Information Day of the cPPPs
Brussels 21st October 2014

Factories of the Future in Horizon 2020
Work programme 2015

A joint presentation by Project Officers of DG RTD & DG CONNECT
Factories of the Future Call Objectives

- "Re-industrialisation"
  - Ensure best use of technology to boost productivity
  - Increase market share of EU suppliers of innovative manufacturing technology
  - Raise industrial investment in equipment from 6% to 9% by 2020

- More environment-friendly and competitive manufacturing:
  - Reduction of energy consumption in manufacturing, up to 30%
  - Less waste generated by manufacturing activities, up to 20%
  - Less consumption of materials (up to 20%)

- R&I to integrate & demonstrate innovative manufacturing technologies in:
  - Adaptive and smart manufacturing equipment, 3D printing, increased production performance, collaborative and mobile enterprises, …
### FoF PPP in Work Programme 2015

| FoF 8:          | ICT-Enabled Modelling, Simulation, Analytics & Forecasting Technologies |
| FoF 9:          | ICT Innovation for Manufacturing SMEs |
| FoF 10:         | Manufacturing of Custom Made Parts for Personalised Products |
| FoF 11:         | Flexible Production Systems Based on Integrated Tools for Rapid Reconfiguration of Machinery & Robots |
| FoF 12:         | Industrial Technologies for Advanced Joining & Assembly Processes of Multi-Materials |
| FoF 13:         | Re-Use and Re-Manufacturing Technologies & Equipment for Sustainable Product Lifecycle Management |
| FoF 14:         | Integrated Design & Management of Production Machinery & Processes |
Innovative ICT makes the difference

EU Suppliers are World Market Leaders

Laser-based manufacturing

Cyber-physical systems for process (chain) optimisation

Robotics

Modelling, Simulation, Analytics

CAx

Digital Factory

Product Planning
Product Design
Production Planning
Ramp-up
Production
Use of Product
Service

Virtual Training

CAD
CAE
CAPP
CAM
DMU

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Direct Contribution to FoF PPP driven by EFFRA Roadmap WP 2014/15: 102M€
Total H2020: up to 450M€

Indirect Contribution to SPIRE PPP and their SRA
Data will become the ‘New Oil’ *)

- Increasingly complex and large sets of data, supported by advanced analytical tools, will enable manufacturing firms to better understand and optimise all stages of their value chains, from design to distribution including supply chain management, production processes and marketing.

MIT Technol. breakthrough '13: Deep Learning

- With massive amounts of computational power, machines can now recognize objects and translate speech in real time.

Transforming data into information and knowledge

- By organizing/structuring data into a meaningful form
- By applying tools for data analytics of unstructured data

*) JRC Foresight study 2013: How will standards facilitate new production systems in the context of EU innovation and competitiveness in 2025?
### FoF-8 topic overview

#### FoF 8: ICT-enabled modelling, simulation, analytics and forecasting technologies

<table>
<thead>
<tr>
<th>Research &amp; Innovation (31 M€)</th>
<th>Innovative Modelling, Simulation, Analytics and Forecasting tools</th>
<th>Integrated modelling, simulation and information management systems</th>
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<tr>
<td><strong>Modelling &amp; Simulation methods involving multiple phenomena</strong></td>
<td><strong>Integrated knowledge-based systems</strong></td>
<td><strong>Integrated information management systems</strong></td>
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<tr>
<td>discrete and continuous models, multidisciplinary and multi-objective design tools</td>
<td>covering the complete product life cycle, with advanced analytics, smart decision support systems</td>
<td>for product–production systems</td>
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<tr>
<th>Support Action (1 M€)</th>
<th>Road mapping and constituency building</th>
<th>Advanced CAx technologies for novel manufacturing processes</th>
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What we ask for: Research and Innovation Actions - main themes

1. Innovative modelling, simulation, analytics and forecasting tools for manufacturing at large, building on advances in ICT.

(i) Modelling and simulation methods

(ii) Development of integrated knowledge-based systems.

- driven by industrial use-cases
- including proof-of-concept/demo for validation on real process chains.

