



## D8.4.2 Policy and Social Impact Report II

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## Executive Summary

The European commission has engaged with the research and business communities for many decades to foster cooperation between the various European members and beyond. This engagement has been promoted via network, collaboration and knowledge sharing activities providing funding streams to enable such activities to flourish.

Various stakeholders from all sectors of the community are encouraged to provide services through the use of emerging technology and social trends. The clear agenda is to promote the growth of wealth creating enterprises and enhance the social well being of the citizens within the European community. The cost of this interaction results in the investment of billions of Euros of taxpayers' money into research project and other activities and it is clear that results and evidence are required to justify such huge investments.

This report examines how that investment is spent and also gives an assessment of where the funding has the most impact. Indeed in the following report D8.4.3, it is envisaged that target areas will be finalised focus the activities of the policy makers to give maximum benefits and justification for future spend.

# 1 Introduction

ADVENTURE – ADaptive Virtual ENTERprise manufACTURING Environment – is a project funded in the Seventh Framework Programme by the European Commission. ADVENTURE creates a framework that enhances the collaboration between suppliers, manufacturers and customers for industrial products and services. This deliverable discusses the technical, social and commercial impact that the ADVENTURE project will achieve in the context of other EU research.

## 1.1 ADVENTURE Project Aims

The framework proposed by ADVENTURE provides mechanisms and tools that facilitate the creation and operation of manufacturing processes in a modular way. ADVENTURE combines the power of individual factories to achieve complex manufacturing processes, providing tools for partner-finding, process creation, process optimization, information exchange, real-time monitoring with the tracking of goods and linking them to Cloud services.

There have already been several research projects that address the combination of different independent manufacturers to so-called virtual factories. However, most of these research projects focus primarily on the business-side in general and on aspects like partner-finding and factory-building processes in particular. However no proven tools or technologies exist in the market that provide for the creation and operation of virtual factories applying end-to-end integrated Information and Communication Technology. This is where ADVENTURE is looking to provide such tools and processes that will help to facilitate information exchange between factories and move beyond the boundaries of the individual enterprises involved. The collaborative manufacturing process will be optimised by enabling the integration of factory selection, forecasting, monitoring and collaboration during runtime.

ADVENTURE builds on concepts and methods of Service-Oriented Architectures and Computing and benefits from the advancements in this field. The monitoring and governance of the collaborative processes will be supported by technologies from the Internet of Things such as wireless sensors. Existing tools and services that can be integrated will be considered during the development of the platform for ADVENTURE.

The increased degree of flexibility provided through ADVENTURE will benefit SMEs especially as it helps them to react quickly to changes and to participate in larger, cross-organizational manufacturing processes. Furthermore, ADVENTURE will help manufacturers in assessing the environmental friendliness of actual manufacturing processes and resulting products and services. Other objectives of ADVENTURE include research in areas such as service-based manufacturing processes, adaptive process management and process compliance or end-to-end-integration of ICT solutions.

## 1.2 Deliverable Purpose, Scope and Context

The goal of this deliverable is to provide a yearly Policy Action Plan, which will contain recommendations for European Policy Makers. To achieve this ADVENTURE is cooperating closely with various organisations and collaborating with other projects where applicable in order to spread awareness and knowledge and to explore the wider societal implications of the project. The vast experience of the project partners and contacts is of great advantage and has led to a synergy of work and a close co-operation between multiple EU projects. These contacts are useful when organising the workshops and when bringing together experts from various domains.

ADVENTURE is also using its networks to collect research results and to foster an active and meaningful discussion about its topics. The results from project activities are being formulated as policy recommendations and are to be made available to the European Commission for standardization issues in the various initiatives where the CEC may collect such information.

The ADVENTURE project objectives and expected outcomes are fully compliant with the revised and re-launched Lisbon strategy under the i2010 initiative (European Information Society 2010). The general indication, inspiring also the discussions on FP7 is towards:

- Promoting a borderless European information space for digital services
- Stimulating research, development and deployment of ICT
- Promoting the effective take up of ICT by industry, especially small firms

The document builds on the contributions in D8.4.1 with updates in all of the impact sections. The brand new section is Section 4 Collaborations with other Projects and EU Initiatives where much of the effort has been directed in D8.4.2. Additional information needs to be referenced from the workpackages such as D8.5.3 Report on Cluster Activities as the details of meetings are provided in full.

## 1.3 Document Status

This document is listed in the DOW as public as the outputs of ADVENTURE will have a number recommendations that will be of interest not only to policy makers but a wide range of stakeholders including the general public justifying the support actions that are currently in place to encourage the growth of business and other social communities.

## 1.4 Target Audience

As well as being used by all participating project members, this deliverable will be accessed by a range of interested parties in order to understand the various areas of impact that ADVENTURE will influence from a policy making point of view. One of the most important issues for ADVENTURE is to communicate with people and consider the needs and emerging problems of European companies in the Factories of the Future domain. There are many political and economic constraints that directly depend on the physical location of a company and ADVENTURE is addressing methods by which these barriers can be removed.

## 1.5 Abbreviations and General Terms

A definition of general, common terms and roles related to the realization of ADVENTURE as well as a list of abbreviations is available in the supplementary document “Supplement: Abbreviations and General Terms” which is provided in addition to this deliverable.

Further information can be found at: <http://www.fp7-adventure.eu/glossary>.

## 1.6 Document Structure

This deliverable is broken down into the following sections:

**Section 1** presents the context of the document.

**Section 2** looks at the Areas of Impact

**Section 3** looks at Strategy, Research and Innovation areas of Impact

**Section 4** covers the cross collaborations and input into the overall EU Dissemination strategy. This includes the work done at conferences and seminars to present a common and coherent understanding of the FoF domain

**Section 5** looks at Areas of Impact with Regard to the Digital Agenda

**Section 6** concludes the Report

**Section 7** provides the References for the document

**Section 8** is the Appendix with meeting notes for quick reference

## 2 Areas of Impact

There are many areas of impact that projects such as ADVENTURE can target beyond the technical bounds. For example, two companies might have different political laws or different taxes regardless of the technologies available in ADVENTURE and this might lead to differences when changing a technological infrastructure and influence the cost effectiveness of the process.

Another example might be a difference in security regulations that were set up by the government and in this instance ADVENTURE will perform a case differentiation between the different circumstances of a company in order to make a clear and correct recommendation whenever necessary.

ADVENTURE aims to have an impact on the following areas and provide:

- EU Businesses a competitive edge in the global market
- Improved cross border mobility
- Accelerated interoperable standard setting
- More open access to research results
- A greener Europe

The above are very broad areas of impact but each of the areas are affected as the overall picture of ADVENTURE is revealed. Functions such as the “plug and play” interoperability of the system impacts on areas such as “providing a competitive edge” and “cross border mobility” for the companies adopting the ADVENTURE platform. More areas are discussed in the following sections providing a wide range of technical, social and commercial types of impact that the ADVENTURE project will achieve. The remainder of this section considers types of technical impact. Technical impact will be gained through the tools and technologies researched and developed during the ADVENTURE project. Further technical impact may be achieved by the adoption, potential enhancement or exploitation by other EU research projects such as IMAGINE connecting with the ADVENTURE platform. Where possible this report will also highlight areas of potential future impact, which may be beyond the scope of the current ADVENTURE research, but which should become possible as the results of ADVENTURE are adopted and developed by the wider business and research communities.

### 2.1 General Overview

In the second year of ADVENTURE, the global economic crisis still plays a major part in the European Commission’s agenda. Product customization, innovation and quick time to market are key success factors, as European SMEs must create sustainable competitive advantages by means other than low prices. Europe is facing a situation of emergency in terms of innovation and spending. Thousands of researchers and innovators have moved to countries where conditions are more favourable than in Europe and although the EU market is the largest in the world, it remains fragmented and less innovation friendly. Countries like China and South Korea are catching up fast.

Product and process innovation and new business models are essential for the success of European SMEs in such a market situation. The Factories of the Future (FoF) initiative was launched to cope with the described situation. There are several areas within the scope of FoF, challenge 7 (“ICT for the Enterprise and Manufacturing”), one of them being the “Virtual factories and enterprises” area, which will be addressed by ADVENTURE. The “Virtual factories and enterprises” area is focused on end-to-end integrated ICT along with other topics of collaboration and faster connectivity, in order to achieve higher management efficiency and foster innovation in networked operations related to manufacturing. Internet technologies are adopted at both intra-firm and inter-firm levels to aid virtualisation strategies (CaAfGaLi98; SaHaHo03). Virtualisation has benefits but the interdependent nature of collaborative activities introduces complexities into the business processes. Indeed processes can be too complicated and time consuming, creating many obstacles to collaboration, and therefore the virtual organisation creation process is critical to the successes of the network (CaOlSeGaDeBaJa09). The powerful combination of automation and information is now resulting in the emergence of “smarter” virtual factories and enterprises (No13). As the Factories of the Future, Strategic Multi-Annual Roadmap (FoF 2010) states, ICT is a key enabler for improving manufacturing at three levels, i.e. through agile manufacturing and customization (smart factories); value creation from global networked operations (virtual factories) and better understanding and design of production and manufacturing systems (digital factories).

As stated in the DoW, ADVENTURE is helping virtual factories and enterprises move beyond their existing operational limitations by providing concrete tools and approaches through the development of the components and sub-components being prototyped and developed in WP4, 5 and 6 for optimizing the information exchange between factories, as well as the manufacturing process design and execution. The latter is being achieved by integrating runtime business partner selection, forecasting, monitoring, and real-time collaboration. The ADVENTURE project will provide novel features in the area of Virtual Factories. It features an End to End integrated framework where the distributed manufacturing processes can be designed, simulated, optimised, monitored and adapted in a flexible way, allowing the Brokers to easily transform the new ideas of products and services into a real distributed manufacturing process, with the advantage of the platform proposals in terms of suitable partners or process organisation.

One of the main advantages of the ADVENTURE approach is that the manufacturing companies do not need a big investment for starting working with ADVENTURE. The ADVENTURE platform does not force them to adopt specific data standards for communication, instead of that, it provides tools to easily adapt the existing interoperability investments and reuse them to join ADVENTURE. Thus, the proposed environment will promote higher levels of flexibility, capacity and capabilities. This will enable European SMEs to move beyond a traditional business ecosystem, which has been defined as “an economic community supported by a foundation of interacting organizations and individuals—the ‘organisms of the business world’ ”. (Mo96), and into digital business ecosystems, which provide a more holistic and systemic approach, founded on ICT but also considering socio-economic factors (NaDiNi07).

Hence SMEs will be able to offer to their customer's unprecedented levels of availability, capability and innovation potential.

Further, ADVENTURE will address the objectives mentioned above by simplifying the establishment, management, adaptation, and monitoring of dynamic manufacturing processes in virtual factories, building on concepts and methods from the field of Service oriented computing and therefore benefiting from the progress that has been made in this domain during the last years, but also contributing to it.

## 2.2 Potential Strategic Impact

This section addresses the estimated impact of ADVENTURE with regard to the wider European research agenda; project activities to assess the dimensions of expected policy and societal needs are also addressed. Policy priorities have been identified and the supporting activities have been shaped under the umbrella of the Commission's ICT Programme Challenge 1 (Pervasive and Trusted Network and Service Infrastructures) priorities. External assemblies such as the "Future Internet Assembly", "Innovation Union" and the "Digital Agenda for Europe" have all been featured.

Societal stakeholders, groups and policy makers that will be relevant to the adoption of project results have been identified in order to support the development of special actions to acquire their motivation and to sustain the deployment of the project results. Task 8.4 also addresses standardization initiatives that will lead to the development of a yearly report on Policy Action Plan containing recommendations for European policy makers.

## 2.3 Standards Impact

Through task T8.4 (Standardization Engagement), as well as in more operational tasks, the project will ensure interaction with standards. It will ensure that there is suitable liaison and follow-through with formal de jure or de facto standards and standardization bodies. This includes different interoperability frameworks and data models via gateways, e.g., the ebXML, XMPP protocol, open semantic web ontologies, OData and other innovative standards. However, upon saying this, it should be clear that the project is not intending to invent technologies for the sake of it. Thus, ADVENTURE will try to use to the maximum available standards and the results of previous European RTD projects since, as previously described, SMEs need very practical, inexpensive and easy to implement and use solutions, which are most often built upon or supported by existing and industry-wide accepted standards.

As an example of the partners standardization credentials, partner TIE's commitment to standards is quite extreme having been chair of the European E-Business Interoperability Forum (eBIF) and European E-Business Standards (EBES), both of which are sponsored by the European Commission and hosted by the Comité Européen de Normalisation (CEN). The former's aim is to address technical and non-technical interoperability issues such as guidance, trust, semantics and possible legal issues, while the latter targets at technical aspects. It is the intention of ADVENTURE to have an interface to such forums in order to provide input and seek feedback. TIE is also active in United Nations E-Business forum, UN/CEFACT, which is responsible for

EDI/EDIFACT standards, ebXML (with OASIS) and TDED semantic dictionaries. CEFAC is recognized as the global focal point in semantic oriented interoperability and semantic content definition and obviously TIE's leadership in this area makes cooperation potentially very fruitful.

ISO TC184 is the ISO standard body in the field of Industrial automation systems, smart objects and integration and encompassing the application of multiple technologies, i.e., information systems, machines and equipment, and telecommunications. It puts great emphasis on enterprise modelling and cooperation. For example, sub-committee ISO TC 184/SC 4 focuses on the modelling of industrial, technical and scientific data to support electronic communication, and ISO TC 184/TC5 focuses on the modelling of enterprise architectures, communications and processes to support manufacturing system integration and application integration frameworks. Therefore, ADVENTURE's proposal to provide focused tools and services to support supply chain interoperability, which has strong connection with the strategic goals of ISO TC184, can provide significant input for the standardization progress in this area. The prime mover in this area is INESC.

ISA-95 is the international standard that can be used for integrated control also in the context of virtual factories. ISA-95 defines terminology and models for collaboration. The standard specifies which information has to be exchanged to share manufacturing- and sales-related process data. The standard is easy to adapt for ADVENTURE's point of view. Enabling especially a linking between ERP and MES-oriented knowledge, the exploitation of ISA-95's application potential in ADVENTURE is envisioned as very beneficial. ISA-88, upon which the ISA-95 standard is based, defines a physical model for flexibility in production. The physical model in ISA-88 comprises the physical concepts "enterprise", "site", "area", "process cell", "unit equipment module" and "control module". ISA-88 with this physical model can be used to link the lower level of communication and utilise, e.g., wireless sensor technology for the purposes of ADVENTURE. Not only the usage of these standards seems very promising, but also the mentioned standards could be even further developed based on the expected successful implementation results from ADVENTURE. D8.4.3 will elaborate more on the final list of standards that ADVENTURE could influence or feed into.

## 2.4 Technical Impact

ADVENTURE will provide a wide range of both software enablers and ready-to-use tools via the components and sub components developed within WP4, WP5, and WP6 and applied within the use cases in the context of WP7. The methodology used to develop the various components should allow a wider adoption of the components as they are written to be interlinked with other proprietary software via the gateways having open connectivity will allow other projects to exchange data with the ADVENTURE platform. Technical impact from ADVENTURE will be achieved in many technology areas, which will now be considered in the following sections.

### 2.4.1 Software Impact

Although some research projects (e.g., the Virtual Factory Framework - VFF) [VFF, 2013], have been working on the establishment of frameworks for virtual factories, these frameworks will not have the desired technical impact if they are not accompanied by concrete software architectures and tools. Furthermore, past and ongoing projects have focused on how the modules of one real factory can be virtualized in order to enhance productivity, but building virtual factories by composing diverse modules from heterogeneous enterprises is still a vision. “The next decade is expected to see a deep change in the way enterprises operate, mainly due to the advent of the Future Internet and the maturity achieved by enterprises in adopting new socio-technical solutions based on the former” [FInESa]. Through the Dashboard of ADVENTURE, many new methods of process design and optimisation are being developed to give a deep insight into the planning strategies of many businesses.

Network and service platforms have become increasingly vulnerable with massive distributed data storage and management capacity. Although ADVENTURE is not specifically focused on security and privacy aspects, the solutions provided need to be made trustworthy i.e. secure, reliable and resilient to attacks and operational failures, guaranteeing quality of service, protecting user data, ensuring privacy and providing usable and trusted tools to support the user in his security management. Trustworthiness needs to be addressed from the outset rather than being addressed as an add-on feature. Societal and legal issues increasingly impact technological choices so ICT must be developed to ensure a society based on freedom, creativity and innovation, whilst providing security for its infrastructures. The architecture of ADVENTURE will have a technical impact on the way enterprise virtual and real factories will be developed in the future, since ADVENTURE will provide an “Enabling Technology Space” which is necessary for the development and evolution of enterprise systems and networks which can fully benefit from and exploit future internet solutions. [FInESb].

