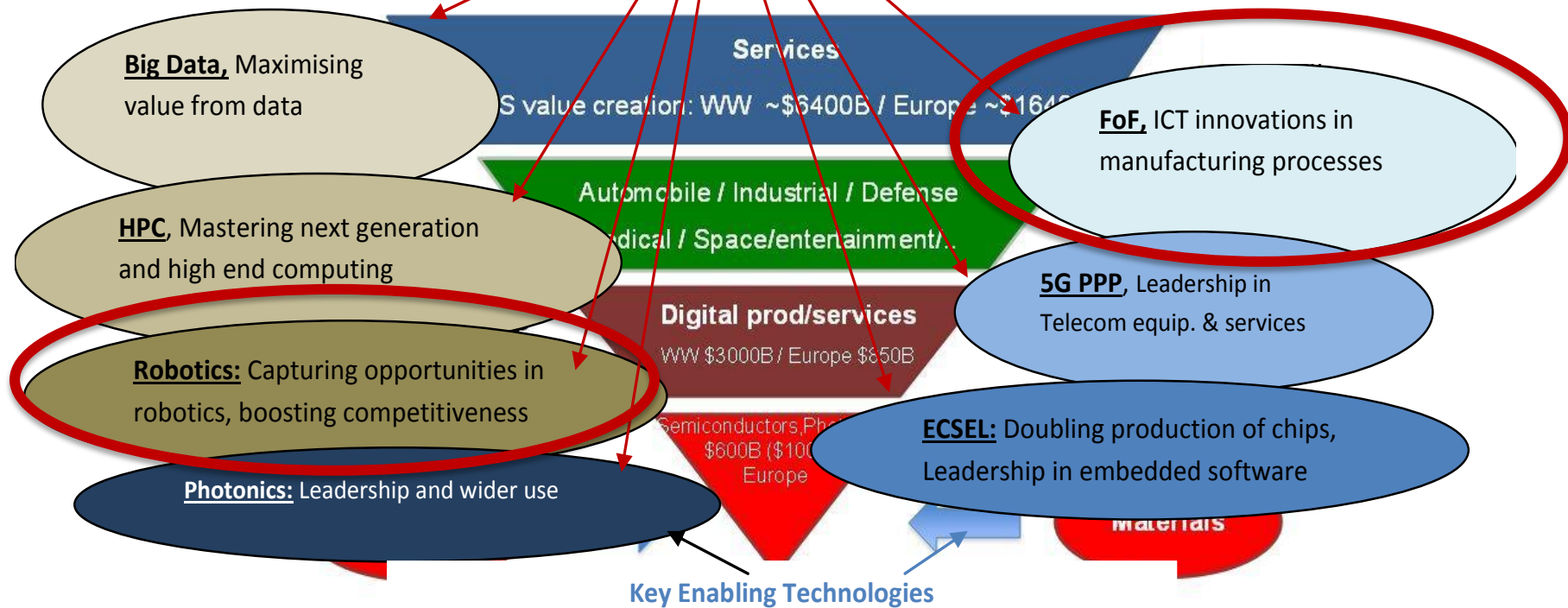   - such as structural funds, EIB

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Regional Specialisation Strategies

Societal Challenges

Excellent Science

Structural Funds

Industrial Leadership

VC, EIB Loans, ...

