ICT and Factories of the Future

Results of the First Two Calls for Proposals

Projects launched under the FP7 ICT Theme in 2010 and 2011
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ICT and Factories of the Future

Results of the First Two Calls for Proposals
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Europe is in transition towards a more service-oriented, knowledge-driven economy. Many young people are participating in the development of (internet-enabled) applications and many with an entrepreneurial spirit are even setting up internet-based companies. New, innovative products are being developed in all sectors tremendously fast. New hardware-software-service solutions are addressing the grand societal challenges of the future such as the ageing of the population, affordable healthcare for all, and sustainable energy generation and use. At such an exciting time, it is also important not to forget about the ‘real economy’ and so to encourage business opportunities in manufacturing.

Manufacturing of advanced products in Europe not only accounts for many high-quality jobs, it allows Europe to keep full control over the solutions it offers and to develop its full innovation potential. For these reasons alone, it is essential to keep a strong manufacturing base in Europe that is competitive at global level. Even going beyond this, Europe must “re-industrialise” by targeting advanced manufacturing.

Europeans seem to have understood this message. In a recent report on Key Enabling Technologies a High Level Group of experts singled out advanced manufacturing as a key enabler for European competitiveness. The report further recommends keeping the entire value chain, including research and manufacturing, in Europe and it makes concrete recommendations to this end. ICT is an important factor for maintaining competitiveness, as it not only facilitates efficient design and development of new products; it also brings intelligence to the shop floor. Moreover, ICT itself is an innovative manufacturing industry of its own.

In late 2008, as a response to the first financial crisis, President José Manuel Barroso launched the European Economic Recovery Plan. The Factories of the Future initiative, part of this Plan, aims to help EU manufacturing enterprises, in particular SMEs, to improve the technological base of manufacturing across a broad range of sectors. It also aims to support Europe’s industry in meeting an increasing global consumer demand for greener, more customised and higher-quality products by helping it convert to a demand-driven industry with lower waste generation and less energy consumption.

The initiative therefore targets industry-driven R&D projects through open and coordinated calls organised between the relevant 7th Framework Programme (FP7) Themes: Information and Communication Technologies (ICT) and Nano-science, Nanotechnologies, Materials and New Production Technologies (NMP). The Factories of the Future Initiative is implemented as a public-private partnership (PPP) with a particular emphasis on SMEs. Its total envelope for the years 2010-2013 is EUR 1.2 billion.

The thematic content for these open calls has been elaborated by industry and is summarised in the Factories of the Future Multi Annual Roadmap which aims in particular at supporting:

1. **Sustainability**: quiet, clean, safe, green production, competitive in the world market;

2. **Intelligence**: ICT-enabled intelligent production systems and manufacturing processes capable for instance of intuitively interacting with operators, with self-monitoring and auto-correction smart features

3. A **high performance**: zero-defect, lean and adaptive manufacturing;

4. **Advanced manufacturing for new products**: processes to handle new materials; processes for new products using lightweight/high performing materials and micro/nano-manufacturing (e.g. the ‘portable factory’).

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ICT has inspired particularly the second element of this Roadmap, “ICT-enabled Intelligent Manufacturing”, which aims at improving the efficiency, adaptability and sustainability of manufacturing systems and their smooth integration into business processes in an increasingly globalised industrial context.

This publication focuses on the ICT aspects of manufacturing and on the projects launched in the first two calls for proposals under the ICT part of Factories of the Future initiative. The ICT areas covered are:

- **Smart Factories**: ICT to support agile manufacturing and customisation including process automation control, simulation and optimisation technologies, robotics, and tools for sustainable manufacturing;

- **Virtual Factories**: ICT supporting value creation from global networked operations including global supply chain management, product-service linkage and management of distributed manufacturing assets;

- **Digital Factories**: ICT to support a better understanding of manufacturing and design, better product lifecycle management including simulation, modelling and knowledge management from product conception to production, including product after-sales, maintenance and end-of-life operations.

I wish you a pleasant reading.

Dirk Beernaert  
*Head of Unit*
A highly productive manufacturing industry is the engine of Europe’s economy. With 33.7 million employees and 2.3 million enterprises the sector has created nearly EUR 1,700 billion value-added in 2010, contributing to more than 15 percent in the European economy. Moreover, through accelerated impact, one job created in the manufacturing sectors ensures two other jobs in related productive or service sectors. The so-called “servo-industrial economy” which contains the wider productive sectors (including energy and construction) as well as the services that strongly depend on them accounts for almost half of Europe’s GDP. Manufacturing plays a particular role in some of Europe’s new members. It accounts for more than 20 percent of gross value-added in the Czech Republic, Slovakia, Hungary and Slovenia.

Figure 1: European manufacturing gross added value (percent of total)
The EU’s wealth creation strongly depends on manufacturing productivity. Before the crisis, between 1995 and 2007, there was a 46 percent increase in manufacturing labour productivity. This is large compared to the economy-wide productivity growth of less than 20 percent over the same period. Europe’s industry also appears to have been able to exploit well the opportunities offered by globalisation and the integration of emerging economies. EU exports have expanded by an annual 4.7 percent between 2000 and 2008. Despite ever-intense international competition, European trade performance has held up notably well compared with the US and the Japanese performance.\(^3\)

The recent economic crisis has hit European manufacturing hard. It has caused a 15.5 percent fall in output in 2008-2009 with more than three million jobs lost. Besides plummeting demand manufacturing has to face ever stronger global competition from high-tech regions (USA, Japan, Korea) as well as emerging mass producers (Brazil, Russia, China, India), countries that heavily invest in high-tech industries. This increasingly competitive environment has led to a decline in the market position of European manufacturing in fast-growing sectors. For example, whilst in 2004 Europe had held five of the top ten positions in the manufacturing of photovoltaics, by 2010 only one European company had remained in the top ten market ranking.\(^4\) In the last 15 months only the Chinese government had provided USD 34 billion of subsidised loans to local-based solar producers. By comparison, in 2010 the EIB had lent EUR 6 billion to the entire renewable energy sector. Similar tendencies are visible in other key industries, such as semiconductor manufacturing and lithium battery production.\(^5\)

![Figure 2: EU manufacturing jobs (in million)](image-url)

3 EU Manufacturing Industry: What are the Challenges and Opportunities for the Coming Years?, 2nd High-level Conference on Industrial Competitiveness, Brussels, 26 April 2010, European Commission, DG Enterprise and Industry
4 valued USD 480 billion by 2015 (together with other photonics products)
The crisis-caused shrinkage of financial sources has had a serious impact on small and medium enterprises (SMEs) and innovative companies. More than 99.5% of European manufacturing enterprises are small or medium sized. These SMEs play a key role. Before the crisis SMEs had contributed directly to 45 percent of the value added and 59 percent of employment, despite the fact that their labour productivity (gross value-added at factory cost per occupied person) is less than the productivity of large companies\(^6\).

