FP6 IST STREP PROJECT N° FP6-027 083

Information Society

FLUID-WIN

Finance, Logistic and Production Integration Domain by Web-based Interaction Network

Deliverable D18

Contributing to ERA Coordination

Release 1

FLUID-WIN

Dissemination Level: Public

Title	:	**Deliverable D18** **Contributing to ERA Coordination**
Document type	:	Deliverable
WP/Task	:	7.1 – IST Research Cooperation
Version	:	1
Date		09.12.2008
Status	:	Final Version

Organisation	:	IPK, TUK
Authors	:	Markus Rabe, Peter Mihók

Distribution	:	Partners, CEC, Review

Purpose of Document	:	Formal project deliverable

Document history	:	

1 Management Summary

This report summarizes activities performed in WP7 with respect to the “Contribution to ERA Coordination”. The report follows and relates to the deliverable D34: the report on the AITPL cluster activities.

The FLUID-WIN topics are related to several upcoming business and research fields in the areas of interoperability, product and service life cycles, integrated use of computer technologies (including ambient intelligence), financial and payment systems and e-business.

The research challenges and results investigated in the framework of the FLUID-WIN project were discussed at workshops and forums in Brussels (February 2006), Milan (June 2006), and Sophia Antipolis (June 2007) and published in a AITPL Cluster book published in 2007. The results were further summarized at the end of the project by the presentations on the “Workshop – European Projects in Academic Environment” organized by TUK in Herľany, Slovakia (October 2008) and on the Conference “AMIF 2008 – Ambient Intelligence Forum, Czech Republic” (October 2008) co-organized by TUK and the AITPL Cluster.

The leaders of this work were IPK and TUK, with substantial contributions from Joinet and support from Régens and LABEIN as well as from two end users in order to integrate the application view.

Information Society
027 083

FLUID-WIN

2 Contents

3 Introduction

This report summarizes activities performed in WP7 with respect to the “Contribution to ERA Coordination”. The report follows and it is related to the deliverable D34, the report on the AITPL cluster activities.

FLUID-WIN participated to the EC cluster activities and in particular promoting integration with the FP6 IST project cluster of Ambient Intelligence Technologies for the Product Lifecycle (AITPL Cluster). This cluster was used for research input and dissemination in a wider scale. FLUID-WIN promoted comparison of results and synergies in exploitation and dissemination activities among the cluster projects. Conferences and workshops were organized, to which the project actively contributed from its commencement date, supporting the preparation and presentation of project results. More details can be found in the deliverable D34.

FLUID-WIN contributed to the discussions and ERA co-ordination activities promoted by the European Commission. FLUID-WIN took part in the activities of the project: "ERA Co-ordination Initiative in the field of Networked Enterprise", an ERA Coordination Study that was launched by the DG INFSO, D4 (Networked Enterprise and RFID) unit. This study has elaborated the following topics: European research activities in the fields described; challenges seen by the groups active in these fields for the future; identification of overlapping research and interests; definition of visions for these fields (horizon 2020) and identification of major steps towards this vision.

This roadmap was presented to the local, regional and national authorities identified, pointing out the potential contributions of the respective geographic region and the advantages for the region identified by the research groups. Detailed information and relevant presentations, reports and documents are available at the related Web page http://www.networked-enterprise-era.eu/. Core results of this study and the project’s contribution are presented in chapter 4.

The research challenges and results investigated in the framework of the FLUID-WIN project were discussed at workshops and forums in Brussels (February 2006), Milan (June 2006), and Sophia Antipolis (June 2007) and published in a AITPL Cluster book published in 2007. The results were further summarized at the end of the project by the presentations on the “Workshop European Projects in Academic Environment” organized by TUK in Herľany, Slovakia (October 2008) and on the Conference “AMIF 2008 – Ambient Intelligence Forum, Czech Republic” (October 2008) co-organized by TUK and the AITPL Cluster.

Chapter 5 is devoted to the description of the research needs and challenges in AITPL, as they were published in the book “New Technologies for the Intelligent Design and Operation of Manufacturing Networks”, edited by Markus Rabe and Peter Mihók and published in Stuttgart by Fraunhofer IRB Verlag in 2007. This book was distributed to members of the AITPL and CERP cluster, and also submitted in 1000 copies to the European Commission, in order to be presented at the EPoSS workshop (11./12. February 2008) and further suitable conferences and workshops. Furthermore, the book contains a report from the forums and workshops listed above.