Skills
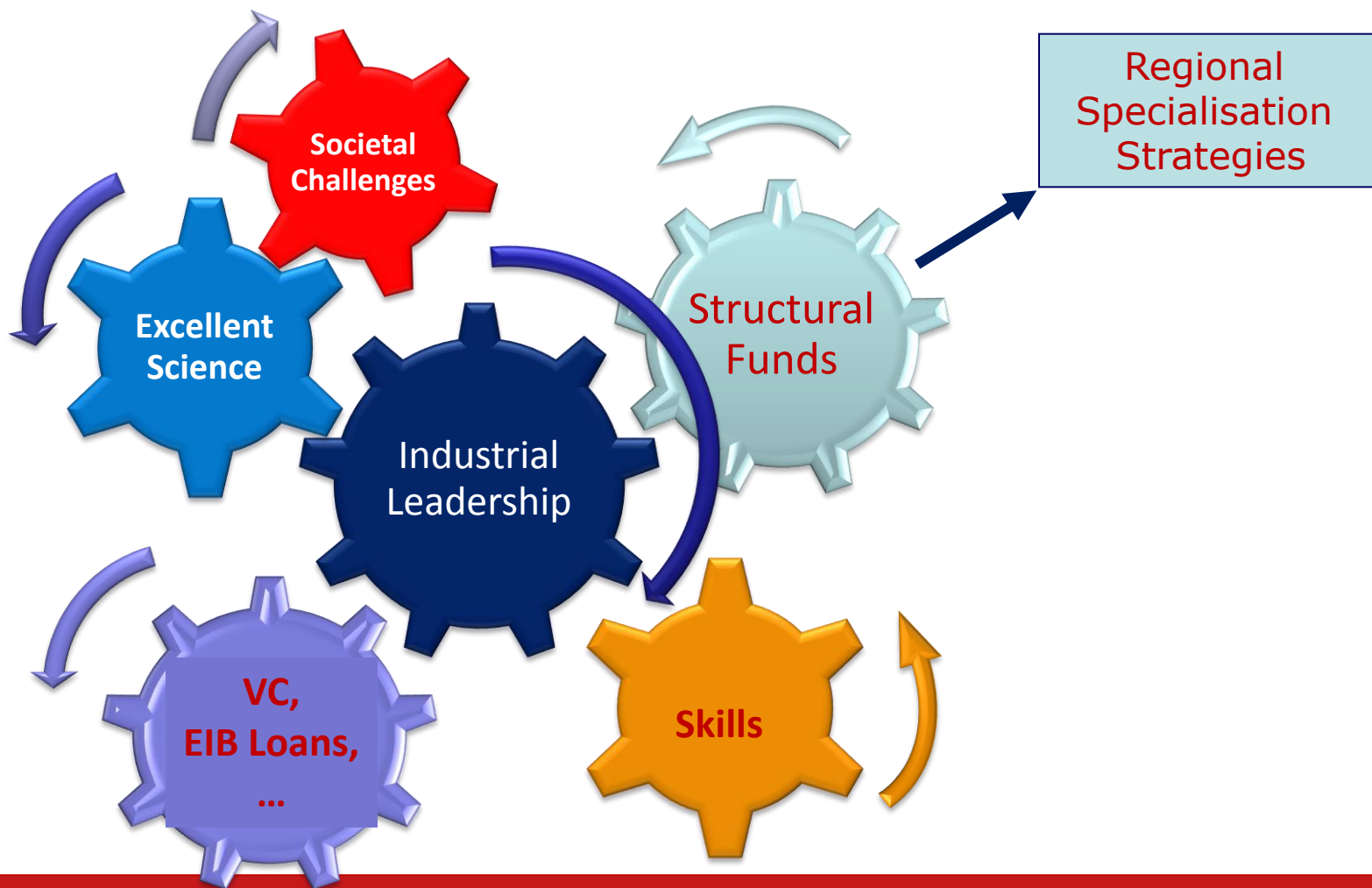
to serve an industrial strategy for Europe

European Commission

PPPs across the Digital Value Chain

+Demand led actions e.g. in EIPs

Big Data, Maximising value from data

HPC, Mastering next generation and high end computing

Robotics: Capturing opportunities in robotics, boosting competitiveness

Photonics: Leadership and wider use

Services

S value creation: WW ~$6400B / Europe ~$1640

Automobile / Industrial / Defense
dical / Space/entertainment/.