Environmental issues have challenged manufacturers also. Europe has adopted a “Climate Action and Renewable Energy Plan” with targets to save 20 percent of energy consumption through energy efficiency, to increase to 20 percent the share of renewable energy use and to reduce by 20 percent the emission of greenhouse gases.

Also, consumer habits change quickly. Consumers have become more and more environment conscious. Demand has evolved towards greener, more customised and higher quality products, which force producers to apply more sustainable technologies.

The industry, in particular SMEs, needs to adapt to this complex competitive pressure by improving the technological base of production. Recognising this, the European Commission has launched the public-private partnership initiative “Factories of the Future” as a part of the European Economic Recovery Plan by promoting research, development and innovation activities in manufacturing. ICT is explicitly mentioned as a key tool to make European manufacturing capable to produce greener, more customised and higher quality products with lower waste generation and energy consumption. The ICT contribution to the Factories of the Future in the period 2010-2013 amounts to EUR 245 million and aims at improving the efficiency, adaptability and sustainability of manufacturing systems, their better integration within business processes as well as in providing manufacturing solutions for new innovative products.

\(^6\) See footnote 3
After two calls, in 2009 and 2010, the portfolio of ICT projects today counts 26 projects and a total of EUR 115 million in committed public funds. Judging by the selected projects, the Factories of the Future initiative appears to have successfully attracted the interest of industry as shown in Figures 3 and 4 below. SME participation is also significantly higher than the average ICT FP7 participation.

Figure 3: Types of organisations participating in projects selected from the 2009 Call (in terms of funding and in terms of number of participations)

Figure 4: Types of organisations participating in projects selected from the 2010 Call (in terms of funding and in terms of number of participations)
Projects from the 2009 Call were launched in 2010. Projects from the 2010 Call were launched in 2011.
Smart Factories – Call 2009

Agile manufacturing and customization including process automation control, simulation and optimization technologies, robotics, and tools for sustainable manufacturing
**Summary**

Today’s major challenges for manufacturing companies in the aerospace and automotive industries are clear: global cooperation with multiple supply chain partners, production optimisation, management and tracking of information so as to meet new requirements in terms of traceability, security and sustainability.

The four-year project titled FoFdation envisions a “Digital and Smart Factory” architecture and implementation. This has the potential to achieve significant benefits in earlier visibility of manufacturing issues, faster production ramp-up time, faster time to volume production and subsequently shorter time to market, reduced manufacturing costs and improved product quality, as well as sustainability objectives like low energy consumption and waste reduction.

These benefits will be achieved by meeting the five objectives which jointly compose the foundation of the “Factory of the Future”:

- End-to-end digitization of the product, process and machine resources
- Development of a “Smart Machine Controller” (SMC) concept, including an extended “Supervisory Control and Acquisition Data System” for monitoring the process performance and the energy efficiency.
- Realization of a ‘Smart Manufacturing Optimizer’ (SMO) using the virtual product information from CAD/PLM and the real machine and on-line process information to adapt process control information to achieve optimal process results.
- Extension of MES systems to a ‘Smart Manufacturing Execution System’ (SMES) by supporting resource efficiency and sustainability goals and interfacing with ‘Enterprise Resource Planning’ (ERP) systems

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<td><strong>Swiss Federal Institute of Technology Zurich</strong>, Switzerland</td>
<td><strong>ARTIS GmbH</strong>, Germany</td>
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<td><strong>CENTRO RICERCHI FIAT S.C.p.A.</strong>, Italy</td>
<td><strong>ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE</strong>, Switzerland</td>
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<td><strong>DELCAM PLC</strong>, United Kingdom</td>
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Compilation of all information into a common dashboard towards the “production-to-enterprise” asset integration and overall sustainability management

In short, the project will extend existing information processing systems by enriching information about product data, machine tools, tools and processes and process monitoring information fed back to the overall manufacturing information systems.

Starting Date: 1 June 2010  
Duration: 48 months  
Total costs: 9,855,009 €  
EC funding: 6,659,910 €

Coordinator:  
Dr Jean-Bernard HENTZ  
Airbus Operations SAS  
IDAS - Standardisation and Backbone Qualification  
ROUTE DE BAYONNE 316  
31060 Toulouse  
France

Phone: +33 561181349  
Fax: +33 561930442  
Email: jean-bernard.hentz@airbus.com  
Website: http://www.fofdation-project.eu

Ready for creating the Foundation for the Smart Factory of the Future
PlantCockpit 260018
Production Logistics and Sustainability Cockpit

Partners

SAP AG, Germany
ACCIONA INFRAESTRUCTURAS S.A., Spain
BAYERISCHE MOTOREN WERKE AG, Germany
COMAU SPA, Italy
DOEHLER, Netherlands
ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE EPFL, Switzerland
TECNALIA, Spain
ICONICS Europe B.V., Netherlands
INTEL PERFORMANCE LEARNING SOLUTIONS, Ireland
POLITECNICO DI MILANO, Italy
TECHNISCHE UNIVERSITAET DRESDEN TUD, Germany
TTY-SAATIO, Finland

Summary

Today, numerous methods, systems, and tools exist to facilitate production management, optimise resource utilisation, and process efficiency. With the growing focus on sustainability, complexity grows even further as production supervisors have to manage energy and material consumption, the carbon footprint, and waste output in addition to classical key performance indicators (KPIs) such as process efficiency, asset utilisation, quality, scrap rate, and costs. Efforts to find the optimum for yield, quality, speed or energy consumption individually often result in local optima, far from the ideal solution. The project targets a tight integration of existing legacy ERP (Enterprise Resource Planning) systems, MES (Manufacturing Execution Systems), SCADA (Supervisory Control and Data Acquisition), and special-purpose solutions that provide the needed visibility and process integration to recognise the potential of and to optimise intra-logistics processes with respect to yield, quality, energy consumption, or waste.

The project’s vision is to offer manufacturers the “Production Logistics and Sustainability Cockpit” (PLANTCockpit) as a central environment for monitoring and control of all intra-logistic processes. It will give production supervisors, foremen, and line managers the required visibility to make well-informed decisions for the optimisation of plant processes. PLANTCockpit will further provide a model for integrating heterogeneous shop floor management systems including ERP, MES, SCADA, condition-based maintenance, energy management, and other special purpose systems.

