

Overview of the Factories of the Future Projects

PROGRESS THROUGH PARTNERSHIP



EFFRA

EUROPEAN FACTORIES OF THE FUTURE
RESEARCH ASSOCIATION

a MANUFUTURE initiative

Editorial Information:

The 'Factories of the Future' public-private partnership (PPP) is a joint initiative of the European Commission and the private sector to promote research in advanced manufacturing across Europe.

In close cooperation, the European Commission's Directorate-Generals for Research and Innovation (DG RTD) and Communications, Networks, Content and Technology (DG CONNECT) have devoted € 645 million stemming from the 7th Framework Programme for Research, Technological Development and Demonstration (FP7) over the period 2010 to 2013. All the projects described in this brochure receive FP7 funding.

In order to help put the 'Factories of the Future' partnership into practice, the European Technology Platform on future manufacturing technologies (MANUFUTURE) has created the European Factories of the Future Research Association (EFFRA), which is the interlocutor of the European Commission from the private sector. EFFRA now comprises of more than one hundred organisations from across Europe and is open to welcoming new members.

EFFRA has compiled this brochure to inform both the general public and the manufacturing industry on the scope of the research projects carried out under the 'Factories of the Future' public-private partnership. The aim of the brochure is to support the dissemination of information on this major European initiative and to increase its transparency.

The information on each project has been kindly provided by the project participants. Neither EFFRA nor the European Commission, nor any third party can assume responsibility for any errors, factual or otherwise, appearing in the texts. This brochure should not be used for commercial gain.

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Foreword

Neelie Kroes, Vice President of the European Commission and Commissioner for the Digital Agenda, and Máire Geoghegan-Quinn, Commissioner for Research, Innovation and Science present the second EFFRA 'Factories of the Future' projects brochure

"We need manufacturing in Europe! The current economic downturn makes it clear that service economies and a strong industrial sector critically depend on one another. The largest share of Europe's exports is in manufactured goods and many ICT-based services are created to support them. The manufacturing sector maintains the key building blocks of our innovation ecosystem, it employs the majority of our scientists and engineers, and it accounts for two thirds of business R&D spending.

Over the past few decades, manufacturing has evolved from performing labour-intensive traditional processes to applying innovative and highly sophisticated ICT-enabled advanced manufacturing. By 2020, energy and raw materials efficiency, as well as emissions and waste reduction, will be higher up in the agenda for manufacturers in all countries. Globalisation will continue to heighten global competition and further drive manufacturers to sell into markets worldwide.

The nature of manufacturing is therefore changing. It is becoming more performance-oriented, more environmentally friendly and more people-centred, by involving intelligent technologies. Many of Europe's 33 million manufacturing jobs are high-productivity, high value-added jobs with good salaries and benefits. Many companies that in the past had outsourced their production to countries with lower labour rates are beginning to shift it back to Europe, because the simple economic arithmetic appears to be more and more doubtful when for instance availability of specialised suppliers, qualification of the workforce, and the whole social fabric play a role in determining success. Other big economies have also realised the importance of keeping manufacturing in their own hands. On 22 February 2012, the United States



Commissioner Máire Geoghegan-Quinn & Vice President of the European Commission, Commissioner Neelie Kroes

announced its "National Strategic Plan for Advanced Manufacturing". Its strategy aims to accelerate private and public investment in advanced manufacturing, to expand the number of skilled workers in a growing advanced manufacturing sector, to create and support partnerships to deploy advanced manufacturing technologies and to optimise and adjust the government's investment. Initiatives to foster advanced manufacturing R&D have recently been started in many manufacturing-driven economies such as China, Japan and South Korea.

The High-Level Group on Key Enabling Technologies (KETs) has recommended that Europe must retain a critical capability and capacity through a coherent approach to KETs, notably micro- and nano-electronics, advanced materials, industrial biotechnology, photonics, nanotechnology and advanced manufacturing systems because of the vital importance of those technologies in creating jobs and growth in the future. KETs are now firmly established in Horizon 2020, the new framework programme for research and innovation. The recently adopted

European Commission Communication on KETs lays out how Europe can capitalise on the knowledge base that exists here.

The EFFRA brochure that you hold in your hands contains many successful industry-driven projects which the Commission has launched, in cooperation with industry, under the public-private partnership "Factories of the Future". It has been supported jointly by the European Commission Directorates General for Research and Innovation (DG RTD) and for Communications Networks, Content and Technology (DG CONNECT).

We are happy to see that the discussion is continuing and that a new multi-annual roadmap for research and innovation in manufacturing for the period 2014-2020 which seriously takes into account the EU2020 strategy is offered as a way forward."

Neelie Kroes

Vice President of the European Commission and Commissioner for the Digital Agenda

Máire Geoghegan-Quinn

Commissioner for Research, Innovation and Science

Brussels, 4th July 2012

Progress Through Partnership

Since its launch in 2009, the Factories of the Future public-private partnership has proven to be a highly successful model for the close co-operation of European industry and the European Union.

Across Europe, 36 research projects have commenced after the second Factories of the Future call with public support of € 160 million from FP7. These projects follow on from the 25 launched after the first Factories of the Future call. There are now 61 projects developing high-added value technologies that will contribute to manufacturing that is sustainable, intelligent, high-performing and that incorporates new materials.

European industry is a central part of Europe's economy with a long standing reputation for high quality and innovative goods. On the global stage, European industry and manufacturing are a vital part of a complex system. Within Europe industry represents 66% of the private expenditure on research and development, directly providing 20% of jobs in Europe and over twice as many in-direct jobs.

66%

of total private expenditure
on R & D in Europe

A highly globalised world contains many challenges for European manufacturing with competition from rapidly developing countries and also more traditional industrialised countries. Recent history has seen a major transfer in manufacturing out of Europe and the disappearance of skilled employment that it traditionally employed both directly and in indirectly.

In addition environmental concerns, diminishing resources and changing demographics also represent significant challenges. The future of manufacturing in Europe, and the highly skilled jobs that it provides, relies on the sector being able to overcome such challenges by becoming more competitive and sustainable.



In 2008, to meet these challenges, the European Commission launched the European Economic Recovery Plan. Understanding the need to engage with industry to develop industry-relevant research, the Commission launched an ambitious new programme, the 'Factories of the Future' public-private partnership.

Eager to engage, recognising the need for a representative body to speak on behalf of the private partners engaged in the public-private partnership and to promote the partnership, the European manufacturing community formed an international non-for-profit legal entity, the European Factories of the Future Research Association (EFFRA). Based in Brussels and staffed by a professional team, EFFRA has built a strong network

centred on the partnership. This network is composed of industries (both large and SME), research institutions, universities and related European associations.

EFFRA actively promotes the partnership through various activities ranging from participation in major industrial conferences to meeting with members of the European Parliament. The dissemination activities of the association ensure that there is a wide variety of information available to interested stakeholders and the general public with transparency being a highly important principle. Within EFFRA, an Industrial Research Advisory Group (IRAG) works to identify the challenges and opportunities that will impact on the future of European manufacturing.

In addition, an Ad-Hoc Industrial Advisory Group (AIAG) has been established by the European Commission and industry as the forum for discussion on the research priorities of the 'Factories of the Future' partnership.

1 Roadmap

identifying key research priorities

In the context of the 'Factories of the Future' public-private partnership the industrial research community have collaborated, through EFFRA and AIAG, with the European Commission to identify key research challenges and opportunities which, though a wide consultation, resulted in the strategic research roadmap. This roadmap is the basis for all of the calls launched in the 'Factories of the Future' programme. Recognising the important factors that impact on industry in Europe – social, technological, economic, environmental and political – the roadmap identifies four sub-domains upon which calls for the 'Factories of the Future' partnership projects are based. These are sustainable manufacturing, ICT-enabled intelligent manufacturing, high performance manufacturing and enabling technologies through manufacturing.

In 2010 the first call was launched with 25 projects addressing aspects of the four sub-domains. A successful application rate of 20% was achieved and the time-to-grant reduced to 8.5 months. Both figures are a substantial improvement on previous European project programmes (FP4, FP5 and FP6). One year later 36 projects have been launched under the second 'Factories of the Future' call. These projects address the

technological challenges in the areas of:

- Virtual Factories and Enterprises
- Digital Factories
- The Eco Factory
- Cooperative Machines
- Robots for Post-Production
- Green, Safe and Healthy Consumer Goods
- Zero-Defect Manufacturing
- Nano-Phased Components and Coatings

The success of the partnership will continue with further projects to be launched under the third and fourth call.

Both the first and the second 'Factories of the Future' call have received a total of € 255 million in public funding, facilitating the diverse range of projects. In addition the private partners have invested significant finances complimented by facilities, resources, expert knowledge and working hours.

€255 million
invested in research calls

This brochure presents a concise update for each of the 25 'Factories of the Future' projects launched following the first call for proposals, a continuation from the project summaries presented in EFFRA's first projects brochure that was published in 2010. In addition, summary explanations of each of the 36 'Factories of the Future' projects launched following the second call for proposals are presented. Each summary contains a full project description and an information box containing the total project budget, the project

start date, its' duration and the name of the organisation that is co-ordinating the project. In addition each summary features an interactive 'quick reference' (QR) code to allow instant access via mobile device to a project website or information page where more additional information is provided.

61 Projects

launched across Europe

The 'Factories of the Future' partnership has shown that there is a clear appetite for pre-competitive research collaboration between large industry, SMEs and research organisations. The continued success of the partnership is built upon this successful collaboration, while EFFRA and its partners remain strongly committed to the long-term future of the partnership.

Beyond the third and fourth 'Factories of the Future' calls it is highly likely that the partnership will continue, supported by the ambitious 'Horizon 2020' programme. EFFRA and the industrial community is already engaged in a roadmapping process, the end result will be a roadmap running from 2014-2020 in tandem with Horizon 2020 based upon the principle of industrial competitiveness from research to industrial application and market uptake.

A strong, formalised programme with expanded opportunities for demonstration projects will ensure that this successful partnership will continue to have an effective impact on the survival of Europe-based manufacturing and contribute to the technological change that is leading to what is being termed as a third industrial revolution.

Project Progress

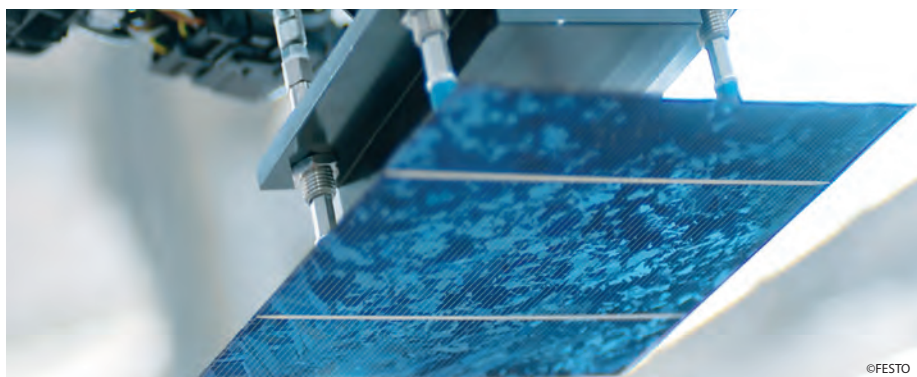
Update on FP-7 Funded Projects Launched Under the First Call

25 projects were launched in 2009 under the 'Factories of the Future' partnership funded by FP7. The initiative has brought together 216 organisations from across Europe who continue to engage in pre-competitive research. With all of these projects now running, significant progress is being made.

Innovative production is central to any increase in productivity in European manufacturing, to promote sustainable growth and to create well-paid jobs in the manufacturing sector.

Production technologies can also form part of the solution to additional long-term challenges such as demographic change, dwindling natural resources and the need to reduce greenhouse gas emissions.

For these reasons the European manufacturing sector committed to a strategic public-private partnership with the European Commission, 'Factories of the Future'. 25 projects were launched after the first call under this partnership with summaries of



each published by EFFRA in 2010. Updates from each of these projects appear in this section.

Each update has been supplied by the project consortium. These project updates show the significant progress that has been made and the future

direction of that the research is likely to take.

Further information on the progress of these projects and on the progress of future projects can be found through the EFFRA website.

ActionPlanT

The European ICT Forum for 'Factories of the Future'

The ActionPlanT project continues in its work to develop a vision on the short, medium and long term role of information and communication technologies (ICT) in the European Manufacturing Industry in order to ensure its sustainable competitiveness.

ActionPlanT develops a vision on the short, medium, and long term role of Information and Communication Technology (ICT) in the European manufacturing industry. The two main activities of ActionPlanT are:

- Developing a vision and roadmap for the role of ICT in manufacturing of the future, herewith identifying the most promising research priorities for the upcoming 'Horizon 2020' research programme.
- Developing and validating a concept for industrial learning for developing ICT for manufacturing skills. This exercise is supported by Industrial Learning Pilot Events and workshops amongst stakeholders in industry, research and academia.

During the period February-April 2012, the ActionPlanT team draft roadmap has gone through a validation exercise, addressing the relevance, completeness and soundness of research topics in ICT for manufacturing.

With regard to industrial learning, a baseline document has been developed laying out the directions in which ActionPlanT believes that efforts should be deployed in the future to develop and apply appropriate e-skills for manufacturing. It provides recommendations to the different IL stakeholders about instruments, methodologies and activities, including raising awareness and motivation that can help them to deliver effective IL programs for the future e-skills in manufacturing.

Since an important part of the ActionPlanT roadmap will be implemented through the Factories of the Future Public-Private Partnership under Horizon 2020, the ActionPlanT project is, besides cooperating closely with the European Commission, strongly liaising with EFFRA.

ActionPlanT
Factories of the Future

www.actionplant-project.eu

CustomPacker

Highly Customisable and Flexible Packaging Station for Mid-to-Upper Sized Electronic Consumer Goods Using Industrial Robots

CustomPacker aims to act as an aid to human workers to automatise the packaging process, meaning that a fuller range of goods can be packaged on the same production line.

This project aims to develop a scalable and flexible packaging tool to aid human workers in packaging a range of goods.

The idea is to automate the packaging process so that several production lines of various consumer goods, mostly heavy goods such as TVs, can be amalgamated into one packaging line.

The final goal is to achieve one setup which is able to package a high variety of products and components using a programmable system architecture. Notably, the system will include an innovative feature to recognise the worker's intentions, namely if it realises

that the worker is due to walk over to it, eventually it will be able, for example, to hand over a tool to him/her, thus streamlining the production process even further.

All of this will enhance the ways in which industrial robots are used today, in particular with regard to human-robot interaction. In addition, product cycle times will be reduced, paying for the increased investment in complex equipment by optimising reliability and the precision of existing technologies.

Given the range of consumer goods produced in Europe and the scope for automation, the impact of this project

on European industry is expected to be important for automated companies and consumers.



www.custompacker.eu

FoFdration

The Foundation for the Smart Factory of the Future

FoFdration creates a data integration standard to help overcome difficulties faced by manufacturers. It seeks to create the foundations of the future of digital manufacturing to overcome productivity pressures, environmental aspects and allow for greater product variability.



www.fofdation-project.eu

FoFdration will establish a universal manufacturing information system based on a "data integration" standard such as STEP and its EXPRESS language, which allows individual entities and their associated devices to share data in a common format. This foundation will then allow the Smart Factory

architecture to be implemented based on a high bandwidth 'manufacturing information pipeline' for data interoperability.

Incorporation of the project into the Smart Factory sub-domain, in view of real-time networking and adaptive capability, also includes:

- Optimisation of numerically-controlled machining systems, including programmable logic controllers through an embedded Supervisory Control and Data Acquisition (SCADA) system.
- Support for an advanced Manufacturing Execution System (MES),

providing not only integrated process automation but also an extension of its scope to achieve energy efficiency and sustainability objectives and promote e-manufacturing and waste reduction.

- Reduction of time-to-market costs and costs related to resource diagnosis-maintenance through a common control and monitoring platform.
- The use of homogenous information sources which generate data from the entire process, achieving information binding from the extended MES to innovation in product lifecycle management and incorporating the business dimension of enterprise resource planning.

KAP

Knowledge, Awareness and Prediction of Man, Machine, Material, and Method in Manufacturing

The KAP research project aims to provide manufacturing standards to ensure that every existing resource can be used as efficiently as possible through the effective coordination of man, machine, material and method.



www.kap-project.eu

KAP stands for knowledge of past performance and awareness of the present state, enabling the prediction of future outcomes. By creating transparency through the usage of data generated on the shop floor, every existing resource can be used as efficiently as possible. This guarantees

the effective coordination of man, machine, material and method.

In order to achieve this, the KAP research project will focus on production performance indicator definitions, including aspects of sustainability and energy-efficiency. Techniques such as complex event processing and data stream analysis will compute these indicators on-the-fly to provide effective real-time monitoring. Data mining in combination with OLAP can support problems with diagnosis and resolution.

Perceptually efficient visualisations will communicate the production performance indicators to decision-

makers in a format which can help reduce cognitive workload and effectively aid improvements of situational awareness.

Within the research project, a well-balanced consortium of research centres and academic as well as industry partners provides the ideal opportunity to develop research outcomes proposed in the project.

The research partners estimate reductions of over 5% per annum in waste and energy and 10% in time to market if the research prototype is potentially used in the future.

PLANTCockpit

Production Logistics and Sustainability Cockpit

The PLANTCockpit research project will focus on defining standard interfaces and a reference model for integrating the most prominent manufacturing processes.

The 'Production Logistics and Sustainability Cockpit' (PLANTCockpit) research project aims to incorporate existing enterprise resource planning systems, as well as MES (Manufacturing Execution Systems), SCADA (Supervisory Control and Data Acquisition) and special-purpose solutions. They provide the integration of visibility and process needed to be able to actually identify potential and optimise intralogistics processes with respect to yield, quality, energy consumption and other such indicators.

The project team's vision is to offer PLANTCockpit to manufacturing communities as the central

environment for monitoring and controlling all intra-logistical processes. The research project aims to supply production supervisors, foremen and line managers with the required visibility to make well-informed decisions for optimising plant processes.

PLANTCockpit plans to provide a model for integrating heterogeneous shop floor management systems, including enterprise resource planning, condition-based maintenance, energy management and other special-purpose systems. It will focus on defining standard interfaces and a reference model for incorporating the most prominent manufacturing

processes. Current shop floor integration standards, such as ISA 95, OAGIS, OPC Unified Architecture and MTConnect will be used as starting points. The consortium includes world-leading system providers, influential academic partners and prominent end-users.



www.plantcockpit.eu

RoboFoot

Smart robotics for high added value footwear industry

This project aims to introduce robots into the production process for footwear to improve productivity in the footwear sector.



www.robofoot.eu

The main achievements in the first year of the project are the following:

The programming framework including all steps from digital data generated at design until off-line program adjustment has been developed, initial results on force control based trajectory adaptation for roughing operations are available and visual servoing system that allows identifying the 6 DOF pose of a shoe and grasp it properly is finished.

Programming by demonstration of a robot with multifinger hand based on the information obtained from a vision system and a data glove has been implemented and the fenceless safety

framework has been designed. Furthermore, they have been designed the robotized working cells for 6 relevant production operations (Last milling, roughing, gluing, inking, polishing and Last removal). Some of them are already available.

TAPAS

Robotics-enabled logistics and assistive services for the transformable factory of the future

This project aims to optimise European production, to prevent manufacturing jobs from migrating to low-wage economies, by breaking new in ground robot-based automation and logistics.

Compounded by current market uncertainties, it becomes more difficult to justify new automation lines being added to the overall production chain. To avoid a consequent shift in manufacturing to low-wage economies, TAPAS will make it possible for future factories to engage in more effective and streamlined production, regardless of changes in volumes and product type.

To do this, TAPAS is focussing on the following tasks:

- Development of mobile robots with arms to make logistical tasks more flexible by collecting, as well as transporting, the parts needed at any

given time and delivering these to their relevant locations.

- Automation of assistive tasks which naturally build on logistical tasks, such as preparatory and post-processing work, e.g. pre-assembly or machine tending with inherent quality control, since the simple movement of parts around the shop floor does not generate value in itself.

Through this additional creation of value and faster adaptation to changes, with tasks being completed in a shorter time, TAPAS will yield much earlier returns on investment and as such deliver better results.

To fulfil these aims, the project consortium are testing and validating the above developments with two pilot installations of increasing complexity and scale.

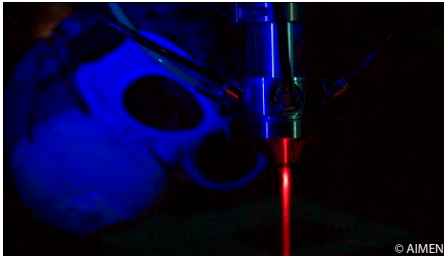


www.tapas-project.eu

QCOALA

Quality control of aluminium laser-welded assemblies

The QCOALA project will develop a new dual-wavelength laser processing system for welding thin-gauge aluminium and copper of 0.1mm to 1.0mm in thickness, with integrated process monitoring and in-line non-destructive inspection.



www.qcoala.eu

The development of the QCOALA laser processing system will mean that testing is carried out so that parts are not tested until breaking point. It will also provide a reliable, high-speed, low-cost and high-quality joining solution for electric car battery and thin-film photovoltaic cell interconnections.

Through fully integrated process ICTs and statistical process control, the new system will facilitate in-line quality control, as well as a higher level of automation in manufacturing and thereby achieve higher yield and throughout for both of these high-in-demand applications.

The new laser processing system will be based on a pulsed platform, capable of laser pulses in the range of micro seconds to milli seconds and pulse energies of up to tens of joules able to generate both near infra-red and green wavelength through a dual-wavelength beam scanner. Real-time temporal pulse control will be developed to allow close-loop control of the monitored

process. The fully-integrated system will produce continuous (i.e. not sample-based) inspection rates, with a 'fingerprint' of each laser weld captured in real time, and allow in-line process control when welding car battery and thin-film PV cell interconnections.

QCOALA is focused on energy-efficient, environmentally-friendly and agile manufacturing, through the feedback of in-line information into the production line relating to monitoring and inspection, allowing for process control and continuous quality improvement, as well as waste reduction.

CoReNet

Customer-oriented and eco-friendly networks for healthy fashionable goods

CoReNet aims to support the production of fashionable and eco-friendly clothing and footwear products for elderly, diabetic, obese and disabled people at affordable prices.

Adopting the CoReNet framework, based on methods and tools for cost-efficient collaborative networking, the European textile, clothing and footwear industries will be able to provide small series of customised fashionable goods for these groups by keeping products digital for as long as possible, thus delaying production so as to be able to produce goods on demand. This has the effect of boosting efficiency and reducing waste, thus positively impacting the environment.

The most important elements of the project are:

- A reference model, which enables sustainable and collaborative supply networks to address, orient and coordinate organisational, technological and knowledge management issues.
- Web virtualisation systems which enable the production of healthy clothes and shoes to take place within design environments which are both collaborative and productive.
- Coordination of the supply networks for process configuration, forecast and planning for stock replenishment, real-time control and tracking and tracing, including the use of sustainability benchmarks.
- Innovations in production processes related to customisation via the adoption of rapid manufacturing

technologies for optimised digital printing and laser engraving.

CoReNet's results will be tested in industrial plants, demonstrating the full potential of this approach, which is based on sustained collaborative networking.



www.corenet-project.eu

e-CUSTOM

A web-based collaboration system for mass customisation

e-CUSTOM aims to bridge the gap between mass production and mass customisation, engaging the customer in the initial design of the products and realizing the manufacturing of these personalised added-value products in a novel, coordinated, eco-friendly and efficient decentralised approach.



www.ecustom-project.eu

The e-CUSTOM project developments will be tested and validated in two pilot cases applications, coming from the automotive and the healthcare industrial sectors.

Based on the requirements of these two scenarios, the detailed software design and specifications extraction have been performed. The software design was carried out using Unified Modelling Language and Entity Relationship Diagrams.

An intermediate version of the User Adaptive Design System (e-CUSTOM Pylon I) and of the Decentralised Manufacturing Platform (e-CUSTOM

Pylon II) software modules, have been implemented, using the JAVATM Programming Framework.

The interoperability between the software modules, is handled by the Network Infrastructure and Systems Integration (e-CUSTOM Pylon IV), which is currently at its final implementation stage.

Finally, the Environmental Assessment Module (e-CUSTOM Pylon III) has been modelled using a knowledge base (ontology).

ManuCloud

ManuCloud: The next-generation manufacturing-as-a-service (MaaS) environment

The objective of the ManuCloud project is the development of a service-oriented ICT environment as a basis for the next level of manufacturing networks by enabling production-related inter-enterprise integration down to shop floor level. Industrial relevance is guaranteed by involving industrial partners from the organic photovoltaic, organic lighting and automotive supply industries.

ManuCloud seeks to implement a vision of a cloud-like architecture concept. It provides users with the ability to utilise the manufacturing capabilities of configurable, virtualised production networks, based on cloud-enabled, federated factories, supported by a set of software-as-a-service applications.

Two major ICT-related R&D focal points have been selected for the project. The intra-factory environment is comprised of production-related ICT systems within a single factory which lays the foundation to connect the factory into the inter-factory environment. A layer above the automation systems will support service discovery, management

and orchestration, allowing for quick development and deployment of new factory-level services.

The implementation of automation system services will be integrated with the engineering process for these systems. The inter-factory environment serves as a market place for virtualised manufacturing services, and supports the dynamic, on-demand interconnection of multiple factories for specific purposes. It will provide facilities for joint specification management, shop-floor data transfer, high level of traceability and distributed quality management.

A front-end system will support the dynamic configuration of virtual production networks and provide interfaces for product configurators, which are supported by a product design & manufacturing advisory subsystem. Furthermore, the project aims to develop configurable organic photovoltaic and lighting products and corresponding virtual value chains on top of the ManuCloud infrastructure.



Micro-Dress

Customised Wearable Functionality and Eco-Materials Extending the Limits of Apparel Mass Customisation

The main objective of Micro-Dress is to extend the limits of feasible customisation for men's and ladies' garments to include, for the first time, user-controllable wearable functionality and user-selectable degree of material eco-friendliness.

www.micro-dress.eu

The Micro-Dress consortium continue to work towards the project's set objectives. Recent developments are as follows:

- To extent the limits of garment customization possible through the addition of micro-electronic functionality, a removable micro-electronic card with different functionality options has been designed and is being prototyped.
- Digital printed lighting devices on plastic films were demonstrated along with the first prototypes on fabrics. Progress has been made also on printing conductive layers on fabrics for electronics. In parallel, OPV solar cells

printed on fabric is on-going to bring innovative energy sources close to smart devices.

- The algorithm to estimate air-emissions on the basis of the textile process and process conditions has been developed. Databases for chemical and emissions have been set. up. The EHS online prediction tool early prototype is currently undergoing usage tests.
- The tool for calculating eco-efficiency indicators and the tool for organising an eco-logistic supply chain have been defined and are in the phase of design and implementation.
- Work on the development of a cost effective, rapid "on-site" screening

method of selected toxic aromatic amines on textile materials is in progress. The resulting technologies are to be applied for screening purposes mainly close to the production process. The screening method will spot those materials which are suspected to contain these toxic target compounds to be detected. Positively tested materials will be subjects for further investigations employing more extensive physicochemical detection methods.

- A first generation of the so-called Kinetic Jacket has been developed, this Tintegrates 3D sensors into smart garments which are tracking human movements and live data in real time for a wide area of applications.

Phocam

Photopolymer-Based Customised Additive Manufacturing Technologies

Developing integrated lithography-based additive manufacturing systems which will, for the first time, facilitate the processing of photopolymer-based materials for the factory of the future.

The focus of the project is to unite industrial know-how in the field of supply chain and quality management, software development, photopolymers and ceramics, high-performance light-sources, system integration and end-users in order to provide a fully integrated process chain at the end of the project.

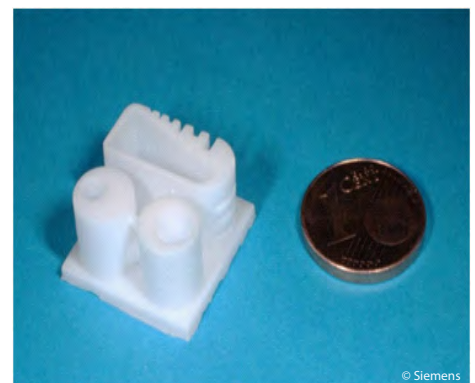
The consortium has relied on two core-technologies for the processing of the envisaged radiation curable materials:

- (1) Digital light processing (DLP) based processes will be used to process ceramic-filled photopolymers, leading to fully dense ceramic parts at the end of the process chain.

- (2) Two photon polymerization (2PP) will be used to fabricate high-resolution structures with features in the range of 100-200nm.

Both processes will be tuned to reduce system costs, and significantly increase throughput and reliability at the same time. Goal is to deliver "first-time-right" strategies for the involved end-users. This necessitates the development of supply chains with integrated quality sensors.

Targeted applications include thread guides for textile machinery, ceramic moulds for the fabrication of high-performance turbine blades and micro-structures for computer tomography equipment.



www.phocam.eu

S-MC-S

Sustainable Mass Customisation - Mass Customisation for Sustainability

The S-MC-S project aims to help European manufacturing businesses adapt to global pressures by developing methods and innovative enabling technologies for personalised, customer-oriented, eco-efficient manufacturing.



web.ttsnetwork.net/SMCS

The S-MC-S project continues to work to define and research a new production process called sustainable mass customisation. This combines the efficiency of mass production with the benefits of customisation.

S-MC-S continues to its work to promote four research pillars, in response to the identified low utilisation of mass-customisation, by:

- Designing and defining methodologies and tools to manage the growing complexity of products, production and supply chain configurations imposed by mass customisation in networked environments.
- Creating an assessment model to evaluate the impact of production systems and different supply chain configurations when dealing with customisation.
- Drawing up a business model and defining the framework and strategies for creating economic, social and ecological values through the systematic implementation of S-MC-S.
- Developing a new specific mass-customisation technology, with enhanced on-demand manufacturing capabilities, greater flexibility and faster overall response times. S-MC-S is also researching pilot mass customisation technologies in three different sectors to support the transition of manufacturing towards sustainable mass customisation production thanks to new developments in rapid small series production.

AIMACS

Advanced Intelligent Machine Adaptive Control System

The objective of AIMACS is to develop active, self-optimising control systems which continuously analyse a wide range of monitored parameters in the machining process and automatically adapt machine operations, thereby enhancing machine productivity.

AIMACS continues in its aim of improving the monitoring techniques for the most critical machining issues, such as load cutting, vibrations and the conservation of energy used in these processes.

Productivity in Europe is compromised, at present, of process planners, programmers and operators who are currently forced to adopt a pre-emptive approach to programming and configuring machines for 'worst case' scenarios.

This continues to be the case because the quality and stability of the machines depends on multiple parameters which change with process conditions such

as cutting speeds, degradation of the machine components and the weight, size and material of tools and basic parts.

At present, modifying these parameters manually with a view to enhancing performance would cause considerable overload and put the efficient functioning of the system in serious jeopardy. This in turn would result in frequent disruptions in production, giving rise to productivity losses, energy waste and the need for reinvestment in machinery.

As a plug-and-produce system, AIMACS will be able to be applied to newly-built machines, as well as existing ones to

the benefit of a substantial number of large and small players in the European domestic manufacturing industry.



COMET

Plug-and-Produce Components and Methods for Adaptive Control of Industrial Robots Enabling Cost Effective, High Precision Manufacturing in Factories of the Future

COMET aims to optimise and control the movement in robots by developing dedicated hard- and software modules combined within an innovative Plug-and-Produce platform. COMET outcomes will improve efficiency and boost productivity in the manufacturing industry.



www.cometproject.eu

Since its start in 2010, the COMET project has established seven robot cells across Europe. Machining experiments performed in these cells have produced valuable data for machining with robots and the issues that may occur.

Each robot cell is taking advantage of several COMET project developments. These include :

- Advanced models that represent the kinematics of the robot, resulting in more accurate tool paths
- An advanced programming and simulation environment (PSIR) dedicated to programming industrial robots for machining purposes with sophisticated tools to analyse singular points and axis behaviours
- A prototype of the High Dynamic Compensation Mechanism (HDCM) which will help to further improve absolute accuracy beyond the

structural capability of the robot system on its own

- Integration of the COMET adaptive tracking system (ATIR) with the HDCM and PSIR technologies

The COMET project will continue to integrate each part of the COMET platform and concentrate on demonstrating the advantages of robot machining in a variety of applications such as automotive parts, mould and die components and aerospace parts.



Dynxperts

New Machine Functionalities Through Process Dynamic Stability Control

This initiative focuses on the development of active spindle heads and smart fixturing so as to offer a new generation of adaptive plug and produce components for the factories of the future.

DYNXPERS is focused on the development of active spindle heads and smart fixturing, proposing a new generation of adaptive plug and produce components.

Such components will be able to improve the dynamic behaviour of machine tools in different senses and will increase their productivity introducing new functionalities on existing production equipment.

Having reached its halfway, the project DYNXPERS has progressed successfully towards the development of the mechatronic gadgets foreseen at the beginning.

The functions of the interchangeable rough milling spindle and the spindle head for HSM have undergone significant development, validation and implementation.

Two prototypes of the magnetorheological fluids-based fixture have been built and two plug and produce dynamic calibrators have been designed, constructed and validated.



www.dynxperts.eu

HARCO

Hierarchical and Adaptive Smart Components for Precision Production Systems Application

The HARCO project aims to achieve cost-effective structural solutions consisting of a new class of smart components based on plug-and-produce modular adaptronic devices which integrate smart and multifunctional actuators and sensors capable of performing a wide array of multiple functions.



www.harcoproject.eu.com

In the first half of HARCO project several relevant adaptronic modules have been developed achieving different technological readiness levels.

All the modules have been extensively validated in a mechatronic simulation environment.

Moreover, the following modules have been fabricated, assembled and tested at laboratory level on stand-alone test benches:

- Adaptronic Platform for Active Vibration Control during milling operations.
- Adaptive Fixturing for thin-walled work pieces.

- Smart Joint for parallel kinematics robot struts.

- Structural Monitoring Module for real time thermal error compensation.

The preliminary test results on the prototypes match the expected target performances in terms of accuracy, stiffness and dynamic response.

The proof of concept of these and of all the other HARCO modules will be demonstrated in the final part of the project, when the most suitable modules will also be integrated in complex manufacturing systems like a Milling Machine or a Parallel Kinematics Robot.

LOCOBOT

The Toolkit for Building Low Cost Robot Co-Workers in Assembly Lines

A system which reaches above and beyond what is currently available for those working in the automotive industry: it incorporates a flexible robotic assistant platform to support and increase manual production processes, as well as the engineering tools required for its setup. Further, this project aims to improve the ergonomics in industrial production processes.

LOCOBOT is developing a toolkit for low-cost robots built from a set of plug-and-produce kinematic modules with compliant yet precise actuators and intelligent sensors for man-machine cooperation. The toolkit will provide higher flexibility, adaptiveness and scalability,

LOCOBOT will be safe, low-cost and tailor-made, complying with the end-user's need to produce greener, more customised and higher-quality products for their industry. Stemming from its increased flexibility and efficiency, the immediate impact (2-5 years) of LOCOBOT will be about €150 million in savings. Three major objectives are being addressed:

- Development of a modular plug and produce robotic assistant platform in which the robot will consist of a set of lightweight, compliant kinematic modules built on a mobile platform.

- Reconfiguration of adaptive control for plug-and-produce components to avoid costly reprogramming and setup procedures for control algorithms and software. Control algorithms need to be adaptive and self-optimising to account for the different kinematic structures, deal with oscillations induced by the mobile platform and achieve precise positioning.

- Intelligent sensing and actuating structures, for which the robot will be

equipped with a stereo camera system and audio components to obtain and process audiovisual information, so that it can learn to cooperate with human workers.



www.locobot.eu

PopJIM

Plug and Produce Joint Interface Modules

PopJIM creates an innovative solution to performance limiting problems by incorporating a self-configuring and optimising mechatronic module (a Joint Interface Module, or JIM) alongside a wireless network. It is based on a novel concept through which the dynamic stiffness of the machine is controlled to maintain process stability, rather than changing the process parameters.



www.popjim.com

PoPJIM project introduces two crucial innovations for the future machine tools.

- Portable Joint Interface Module (JIM) is a self-optimising mechatronic element that controls the dynamic behaviour of a machine-tool during its

interaction with the cutting process by adjusting dynamic stiffness of the machine tool at structural joints. Instead of changing the process parameters, dynamic stiffness of the machine tool is tuned to maintain the process stability.

The adaptive characteristic for maintaining optimum dynamic stiffness is achieved by exploiting both passive and active multifunctional materials in the JIM design. Additionally, JIM incorporates an integrated control system which enables it to be self-adaptive for optimising the dynamic stiffness within its design range during a machining operation.

- Distributed Wireless Configuration

and Control Network (DWCN) that allow plug and produce capability and decentralised control of JIMs through a wireless communication network. This is essential for achieving operational flexibility and efficiency required for the modularity characteristics inherent in the JIM-based machine tools.

The DWCN is responsible for collaborative control of JIMs so that the overall dynamic stiffness of the machining system (machine tool structure and machining process) remains optimised at the system level and it facilitates swift and reliable reconfiguration of JIMs and machine modules for plug and produce capabilities.

FAB2ASM

Efficient and Precise 3D Integration of Heterogeneous Microsystems from Fabrication to Assembly

The FAB2ASM project will develop a new manufacturing technology for the 3D integration of microelectronics and microsystems. It aims to fulfil an urgent need of the industry in 3D integration to bridge the gap in technology which currently exists

The FAB2ASM project will develop a new manufacturing technology for 3D integration of microelectronics and micro-systems which is simultaneously very fast and very accurate – which currently is the bottle neck limiting industry take-up.

At mid-term, the project has made very good progress, with all the deliverables and milestones met as planned. Some intermediate targets have been achieved better than expected. The technical achievement in the first half of the project has already started been integrated into the three technical demonstrators of the project.

The consortium is actively disseminating information about the project and its achievements through publications and presentations. The consortium has also started to address issues concerning eventual exploitation of the results.



www.fab2asm.eu

Femtoprint

Femtosecond Laser Printer for Glass Microsystems with Nanoscale Features

Femtoprint will develop a printer for microsystems which can produce three dimensional patterns with nano-scale features in glass material using a low-power femtosecond laser beam. With increasingly efficient technologies, the scope of this project is foreseen to expand to the benefit of multiple commercial and industrial sectors.



www.femtoprint.eu

FEMTOPRINT is developing a printer for micro-systems with nano-scale features fabricated out of glass. The ultimate goal is to provide a large pool of users from industry, research and universities with the capability of producing their own micro-systems, in a rapid-manner without the need for expensive infra-structures and specific expertise.

Recent research has shown that three-dimensional patterns in glass material using low-power femtosecond laser beams. This simple process opens interesting new opportunities for a broad variety of micro-systems which feature sizes down to the nano-scale. These patterns can be used to form integrated optics components or be 'developed' by chemically etching to

form three-dimensional structures like fluidic channels and micro-mechanical components.

Notably, sub-micron resolutions can be achieved and sub-patterns smaller than the laser wavelength can be formed. Thanks to the low-energy required to pattern the glass, femtosecond laser, consisting simply of an oscillator, are sufficient to produce such micro- and nano- systems.

IMPRESS

Flexible Compression Injection Moulding Platform for Multi-Scale Surface Structures

The IMPRESS project aims to develop an injection moulding platform to produce plastic components with micro or nano-scale functional features.

Significant results are being obtained. The "Tool manufacturing module", micro-nano structured inserts have been realized. These inserts are integrated into a complex dedicated mould which provides the possibility to benchmark innovative replication technologies.

Concerning the "Replication module", the IMPRESS platform is now ready to produce, in an automatic way, plastic components with micronanofeatures. It includes a two-shot full electric injection compression moulding machine with a maximum clamping force of 200 T and a vacuum unit which applies vacuum in a 20 L tank. Then the vacuum valve is switched to evacuate air from cavities and runner, in few milliseconds (i.e. without affect on the cycle time).

- Two rapid heating and cooling technologies driven by the injection moulding machine :

- Roctool® induction technology: the tool surface is rapidly heated by induction thanks to internal inductors.

- GWK® technology which combines internal ceramic heaters with optimized cooling channels made by strato-conception.

With regard to the "intelligence and reliability module", innovative sensors have integrated into the mould.

Current objectives are the establishment predictive models that correlate machine parameters, online process data and product quality.

Two main technologies have been developed at partner plants and will be integrated in the IMPRESS platform:

- Online cleaning technology: based on a CO₂ snow jet cleaning process. This uses specific nozzles suitable for micro and nanostructures.

- Online metrology equipment: within the metrology box, a light source is irradiated to the sample, and scattered in the direction of the detector. Thereby the scattered light is induced by the nano and micro structure of the sample. The platform is now ready to launch the demonstration activities with part and mould designs being carried out in order to have the moulds ready to produce first prototypes in May 2012.

www.impress-fp7.eu

ManuCyte

Self-Learning Modular Manufacturing Platform for Flexible, Patient-Specific Cell Production

The ManuCyte project will focus on the development of an intelligent, modular manufacturing platform for cell production with a view to creating personalised medicine. In particular, it will make cell production tailored to the patient's needs.



www.manucyte-project.eu

Upon the commencement of the ManuCyte project the consortium specified use cases and requirements on an automation platform for patient-specific cell cultivation. This was achieved by combining know-how from biology, process automation, and IT.

As part of this process a detailed design and the first prototypes were developed for the core components. This included standardised mechanical, electrical, and software interfaces for all components to integrate them with the module framework and the bio-specific MES.

Several tests have been executed for the component prototypes e.g. in order to choose the most appropriate mixing principle for cell culture medium, to test the capability for cell cultivation and autoclavation of the bioreactors, and to adjust cell imaging algorithm parameters. The results were discussed among project partners and used to improve the components iteratively. In order to generate first data sets

for the process control system, to evaluate the applicability of the sensor technologies used for cell monitoring (optical, physical, and biochemical), and to execute research on further biochemical indicators for cell status (division, stress, death) several tests have been executed within cell cultivation laboratories.

After the completion of this project not only will the platform as a whole be of use for exploitation but the single components and the knowledge generated during their development will also be of further benefit.

WaferLevelOptics

Specific Technological Developments to Create an Intelligent and Scalable Production Platform for Glass Optics Manufacturing

WaferLevelOptics stems from the concept of implementing wafer level glass moulding to reproduce micro optics at this level. The project will benefit manufacturing processes where there is both a current need to further miniaturise and produce in larger quantities at the same time.

Upon the commencement of the ManuCyte project the consortium specified use cases and requirements on an automation platform for patient-specific cell cultivation. This was achieved by combining know-how from biology, process automation, and IT. As part of this process a detailed design and first prototypes were developed for the core components. This included standardised mechanical, electrical, and software interfaces for all components to integrate them with the module framework and the bio-specific MES.

Several tests have been executed for the component prototypes with the results used to improve the components iteratively. The results of the research executed within the ManuCyte project will be a scalable, intelligent automation platform for cell cultivation (optical, physical, and biochemical), and to execute research on further biochemical indicators for cell status (division, stress, death).

After the completion of this project not only will the platform as a whole be of use for exploitation but the single components and the knowledge generated during their development will also be of further benefit.



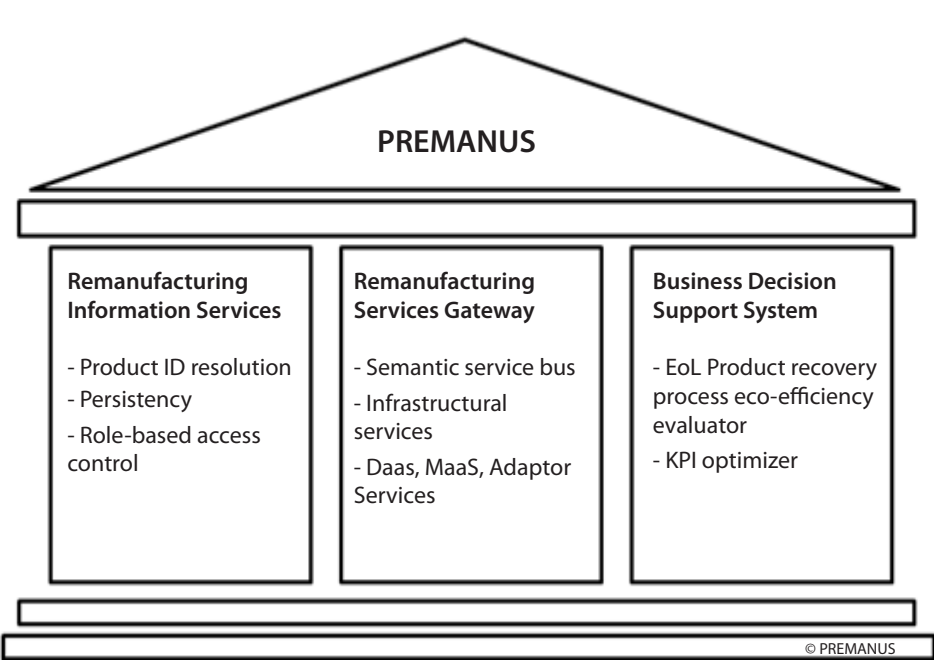
www.waferleveloptics.org

FP-7 Projects Launched Under the Second Call

PREMANUS

Product Remanufacturing Service System

PREMANUS aims to overcome the asymmetric distribution of information in the End-of-Life (EoL) recovery of products, with a special emphasis on remanufacturing.



FoF ICT

Start: 1 September 2011

Duration: 36 months

Total Budget: € 5.8 million

Coordinator: SAP

www.premanus.eu

As the wealth of modern man has grown, the financial necessity to utilize the lifetime of goods has dramatically declined, especially in developed countries with a high focus on manufacturing. The demand for new products has also placed undue pressure on the world's resources, creating an ethical imperative to conserve and reuse.

Remanufacturing is the process of bringing used products to "like-new" functional state with an equivalent quality assurance. One of the key issues deterring the uptake of remanufacturing is the information gap which is created when products leave the Original Equipment Manufacturers (OEM).

The information gap is the result of the lack of data on product usage and its

lifecycle. In general, the product user possesses much greater knowledge regarding a product as he or she has used, repaired and replaced it.

This, in turn, results in the fact that the input to the remanufacturing process is of unknown quality. The lack of reliable information on product usage and lifecycle leads to missed opportunities with respect to increased economic or environmental impact.

The goal of PREMANUS is to overcome the asymmetric distribution of information in the end-of-life (EoL) recovery of products, with a special emphasis on remanufacturing. To achieve this goal, PREMANUS will provide an on demand middleware which combines product information and product services within one service oriented architecture.

In addition to closing the information gap, the PREMANUS middleware would compute EoL-specific key performance indicators (KPIs) based on product usage data and make recommendations to its users regarding the viability (in terms of profitability, scope, and time) of remanufacturing a product.

PREMANUS
Factories of the Future

Virtual Enterprises by Networked Interoperability Services

The VENIS project is aimed at providing a new level of interoperability between Large and Small Enterprises, according to the "Virtual Enterprise" paradigm.

Enterprises interoperability is the emerging need in Europe for joint projects and business facing new marketing challenges.

In multi-partners projects and business, aimed at developing innovative joint products, Large Enterprises suffer from a lack of synergy and cohesion with the Small-Medium and Micro Enterprises, due to the missing sharing of project information, knowledge, workflows, etc.

A novel level of integration is expected, while guaranteeing the intellectual property rights and preserving the already existing company management processes fixed in years of past activity.

The VENIS project is aimed at providing the a new level of interoperability between Large and Small Enterprises, according to Virtual Enterprise paradigm:

- A distributed web-based repository will be implemented in order to connect the existing information systems

- A set of lightweight web services will be developed for a smart exchange of the common data based on legacy email systems

- The local business processes will be modelled and linked by a distributed business engine mechanism, in order to assist the work in joint businesses and create novel synergies in marketing competition.

Latest documents and multimedia, project activity planning, joint work flow and milestones, etc. will be then easily available to all the persons involved from Large and Small enterprises, while leaving unchanged the already existing legacy procedures.

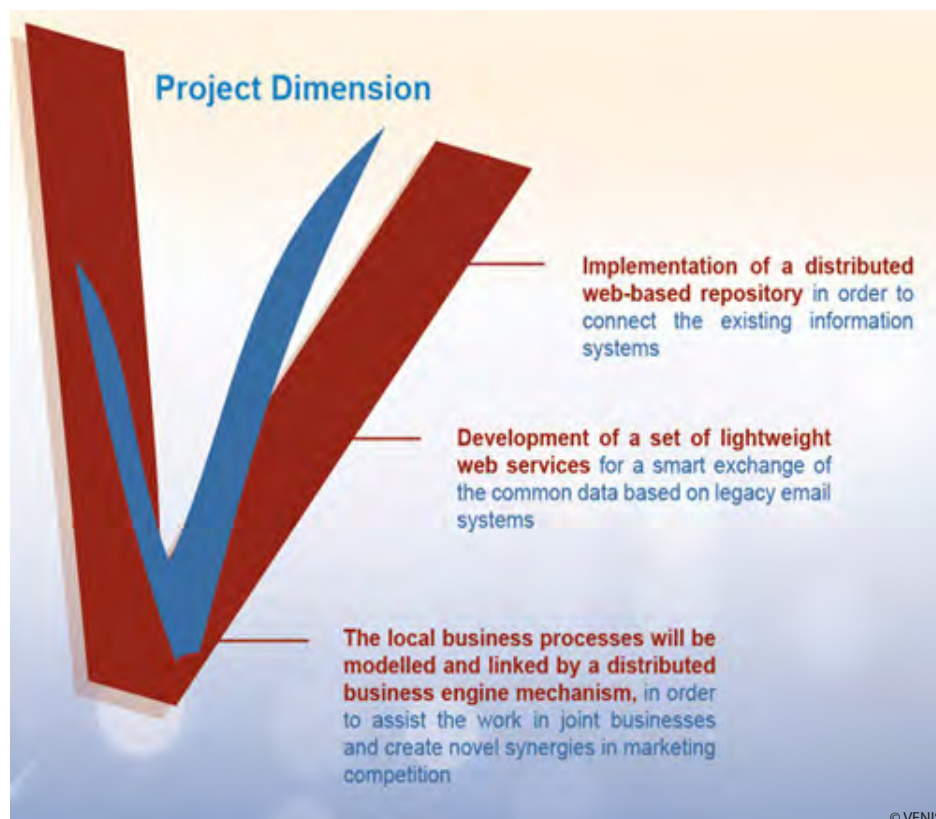
FoF ICT

Start:	1 September 2011
Duration:	30 months
Total Budget:	€ 1.6 million
Coordinator:	The Engineering Group

www.venis-project.eu

The Consortium, composed by 7 Partners skilled in international collaboration, is well balanced in expertises between technology developers and final users.

The VENIS results will be disseminated on the Web and in International Conferences. Boosted by VENIS results, the involved Enterprises expect to improve their competitive edge in joint projects, by receiving a significant advantage in their business, measurable in 20-30% increase.



GloNet

Glocal enterprise network focusing on customer-centric collaboration

GloNet aims at designing, developing, and deploying an agile virtual enterprise environment for networks of SMEs involved in highly customized and service-enhanced products through end-to-end collaboration with customers and local suppliers (co-creation)



FoF ICT

Start:	1 September 2011
Duration:	36 months
Total Budget:	€ 3.68 million
Coordinator:	CAS

sites.google.com/site/glonetproject

GloNet implements the glocal enterprise notion with value creation from global networked operations and involving global supply chain management, product-service linkage, and management of distributed manufacturing units.

In specific it aims to:

- (i) develop a novel way to commonly represent/provide information and knowledge (e.g. catalogue of products, brochures, process descriptions, best practices, company profiles, etc.) which needs to be shared/exchanged among different stakeholders in the collaborative environment as dynamic software services that may upgrade in time;
- (ii) generate user-customized interfaces which dynamically adjust to different

stakeholders, supporting their access and visualization needs;

(iii) provide these services through the cloud, to be available to anybody, at any time, from anywhere,

(iv) demonstrate how a broker in very close contact with the customer who gives an order, can iteratively retrieve all needed information to step by step design the customer order and finally presenting the solution that is accepted by the customer,

(v) support the negotiation among all involved parties,

(vi) generate a workflow from the accepted/negotiated solution, which will then be automatically monitored, while also available for monitoring by the involved stakeholders, during its execution,

(vii) the automatic monitoring aims will forecast potential risks, and will suggest prevention measures to the broker during the execution of the order.

The guiding use case is focused on the manufacturing and life cycle support of solar parks. GloNet results are expected to bring major improvements in production and product life cycle support processes shortly after the conclusion of the funded project.



ADVENTURE

ADaptive Virtual ENterprise ManufacTURING Environment

ADVENTURE aims to create a framework that provides the tools to combine factories in a pluggable way to manufacture a particular product. This includes the creation of manufacturing processes and finding partners as well as real-time monitoring of the processes that are put into play

Virtual factories are a well-established concept although existing solutions have limitations:

- Scoped at the business level
- Provide an isolated view on certain virtual factory aspects
- Restricted to simple tasks
- Simple extensions to classic Enterprise Resource Planning (ERP) and Supply Chain Management (SCM) systems
- Limited integration from other information sources
- Lack of distinction between internal and cross-company processes

- Limited interoperability of systems/ data across factories

There are limited tools and technologies which provide reliable end-to-end cross partner interoperability of ICT systems in the manufacturing domain and to easily fuse dispersed assets such as processes, information, status and other resources.

In order to cope with the demand for flexibility and fast-paced business innovation, there is a need for an integrated, yet framework, environment which is able to establish, manage, monitor, and adapt virtual factories.

This needs to be based on the requirements of the manufacturing processes at a deep technical level to provide easy, flexible interoperability

FoF ICT

Start:	1 September 2011
Duration:	36 months
Total Budget:	€ 3.62 million
Coordinator:	TU Darmstadt

www.fp7-adventure.eu

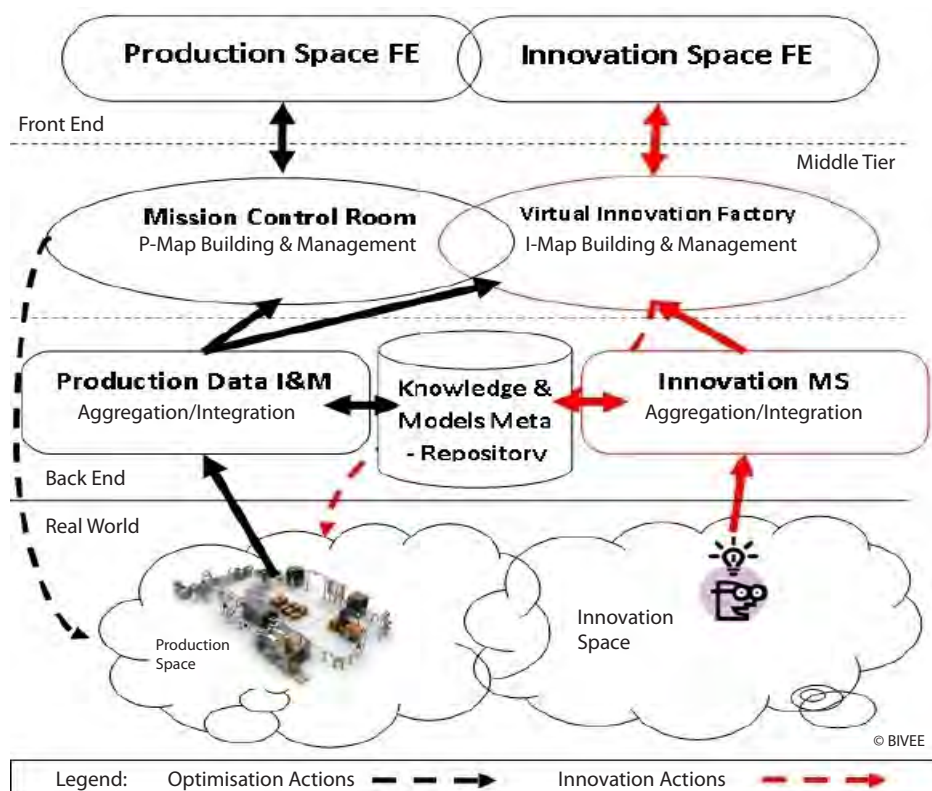
with minimal user skills especially to support SMEs.

ADVENTURE will deliver this platform and the accompanying tools by providing a holistic environment for plug-and-play virtual factories based on cross-organisational manufacturing processes.



Business Innovation and Virtual Enterprise Environment

Bivee aims to develop a conceptual reference framework, a novel management method and a service-oriented ICT platform to enable Business Innovation in Virtual Factories and Enterprises.



FoF ICT

Start:	1 September 2011
Duration:	36 months
Total Budget:	€ 4.26 million
Coordinator:	Ingegneria Informatica

www.bivee.eu

The EU needs an effective exit strategy from crisis: for European industry innovation is the key issue. Innovation is a complex issue requiring both special expertise and a large amount of knowledge of particular sectors (e.g. the industrial sector) but it also requires knowledge in the areas of technology, business models, finance, markets, etc.

Innovation is not an easy job for a single enterprise but it is really a challenge for a networked virtual enterprise (VE). The BIVEE project aims to develop a rich framework, i.e., a software environment that includes business principles, models, and best practices, to promote innovation in VE environments.

Effective innovation needs to be aware of what is going on inside the VE at the production level and at the same time outside of it, where a

plethora of elements move fast and often unexpectedly (e.g. markets, technology, finances, competitors, etc.). BIVEE introduces the notions of 'Value Production' and 'Business Innovation' space that shape the BIVEE framework, including the knowledge repository that collects all the required elements, inside and outside the VE.

The knowledge repository is the key asset of the mission control room that monitors and manages VE production, the Virtual Innovation Factory that produces innovatively and manages its introduction in the VE.

The work plan of BIVEE emphasizes impact achievement. To this end it has been based on two different trial applications (in furniture and in high-tech equipments) with both organised into two major trial phases: phase one

for monitoring the course of production before the introduction of BIVEE environment and phase two where the VE achievements are assessed as having the BIVEE environment in place.

The two trial cases are quite different to prove the flexibility and adoptability of BIVEE.



IMAGINE

Innovative End-to-end Management of Dynamic Manufacturing Networks

IMAGINE aims to design and develop a novel, user-friendly networked manufacturing management framework, based on an associated engineering methodology that respects the interplay between the lifecycle of processes, resources and policies between cooperating consumers and providers, notably SMEs.

Effective end-to-end management of dynamic manufacturing networks is consistently touted as a top priority for manufacturing enterprises that strive to improve their efficiency, adaptability and sustainability of their production systems. Moreover, it is a crucial prerequisite for the emerging powerful new model of production based on community, collaboration, self-organisation and openness rather than on hierarchy and centralised control.

IMAGINE addresses the need of modern manufacturing enterprises for a novel end-to-end management of dynamic manufacturing networks and will develop a multi-party collaboration platform for innovative, responsive manufacturing that encompasses globally distributed partners, suppliers & production facilities (SMEs and/or

original equipment manufacturers) that jointly conduct multi-party manufacturing.

The project will implement a novel comprehensive methodology for the management of dynamic manufacturing networks. This provides a consolidated and coordinated view of information from various manufacturing sources and systems, enables service-enhanced product, production lifecycle and responsive manufacturing processes throughout the value chain. The implementation, testing, evaluation and dissemination of the IMAGINE methodology and supporting ICT platform will be driven by 'Living Labs' in major industrial sectors.

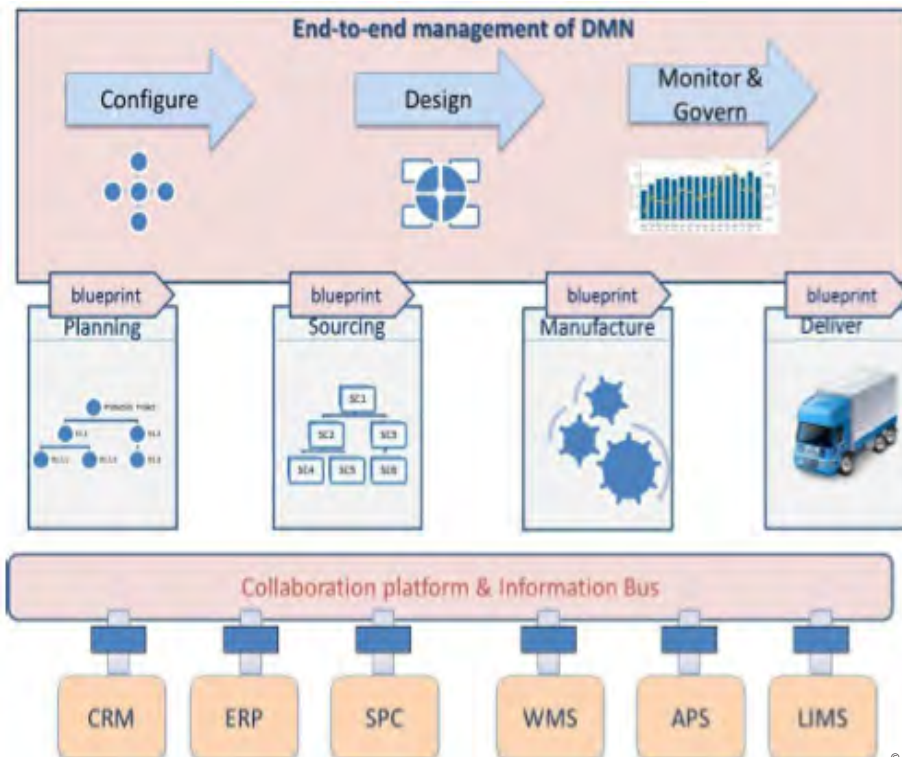
The IMAGINE manufacturing model

FoF ICT	
Start:	1 September 2011
Duration:	36 months
Total Budget:	€ 10.3 million
Coordinator:	Intrasoft

www.imagine-futurefactory.eu

is an innovative plug-in and produce approach that implements an end-to-end manufacturing interoperability solution. The IMAGINE solution is market-oriented with a focus on value chain streamlining and support for emerging manufacturing business models.

IMAGINE promises to have a profound and long lasting impact on EU manufacturing enterprises' efforts to adapt to global competitive pressures by providing the technological base that helps reduce manufacturing cycle times, increase production and improve on-time delivery rates while enabling SMEs to participate in the design and production of new generation applications.



ComVantage

Collaborative Manufacturing Network for Competitive Advantage

ComVantage is intended to be a product-centric collaboration space for dynamic and flexible information exchange between multiple companies including the end-customer build on top of best practises, from the web, for providing product-centric and workflow-based mobile apps



FoF ICT

Start:	1 September 2011
Duration:	36 months
Total Budget:	€ 10.9 million
Coordinator:	SAP

www.comvantage.eu

ComVantage is envisioned to be an inter-organisational collaboration space turning today's organisation-centred manufacturing approach into a product-centred one. Manufacturers will benefit from a flexible, efficient platform that helps them to operate as one virtual factory and thus gain competitive advantages in their markets.

Based on best practises of Web 2.0 technologies the collaboration space will be an extension to existing business and engineering software.

The framework of the virtual factory will encompass a secure access control that is founded on dynamic workflow models and flexible user roles accounting for large enterprises, SMEs and for end-customers. It will enable

temporary and decentralised access management for ad-hoc collaboration between geographically distributed experts.

To adhere to changing working situations, to efficient communication, and to rich interaction technologies, ComVantage will focus on mobile devices. Intuitive and secure mobile apps will support users in fast decision making and problem solving. Information from different sources across the organisations will be provided and maintained via 'Linked Data'. The integration of sensor data allows for products to be members of the collaboration space.

A continuous evaluation of the ICT and business model considering use cases throughout the project will verify

the added-value of ComVantage for European industry. The utilisation of existing technologies, a close user approach, and an incremental project set-up will provide sound concepts ready for fast production.

Thus implementing ComVantage will increase lean communication, agile and highly efficient production processes, cost control and a low carbon footprint.



MSEE

Manufacturing Service Ecosystem

MSEE aims to evolve SSME towards Manufacturing Systems and Factories of the Future and to transform current manufacturing hierarchical supply chains into manufacturing open ecosystems, defining business processes and policies to support collaborative innovation in a secure industrial environment as well as a new collaborative architecture for ESA

"By 2015, novel service-oriented management methodologies and the future internet universal business infrastructure will enable European virtual factories and enterprises to self-organize in distributed, autonomous, interoperable, non-hierarchical innovation ecosystems of tangible and intangible manufacturing assets, to be virtually described, on-the-fly composed and dynamically delivered as a Service, end-to-end along the globalised value chain."

The first grand challenge for MSEE project is to make SSME (Service Science Management and Engineering) evolve towards Manufacturing Systems and Factories of the Future, i.e. from a methodological viewpoint to adapt, modify, extend SSME concepts so that they could be applicable to traditionally

product-oriented enterprises; from an implementation viewpoint to instantiate 'Future Internet' service oriented architectures and platforms for global manufacturing service systems.

The second grand challenge for MSEE project is to transform current manufacturing hierarchical supply chains into manufacturing open ecosystems, i.e. on the one side to define and implement business processes and policies to support collaborative innovation in a secure industrial environment and, on the other side, to define a new collaborative architecture for ESA (Enterprise Software and Applications), to support business-IT interaction and distributed decision making in virtual factories and enterprises.

FoF ICT

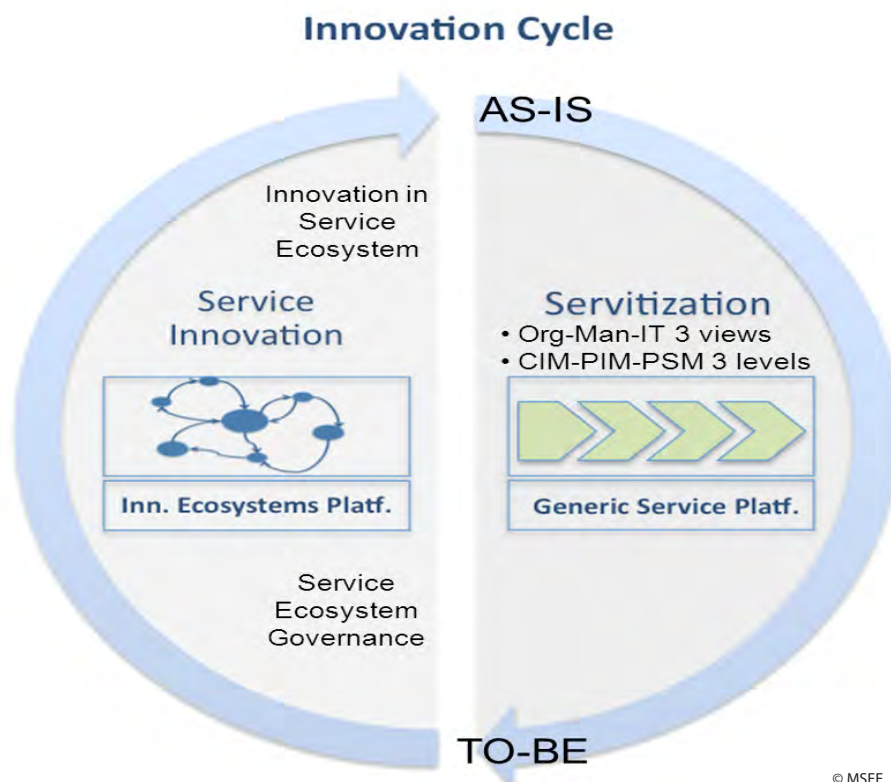
Start:	1 October 2011
Duration:	36 months
Total Budget:	€15.2 million
Coordinator:	TXT E-SOLUTIONS

www.msee-ip.eu



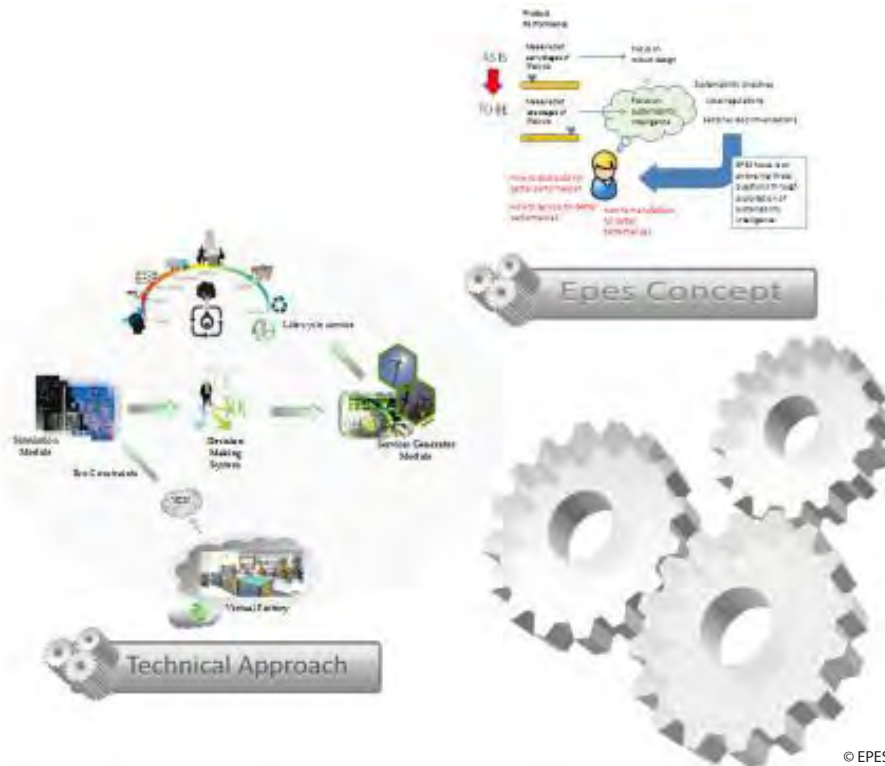
The synthesis of the two grand challenges above in industrial business scenarios and their full adoption in European test cases will result in new Virtual Factory Industrial Models, where service orientation and collaborative innovation will support a new renaissance of Europe in the global manufacturing context.

The MSEE system will be implemented by an ecosystem of models and services distributed at the level of: i) the single manufacturing enterprise, ii) its value network and business ecosystem and iii) the 'Future Internet' of knowledge models and services. Alignment of the distributed heterogeneous enterprise models, as well as interoperability of the relevant applicative and utility services will be the two main technical challenges of the project.



Eco-Process Engineering System For Composition Of Services To Optimise Product Life-Cycle

EPES aims to produce a set of tools for improving products and processes along their lifecycle



FoF ICT

Start:	1 September 2011
Duration:	36 months
Total Budget:	€ 5.8 million
Coordinator:	Fundacion Tecnalia

www.epes-project.eu



The project will develop a novel 'eco-process engineering system' (EPES) which will be composed of a comprehensive platform enabling a dynamic composition of services adaptable to the different products and operating conditions, supporting Product Service System. It will consist of:

- A set of ICT tools aimed to:
 - An easy configuration/adaptation of new services
 - Storing, reusing the knowledge gathered in order to improve the services and develop new ones with the objectives of continuous improvement of products in operation along its life cycle and applying up-to-date technologies for the end of life disposal of the products.

- The same in order to improve future product designs.

- A methodology and working handbook

The set of ICT tools and the methodology and working handbook will enable the manufacturing companies to enter into a continuous process of upgrading their products along the life cycle of these products, within the frame of the virtual factory and Product Service System (PSS) concept through a configurable and adaptable set of services.

The services will focus on improving the performance of products in operation taking into account different knowledge based aspects such as reliability, availability, maintainability, costs, productivity, and quality and energy efficiency. This service-oriented

framework will allow industries to evaluate the performance of engineered products considering their whole lifecycle rather than only early stages such as design and manufacturing.

The research will enable manufacturers to capitalise on reliable global and local sustainability intelligence. For example, product engineering teams could exploit this intelligence to adapt design, operation and disposal strategies through managed 'eco-constraints' relevant to their market contexts.



ExtremeFactories

On-the-cloud environment implementing agile management methods for enabling the set-up, monitoring and follow-up of business innovation processes in industrial SMEs

This project will develop a concept of a collaborative internet-based platform that will support SMEs in their management and implementation of complex innovation process that arise in a networked environment.

The 'ExtremeFactories' project proposes the conception of a collaborative internet-based platform with semantic capabilities (by means of ontology modelling) that implements a new methodology for the adoption of a systematic innovation process in globally acting networked SMEs.

The platform will support SMEs to manage and implement the complex innovation processes that arise in a networked environment, taking into account their internal and external links, by enabling an open multi-agent focused innovation (i.e. a customer/provider/supplier/employee focused innovation). The solution will be specifically focused on the needs of manufacturing companies and will observe both product and process innovation.

The construction of the 'ExtremeFactories' methodology will be based on individual practices found in traditional innovation management methods, such as TRIZ, combined with a selected group of practices obtained from different Agile Methodologies, such as 'Extreme Programming', SCRUM and others (the project gets its name from the Extreme Programming methodology).

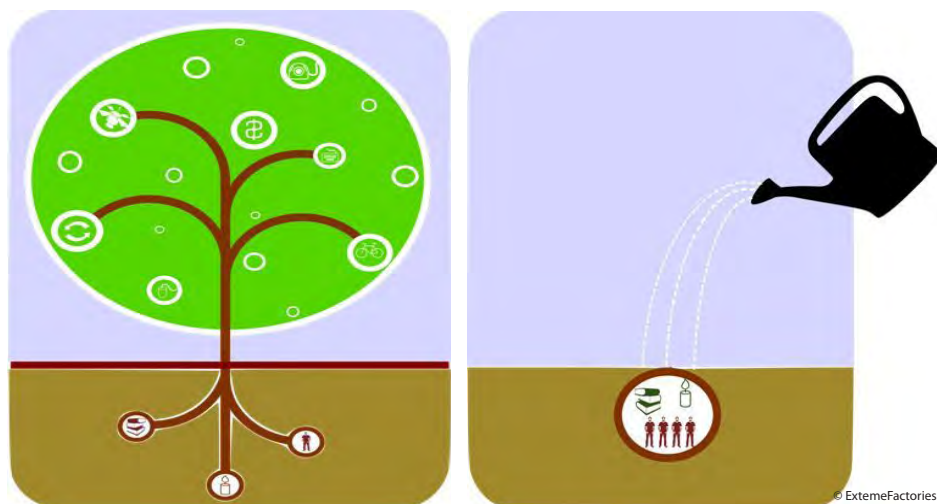
The platform will be built upon a service-oriented architecture, implementing semantic functionalities. This platform will provide SMEs with services to support them in any step of the innovation life-cycle: problem detection, inception of ideas, and prioritisation of ideas, implementation and follow-up.

FoF ICT	
Start:	1 September 2011
Duration:	30 months
Total Budget:	€ 3.2 million
Coordinator:	INNOPOLE

www.extremefactories.eu

The project has a strong industrial basis, with project participants acting as a virtual network made evident by the way that they handle their relationships with third parties, such as customers, suppliers, distributors, etc. The resulting methodology and platform of this project will be validated and assessed in predefined business scenarios at these organizations.

The project proposes a solid dissemination plan, offering a community management activity in order to get a wider target, as well as a first version of an exploitation plan to be further detailed.



The ExtremeFactories methodology and platform will support SMEs in preparing the adequate context for Innovation. Further on, ExtremeFactories will help them to keep the Innovation process alive, as part of their daily activity.

extreme factories



RLW Navigator

Remote Laser Welding System Navigator for Eco & Resilient Automotive Factories

The RLW Navigator project's aim is to develop an innovative 'Process Navigator' to configure, integrate, test and validate applications of remote laser welding (RLW) in automotive assembly



RLW Navigator aims to develop an innovative 'Process Navigator' to configure, integrate, test and validate applications of remote laser welding (RLW) in automotive assembly addressing today's critical needs for frequently changing operating conditions and product-mix provisions. Thus, RLW Navigator will crucially serve as an enabler for future energy efficient smart factories.

RLW is emerging as a promising joining technology for sheet metal assembly due to a number of benefits including reduced processing time (50-75%), decreased factory floor footprint (50%), reduced environmental impact through energy use reduction (60%) and providing a flexibility process base for future model introduction or product change.

Currently, RLW systems are limited in their applicability due to an acute lack of systematic ICT-based simulation methodologies to navigate their efficient application in automotive manufacturing processes. This project aims to address this by developing a 'Process Navigator' simulation system that will deal with three key challenges thereby allowing manufacturers to utilize the advantages of the RLW system.

The three challenges are:

1) The most critical obstacle that currently prevents the successful implementation of RLW is the need for tight dimensional control of part-to-part gap during joining operations, essential to ensure the quality of the stitch.

FoF ICT

Start:	1 January 2012
Duration:	36 months
Total Budget:	€ 5.03 million
Coordinator:	University of Warwick

www.rlw-navigator.eu

2) The existing assembly system architecture must be reconfigured to provide the opportunity to evaluate the RLW system in terms of its feasibility to perform all required assembly tasks. This will provide crucial information about the most advantageous workstation/cell reconfiguration, which will serve as the basis for optimal robot path planning to reduce joining process time and workstation level efficiency assessment.

3) The project will develop systematic evaluation and learning methods in response to the need to assess and improve the overall performance, cost-effectiveness and eco-efficiency of the RLW system.



SIMPOSIUM

Simulation Platform for Non Destructive Evaluation of Structures and Materials

SIMPOSIUM will provide, in a single software platform, numerical models specifically designed to respond to manufacturers' applications

In all industrial sectors, non-destructive evaluation (NDE) techniques play a critical role for ensuring a structures' reliability, plant safety and increasingly also for ensuring quality and efficiency of products and processes. The emerging use of numerical simulation is a major trend in the field with tremendous potential benefits in terms of cost reduction, enhanced diagnosis reliability and, consequently, increased competitiveness.

A strong industrial need exists for efficient NDE simulation tools which SIMPOSIUM aims at fulfilling. The project objective is to provide, in a single software platform, numerical models specifically designed to respond to manufacturers' applications. The project will address both flaw detection and material characterization

methods. Particular effort will be put into challenging modelling of material features, complex geometries of parts and complex defects.

The models will be based on multi-scale and multi-physics approach and capable of exchanging data with CAD design software, mechanical codes, and material models. Emphasis will be put on efficient coupling strategies based on hybrid semi-analytical / numerical approaches. Such strategies will be made possible by the development of software platform tools allowing communication between codes developed by different partners. Particular attention will be paid to the validation of the models codes challenging modelling of material features, complex geometries of parts and defects.

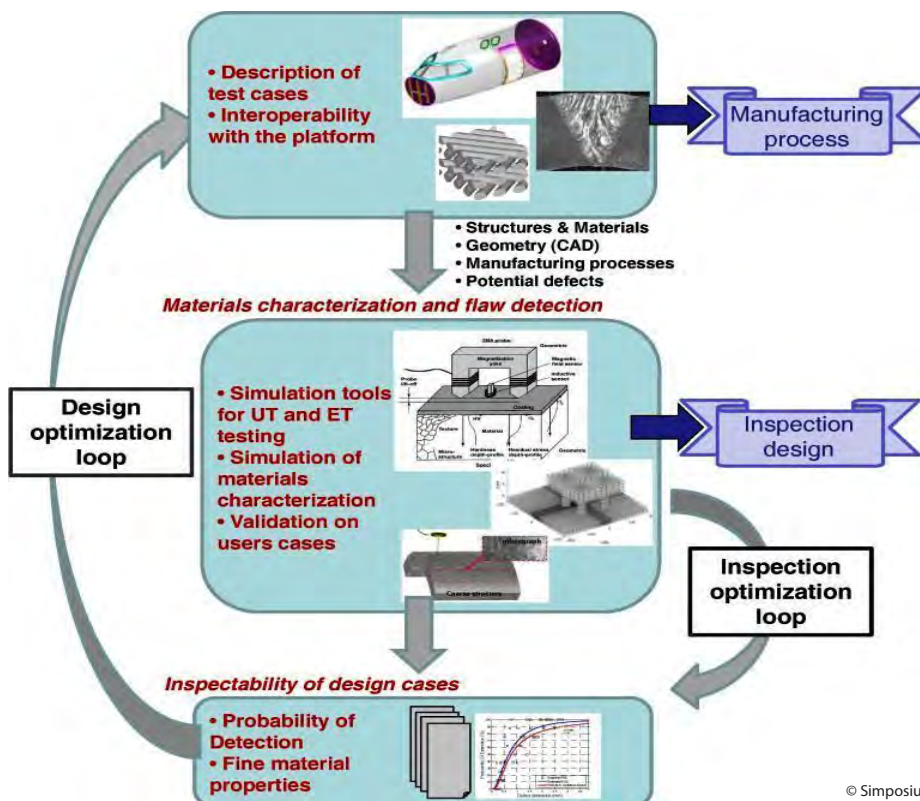
FoF ICT

Start:	1 September 2011
Duration:	36 months
Total Budget:	€ 5.9 million
Coordinator:	CEA

www.simposium.eu

SIMPOSIUM will have a significant impact at the different stages of NDE practice: design and implementation of emerging NDE techniques, reliability assessment, performance demonstration and the training of NDE staff.

By reducing the cost linked to inspections, making possible virtual testing at the earliest stages of the part design, SIMPOSIUM will significantly contribute to improve time-to-production, time to market and competitiveness. SIMPOSIUM will confirm the leading position of Europe in the field of NDE simulation.

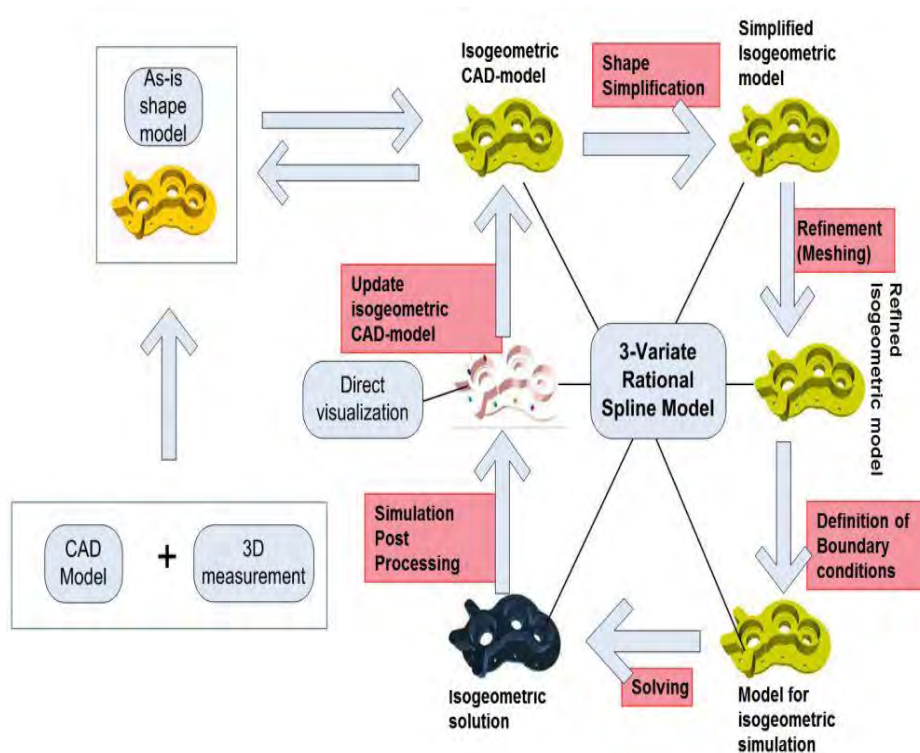


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TERRIFIC

Towards Enhanced Integration of Design and Production in the Factory of the Future through Isogeometric Technologies

TERRIFIC aims at a significant improvement in the interoperability of computational tools for the design, analysis and optimization of functional products



FoF ICT

Start:	1 September 2011
Duration:	36 months
Total Budget:	€ 5.2 million
Coordinator:	SINTEF

www.terrific-project.eu

the isogeometric concepts can actually be introduced on a large scale, starting from the interoperability of typical CAD-models and new isogeometric CAD-models all the way to product data management issues and standards.

Our vision is to provide and disseminate tangible evidence of the performance of the isogeometric approach in comparison to traditional ones in four important application areas as well as addressing interoperability and other issues that necessarily arise in a large-scale industrial introduction of isogeometry.

The project aims at a significant improvement in the interoperability of computational tools for the design, analysis and optimization of functional products. An isogeometric approach is applied for selected manufacturing application areas (cars, trains, and aircraft) and for computer-aided machining.

Computer aided design (CAD) and numerical simulation algorithms are vital technologies in modern product development, yet they are today not being seamlessly integrated. Their interoperability is severely disturbed by inconsistencies in the mathematical approaches used. Efficient feedback from analysis to CAD and iterative refinement of the analysis model is a feature of isogeometric analysis, and would be an essential improvement for

computer-based design optimization and virtual product development.

The new paradigm of isogeometric analysis demonstrates that much is to be gained in efficiency, quality and accuracy of the analysis step by replacing traditional 'finite elements' by volumetric (trivariate) NURBS elements.

A general uptake of isogeometric approaches in industry can only be expected if there exist convincing technically verified and validated case studies showing real advantages over the current approaches, using both qualitative and quantitative indicators. It is also clear that the prior knowledge, such as it is contained in existing CAD-models, CAD-systems and numerical solvers, cannot just be dumped. It has to be investigated how


TERRIFIC
Enhancing Interoperability



Future Fashion Design Real-time, Accurate Fabric to Garment Virtual Prototyping in Collaborative Environments

FFD aims to drastically improve the speed of obtaining realistic garment simulations thereby removing one of the main barriers inhibiting the wider adoption of Virtual Prototyping and enabling fashion development teams to unleash their full joint creativity potential in an open, online collaborative system

The Future Fashion Design (FFD) project aims to remove the main barriers inhibiting the wider adoption of Virtual Prototyping (VP) by textile and clothing companies by drastically improving the speed of obtaining realistic garment simulations, the accuracy of textile simulation and functional integration aspects. A new business model will offer strong improvements in product development efficiency and services at low-cost while opening new market opportunities for CAD and PDM/PLM system vendors.

The main business objective of FFD is to enable fashion development teams to unleash their full joint creativity potential in an open, online collaborative system featuring rich 3D virtual representations, where the virtual is very close to the real. A major goal of the project is to drastically

reduce the time to production for a complete new collection.

In detail, the project targets several challenging aspects of current VP solutions with focus on improving the simulation accuracy to enable a purely virtual prototyping solution from the weave pattern to the final garment.

A parallel textile simulation engine based on multi-core architectures to speed up current simulation approaches will be developed. This will also provide additional computing resources to enhance the accuracy of the simulation and the textile rendering in all phases. A Collaborative Design and Prototyping platform (CDP) for enhancing distributed development based on these new, purely virtual prototyping technologies will also be developed. One additional result of

FoF ICT

Start:	1 October 2011
Duration:	36 months
Total Budget:	€ 3.51 million
Coordinator:	Fraunhofer IGD

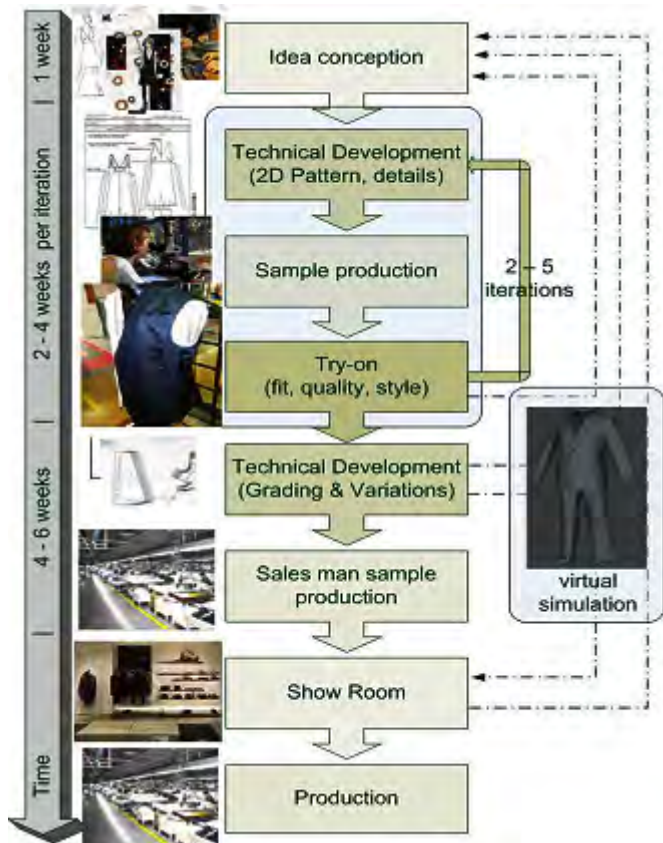
www.future-fashion-design.eu

this project will be a new business and production workflow.

These newly developed business and production workflows will be evaluated and tested by two end-user companies. They will integrate the VP platform in joint product development processes and evaluate and demonstrate its efficiency and impact. Various exploitation schemes will be adopted, including newly packaged VP fabric and garment solutions, integrated fabric-garment design and VP offers, and a joint exploitation of the CDP platform through a SaaS approach.

The FFD business model will offer drastic improvements in product development efficiency (reduced number of physical samples from 20% to 100%, time-to-market reduced by several weeks, intensified collaboration between fabric and garment producers), services at low-cost (open, vendor independent and scalable platform), while opening new market opportunities to vendors of CAD and PDM/PLM systems.

Virtual prototyping can be used in every stage of the current garment design process, but its full potential can only be enabled through an integrated approach in all stages of the production chain.



FFD
FUTURE FASHION DESIGN



Know4Car

Internet-Based Collaborative Platform For Managing Manufacturing Knowledge

Know4Car aims to develop a platform for managing manufacturing knowledge with autonomous software agents capable of undertaking a series of everyday activities towards accelerating the product design and manufacturing process.

The Know4Car project will attempt to make knowledge management and collaboration more effective throughout the product lifecycle, supporting the capture and the systematic organization of knowledge in the form of manufacturing templates. Furthermore, Know4Car will develop faster, easier, error-free user-interfaces for data entry/checking in the shop floor along with serious games options for instantaneous knowledge retrieval, training and/or design purposes.

The Know4Car platform will integrate four components which will be developed separately:

1) Manufacturing Process Knowledge: The first component of the Know4Car platform is an ontology-based database, through which, knowledge related to process design may be structured and organized, so that it may be managed more efficiently.

2) Agent-based Engineering Collaboration: The core component is the Agent-based platform, which will utilize autonomous software agents for assisting the organisation as well as the distribution of the engineering knowledge. This platform will be capable of supporting engineers and technical teams by reacting to changes related to the engineering projects development and evolution and by managing the knowledge generated.

3) Extended Engineering: The platform will be capable of managing the way the knowledge is exchanged and distributed among OEMs, system integrators and suppliers. A specific part of the platform will take into consideration a series of rules and will support project managers in the process of managing data workflow and

integration issues. Common knowledge models, residing in a shared central repository will be accessible by different nodes of the extended enterprise, the system integrators and the suppliers.

4) Advanced User-Interfaces and Training: The introduction of advanced user-interfaces and training options within the platform aims at streamlining the interaction, the performance of the engineering teams and available IT tools. Different types of interfaces will be available for addressing the needs originating from different groups of technical personnel. In addition, a set of Augmented-Reality (AR) techniques and tools will be employed for providing faster training for operators and technicians.

Two pilot cases are planned to be deployed in the context of demonstrating the added value of the Know4Car developments in the manufacturing sector:

1) Automotive Assembly: This pilot case will be implemented for evaluating the project's developments regarding the collaboration of the engineers and the operators in an automotive assembly process. The pilot case will include activities, such as process design with the use of historical knowledge, serious games and AR training system implementation, as well as shop floor to production management and communication.

2) Extended Engineering Collaboration: This pilot case the engineers from the suppliers' side will have to work with the OEMs in order to complete certain predefined tasks by using the Know4Car platform. The validation criteria will be both quantitative and qualitative. Special requirements

FoF ICT

Start:	1 September 2011
Duration:	48 months
Total Budget:	€ 9.6 million
Coordinator:	Volvo Technology

www.know4car.eu

from the industrial partners will form the specifications for the test-bed implementation and the results will be used for the evaluation of the platform.

Through the Know4Car platform, the process of capturing, organizing and distributing the manufacturing knowledge will become more efficient, and will reinforce the European leadership in knowledge-driven platforms, tools, methodologies, product development and manufacturing. The autonomous software agents of the platform will be capable of undertaking a series of everyday activities towards accelerating the product design and manufacturing process, enabling new products to be realized with a considerably shorter time-to-production and time-to-market.



amePLM will offer a radically new and extensible approach to collaborative engineering, leveraging state-of-the art research on semantics, heuristics and visualization

Product and production engineering in companies are typically fragmented across different functional units, distributed across companies along the value chain, requiring input from experts from a variety of disciplines using different methods and tools. This leads to a high coordination effort to synergise work and information transfer as well as to sub-optimal decisions and unused knowledge and experiences.

The resulting waste in engineering processes results in an unnecessary lengthening of time-to-market and time-to-production of new products and to a loss of competitiveness of European companies. amePLM will offer a radically new and extensible approach to collaborative engineering, leveraging state-of-the art research on semantics, heuristics and visualization.

The objectives are to:

- Engineer an ontology that serves as an interoperable model and integrating element for an open engineering system: the amePLM Platform.
- Develop an open engineering platform based on existing tools and libraries, by special consideration of open-source software.
- Research and develop tools to assist in product and process development, analysis, virtual testing and optimization based on heuristic methods and simulation that operate on knowledge represented by information which is structured by means of an ontology.
- Devise a visualization module to enable cross-disciplinary collaboration and remote consultation approaches.

FoF ICT

Start:	1 October 2011
Duration:	36 months
Total Budget:	€ 4.2 million
Coordinator:	Fraunhofer IAO

www.amePLM.eu

The development of a solution will be accomplished through a user-centric approach by 2 leading edge high tech software providers, guided and validated by industrial cases from 3 SME and 2 international companies.

The research needed for the innovative amePLM-solutions is performed by 5 leading universities and Fraunhofer.

The knowledge-driven amePLM-platform will drastically accelerate product and production engineering by integrated workflows, capturing and reuse of knowledge and experiences and by facilitating cross-disciplinary knowledge-sharing and collaboration.



© amePLM



LinkedDesign

Linked Knowledge in Manufacturing, Engineering and Design for Next-Generation Production

The LinkedDesign project is intended to boost today's engineers by providing an integrated, holistic view on data, persons and processes across the full product lifecycle as vital resource for the outstanding competitive design of novel products and manufacturing processes.



FoF ICT

Start:	1 September 2011
Duration:	42 months
Total Budget:	€ 12.5 million
Coordinator:	SAP

www.linkeddesign.eu

Manufacturing is the driving force of Europe's economy, contributing over €6,553 billion in GDP and providing more than 30 million jobs. A strong manufacturing sector is vital to European economic growth and stability but this sector is facing increasingly difficult challenges. The economic crisis has decreased industry output by around 20%, while global competition is growing dramatically.

Furthermore, new trends and paradigms like an increasing demand for sustainable manufacturing and mass customization are increasing. ICT is the key enabler for coping with these changes to push engineering and manufacturing excellence as driver for European success.

LinkedDesign is intended to boost today's engineers by providing an integrated, holistic view on data, persons and processes across the full product lifecycle as vital resource for the outstanding competitive design of novel products and manufacturing processes. To achieve this goal the project will develop the Linked Engineering and mAnufacturing Platform (LEAP) as an integrated information system for manufacturing design that federates all relevant product lifecycle information, independent of its format, location, originator, and time of creation.

The LinkedDesign project aims for user-centric lifecycle information management. LEAP will therefore provide specific knowledge exploitation

solutions such as design decision support systems and collaborative reporting. LEAP will provide a context-driven access to federated information and knowledge and foster cross-discipline collaborations between users by novel approaches for collaborative engineering.

LinkedDesign will provide tight feedback connections to existing engineering tools (e.g., CAx Systems) in order to push back formalised knowledge to enable the automated design of elementary product components.



VISTRA

Virtual Simulation and Training of Assembly and Service Processes in Digital Factories

VISTRA aims at the development of a comprehensive platform for simulation and training of manual assembly processes

The information gap between virtual product and manufacturing engineering and the physical start of production is a fundamental problem for European manufacturers. Knowledge about products and processes, which is currently distributed over heterogeneous systems, is rich in information but a platform for presenting this knowledge according to the different user roles (e.g., production planners or shop floor people) is missing. Enterprise data must be captured, updated, enriched and transferred into an interoperable platform, which enables cross-disciplinary knowledge sharing throughout the product life-cycle.

Reuse of product and process data is a promising approach to leverage virtual simulation of manual manufacturing

processes. Up to now, the complexity and incompatibility of digital data are the main reasons why planning and training of manual manufacturing processes, e.g. in automotive and aerospace, are still carried out in physical stages or during the ramp-up. The simulation and training of complex manufacturing processes in physical stages are expensive and often ineffective. In order to reduce the need for physical prototypes and to reduce time-to-market, virtual training must overcome the problems of former approaches, e.g., inadequate authoring times, cost-prohibitive hardware and insufficient user integration.

VISTRA aims at the development of a comprehensive platform for simulation, documentation and training of manual assembly processes based on advanced

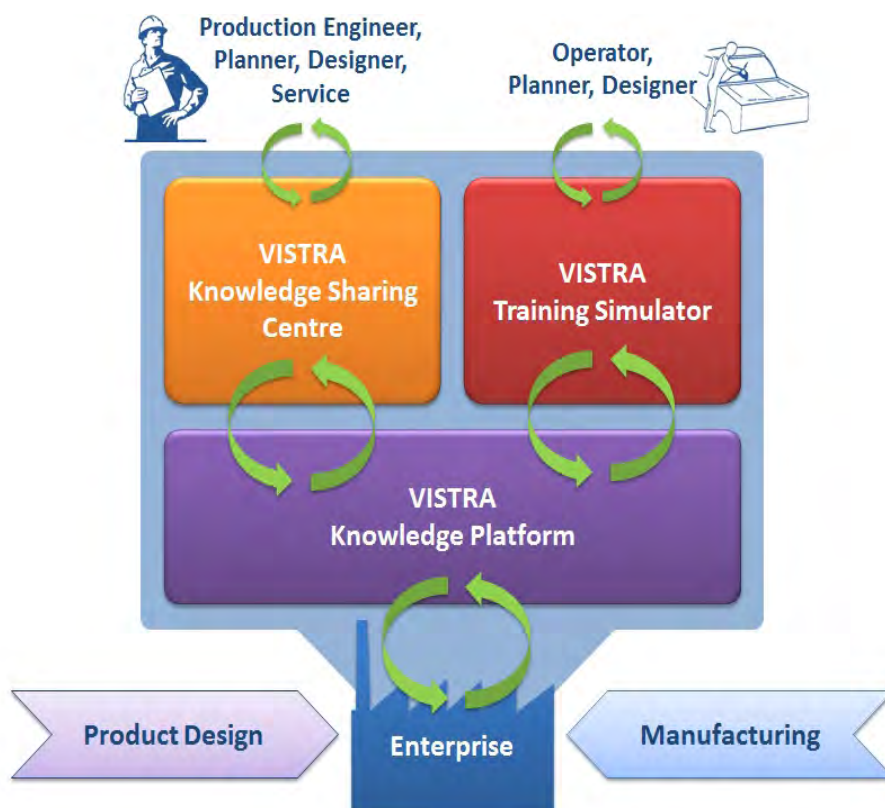
FoF ICT

Start:	9 September 2011
Duration:	36 months
Total Budget:	€ 5.3 million
Coordinator:	DFKI

www.vistra-project.eu

ICT-technologies and concepts, such as auto-generation and re-use of data, realistic physical behaviour, game-based learning, advanced user-interaction and cross-disciplinary information sharing.

VISTRA will support the European labour-intensive industries in two ways: it will allow for the training of workers in a way which is more efficient, straightforward and resource-saving than today's methods, and it will enable production engineers to analyse assembly processes before physical mock-ups exist.



© VISTRA

REFORM

Resource-Efficient Factory Of Recyclable Manufacturing composite components

REFORM will focus on the manufacturing processes of FRP components considering, with a holistic view, the whole manufacturing cycle.

REFORM focuses on more resource-efficiency and cleaner manufacturing technologies for composite components to be exploited in different industrial sectors (e.g. Transport, Energy, and Construction). Fibre reinforced polymer (FRP) composites are becoming very popular as their use reduces weight and allow innovative designs for energy-saving products during service-life. Nevertheless, service-life does not represent the total solution.

A total life cycle view must be taken including manufacturing and end of life reuse, recyclability and/or disposal.

The central idea of REFORM is to focus on the manufacturing processes of FRP components considering, with a holistic view, the whole manufacturing cycle. The environmental friendly process technologies for Forming, Machining (cutting & trimming), Assembly and Recycling are specifically considered, as well as methods to integrate the proposed technologies into the eco-factory of the future.

REFORM considers specific RTD and Demonstration activities capable to provide advances towards full green economically viable manufacturing.

Work will start by defining the industrial requirements and business models (our demonstrators), and benchmarking the environmental footprints of the current manufacturing processes. Eco-efficiency bottlenecks in current processes will be identified, and the key constraints and technology requirements of industrial partners will be defined.

Partners will investigate three manufacturing techniques in parallel: forming, machining assembly, and look at ways of making these greener and more efficient for composite production.

- Forming is defined as the activities that give shape and structure to the composite components. REFORM will investigate two main eco-friendly processes, laser assisted thermoplastic tape-laying systems and the use of virtual and augmented reality for ply positioning systems.

- The machining work will focus on the use of abrasive water-jet machining (AWJM) for cutting and trimming composites. REFORM will develop a hybrid, multi-tasking cutting head to be integrated into the AWJM and investigate water-recycling techniques. These will be integrated into a novel AWJM system and CAM modules will be created which optimise cutting and milling parameters for eco-efficiency.

- REFORM will also develop modular, reconfigurable fixtures to allow large, monolithic composite parts to be built. Particular focus will be placed on thermal stability and a vacuum-tight surface. Methods of aligning, supporting and fixing joints will also be investigated.

At the same time, disposal and recycling techniques will be developed for FRP composites. This work will look at dismantling composite parts and recovering fibres with as-new mechanical properties. Energy-recovery will be investigated for epoxy parts and methods of generating marketable products from thermosets will also be developed.

FoF NMP

Start:	1 December 2011
Duration:	48 months
Total Budget:	€ 7.09 million
Coordinator:	University of Sheffield

www.reform.eu.com

This work will be brought together into three demonstrators and the new processes and techniques will be validated against the production benchmarks measured at the start of REFORM. A business plan will be developed to show where REFORM technologies can be used. This will include life-cycle assessments, health, and environment and reliability assessments.




EMC2-FACTORY

Eco Manufactured transportation means from Clean and Competitive Factory

EMC²-Factory will develop a radically new paradigm for cost-effective, highly productive, energy-efficient and sustainable production systems



According to the International Energy Agency, the Manufacturing sector is at worldwide level responsible for approximately 37% of primary energy consumption being, in most of the developed countries; it is the largest energy consumer and CO₂ producer.

In this new competitive scenario, European manufacturers have to rethink the current ideas of manufacturing and factories, to be prepared for the new resource and energy efficient, sustainable factories of the future. The EMC²-Factory project will develop a radically new paradigm for cost-effective, highly productive, energy-efficient and sustainable production systems, by using a breakthrough approach in:

- Defining economically and ecologically oriented requirements

for processes, equipment and management strategies, and provide system solutions to meet these requirements

- Defining enabling technologies to provide resource and emission reduction in manufacturing systems
- Providing integration technology reference models enabling and supporting new sustainable production
- Devising new factory design tools aimed at increasing overall energy/resource efficiency
- Providing standards for economically and environmentally sound factory infrastructures.

The Project will improve and develop new technologies and processes,

FoF NMP

Start: 1 October 2011
Duration: 36 months
Total Budget: € 12.48 million
Coordinator: CRF

www.emc2-factory.eu

combining existing tools and methods in an overall integrated framework, in order to achieve the highest impact in terms of environmental sustainability of manufacturing systems. It will focus on main energy intensive processes within the most relevant industrial sectors in Europe (automotive, rail and aerospace), developing tangible and industry relevant results to be easily implemented in manufacturing environments.

The project results will therefore lead to a sustainable green factory framework, oriented towards a highly resource and energy efficient production, as well as economically profitable. The new established paradigm will become a permanent reference point in European manufacturing.



ENEPLAN

ENergy Efficient Process pLAnning system

The ENEPLAN project aims to develop manufacturing systems that will be highly flexible while at the same time being closely adapted to the single product

Today's manufacturing plants provide a number of different processing possibilities for manufacturing a specific product. Each one of these processing possibilities poses different advantages and limitations that are function of both geometry and lot size of the part to be manufactured.

However, one of the main driving forces in today's production is the environmental friendliness and the energy efficiency of the production itself. Additionally, the manufacturing processes are needed to be able to quickly shift between diverse manufacturing operations with short transfer, program and set-up times without compromises to quality, reliability and life-cycle costs.

In the proposed project the main object is the development of manufacturing

systems that will be highly flexible, and, at the same time, closely adapted to the single product. These manufacturing systems need for an engineering tool able to cover the whole plant operation, from the overall planning of the plant operation (such as the routes that the product follow within the plant and the scheduling of the production) down to the individual process programming (such as process operation, energy efficiency etc).

The process planning approach of today is based on expert systems that are able to propose alternative process plans for the manufacturing of a specific product. Additionally there are tools able to simulate the operation of each machine station both from technological (process parameters, energy efficiency, etc) and economical point of view. All of the available

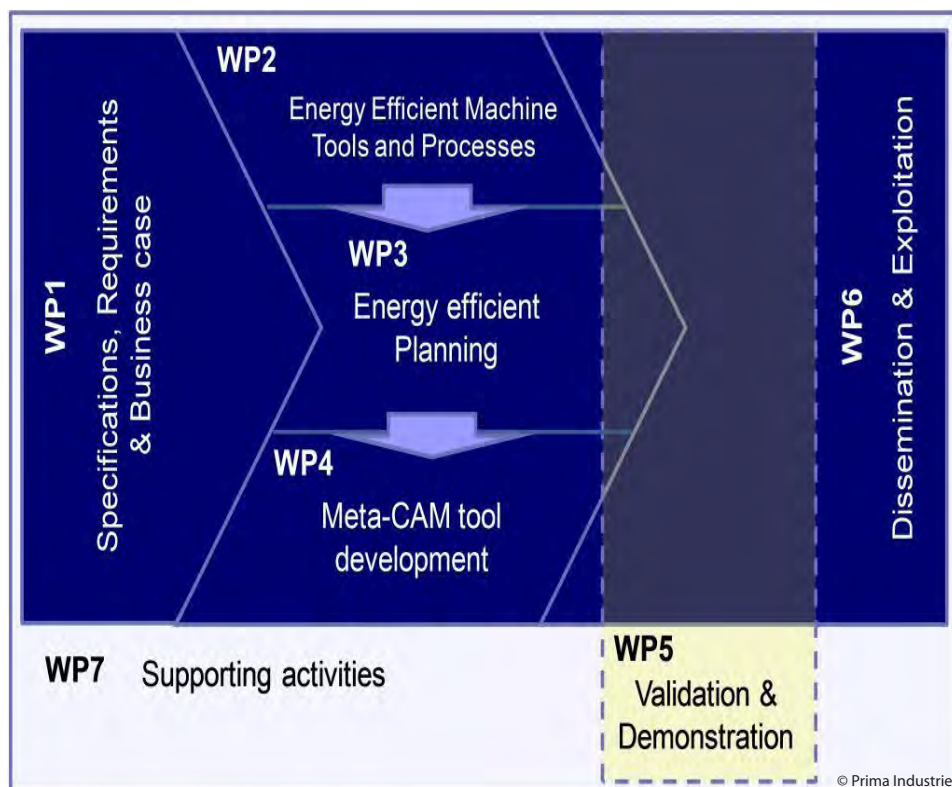
FoF NMP

Start:	17 October 2011
Duration:	36 months
Total Budget:	€ 7.19 million
Coordinator:	Prima Industrie

www.eneplan.eu

systems though are able to cover only a portion of the production, requiring exchange of data between different systems and thus making the overall optimization of the plant operation a hard task.

The proposed project will deliver a manufacturing planning decision support tool for the optimization of the plant operation that will be able to be used from the conceptual phase of the product to the final dispatch of the product to the customer.



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HOL-I-WOOD PR

Holonic Integration of Cognition, Communication and Control for a Wood Patching Robot

The HOL-I-WOOD PR project intends to develop a holonic concept that subsumes automated visual inspection and quality/artefact classification by a skilled robot visually guided and controlled by non-linear approaches

The repair and patching of resin galls and loose dead knots is a costly and disruptive process of inline production in timber industry. A large variety of plain as well as laminated wooden end-products require off-line human interaction and skilled handcrafting in order to add value and quality to the final products.

The human workforce involved in these production tasks is hard to replace by machines. Another request for human recognition and decision-making capabilities, occurring at a previous stage of the production line, is the detection and classification of significant artefacts in wooden surfaces.

The dimension of these plain or laminated wooden products ranges from a few centimetres up to several meters, thus requiring a related

scalability of the fully atomised solution being researched for within this project.

For that reason this project proposes a holonic concept that subsumes automated visual inspection and quality/artefact classification by a skilled robot visually guided and controlled by non-linear approaches that combine manipulation with energy saving in trajectory planning under real-time conditions enabling the required scalability for a wide range of applications.

The interaction of these holonic sub-systems is implemented in agent technology based on a real-time communication concept while fusing multi-sensoric data and information at different spatial positions of the production line.

FoF NMP

Start:	1 January 2012
Duration:	36 months
Total Budget:	€ 4.2 million
Coordinator:	Microtec

<http://holiwoodpr.wordpress.com/>

The feasibility of inter-linking independent autonomous processes, i.e. agents for inspection, wood-processing, transport (conveying) to repair by a patching robot, will be demonstrated by a pilot in a glue lam factory since shutter boards are a perfectly representative mid-size product.



A mobile HMI concept makes interaction with the machine park easy to control, reliable and efficient, while at the same time increasing the safety for workers within the potentially dangerous working environment of glue lam factories and saw mills.



AUTORECON

AUTOnomous co-operative machines for highly RECONfigurable assembly operations of the future

AUTORECON aims to enable the development of autonomous, exchangeable and mobile production units, highly interactive robotic structures and random production flow

Several industrial sectors today are still using linear sequences of operations where the same manual and automated tasks are repeated in each cycle. This paradigm is efficient when aiming at maximum capacity and considering no breakdowns, but very inefficient in case of line de-saturation.

AUTORECON proposes the enablement, development and introduction of:

- Autonomous, exchangeable and mobile production units which can change tasks and position in the shop floor.
- Highly interactive robotic structures.
- Random production flow.

With all of these integrated under a common and open architecture.

The factory of the future as envisaged by AUTORECON encompasses:

- Reconfigurable transformers like tools that enable autonomous assembly equipment which can adapt production process to process disturbances and market variations. The concept integrates novel actuators, end effectors with multiple connection points and advanced sensing capabilities as well as mobile robotic units, fostering efficient multi-variant production.
- Intelligent Control & Monitoring systems enabling enhanced performance and high reconfiguration abilities using distributed controls. AUTORECON unit control will fuse data coming from a peripheral sensing network to allow resource awareness of disturbances.

FoF NMP

Start:	1 October 2011
Duration:	36 months
Total Budget:	€ 5.07 million
Coordinator:	CRF

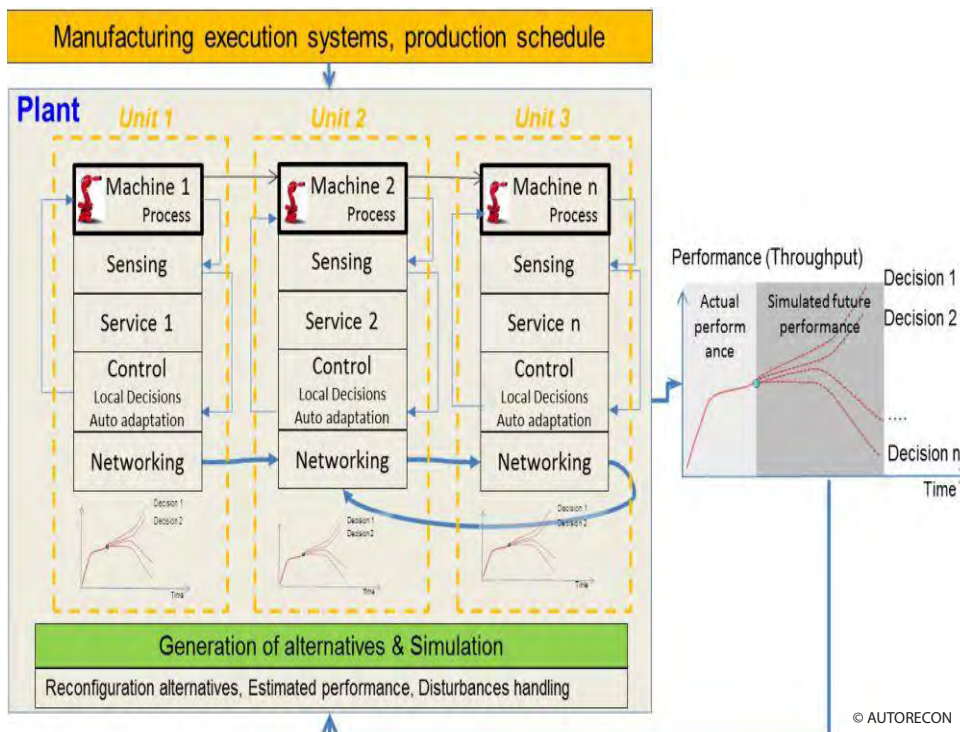
www.autorecon.eu

At the line control level a service oriented architecture will enable:

- Autonomous communication between resources for deciding on adaptation actions
- The effortless integration of new equipment.

A demonstration in the automotive industry will involve the live reconfiguration of an assembly line in the case of a simulated breakdown.

The AUTORECON intelligent control will evaluate alternative actions (e.g. use of mobile robotic units etc.) and select the optimal one. A second demonstration in the consumer goods industry case will use the AUTORECON reconfigurable grippers and sensing network in order to pick randomly placed components and route them by using cooperative robot handling.



AUTORECON



PRACE

The Productive Robot Apprentice

The objective of PRACE is the development of a highly adaptable two handed, mobile robot system for automation of typical small batch assembly operations. An important key feature is the fast and intuitive training of the PRACE system.

Driven by the trend to a more and more customer specific production the boundary conditions for assembly automation have changed significantly. As the systems available on the market cannot cover this extreme flexibility towards weekly changing applications, a new robot system concept will be developed within PRACE. An important requirement is the ability to train the robot system with worker skill fast and intuitive.

The PRACE concept basically relies on a robot learning by demonstration. We compare the robot learning to a master-apprentice relationship. There, a master teaches an apprentice by instructing certain skills by demonstration. The apprentice watches the actions and effects to categorize this newly gathered knowledge into his knowledge base. Then, while applying

this new skill, the master corrects the execution by refining the experience. This loop is iterated until the master is satisfied with the result.

Another important aspect of the PRACE robot system is the operation without safeguards to reach the target of fast setup times. Operation without safeguards however limits the maximum robot velocity. To remain competitive with the human worker a dual-armed robot approach is followed to reach a similar working output as the human worker by modest robot velocities.

With the combination of dual-armed manipulation and a mobile platform to provide local mobility within the workplace basic new application tasks may be now automated economically by this new system approach. Using a

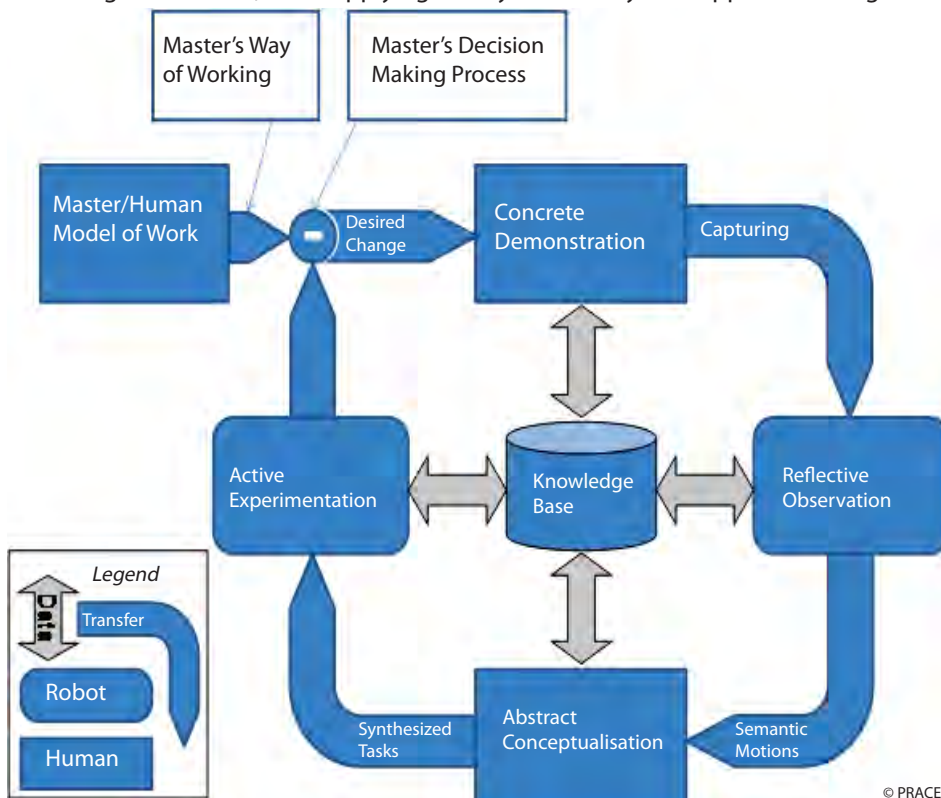
FoF NMP

Start:	1 November 2011
Duration:	36 months
Total Budget:	€4.8 million
Coordinator:	Robert Bosch

www.prace-fp7.eu

modular approach the PRACE system can even be recombined to use only parts of the robot system for dedicated applications, i.e. using only a single arm or using the system without mobility.

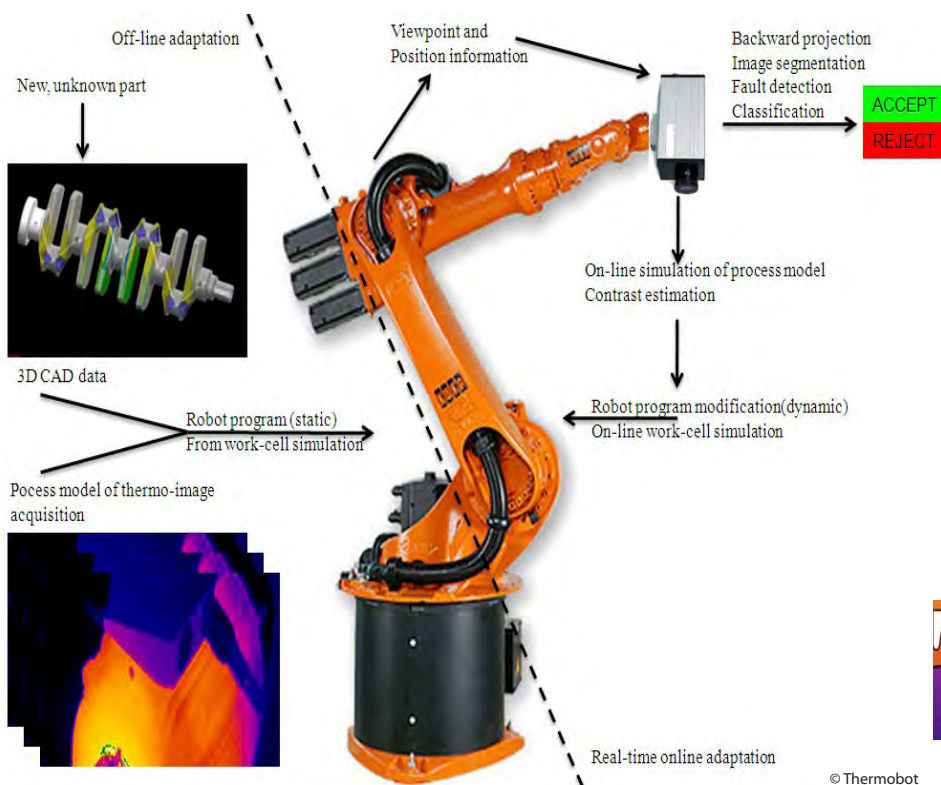
Different assembly use cases are defined as test environment of the PRACE concept. At end of the project an evaluation phase in real production environment is planned to test the functionality of the system and to ensure the ability to train the system by non-expert users within half a day.



THERMOBOT

Autonomous Robotic System for Thermo-Graphic Detection of Cracks

THERMOBOT aims to provide fully automated non-destructive testing in post production and in regular maintenance with the use of thermographic imaging, an automatic path and motion planning model and thermo-image analysis



FoF NMP	
Start:	1 January 2012
Duration:	36 months
Total Budget:	€ 3.5 million
Coordinator:	University of Padua

www.thermobot.eu



Non-destructive testing of components is an important auxiliary process step, not only in post-production but also in regular maintenance.

The detection of cracks is currently done by using magnetic particle inspection, which is a decades-old, inefficient and ecologically undesirable process. There is an urgent need in industry to replace this technology with more up-to-date methods that provide fully automatic testing. This project thus aims at the development of an autonomous robotic system for the inspection of metallic and composite parts using thermography.

By combining automatic path planning for robots using a process model of thermographic image acquisition and knowledge-based image analysis

methods, an inspection robot will be developed that can adapt to new parts within 15 minutes and achieve cycle times in a range of 20-30 seconds.

Applications include inspection of metallic and composite parts in the automotive and aircraft industry as well as inspection during regular maintenance, mainly in the aircraft industry, where magnetic particle inspection is often a requirement. Market estimates show a potential of more than 1000 such inspection systems within 5-7 years after the end of the project.

Despite a higher initial investment (compared to magnetic particle inspection) the robotic inspection system will save more than 400kEUR after 5 years of operation, thus

contributing to a substantial increase in efficiency in these tasks. Furthermore, ecologically undesirable suspensions of magnetic particles that include corrosion-inhibitors can be avoided.

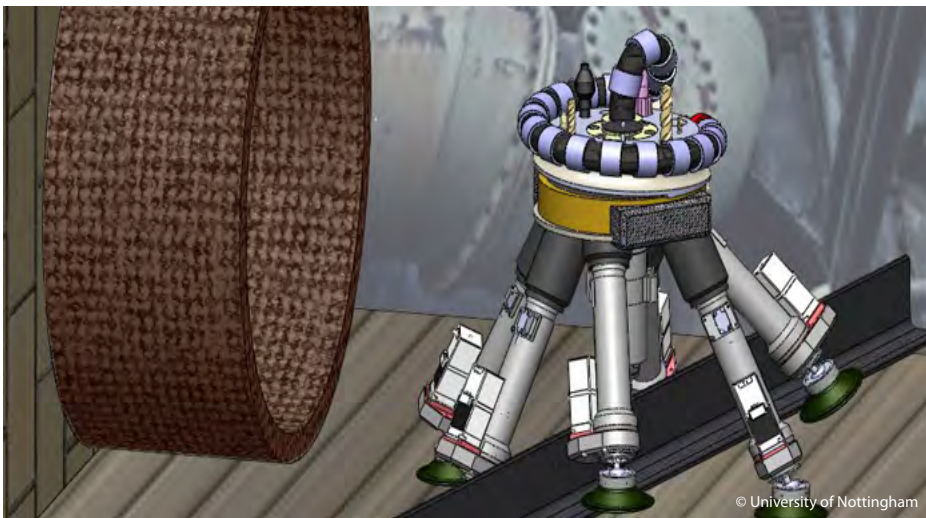
The consortium consists of technology providers in robotics, industrial inspection and thermographic cameras and end-users that cover metallic and composite parts in the automotive and aircraft industry. SMEs play a leading role in the project and contribute 60% of the total effort.



MiRoR

Miniaturised Robotic systems for holistic in-situ Repair and maintenance works in re-strained and hazardous environments

MiRoR will develop a fundamentally novel concept of a Miniaturised Robotic Machine (Mini-RoboMach) system equipped with intelligence-driven and autonomous abilities



MiRoR aims to develop a fundamentally novel concept of a Miniaturised Robotic Machine (Mini-RoboMach) system, that equipped with intelligence-driven and autonomous abilities, will be demonstrated for holistic in-situ repair and maintenance of large and/or intricate installations. This will be done via the following research steps:

- Develop a novel concept of Mini-RoboMach, with unique complementary miniature systems:

- (1) Novel free-leg hexapod (i.e. without base platform) for providing both walking and 6-axis processing capability;

- (2) An original stiffness-controlled flexible-arm robot for enabling snaking and 6-axis light processing

ability. The complementarily means by which a hybrid configuration of Mini-RoboMach, i.e. walk & snake-in can be utilised.

- Develop MiRoR intelligent controller equipped with following key abilities:

- (1) Self-positioning: enable walk and/or snake navigations to/from work and calibration of end-effectors on required features:

- (2) Reasoning: decide on methods of accessing the working area (walking and/or snaking-in mode) while learning from these experiences.

- (3) Planning: schedule task successions and optimise Mini-RoboMach path in reference to intervention on different places within the installation

FoF NMP

Start:	1 February 2012
Duration:	48 months
Total Budget:	€ 5.03 million
Coordinator:	University of Nottingham

www.miror.eu

(4) Adaptation: modify the parameters of treatment procedures for developing a self-protection ability of Mini-RoboMach in case it encounters harmful/unfavourable conditions.

- Develop a unique virtual test bench for the hardware (e.g. Mini-RoboMach) and software (intelligent controller) of MiRoR so that its robustness and capability to work unsupervised within required harsh/remote workspaces can pre-assessed and corrected before its effective utilisation.

- Demonstrate MiRoR by performing in-situ holistic repair/maintenance works (e.g. inspection and processing material deposition, removal) on high investment, large and/or intricate industrial such as (power plants, aero-engines, construction / infrastructure, offshore platforms, etc).



MAINBOT

Mobile Robots for Inspection and Maintenance Activities in Extensive Industrial Plants

MAINBOT will take available wheeled mobile platforms and climbing robots, adapting them to fulfil the industrial objectives of autonomous navigation, mobile manipulation and sensor fusion instantiated in a real industrial scenario



FoF NMP

Start:	1 November 2011
Duration:	36 months
Total Budget:	€ 3.79 million
Coordinator:	Fundacion Tekniker

www.mainbot.eu

- Autonomous navigation: Robots (ground and climbing) must be able to autonomously navigate in a rather structured environment in a safe way

- Mobile manipulation of tools and sensing equipment for maintenance and inspection

- Sensor fusion: to exploit the information provided by multiple sensing technologies deployed in the robot.

These industrial objectives will be instantiated in a real industrial scenario, a thermal solar plant that depicts common problems of this kind of plants: 230 hectares, 209.664 mirrors, 90 km of absorber tubes, huge tanks (Diam. 38 m, height 14m), hazardous working conditions.

The operation of semi-autonomous or fully autonomous mobile robots will increase the efficiency of the plant, reduce the operation and maintenance costs and improve safety and working conditions of workers.



Efficient and effective maintenance is crucial for all kind of industries. In the case of capital intensive investment industries it is even more relevant and has an important impact in the operation costs during the long life cycle of their production means. Besides the traditional maintenance problems of any industrial installation, these kinds of facilities present other additional challenging characteristics:

- Extensive production facilities
- Huge number of control points
- Multiple inspection technologies to be used
- Hazardous working conditions

MAINBOT proposes using service robots to autonomously execute inspection

tasks in extensive industrial plants in equipment that is arranged horizontally (using ground robots) or vertically (climbing robots).

The industrial objectives are:

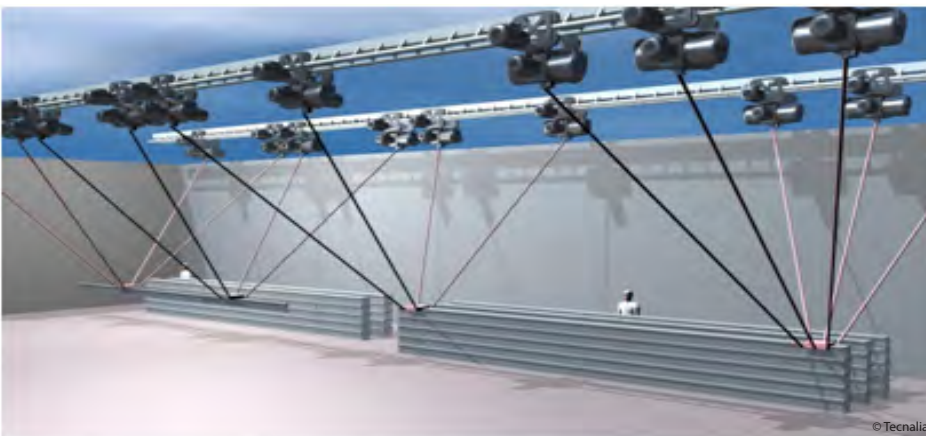
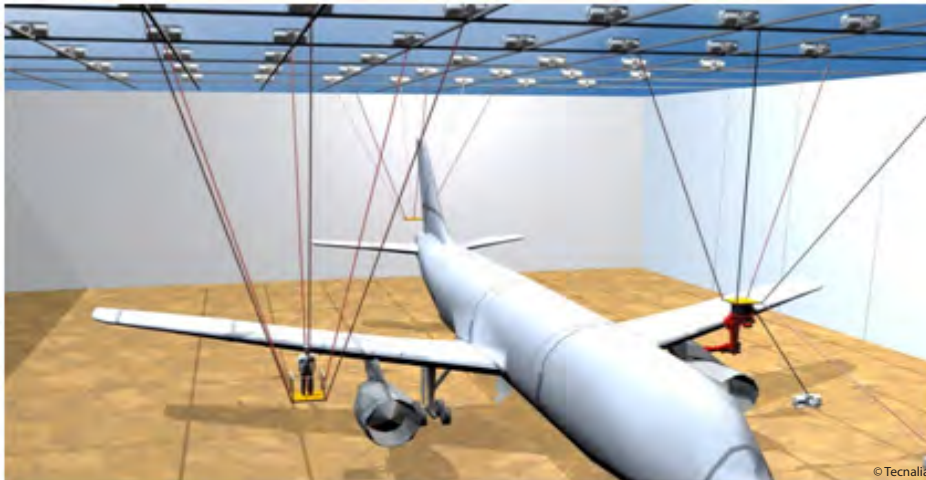
- Ubiquitous sensing
- Leakage detection
- Surface and internal monitoring of equipment

Our approach is not to develop robots from scratch but to take available wheeled mobile platforms and climbing robots that have already been tested in other related scenarios as starting point, and to adapt them by deploying innovative solutions in order to fulfil these industrial objectives:

CableBOT

Parallel Cable Robotics for Improving Maintenance and Logistics of Large-Scale Products

CableBOT aims to develop a new generation of modular and reconfigurable robotic devices that are capable of performing many different steps in the life-cycle stages of large-scale structures.



The main objective of CableBOT project is the development of a new generation of modular and reconfigurable robotic devices that are capable of performing many different steps in the life-cycle stages of large-scale structures.

The CableBOT project deals with a novel methodology for designing, developing and evaluating cable robots customised for the automation in large-scale auxiliary processes. Parallel cable robots extend the payloads and workspace of conventional industrial robots by more than two orders of magnitude.

Three key technologies will be developed to enable the vision:

- Design of Cable Robot: Software tools to design the layout and geometry of cable robots. The ad-hoc connection of groups of winches to different end-effectors creates different setups for cable robots in order to achieve flexibility and reconfigurability
- Industrial Process Planning: Simulation of cable robots to verify the operation of cable robots in environments with large-scale structures
- Control Algorithms and Systems: Distributed control and kinematic transformation to operate modular cable robots such as grids of cable robots under industrial requirements.

FoF NMP

Start:	1 November 2011
Duration:	36 months
Total Budget:	€ 4.4 million
Coordinator:	Fundacion Tecnia

www.cablebot.eu

The combination of these technologies in an integrated robotic system results in a versatile system. CableBOT will demonstrate the potential of such automated systems for life-cycle maintenance and repairing of aircrafts and to introduce automation in life-cycle applications in the construction industry such as handling of beams.

Within CableBOT two fields of application are targeted in close cooperation to industry: Aircraft life-cycle maintenance in the aerospace industry and the construction beams post-production handling. Both applications are characterized by the fact that the state-of-the-art automation can hardly be used due to manoeuvrability of heavy and large structures and risks associated.

The results are feasible for many other fields including large-workspace movements of products, with impact in logistics, transport, and warehousing.



FASHION-ABLE

Development of new technologies for the flexible and eco-efficient production of customized healthy clothing, footwear and orthotics for consumers with highly individualised needs

FASHION-ABLE project aims at providing SMEs with the technological means that will enable the agile and eco-efficient production of personalised products.

FASHION-ABLE project aims at providing the European innovative and customization-concerned SMEs with the technological means that will enable the agile and eco-efficient production of personalised products addressing the complex individualised needs of growing market niches out of the scope of mass-produced goods in terms of health and performance.

FASHION-ABLE vision is to provide the innovative European SMEs concerned in customization with the technological means that will enable the conception, co-design and the sustainable manufacture of fully personalised products.

The expected results of the project are:

- a user framework defining and quantifying the relevant user attributes

- new Collaborative Product Customization Services
- new stretch-leather's lean manufacturing processes and equipment
- new 3D-spacer fabric's flexible manufacturing process and machinery
- new textile's finishing operations and equipment; extended manufacturing order management structure and tools
- Life-Cycle Analysis instruments; and interoperable Product Data Management tools.

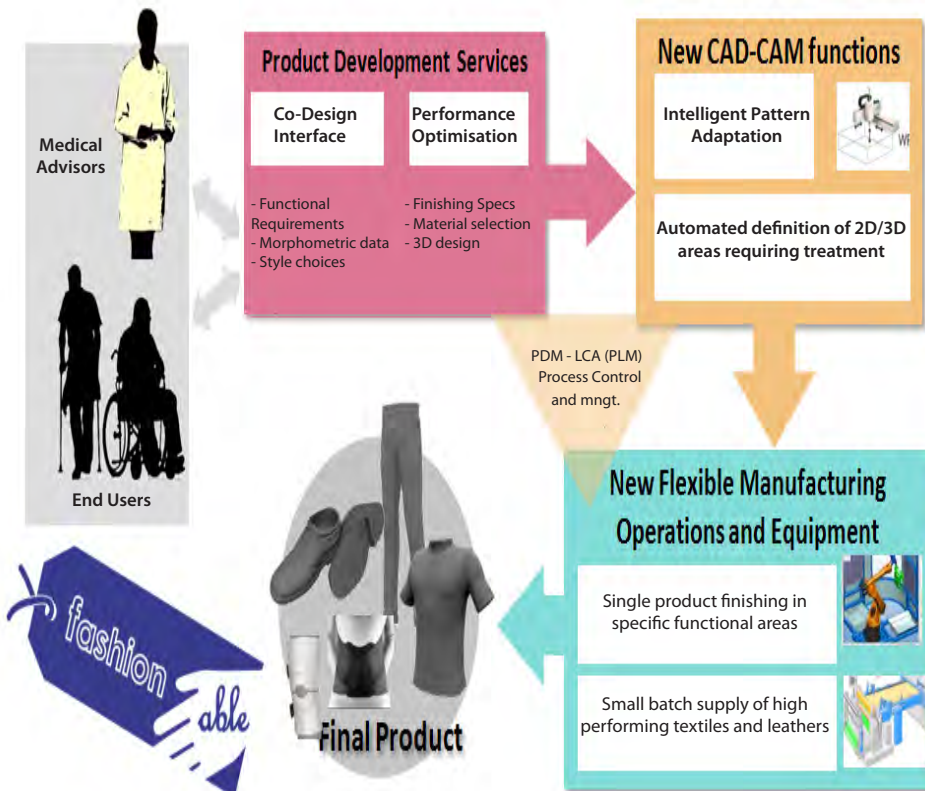
In particular, FASHION-ABLE action will implement and demonstrate in industrial contexts the new cross-sectoral technologies developed for three highly challenging target groups:

FoF NMP	
Start:	1 November 2011
Duration:	36 months
Total Budget:	€ 4.9 million
Coordinator:	IBV

www.fashionable-project.eu

fashionable footwear for diabetic feet, fashionable clothing for wheelchair users and high-performing textile compression bandages.

The harmonized combination of developed technologies will have a direct impact on health, comfort, safety and quality of life of the targeted populations: diabetics developing diabetic feet (30 million); physically disabled people requiring a wheelchair (5 million); and sufferers from acute periods of musculoskeletal disorders (40 million) which prevalence increases with age and weight. Furthermore, our cross-sectoral approach will allow extending and up-scaling functional customisation with little effort to future unexpected functionalities as well as to be transferred to other products and high demanding markets.



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MY-Wear

Customized eco-friendly, safe, healthy and smart work and sportswear

Developing new process technologies in order to realize a new generation of customized, eco-friendly, safe, healthy and smart work wear and sportswear products for elderly, obese, diabetics and disabled people is the MY Wear main goal

Social phenomena like aging, an increase in obesity and increased sensitivity towards disabled, diabetic people, together with eco-friendly products, are new challenges to find fitted solutions for sport and safety equipment.

In this area, European manufacturers need to develop a new approach to fully exploit their excellence. In addition, the adoption of customer-driven production methodologies and technologies is a key strategy to improve the competitiveness in the current market scenario.

To achieve this strategic vision, the project addresses the following sub goals:

- Integrated Data Platform, to collect customer data requirements

- Developing new adaptive production systems & processes for the production of customized goods

- Efficient and controlled use of "light" biodegradable materials and integrated LCA methodologies

- Technologies for constant monitoring, over long distances, of customer bio-metric parameters.

To achieve the MY Wear project's objectives a lean, experienced and complementary partnership has been settled which involves 10 partners of 6 different member states. MY Wear is strongly industry driven with 7 industrial partners out of a total of 10 in the project consortium, 6 of which are SMEs with leading roles.

The results of the MY Wear project

FoF NMP

Start:	1 December 2011
Duration:	36 months
Total Budget:	€ 4.54 million
Coordinator:	Base Protection

www.mywearproject.info

will be validated in an integrated industrial demonstration set up and involving all industrial partners of the project and the target consumers groups. In particular a smart textile and a customized shoes production processes will be assessed. Therefore an innovative pilot factory for fully automatic customized safety shoes production will be realized in the project coordinator facilities.

The strong involvement of qualified companies will also guarantee a fast and effective business exploitation of the MY Wear project's results for both new materials, components and technologies developed and new consumer-oriented products for the target groups.



Interaction between objectives



MEGAFIT

Manufacturing Error-free Goods at First Time

The primary goal of MEGaFiT is to develop and integrate all necessary technologies which create the basis to reduce the number of defects in the manufacturing of complex high-precision metal parts

Today, Europe's leading position in manufacturing of high-precision metal parts is being threatened by developed non-EU countries that catch up quickly on product quality at low cost. If no further action is taken, loss of jobs and GDP are at risk.

To face global competition, a breakthrough is needed in tackling the following 4 challenges:

- 1) High number of defects
- 2) Many costly, energy consuming finishing operations are needed.
- 3) Continuous trend for higher quality, smaller features, lower costs, at simultaneous demand for customised products.
- 4) Six-Sigma methodology reaches its limits for these complex processes (multi step / customised)

MEGafIT will realise this essential breakthrough.

The primary goal of MEGaFiT is to develop and integrate all necessary technologies which create the basis to reduce the number of defects in the manufacturing of complex high-precision metal parts. This will be achieved by developing and integrating in-depth process knowledge, in-line measurement and real-time adaptive process control. Proof will be given on pilot production lines in industrial settings.

MEGafIT will do this with a consortium of partners best-in-class in these fields. The methodology that will be used to come to efficient realisation is the following:

- 1) Define and describe the process

FoF NMP	
Start:	1 December 2011
Duration:	36 months
Total Budget:	€ 10.6 million
Coordinator:	Philips

www.mega-fit-project.eu

- 2) Measure actual process performance
- 3) Identify potential adaptive control solutions
- 4) Design adaptive control solutions
- 5) Verify the adaptive control solution.

This methodology will result in reduction of: defects from 5-15% to <1%; cost by >20%; material and energy consumption by >20%; and number of finishing operations by >35%.

The knowledge-based MEGaFiT results are also applicable in different sectors, leading to low defects, despite customization trends. MEGaFiT will therefore help in assuring a competitive and sustainable European manufacturing industry.



© Philips



MUPROD

Innovative proactive Quality Control system for in-process multi-stage defect reduction

MUPROD will develop a new quality control system in response to the need to provide defect prediction and to avoid end of line failures



FoF NMP

Start:	1 November 2011
Duration:	36 months
Total Budget:	€ 7.9 million
Coordinator:	Tecnalia

of new hardware technologies, techniques and software solutions that in turn are based on real-time multi-data gathering by the integration of new sensor and inspection equipment, development of intelligent actuators and the development of new monitoring and prognosis knowledge-based models. With the aim of developing a universal system that can be integrated into different production processes - feasibility will be demonstrated in machining and assembly processes at both macro and micro product scales.

Application domains will include emerging strategic European sectors such as the production of electrical engines for sustainable mobility (a raise of 1020% in production of motors for electrified powertrain is foreseen for the next 7 years), large-part manufacturing for the wind power sector (between years 2000 and 2005 there was a 217% increase in wind power generation in the EU-27) and the production of customized micro-intravascular catheters as high value medical products for the aging society (medical technology sales in Europe amounted to €72.6 Billion in 2007).



This project aims to develop an innovative quality control system that will drastically change the current concept of end of line quality control, going beyond currently established methodologies such as six-sigma and SPC.

Industry is demanding solutions to avoid end of line failures. Solutions that are able to predict defects before they are generated and solutions that immediately react and act over the generated defects when they are detected without having to wait until the final stage of the manufacturing chain.

Industry has to face manufacturing targets that are even more challenging when they have to deal with new complex products of bigger/smaller size or made of new materials and with more severe quality requirements. To this purpose, industry is demanding

new flexible technological solutions to enable the on-line inspection of such products.

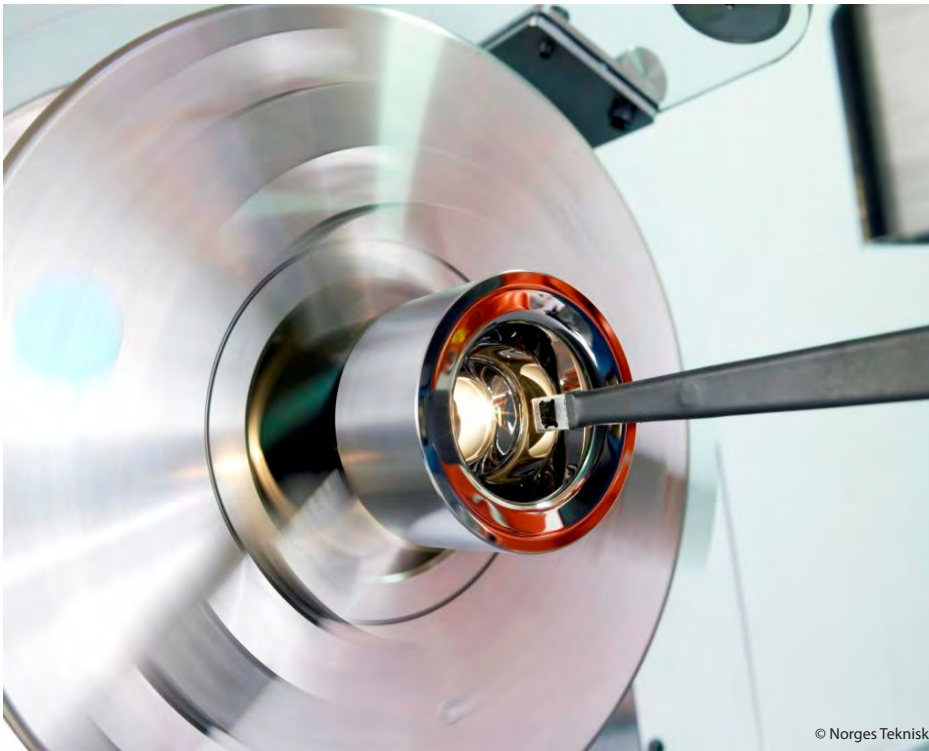
This Quality Control System will prevent the generation of defects within the process at single stage and the propagation of defects between processes at multi-stage system level.

This quality control system will be proactive, offering three different solution strategies to avoid end of line defects - (i) The elimination of the predicted defect through adjustment of process characteristics by proactively intervening on the inputs to the process (process parameters, etc.), (ii) The on-line reworking of the product in order to eliminate the defect and (iii) the on-line workpiece repair through defect elimination at consecutive process stages. The development of this proactive quality control system will be based on the design and development

IFaCOM

Intelligent Fault Correction and self Optimizing Manufacturing systems

IFaCOM aims to achieve a near zero defect level of manufacturing for all kinds of manufacturing, with emphasis on production of high value parts, on large variety custom design manufacturing and on high performance products



© Norges Teknisk

FoF NMP

Start:	1 November 2011
Duration:	42 months
Total Budget:	€ 10.49 million
Coordinator:	Norges Teknisk

www.ifacom.org

The vision of IFaCOM is to achieve a near zero defect level of manufacturing for all kinds of manufacturing, with emphasis on production of high value parts, on large variety custom design manufacturing and on high performance products. This shall be achieved through:

- Improved performance process control to reduce defect output and reduce the costs of defect avoidance.
- Enhanced quality control to obtain more predictable product quality.
- Enhanced manufacturing process capability independent of manufactured parts.

The project has three core objectives:

- 1) Reach a level of excellence for a systematic body of knowledge on near zero defect manufacturing output through improved process control, and long range stability by use of intelligent manufacturing quality control systems.
- 2) Development of new manufacturing strategies and methods which will be demonstrated in industrial cases. Manufacturing processes will be brought into higher stability both on short and long term.
- 3) Implement process control strategies based on the use of advanced computational intelligence methods for analysis and decision making.

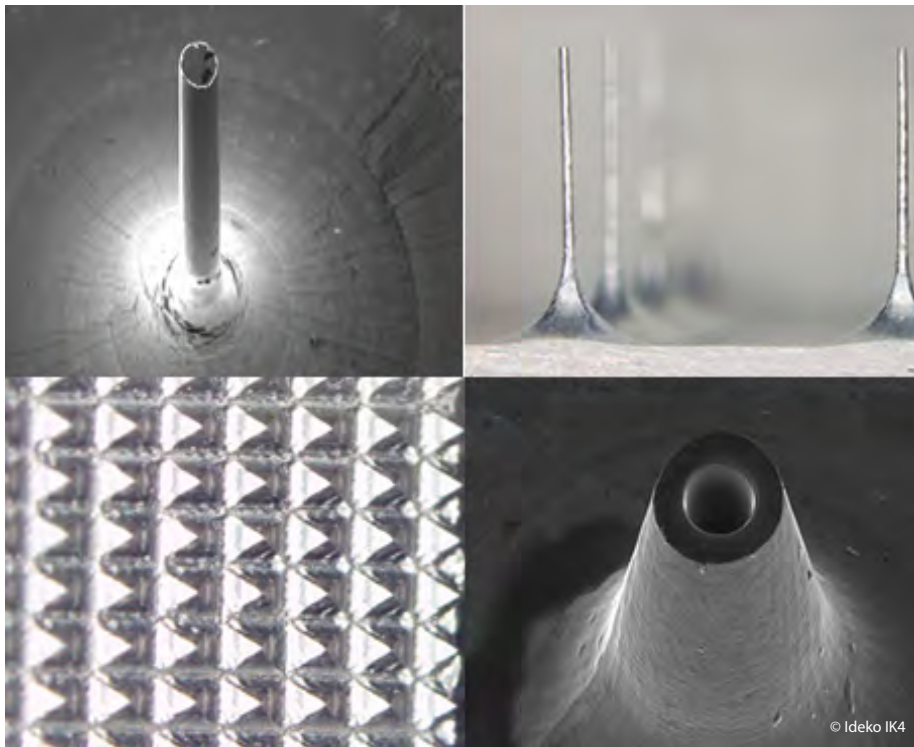
IFaCOM



MIDEMMA

Minimizing Defects in Micro-Manufacturing Applications

The MIDEMMA project will give a global solution for the 'zero defect' approach in micro-manufacturing, with a focus on the aspects that are specific to micro-manufacturing



Micro-manufacturing requires a 'zero-defect' oriented approach, both in large scale and in short-run production.

Current quality control approaches, coming from macro-manufacturing, are mainly based on post-process geometric control which produces a large time lag between the defect generation and its detection, usually leading to large amount of defective parts (large scale) or wasted high value processing (short run). Moreover, this approach does not immediately point to the error source to help with error correction, and other criteria such as material integrity, physical properties, surface topography and piece or component functionality are not taken into account.

There is clear need for extending the final product validation to a

process monitoring approach in micro-manufacturing, where all the manufacturing process is monitored, from the raw material to the fabrication processes and the manipulation of the final parts, and where all this information is processed in real time with suitable models for error prediction, automatic detection and process optimization by system correction.

The project will give a global solution for the 'zero defect' approach in micro-manufacturing, with a focus on the aspects that are specific to micro-manufacturing.

The technology concepts that will be developed are expected to have an impact in the competitiveness of the micro-manufacturers in the following ways:

FoF NMP	
Start:	1 November 2011
Duration:	36 months
Total Budget:	€ 5.5 million
Coordinator:	Ideko IK4

www.midemma.eu

- Reducing process variability detecting defects as soon as they are generated or in the case that it is possible, are going to be generated by predicting models

- Allowing the use of less expensive machines, that can reduce their variability through monitoring

- Requiring less skilled working force, thanks to acquired process setting knowledge and the development of smart decision-making tools.



Graphene Chemical Vapour Deposition: Roll to Roll Technology

The project aims to develop the first roll-based chemical vapour deposition (CVD) machine for the mass production of few-layer graphene for transparent electrodes for LED and display applications

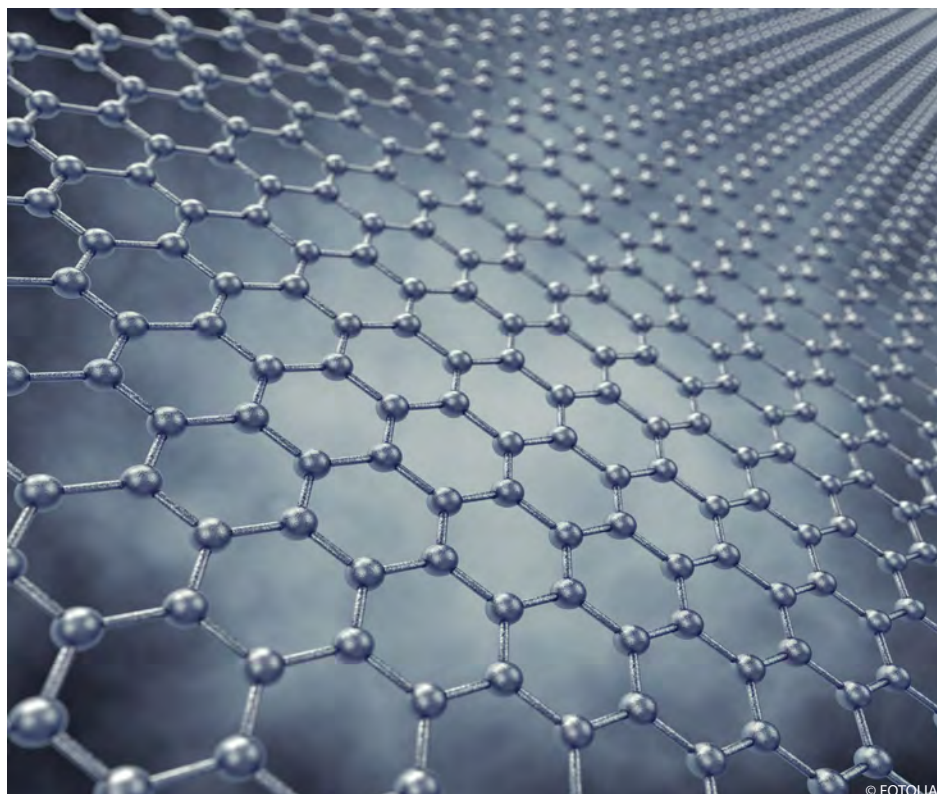
Graphene has some unique properties resulting from its linear dispersion band structure, its high carrier mobility, and its low dimensionality. However, its use is presently limited by its synthesis and mass production.

The project aims to develop the first roll-based chemical vapour deposition (CVD) machine for the mass production of few-layer graphene for transparent electrodes for LED and display applications, and adapts the process conditions of a wafer-scale carbon nanotube growth system to provide a low-cost batch process for graphene growth on silicon.

The project focuses on applications such as transparent electrodes for OLEDs and GaN LEDs, optical switches, plasmonic waveguides, VLSI interconnects, sensors and RF NEMs.

FoF NMP

Start:	1 November 2011
Duration:	48 months
Total Budget:	€ 10.5 million
Coordinator:	University of Cambridge



NanoMaster

Graphene based thermoplastic masterbatches for conventional and additive manufacturing processes

The NanoMaster project will develop the next generation of graphene-reinforced nanointermediate that be used in existing high-throughput plastic component product processes

The aim of the NanoMaster project is to reduce the amount of plastic used to make a component by 50% and hence reduce the weight of the component by 50%, at the same time as imparting electrical and thermal functionality.

This will be achieved by developing the next generation of graphene-reinforced nanointermediate that can be used in existing high-throughput plastic component production processes.

Graphene reinforced polymers have been demonstrated at lab scale in both Europe and the USA, and it has been shown that very low loadings of graphene can have a dramatic impact on the mechanical and physical properties of the polymers it is added to. However, industrial compounding processes have only so far been developed in the United States, where

Ovation Polymers are already offering graphene thermoplastic master batches and compounds based on graphene from XG Sciences.

The concept for this project is to develop the knowledge-based processing methods required to up-scale the production of graphene and expanded graphite reinforced thermoplastic master batches and compounds and, ultimately, enables its industrial commercialisation in Europe.

The work will focus on developing processes for large scale rapid production of graphene reinforced plastic intermediate materials which can be integrated into current conventional and additive manufacturing processes. Successful development of these materials and processes will have a significant effect

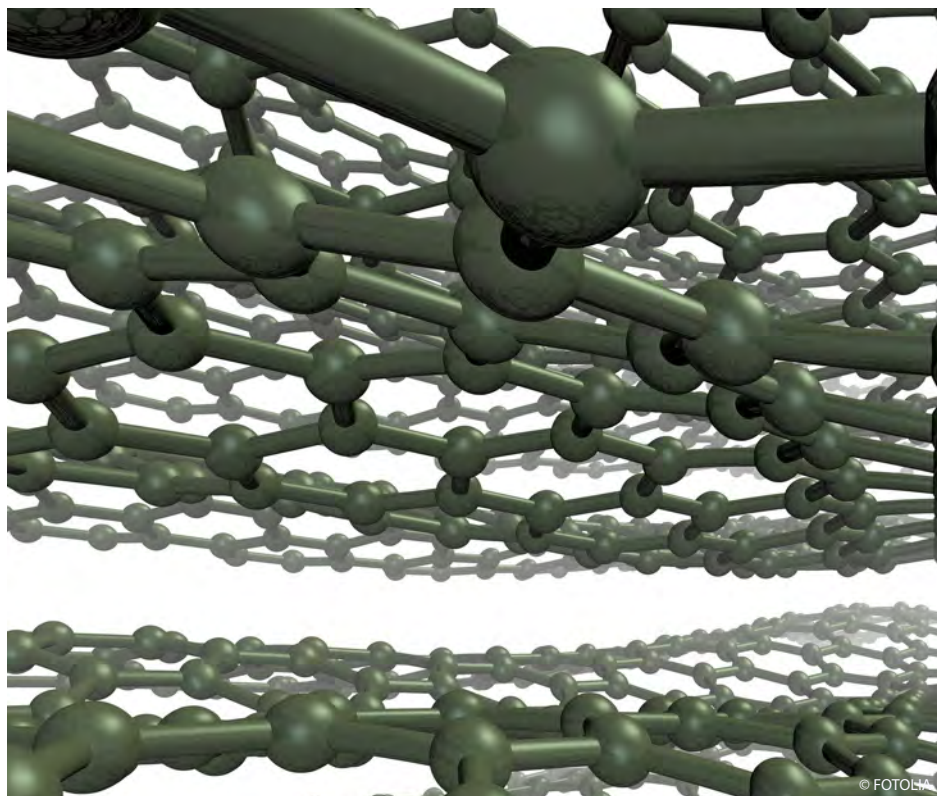
FoF NMP

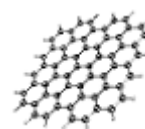
Start:	1 December 2011
Duration:	48 months
Total Budget:	€ 6.3 million
Coordinator:	Netcomposites Ltd

www.nanomasterproject.eu

on the amount of polymer that needs to be used in a component to meet its performance criteria, and on the ability of plastic mouldings to deliver significantly enhanced functionality.

These breakthroughs will open the door to a vast range of applications enabling the benefits to be exploited throughout Europe and beyond. They will also help to place European companies in a position to exploit the rapidly growing markets in the US and Asia-Pacific.



 Nano
Master



List of Participating Organisations

The following is a concise list of organisations who are participating in projects launched after the second 'Factories of the Future' call. The name of the organisation is followed by the project(s) that it is involved in.

A	AZEV (ADVENTURE)	CECIMO (EMC2-FACTORY)
Aalto University (LINKEDDESIGN)	Azimut (REFORM)	Centre for Factories of the Future (EXTREMEFACTORIES)
AAG (PRACE)	B	Chalmers University of Technology (KNOW4CAR)
ABB (ADVENTURE)	BAM (THERMOBOT)	Charmilles (IFACOM)
ACCIONA (REFORM, MIROR & CABLEBOT)	Base Protection (MYWEAR)	CITEVE (MYWEAR)
OPEL (VISTRA)	Ben-Gurion University of the Negev (COMVANTAGE)	CNRS (IMAGINE, GRAFOL & CABLEBOT)
Aero Engine Controls (NANOMASTER)	BIAS (MEGAFIT)	COMAU (LINKEDDESIGN, COMVANTAGE, RLW NAVIGATOR, AUTORECON & EMC2-FACTORY)
AEROGEN (AMEPLM)	BIBA (LINKEDDESIGN, MSEE & BIVEE)	Consitex (FFD)
AIDIMA (IMAGINE)	BIC (AUTORECON)	Correa (EMC2-FACTORY)
AIDIMA (BIVEE)	Bivolino (MSEE)	Create It Real (NANOMASTER)
AIMPLAS (NANOMASTER)	Bivolino (FASHION-ABLE)	CREATECH (MIDEMMA)
AIUT (EMC2-FACTORY)	Blum-Novotest (MIDEMMA)	CRF (KNOW4CAR, MEGAFIT, IMAGINE, AUTORECON, EMC2-FACTORY, ENEPLAN & PREMANUS)
AIXTRON (GRAFOL)	BOC Asset Management (BIVEE)	CTOOLS (EXTREMEFACTORIES)
AKER Solutions (LINKEDDESIGN)	BOC Business Objectives Consulting (COMVANTAGE)	D
Alenia (TERRIFIC)	BOSCH (MUPROD & PRACE)	DESMA (MYWEAR)
Alesamonti (IFACOM)	BRP-Powertrain (THERMOBOT)	DFKI (VISTRA)
AMMR (SYMPOSIUM)	Brunel University (MIDEMMA)	DIGRO (REFORM)
AMO (GRAFOL)	BSCT (THERMOBOT)	DITF (MSEE & FASHION-ABLE)
Armbruster (EXTREMEFACTORIES)	BSN Medical (FASHION-ABLE)	Dresscode21 (COMVANTAGE)
ARMINES (AMEPLM)	C	DTI (PRACE & NANOMASTER)
ASCORA (ADVENTURE)	CADCAMation (ENEPLAN)	DTU (GRAFOL & IFACOM)
ASSYST (FFD)	CADCAMation (IFACOM)	DVST (REFORM))
ATB (EPES)	Calzamedi (FASHION-ABLE)	
ATB (EXTREMEFACTORIES)	Cambridge CMOS Sensors (GRAFOL)	
Athens Technology Center (FASHION-ABLE, FFD)	CAS Software (GLONET)	
ATOS (BIVEE)	CASP (AUTORECON & ENEPLAN)	
Avanzare (NANOMASTER)	CEA (GRAFOL & SYMPOSIUM)	

E

EADS (IMAGINE, CABLEBOT & SIMPOSIUM)

EADS UK (EPES)

EDAG (KNOW4CAR)

EMA (IFACOM)

ENG (BIVEE, MSEE & VENIS)

Engineering Center Steyr (TERRIFIC)

EnginSoft (RLW NAVIGATOR)

ENKI (MUPROD)

EPFL (LINKEDDESIGN, RLW NAVIGATOR, MUPROD, GRAFOL & IFACOM)

EPL (PREMANUS)

ESTECO (EPES)

ETH Zurich (MEGAFIT & MIROR)

EURATEX (FASHION-ABLE)

EVIDIAN (COMVANTAGE)

EXALCO (ENEPLAN)

EXTENDE (SIMPOSIUM)

F

FAMMSA (EXTREMEFACTORIES)

FCC (VISTRA)

FESTO (EMC2-FACTORY)

FhG-IAO (MSEE)

FHI (GRAFOL)

FIDIA (IFACOM)

FINNPOWER (ENEPLAN)

Formtech (REFORM)

Fratelli Piacenza (FFD)

Fraunhofer FIT (VENIS)

Fraunhofer IAO (AMEPLM)

Fraunhofer IFF (MAINBOT)

Fraunhofer IGD (VISTRA & FFD)

Fraunhofer IPA (MIROR, CABLEBOT & IMAGINE)

Fraunhofer IPK (PRACE)

Fraunhofer IPT (REFORM)

Fraunhofer IZFP (SIMPOSIUM)

FSA (VENIS)

G

GAMESA (MUPROD)

General Impianti (BIVEE)

Gigant (ENEPLAN)

Gizelis (ENEPLAN)

Gorenje Orodjarna (ENEPLAN)

Graphenea (GRAFOL)

Grupo Tamoin (EPES)

H

Hardis (MSEE)

HOLONIX (LINKEDDESIGN)

Human Solutions (FASHION-ABLE)

I

IAM (KNOW4CAR & ENEPLAN)

Ibarmia Innovatek (MSEE)

IBM Israel (MUPROD)

IBSPE (MIDEMMA)

IConverter (FASHION-ABLE)

IDEKO (ENEPLAN & MIDEMMA)

IISAS (VENIS)

IIT (AUTORECON)

IK4 Tekniker (MIROR, MAINBOT & MIDEMMA)

Imperial College London (SIMPOSIUM)

INDESIT (MSEE)

iNDT (MIROR)

INESC PORTO (ADVENTURE)

InfAI (LINKEDDESIGN)

InfraTec (THERMOBOT)

INNO (COMVANTAGE)

INNOPOLE (EXTREMEFACTORIES)

Inosens (IFACOM)

INRIA (TERRIFIC, CABLEBOT & SIMPOSIUM)

INSTITUTE OF OCCUPATIONAL MEDICINE (NANOMASTER)

INSTITUTO DE BIOMECANICA DE VALENCIA (FASHION-ABLE)

INTEL Ireland (AMEPLM & GRAFOL)
Intersoft (VENIS)

INTRASOFT (IMAGINE)

IPLON (GLONET)

ISN DOO (COMVANTAGE)

I-SOFT (ADVENTURE)

ITIA-CNR (BIVEE, FASHION-ABLE, EMC2-FACTORY, ENEPLAN & MYWEAR)

ITL (VENIS)

ITRobotics (THERMOBOT)

I-VLAB (MSEE)

J

Jaguar Cars (RLW NAVIGATOR)

JOTNE (TERRIFIC)

K

K&A (COMVANTAGE)
K.U. Leuven (SIMPOSIUM & MIDEMMA)
KALEIDO TECHNOLOGY ApS (MIDEMMA)
Karlsruher Institut fuer Technologie (KNOW4CAR)
KNOPF (FASHION-ABLE)
KOMIX (GLONET)

L

LATI (NANOMASTER)
LFT (MEGAFIT)
LINKTECH (VENIS)
LipBled (HOL-I-WOOD PR)
LOGO (IMAGINE)
LONGHI SA (MYWEAR)
Loughborough University (PREMANUS)
LR (RLW NAVIGATOR)
LULEA TEKNISKA UNIVERSITET (HOL-I-WOOD PR)
Lunds Universitet (PRACE)
Luneburg (IFACOM)
LZH (MIDEMMA)

M

MACH4 Lab (REFORM & MUPROD)
MAG (PRACE)
Marposs (MUPROD)
MB Proto (NANOMASTER)
MBAS (EXTREMEFACTORIES)
MB-T (AMEPLM)
Micreon (MIDEMMA)

MiCROTEC (HOL-I-WOOD PR)
Missler Software (TERRIFIC)
ModuleWorks (REFORM)

Montronix (IFACOM)
MSLUK (MIDEMMA)

N

N. Bazigos (KNOW4CAR)
Netcomposites (NANOMASTER)
Newburgh Engineering (ENEPLAN)
NEXTEL (COMVANTAGE)
NIKARI (EXTREMEFACTORIES)
NKT (EPES)
Noesis (MEGAFIT)
Nova (REFORM)
NPL (MIDEMMA)
NTNU (LINKEDDESIGN & IFACOM)
NTUA (MAGINE)

O

OAS (EXTREMEFACTORIES)
OFOONR (FASHION-ABLE)
Ohmatex (MYWEAR)
Ontoprise (AMEPLM & KNOW4CAR)

P

P&R TEXTEIS (MYWEAR)
PDTEC (KNOW4CAR)
Petrom (MIROR)
Philips Consumer Lifestyle MEGAFIT, MSEE & NANOMASTER)
Philips Technologie (GRAFOL)
Politecnico Di Milano (LINKEDDESIGN, MSEE & RLW NAVIGATOR)

Politecnico Di Milano (MUPROD & EMC2-FACTORY)

Politecnico Di Milano (PREMANUS & AMEPLM)

Precitec (MEGAFIT & RLW NAVIGATOR)
PREDIF (FASHION-ABLE)
Prima Industrie (ENEPLAN)

Profactor (THERMOBOT)
Prolon (GLONET)

Promolding (NANOMASTER)

Q

Quotec (RLW NAVIGATOR)

R

RIHS (MEGAFIT)
ROBOSOFT (MAINBOT)
Röchling (NANOMASTER)
Rolls Royce (MIROR)
Romania Telecommunications Trading (AMEPLM)
Ropardo (MYWEAR)

RST Industrie Automation (COMVANTAGE)

S

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Safeview (EXTREMEFACTORIES)
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Santer Reply (IMAGINE)
SAP (KNOW4CAR, LINKEDDESIGN, MSEE, COMVANTAGE & PREMANUS)
SARIX (MIDEMMA)
Science and Technology (MEGAFIT)
SCOTCAD (FFD)

SCS (AMEPLM)

Senseor (EMC2-FACTORY)

SENSOFAR (MIDEMMA)

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Serious Games Interactive (VISTRA)

ServTech (IMAGINE)

SICOMP (REFORM)

SIE (MEGAFIT)

Siemens AG (TERRIFIC & EMC2-FACTORY)

Siemens AG Österreich (EMC2-FACTORY)

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SIR (PREMANUS)

SistePlant (EPES)

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SUPSI (MYWEAR)

Synesis (FASHION-ABLE & MYWEAR)

SZTAKI (RLW NAVIGATOR)

T

Tagueri (MIDEMMA)

TAL (BIVEE)

TANet (ADVENTURE)

Tecnalia (MUPROD, REFORM, KNOW4CAR, MSEE, MUPROD, EPES, AUTORECON, EMC2-FACTORY & CABLEBOT)

TECNATOM (MAINBOT)

TEKS (REFORM & ENEPLAN)

Thales RT (GRAFOL)

TIE (ADVENTURE & PREMANUS)

TIMCAL (NANOMASTER)

TNO (MEGAFIT & EMC2-FACTORY)

TOFAS (AUTORECON)

Torresol Energy Investments (MAINBOT)

TRIMEK (THERMOBOT, LINKEDDESIGN & MUPROD)

Trinity College Dublin (GRAFOL)

TTTECH Computertechnik (HOL-I-WOOD PR)

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TU Muenchen (HOL-I-WOOD PR)

TU Wien (HOL-I-WOOD PR)

TUENKERS (AUTORECON)

TWI (EMC2-FACTORY)

TXT E-Solutions (MSEE)

U

UBITECH (LINKEDDESIGN)

ULG (MIDEMMA)

UNINOVA (IMAGINE, MSEE & GLONET)

UNIST (RLW NAVIGATOR)

Universidad del País Vasco (MUPROD)

Università degli Studi del Molise (RLW NAVIGATOR)

Università degli Studi di Cassino (SIMPOSIUM)

Università degli Studi di Genova (AUTORECON)

Università degli Studi di Napoli Federico II (SIMPOSIUM & IFACOM)

Università degli Studi di Padova (THERMOBOT)

Università degli studi di Pavia (TERRIFIC)

Universita di Trieste (AMEPLM)

Universität Bremen (MIDEMMA & MEGAFIT)

Universität Duisburg-Essen (CABLEBOT)

Universität Innsbruck (MSEE)

Universität Leipzig (LINKEDDESIGN)

Universität Linz (TERRIFIC)

Universität Stuttgart (MUPROD & AMEPLM)

Universität Wien (COMVANTAGE & ADVENTURE)

Université Bordeaux 1 (MSEE)

Universiteit Twente (MEGAFIT)

Universiteit van Amsterdam (GLONET)

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University of Limerick (AMEPLM)

University of Nottingham (VISTRA,
MIROR & AMEPLM)

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ENEPLAN, IMAGINE, KNOW4CAR & RLW
NAVIGATOR)

University of Sheffield (ENEPLAN &
REFORM)

University of Vaasa (ADVENTURE)

University of Warwick (IMAGINE, RLW NAVIGATOR)

UNIVPM (BIVEE)

V

Vaibmu OY (EXTREMEFACTORIES)

VEW (MEGAFIT)

Vicinay (CABLEBOT)

Volkswagen (LINKEDDESIGN &
SYMPOSIUM)

Volvo Aero Norge (IFACOM)

Volvo Technology (VISTRA &
KNOW4CAR)

VSL (MEGAFIT)

VTT (EPES & ENEPLAN)

W

WZL (IFACOM)



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