4 ERA Coordination Study and "The Future Enterprise"

Activities of WP7 were aimed to support the objectives of the Community in "Towards a common Vision and strategy in the Networked Enterprise & RFID research areas" in the creation of the European Research Area by coordination and joint activities conducted at national or regional level. Different activities have been promoted by the ICT for Enterprise Networking unit and a focussed ERA Coordination Study has been launched in December 2006. The strategic aim of this study was to facilitate the networking and contribute to the understanding of how to create better synergies between European, national, and regional research innovation programmes in four key research areas:

- Collaborative Business Networks,
- Digital Ecosystems for Business Innovation,
- Enterprise Interoperability,
- Ambient Intelligence Technologies for the Product Lifecycle.

4.1 ERA Coordination Initiative in the field of Networked Enterprise

FLUID-WIN took part at the "ERA Co-ordination Initiative in the field of Networked Enterprise" – an ERA Coordination Study, launched by the DG INFSO unit D4 (Networked Enterprise & RFID). The study focused on the field of Networked Enterprise and targeted to facilitate the networking among the EC, national and regional policy makers and key stakeholders and to improve the coordination of the related research policies, programmes and joint activities conducted at European, national and regional level. The study includes the elaboration of a wide pool of preparatory reports (i.e. Compendiums of Policies, European, National Reports, etc) targeting to contribute to the development of the common knowledge base necessary to support ERA coordination in the field. The study also deploys ERA coordination activities (i.e. consultation, policy workshops) targeting to involve EC, national and regional public authorities and policy makers in discussions and joint actions to improve ERA coordination in the Networked Enterprise field. Through them, the study aims to create sustainable networking and coordination interfaces and patterns and thus contribute to the realization of ERA in the respective field. The work covers all the European Union Member States (EU-27) as well as Turkey.

Furthermore, an on-line consultation was conducted on "ERA Coordination Initiative in the field of Networked Enterprise" targeted to validate and update/enrich findings regarding the existing situation in EU-27 with respect to the national and regional ICT policies / research programmes relevant to the field of Networked Enterprise and its four key areas.

Among the ERA study's objectives was to perform an analysis in a comprehensive compendium that contains ERA-related activities of the 53 FP6 projects funded by the Networked Enterprise & RFID Unit, ERA related activities and priority actions of the respective four clusters of projects and the policy-related activities of the unit in the field of Networked Enterprise. The compendium provides an overall insight on the strengths and weaknesses of the ERA-related activities in the Networked Enterprise field; the missing activities that should be addressed by the EC in the future; the key success factors for ERA coordination; and the areas where benefits from ERA coordination can be gained in the field of Networked Enterprise. Finally, the compendium also provides an inventory of the ERA-related activities, additional good practices for ERA coordination and the ERA coordination projects' profiles, summarising the coordination activities of the 53 FP6 Networked Enterprise projects. A comparative analysis concludes to a final recommendation action plan to improve ERA coordination in the field of Networked Enterprise and its key areas and puts the emphasis on the mapping and comparison of those relevant to the Networked Enterprise field and to its four key areas, European, national and regional ICT policies, research programmes and their technologies and research areas of focus as those were identified within the respective policy and programme documents.

The ERA study organised four workshops targeting to involve EC, national and regional public representatives and policy makers in discussions to improve ERA coordination in the Networked Enterprise field:

- The first workshop ("ERA Co-ordination in the field of Networked Enterprise", 13th December, 2007, Brussels) aimed to provide a forum in which participants met to discuss the opportunities to co-ordinate research efforts in the field of Networked Enterprise research and innovation. The workshop targeted to identify common interests on relevant research areas of Networked Enterprise, which might become the basis for future research co-ordination actions across member states.
- The second workshop ("Setting up a common ground for ERA coordination in the field of Networked Enterprise - The focus on Enterprise Interoperability and on RFID: Towards the Internet of Things", 16th April, 2008, Paris) aimed to address the ERA coordination topic in the field of Networked Enterprise among the member states. It focused on defining the research areas of common interest, the group of member states mostly dedicated on them and the potential coordination initiatives that could be designed and deployed in the near future. It was evident during the discussion that most of the countries have national ICT research priorities and programmes that are relevant to Enterprise Interoperability and RFID, despite the different terminology that is being used to express similar research domains. In addition, most of the participants also expressed their interest for coordination initiatives in those fields. Therefore, the discussion mostly focused on exploring the options for coordination actions and on setting up a plan of actions towards a concrete coordination initiative (in the form of an ERA-NET).
- The third workshop (" Setting up a regional ERA Coordination Initiative in the area of Digital Business Ecosystems", 15th April, 2008, Brussels) targeted to address the ERA coordination topic in the field of Networked Enterprise at regional level. It focused on defining the research and innovation priorities of common interest in the DBE area, a group of regions mostly dedicated on them and the potential coordination initiatives that could be designed and deployed in the near future.
- The fourth and final workshop of the ERA Coordination Study took place in Brussels on the 4th of June 2008. The aim of the workshop was to provide a forum in which member state representatives would meet to discuss the opportunities to co-ordinate research efforts in the area of Future Enterprise. In addition, it was targeted to prepare the ground towards a concrete coordination action (ERANET) within the context of the existing call for ERA-NETs that was currently open. During the discussions, it became clear that there were a number of organisations (7), national and regional public authorities, who have already confirmed their interest in setting up a 'Future Enterprise' ERANET.