PLANTCockpit will focus on defining standard interfaces and a reference model for integrating the most prominent manufacturing processes. Current shop floor integration standards such as ISA 95, OAGIS, OPC Unified Architecture, MTConnect will be used as starting points.
The consortium includes world-leading system providers (INTEL, SAP), technology leaders (Iconics), strong academic partners (EPFL, TECNALIA, POLIMI, TUD, TUT), and high-profile end-users (ACCIONA, BMW, COMAU, DOELHER).

**Starting Date:** 1 September 2010

**Duration:** 36 months

**Total costs:** 12,711,558 €

**EC funding:** 7,979,682 €

---

**Coordinator:**

Dr. Volodymyr VASYUTYNKYY

SAP Research Dresden

SAP AG

Chemnitzer Straße 48

01187 Dresden

Germany

Phone: +49 35148116159

Fax: +49 62277856171

Email: volodymyr.vasyutynskyy@sap.com

Website: [http://www.plantcockpit.eu](http://www.plantcockpit.eu)
QCOALA 260153
Quality Control of Aluminium Laser-welded Assemblies

Summary

The QCOALA project will develop a new dual-wavelength laser processing system for welding thin-gauge aluminium and copper, 0.1mm to 1.0mm in thickness, with integrated process monitoring and in-line non-destructive inspection, and establish its capability to provide a reliable, high-speed, low-cost and high-quality joining solution for electric car battery and thin-film photovoltaic (PV) cell interconnections. Through fully integrated process ICT and Statistical Process Control (SPC), 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 throughput, for both these high-in-demand applications. This project will help the beneficiaries, with expertise in the constituent components of the new system, to increase their annual turnover between 15 and 25%, their productivity between 50% and 100% and their yield between 2 and 10%.

The new laser processing system will be based on a pulsed platform, capable of laser pulses in the range of μs to ms and pulse energies of up to (tens of) Joules, and capable of generating both the near-IR and green wavelength through a dual-wavelength beam scanner. Real-time temporal pulse control will be developed to allow closed-loop control of the monitored process. The fully-integrated system will produce 100% inspection rate, 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, environmental-friendly and agile manufacturing, through the feedback of in-line-monitoring and inspection information into the production line, allowing process control, continuous quality improvement and waste reduction. Whereas the concept of the project is aimed at
smarter and more energy-efficient manufacturing, the applications that are addressed in the project fall are categorised in the 'green' alternative energy market.

**Starting Date:** 1 September 2010  
**Duration:** 36 months  
**Total costs:** 3,926,091 €  
**EC funding:** 2,627,239 €

**Coordinator:**  
Miss Paola De Bono  
TWI Ltd  
Granta Park  
Great Abingdon  
Cambridge CB21 6AL  
United Kingdom

Phone: +44 1223 899000  
Fax: +44 1223892588  
Email: paola.debono@twi.co.uk  
Website: [http://www.qcoala.eu/work_packages/index.jsp](http://www.qcoala.eu/work_packages/index.jsp)
ActionPlanT 258617
European Forum for ICT in Factories of the Future

Partners

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<tr>
<th>SAP AG, Germany</th>
<th>EPFL, Switzerland</th>
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<td>Dassault Systemes DELMIA, France</td>
<td>University of PATRAS-LMS, Greece</td>
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<tr>
<td>Fraunhofer-IPK, Germany</td>
<td>Politecnico di Milano, Italy</td>
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<tr>
<td>TECNALIA, Spain</td>
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Summary

ICT plays a multifaceted role in all major European industrial sectors and its contribution to the manufacturing sector has become paramount over the last few years. Quite undeniably, ICT will become increasingly intertwined with Factories of the Future and will be seen developing efficient business processes through dynamically evolving business models.

For Europe to hold on to its global leadership and excellence in manufacturing, it is imperative that improvements at both the technological and the awareness level are made for ICT-enabled manufacturing processes. This can be done only through a thorough analysis which will help understand the fundamental driving factors of the future manufacturing landscape - both in terms of quantifiable factors such as technology as well as of other more qualitative factors such as politics, environment, and societal needs. ActionPlanT is set out to address the improvement in this respect of the short, medium and long term role of ICT in the manufacturing industry.

The two main activities of ActionPlanT are:

- Establishing a vision for the role of ICT in manufacturing of the future, in cooperation with the European Commission. ActionPlanT also liaises with EFFRA, the Factories of the Future Research Association, as a key industry representing body. ActionPlanT activities include the development of a roadmap to prioritize most promising topics for the next Framework Programme for Research and Innovation (‘Horizon 2020’, covering the period 2014-2020).

- Developing and validating a concept for industrial learning, extensively piloted via Industrial Learning Pilot Events (ILPEs) and workshops amongst stakeholders in industry, academia, and the European technology platforms alike. The related activities include the development of an IL model and methodology, their testing and evaluation through the organization of ILPEs and workshops, and the dissemination of the validated results to reach a wider audience among European manufacturing workers.
Starting date: 1 June 2010
Duration: 24 months
Total costs: 2,103,623 €
EC funding: 1,499,964 €

Coordinator:
Dr. Anirban MAJUMDAR
SAP Research Dresden
SAP AG
Chernnitzer Str. 48
D-01187 Dresden
Germany

Phone: +49 351 4811-6163
Fax: +49 6227 78-53103
Email: anirban.majumdar@sap.com
Website: http://www.actionplant-project.eu
KAP 260111
Knowledge, Awareness and Prediction of Man, Machine, Material and Method in Manufacturing

Partners

| SAP AG, Germany          | FUNDACION LEIA CENTRO DE DESARROLLO TECNOLOGICO, Spain |
| ATOS ORIGIN SOCIEDAD ANONIMA ESPANOLA, Spain | UNIVERSITY OF PATRAS, Greece |
| EUROPAISCHES MICROSOFT INNOVATIONS CENTER GMBH, Germany | MISSLER SOFTWARE, France |
| DE MONTFORT UNIVERSITY, United Kingdom | NISSAN MOTOR IBERICA SA, Spain |
| INFINEON TECHNOLOGIES DRESDEN GMBH UND CO OHG, Germany | TECHNISCHE UNIVERSITAT BERLIN, Germany |
| INTEL PERFORMANCE LEARNING SOLUTIONS LIMITED, Ireland | UNIVERSITA DEGLI STUDI DI TRENTO, Italy |
|                         | VOLVO TECHNOLOGY AB, Sweden |
|                         | OPTITIVE SL, Spain |

Summary

Manufacturing is the driving force of Europe’s economy, providing over € 6,553 billion in GDP. However, against a background of climate change legislation, volatile energy prices and increased environmental awareness, modern manufacturing must encompass a focus on eco-efficiency. Given the current economic situation, this must be achieved without the need for large capital expenditure. Adding information technology to an already existing production facility is a cost-effective investment. The KAP project will deliver energy management standards and a technology framework for next-generation, sustainable manufacturing. KAP stands for Knowledge of past performance, combined with Awareness of the present state, which together can support Prediction of future outcomes. This philosophy forms the basis of a framework that will enable every existing resource to be used as efficiently as possible through the effective co-ordination of man, machine, material and method. To achieve this goal the project will define a range of sustainable manufacturing standards. Measurements will be gathered through a factory-wide network of sensors. Complex Event Processing (CEP) and data stream analysis will compute on-the-fly production performance indicators (PPIs) for real-time monitoring. Data mining in combination with OLAP will support problem diagnosis and resolution.