Small projects: 2-4 M €

RIA 100%
What we ask for: Modelling and simulation methods (i)

Small projects (2-4 M€)

(i) Modelling and simulation methods for multiple phenomena (physical, mechanical, energetic, chemical, energy, material characteristics, cost, ...) which include multi-scale and integrated discrete/continuous models, multidisciplinary and multi-objective design optimisation tools taking a holistic approach;

New developed methods can integrate virtual and physical experiments building on the combination of simulated, experimental, and real world data in real time.
ii. Development of integrated knowledge-based systems covering the full product life-cycle which are based on advanced analytics, smart decision support systems and self-learning capabilities exploiting "big data" coming from smart sensors, historical process files, or human-authored data;

\[ \text{Important aspects to be addressed are interactivity, real-time, data-fusion, imprecise computing, compressed sensing, advanced visualisation, security and privacy.} \]
What we ask for: Research and Innovation Actions - main themes

2. Integrated modelling, simulation and information management systems benefiting from recent advances in ICT.

(i) Integrated information management systems for product-process-production systems
   • well embedded into their social, environmental and economic context

(ii) Advanced computer aided technologies (CAx)
   • modelling, simulation and decision tools tailored for novel manufacturing processes and additive manufacturing
   • integrated modelling, simulation and information management systems benefiting from recent advances

Large projects: 5-8 M€

RIA 100%

✓ including pre-normative/standardisation activities
✓ reference implementations and demonstration and validation in min two industrial use cases
Expected impact:

- *Increased productivity for higher mass customization capacity for big enterprises as well as SMEs*

- *Improved cost efficiency, accuracy, reliability and speed of simulation for manufacturing processes and products*

- *Reduced time to production enabled by tool interoperability and data integration*

- *Enhanced interoperability of integrated product and production systems enabling new type of services* (e.g. data analysis, simulations and visualization techniques)
What we ask for: Support Action (CSA)

Main tasks include:

• **Roadmapping activities and constituency building for novel concepts in manufacturing enabled by ICT on**
  - wider adoption of virtual, integrated, scalable, semantic factory models
  - merging design and production models
  - integrating novel ICT for creativity

• **Stimulating EU-US cooperation on research and innovation related to modelling and simulation**
FoF PPP in Work Programme 2015

FoF 8: ICT-Enabled Modelling, Simulation, Analytics & Forecasting Technologies

FoF 9: ICT Innovation for Manufacturing SMEs

FoF 10: Manufacturing of Custom Made Parts for Personalised Products

FoF 11: Flexible Production Systems Based on Integrated Tools for Rapid Reconfiguration of Machinery & Robots

FoF 12: Industrial Technologies for Advanced Joining & Assembly Processes of Multi-Materials

FoF 13: Re-Use and Re-Manufacturing Technologies & Equipment for Sustainable Product Lifecycle Management

FoF 14: Integrated Design & Management of Production Machinery & Processes
**Scope:**
- To take-up advances in ICT in manufacturing
- Strengthen SMEs by adopting new concepts and business models on based on servitisation for product operation or for end-of-life use.

**Concept:**
- Projects consist of a critical mass of experiments with common tasks
- Experiments bring together actors across value chains
- Common tasks: dissemination, call for new experiments, exploitation
- Open Calls for 3rd parties

Information of Phase 1 available in
What we ask for: Innovation Actions in one of the following areas of technologies

Large projects (5-8 M€)

Highly flexible and near-autonomous Robotics systems

HPC Cloud-based modelling, simulation and analytics services for modelling multiple interconnected phenomena

Integration of CPS modules in manufacturing processes and process chain

Cascading Funds

Application experiments

Application/Assessment experiments
**Expected impact:**

- **Attract new users** of advanced ICT in the manufacturing sector
- **Innovative technology suppliers** to provide with new equipment, components, and tools for improved manufacturing and engineering operations
- **More competitive European service providers** provisioning new types of services
- **Exploration of new application areas for advanced ICT in manufacturing** at large

![IA 70%]

- Max 50% of funding flexible
- Through financial support to Third Parties
- Conditions set out in part K of GA
**FoF-9.b Support Actions**

