MANU*FUTURE*-BE

MANU*FUTURE*
& 'Factories of the Future' Public Private Partnership

Infosession

22 June 2009

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Agenda

10:00 Welcome - Introduction

10:05 EFFRA: European Factories of the Future Research Association: What, why, membership?

10:25 Overview: Manufuture & 'Factories of the Future' PPP in FP7 call 2010

10:40 'Research for SMEs' oproep, Luc de Ridder, IWT

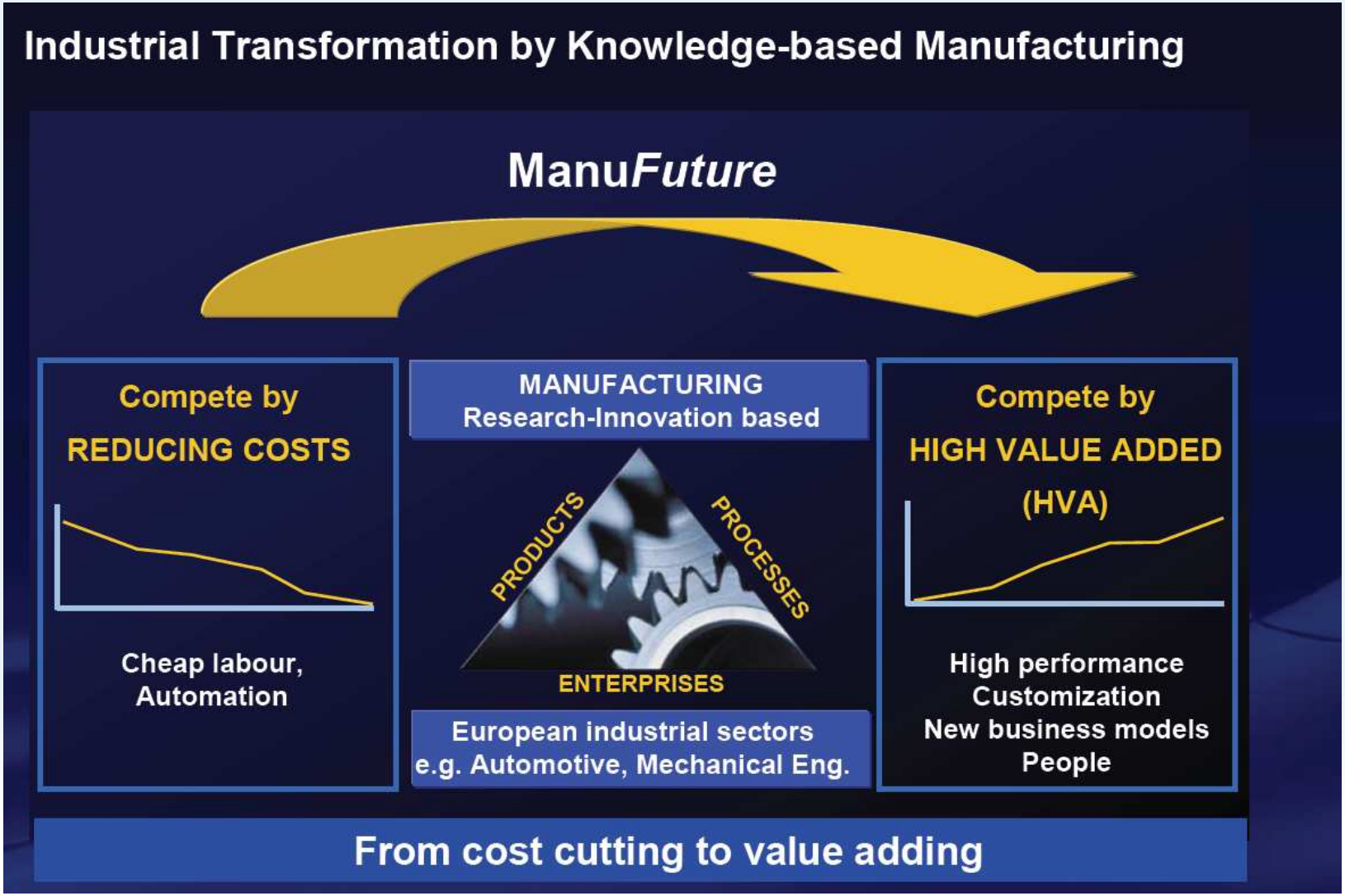
10:50 Participation of Belgium in FP7 NMP, Luc de Ridder, IWT

11:10 Break

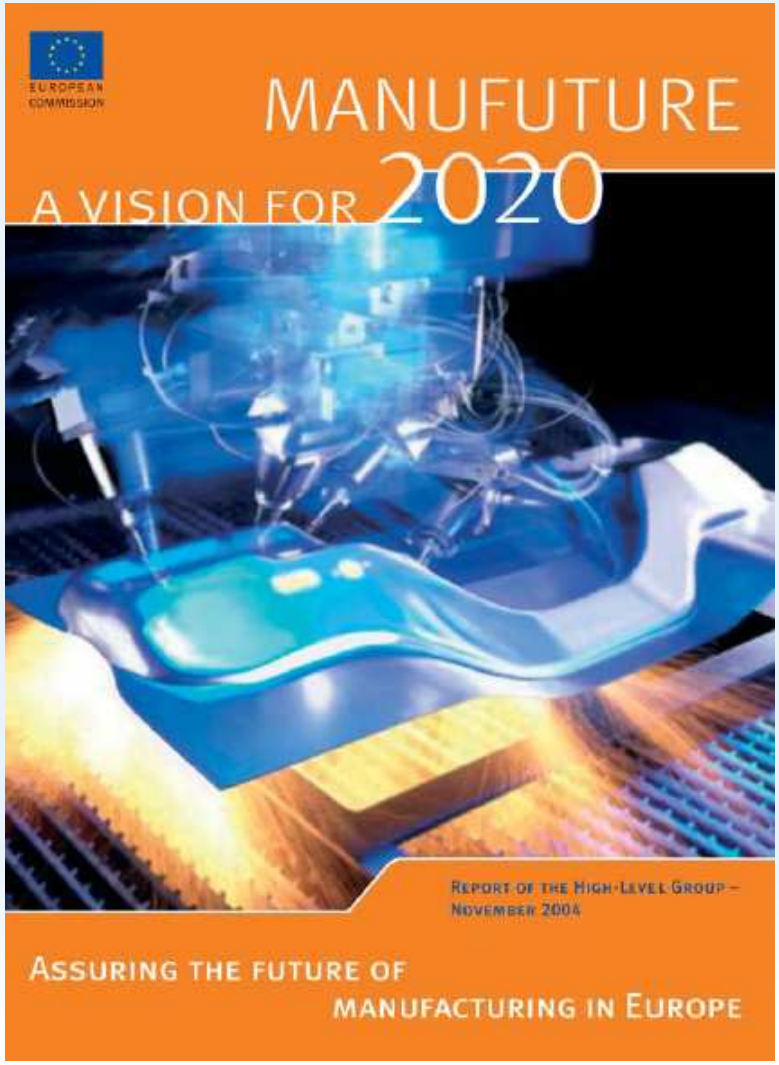
11:25 EFFRA: development of work programme (research areas and instruments) of the 'Factories of the Future' Public Private Partnership