Computational learning techniques will create a self-improving system for operational control. The inclusion of energy management makes the interpretation of system data an even greater challenge. Perceptually efficient visualisations will communicate PPI’s to decision makers in a format that will reduce cognitive workload and improve situation awareness.
well-balanced consortium of research centres, academic and industry partners provides an ideal opportunity to realise the innovations proposed by the project. In terms of impact, partners estimate reductions of over 5% p.a. in waste and energy and 10% in time to market.

**Starting date:** 1 September 2010  
**Duration:** 36 months  
**Total costs:** 12,827,466 €  
**EC funding:** 7,545,000 €

**Coordinator:**
Mr. Raik HARTUNG  
SAP Research Dresden  
SAP AG  
Chemnitzer Straße 48  
01187 Dresden  
Germany

Phone: +49 35148116164  
Fax: +49 62277843604  
Email: raik.hartung@sap.com  
Website: [http://www.kap-project.eu](http://www.kap-project.eu)
Summary

With more than 26,000 companies and almost 400,000 employees, the footwear industry is still relevant in Europe. However, the trend shows a clear decline in business figures; low cost countries are becoming an obvious threat for the future of the sector.

Fashion footwear production is currently mainly handcrafted. Some manufacturing processes are assisted by specialized machinery and there exist highly automated lines in mass production of technical shoes (i.e. safety footwear). But most production is still handmade, being especially true in the case of high added value shoes production, where Europe maintains its leadership.

The introduction of intelligent robotics will contribute to overcome the complexity in the automation of the processes and contribute to European Footwear competitiveness.

To achieve this objective the consortium aims to research and develop:

- New manipulation strategies and devices for rigid and non-rigid parts that allow manufacturing and packaging shoes without damaging them;
- Off-line and sensor-based programming tools;
- Sensor-based robot trajectory adaptation and generation, in particular force control and visual servoing;
- The re-design of a set of shoe production processes for robot-assisted manufacturing and assembly, such as roughing, gluing, last milling, inking, polishing, visual inspection and packaging.

The project will further address those operations that are most suitable for short-to-medium term introduction of robotics in this sector. They will be used in three prototypes that will be scheduled throughout the 30-month duration of the project in such a way that, from the beginning, the footwear industry becomes aware of potential applications and the benefits of robotics.
Starting Date: 1 September 2010
Duration: 30 months
Total costs: 3,685,073 €
EC funding: 2,559,540 €

Coordinator:
Mr Iñaki MAURTUA
Fundacion Tekniker
Avenida Otaola 20
20600 Eibar Guipuzcoa
Spain
Phone: +34 943206744
Fax: +34 943202757
Email: imaurtua@tekniker.es
Website: http://www.robofoot.eu
TAPAS 260026
Robotics-enabled Logistics and Assistive Services for the Transformable Factory of the Future

Partners

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Summary

Today's automation and logistics paradigms make it difficult, time consuming, and costly to change the type of the product manufactured and to scale the production up-and-down in response to market volatility. Consequently, and with the increasing market uncertainties, it becomes more and more difficult to justify new automation lines. To keep production in Europe instead of shifting it to low-wage countries, this project will break new ground in robot-based automation and logistics as the backbone of a transformable factory of the future, enabling an economic production regardless of changes in volumes and product type.

TAPAS aims to pioneer the following tasks in real production environments: mobile robots with manipulation arms will make logistic tasks more flexible and more complete by not only transporting, but by also collecting the parts needed and delivering them right to the place where they are needed. Since moving parts around the shop floor does not create value by itself, TAPAS robots go even beyond: they will automate assistive tasks that naturally extend the logistic tasks, such as preparatory and post-processing work, e.g., pre-assembly or machine tending with inherent quality control. Through this additional creation of value and by a faster adaptation to changes with new levels of robustness, availability, and completeness of jobs TAPAS promises to yield an earlier return of investment.

To reach the objectives, the TAPAS consortium will iteratively test and validate the developments with two pilot installations of increasing complexity and scale. The drivers behind TAPAS are a robot manufacturer and a system integrator, providing both their production environments for intensive testing and validation, and a software technology provider. Teaming up with three excellent research partners they will develop logistic and assistive robotic solutions for transformable automation that are generally applicable and scalable.
Starting Date: 1 October 2010
Duration: 42 months
Total costs: 5,179,257 €
EC Funding: 3,400,000 €

Coordinator:
Dr. Rainer BISCHOFF
KUKA Laboratories GmbH
Zugspitzstrasse 140
86165 Augsburg
Germany
Phone: +49 821 797 3244
Fax: +49 821 797 413244
Email: Rainer.Bischoff@kuka.com
Website: http://www.tapas-project.eu
CUSTOMPACKER 260065
Highly Customisable and Flexible Packaging Station for Mid- to Upper-sized Electronic Consumer Goods Using Industrial Robots

Summary

The project aims at developing and integrating a scalable and flexible packaging assistant that aids human workers while packaging mid- to upper-sized and mostly heavy goods. Electronic consumer goods, e.g. TV sets, have a large number of variants and are packaged manually. Only in single-variant production lines with high lot sizes, automation of the packaging step has been introduced. However, automating the packaging process will decrease the production cycle time and costs also for mixed variant production lines, thus allowing that several production lines can be merged to a reduced number of flexible packaging stations. This also allows optimisation with regard to the actual demands of the various goods (i.e. number of items produced per day).

To achieve the realisation of these challenging goals for a highly flexible packaging station, CustomPacker will bring together the highly adaptable skills of a human worker with the precision and ability of robots to carry heavy goods. The main goal of CustomPacker is to design and assemble a packaging workstation mostly using standard hardware components resulting in a universal handling system for different products. Ideally one setup for packaging a high variety of products and components can be implemented, which can be achieved by a teachable system architecture. This will open a new dimension in how industrial robots are deployed today, namely the collaboration of human workers with robot co-workers. Only by driving reliability and precision of today’s available technology to the limit and by additionally forcing the use of highly sophisticated software modules for worker detection and intention recognition, the cycle times can be reduced to justify the investment costs for additional complexity.