FLUID-WIN supported this study in several ways and through different channels. TUK (represented by Peter Mihok) was in close contact with the Slovak partner of the study's consortium, BIC Bratislava, namely with Mr. Ivan Filus. Relevant information on the AITPL cluster and on FLUID-WIN research was provided to the study members, and TUK took part in the on-line consultation. The contribution supported the preparation of "the Comparative analysis key findings" in the concept of the "Future Enterprise".

The "Future Enterprise", a cross-thematic, cross-disciplinary and cross-sectoral research area of horizontal nature, which was presented, discussed and proposed by the Study, will combine research on key ICT enabling technologies for enterprise and business networks with research on the respective business and socio-economic aspects and disciplines.

The ERA Study Comparative Analysis key findings are summarized into six prominent research areas and selected topics:

1. Business Networks and Services – reference models, engineering frameworks and technologies for new business collaborative forms, ICT architectures and platforms for the intra-inter enterprise collaboration in supply (value chains) business networks;
2. AITPL-RFID – Internet of Things, ubiquitous computing or ambient intelligence, RFID enabled ICT architectures and platforms supporting innovative applications for the product lifecycle (e.g. in a variety of business sectors), highly distributed RFID/sensor based systems;
3. Interoperability in business networks and services – interoperability reference architecture and associated methodologies, guidelines and best practices, service oriented architecture, service discovery and composition, business models for Enterprise Interoperability (in the Web 2.0 era)
4. Interoperability and Semantic Web – ontology and semantics, web technologies for Enterprise Interoperability, semantic web technologies, semantic systems and applications, registries and repositories;

5. Trust, contract and security management in ICT systems and business networks – trust, contract and security management enabling secure collaborative business processes, next generation e-business tools enabling secure and trusted collaboration between partners in real time, trust in IT Systems and Business Networks
6. Digital Business Ecosystems – 4 broad research areas (e.g. interdisciplinary research on new value systems, standards, distributed decentralised dynamic P2P architectures, natural and formal languages to connect business knowledge and requirements) of special interests on Digital Business Ecosystems.

The FLUID-WIN project research topics relate mainly to the Business Networks and Services, Interoperability in business networks and services and Trust, contract and security management in ICT systems and business networks. The research results are described in deliverable D30 (Dissemination Summary). The project has organized a workshop in Herľany (Slovakia) „European Projects in Academic Environment" and co-organized a Session in Hradec Králové (Czech republic) at Ambient Intelligence Forum 2008, were these prominent research areas were promoted and discussed with researchers from different countries. The project also sent a delegate to the Business Information Days (P. Mihók was invited as a keynote speaker) in Cluj-Napoca (Romania), where the ERA related topics have been discussed by the researchers from Romanian academic institutions with great interest.

4.2 Cooperation with other Clusters and Projects

FLUID-WIN supported the cooperation between the AITPL and the Interoperability Cluster and contributed to the roadmap activities of this cluster,also.

Since its foundation, AITPL kept very close relations to the *Cluster of European RFID Projects* (CERP). Both clusters sent mutually delegates to their meetings. The public Web sites are presented in parallel within the same environment, which was maintained by the CE RFID project. Where possible, each of the clusters supported the public activities of the other one, e.g. by including abstracts and papers from the CERP cluster in a book that was edited by the AITPL cluster (for details see deliverable D34).

