Welcome to the first edition of **Impact**, the newsletter from the European Factories of the Future Research Association (EFFRA) focusing on the work of projects launched under the EU's research and innovation programme for advanced manufacturing – 'Factories of the Future'.

Since its start in 2010 'Factories of the Future' has been responsible for the launch of 208 projects which in turn are responsible for exploitable technologies, demonstrators, pilot activities and spin-off companies. Such results are having a substantial impact on European manufacturing across multiple sectors.

The aim of our newsletter is to bring news from these projects and related activities to a European audience. The newsletter is free and readers are welcome to share it with their networks.

If you have project news you wish to share you can submit it to: info@effra.eu

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Subscribing to Impact

Impact is available to anyone with an interest in factories of the future and is registered on the EFFRA Innovation Portal.

If you have colleagues/contacts who are interested in receiving this newsletter direct them to the EFFRA Innovation Portal and they will receive our next edition direct into their mailbox.

Access to the EFFRA Innovation Portal and subscription to this newsletter is free.

Link

EFFRA Innovation Portal: effra.eu/portal

Factories of the Future: An Introduction

'Factories of the Future' is a public-private partnership supported through the European Union's Horizon 2020 research and innovation programme. Now in its sixth year of existence the partnership has seen the involvement over 1,500 organisation from across Europe participating in 208 projects.

The overall aim of the partnership is to enable a more sustainable and a more competitive European industry at the centre of Europe's economy – generating growth and securing jobs.

'Factories of the Future' projects are launched in response to annual calls for proposals addressing the challenges and opportunities identified in its strategic roadmap 'Factories of the Future 2020'. This roadmap is the result of close cooperation between the representatives of the public sector, large, small and medium companies, universities and research organisation. This diverse community lies at the heart of the 'Factories of the Future' partnership.

Link

Factories of the Future: effra.eu

FoF-Impact: Call for Interest in Services in Support of Exploitation of Project Results

Within the EFFRA co-ordinated CSA project FoF-Impact, a set of tools and guidelines (known as the FoF-Impact Toolkit) is being developed, which can be used by FoF project coordinators and beneficiaries (in particular exploitable results owners) to improve their chances of success with regards to the actual possibility to translate technologies developed within the projects in new products and services to be sold on the market.

The toolkit identifies a set of success factors, i.e. aspects and issues to be taken into consideration when developing a proposal and implementing a FoF project. An overview of the current set of success factors can be found here.

A related feature of the FoF-Impact toolkit is the stimulation of an actual brokerage area or marketplace where organisations can promote services that can support project consortia and their participants in addressing the success factors (for example: IP management coaching, market analysis, etc.).

The FoF-Impact CSA project has allocated a small subcontracting budget to the financing of some of these services to projects or project participants as test cases. The test case should involve a service that would help the project or project participant in increasing the potential of exploitation of project results. The earlier mentioned list of success factors can serve as inspiration in order to express the need the required support would address.

Each case study will go through the following steps:

- Analysis of the requested service and the associated success factor(s)
- Identification of possible service providers by the FoF-Impact CSA project team in consultation with the project or project participant that is looking for support
- Establishment of the contract/order (if required)
- Service delivery
- Analysis of whether the offered support was adequate

Examples may include the delivery of a market analysis, the organization of a set of meetings with potential end users, a study on relevant standards, etc.

Interested consortia or project participants with a FoF project are requested to contact Chris Decubber with an email which should contain:

- Mention to the relevant FoF project
- A short description of the requested service and the associated success factor(s)

Requests will be treated on a first come, first-served basis.

Questions? Contact chris.decubber@effra.eu

About FoF-Impact

The production of Impact is supported by the FoF-Impact coordination and support action a two-year European project coordinated by EFFRA and funded through the 'Factories of the Future' PPP.

The project's objective is to increase the impact of the European Union's 'Factories of the Future' partnership under Horizon 2020. The project ultimately aims to speed up and increase the exploitation and up-take of 'Factories of the Future' project results.

FoF-Impact is integrate a set of guidelines and tools in support of the exploitation of 'Factories of the Future' project results. FoF-Impact will build upon the existing work including the EFFRA Innovation Portal (see www.effra.eu) which offers a dynamic community-based environment for sharing and retrieving information about exploitable results.

FoF-Impact envisages the creation of a 'Factories of the Future' Help-Desk that will service both individual 'Factories of the Future' projects and clusters of 'Factories of the Future' projects.

FoF-Impact will facilitate collaboration between stakeholders who are capable of enhancing the impact of the 'Factories of the Future' partnership at a local level. These stakeholders include manufacturing companies, European, national and regional initiatives, technology transfer and market-uptake experts, RTOs, investors and potential users of the project results.