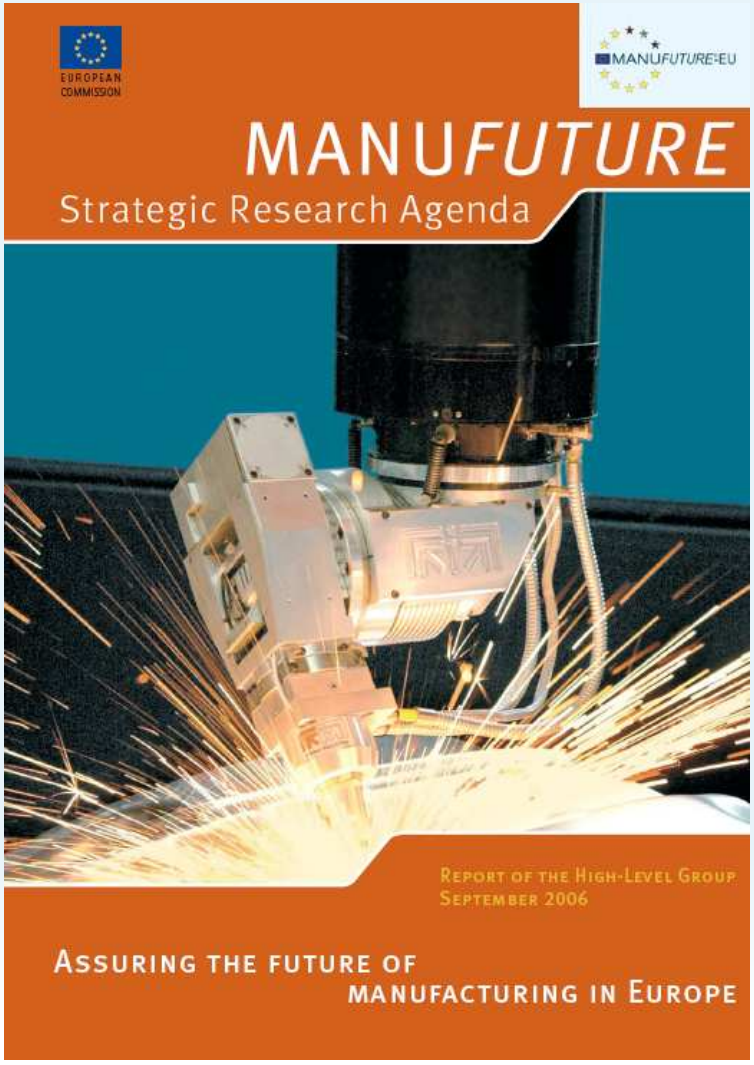
12:00 – 13:00 Q&A – Sandwich Networking Lunch

The ManuFuture Strategy



The Manu*future* vision and Strategic Research Agenda





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ManuFuture Research Fields

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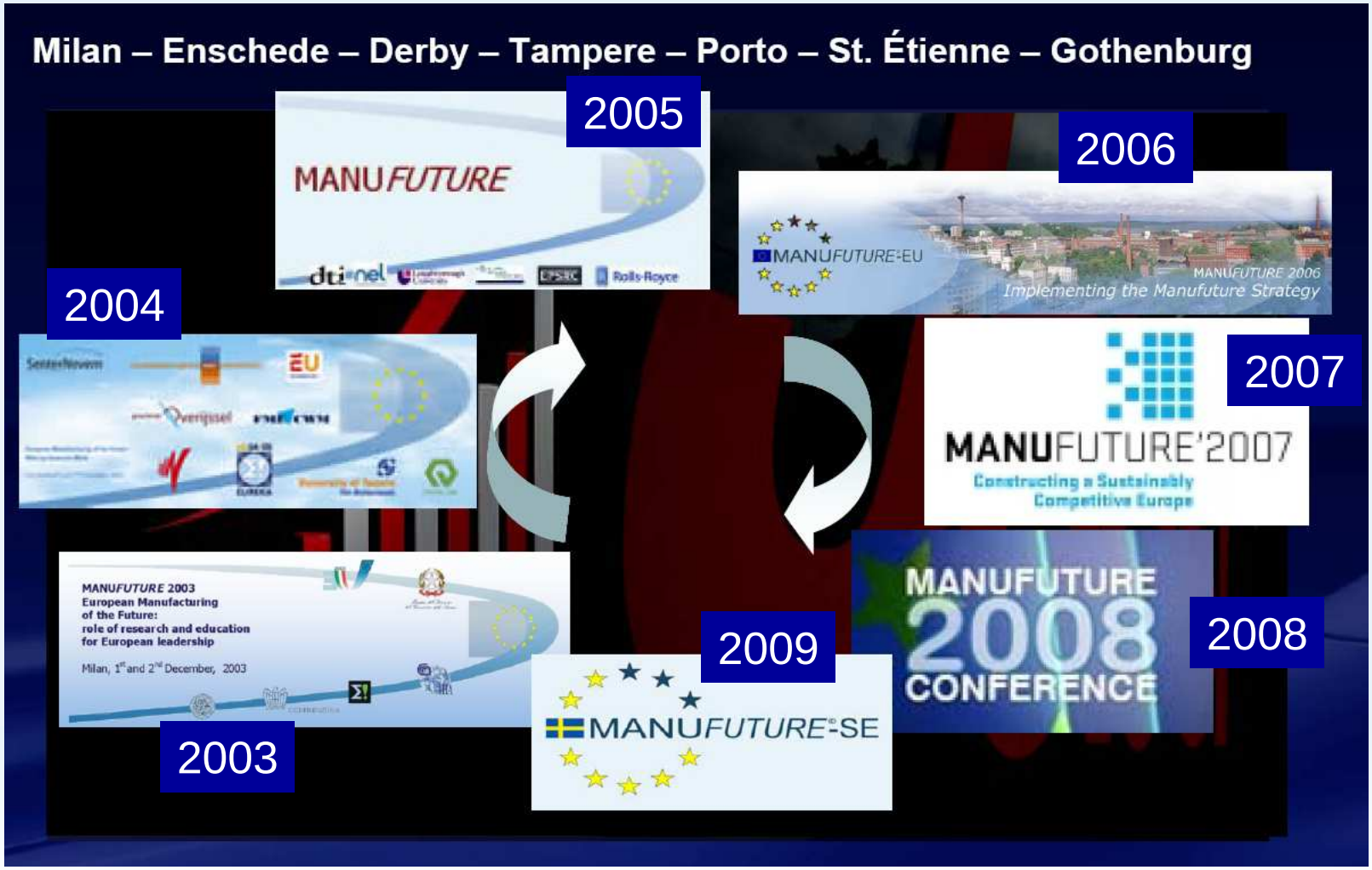
ManuFuture started in Milan 2003