**Scope:** To advance the I4MS Ecosystem

- Single portal for newcomers
- Sharing of best practices
- Dissemination
- Brokering between users and suppliers
- Levering further investment
  - Exploit local competence centers
  - Access to regional funds
  - Access to venture capital
Proposals shall clearly detail the objectives and results to be obtained from the financial support to third parties, and include at least:

- A closed list of the different types of activities supported
- Persons or categories of persons supported
- Criteria for award of support
- How to calculate the exact amount of support (for instance 70% of total costs)
- Maximum amount of support for each party

We suggest additionally:

- Payment arrangements to keep control on outcomes of experiment
- IPR arrangements with centres and third parties
Next events

• Infoday – 17 December 2014 – Brussels- on the topics:

• **ICT4** Customized and low power Computing

• **ICT30** Internet of Things and Platforms for Connected Smart Objects

• **FoF8 & FoF9** including a presentation from Pathfinder and examples from I4MS

Special on I4MS:

Experience of running projects

Experience of grant preparation for cascading funds (GA Annex K)
THANK YOU

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FoF 10 Manufacturing of Custom Made Parts for Personalised Products

Specific Objective:

- Manufacturing of custom-made parts for personalized products

- Higher consumers' demand for products & services:
  - fully personalized to satisfy individual requirements through the design and manufacturing of custom made parts
  - with increasing complexity and higher quality
  - at an affordable price and with quick delivery time
Scope:

- Production of new custom made parts personalised to an individual
- Development and integration of design and manufacturing technologies able to transform the new product-service data descriptions and protocols into manufacturing operations and processes exploiting

- Development of new machines and processes integrating advanced materials for the manufacturing of personalised parts and products
FoF 10 Manufacturing of Custom Made Parts for Personalised Products

Scope:

- Fast production and delivery of custom made parts and products
  
  **Seamless data integration** across the process and supply chains (between the supplier of the custom made part and the manufacturer of the final product)

  **Methodologies and tools for the management** and running of effective **value chains** for the fast production and delivery of personalised products **up to the sales points (shops)** or to the final consumers

**TRL 4-6**

**RIA 100%**
FoF 10  Manufacturing of Custom Made Parts for Personalised Products

Expected Impact:

- Increased capability to provide value added products/services and to rapidly follow the market dynamics by means of fast production and delivery of customised parts and products.

- Reduction by 50% in the lead-time for manufacturing one new custom part with respect to current values for same requirements.

- Cost reduction of personalised products manufacturing by 20% by decreasing lead times in products and processes development.

- Reduction of the time to market of customised parts and products by 30% by decreasing lead times and manufacturing costs.
Flexible Production Systems Based on Integrated Tools for Rapid Reconfiguration of Machinery & Robots

Specific Objective:

- Fast reconfigurable machinery and robots
  - Highly complex products
  - Rapid changes in market demands
FoF 11 Flexible Production Systems Based on Integrated Tools for Rapid Reconfiguration of Machinery & Robots

**Scope:**

- Integrated tools for MES
  - Fast reconfiguration
  - Optimising changeover time & costs
- Standardisation
  - Communication protocols & Data structures
- Interconnecting protocols
  - Production system information <-> plant management systems
- Integration into production system
  - Automatic monitoring
  - Optimisation of energy usage
- Demonstration in existing production environment
Flexible Production Systems Based on Integrated Tools for Rapid Reconfiguration of Machinery & Robots

**Expected Impact:**

- Smaller lot sizes & product variations in an economical way
- Reduction set-up & changeover times and costs
- Reduction of energy consumption
- Support for standardisation and tool connectivity

**TRL 5-7**

**IA 70%**
FoF 12 Industrial Technologies for Advanced Joining & Assembly Processes of Multi-Materials

Specific Objective:

- Unite different materials in a single object
  - Various parts with various properties
  - Disassembly and recycling made possible

IA
70%

TRL
5-7
FoF 12 Industrial Technologies for Advanced Joining & Assembly Processes of Multi-Materials

Scope:

- High-performing joints
  - Techniques & processes to maximise joint performances
  - Efficient, cost-effective & flexible surface conditions
- Disassembly
  - Easy dismantling & recycling for a "cradle-to-cradle" lifecycle
- Numerical simulations
  - Understand joining processes using models and simulations
- Reliable, robust & safe production conditions for industry
  - Automatic non-destructive tests
  - In-situ monitoring
- Demonstration with prototypes or pre-industrial pilot → solution scalability
FoF 12 Industrial Technologies for Advanced Joining & Assembly Processes of Multi-Materials