The interaction among projects, including project clustering, is supported by the EFFRA Innovation Portal and through thematic events (e.g. technologies, challenges, application sectors etc.). FoF-Impact encourages such interaction in order to identify additional opportunities for the exploitation of project results.

Link

FoF-Impact: effra.eu/impact

Factories of the Future Conference 2016: Materialising Factories 4.0

15 & 16 September (Brussels)

Factories of the Future Conference 2016: Materialising Factories 4.0 will bring together Europe's leading experts in industrial research and innovation to debate major priorities for the future of manufacturing in Europe. The conference is dedicated to the transformation of manufacturing across Europe. It will showcase the achievements of research and innovation projects that are revolutionising manufacturing in Europe under the EU's €1.15 billion 'Factories of the Future' partnership.

Conference Themes:

- Digital Technologies & the Factory Floor
- Energy & Material Efficiency
- Digital Technologies & Networked Factories
- Human-Centred Manufacturing
- Data Security, Liability & Integrity in Connected Factories
- Product Life-Cycle Management & Business Models in a Product-Service Economy
- Lightweight Components & High Precision Manufacturing
- High-Performance Computing & Simulation
- Additive Manufacturing & Advanced Joining Technologies
- Next Generation Robotics & Mechatronics in Manufacturing

The conference will also include a pitching session – The FoF Pitch – where project representatives will have the opportunity to pitch their results to an audience of potential investors and experts.

Factories of the Future Conference 2016: Materialising Factories 4.0 will take place at the B44 Centre in Brussels (Close to metro Botanique & Rogier).

Link

Conference: conference2016.effra.eu

DIPLAT Project - Addresses the Need for Efficient, Precise & Flexible Processing Technologies for Ultra-Hard Materials in Tooling

Diamonds and other ultra-hard materials possess outstanding mechanical, wear and thermal properties which make them attractive to manufacture high-performance tools. However, due to the extreme properties of this group of materials, the generation of complex 3D-freeform geometries and structures to meet the requirements of high-performance tool manufacturing is a challenge.

The DIPLAT project addresses the need for an efficient, precise and flexible processing technology for ultra-hard materials in tooling applications, in order to exploit the full potential of these materials. By smartly utilizing the advantages of high- brilliance, short and ultra-short pulsed lasers, 3D Pulsed Laser Ablation (PLA) processes are developed and demonstrated for various industrial applications. A new technology platform for producing ultra-hard tools with enhanced functionalities, outstanding machining performance and superior lifetime is introduced.

The project is structured according to three main application domains: abrasive surfaces for materialographic analyses, grinding and dressing tools for the gear grinding industry and milling and drilling tools for challenging applications.

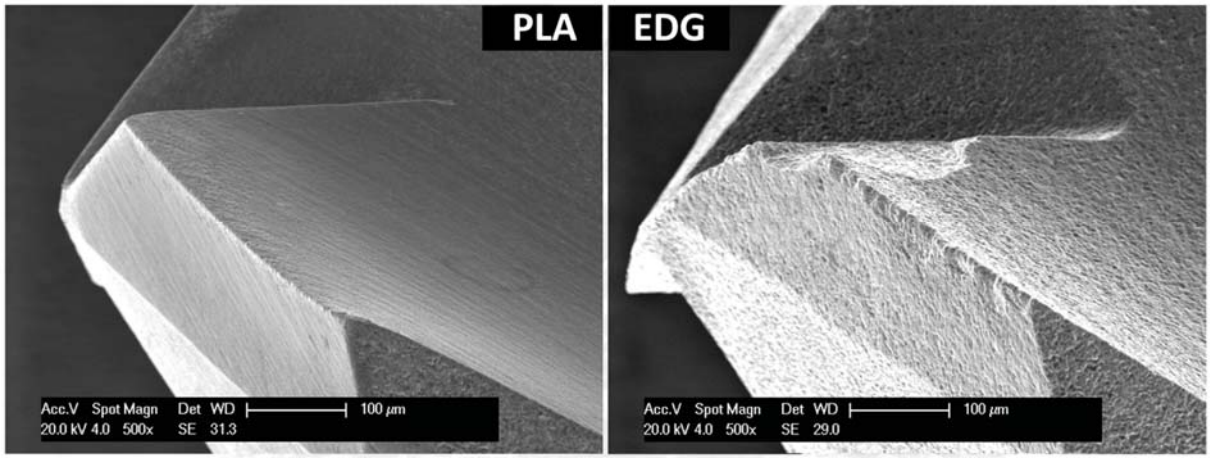
The surface topography of a conventional abrasive tool is characterized as geometrically undefined, since it contains abrasive particles with random crystallographic orientation, size and positioning. To address the limitations associated with stochastic geometric characteristics of abrasive surfaces, a novel PLA process has been developed, to generate arrays of abrasive micro-features of identical size, shape, crystallographic orientation and spacing into solid diamond structures. Such features, 50 x50 x30 µm square frustums, ablated into mechanical-grade CVD diamond were analysed and compared to conventional, state-of-the-art abrasive pads. The engineered abrasive grits are superior to conventional abrasive grits in the aspect of achieving better finishing performance in a shorter period of time. This is achieved by reducing the share of cutting edges which perform ineffective ploughing movements in the material due to their disadvantageous orientation, shape and position.