2010
(NMP – ManuFuture Event under the Belgian Presidency)

National and Regional ManuFuture Platforms

Interaction AGORIA / Manufuture

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Technology Platform

Strategic Research Agenda
(Presented in December 2005)

AGORIA = High Level Group member, Support Group member

eumecha pro
european mechatronics generation of productic
www.eumecha.org

April 2005 – June 2007
AGORIA = Coordinator

Industry roadmaps

Research roadmaps

eumecha-pro Structured Roadmaps

leadership

February 2006 – October 2007
AGORIA = Participant

Launch of Belgian Manufuture Platform: 15 June 2006

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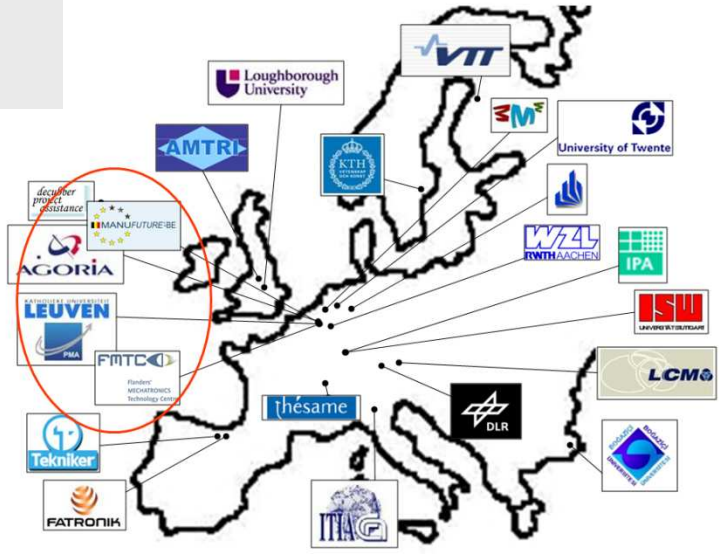

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December 2007 – December 2008
Towards a 'Manufuture JTI'?

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EuropeanTechnology Platforms

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Technology Platform

EU Framework Programmes

Sixth Framework Programme
2002 - 2006

SEVENTH FRAMEWORK PROGRAMME

Capacities

Research for the benefit of SMEs

Cooperation

Nanosciences, nanotechnologies, materials & new production technologies (NMP)

2002

2007

2011

2013

Joint Technology Initiatives

ARTEMIS

CLEANSKY

imi

niac

€

€

MANUFUTURE-EU

Joint Technology Initiative???

FP8

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November 2008 – EU Recovery Plan: Public Private Partnership FoF

Factories of the Future PPP Implementation scheme

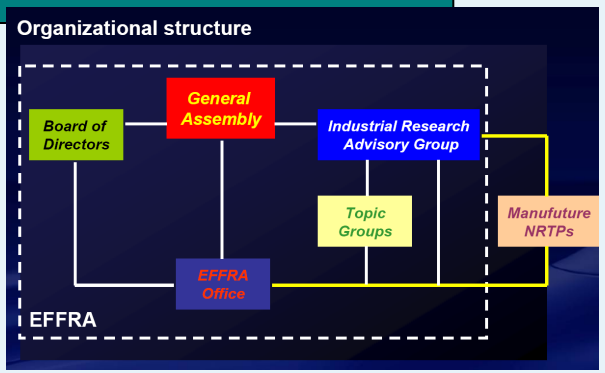
- **Short term**
  - Dedicated cross thematic FP7 calls for R&D projects, launched by EC as an immediate action (call 2010)
- **Medium to long term**
  - Aim to establish a Joint Undertaking (JU) between EC and **legal entity EFFRA (representing the private side)** on the basis of Article 171 of the Treaty
  - The JU would define, launch and manage an industry-driven programme of pre-competitive research, development and demonstration.