*Expected Impact:*

- 20% materials consumption
- +30% product performance *(with equal final price)*
- Higher automation
- Lower production time

**IA**

70% - 100% (non-profit)

**TRL**

5-7
**Specific Objective:**

- Manufacture added-value products with fewer resources
  - through re-use and re-manufacturing
  - for a sustainable product life cycle
  - for "modern high-tech products"
  - from "electronics, medical energy and transport industries" (not other industries)
  - either "advanced materials that are at present poorly recovered and re-used" because of "low substitutability and low recycling rates"
  - or "conventional materials that are today not considered for re-use due to absence of data on re-processed performance."
  - so re-cycling of scrap metals such as iron, steel & copper would not fit as these metals are already commonly recycled and re-used
FoF 13 Re-Use and Re-Manufacturing Technologies & Equipment for Sustainable Product Lifecycle Management

**Scope: ALL of the following areas**

- Eco-innovative approaches for product design
  - re-use and re-manufacturing aspects for enhanced product recovery and spare parts/services support
- New manufacturing and equipment concepts for re-use & re-manufacturing
  - improved resource efficiency and service lifetime
- New technologies and automation solutions
  - effective disassembly/separation and recovery of advanced materials
- Generation and validation of new business models
  - improved economic viability of closed-loop life cycles

**RIAs**
- 100%

**IMS**
- int’l

**TRL**
- 4-6
**FoF 13 Re-Use and Re-Manufacturing Technologies & Equipment for Sustainable Product Lifecycle Management**

**Expected Impact:**

- Significant reduction of energy consumption in manufacturing activities by 2020.
- Significant reduction in non-renewable materials through substitution, re-use, re-manufacture & recycling of materials.
- Reduction of minimum 20% in greenhouse gas emissions from manufacturing activities.
- Reduction of waste generation by 10% minimum.
- Enabling the manufacturing of eco-products.
- Increase of above 20% in productivity rates.
- Clear illustration of possibilities for new safe and sustainable jobs creation.
FoF 14  **Integrated Design & Management of Production Machinery & Processes**

**Specific Challenge:**

- Innovative machines & processes depend on model-based approaches throughout the machine lifecycle
- Crucial: computational models capable of simulating the machine-to-part process:
  - to predict manufacturing quality & productivity
  - to compensate wear/partial damage through model-based control
- Needed: new, integrated approaches & cross-disciplinary collaboration
  - Machine & s/w suppliers - users
FoF 14 Integrated Design & Management of Production Machinery & Processes

Scope:

Develop & test suitable model-based approaches for production machinery/demonstrate the power of model-driven approaches for machine innovation through:

- Integrated, accurate simulation models & algorithms for model-based control of production machinery (cross-disciplinary input & actual (=real) machine parameters)
- Easy-to-use tool programming strategies, adaptable by worker on the machine (ergonomics: an advantage)
- Demonstrate reliability of model-based machines for production accuracy/quality, maintainability & lifecycle RoI (e.g. industrially scalable demonstrator).
**FoF 14** Integrated Design & Management of Production Machinery & Processes

**Expected Impact:**

- Improved system adaptability
- 30% reduction in lifecycle cost (manufacturing system & process)
- New maintainability concepts based on predictive "(self-)maintenance":
  - Machine reliability improved by 10% (MTBF)
  - Maintenance costs reduced by 20%
- Environmental:
  - Less waste
  - Energy efficiency improved by 30%
FoF 2015 call details:

- **Deadline Date (single stage):**
  - 04-02-2015 @ 17:00:00 (Brussels)

- **Total Budget for the 2015 call:**
  - € 68 million (ICT)
  - € 75.2 million (NMP)

For specific questions, contact the Research Enquiry Service

http://ec.europa.eu/research/index.cfm?pg=enquiries
Thank you for your attention

More information:

HORIZON 2020:

Contractual Public-Private Partnerships in research and innovation: