


Road 4 FAME

Road4FAME EU-Consultation Meeting

DIGITAL REVOLUTION IN EUROPE: CONVERGING VISIONS FOR A SMARTER WORLD

Brussels, 22nd May 2015 | Diamant Brussels Conference & Business Centre

Road4FAME: A Roadmap for Future Architectures and Services for Manufacturing
Dr. Meike Reimann
Steinbeis-Europa-Zentrum


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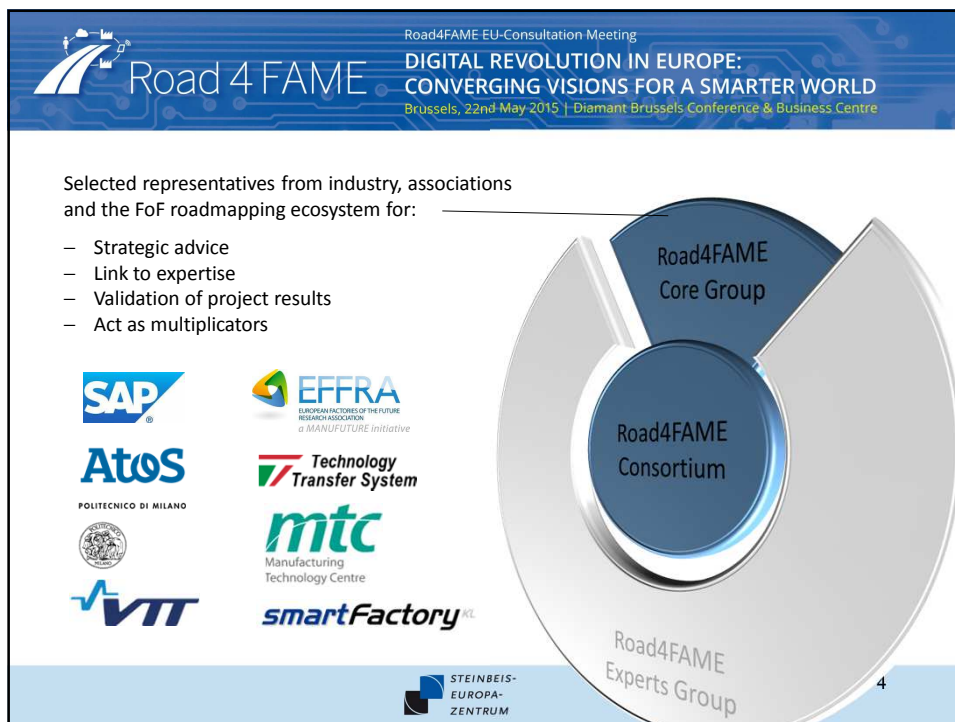
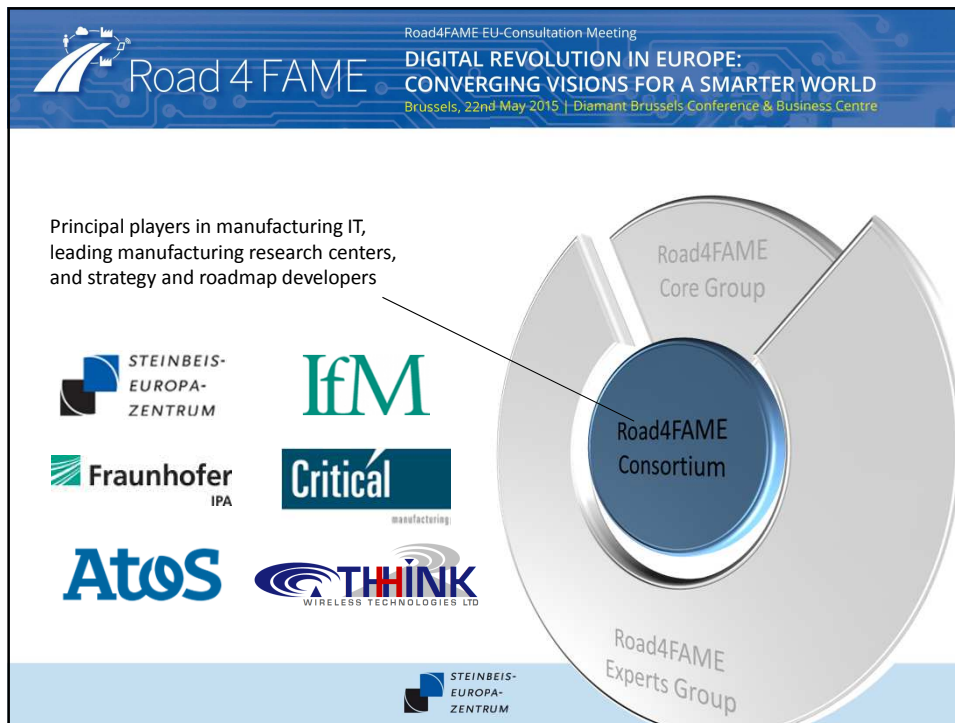
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- **Road4FAME** = Development of a Strategic Research and Innovation **Roadmap** for Future Architectures and Services for Manufacturing in Europe
- **Coordination Action**, co-financed under the Factories of the Future PPP, FP7-ICT: ICT for the Enterprise and Manufacturing
- Project duration: June 2013 - Oct 2015, 29 months
- Total budget: EUR 1.216.272
- Total EC contribution: EUR 859.968
- GA No. 609167



The diagram shows a circular structure representing the Road4FAME Consortium. It consists of a central dark blue circle labeled "Road4FAME Consortium". Surrounding this central circle is a larger, light blue ring. This ring is divided into two main sections: a top section labeled "Road4FAME Core Group" and a bottom section labeled "Road4FAME Experts Group".





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Around **100** selected representatives from industry and academia for:

- participation in expert consultations, interviews
- participation in workshops
- involvement in deliverables
- involvement in orientation paper
- development and review process

Road4FAME Core Group

Road4FAME Consortium

Road4FAME Experts Group

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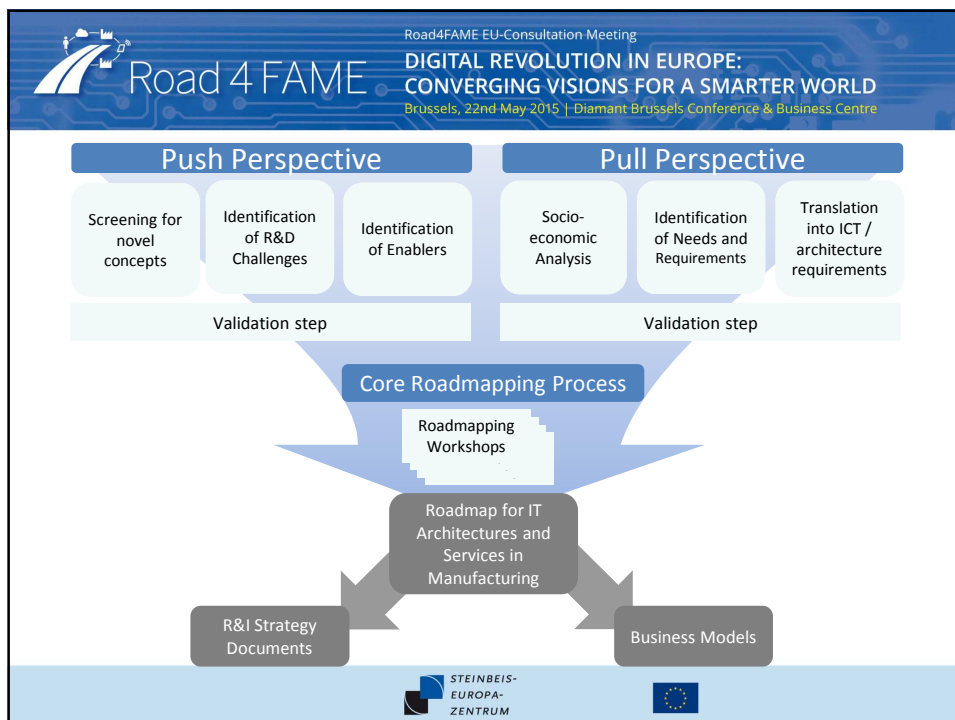


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Main products:

- **Roadmap** in manufacturing IT, focusing on future Architectures and Services in the Manufacturing Domain
- **Catalogue of Business Services and Business Opportunities** enabled by future architectures and services, tailored to manufacturing businesses in industry and service sector
- **Recommendations for Future Research Priorities and Innovation Strategies** tailored to the EC, policy makers, academia and manufacturing businesses

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Megatrends

- Demographic change
- Climate change
- Urbanisation
- Globalisation...

(Mega) trends related to FoF, CPS & IoT


- Digitalisation of economy & increasing connectivity
- Rise of the individual, personalisation
- Sustainability, green thinking (sharing global responsibility)
- Knowledge as a key enabler (global knowledge society)

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Manufacturing-related trends

- Continuous drive for manufacturing **efficiency and quality** (requiring optimisation tools and decision support)
- Rapidly evolving and **pervasive ICT technologies** (digitisation, visualisation, virtualisation)
- Demand by customers for **individualised/highly configurable products**
- Increasing **hybrid cross-over products/embedded IT** and integrated services
- Increasing **complexity** of products, processes, and supply networks



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Manufacturing Business Needs

- Reduction of **costs**, start-up times, fast scale-up
- Increasing **flexibility** of production environments
- Identify/anticipate **changes in demand**
- Reduction of effort for **integration of new equipment & tools**
- **Traceability** – cradle to grave
- Monitoring, optimisation and **predictive maintenance**
- More **intuitive system interaction / mobile devices**



BUT: Digitalisation (especially in SMEs) is mainly driven by IT solution providers and less strongly demanded by manufacturing companies (potentially underestimated)

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Key Barriers and Showstoppers

Manufacturing IT landscape is a 'wild garden'.

- History of point solutions creating a heterogeneous manufacturing IT landscape
- Difficult to support and add capabilities

Manufacturing IT technologies are out of reach

- Especially for SMEs, due to the very high implementation costs
- Here future architectures could contribute to alleviating such issues, making manufacturing IT innovation more accessible

Security and privacy

- Number one show stopper

The following ICT Solutions were identified to meet these trends and needs...

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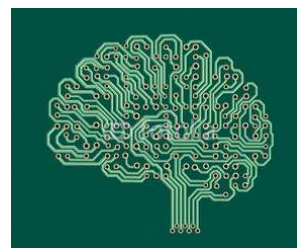



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ICT Solutions

- Real time data acquisition and analysis/
Big data analysis and use for quality control
- Flexible production equipment and interconnections
- Engineering Platform for design/operations continuum
- Joint Cognitive Systems for decision support
- Supply chain visibility and decision assistance/
ICT platform for advanced supply chain decision support
- Security solutions for collaborative networks
- Modelling of virtual enterprise
- Interoperability, standards, reference architectures and tools
- Open data and system integration platform for unstructured data environment
- IT-OT convergence: integrated architecture PLM-MES-ERP
- Problem and context-centric display of only crucial information to the users
- Customer and demand data gathering for analysis
- Product and service co-design with customer

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Orientation Paper: Research Recommendations

- Scalable **Cyber-Physical System architectures** for adaptive and smart manufacturing
- **Real-time data** acquisition and analysis
- **Network-centric communication and collaboration** between players, humans and systems across the entire value chain
- **ICT platform** for advanced supply chain decision support
- Modelling of **virtual enterprises**
- **Cross-cutting** and non-functional challenges
 - Interoperability / Standards
 - Semantic mechanisms
 - Socio-technical issues
 - Training and education
 - Cyber security





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Integration

- **Integration approaches for existing ICT systems and information** (tackling the “wild garden”)
- **Integration of new smart components** (e.g. new improved low cost, miniaturised sensors) **for data collection, analysis and visualisation**
- Development/promotion of **standardisation and reference ICT architectures** as well as **interoperability** and harmonization of different interfaces

Data and Information

- **Big Data capture** (live streaming for situational awareness), **storage** (event driven databases) and **analysis** (data mining – ideally in real time)
- **Distributed processing algorithms** for data and systems in real time supported by resilient “industrial strength” **cloud computing** for the plant floor
- **Visualisation techniques** and specifically context-aware responsive visualisation of data
- **Decision support systems** to reduce operator load
- **Unified engineering exchange of data** considering provenance, accuracy, contextual awareness and semantic content of unstructured data