Another important class of software solutions that will be impacted by the results of ADVENTURE will be the specialized SOA tools for manufacturing processes, i.e., manufacturing process designers, orchestrators, service annotators etc. Although the basic technologies of SOA will be reused in this context, it is to be expected that the ADVENTURE platform will show the way towards either extensions or new versions of SOA tools, which will be specialized in the highly important domain of manufacturing processes. ADVENTURE will show, for example, how “SOA software” should include modules that connect to real factories in order to check their processes, designers that can generate PCF-processes from simple workflows with the ADVENTURE processes designer and gateways etc.

With regard to enablement, the models of ADVENTURE for data description and dissemination are also expected to have an impact on the interoperability and connectedness of disparate virtual factories. The data exchange modules can be employed and reused in future ICT solutions that want to connect factories either with other factories or with production-related Smart Objects. The foundations on which the reusability of these solutions will be based are the related underlying standards, data description schemata, and semantics. The impact of the latter will be explained sepa-

rately, while it is anyway a goal of the project to be based as much as possible on existing, widely accepted solutions. However, the data models and the data-handling software solutions of ADVENTURE such as message routing and cloud storage, which lie one level of abstraction above schemata and semantics, will be themselves a powerful reusable artefact for the world of ICT-supported production.

Getting “down” to particular, specialized software, it should be mentioned that ADVENTURE will develop innovative virtualization and visualization tools. Such tools will be mostly end user utilities that will be provided through the ADVENTURE Dashboard.

### 2.4.2 Process Design and Execution Impact

A central contribution of ADVENTURE will be enabling the manufacturing partners, in particular SMEs, to orchestrate joint manufacturing processes without the support of consultants or a big company. This bears several facets, especially compliance checking in process collaborations, process change management and adaptability, as well as enhancing the process design procedure, to mention only a few.

First, usually, SMEs cannot afford paying expensive consultants to specify the EDI or SOA relationships between various partners. For safe, collaborative, cross-organizational process scenarios, assuring compliance with regulations (e.g., privacy) is a central condition. A large number of business constraints exist, that need to be governed and checked. Second, managing process change, and thus process adaptation, is a frequent challenge to be solved during process collaborations between business partners (e.g., due to new or environmental, organizational, and legal regulations). Affected process choreographies are then subject to costly renegotiation, whose optimization lacks scientific and procedural attention. These tasks are to be accomplished under the restrictive condition of considering the non-disclosure of partner details. Realizing approaches and solutions for these fields of process compliance and change management in collaborative scenarios will have academic and industrial impact beyond the duration of ADVENTURE.

Integrating and utilizing dynamic data from real-time sensor networks at design time, for process design, as well as process compliance purposes, is of central interest to end users since it is the link to getting real-time data into ADVENTURE. The impact of ADVENTURE will be the exploration of new ways/methods of enabling the interaction with processes at design time. Hence, ADVENTURE provides impact by moving towards embodiment of the vision of the Sensing Enterprise, which considers an enterprise to be a complex smart entity capable of sensing and reacting to a wide-ranging set of (business) stimuli. The term, Sensing Enterprise originated from the FInES Position Paper of 2011 [FInES2011]. The impact of process management is, due to the nature of ADVENTURE, closely related to many other research fields: privacy aspects can be transferred to the cloud, the Internet of Things is linked in process design, process and supplier description and discovery are closely related to the semantics impact etc.

ADVENTURE’s Smart Process Designer, Data Provisioning and Discovery browser in the ADVENTURE Dashboard visualizes the necessary connections, allows an

easy specification of roles of partners in a network, and provides the basis for secure seamless data exchange. In the field of process design and compliance, ADVENTURE will significantly contribute to realizing the vision of making the cross-organizational aspect of process collaborations transparent, i.e., realizing a working environment across companies with the “look and feel” of the process management within one company as it is today. Process Execution and Adaptation at execution time will offer a radical way forward to the planning stages of virtual factories and indeed more information will be provided in D8.4.3 as these components are tested in the use cases of D7.2.

### 2.4.3 Internet of Things Impact

An integral part of ADVENTURE for providing a foundation for process efficiency and the potential for real-time process adaptation within the context of virtual enterprises is its Smart Object Integration Component. For the development of this component various smart objects and smart object technologies are being analysed with regard to their potential as information sources for process monitoring and governance purposes. With the integration of different smart objects such as wireless sensors, RFID-systems etc. as information sources, ADVENTURE will contribute with new methods and technologies for connecting these diverse technologies and aggregating data from them.

The FInES-Aarlborg workshop in May, 2012 had the objective of exploring and debating the Internet of Things advancements as these are expected to have a significant impact on the development of next generation Enterprise Systems. [FInES2012]. ADVENTURE will mark an important step towards the realization of the vision of the Internet of Things. The internet is revolutionizing the Enterprise and Business environments with the introduction of RFID technologies enabling more automated processes. These open the way towards an Internet of Things where multiplicity of tags, sensors and actuators provide physical world information enabling new classes of applications combining virtual and physical world information. Open architectures supporting such environments as well as understanding of their impact on the Internet emerge as Research Drivers Furthermore, as ADVENTURE is not only concerned about smart objects as information sources, but seeks new and efficient possibilities to store and use this data in cloud-based approaches, an important contribution of ADVENTURE is the integration of Internet of Things technologies like the mentioned wireless sensors or RFID-systems with cloud-based systems.

Additionally, one intended usage for sensor data in this context is sustainability. Here, ADVENTURE will make use of wireless sensor data and other data stemming from the Internet of Things to reduce CO2 emissions, e.g., in the context of transport. This will provide one of the first insights into possibilities to use smart objects and corresponding Internet of Things technologies to address sustainability issues and improve the environmental friendliness of various transport processes. The potential for impact in this area is increased when considered in the context of complementary research in other project, such as the FASyS project, where the sensing enterprise is instantiated as the “caring manufacturing enterprise”, where new levels of industrial safety and workplace comfort are facilitated by the Internet of Things. [FASys2013]

In the context of smart objects in general and especially against the background of ADVENTURE's targeted application scenario with different companies collaborating to form virtual enterprises, IT security, and especially privacy, is an important issue. This is addressed by ADVENTURE in general, but more attention will be paid to this especially during the development of the Smart Object Integration Component. With a risk analysis conducted in this context, ADVENTURE will basically provide deeper knowledge about which problems arise when heterogeneous Internet of Things technologies are employed in heterogeneous environments like virtual enterprises and how these problems can be addressed.

#### 2.4.4 Cloud Impact

ADVENTURE will also contribute to the field of cloud computing in WP4. Most notably, the developed concepts and tools will have an impact on cloud-based data storage solutions and related projects. First of all, ADVENTURE addresses the data privacy and security issues of cloud computing. For this, ADVENTURE develops methods, technologies, a role-based access model and corresponding privacy levels ensuring that only the people who have the right permissions are allowed to access the respective data. In addition, ADVENTURE establishes a relation between cloud computing and the Internet of Things by collecting and storing sensor data in the cloud. The information retrieved from the smart objects allows for the combination of real-world object data and IT-based process information. In doing so, a holistic view on distributed, cross-organizational manufacturing processes can be provided.

Hence, partners are aware of the delivery status of a product and are able to predict bottlenecks and delays. But ADVENTURE does not only provide access to the latest information. Instead, a cloud-based data warehouse may be created containing current and former manufacturing process information. Therefore, ADVENTURE provides cloud-based data management and archiving solutions. This permits to conduct simulations, data analysis and reporting in order to detect process failures, to perform risk assessment and to identify room for improvement, but it also allows for business traceability and continuity. Thus, ADVENTURE provides competitive advantages for Europe's SMEs.

Longer term, manufacturing enterprises and networks are likely to be faced with the Data Deluge problem [DATA\_D]. Then, according to the FInES Roadmap 2025, in addition to Cloud Computing it will be necessary to develop Ground Computing, i.e., diffused storage and computing power offered in the real world by concrete smart interconnected objects [FInESc]. ADVENTURE is well placed to potentially also have longer term impacts in this area due to its combined contributions in the area of cloud-computing and smart object integration.

The Cloud Storage component expands the possibilities for software development in the Cloud markets by providing a facade to different storage technologies and therefore abstracting not only from concrete resources but also from the backing technologies, providing the best technology for certain sets of data based on their structure (binary, level of structure, semantic). The Message Routing and Transformation components provide high performance interoperability between cloud services and

silos, which, considering the high data volumes that cloud storage solutions can provide, is a clear need.