Digital prod/services

WW $3000B / Europe $850B

Semiconductors,Ph
$600B ($100
Europe

Materials

FoF, ICT innovations in manufacturing processes

5G PPP, Leadership in Telecom equip. & services

ECSEL: Doubling production of chips, Leadership in embedded software

Key Enabling Technologies

Industry - academia- EC- Public sector

Co-engagement to support roadmaps to reinforce/build leadership

More than 23 B€ of investments: ~5 B€ from ICT in LEIT

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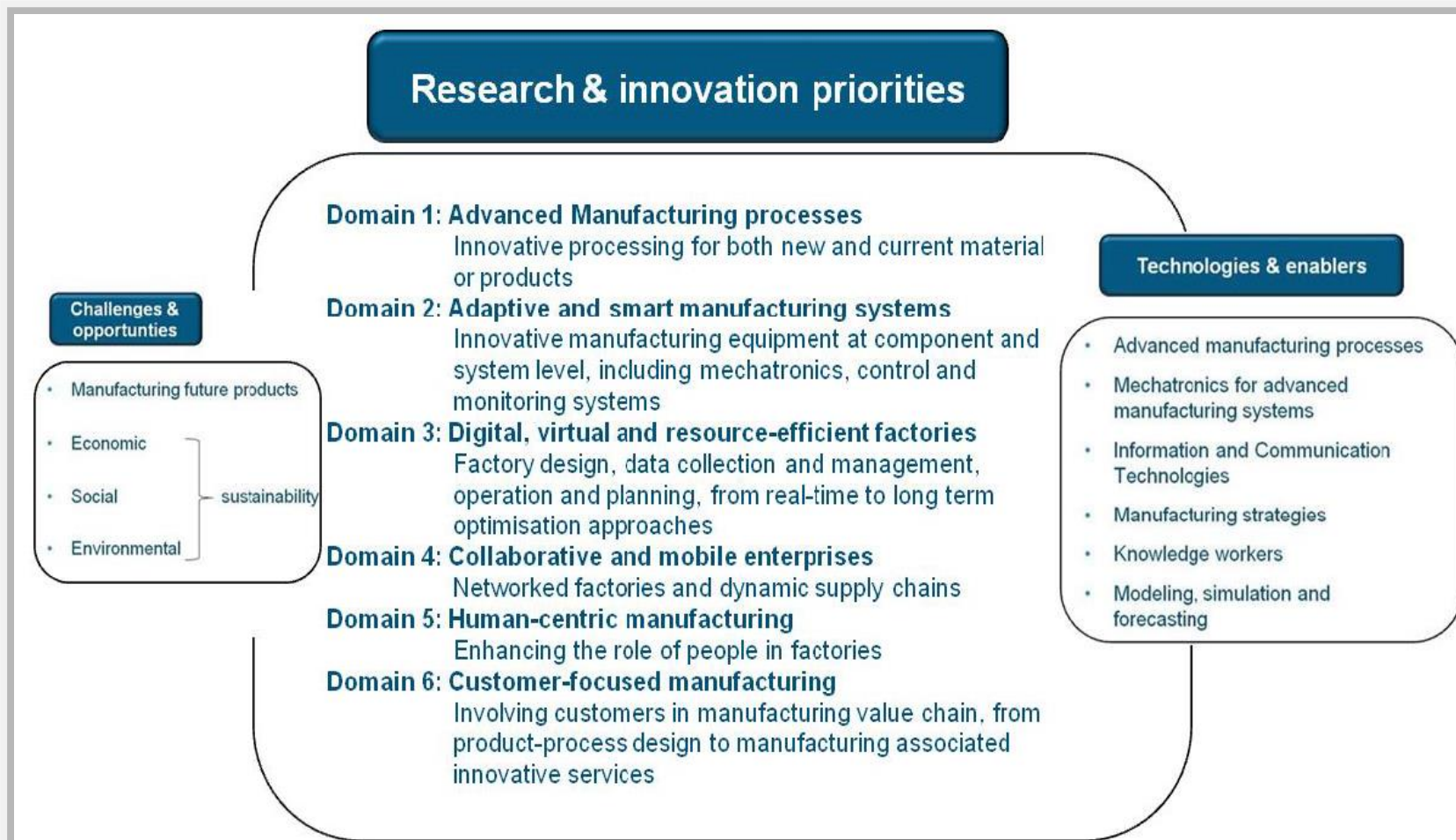
Factories of the Future PPP

- PPP supporting research & innovation in production technologies
  - Launched in 2009
  - 1,000+ organisations from across Europe
  - High involvement of SMEs: 200+ to date
    - Expanding – increasing involvement from across all of Europe

- 180 Projects launched to address multiple challenges
  - Majority of projects feature demo activities
  - Success
    - New methods, technology break-through, spin-offs
- Continuation of partnership under Horizon 2020

- Formal agreement between EU & EFFRA =
  - €1.15 billion of EU funding
    - 450 M€ from ICT
  - > 3 B€ of industry commitment

- Strategic research roadmap: 'Factories of the Future 2020'

- ICT as an enabling technology
- Expected main contributions to
  - Domains 1, 2,3,4,5,6

Research & innovation priorities

Challenges & opportunties

- Manufacturing future products
- Economic
- Social — sustainability
- Environmental

Domain 1: Advanced Manufacturing processes
Innovative processing for both new and current material or products

Domain 2: Adaptive and smart manufacturing systems
Innovative manufacturing equipment at component and system level, including mechatronics, control and monitoring systems