Partners

| TECHNISCHE UNIVERSITAET MUEENCHEN, Germany |
| FERROBOTICS COMPLIANT ROBOT TECHNOLOGY GMBH, Austria |
| LOEWE OPTA GMBH, Germany |
| PROFATOR GMBH, Austria |
| VALTION TEKNILLINEN TUTKIMUSKESKUS, Finland |
| FUNDACION TEKNIKER, Spain |
| MRK-SYSTEME GMBH, Germany |
Starting Date: 1 July 2010
Duration: 36 months
Total costs: 3,812,766 €
EC Funding: 2,615,000 €

Coordinator:
Dr. Frank WALLHOFF
Institute for Human-Machine Communication
Technical University of Munich
Building N1, Room 151
Theresienstrasse 90
80333 München
Germany

Phone: +49 8928927534
Fax: + 49 8928928535
Email: wallhoff@tum.de
Website: http://www.custompacker.eu
3 Virtual Factories
Call 2010

Value creation from global networked operations including global supply chain management, product-service linkage and management of distributed manufacturing assets
For centuries mankind has attempted to exploit the resources available to it through the reuse of objects and artifacts. However, as wealth of modern man has grown, the financial necessity to utilize the lifetime of these objects has dramatically declined, especially in developed countries with high focus on manufacturing. The demand for new products 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. As this activity provides profitability whilst reducing land-filling and usage of virgin material, it is a financially viable as well as a sustainable business concept. One of the key issues deterring the uptake of remanufacturing is the information gap which is created when products leave the 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 has used it, repaired it, and replaced components. 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 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.
Starting Date: 1 September 2011
Duration: 36 months
Total costs: 5,887,743€
EC Funding: 3,944,550€

Coordinator:
Dr. Anirban MAJUMDAR
SAP Research Dresden
SAP AG
Chemnitzer Str. 48
D-01187 Dresden
Germany

Phone: +49 351 4811-6163
Fax: +49 6227 78-53103
Email: anirban.majumdar@sap.com
Website: http://www.premanus.eu
Summary

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 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. The Consortium, composed by seven Partners skilled in international collaboration, is well balanced in expertises between technology developers and final users. Boosted by VENIS results, the involved Enterprises expect to improve their competitive edge in joint projects, by receiving a significant advantage in their business.
**Starting Date:** 1 September 2011  
**Duration:** 30 months  
**Total costs:** 1,596,778€  
**EC Funding:** 1,262,991€

**Coordinator:**
Mr. Marco Alessi  
ENGINEERING INGEGNERIA INFORMATICA Italy  
Viale Regione Siciliana Nord Ovest, 7275  
90146 Palermo, Italy  
Phone: +39 3492522309  
Fax: +39 091 7511720  
Email: marco.alessi@eng.it  
Website: [http://www.venis-project.eu](http://www.venis-project.eu)
GloNet 285273
Glocal enterprise network focusing on customer-centric collaboration

Partners

| CAS SOFTWARE AG, Germany       | STEINBEIS GMBH & CO. KG FUER TECHNOLOGIETRANSFER, Germany |
| UNINOVA - INSTITUTO DE DESENVOLVIMENTO DE NOVAS TECNOLOGIAS, Portugal | SKILL ESTRATEGIA, S.L. Spain |
| UNIVERSITEIT VAN AMSTERDAM, Netherlands | KOMIX S.R.O., Czech Republic |
| IPLON GMBH THE INFRANET COMPANY, Germany | PROLON CONTROL SYSTEMS, Denmark |

Summary

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). 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.
**Starting Date:** 1 September 2011  
**Duration:** 36 months  
**Total costs:** 3,676,391€  
**EC Funding:** 2,618,000€

**Coordinator:**  
Ms. Susanne Imhof  
CAS SOFTWARE AG Germany  
Innovation & Business Design  
Wilhelm Schickard Strasse, 10-12  
76131 Karlsruhe  
Germany

Phone: +49 7219638748  
Fax: +49 72196383748  
Email: susanne.imhof@cas.de  
Website: [https://sites.google.com/site/glonetproject/home-1](https://sites.google.com/site/glonetproject/home-1)
There are limited tools and technologies which provide reliable end-to-end cross partner interoperability of ICT systems in the manufacturing domain that easily fuse dispersed assets such as processes, information, status and other resources. In order to cope with the demand for flexible and fast-paced business innovation, there is a need for an integrated 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 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. ADVENTURE consortium is experienced, geographically wide, and represents a spectrum of organisations being composed of Universität Darmstadt (DE & Coord), research organisations INESC (PT), U.Vaasa (FI), U.Vienna (AT) and companies Ascora (DE), TIE (NL), ISOFT (BG), TANET (UK), AZEV (PT) and ABB (FI) of which most are SMEs. The partners provide world leading expertise in SOA, Cloud, the Internet of Thing, eBusiness/eCommerce, Interoperability, industrial engineering, complex supply chains, workflow, flexible process management, semantics, and virtualised Infrastructures, SME manufacturing & collaboration, Quality Management and measurement Systems.
Starting Date: 1 September 2011
Duration: 36 months
Total costs: 3,623,613€
EC Funding: 2,807,000€

Coordinator:
Prof. Ralf Steinmetz
Technische Universität Darmstadt
Multimedia Communications Lab
Rundeturmstraße, 10
64283 Darmstadt
Germany

Phone: +49 6151166150
Fax: +49 6151166152
Email: stefan.goebel@kom.tu-darmstadt.de
Website: http://www.fp7-adventure.eu
BIVEE 2857467
Business Innovation and Virtual Enterprise Environment

Summary
EU needs an effective exit strategy from crisis: to this end innovation is a key issue for the EU industrial system. Innovation is a complex issue, requiring both special expertise and a large amount of knowledge. I.e., domain knowledge (on the industry sector), but also knowledge on technology, business models, finances, markets, etc. Innovation is not an easily job for a single enterprise, then 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 virtual enterprise 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 it, where a plethora of elements move fast and often unexpectedly (i.e., 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 the VE production, and of the Virtual Innovation Factory that produces innovation and manages its introduction in the VE. The work plan of BIVEE emphasizes the impact achievement. To this end it has been based on two different trial applications (in furniture and high tech equipments, respectively), both organised in two major trial phases: Phase1 for monitoring the course of production before the introduction of BIVEE environment and Phase2 where the VE achievements are assessed having the BIVEE environment in place.