### 2.4.5 Semantics Impact

One of the research challenges identified in the FInES Research Roadmap 2025, is to obtain the Unified Digital Enterprise. This challenge is multi-faceted, but it is clear that an important requirement is to overcome the current fragmentation of knowledge in order to achieve a holistic view of an enterprise, for example by the inclusion of semantics [FInESd]. As it has been highlighted in different parts of this description of work, ADVENTURE will consider the creation of a semantic data warehouse in the context of manufacturing processes. In order to provide advanced discovery mechanisms for sharing the data needed by manufacturing processes, ADVENTURE will carefully define a data model, addressing every entity of a virtual factory. The entities range from resources, materials, and engines, to complex manufacturing processes and business models. Therefore, ADVENTURE relies on Semantic Web activities and standards. The related data will conform to common standards and use shared ontologies and schemata. In addition, results from the FP6 STASIS project will be used to ensure the interoperability between different data formats. This eases the sharing of both technical and non-technical data between the participants of a virtual factory.

Furthermore, the use of shared ontologies and schemata enables fast connection to new virtual factories, provided that the latter are willing to conform with them, as well. The more use cases the modelled data can support, the more new software will be developed on their basis, leading to a bigger technical impact. As a result, ADVENTURE will provide valuable information on the application of Semantic Web standards on a large scale and will help to spread the usage of Semantic Web concepts and technologies.

### 3 Strategy, Research and Innovation Impact

D3.4 Conceptual Manufacturing Reference Model highlights ADVENTURE's approach to front-end innovation perspectives within the virtual enterprises while maintaining the unique strategy for business solutions. This approach contributes towards information exchange and versatile business relations among collaborative partners. It overcomes the traditional rigid controls on organizational processes and offers a new flexibility in the operational activities. The provided appropriate and on-time information-sharing facility of ADVENTURE will help to eliminate the consequences of information hiding which cause substantial damage among partners, e.g., concerning their competencies and capabilities. The real-time knowledge sharing among the network partners will constitute a significant added value for the partner companies involved in the virtual enterprise environment.

ADVENTURE aims to ultimately give EU businesses a competitive edge in the global market and to gain easier participation in EU research and innovation programmes.

In order to compete with today's business environment, the virtual enterprises need to demonstrate the ability to use, describe, store and retrieve the manufacturing process related data for efficient process control and to adapt processes in real time. ADVENTURE will create and implement a communication platform for this purpose, supporting both static and dynamic types of process flows for manufacturing processes. Most of the current virtual enterprises suffer from lack of such communication and cooperation platforms, with which ADVENTURE will provide a significant added value to the value creation process among participating partners in virtual enterprises. In this context, the proposed ADVENTURE platform will specifically allow for higher innovation potential and managerial efficiency in networked operations like manufacturing processes.

ADVENTURE will enable virtual enterprises to diminish operational bottlenecks by providing enterprise-oriented ICT tools within the scope of optimizing the information exchange and simplifying collaboration and facilitating immediate adaptation of networked processes. In this context, ADVENTURE contributes to the end-to-end approach in the selection process of virtual enterprises' partners, forecasting the demand levels, and easily facilitating improved target based collaborations. ADVENTURE will as well provide the ability to capture product information, which in turn offers a holistic approach for product analysis and improves the related smart semantic information.

Current solutions for managing manufacturing process data through product data management and product lifecycle management are not sufficient to cover the wide scope of the operational activities within virtual enterprises. They do not support the versatile solutions for the concept of e-manufacturing and e-commerce which are the crying need in today's business communities. The concept and approach of ADVENTURE will precisely fill up this substantial gap in the industrial sectors, which will also impact on the innovation perspectives of the operational processes. ADVENTURE will help virtual enterprises to supersede the operational bottlenecks

and limitations and will establish simplified and dynamic manufacturing process integration among collaborative partners.

### 3.1 European and Competitiveness Impact

The current business markets are dynamically changing over time. Furthermore, the ongoing globalization leads to strong market competitions within and outside Europe. European companies have to compete with companies from all over the world. Especially in the manufacturing sector, companies from the European Community are struggling to compete with low cost countries in terms of cost benefit, market segments and customers acceptance.

To preserve competitiveness under these market conditions, efficiency and fast adaptation are key factors. It is difficult for SMEs in Europe to focus on target-oriented approaches for communicating and sharing their individual business needs. The virtual environments of ADVENTURE will provide them with tools that support sufficiently the search and allocation of valuable pieces of information that can make them competitive in their product lines. Thus, ADVENTURE will increase European competitiveness with two main impacts, which concern management efficiency and fast manufacturing process adaptation.

Virtual factories that are facilitated through ADVENTURE will have the ability to utilize common resources and information as well as common forecasting and optimization algorithms that act upon this information. Thus, the involved enterprises will be able to calculate cost-benefit curves of a variety of alternatives, not only from their own point-of-view, but also from the point-of-view of their potential partners. This will help to form the right manufacturing processes and achieve benefit optimization with resource minimization, i.e., higher management efficiency. This will enhance the competitiveness of every participating SME, but also the competitiveness of the European market as a whole, as the building of the most beneficial partnerships and manufacturing schemes contributes to the efficiency of the whole market.

The mentioned manufacturing schemes will be highly competitive also because they will support continuous adaptation. The modelling of manufacturing steps as exchangeable services will make fast process adaptations possible. These adaptations will not only ensure that maximum benefit is still achieved even upon market changes but also that the used manufacturing approaches are hard to copy. The latter aspect will ensure the sustainability of the participants of adaptive manufacturing virtual factories.

### 3.2 SME Impact

The business segment of small and medium-sized enterprises is the most important in terms of workforce employment and GNP share in Europe. SMEs exist in every industry and in every country of the European Union. As stated in the DoW, SMEs have not benefited the most from the advantages that modern business strategies and sophisticated technologies can offer. These advantages have mostly been limited to major companies so far.

The common usage of manufacturing execution systems among SMEs is rare. Currently, SMEs are mostly component suppliers for leading companies and the com-

plexity of operational processes is limited. However, during the recent economic recession, the SMEs noticed rapidly how the large enterprises quickly changed their procedures and minimised the number of bought components. To compete in an open market, the large players have to follow their competitors and find components as cheap as their competitors do. For SMEs this situation is demanding. They have to automate their procedures, minimize the personnel cost and move from operational optimization to new, innovative solutions, joining forces through collaborative networks as the latter are their only chance to keep up with the mentioned changes. If the business model is to just subcontract for market leaders the risk is usually losing the position to low-cost country competitors.

SMEs might choose between two strategies:

- Provide more advanced, module-based solutions for the main contractors
- Join efforts to develop and manufacture export products themselves.

Both strategies require more tight collaboration with other partners and supporting tools and methods to move on. ADVENTURE provides solutions for both scenarios. One SME may take a broker role to offer a more integrated solution for the main partner and find proper partners; in most of the cases one single company does not have the resources needed. On the other hand, if a group of SMEs decides to create a product or service of their own, they have to resolve a similar puzzle. ADVENTURE provides a platform to integrate manufacturing processes even with distant partners and take for example care of logistics issues and scheduling challenges.

Importantly five of the project partners of ADVENTURE are SMEs: TIE, TANet, ISoft, Ascora, and Azevedos. Therefore, ADVENTURE is able to gather the special requirements of SMEs and explicitly address them. Even though some of these are technical SMEs rather than users the importance is an “SME mentality” which encourages SME-orientated solutions in whatever field. Furthermore, this can be made considering the situation in various European countries for SMEs, as the mentioned SMEs originate from different European countries, being situated at the Netherlands, the United Kingdom, Bulgaria, Germany, and Portugal. With TIE, TANet, ISoft, and Ascora each leading a work package, ADVENTURE will have an even higher benefit from their involvement. This way, a significant SME impact on an encompassing European level is ensured for ADVENTURE.

### 3.3 Education and Training Impact

Having three Universities and one university research centre in the consortium, ADVENTURE will provide a strong impact into the Training and Education domain. Technische Universität Darmstadt (TUDA) will provide a course for master students to utilise the project results. The students are able to simulate the collaboration in a virtual factory and plan and operate manufacturing activities. Furthermore, students' thesis regarding the content and usage of ADVENTURE will be offered by TUDA giving the students the possibility to work on new technologies and providing them with insights in the latest research developments in the addressed domain.