Domain 3: Digital, virtual and resource-efficient factories
Factory design, data collection and management, operation and planning, from real-time to long term optimisation approaches

Domain 4: Collaborative and mobile enterprises
Networked factories and dynamic supply chains

Domain 5: Human-centric manufacturing
Enhancing the role of people in factories

Domain 6: Customer-focused manufacturing
Involving customers in manufacturing value chain, from product-process design to manufacturing associated innovative services

Technologies & enablers

- Advanced manufacturing processes
- Mechatronics for advanced manufacturing systems
- Information and Communication Technologies
- Manufacturing strategies
- Knowledge workers
- Modeling, simulation and forecasting

❑ Bring the benefits of latest ICT to all industry in Europe

  Wider uptake of latest ICT

❑ Ensure a strong supply industry of ICT systems for manufacturing

  Essential to bring value across sectors

❑ Build a strong ICT industry for a strong economy in all sectors

  Essential strengths for innovative products development

❑ ICT in FoF: A key instrument supporting the EU digitisation of industry strategy

❑   Contractual PPPs

❑   FoF: Objectives and approach

➡️ ❑   What have we done so far?

❑   Looking ahead

❑ **252 M€ funding**

ICT part of total FoF ~40%

❑ **~50 projects launched**

❑ **High industrial participation**

33% large industries, 35% SMEs

❑ **Focus: Smart, digital and virtual factory**

driving product and production innovation from design, development, production to end of life

❑ **+ Robotics + Photonics technologies in FP7 (> 400M€)**

FOF
ICT In FP7
Total
252M€

ICT
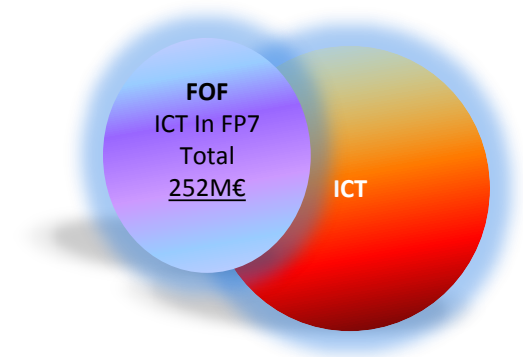
- **Problem:** Complex re-design and ramp-up cycles lead to delays in production
- **Cause:**
  - CAD and production set up are not yet integrated
  - Complex value chain and supplier network structure not fully integrated
- **Our contribution to a solution:** Strengthen the integration of the Airbus supplier network from ERP down to production and customization level

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FoFdation
Integrate CAD and production

- Manufacturing "TO-GO"
- CNC machines understand CAD
- Win-Win
  - OEM can produce 'on the fly'
  - Supplier save time and resources
- Prototype successfully demonstrated

ARUM
Integrate supply chain actors

- A350 real use case: First Full Digital PLM cycle
- **Smart assembly station** that triggers, monitors and schedules supply chain and assembly steps
- Concept phase

ICT Project VISTRA:

- **OEMs + HiTech SMEs = Back to business in Europe**

- **Gaming & training of production ramp-up in Automotive**

SERIOUS GAMES INTERACTIVE
Founded in 2005
30 employees
Located in Copenhagen
Leader in game-based
training solutions

Opel is a traditional innovator in the European automotive industry

Transfer of the solution to other sectors like airplanes, trains or wind turbines

Emphasis is on strengthening European SMEs adopting new concepts and business models based on servitisation.

Target areas :

a) Highly flexible and near-autonomous robotics systems

b) HPC Cloud-based modelling and simulation services

c) Integration of Cyber-Physical-System modules in manufacturing processes and process chains

d) Real time data analysis and data sharing via web and cloud infrastructures;

EU-wide networks of competence centres

Acting as the heart of Digital Innovation Hubs

Regional Nodes/Projects

- Feasibility studies
- Best practice experiments
- Local dissemination
- Skills development
- Infrastructure provisioning