The two trial cases are quite different, to prove the flexibility and adoptability of BIVEE. To achieve the
objective goals we organised a strong industry-driven consortium, having 7 industrial and 3 research partners

**Starting Date:** 1 September 2011  
**Duration:** 36 months  
**Total costs:** 4,268,054€  
**EC Funding:** 2,989,000€

Coordinator:
Mr. Stefano De Panfilis  
ENGINEERING – INGEGNERIA INFORMATICA SPA  
Via Riccardo Morandi, 32  
00148 Roma  
Italy  
Phone: +39-068307-4295  
Fax: +39-068307-4200  
Email: stefano.depanfilis@eng.it  
Website: http://research.loccioni.com/index.php/projects/bivee
Innovative End-to-end Management of Dynamic Manufacturing Networks

Summary

Effective end-to-end management of dynamic manufacturing networks is consistently touted as a top priority for manufacturing enterprises that need to 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, and self-organisation 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 OEMs) that jointly conduct multi-party manufacturing. The project will implement a novel comprehensive methodology for the management of dynamic manufacturing networks that provides consolidated and coordinated view of information from various manufacturing sources and systems and enables service-enhanced product and production lifecycle and responsive manufacturing processes throughout the value chain. Living Labs in major industrial sectors will drive the implementation, testing, evaluation and dissemination of the IMAGINE methodology and supporting ICT platform. The IMAGINE manufacturing model is an innovative plug and produce approach that implements an end-to-end...
manufacturing interoperability solution. The IMAGINE solution is market-oriented with 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 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.

**Coordinator:**
Dr. Antonis Ramfos
INTRASOFT INTERNATIONAL SA
Rue Nicolas Bové 2b
1253 Luxembourg

Phone: +352 441012000
Fax: +352 441012359
Email: antonis.ramfos@intrasoft-intl.com
Website: [http://www.imagine-futurefactory.eu/index.dlg](http://www.imagine-futurefactory.eu/index.dlg)

**Starting Date:** 1 September 2011
**Duration:** 36 months
**Total costs:** 10,670,093€
**EC Funding:** 7,537,000€
Summary

With ComVantage we envision an interorganisational collaboration space turning today’s organisation-centric manufacturing approach into a product-centric 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. It will allow to share, administrate and monitor focused information throughout a product’s life cycle in a de-centralised manner. The close collaboration on the B2B and B2C levels will foster existing trends such as Open Innovation or Crowd Sourcing. 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 de-centralised 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 trustful mobile apps shall support users in fast decision making and problem solving. Information from different sources across the organisations is 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 the European industry. The utilisation of existing technologies, a close user approach, and an incremental project set-up will provide sound concepts ready for fast productisation. Thus implementing ComVantage will increase lean communication, agile and highly efficient production processes, cost control and a low carbon footprint.
Starting Date: 1 September 2011
Duration: 36 months
Total costs: 10,941,334€
EC Funding: 7,339,000€

Coordinator:
Dr. Angelika SALMEN
SAP AG
SAP Research Dresden
Chemnitzer Strasse 48
01187 Dresden
Germany

Phone: +49 351 4811 6217
Fax: +49 6227 78 53483
Email: angelika.salmen@sap.com
Website: http://www.comvantage.eu
VISION: “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; 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.

The synthesis of the two Grand Challenges above in industrial business scenarios and their full adoption in some 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; 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.

**Starting Date:** 1 October 2011  
**Duration:** 36 months  
**Total costs:** 15,206,520€  
**EC Funding:** 9,870,000€

**Coordinator:**  
Mr. Sergio Gusmeroli  
TXT e-Solutions Research Labs  
Via Frigia 27,  
20126 Milano (Italy)  
Phone: +39 02 25771310  
Fax: +39 02 2578994  
Email: sergio.gusmeroli@txt.it  
Website: [http://www.research.softeco.it/msee.aspx](http://www.research.softeco.it/msee.aspx)
EPES 285093

Eco-process engineering system for composition of services to optimize product life-cycle

Summary

The project will develop a novel Eco Process Engineering System (EPES), which will constitute a comprehensive platform enabling a dynamic composition of services adaptable to the different products and operating conditions, supporting the Product Service System concept.

It will consist of a set of ICT tools supported by a methodology aiming to, on the one hand, an easy configuration/adaptation of new services and, on the other hand, storing and reusing the apprehended knowledge in order to improve the services and develop new ones with the objectives of achieving a continuous improvement of products in operation along its life cycle and applying best up to date technologies for both end of life disposal of the products and for improving future product designs.

The set of ICT tools and the methodology along with the working handbook will enable the manufacturing companies to enter into a continuous process of upgrading their products along their life cycle within the frame of the Virtual Factory and Product Service System 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 as reliability, availability, maintainability, costs, productivity, quality, energy efficiency, etc. This novel 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 capabilities resulting from the research will enable the capitalisation on trustable global and local sustainability intelligence. Product engineering teams can exploit this intelligence to adapt design, operation and disposal strategies through managed “eco-constraints” relevant to their market contexts.

Partners

| FUNDACION TECNALIA RESEARCH & INNOVATION, Spain | VALTION TEKNIILINEN TUTKIMUSKESKUS, Finland |
| INSTITUT FÜR ANGEWANDTE SYSTEMTECHNIK BREMEN GMBH, Germany | ESTECO - ENGIN SOFT TECNOLOGIE PER L'OTTIMIZZAZIONE SRL, Italy |
| SISTEPLAN SL, Spain | GRUPO TAMOIN, Spain |
| EADS UK Ltd., United Kingdom | BOSCH REXROTH AG, Germany |
Starting Date: 1 September 2011
Duration: 36 months
Total costs: 5,558,200€
EC Funding: 3,836,000€

Coordinator:
Dr Mikel Sorli (Product Manager)
FUNDACION TECNALIA RESEARCH & INNOVATION
Innovation Systems Unit
Parque Tecnológico de Bizkaia, Laida Bidea, Edificio 204, N/A
48170 Derio
Spain
Phone: +34 946430850
Fax: +34 946460900
E-mail: mikel.sorli@tecnalia.com
Website: http://www.fines-cluster.eu/fines/jm/FinES-Private-Information/epes.html
EXTREMEFACTORIES 285164

Internet-based platform implementing agile management methods for enabling the set-up, monitoring and follow-up of business innovation processes in industrial SMEs

Partners

INNOPOLE S.L., Spain
INSTITUT FÜR ANGEWANDTE SYSTEMTECHNIK BREMEN GMBH, Germany
CENTRE FOR FACTORIES OF THE FUTURE LIMITED, United Kingdom
VAIBMU LTD., Finland
SAFEVIEW SL, Spain
NIKARI OY, Finland