During the DIPLAT project, new possibilities enabled by the laser processing of dressing and grinding tools, such as the structuring of dressing tools, were researched. Geometrically defined micro-structures, 90 µm deep and 300 µm wide, were ablated on the surface of a negative electroplated dressing tool. By developing an effective process, overheating of the tool could be avoided, to conserve the high-precision geometry of the tool. In order to measure the effects of the structures on the dressing process, a benchmarking test was set up. The processing forces of the structured tools

were compared to those of a non-structured tool when dressing vitrified corundum grinding wheels. The beneficial reduction of cutting, feeding and passive forces by the micro-structures was demonstrated. Both analysed structured tools (20 and 80 ablated grooves) exhibit up to 50 % reduced processing forces.

Not only the potential benefits of laser processing grinding and dressing tools were shown, but also the industrial ripeness of such processes was demonstrated. State-of-the-arts tools were processed on a fully automated five-axis laser-machining centre.

Laser processes for manufacturing fluted drilling and milling tools were developed during the DIPLAT project. In-depth research shows that processes by which PCD tools are produced can significantly influence their wear and cutting performance. This is due not only to the cutting edge geometries and surface textures produced, but also due to process effects on the supporting PCD structure. It is shown that Electro Discharge Machining (EDM) undermines the material structure of PCD tools through the preferential erosion of the electrically conductive metallic binder leading to chipping of the tools' cutting edges. By contrast the pulsed laser ablation (PLA) process leads, through its ultrashort pulses, to minimal thermal effects on the underlying PCD structure. The results of this significant difference in material damage during manufacturing (see picture).



Comparison of the wear of two tools, with identical geometry, after drilling 300 holes into CMC material. The tools were produced by PLA (left) and EDG (right)

The remarkable properties of laser produced PCD tools, especially when machining sintered ceramics lead to the founding of 6C Tools as a spinoff from ETH Zurich to exploit the potential of this emerging technology.

During DIPLAT the potentials of laser machining for ultra-hard material tools were demonstrated. Such novel technologies will push European manufacturing industries to the cutting edge of high-performance machining and tooling technology. It is anticipated that the project outcome will have significant influence on the way ultra-hard tools will be produced in a near future. Moreover, the developed technology will enable entirely new possibilities with respect to tool design and feature fabrication. In

this context, a major competitive advantage for highly specialised SME's in the tooling and tooling machinery sector is expected.

Link

Project: fp7-diplat.eu

Contact: warhanek@iwf.mavt.ethz.ch

Ecogel Cronos Project Successfully Exhibited at JEC World 2016

The Ecogel Cronos project was successfully exhibited at JEC World 2016, the largest international composites show which took place in Paris Nord Villepinte.

The three day show was attended by nearly 37,000 composite industry professionals from more than 100 countries which saw over 1,300 exhibitors showcasing their products and services across 62,000 m^2 in two halls.

Ecogel Cronos aims to demonstrate how powder gel coats can directly replace liquid gel coats in RTM applications. It is intended to provide tools to implement this novel material into a real production of composite parts. The coating and process offers significant reductions in VOC emissions in the RTM production plant.

This innovative product and process were displayed at JEC World, in Hall 6, Stand R52, through the following:

- An example of the powder coating.
- Flat panels created using the powder coating.
- An RTM machine used in the process.
- A 1 m^2 heated skin.

Raquel Giner Borrull, Project Manager and Coordinator from AIMPLAS, said "Replacement of liquid gel coats with powder gel coats, in the RTM industry, provides significant benefits related to economics, safety, the environment and process flexibility. Curing time of powder gel coat is reduced by up to 80% when compared to conventional liquid gel coat which will contribute to increase RTM process production ratios."

JEC Group President and CEO Mrs Frédérique Mutel commented, "...composite materials continue to become more widespread. In a world where energy savings and recyclability are sought, composites seem to stand out as one of the best answers. Innovative solutions must be found for current and upcoming challenges in terms of

higher performance, lower weight, reduced costs and processing time, and of course, addressing the pressing matters of environmental concerns."

Ecogel Exhibition Stand

Link

Project: ecogelcronos.eu

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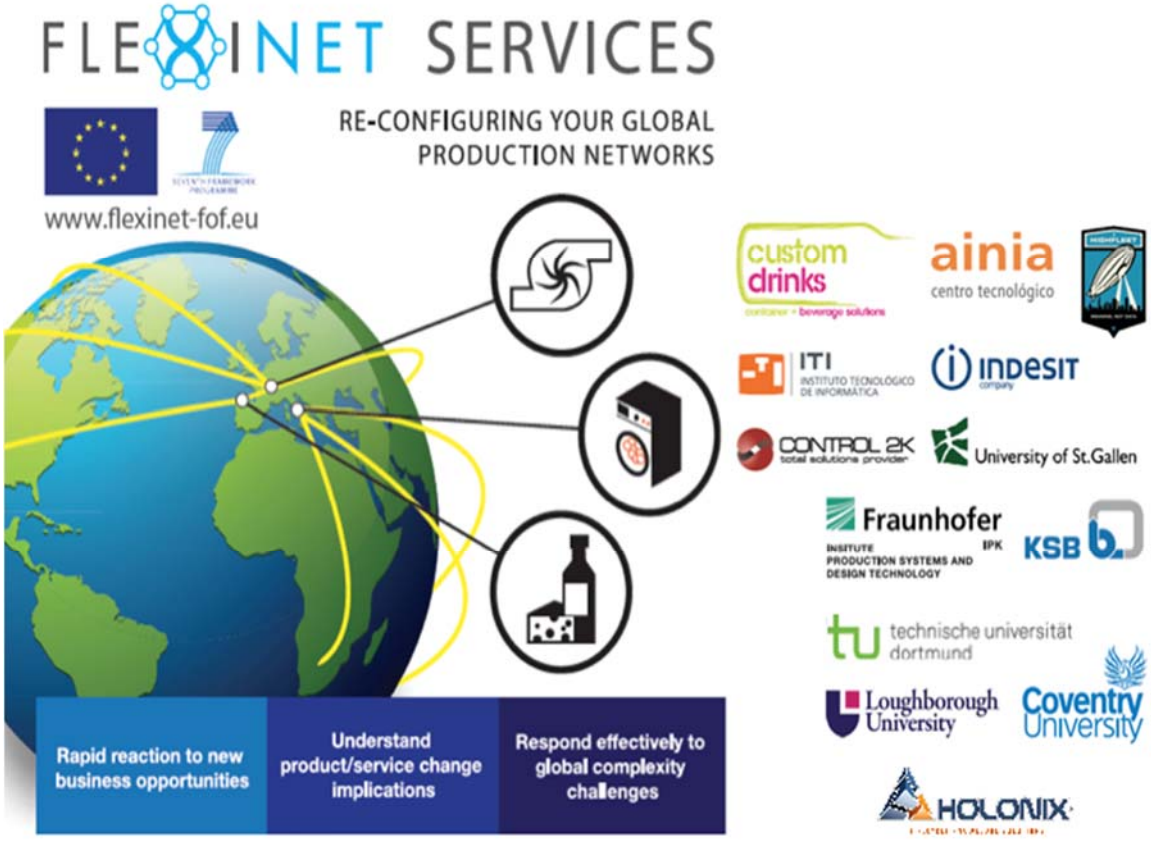
FLEXINET - A One-Stop Platform for Evaluation of New Business Ideas for Products & Services

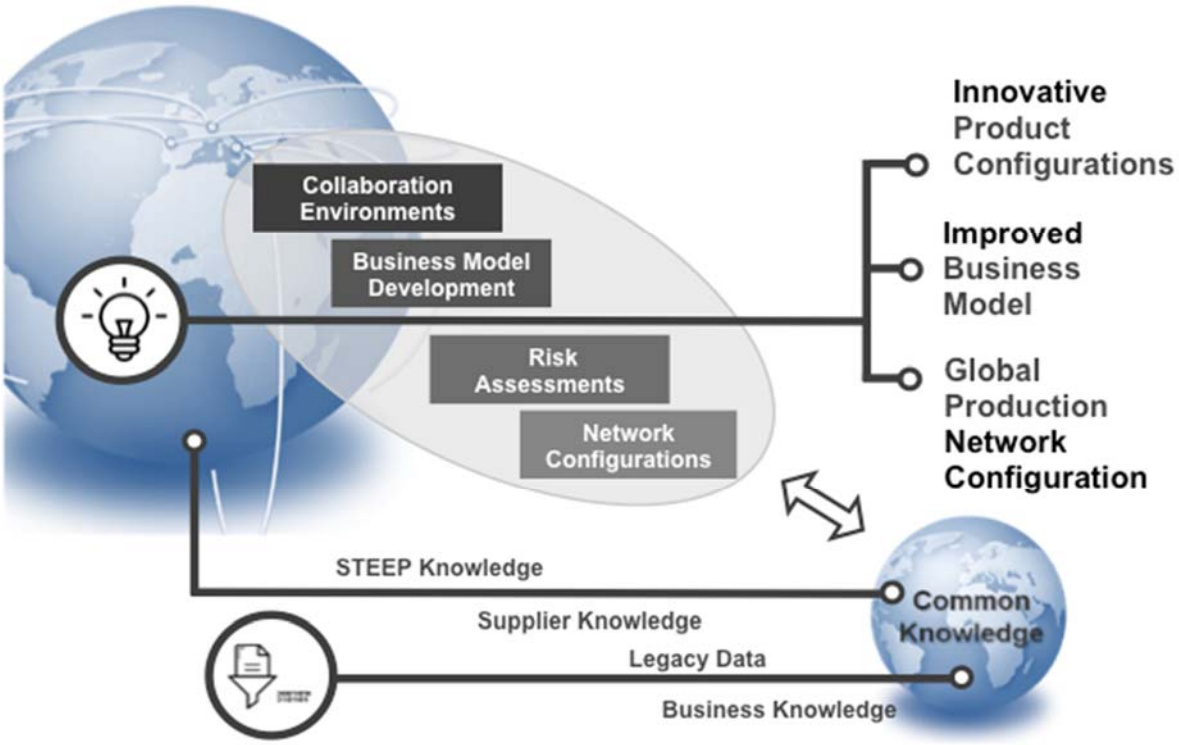
The FLEXINET conceptual model for business model innovation is focused on strategic and tactical decisions during the early phases of product and business model development, and strongly related to external global factors that influence these decisions. The vision underlying FLEXINET[1] is 'to start with a new business idea in the morning and have all required data and production networks understood by the afternoon'. The drive towards this aim requires businesses to rapidly make high quality multi-perspective decisions and this requires access to the right people, access to the right information and support from the appropriate analysis tools.



FLEXINET brings a one-stop platform for the evaluation of new business ideas for products and services with an integrated business and global production perspective and what-if capabilities at value chain level addressed to innovative manufacturing

[1] The FLEXINET Project No. 608627 is funded by the European Commission under the Seventh Framework Programme call FP7-2013-NMP-ICT-FOF (RTD). For further information see http://www.flexinet-fof.eu/Pages/FlexHome.aspx

companies looking forward to improving their market potential and reducing lead-time and associated costs.



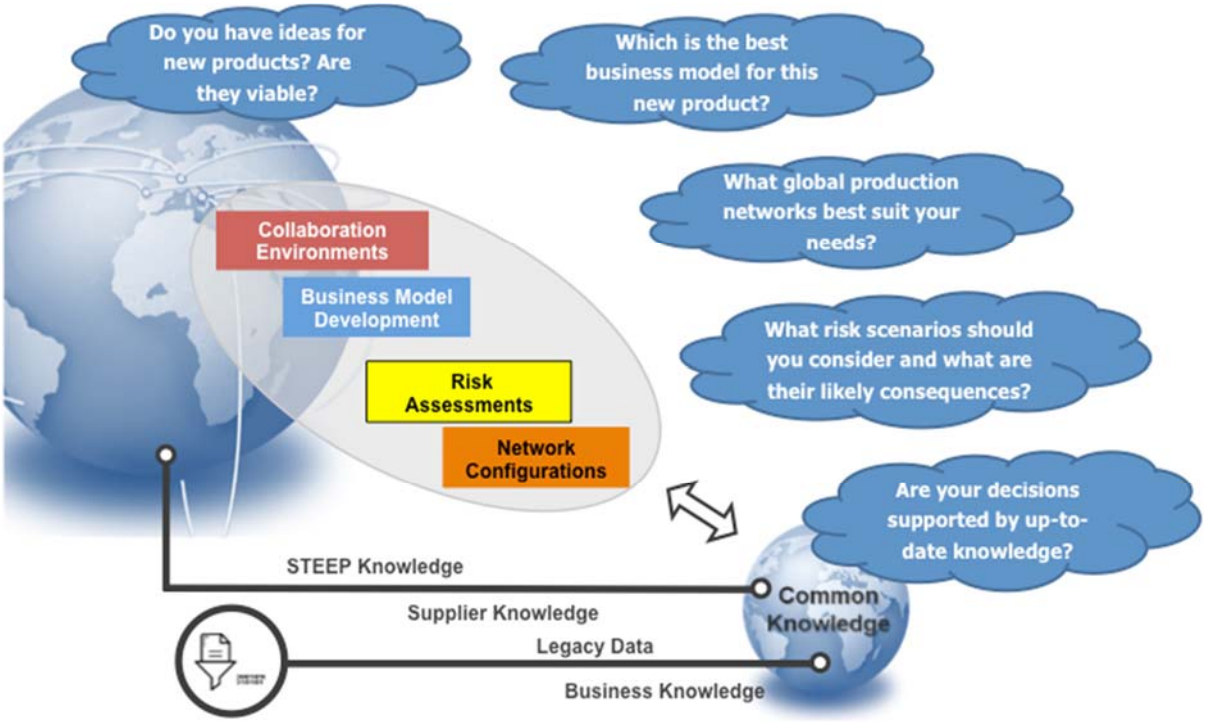
The FLEXINET Global Business Support Environment

FLEXINET results demonstrate how this is possible, linking a collaboration environment with business modelling, production network configuration, and risk analysis tools, all interacting through an underlying knowledge base which is itself designed to support interoperability across the range of supporting applications. This also exploits external and legacy knowledge providing a comprehensive analysis capability.

The FLEXINET toolset can be tailored to suit each specific company's requirements, but overall is aimed at early stage decision support; taking new ideas forward to achieve successful business implementations. The sorts of questions that can be supported are illustrated here, but cover issues where collaboration must be supported, where business and technical analysis is needed and where the implications of risk must be analysed, all in the context of global and local business knowledge that can be shared via a common knowledge base to support high quality decision making.

The FLEXINET set of applications operate along a timeline that starts from the information and knowledge that can be pre-configured prior to the use of the tools. Thereafter the tools can be used at each stage of business or product development through to the development of a prototype product. The focus is on the parallel business model development and production network configuration to meet a new business or product idea. How these can be used will be shown in the demonstrations.

FLEXINET demonstrations will be provided at an I-ESA workshop on 29 March 2016 and again at the Hannover Fair on 27th April 2016.



FLEXINET Decision Support

Fundamental to the FLEXINET approach is the development and use of an end user knowledge base that provides the integration link between the applications, the link to business specific, GPN and external STEEP knowledge as well as the interface to legacy systems. The development of these KBs takes the radical view that to be effective they need to be relatively easy to construct but yet be able to manage and support the many complex relationships that exist across the manufacturing business and technology disciplines. To this end FLEXINET has developed a reference ontology that provides the underpinning common foundation on which company specific knowledge bases can be constructed and queried via the software services to answer a broad range of 'what-if' questions.

The FLEXINET reference ontology provides ease of construction, effective interoperability and flexible re-use and maintenance of knowledge bases. The core of that ontology is now being developed in ISO TC184 SC4 JWG8 as an International Standard entitled "Formal Semantic Models for the Configuration of Global Production Networks (SP-NET)" (ISO 20534).

The generic FLEXINET demo is based around a fictional company "Buzz Bikes", based in Denmark, producing small-medium volume bicycles for the mid-upper price range customers. They supply bikes built using internationally sourced parts, materials and services. Their product development department want to investigate the viability of a new model of bike currently code named eBike that features SMART technology that

would support further service opportunities. They have chosen to use the FLEXINET platform to evaluate the development and manufacture of this new product.

The company's objectives are (i) to manage the conceptual development of the new bike, (ii) to develop a coherent business model for the new bike & additional services, (iii) to identify potential global production networks (GPN) to produce the new bike, (iv) to evaluate the associated risks with alternative options (v) to evaluate the strengths of each facility against defined business factors (vi) to manage the Product-Service Configuration & associated knowledge.

In addition to the fictional Buzz Bikes demonstration our FLEXINET tool set is in the process of being evaluated by our three industry partners across three distinct manufacturing sectors; pumps, white goods and food & drink, illustrating the flexibility and ease of configuration to suit each company's specific needs.

Link

Project: flexinet-fof.eu

Contact: k.popplewell@coventry.ac.uk

Flex-O-Fab - Completion of Project Signals Next Stage of Flexible OLED Industrialisation

Flex-o-Fab, a major collaborative project run by Holst Centre, has successfully completed its goals in the development of flexible organic light-emitting diodes (OLEDs). Building on existing technologies and innovating new processes, the project's partners can be congratulated on many achievements – including indium-free electrodes and brighter OLEDs. Overall, the project has strengthened Europe's leading position in the lighting industry by taking flexible OLEDs a giant step closer to commercial reality.

More robust than their rigid, glass-based counterparts, flexible OLEDs open up a whole new field of lighting systems. Thin, lightweight, bendable and transparent, they can be embedded into all kinds of everyday objects – imagination is the only limit to their potential applications. And with the completion of the European funded Flex-o-Fab project in 2015, such applications are now much closer to commercial reality.

Coordinated by Holst Centre, an independent open-innovation R&D centre, the 3-year Flex-o-Fab project aimed at realizing the technologies needed for industrialization of flexible OLEDs. By developing reliable processes for manufacturing OLEDs on plastic foils, Flex-o-Fab has successfully taken flexible OLEDs from lab to fab. To do this, the project used a distributed pilot production line and associated manufacturing chain involving partners and facilities at different locations across Europe.

The project's goals included reducing costs and enabling higher volume production. One of the main achievements towards these was the migration of key processes from existing sheet-to-sheet (S2S) to roll-to-roll (R2R) production. This was enabled by developing existing technologies and creating new processes. The resulting flexible OLEDs are based on an R2R multilayer barrier technology developed by Holst Centre. Overall, the project has achieved what it set out to do by making a larger scale demonstration of the hybrid process chain to produce flexible OLED lighting panels.

"We contributed significant expertise throughout the process, especially in the areas of barrier and electrode substrate technology", said Date Moet, project coordinator and research scientist at Holst Centre. "It is very gratifying to see the project realize industrially relevant results. There has been positive feedback from the European Commission, showing they value the progress that has been made in making OLEDs in the hybrid R2R/S2S process in higher numbers."

Among the key achievements of the project are the creation of an indium-free transparent conductive oxide (TCO) and an increased brightness in the flexible OLED solution.

The new, indium-free electrode for the flexible OLEDs was developed by project partner École Polytechnique Fédérale de Lausanne (EPFL). “Indium, the main component of indium tin oxide (ITO) widely used in electrodes for flexible applications, is rare and expensive, especially for use at industrial scale,” said EPFL team leader Monica Morales-Masis. “Zinc-tin oxide (ZTO), an all earth-abundant TCO, has the same mechanical and chemical stability as ITO, but its relatively poor electrical properties have limited its use. We overcame this drawback by improving the conductivity of the ZTO electrode and choosing the right metal grid to support it. When integrated in flexible OLEDs, our ZTO-metal grid electrode outperformed reference ITO-based OLEDsi. By replacing ITO with indium-free ZTO we significantly reduced cost, making the technology more applicable for volume production.”

Light emission was enhanced by about 30% compared to ITO through a substrate developed by DuPont Teijin Films (DTF), which used plastic with outcoupling features. In an S2S process, a brightness of 10,000 cd/m2 was achieved for a white flexible OLED. This shows just how much progress has been made: changing from rigid glass to a flexible, 0.2 mm thick light source while maintaining luminance, homogeneity and visual quality. Furthermore, as all the processes are compatible with R2R production, there are no technical barriers to stop Flex-o-Fab’s hybrid R2R/S2S process being up-scaled further to R2R.

The future also looks positive. Various projects are in place to carry on from the success of Flex-o-Fab. For example, OLEDWorks is excited by the substantial market interest shown in flexible OLEDs. “As a key industrial player linked to the project, OLEDWorks will build further on the results obtained and is now exploring the potential use of these processes in further commercialization of flexible OLEDs,” said Eric Meulenkamp, general manager at OLEDWorks GmbH.

Link

Project: www.flexofab.eu

Contact: info@flexofab.eu

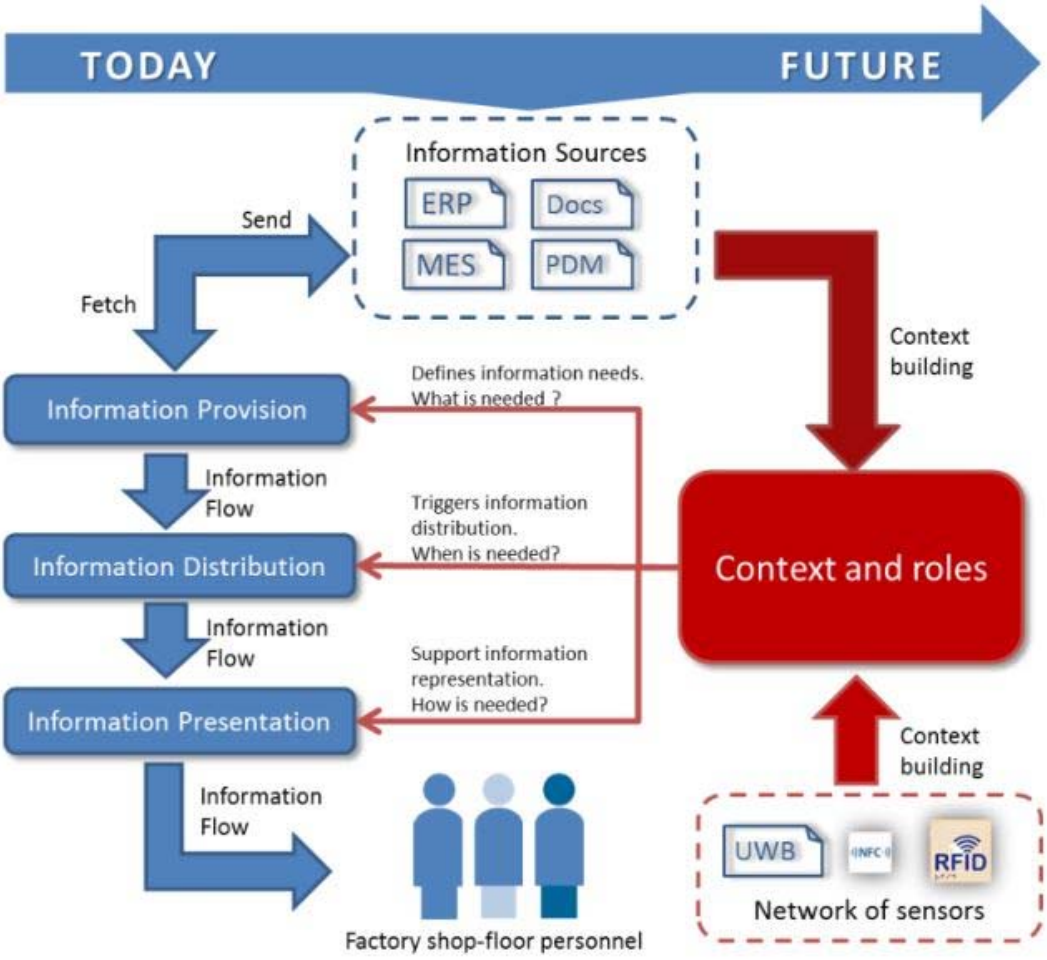
Sense&React Project Results in "Sense&React Solution"

The main objective of the Sense&React project was the development of a technology that would be extremely familiar with everything concerning the factory floor. It would also support the people, working in the manufacturing environment, namely the operators and the team leaders in the assembly line, by providing them with the right information, at the right time and location.

The project mainly resulted in the Sense&React solution, ready to meet the expectations of Industry 4.0. The Sense&React solution provides the manufacturing floor with information distribution services and applications that enable up-to-date information provision and immediate reaction to issues and shortcomings. This is achieved through the intelligent combination of different types of data, such as production data, re quantities and type of products, engineering data, namely instructions that guide operators during production, and data from sensors such as weight, Near Field Communication (NFC) and Radio Frequency Identification (RFID). The smart, context-aware Graphical User Interface (GUI) solution provides the Sense&React users with web-apps from various sources on a single screen, so as to be able to focus on the most relevant information about every situation that might arise. This solution optimizes the amount of information received by the user in order to be processed, thus rendering him less stressed, less distracted but more confident with his work task. Sense&React supports mobile users through smart apps that provide the information directly to the mobile device.

Electrolux, a Sense&React partner, is a world-leader supplier of home appliances such as washing machines. In the Electrolux plant in Porcia, Italy, the Sense&React system has been installed directly on the assembly line to support operators and team leaders in their daily activities. The pilot installation and usage of the Sense&React solution has proven its capability to improve the efficiency of the assembly line. The operator can now quickly report several types of problems or requirements to his foreman. With the click of a button, the operator can deliver a message to the correct foreperson, who receives it on his smart phone. At manual and semi-automatic workstations, the proactive delivery of relevant information renders the assembly process easier, especially for unexperienced employees besides reducing the number of assembly errors.

The Sense&React system can be applied to various other industrial cases. It has been successfully tested in the production line of Volvo trucks cylinder heads in Skövde, Sweden as well in ENP, a small-sized shipyard, located in Peniche, Portugal.



The Sense&React Network

Link

Project: sense-react.eu

Contact: makris@lms.mech.upatras.gr

Contact

If you have suggestions, questions or comments concerning this newsletter, contact info@effra.eu.

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