EFFRA and the Factories of the Future Joint Undertaking

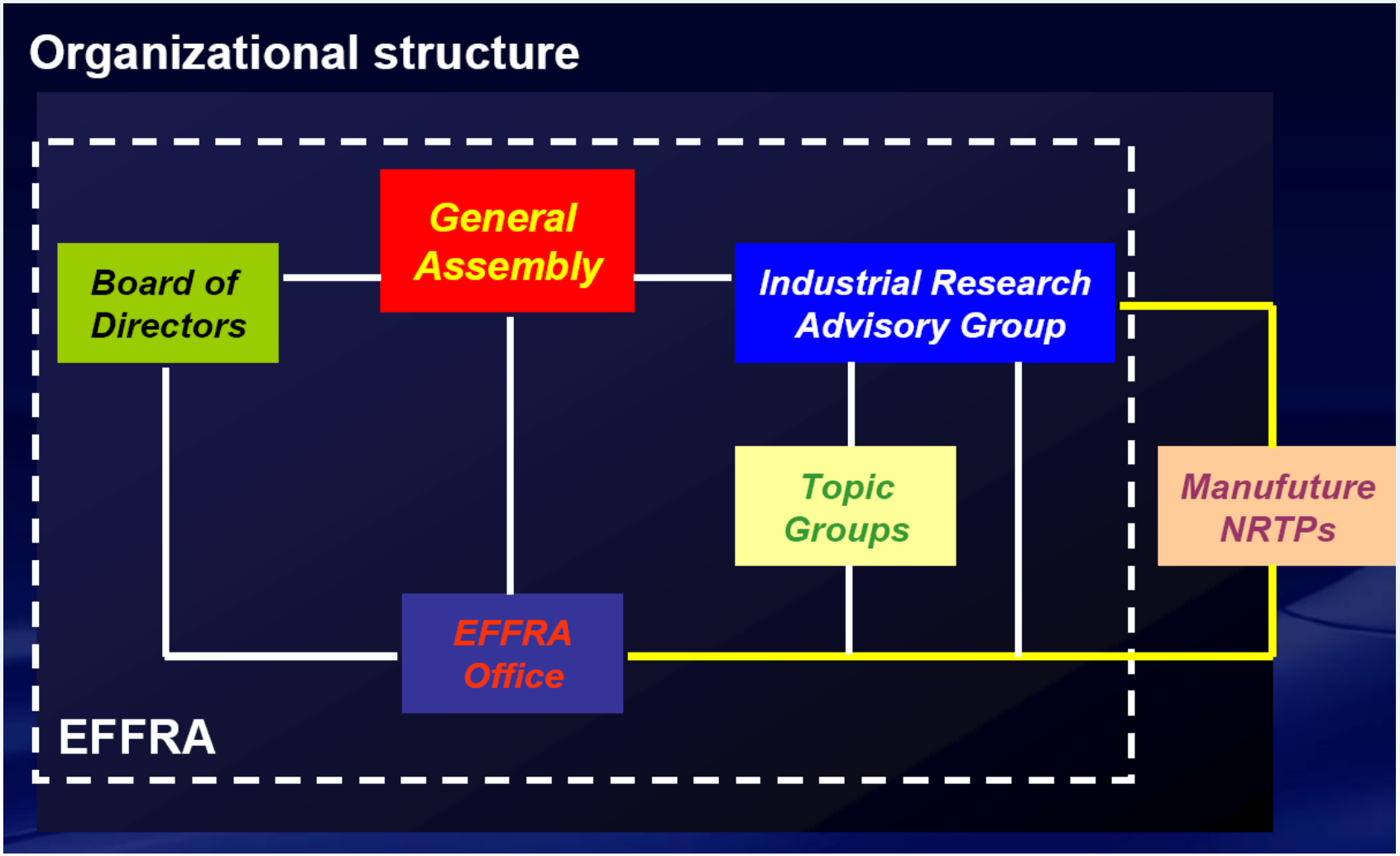
Governing Board

European Commission
DG Research, DG INFSO

EFFRA- European Factories of the Future Research Association



Formal partner from Industrial side: EFFRA – European Factories of the Future Research Association



Why a Joint Undertaking (JU)

- **Industry has a leading role in defining research priorities, time lines,** and rules. Industry co-decides and manages the implementation
- **Multi-annual integrated Work Programme**, ensuring a long-term continuity in the implementation of manufacturing research strategies
- **No fragmentation of RTD governance**: a Single management structure to mobilise in a single legal entity all the funds assigned to the research programme from the public and the private sectors.
- **Pre-defined budget for a long-term horizon** raises confidence in private sector investors and allows industry to make long-term investment plans
- **Increased use of SME-friendly research instruments** with a possibility to develop also new measures
- **Simpler and streamlined procedures**, for project preparation, evaluation and implementation, reduced time-to-contract and efficient follow-up.
- **More experts / evaluators** coming from industry
- **More emphasis on industrial innovation** and impact on the realization of manufacturing strategies and roadmaps, boosting the knowledge level and stimulating exploitation

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EFFRA membership

- Industry members
  - Companies (suppliers/customers)
  - Industry associations
- Research members
  - Universities, Research institutes
- Others

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Recruitment of members

- By national engineering associations *(Orgalime members)* and sectoral engineering associations
- By national MANUFUTURE platforms and the MANUFUTURE members
- Other channels + EFFRA website
  (not operational yet)

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Benefits

- Possibility of shaping EU R&D programmes
- Possibility of forming networks

Note:

- EFFRA membership **does not** mean guaranteed funding
- FoF will work with competitive calls = excellence of the proposal remains the only criteria

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Planned membership fees

- Reaching from 1.000 Euros to 10.000 Euros
  - first year: 1/3 of the full fee
  - second year: 2/3 of the full fee

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Factories of the Future
Development of Multi-annual Roadmap: Milestones

- Multi-annual Roadmap:
  - Strategy document of 20 to 30 pages
  - Base for call in the period 2010 to 2013
  - Challenge and target oriented: leading to the needed impacts
  - Coherent approach: addressing Themes in a complementary way
  - Realistic estimation of funds to be devoted for each priority area
  - Consensus-based to generate wide stakeholders support
  - Not so extremely detailed as to define the specific call topics

- May-June 2009: Drafting work by Ad-hoc Industrial Advisory Group End of June 2009: Complete Draft of the Multi-annual Roadmap
- September-October 2009: Input from the wider range of stakeholders and from the Member States representatives
- Mid November 2009: Final version of the Multi-annual Roadmap is ready
- Call topics will be derived from Multi-annual Roadmap

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Manufuture & ‘Factories of the Future’ PPP in FP7 call 2010

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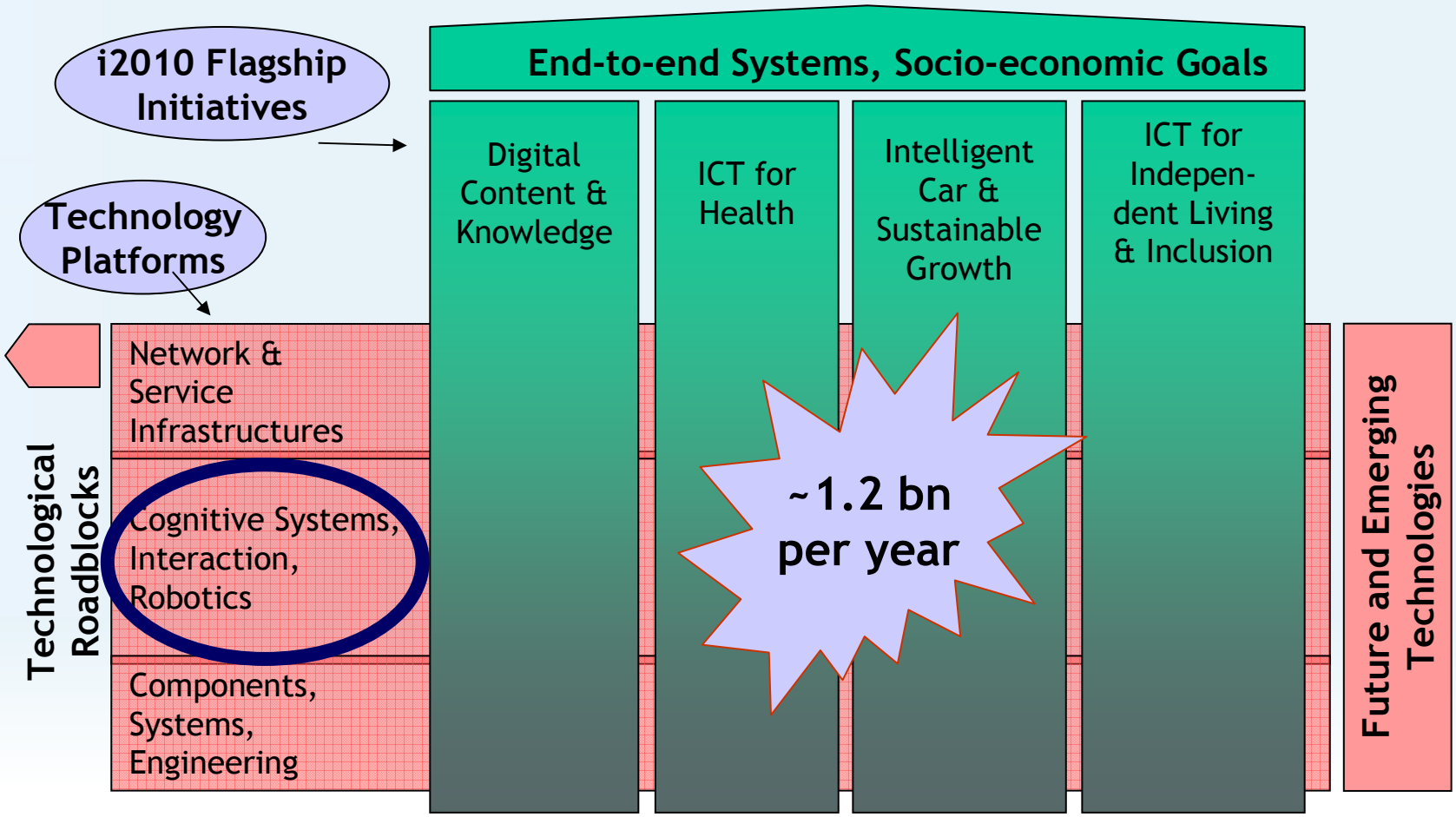
ICT - Theme structure (outside FoF PPP)



ICT - Instruments

- Collaborative projects (CP)
  - 'Small or medium-scale focused research actions' (STREP)
  - 'Large-scale integrating projects' (IP)
- Coordination and Support Actions / Networks of Excellence

STREPs target a specific research objective in a sharply focused approach while

Large scale integrating projects have a comprehensive 'programme' approach and include a coherent and integrated set of activities dealing with multiple issues

ICT – call 5 and call 6

- **Call title: ICT call 5**
  - Call identifier: FP7- ICT -2009-5
  - Date of publication*40*: 31 July 2009
  - Deadline: 3 November 2009
  - Indicative budget: EUR 722 million
  - See indicative budget breakdown in Section 5 of the ICT work programme (http://cordis.europa.eu/fp7/ict) .
  - 'Manufuture-relevant' topics called:
    - ✓ ICT 2009.3.5 Engineering of Networked Monitoring and Control Systems
    - ✓ ICT 2009.8.5 Self-Awareness in Autonomic Systems
- **Call title: ICT call 6**
  - Call identifier: FP7-ICT-2009-6
  - Date of publication*44*: 24 November 2009
  - Deadline*45*: 13 April 2010
  - Indicative budget*46*: EUR 286 million
  - See indicative budget breakdown in section 5 of the ICT work programme.
  - Topics called:

ICT - Challenge 2: Cognitive Systems, Interaction, Robotics

Objective ICT-2009.2.1: Cognitive Systems and Robotics

a) **New approaches towards understanding and solving key issues related to the engineering of artificial cognitive systems**; among these issues are the following:

- representation / categorisation / recognition / interpretation of objects, events, situations, behaviours and affordances in realistically scaled real-world environments;
- the role and implementation of memory and learning in artificial systems;
- adaptive and anticipatory behaviour within incompletely specified environments;
- goal-setting and strategies for achieving goals;
- collective behaviour arising from the interplay of (possibly large numbers of) individual subsystems;
- modelling and design of (multimodal) interaction, communication and collaboration.

c) **New ways of designing and implementing complete robotic systems** that operate largely autonomously in loosely structured dynamic environments and, where necessary, in close co-operation with people. Systems may be distributed and should integrate rich sensory-motor skills (for example, grasping, manipulation, locomotion) with high level cognitive competencies (for example, reasoning, planning and decision-making). As appropriate, they should be demonstrably more robust, dependable, flexible and adaptive, and safer than it is possible today, and improve their performance through learning.

e) **A framework to facilitate cross-fertilisation between academic and industrial research efforts in robotics** through widespread experimentation with industry-strength platforms in academic research labs and through the joint definition of longer term scenarios and requirements to direct robotics research towards common goals; to assure a comparative assessment of performance through definition of suitable metrics and through benchmarking (supported by competitions or otherwise).

h) Co-ordinated **co-operation and communication** within a multidisciplinary artificial cognitive systems research community in Europe, with concomitant outreach to potential industrial applications.

ICT call 6: target outcomes (a), (c), (e), (h)

- **IP/STREP: EUR 78 million of which a minimum of 50% to IPs and a minimum of**
- **30% to STREPs**
- **CA: EUR 2 million**

ICT - Challenge 3: Components, systems, engineering

Objective ICT-2009.3.1: Nanoelectronics Technology

ICT call 5

a) **Miniaturisation and functionalisation**

b) **Manufacturing technologies**

c) **Support measures**

Funding schemes: a) STREP, NoE; b) IP, STREP; c) CSA

Objective ICT-2009.3.5 Engineering of Networked Monitoring and Control systems

The activities in this area address engineering technologies for large scale, distributed and cooperating systems for monitoring and control, including wireless sensor networks.