INNOPOLE S.L., Spain
FABRICACIONES METÁLICAS MORENO S.A., Spain
OAS AKTIENGESELLSCHAFT, Germany
ARMBRUSTER ENGINEERING GMBH & CO. KG, Germany
MB AIR SYSTEMS LIMITED, United Kingdom
CHARLES ROBINSON (CUTTING TOOLS), United Kingdom

Summary

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 arisen 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 ExtremeFactoriesN 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 the SMEs with services to support them in any step of the innovation life-cycle (problem detection, inception of ideas, prioritization of ideas, implementation and follow-up). The project has a strong industrial basis, putting together the efforts of 7 industrial manufacturing SMEs in the way to become virtual networked organizations by the way they handle their relationships to third parties, such as customers, suppliers, distributors, etc. This big effort will result in a methodology and platform that 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.

**Starting Date:** 1 September 2011  
**Duration:** 36 months  
**Total costs:** 3,189,117€  
**EC Funding:** 2,448,343€

**Coordinator:**  
Mr. Fernando Ubieta  
INNOPOLE Management  
AVENIDA DE PARIS 10  
45111 COBISA TOLEDO  
Spain  
Phone: +34 925283665  
Email: fubieta@innopole.net  
Website: http://www.extremefactories.eu
4 Digital Factories Call 2010

Towards a better understanding of manufacturing and design for better product life cycle management including simulation, modelling and knowledge management from product conception to production, including a product’s after-sales, maintenance and end-of-life operations
Summary

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 service as an enabler for future energy efficient smart factories. RLW is emerging as a promising joining technology for sheet metal assembly due to benefits on several fronts including reduced processing time, (50-75%) and 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. The 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. Firstly, 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. Secondly, 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. Finally the project will develop systematic evaluation and learning methods to assess and improve the overall performance, cost-effectiveness and eco-efficiency of the RLW system.
**Starting Date:** 1 January 2012  
**Duration:** 36 months  
**Total costs:** 6,687,036€  
**EC Funding:** 3,979,984€

**Coordinator:**  
Prof. Darek Ceglarek  
University of Warwick  
Research Support Services  
Kirby Corner Road-University House  
Coventry, CV4 8UW  
Phone: +44 2476523716  
Fax: +44 2476524991  
Email: d.j.ceglarek@warwick.ac.uk  
In all industrial sectors, Non Destructive Evaluation techniques play a critical role for ensuring 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 costs reduction, enhanced diagnosis reliability and consequently increased competitiveness. Today strong industrial needs exist 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 on challenging modelling of material features, complex geometries of parts and complex defects. The models will be i) based on multi-scale and multi-physics approach, ii) capable to exchange data with CAD design software, mechanical codes, 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. SIMPOSIUM, will have significant impacts
at the different stages of NDE practice: Design and implementation of emerging NDE techniques, reliability assessment and performance demonstration, 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. Last it will confirm the leading position of Europe in the field of NDE simulation.

**Starting Date:** 1 September 2011  
**Duration:** 36 months  
**Total costs:** 5,991,630€  
**EC Funding:** 4,250,554€

**Coordinator:**  
Dr. Catherine GILLES-PASCAUD  
COMMISSARIAT À L’ÉNERGIE ATOMIQUE ET AUX ÉNERGIES ALTERNATIVES  
CEA LIST / DISC  
CEA de SACLAY - LIST/DISC - Bât. 611 - Point courrier 120  
Gif-sur-Yvette Cedex  
91191  
France

Phone: +33 169086429  
Fax: +33 169087597  
Email: catherine.gilles-pascaud@cea.fr  
Website: http://www.simposium.eu
Towards Enhanced Integration of Design and Production in the Factory of the Future through Isogeometric Technologies

Summary

The project aims at significant improvement of 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, aircraft) and for computer-aided machining. Computer Aided Design and numerical simulation algorithms are vital technologies in modern product development, yet they are today far from 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 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.
Starting Date: 1 September 2011
Duration: 36 months
Total costs: 5,213,450€
EC Funding: 3,496,000€

Coordinator:
Dr. Tor Dokken, (Chief Scientist)
STIFTELSEN SINTEF
P.O. Box 124
Blindern
N-0314 Oslo
Norway

Phone: +47 22067661
Fax: +47 22067350
Email: Tor.Dokken@sintef.no
Website: http://www.terrific-project.eu
**Summary**

The FFD project (targeting the Objective FoF-ICT-20111.7.4, focusing on target 7.4b and partly addressing 7.4c) aims to remove the main factors inhibiting the wide adoption of Virtual Prototyping (VP) by the Textile and Clothing companies (TCI), by drastically improving the speed of obtaining realistic garment simulations (development of massively parallel simulation techniques based on multi-core computing), the accuracy (simulation from yarn - to fabric - to garment, virtual garment close to real sample) and the functional integration aspects (Collaborative Prototyping offered as a SaaS platform).

The new business model will offer drastic improvements in product development efficiency (reduced number of physical samples from 20% to 100%, time-to-market reduced by 3 weeks, 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. A just-right Consortium of 6 organisations:

A leading European Institute (Fraunhofer-IGD) as Coordinator (will develop the massively parallel simulation engine), Assyst (apparel CAD) and ScotCad (fabric CAD) already offering state-of-the-art 3D VP solutions will work on improving simulation accuracy (from yarn to garment), ATC an ICT company with expertise in web integration based on the SOA model will develop a Collaborative Design and Prototyping platform (CPD), and two end-users (Piacenza-manufacturer of fine woollen fabrics and Consitex, the garment manufacturing member of the Ermenegildo Zegna Group) will integrate the innovative VP platform in their joint product development processes and will demonstrate/ evaluate it’s efficiency and impact. Various exploitation schemes will be adopted (new packaged VP fabric and garment solutions, integrated fabric-garment design and VP offer, joint exploitation of the Software as a Service CPD platform. The project duration is 36 months.
**Starting Date:** 1 October 2011  
**Duration:** 36 months  
**Total costs:** 3,507,317€  
**EC Funding:** 2,549,000€

**Coordinator:**  
Dr.-Ing. Jörn Kohlhammer  
Fraunhofer-Institut für Graphische Datenverarbeitung  
IGD  
Fraunhoferstr. 5  
64283 Darmstadt  
Germany  
Phone:+49 6151155646  
Fax: +49 6151155139  
Email: joern.kohlhammer@igd.fraunhofer.de  
Website: [http://www.future-fashion-design.eu](http://www.future-fashion-design.eu)
Summary