- H2020 Funding augmented through
  - regional/structural funds, e.g. ESIF
- Focus on regional strengths/smart specialisation
- Flexibility/little synchronisation needs
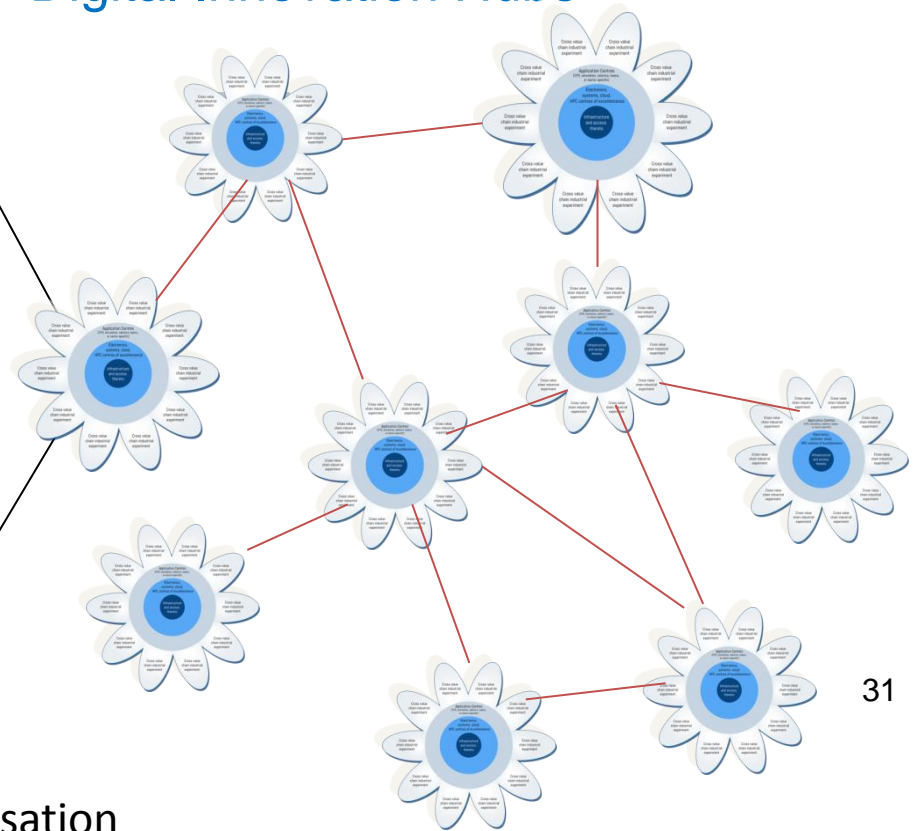
+ access to finance
for SMEs and Mid-Caps

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European Commission

I4MS **under the PPP Factories of the Future**

✓ **About 111 M€ of EU funding**
✓ **11 large projects**
✓ **72 competence centres**
✓ **220 experiments**

Technology areas
  ✓ **HPC cloud-based modelling and simulation services**
  ✓ **Industrial robotics systems**
  ✓ **Laser-based manufacturing**
  ✓ **Smart sensors systems, CPS and IoT**

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WP 2014

Process and Process Chain Optimization

Cyber Physical Systems (CPS), IoT, lasers, ...