Machine Learning and Adaptive Systems to Enable Flexible and Adaptive Manufacturing

- Environments and infrastructures for **machine learning, self-adapting and reconfigurable** manufacturing
- **Intra- and inter- machine communication standards**
- **Human-centric adaptive interfaces** to enhance usability

Multidisciplinary Modelling

- **Modelling** of factories, information modelling and work domain modelling of socio-technological systems

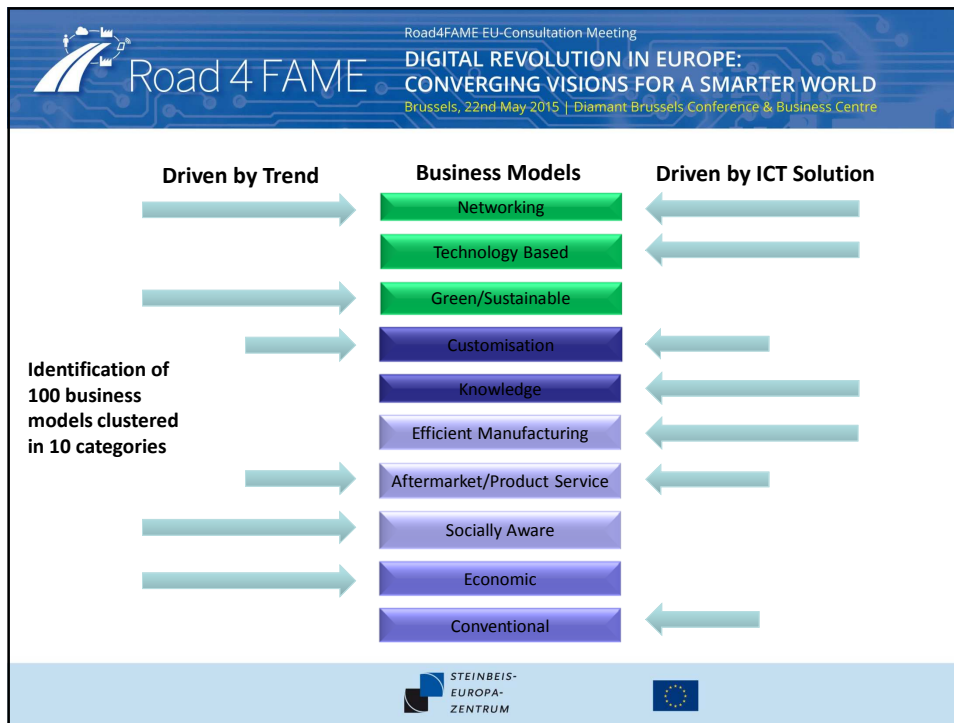
Security and Privacy

- **Robust Machine-to-Machine (M2M)** security protocols that guarantee operational safety and reliability
- Affordable **security for privacy**, especially within manufacturing supply networks

Demonstrators & Education

- To **convince the conservative manufacturing sector** of the cost/benefits of new ICT architectures and services
- **Education initiatives** and training materials to increase awareness





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New Business Opportunities

- **Ownership** becomes **decoupled** from use of products leading to new ways for **sharing products, providing value** and generating revenue. Here **IT** has an important role in **tracking, measuring/analysing** and **billing**.
- The ability to **associate information** with products allows **tracking from cradle to grave** to e.g. gather data on **sustainability**, provide **personalised products**.
- Market drivers towards **customised products** requires new levels of **connection** between the customer and manufacturing and **flexibility** within the **manufacturing supply chain**.
- **Green thinking** (& regulation) drives **circular economy** which requires an ecosystem that supports recycling and **re-manufacture** or products being used/**shared** instead of owned.


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Conclusion for Converging Themes

- Seamless **integration** of systems and components
- Acquisition and use of **big data in real time** & handling of complexity
- Visualisation, virtualisation, situational awareness, **decision support**
- Interoperability**, standardisation, **reference architectures** and tools
- Platforms** (organisational, technological, operational, customer,...)
- Security, privacy, trust
- IP, Regulatory issues
- Demonstrations, living labs
- Business models
- De-fragmentation, cross-fertilisation
- Raise awareness & education
- Commitment of large industries
- Enhance involvement of SMEs



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For more information contact
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www.road4fame.eu

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