Current digital manufacturing ICT platforms have provided a series of tools, including CAx, PDM and PLM systems, to support engineers in a series of collaborative activities, allowing them to communicate as well as to design and validate the manufacturing processes. However, they still have a long way to go for effectively addressing engineering knowledge management issues:

- Today's ERP systems are often detached from the engineering knowledge they are associated with, while PLM systems provide no link to actual performance indicators, such as cost, time, and quality parameters
- Current User Interfaces (UI) are often too complex and require much effort to follow and use effectively;
- Knowledge is often dispersed over many stakeholders and many IT systems;
- There is still a significant absence of robust tools for automatic knowledge capturing as well as for systematic reuse of knowledge, especially in the area of engineering;

The I-CONIK project attempts to address the following objectives:

- The more efficient knowledge management and collaboration throughout the product lifecycle, supporting the capture, the systematic organization in the form of manufacturing templates of knowledge;
- To revolutionize the UI context in the engineering office and the shop floor, with particular emphasis on training activities
- Faster, easier, error-free UI for data entry / checking in the shop floor along with serious games options for instantaneous knowledge retrieval, training and/or design purposes;
Ultimately, I-CONIK aims at delivering a state-of-the-art web-based ICT platform for managing manufacturing knowledge, comprising the following key characteristics:

- Web-based “Engineering Desktop” for agent-based collaborative design (using cross-platform runtime environments) throughout the value chain, using PPIs and manufacturing templates;
- Faster, easier, guided UI for blue collar workers and engineers.

**Starting Date**: 1 September 2011  
**Duration**: 48 months  
**Total costs**: 9,664,633€  
**EC Funding**: 6,154,998€

**Coordinator**:
Dr. Thomas LEZAMA  
VOLVO TECHNOLOGY AB  
Gotaverksgratan, 10, M1.4  
40508 Goeteborg  
Sweden  
Phone: +46 313229421  
Fax: +46 31666577  
Email: thomas.lezama@volvo.com  
Website: http://noam.mech.upatras.gr/i-conik
amePLM Advanced Platform for Manufacturing Engineering and Product Lifecycle Management

Summary

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 (1) to Engineer an ontology that serves as an interoperable model and integrating element for an open engineering system: the amePLM Platform, (2) to develop an open engineering platform based on existing tools and libraries, by special consideration of open-source software, (3) to 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, and (4) to devise a visualization module to enable cross-disciplinary collaboration and remote consultation approaches. The solution development 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.

**Starting Date:** 1 October 2011  
**Duration:** 36 months  
**Total costs:** 4,407,135€  
**EC Funding:** 3,025,859€

**Coordinator:**  
Mr. Joachim Lentes  
Fraunhofer IAO  
Nobelstraße 12  
70569 Stuttgart  
Germany  
Phone: +49 7119702285  
Email: joachim.lentes@iao.fraunhofer.de  
Website: [http://www.amePLM.eu](http://www.amePLM.eu)
**LinkedDesign 284613**

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

**Partners**

- **SAP AG**, Germany
- **AALTO-KORKEAKOULUSAATIO**, Finland
- **BIBA - BREMER INSTITUT FUER PRODUKTION UND LOGISTIK GMBH**, Germany
- **ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE**, Switzerland
- **NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU**, Norway
- **POLITECNICO DI MILANO**, Italy
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- **TRIMEK S.A.**, Spain
- **GIOUMPITEK MELETI SCHEDIASMOS YLOPOIISI KAI POLISI ERGON PLIROFORIKIS ETAIREIA PERIORISMENIS EFTYNIS**, Greece
- **UNIVERSITAET LEIPZIG**, Germany (to be confirmed)
- **AKER ENGINEERING & TECHNOLOGY**, Norway
- **COMAU SPA**, Italy
- **VOLKSWAGEN AG**, Germany

**Summary**

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%, and global competition is growing dramatically. Further, we witness new trends and paradigms like an increasing demand for sustainable manufacturing and mass customization. ICT is the key enabler for coping with these changes to push engineering and manufacturing excellence as driver for European success.

With LinkedDesign we envision to boost today's engineers by providing an integrated, holistic view on data, persons and processes across the full product lifecycle as a 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, origin, or time of creation.

Furthermore, LEAP will provide specific knowledge exploitation solutions like sentiment analysis and design decision support systems. Within LinkedDesign we aim for user-centric lifecycle information management. 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. Finally, 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.
Starting Date: 1 September 2011
Duration: 42 months
Total costs: 12,561,115€
EC Funding: 8,061,848€

Coordinator:
Mr. Eldad Louw
SAP Research Center Dresden
SAP AG
Chemnitzer Str. 48
01187 Dresden
Germany

Phone: +33 (0) 4 92 28 63 41
Fax: +49 6227 78-51625
Email: eldad.louw@sap.com
Website: http://linkeddesign.cloudaccess.net
Virtual Simulation and Training of Assembly and Service Processes in Digital Factories

Summary

The information gap between virtual 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 of information, but a platform for presenting this knowledge according to the different user roles (e.g., manufacturing system engineer or operator) 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. Up to now, the complexity and incompatibility of digital data are main reasons why planning and training of manual manufacturing processes, e.g. in the automotive industry, are still carried out in physical stages. This training method is expensive and often ineffective. In order to reduce the need for physical prototypes and to speed up time-to-market, virtual training must overcome the problems of former approaches, such as inadequate authoring times, cost-prohibitive hardware and insufficient user integration. VISTRA aims at the development of a comprehensive platform for simulation and training of manual assembly processes based on advanced 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 allow to train workers in a way, which is more efficient, straightforward and resource-saving than today’s methods. VISTRA will enable production engineers to analyse assembly processes before physical mock-ups exists. Overall, VISTRA will sustainably support Europe’s labour-intensive industries in their worldwide competition.
Starting Date: 1 September 2011
Duration: 36 months
Total costs: 5,336,798€
EC Funding: 3,629,000€

Coordinator:
Dr. Jochen Schlick
German Research Center for Artificial Intelligence (DFKI)
Trippstadter Straße 122
D - 67663 Kaiserslautern

Phone: +49 6312053703
Fax: +49 6312053705
Email: jochen.schlick@dfki.de
Website: http://www.vistra-project.eu/cms/htdocs/index.php
The information contained in this booklet was compiled by Marta Bulik on the basis of information provided by the projects mentioned herein.

**Contact:**
Marta Bulik
marta-anna.bulik@ec.europa.eu

**Directorate-General Information Society and Media**
Unit G2 - Microsystems
B-1049 Brussels, Belgium