Target outcomes

a) Foundations of complex systems engineering

To achieve robust, predictable and self-adaptive behaviour for large-scale networked systems characterised by complex dynamic behaviour through the development of novel abstractions and scalable methods for sensing, control and decision-making. The scope covers foundational multi-disciplinary research and proof of concept addressing the whole chain from modelling, sensing, monitoring and actuation, to adaptive and cooperative control and decision making. Activities to encourage and enable multi-disciplinary education in the areas of systems engineering and monitoring and control are welcome.

b) Wireless Sensor Networks and Cooperating Objects

To develop architectures, hardware / software integration platforms and engineering methods for distributed systems composed of heterogeneous networked smart objects that are enabled by sensors, actuators and embedded processors. This will contribute to better dependability, safety, security, cost and energy efficiency e.g. in manufacturing, process plants, buildings and large scale infrastructures (including environmental management systems). Research challenges include: methods and algorithms to support spontaneous ad-hoc cooperation between objects; network-centric computing with dynamic resource discovery and management; semantics that allow object/service definition and instantiation; lightweight operating systems and kernels; open wireless communication protocols for harsh (industrial or outdoor) environments; abstractions and support tools to enable (re)programming; virtual sensing and actuation through low-cost aggregation of sensors and actuators; and experimenting with novel large-scale applications of wireless sensor networks.

The objective is to support one IP only to address architectures and integration platforms, including design and demonstration, for very large scale systems of cooperating objects and wireless sensor networks. STREPs should target specific issues or topics.

c) Control of large-scale systems

To enable the optimal operation of large-scale dynamic systems through proactive process automation systems. Such systems should be based on process control algorithms, architectures and platforms that are scaleable and modular (plug & play) and are applicable across several sectors, going far beyond what current Supervisory Data Acquisition and Control (SCADA) and Distributed Control Systems (DCS) can deliver today. Pro-activeness requires novel predictive models for higher performance and fault adaptation and recovery. The architectures should facilitate re-use, enable QoS, and reduce the reconfiguration effort. Standardisation of monitoring and control systems in industrial environments is encouraged in all projects. The objective is to support one IP only to architect, develop and demonstrate a new generation of open and proactive process automation monitoring and control systems, and to address associated standardisation. STREPs should target specific issues or topics.

ICT call 5

Funding schemes: a): STREP, NoE; b): IP, STREP; c): IP, STREP; d): CSA

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NMP – 2010 WP
4th FP7 call

Activity 4.3 New Production (2 topics)

LArge | SME | SMall | Other

4.3.1 Development and validation of new industrial models and strategies (1 topic)

4.3.1-1 New industrial models for a sustainable and efficient production - SM

4.3.2 Adaptive production systems (0 topic – topic moved to FoF PPP)

"Plug-and-Produce components for adaptive control" –SM -
This topic was moved to the "Factories of the future" PPP initiative

"New technologies for energy-efficient buildings at district level" – SM -
This topic was moved to the "European energy-efficient buildings" PPP initiative

4.3.3 Networked production (0 topic - topic moved to FoF PPP)

"Supply chain approaches for small series industrial production" – SME -
This topic was moved to the "Factories of the future" PPP initiative

4.3.4 Rapid transfer and integration of new technologies into the design and operation of manufacturing processes (1 topic)

4.3.4-1 Manufacturing systems for 3D-shaped, multilayered products based on flexible materials – LA

4.3.5 Exploitation of the convergence of technologies (0 topic)

"Intelligent, scalable, manufacturing platforms for components with micro- and nano-scale functional features" – LA -
This topic was moved to the "Factories of the future" PPP initiative

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NMP – 2010 WP 4th FP7 call

Activity 4.4 Integration of technologies for industrial applications
(9 topics)

LArge | **SME** | Other

4.4.0-1 Development of nanotechnology-based systems for detection, diagnosis and therapy for combating cancer - LA

4.4.0-2 Capacity building for the development of nanotech-based multi-parameter sensors - LA

4.4.0-3 High throughput technologies for the development of formulated products - LA

4.4.0-4 A new generation of multi-functional fibre-based products produced by new and flexible manufacturing concepts - SME

SME

4.4.0-5 Support to coordination activities of NMP related to European Technology Platforms – CSA - Coordination

4.4.0-6 Organisation of events related to the Presidencies of the EU – CSA - Support

4.4.0-7 ERANET on Nanotechnologies, including Nanotoxicology - ERANET

4.4.0-8 ERANET on Manufacturing - ERANET

4.4.0-9 ERANET on Catalysis - ERANET

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Factories of the Future PPP Call 2010

NMP

- Plug-and-Produce components for adaptive control
- Supply chain approaches for small series industrial production
- Intelligent, scalable, manufacturing platforms and equipment for components with micro- and nano-scale functional features

ICT

- Smart Factories: ICT for agile and environment-friendly manufacturing

A5-PPP1-NMP-2010-1: Plug-and-Produce components for adaptive control

Technical content/scope: The main objective is to develop active, self-optimising, portable plug-and-produce components for a new generation of adaptive production systems. These plug-and-produce components should hold the manufacturing process at optimal performance despite influence of disturbances, variations in plant performance or voluntary changes in the production. Research should also explore the potential of adaptive smart materials or combination of passive and active materials (mechatronic solutions and/or engineered materials) to increase the adaptability of production systems for changing conditions. The intelligent plug-and-produce systems can feature sensing and actuating structures, adaptive control and energy harvesting to allow a high accuracy in production systems under different conditions and to overcome the traditional limitations on dynamics versus precision.

Research should focus on self-sufficient intelligent plug-and-produce components with advanced sensing and actuating functionalities, e.g. based on smart materials. Such systems should easily implement and self-adapt their range of properties, depending on the changing process conditions. Regarding the use of smart materials, technical key points are the compensation of static and/or thermally induced dislocations, vibration damping and the decoupling of oscillations. Vibrations could be used for energy harvesting processes to transform kinetic energy into electric energy, to drive the intelligent system. Deliverables should include components and methods for intelligent, self-sufficient plug-and-produce systems. The system should be of an open architecture to facilitate any additions of new modules as needed for implementation in a new environment.

The projects are expected to include significant demonstration elements, including pilot implementations in industrial settings.

Funding Scheme: Collaborative projects.

A5-PPP1-NMP-2010-1: Plug-and-Produce components for adaptive control

Expected impact: The new generations of adaptive production systems by means of active, self-optimising plug and produce components should lead to significantly improved dynamics, a higher precision as well as a high level of reliability in the use of changing process conditions. This should result in higher productivity as well as higher product quality.