34 M€

WP 2015

Modeling, Simulation, Analytics Tools

Advanced Computing, Big Data, ...
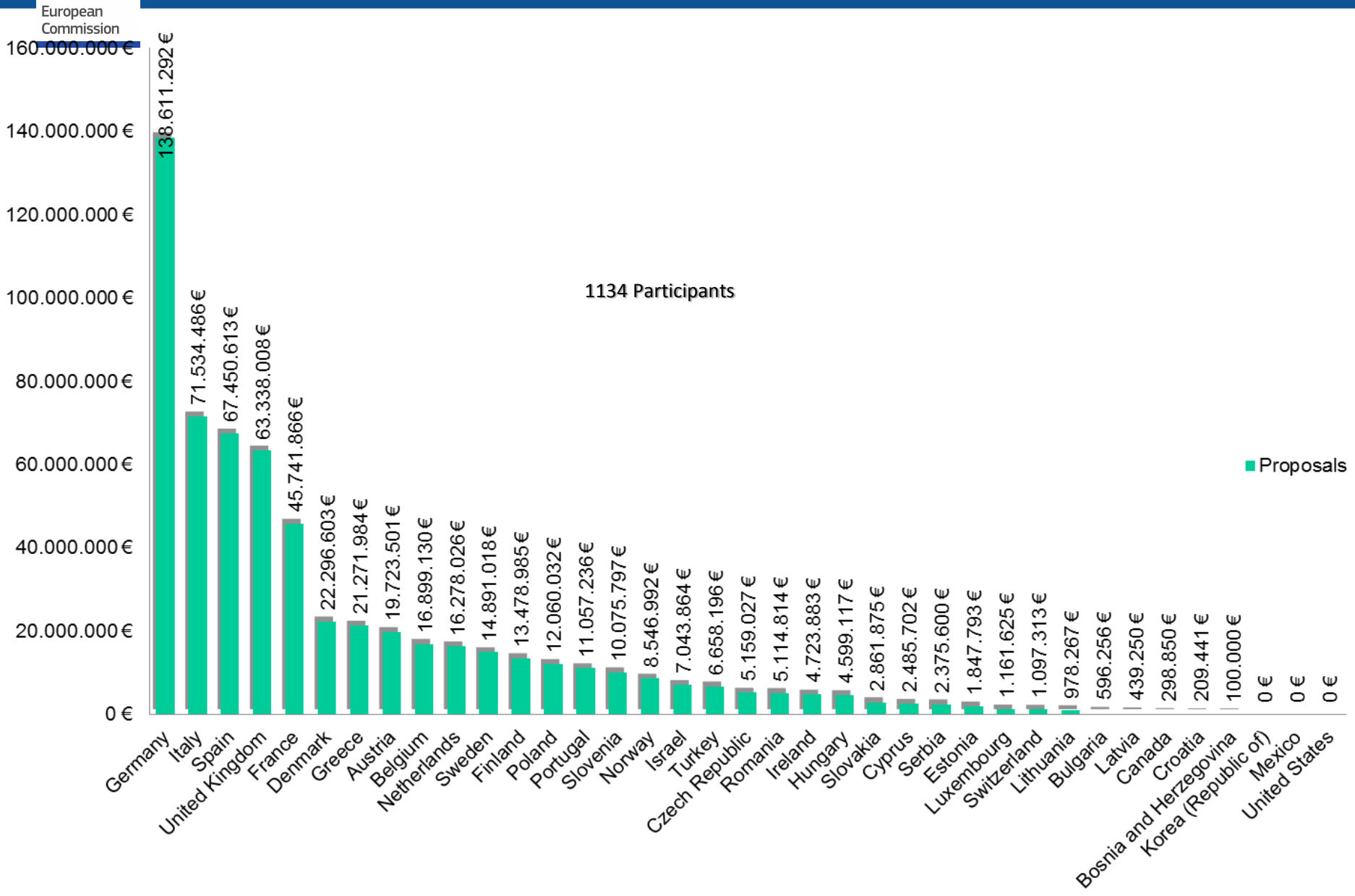
32 M€

ICT Innovation Pilots & SMEs

Robotics, Simulation, CPS: I4MS

36 M€

Participation in ICT calls in FOF in H2020

❑ Contractual PPPs

❑ FoF: Objectives and approach

❑ What have we done so far?

➡ ❑ Looking ahead

Collaborative manufacturing and logistics

Real-time architectures, management of big data flows, connected objects & sensors, information sources within the factory & supply chain

Factory automation based on CPS and IoT

virtualisation of automation pyramid from sensors to enterprise-level, synchronization of digital & real world, self-adjustment of models, real-time co-simulation

I4MS: CPS, IoT, robotics, Simulation, Analytics, modelling tools

Networks of competence centres, uptake of technology, experiments and pilots

Laser based manufacturing

From "design to piece" – Excellence in laser-based additive industrial manufacturing

European Commission

ECSEL Joint Undertakung

Photonics21 PPP

Direct Contribution to **FoF PPP** driven by EFFRA Roadmap
WP 2016/17: ~115 M€
Total H2020: up to 450M€

ICT Work Programme

Indirect Contribution to **SPIRE PPP** and their SRA

SPARC PPP

All together more than 1 B€ of investment in H2020!

- ❑ **Towards a digital industrial strategy for Europe**

  - ▪ Bold, agile, open and transparent

  - ▪ Develop the strategy in partnership with PPPs: FoF, SPARC, …

- ❑ **Cover full value and innovation chains**

  - ▪ Special emphasis on innovative manufacturing SMEs – supply and demand side

- ❑ **Capitalize on the size of EU markets & diversity of strengths**

  - ▪ Smart specialization, co-operation, ...

- ❑ **Align policies and resources**

  - ▪ EU, Member States, Regions

  - ▪ Horizon 2020, ESIF, national and regional programmes

THANK YOU

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DG CONNECT (Communications Networks, Content and Technology):
http://ec.europa.eu/dgs/connect/index_en.htm

Horizon 2020 on the web:
http://ec.europa.eu/research/horizon2020/index_en.cfm

I4MS:
i4ms.eu