Additionally, PhD candidates will use research results from the project for their dissertations. University of Vaasa will provide a manufacturing simulation environment in a 3Dsolution to enable any Internet user to see both the manufacturing floor activities

of the virtual company and also monitor the partners' production updates and view the overall production process with the integrated Dashboard. The 3D-environment is for demonstration purposes to motivate students to get closer information from distance web-courses. University of Vienna will use the results of ADVENTURE in seminars, lab exercises and students' projects as an example and foundation for the usage of collaborative manufacturing executive system technologies in a real-world scenario. Furthermore, results from ADVENTURE will be presented especially in the courses "Workflow Intelligence" and "Business Intelligence", enriching the contents of these courses with latest research developments for the benefit of the participating students. INESC has as main shareholders the University of Porto and the Faculty of Engineering of University of Porto (cp. Section B2.3.6). Also, about one third of the members of INESC are teaching at the Faculty of Engineering. From this position, INESC will actively promote the transfer of training materials and will provide training to the relevant teachers at the Faculty of Engineering, to allow them to disseminate the ADVENTURE results in lectures and lab work with the students. INESC will provide also professional training services to companies from all industrial sectors, including in particular the machinery industry, which is the focus of the Portuguese demonstrator. Furthermore, INESC will provide a collaboration platform to the University of Porto for the master students to simulate SMEs collaborating in machinery industry with incorporated smart sensors.

### 3.4 Market Impact

The European SMEs, especially in the manufacturing sector, have a high pressure to compete with low-cost countries. The international enterprises have to select more and more cost efficient component suppliers. The simple and small components are easy to outsource to low-cost countries. By providing the SMEs an open interface to be virtually connected to these enterprises, SMEs can enhance their competitiveness by flexibility and fast deliveries.

ADVENTURE offers also another benefit for the European market. By providing a partner discovery, process runtime and data exchange platform even large groups of SMEs can be brought together and managed effectively in order to fulfil demanding business opportunities, without being dependent upon a big company that wants to outsource specific tasks to them. The scope of virtual factories will meet the scope of virtual enterprise, so that tens of SMEs can build ad hoc relationships and even compete with big international companies.

## 4 Collaborations with other Projects and EU Initiatives

The following section deals with collaborative actions with other projects and covers the cross collaborations and input into the overall EU Dissemination strategy. (For more detail, please see D8.5.3 Report on Cluster Activities). This includes the work done at joint conferences and seminars hosted by other projects such as IMAGINE presenting a common and coherent understanding of the FoF domain. (Further details can be found in Section 8 Appendix - Background Information). The interactions with other projects helps to shape EU policy as new ideas are discussed and brought into focus. D8.5.3 clearly shows the activities that the ADVENTURE partners have undertaken to interact and get the message out that ADVENTURE is looking seriously at solving key areas of Virtual Factory operations but this deliverable is focused on the overall message that all the other projects in this group are giving a clear pointer as to what the next steps should be to progress the work currently undertaken. Indeed it will feed into the Horizon 2020 programme where many of the ideas being generated in the current projects will be funnelled into strategies for SME adoption. The following sections show how each of the activities undertaken by project partners (primarily TANet and TIE) are interrelated and are creating a clear direction that should be distilled in the final report D8.4.3.

### 4.1 FInES FoF Projects

ADVENTURE is one of 10 projects that were launched under the FoF.ICT.2011.7.3 Virtual Factories and Enterprises call. The other projects include MSEE, COMVANTAGE, VENIS, EPES, IMAGINE, EXTREMEFACTORIES, GLONET, PREMANUS and BIVÉE. The commission has been keen to ensure that the projects communicate effectively with each other and naturally present a common message from the point of view to shape any future work on Factories of the Future. Although the FInES group has not been as active in previous years and changes are underway to reshape the various units in the commission, the networking power the group has led to numerous collaborations with the individuals with the consortium. Indeed the FInES cluster has produced two key positioning papers; “FInES-H2020\_PP-v2.0\_final” and “+FINES-ResearchRoadmap2025-v2.0”<sup>1</sup> Which state that “The European way to the Internet of the Future, based on open platforms, web entrepreneurship and collective innovation, represents now an unprecedented opportunity for European enterprises to obtain multi-faceted business innovation, socio-economic competitive advantage and human-centric sustainable growth. According to many international analysts, ICT is now evolving into a global Internet of Everything (IoE), contributing to an economy that, from 2013 to 2023, will generate \$14.4 trillion in Value at Stake.” Whilst these papers are looking towards the future, it is important to see what impact projects such as ADVENTURE can make in the present economy.

<sup>1</sup> Downloadable from [http://www.fines-cluster.eu/fines/jm/index.php?option=com\\_docman&Itemid=90](http://www.fines-cluster.eu/fines/jm/index.php?option=com_docman&Itemid=90)

## 4.2 Feeding information into EFFRA

Recognising the need for a representative body to speak on behalf of the private partners in the 'Factories of the Future' public-private partnership, in 2009 the manufacturing community formed the international non-for-profit association "European Factories of the Future Research Association" (EFFRA). The association is composed of over 100 members including industries (both large and SME), research and technology organisations (RTOs), universities and related European associations.

This document has been developed by EFFRA through numerous internal and external consultations over a period of 24 months. Meetings included discussions with representatives of the European Commission within the 'Factories of the Future' Public-Private Partnership (PPP) Ad-hoc Industrial Advisory Group (AIAG) and close consultations with representatives of companies and RTOs organised in other related European Technology Platforms.

An extensive public consultation on this roadmap took place in summer/autumn 2012. The consultation was publicised through the communication tools and social media of EFFRA, platforms and related stakeholders. It provided companies, RTOs, universities, European Technology Platforms, associations, NGOs, trade unions and other grouping with an interest in manufacturing with the opportunity to provide their input. ADVENTURE is one of the projects chosen to feed into the Factories of the Future Public-Private Partnership Roadmap current version: 14 June 2013)

EFFRA has capture data on most of the projects in their portal including ADVENTURE (See Section 8 Appendix - Background Information).

In March 2013, the European Commission, with the support of the European Factories of the Future Research Association (EFFRA), organised the 3rd Workshop on the Impact of the FoF PPP. All FoF projects funded in the first 3 calls (2010-2012) were invited to a 2-day event to assess the impact of the PPP initiative and to strengthen the cooperation links within the community. ADVENTURE was again represented at the workshop and the link between the other FoF projects was clearly established.

## 4.3 Project Inter-co-operation and cross dissemination

TANet and TIE are jointly responsible for ensuring cross project co-operation and many activities have been carried out to support this activity. One of the key developments over the year has been the drive from the commission to get projects to jointly disseminate their work and ADVENTURE has been represented at every meeting. One of the key follow-up meetings after the workshop "Impact of the Factories of the Future PPP" held on 11-12 March 2013 (see Section 8 Appendix - Background Information for more details) was hosted by InnoLAB<sup>2</sup> based at 103 route de Chancy, 1213 ONEX, Genève – Suisse hosted the event and much of the documen-

<sup>2</sup> <http://www.innolab-swiss.eu/cde-conference-videos.html>.

tation can be found on their website. The ADVENTURE input was in Session B: Integrated Platforms for Smart Factory 2<sup>3</sup>

This workshop acted as a catalyst to introducing the work of each of the FoF projects and many discussions followed as it was clear that there were many synergies that the various projects could exploit. In particular, IMAGINE and ADVENTURE could be seen as two projects addressing very similar themes and this led to the discussions to the formation of the MiniCluster as detailed in section 4.5 MiniCluster Meetings.

#### 4.4 First ADVENTURE workshop - FAIM – Porto, Portugal - 28th June 2013

First ADVENTURE Workshop: Co-hosted with the FAIM 2013 and offered the opportunity to:

- Generate awareness of ADVENTURE within the collaborative business communities
- Present the prototype software components of ADVENTURE to potential end users
- Seek feedback on the ADVENTURE approach from different target groups
- Encourage a wider uptake of ADVENTURE

The workshop presented a clear picture as to how a “plug-and-play” factory design challenge was actually being solved widening and covering a more diverse range of topics, more people would be encouraged to attend the workshop. (Full details of the workshop can be found in D8.3.4 ADVENTURE Workshop 1 Report).

Here the ADVENTURE advisory board that was setup to bring manufacturing expertise really became a valuable tool to assess the true progress of the ADVENTURE platform. It was clear that ADVENTURE was addressing key areas that could improve the visibility of supply chains in the automotive and aerospace industries alike. Many of the questions from the audience also proved that project is having a clear impact in areas such as reducing the carbon footprint and making tools available to SME's and not just the larger organisations.

#### 4.5 MiniCluster Meetings

Throughout the 2<sup>nd</sup> year TANet and TIE have worked hard along with the other members of ADVENTURE to foster strong co-operation with the other FoF projects. (Full details of this activity can be found in D8.5.3 Section 3.4).

The first of these meetings took place in the TIE building in Breukelen (The Netherlands) on the 16<sup>th</sup> July 2013 and the purpose was to start the co-operation process off.