A5-PPP1-NMP-2010-2: Supply chain approaches for small series industrial production

Technical content/scope: Manufacturing systems for small series production will enable the transition from mass production to the personalised, customer-oriented and eco-efficient manufacturing needs of the future, requiring innovative interactions between design, materials, processes and ICT. A complete supply chain model addressing new challenges such as involving customers in design, which could include the creation and management of personalised data files, and on-demand manufacturing, requiring appropriate raw materials availability, highly flexible, fast response manufacturing techniques and final product acceptance criteria and procedures, needs to be developed. Typically, data capture, reverse engineering, design activities and manufacturing may take place in various geographical locations and need reliable data transfer capabilities.

The research should focus on advanced techniques for fast and reliable data capture and data management, flexible and multifunctional computer-aided component design systems, on-purpose planned raw material specification and supply as well as on fostering on ad-hoc logistics, legislative and organisational aspects in order to offer solutions in building sustainable supply chain approaches. Special attention will be required for final product quality management in the whole production chain. Particular emphasis may also be given on developing machines capable of processing specifically upgraded single or multi-materials parts.

The topic is aimed at projects driven by industry and service-to-industry companies, with significant demonstration elements of the complete manufacturing cycle distributed over the whole value chain. The overall objective of the topic is to involve the relevant industrial sectors, including OEMs (Original Equipment Manufacturers), design and service providers as well as material manufacturers.

Regarding industrial SMEs, a strong participation, a significant role in the decision making structure of the project and clear benefits in the exploitation of the results are expected.

The projects are expected to include significant demonstration elements, including pilot implementations in industrial settings.

Funding Scheme: Collaborative projects.

A5-PPP1-NMP-2010-2: Supply chain approaches for small series industrial production

Expected impact: First-time right flexible, energy and eco-efficient manufacturing systems will play a crucial role in maintaining the economic viability of manufacturing organisations within the EU. It is expected that the removal of technical barriers will open the way for wide-scale introduction and implementation of those systems. For example, Rapid Manufacturing technologies are expected to be in the market place for high value added products (replacing 5-15% of the conventional production techniques within the next 5-10 years), in a wide range of sectors. New supply chain approaches are particularly crucial for sectors in which citizens play an important role, such as health, consumer, automotive, electronics, but also high-end equipment.

A5-PPP1-NMP-2010-3:Intelligent, scalable, manufacturing platforms and equipment for components with micro- and nano-scale functional features

Technical content/scope: In order to be competitive in the global market, manufacturing industry needs to be cost-efficient and flexible in volume and product features, meeting at the same time quality and sustainability targets.

The integration of micro- and nano-features in products and production equipment shows high potential to enable the achievement of these targets. The aim is to deliver new reconfigurable, upscalable and multipurpose micro- and nano-manufacturing platforms and equipment that can facilitate cost efficient and competitive industrial-scale manufacturing of customised products.

This will require the development of a new generation of modular, knowledge intensive, scalable and rapidly deployable systems, which should utilise the emerging technologies from micro- and nano-research and follow a flexible industrial production philosophy where production chains are easily downscalable in size or resolution, upscalable in volume and open to the introduction of new technologies, ensuring quality and reliability at low costs.

A5-PPP1-NMP-2010-3:Intelligent, scalable, manufacturing platforms and equipment for components with micro- and nano-scale functional features

The **research focus** is on:

- New design and modelling tools for intelligent, integrated cross-domain design approaches to all aspects of the future manufacturing platforms (including design for manufacturing rules, prototyping, process & material characterisation, integrated process chains, assembly, packaging, metrology, testing, standardisation).
- New (in-line) control solutions and embedded sensor technologies for reconfigurable, modular micro- and nano-manufacturing systems, with potential link to factory level control systems (e.g. Manufacturing Executive System).
- Integrated new solutions for automatic handling of large volumes of very small parts or macro-components integrating small parts using high precision positioning and handling techniques.
- Novel solutions of nano-processing operations integrated within conventional mass production lines
- Modular and knowledge-based approaches, e.g. self-learning & auto-calibrating systems.
- Characterisation, quality control and yield management.

The projects are expected to include significant demonstration elements, including pilot implementations in industrial settings.

Projects must integrate players of the supply chain of the manufacturing systems, and exploit the inter-sectorial integration of technologies (micro- and nano-manufacturing, bio-, IT etc.).

A5-PPP1-NMP-2010-3:Intelligent, scalable, manufacturing platforms and equipment for components with micro- and nano-scale functional features

Funding Scheme: Collaborative projects.

Expected Impacts: The approach must demonstrate its ability to:

i) establish and to support a competitive European nano- and µ-manufacturing industry, creating favourable conditions for private investment and economic growth;

ii) enable new factories and new products, integrating results from manufacturing of nano-materials & nano-surfaces and production technologies for µ-components;

iii) upgrade existing factories by means of effective integration of nano-manufacturing processes; iv) reverse the trend of out-sourcing to low cost countries by allowing manufacturing on demand at the right time and place. The target is to strengthen Europe as a NMT-location for both equipment and production industry by creating the technology and infrastructure basis.

ICT Work Programme 2010 Update

Relevant to "Factories of the Future":

- Focus in 2010 is on "Smart Factories"
- Industry-driven projects

Projects should:

- Focus on the use of advanced ICT-based technologies
- Contain a strong validation element
- Have quantifiable targets

Funding: € 35 million

- Mainly collaborative projects: IPs and STREPs
- 1 European "ICT for Factories of the Future" Coordination Action

Expected impact:

- Higher level of intelligence & environmental consciousness on the shop floor
- Introduction of advanced automation into mainstream manufacturing
- Develop European market for advanced shop floor technologies
- Higher productivity of customised manufacturing paired with reduced emissions & waste

Objective 10.1 - "Smart Factories: ICT for Agile & Environmentally Friendly Manufacturing"

€ 35 M

(a) Integrated process automation & optimisation for sustainable manufacturing:
- Shopfloor-based platforms & systems in seamless cooperation with enterprise software (MIS, ERP, MES)
- High yield, high quality paired with low energy consumption, low waste

IP

(b) Context-aware ICT applications & scalable networks of sensors integrated in machines & factory-level infrastructure
- "Self" sensors: wireless, energy autonomous, self-diagnosing & -repairing
- To support real-time monitoring of energy use & material flow

IP

(c) Robotics-enabled production processes tested & validated in real-world environments
- To test & validate robotic prototypes in smart factory environments
- Projects in food processing, packaging, service & lightweight goods industries

STREP

(d) Laser applications: To integrate, test & validate lasers & laser systems
- In energy efficient processes and/or
- For the production of environment-friendly products