Representatives of the projects ARUM, CREATE, EXTREMEFACTORIES, PREMANUS, GETSERVICE, MSEE and IMAGINE were present. As mentioned previously, the origins of the MiniCluster was the joint initiative of the dissemination leads from ADVENTURE and IMAGINE. The meeting established the common goals of each of the projects attending and this was a first step into working collaboratively

<sup>3</sup> <http://www.youtube.com/watch?v=o-7Pb7Uy-GQ>

to reduce the amount of repeated effort in each of the projects. Although the Mini-Cluster has exchanged project data, it is at the early stages of provided further policy statements but these should become concrete, ready for the final report D8.4.3.

#### 4.6 IMAGINE SIG Meeting

Following the MiniCluster meetings, representatives of several projects were invited to Greece to form a special interest group (SIG) to listen to the IMAGINE project representatives explain in detail the structure of the IMAGINE project. The gathered audience of experts (Including TANet representatives) were asked to pass comment on the progress and direction of the project. They were also asked how the various projects that each of the SIG members represented could work with each other. The results have been uploaded to the IMAGINE portal and will be available in the next report D8.4.3.

#### 4.7 FI-PPP Links

As part of the Future Internet PPP initiative, FITMAN is one of the 5 phase II projects that were selected to continue the commission's strategy of Internet-Enabled Innovation in Europe focusing on the manufacturing sector. Initial linkage with the project was made through the FIA Conference in Dublin (see above) and TANet is now one of the use case trials bringing ADVENTURE into the FI-PPP domain. The FI-PPP is a very large undertaking by the commission and the success of the initiative could open the doors to a European platform similar to that of the American giants AMAZON platform.

Again in terms of policy and decision making, the direction taken by the commission is to clearly develop the software as a service model and ADVENTURE fits perfectly into this role. It is clear that applications are being developed more at the server level as in the case of FI-WARE platform<sup>4</sup>, where Generic Enablers are pieces of software that FI-WARE seeks to provide for truly open, public and royalty-free architecture and a set of open specifications that will allow developers, service providers, enterprises and other organizations to develop products that satisfy their needs while still being open and innovative.

The initiative is aiming to dramatically increase Europe's Information and Communications Technology competitiveness by introducing an innovative infrastructure that enables cost-effective creation and delivery of versatile digital services, high quality of service and security guarantees. The platform aims to reduce obstacles and foster innovation and entrepreneurship in a variety of ways:

- Offering a set of open APIs that allow developers to avoid getting tied to any specific vendor, therefore protecting application developer's investment
- Providing a powerful foundation for the Future Internet, cultivating a sustainable ecosystem

<sup>4</sup> <http://www.fi-ware.eu/> - The FI-WARE project will design, develop and implement the so-called Core Platform within the European Future Internet Public Private Partnership (FI-PPP) Program defined under the ICT FP7 Work Programme.

- Delivering new applications and solutions meeting the requirements of established and emerging areas of use to service providers
- End users and consumers actively participating in content and service consumption and creation.

Clearly ADVENTURE is already geared to provide services in a similar fashion and can be expanded to follow the FI-WARE philosophy.

Much of this will be explored ready for presentation in the final report D8.4.3.

## 5 Impact with Regard to the Digital Agenda

With regard to the *Digital Agenda for Europe*, ADVENTURE will contribute to the following Action Items:

### 5.1 Digital single market

ADVENTURE facilitates the deployment of virtual factories regardless of where they are located. Information about manufacturing processes and virtual factories is prepared regardless if business partners are located next door to their own manufacturing facilities in a completely different corner of Europe or indeed anywhere in the world.

### 5.2 Interoperability and standards

The facilitation of interoperability between the IT systems of partners in manufacturing processes is one of the key concepts of ADVENTURE. The project is based on the end-to-end integration of ICT systems of companies through the Internet and provides a single view on manufacturing processes through the ADVENTURE Dashboard. This is done through the realization of cross-organizational manufacturing collaborations through service and process based virtual factories. Interoperability is not only supported regarding the possibility to automatic exchange and processing of manufacturing-related data, but also by giving the possibility to monitor, forecast, and simulate manufacturing processes. ADVENTURE will also reduce the barriers to interaction between ICT systems by providing the technical means to access this data.

### 5.3 Research and innovation

ADVENTURE will add value for partner companies within virtual factories by delivering innovative concepts and technical solutions. Apart from the funding by the European Union, ADVENTURE's beneficiaries will commit substantial resources to further promote research and innovation within the Factories of the Future (FoF) initiative. Research conducted within the project will be industry-driven and aims at direct utilization by companies. Innovation provides real benefits for European citizens, consumers and workers. It speeds up and improves the way we conceive, develop, produce and access new products, industrial processes and services. It is the key not only to creating jobs, building a greener society and improving quality of life, but also to maintaining competitiveness in the global market.

### 5.4 ICT-enabled benefits for EU society

Apart from the positive impact of ADVENTURE on Europe, Competitiveness, SMEs and Education and Training, ICOLOGY will also have an impact on the usual EU citizen by providing the means to minimize the environmental impact of manufacturing processes. There are certain expectations regarding environmental- or health-related characteristics of products. Through ADVENTURE, it will be possible to adapt manufacturing processes so that these expectations will be met This information could also

be used by companies to enhance environmental awareness of consumers and incorporating this into buying decisions, thus aiming at new business models and innovation scenarios for a low-carbon economy and a greener Europe.

## 6 Conclusion

ADVENTURE has played a far more significant role in helping to shape the future strategy of the EU Commission through the various interactions as described in section 4 and in so doing will have an impact on Policy Action Plan heading towards Horizons 2020.

ADVENTURE's impact on standards, technical, software, process design is now becoming visible as the workshop in Porto, Portugal proved through the feedback from the advisory board members, specifically from the automotive and aerospace sectors in terms of how ADVENTURE could influence the visibility of the supply chains.

Heading into the final year, ADVENTURE is set to make a major impact on the "software as a service" model that is being promoted through the Horizon 2020 programme. By having such tools and services to showcase the key benefits that ADVENTURE brings, a very positive message can be given that the commission is backing the right strategy in terms of promoting virtual factories.

The collaboration with other projects such as IMAGINE could lead to the formation of a joint policy document to help the commission shape the focus on the next funding programme.

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## 8 Appendix - Background Information

T8.4 Policy and Social Impact (Original Lead: ABB) – Deliverables: D8.4.1-3

This task addresses special activities of the project to assess the dimension of expected policy and societal impact and the viability of the project in view of expected acceptance of such impact. The project should identify the policy priorities or pillars that it will support by its activities, notably under the umbrella of the Commission's ICT Programme Challenge 1 priorities or external assemblies such as the Future Internet Assembly. The Commission "Innovation Union" and the "Digital Agenda for Europe" Communications are reference documents to be carefully considered by the project.

Specific attention shall be paid to the identification of societal stakeholders, groups and policy makers that will be relevant to the adoption of project results, in order to support the development of special actions to acquire their motivation and to sustain the deployment of the project results. This task addresses as well as any standardization initiatives. This will lead to the development of a yearly report on Policy Action Plan containing recommendations for European policy makers.

### KEY Meetings for ADVENTURE Year 2

FInES Cluster Meeting	11/10-12/102012
Review meeting at Darmstadt	23/10-26/102012
Fire Conference	13/11-16/112012
Technical Meeting	04/12-05/122012
FInES Cluster	05/05-07/052013
FIA Dublin	07/05-11/052013
Digital Conference	04/06 2013
Imagine Geneva	12/06-14/062013
FAIM Portugal	26/06-28/062013
VLAB Meeting	30/06-05/072013

Details of meetings are provided here for easy reference. Full details are provided in D8.5.3 Report on Cluster Activities.

### Summaries of Meetings:

#### *FInES Cluster Meeting 11th October 2012*

With the participation of more than 50 experts, the latest FInES Cluster Meeting was held on 12 October 2012, hosted by the European Commission DG CONNECT Unit E3 Net Innovation at Avenue de Beaulieu 25, Room 0/S1, 1160 Brussels. The meeting was open to all interested stakeholders.

The objective of the two sessions was to disseminate the state of the art and relevant research insights and findings concerning each of the topics, including relevant work on the technologies and business scenarios/models for applications and services that enhance the innovation potential of business. Consideration of the broader societal impacts is welcome. These two sessions build on the discussions and outcomes of successive FInES meetings in 2011 and 2012, and existing FInES publications and meeting reports relating to next-generation enterprises and enterprise systems, including the [FInES Position Paper of 2011](#) and the [FInES Research Roadmap of 2012](#).

### **Fire Conference 13th November 2012**

[http://www.ict-fire.eu/events/past-events/list/2012/november/select\\_category/1.html](http://www.ict-fire.eu/events/past-events/list/2012/november/select_category/1.html)

### **Workshop - Impact of the Factories of the Future PPP 11-12 March 2013**

Venue: Centre Borschette, rue Froissart 36, Brussels

Rapporteur for the event: Paul Kidd, Cheshire Henbury

The objectives of the Workshop were to address innovation and exploitation issues in running projects and explore potential for cross-project clustering. To this aim, projects were grouped in small clusters and asked to discuss common technical and non-technical issues and possible synergies. Joint presentations were then delivered in three parallel sessions. The second day, in a plenary session, participants could listen to a number of success stories and to EC and private sector representatives talking about their views on the Factories of the Future PPP.

### **FInES Cluster 5th May 2013**

The meeting was expected to be a milestone event in the history of the Cluster.

Welcome: FInES Cluster Co-Chairs Man-Sze Li, Oscar Lázaro, Jesper Thestrup

10:15-10:30 Opening Keynote - Constantijn Van Oranje-Nassau, Head of Cabinet of European Commission Vice-President Neelie Kroes

10:30-10:50 Keynote by European Commission DG CONNECT Unit E3 Net Innovation - Peter Fatelnig Deputy Head of EC DG CONNECT Unit E3

10:50-11.20 Briefing on Horizon 2020, Annalisa Bogliolo, Research Programme Officer, EC DG CONNECT Unit F3

11:20–11:40 FInES Overview and Status Man-Sze Li

11:40-12:30 FInES Cluster Position Paper towards Horizon 2020

- Overview (Oscar Lázaro and Jesper Thestrup)
- FI-PPP (Oscar Lázaro)
- Web Entrepreneurship (Stuart Campbell)
- Various presenters / All

12:30-14:00 FInES Cluster Position Paper towards Horizon 2020 (cont.)

- Sensing Enterprise (Man-Sze Li)
- Digital Enterprise (Ricardo Goncalves)
- Collective Awareness Platforms (Michele Missikoff)
- Contributions from meeting participants
- Discussion
- Conclusions and next steps
- Various presenters / All

15:30-15:45 Coffee

15:45-16:05 Overview of FI-PPP Phase II Use Case Project FITMAN (manufacturing domain) , Sergio Gusmeroli, TXT FITMAN Coordinator

16:05-16:20 FInES Cluster Status & News from the Secretariat viewpoint - Fenareti Lampathaki (via video) FInES Cluster Interim Secretariat

16:20-16:50 Looking Ahead and Future Perspective: Management Announcement

Formal Ratification of FInES Cluster Co-Chairs

Man-Sze Li, Oscar Lázaro, Jesper Thestrup

16:50-17:00 Wrap Up and AOB

17:00 Meeting Closure

**FIA Dublin 7th May 2013 – Info from website <http://www.fi-dublin.eu/>**

FIA Dublin will be kicked off by a one “Opening Plenary Day” on 8th May, opened at Irish ministerial level, on the “Future Internet accelerates innovation” theme. This opening event is designed to grasp prominent experts’ views on future research trends and topical Internet issues.

The day is framed around three main questions:

- Technology: How and against which topic can we support a strong Future Internet supply industry?
- Innovation: How to foster innovation and stimulate demand?
- Transfer of Technology: How can we better stimulate transfer of research results towards start-ups and entrepreneurs?

Sean Sherlock – Minister of State, Department of Enterprise, Jobs & Innovation and Department of Education & Skills with responsibility for Research & Innovation  
Welcome video message from Máire Geoghegan-Quinn Commissioner for Research, Innovation and Science

How and against which topics can we ensure a strong EU Future Internet supply industry?

How to stimulate the demand of Future Internet technologies?

How can we better stimulate transfer of research results towards start-ups and entrepreneurs?

The following two days are dedicated to twelve research oriented working sessions of a higher technical nature, driven by the EU Future Internet research projects constituency:

- Mobile games in the Cloud
- Internet-of-Things: IoT architectures as crucial element in the Future Internet
- Boosting the App Economy: What's the role of APIs, Cloudlets and Data Driven Services?
- Where's the business in the Internet of Things?
- A Sharing Economy Perspective on Future Wireless & Wired Networks
- Green ICT: What would be the cost of doing nothing?
- Capitalizing on Sound for a smarter Future Internet
- Linking user populations to novel networks in Future Internet research programmes
- EU and US Innovation Platforms for Future Internet
- Open Data in Future Internet
- How far do we have to go to make the Future Internet Secure? Research challenges and perspectives for the FI
- Network operators' perspective on Future Networks challenges

Future Internet Public-Private Partnership: The Future Internet Public Private Partnership is a research and development initiative which takes FP7 research into innovation, notably in the need for strong cooperation among the participants and that it envisages results closer to the market. Today the Future Internet PPP moves from development into delivery mode!

This session will focus on the presentation of the current technology results: the Generic Enablers and the Open Innovation Lab, a place where developers will be able to use the technology to build innovative services and applications. It will show as well how this technology can be applied in some usage areas such as energy efficiency or manufacturing to create smarter business processes. Finally it will glimpse into the future when SMEs and web entrepreneurs will be able to use the technology to create crazy applications nobody thought of the following team will guide you through this exciting initiative:

David Kennedy (Eurescom), CONCORD project

Fiona Williams (Ericsson Research), FINESCE project

Andreas Metzger (University Duisburg-Essen) and Haluk Gökmen (Arcelik), FI-SPACE project

Carmen Mac Williams (Grassroots-arts), FI-CONTENT 2 project

Juanjo Hierro (Telefonica Digital), Future Internet PPP Chief Architect, FI-WARE

Stefano de Panfilis (Engineering), FI-WARE

Nuria de Lama (Atos Research), FI-WARE

**Digital Conference 4th June 2013**

Event Description: Learn, be inspired & understand your digital future

Whatever your organisation, digital technology is becoming integral to the way you work. From finding new markets to streamlining services and, the Internet has revolutionised the way each and every sector operates.

But with daily developments in the world of digital, it can be a full time job to stay ahead. And when the benefits for your business can be measured in pounds and pence, it becomes a critical decision to know whether something is noise or the next big thing.

Register your interest in attending Digital 2013, the free Welsh Government event where you can learn, be inspired and understand your digital future.

Learn what industry thought-leaders really think about the future and hot topics such as customer engagement, mobile, social media, big data and more, with advice and resources on how to effectively develop a digital culture at the centre of a business strategy.

Be inspired by 'mega' trends, cutting edge technologies, best practices, hands-on techniques and the practicalities of implementing new user engagement channels, analytical tools and social media technologies through speakers, case studies and workshops.

Understand your digital future by meeting like-minded businesses, buyers and suppliers and finding out how they're harnessing digital technology to win customers, collaborate, deliver services and engage stakeholders.

**About Digital 2013 - The ICT Sector in Wales**

The ICT sector in Wales contributes in excess of £1.2 billion to the Welsh total Gross Value Added (GVA) and comprises all sizes of business, from indigenous sole-traders to multi-national corporations. And it's a growing sector; with employment of ICT professionals within Wales forecast to increase twice as quickly as the average employment growth in Wales by 2020.

**Opportunities**

Predictions show that optimisation of ICT by businesses could generate a further £1.5bn for the economy over the next five years. It's a sector that's integral to businesses in Wales - across all sizes and sectors - and effective utilisation of digital technologies has never been as important for enterprise, jobs, and growth.

But with developments in the digital sphere unfolding at a startling pace, it's crucial that Welsh businesses are equipped with cutting-edge digital knowhow to enable them to exploit new technologies for business benefit.

*Why so many delegates attended across the two day event*

Digital 2013 provided a platform for knowledge transfer; anchored by talks from industry-leaders from organisations including Cisco, Microsoft, Cassidian and HP.

The two-day event on 3rd and 4th June 2013 at the Celtic Manor Resort in Newport brought together businesses, academia, decision-makers and industry leaders from across the private and public sector with over a thousand delegates attending across the two days.

*Digital Skills 2013*

Skills professionals and decision-makers working in the field of ICT, along with businesses attended on Monday 3rd June 2013 to take part in workshops and discuss issues around the ICT skills agenda. The Digital 2013 skills day was developed to provide a forum for the discussion of issues including the current ICT skills gap which exists across the UK. Inspirational speakers included Maggie Philbin and Emma Mulqueeny on the main stage and nine informative workshops relating to IT Skills.

*Digital 2013*

On Tuesday 4th June businesses heard from global thought-leaders on how digital technology can provide opportunities to win customers and collaborate. Delegates from businesses across Wales, The UK and further afield who attended Digital 2013 reported being inspired to take on new technological challenges and were given a platform for buyers and suppliers to identify opportunities for collaboration through main stage presentations and a series of workshops. The event also showcased businesses in Wales that are using ICT to grow their bottom lines; demonstrating to others how they too can benefit from being part of the digital agenda in Wales.

Digital 2013 also showcased businesses and provided networking opportunities through its Exhibition Hall with over fifty exhibition stands showcasing businesses of all sizes and providing opportunities for collaboration, networking and securing new business contracts.

If you were unable to attend the event or were there but would like to re-visit the discussions from the day, copies of the presentations and video footage are both available to view on this site, just select the presentations tab in the left hand menu or to view video footage from the day, select the media tab at the top of the page <http://www.digital2013.com/>

**Imagine Geneva 12th June 2013 - Factories of the Future**

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June 2013

**Factories of the Future towards Horizon 2020**

Hosted by the 12<sup>th</sup> international trade show

EPHJ-EPMT-SMT

As part of its European Economic Recovery Plan, adopted in November 2008 to tackle the global economic downturn that badly affected key sectors of European industry, in early 2009 the European Commission launched three public-private partnerships (PPPs). These PPPs were designed to fund research and innovation in the manufacturing, construction and automotive sectors to boost competitiveness and increase employment. Progress over the past year shows the scheme is having a positive effect in manufacturing and in the automotive industry and is starting to boost energy efficiency in construction.

The Factories of the Future (FoF) PPP aims to support the development of enabling technologies to foster innovation in the EU manufacturing sector, in particular by SMEs as manufacturing still played an important role in the European economy, constituting 21 % of the Union's GDP. Some 230,000 enterprises, many of them SMEs, directly provided more than 30 million jobs – some 20% of EU employment – with twice that number in related services. European manufacturing is also dominant in international trade, leading the world in areas such as car manufacture, machinery and agricultural engineering.

**FAIM – Porto, Portugal - 28th June 2013**

First ADVENTURE Workshop: Co-hosted with the FAIM 2013 and offered the opportunity to:

- Generate awareness of ADVENTURE within the collaborative business communities
- Present the prototype software components of ADVENTURE to potential end users
- Seek feedback on the ADVENTURE approach from different target groups
- Encourage a wider uptake of ADVENTURE

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The workshop was held just after midway through ADVENTURE, after all research and design deliverables had been completed and technical development work was under-way. The timing of the workshop was well suited in terms of the finalisation of important activities such as the definition of the project's vision and technical architecture, specification of both functional and technical requirements, completion of first prototypes of project components. At this point in the project, solid foundations had been laid out in the form of the aforementioned deliverables and ADVENTURE was able to present a clear picture as to how a "plug-and-play" factory design challenge was actually being solved widening and covering a more diverse range of topics, more people would be encouraged to attend the workshop.

The focus of the FAIM'13 conference is to discuss the theme: The Challenge of Sustaining Global Competitive Manufacturing Systems.

### ***VLAB Meeting 30th June 2013***

Meeting of TF2 – MDI / SOA

1. Actual status of the MDI / SOA Task Force after 7 years of work
2. State of the art on MDI / SOA. Reference work and white paper.
3. Strategy and vision of TF2 towards Horizon 2020
4. Plan of actions for TF2 (2013-2014)

*Meeting of TG11*

1. Progress since the last TG11 meeting
2. Route to the exploitation of the MEI vision document.
3. Future activities of the group

*Meeting of TG13 Collaborative Supply Networks (CSN)*

1. Presentation of the TG13 Collaborative Supply Networks (CSN)
2. Analysis of research and innovation priorities
3. Definition of needed partner's competences
4. Constitution of a core consortium to prepare a project proposal for H2020

### ***Other Topics:***

Enterprise Modelling for Enterprise Interoperability

- Distributed Modelling
- Meta-Modelling
- Methods and Tools
- Requirements engineering for interoperable enterprises
- Service Modelling for Business
- Synchronization of models

### Semantics for Enterprise Interoperability

- Enterprise applications analysis and semantic elicitation
- Reasoning methods and tools for model transformation and data reconciliation
- Semantic mediation and enrichment of enterprise models
- Semantic Web based approaches

### Architectures and Frameworks for interoperability

- Enterprise Application Integration
- Model Driven Architectures
- Service Oriented (Enterprise) Architectures
- Ubiquity, mobility, open architectures and large scale interoperability

### Future Internet and Enterprise Systems

- Future Internet and Enterprise Interoperability
- Future Internet in Enterprise Collaboration and Virtual Organizations
- Future Internet and Digital Ecosystems
- Next generation and vision for FlNES

### Platforms for Enterprise Interoperability

- Intelligent infrastructure and automated methods for business system integration
- Interoperability of operational Systems – Aspects of Service Management
- Non-functional aspects of interoperable solutions
- Open platforms supporting collaborative businesses

### Services for Enterprise Interoperability

- Utility and Value Added Services for Enterprise Interoperability
- Micro-services, negotiation and federated Interoperability
- Service-oriented Integrated Development Environments (IDE) for Enterprise Interoperability
- Service Science Management and Engineering
- Cloud Computing, everything as a Service (XaaS)

### Enterprise Interoperability Science-based

- Concepts, theories, and principles for solving Enterprise Interoperability problems
- Frameworks for the development of Enterprise Interoperability Science-based
- Contribution for Enterprise Interoperability Science-based from neighbouring scientific domains
- Proof of concept and assessment in Enterprise Interoperability Science-based

### Standards for Interoperability

- Challenges in standardisation
- Open Standards
- Standardisation policies
- Standards Organisations works on Enterprise Interoperability

#### Agenda –INTEROP-VLab meeting

##### Interoperability Scenarios and Case Studies

- How to reduce application gaps of new interoperability results
- Initiatives and communities
- New Interoperability Scenarios and derived requirements
- Problem statements
- Success stories and lessons learnt

##### Education on Enterprise Interoperability

- Business needs
- Curricula on Enterprise Interoperability
- Educational Methods
- Vocational Training on Enterprise Interoperability

##### Other Business

- Preparation of a “White document” with the state of the art for EI and associated domains
- I-VLab repository for reference papers. A repository must be created to store the reference papers in the domain of EI and Associated domain.
- Planning for I-ESA 2014

## EFFRA Portal

EFFRA is collecting information about All projects relating to Industry. ADVENTURE was invited to enter information into the portal so that it becomes immediately visible to its members and this in turn helps to disseminate the project further.

A screenshot of the ADVENTURE entry is shown below:

The screenshot displays the EFFRA website interface. At the top, the logo for EFFRA (European Factories of the Future) is shown, along with the text 'a MANUFUTURE initiative'. Below the logo, there is a navigation bar with links for 'Forum', 'Manufacturing Innovation Database Index', 'Your Profile', and 'Logout'. A user is logged in as 'gash.bhullar' with a last visit on 2013-03-13 at 13:58:40.

The main content area is titled 'RESEARCH & INNOVATION PROJECT | edit general information'. The project details are as follows:

- Acronym:** ADVENTURE
- Title:** ADaptive Virtual ENTERprise ManufacTURING Environment
- Registration code:** (this code is only visible to project participants)
- Website address:** [www.fp7-adventure.eu](http://www.fp7-adventure.eu)
- Project duration:** 36 months (2011-09-01 until 2014-08-31)
- Number of participants:** 10 participants
- Total budget - EC contribution:** 3,623,613 Euro - 2,807,000 Euro
- Description:** Virtual factories are a well-established concept although existing solutions have limitations:
  - Scoped at the business level
  - Provide an isolated view on certain virtual factory aspects
  - Restricted to simple tasks
  - Simple extensions to classic Enterprise Resource Planning (ERP) and Supply Chain Management (SCM) systems
  - Limited integration from other information sources
  - Lack of distinction between internal and cross-company processes
  - Limited interoperability of systems/data across factories

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

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

This needs to be based on the requirements of the manufacturing processes at a deep technical level to provide easy, flexible interoperability 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.
- Call topic:** [FoF\\_NMP\\_2011-2](#)
- Call topic title:** Cooperative machines and open-architecture control systems
- Instrument:** Small or medium-scale focused research project INFSO (STREP)

Below the description, there are sections for 'Related Demonstrators' (with an 'add demo' link and a placeholder 'Please fill out demo acronym - - -') and 'Related Challenges and technologies' (with links to 'edit related challenges' and 'edit related technologies'). A note at the bottom of this section states: '(The content of this section is under development and only visible to roadmapping team and project coordinators)'. A vertical scrollbar is visible on the right side of the page.

Figure 1 - EFFRA website screenshot