STREP

(e) European "ICT for Factories of the Future" Coordination Action:
- Facilitate industrial learning across industries
- Elaborate European vision & roadmap "ICT for Factories of the Future"

CSA

Objective ICT-2009-10.1: Smart Factories: ICT for agile and environmentally friendly manufacturing

Same timing as ICT Call 5

Targeted outcomes:

- **Integrated process automation and optimisation for sustainable manufacturing:** Highly integrated shopfloor-based platforms and systems[1], in seamless cooperation with enterprise software[2], capable of achieving operational targets, such as yield and quality increase, while ensuring energy efficiency and reduction of waste. R&D is expected to be accompanied by training measures.
- **Applications based on context-aware ICT and scalable networks of sensors, exhibiting features such as energy autonomy, wireless connectivity, self-diagnosis and repair integrated in machines and factory-level infrastructure**, supporting real-time monitoring of energy use and material flow. Work should aim at promoting standards-based approaches in conjunction with international initiatives involving industry groups and standardisation bodies[3].
- **Robotics-enabled production processes tested and validated in real-world environments**. Projects are expected to involve system integrators and manufacturers and to test and validate robotic prototypes, paving the way for large-scale operations in smart factory environments. The projects should target domains which have until now not made much use of robotics technology such as in food processing and packaging, service supply (logistics, transport and warehousing), lightweight goods industries and SMEs.
- **Laser applications**: To integrate, test and validate novel lasers and laser systems (including for example high-power sources, new wavelengths, frequency conversion and remote processing) in energy-efficient processes, and/or for the production of environmentally friendly products.
- **European "ICT for Factories of the Future" Coordination Action**: One coordination action should bring together all relevant stakeholders and aim at facilitating industrial learning about the role of ICT in "Factories of the Future" in Europe. Its tasks should include exchange of engineering and manufacturing knowledge across industry sectors and elaborate a European vision and roadmap “ICT for Factories of the Future” in conjunction with other related activities (e.g. Manufuture ETP and IMS).

Proposals are expected to be industry-led, to focus on the use of advanced ICT based technologies and to contain a strong validation element with quantifiable targets.

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EFFRA: development of work programme (research areas and instruments) of the 'Factories of the Future' Public Private Partnership

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Multi-annual Roadmap FoF PP

- Strategy document of 20 to 30 pages
- Time focused on the period 2010 to 2013
- Challenge and target oriented: leading to impacts
- Coherent approach: addressing Themes in a complementary way
- Realistic estimation of funds for each priority area
- Consensus-based to generate stakeholders support
- Not so detailed as to define the specific call topics

Structure - Multi-annual Roadmap FoF PP

Background

Vision and strategic objectives

Main industrial needs and related R&D challenges

- 3.1 Sustainable Manufacturing
- 3.2 ICT-enabled Intelligent Manufacturing
- 3.3 High Performance and Quality manufacturing
- 3.4 Manufacturing processes for new materials

Timeline and budget

Expected impact of the Factories of the Future Initiative

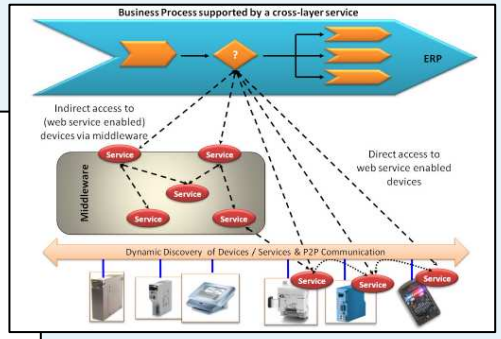
Implementation through stakeholders involvement

Other relevant issues

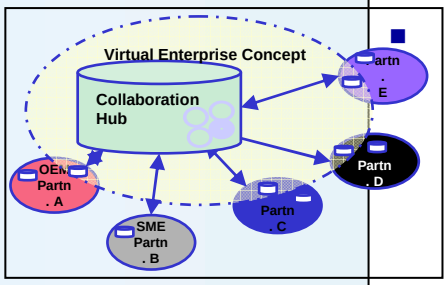
SP1 Sustainable Manufacturing

- Energy efficiency
- Resource efficiency
- Migrating to sustainable supply-chains
- Reduction of environmental impact
- Putting the factory worker first
- Developing “greener” products

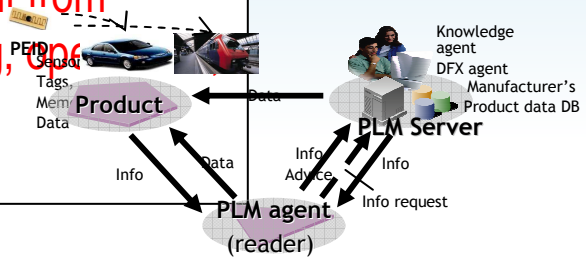
SP2 ICT-enabled Intelligent Manufacturing (ICT for FoF)



- Smart Factories:
  - Agile manufacturing & customisation: Process automation, control & optimisation technologies, robotics & tools for sustainable manufacturing



- Virtual Factories:
  - Value creation from global networked operations: global supply chain management, product/service linkage, management of distributed manufacturing assets
- Digital Factories:
  - Better understanding & design of manufacturing systems: simulation, modelling, lifecycle & knowledge management from product conception, manufacturing, use, maintenance, disposal



SP3 High quality and high performance manufacturing

- Technologies (machines and processes), that overcome the current frontiers in terms of accuracy.
- Technologies (machines and processes) with special mechanical and control characteristics and configurations in order to provide drastic improvements in process dynamics, increasing the productivity in the same level.
- Robotics for assembly and other manufacturing operations, including flexible manipulation.
- Technologies (machines and processes) for production systems' dematerialisation.

SP4 Manufacturing processes for new materials

- Net shape manufacturing for advanced structural and functional materials
- New material functionalities through manufacturing processes
- Rejuvenation and repair
- Sustainable material processing technologies and associated sustainable product design.

Basic content and structure of the multi-annual roadmap

Criteria to select the topics in the future calls of FoF:

Eligibility criteria: innovative enabling technologies, Factory-oriented technologies, complementary and not overlapping

Impact criteria: cross sectorial application fields, clear impact on sustainable growth and competitiveness, perspective for the creation of high added value jobs, societal impact: Health, Environment and safety

Multi-annual Roadmap - milestones

- End of June 2009: Complete Draft of the MR
- September-October 2009: Input from the wider range of stakeholders and from the Member States representatives
- Mid November 2009: Final version of the MR is ready