TUK registered in the Aml@work group and contacted ongoing FP6 projects. Common research problems were identified with ABILITIES, SEAMLESS, and TOOL EAST projects. Common research problems in Ambient Intelligence, ontology and standardization were found in cooperation with HYDRA, SAKE and Access-eGov FP6 projects. TUK took part in workshops and events, creating contacts with national and regional representatives (e.g. PRO-NMS project, a brokerage event in 2006). Based on activities done in the AITPL Cluster and in the ERA coordination, a list of technological and research challenges was prepared in the following areas:

- Intelligent products, which possess and collect relevant information during their "life cycle" supported by Ambient Intelligence Technology.
- Intelligent production processes which adapt themselves according to the request of the customer, the resources or the (intelligent) products
- New context-aware services and methods supporting AITPL.
- Technologies and processes which lead to trust and confidence with respect to security, policy, privacy, IPR and legacy aspects.

Workshops in Slovakia, where researchers of different EU projects (e.g. Abilities, Seamless, Tool East, HYDRA) presented their research goals in order to identify the overlapping research and interests were organized and TUK took part in further workshops organized by EU projects in Hungary, Poland, Romania and Czech republic (see deliverable D30).

5 Research Needs and Challenges

Ambient intelligence (AmI) is a concept representing a vision where humans are surrounded by various computing and networking devices, unobtrusively embedded in human environments (ISTAG 2003, ISTAG 2001). This vision emphasises user friendliness and participation, efficient and distributed services support, intelligent interfaces and support for human interactions. The realisation of this vision requires development of numerous new technologies like: unobtrusive miniaturised hardware, seamless communication infrastructures, massively distributed device networks (often referred to as an Internet of things), intelligent interfaces, security and dependability.

Product lifecycle management (PLM) is the process of managing the entire lifecycle of a product from its conception and design, production, support, and upgrade, to the product recycling. During a product's lifecycle an enormous diversity of workers' competencies, working styles and environments, as well as tools may be required. Often workers and their tools are distributed over numerous enterprises that also can be geographically dispersed. Even a basic analysis of benefits of the use of AmI technologies in PLM reveals a great potential for improvements of numerous characteristics of a product, like customisation, configuration by users, easiness of maintenance and upgrade of product services, self diagnostics, as well as reduction in material waste and increased recycling.

Ambient Intelligence in the 6th Framework Programme of the European Union focussed on human-centred environments, like home, workplace or healthcare. Although this approach still has the prime concern, new AmI technologies address also manufacturing and thus in fact the whole product lifecycle. The visions and conclusions were presented in the paper by Rabe, Frederix, Mihok, and Pawlak (2007) and are summarized in section 5.1. Section 5.2.deals with the conferences and workshops which have been organized by the FLUID-WIN Project to discuss the research needs and challenges with other EU projects and research communities to build ERA.

Today's highly competitive markets for new products result in an increased collaboration, often between competitors, during product design and development phases. Current design processes are characterized by the use of distributed resources. Knowledge sharing in design processes is practiced only in established partnerships based on mutual trust and appropriate agreements. Large enterprises prefer proprietary solutions to integrate their suppliers. Distributed collaborative engineering, which is an innovative method for product design and development that integrates widely distributed engineers for virtual collaboration, is typically restricted to engineering groups of large global companies. Inter-company collaboration in collaborative networks formed by SMEs is still a challenge. This is a consequence of a lack of inter-company secure collaborative infrastructures enabling easy "join and leave", adequate network-aware design methodologies including methodologies for participatory design that will enable smooth involvement of users in a design process and adequate business models for accessing engineering services over the network. Ambient Intelligence (AmI) technologies like RFID are now more often applied in logistics and Supply Chain Management, but as they are merely replacing older identification techniques they are by themselves not exploiting the full potential of the new technologies. There is no substantial use of AmI at the production ramp-up and manufacturing. Further applications are different stages of pre-competitive research, e.g. approaches for self-controlled production, scalable virtual reality technologies or intelligent supply chain support.

The "Ambient Intelligence Technologies for the Product Lifecycle" (AITPL) cluster of European projects has been established by the European Commission (EC) under the 6th Framework Program in the domain of Enterprise Networking. Following the AITPL Mission Statement, the strength of the European economy is substantially based on relationships among many enterprises, which together form agile networks, able to react to market demands in shortest time. These networks are competing successfully on a worldwide scale with enterprises from distant countries, which offer wages in a completely different dimension. This success can only be maintained if the networks establish and maintain smooth communication and collaboration of workers, as well as integration of enterprise infrastructures and resources, which cover the complete lifecycle of a product. Significant effort has been spent to synchronize the product development in such networks. However, the same exertion is indispensable to improve the manufacturing chain itself, providing means for a radical make-to-order strategy. This includes substantial new methods for product configuration, for supply network management, for the control of the supply network material capability, as well as for

propagating forecast for new model variants, and carefully monitoring the time-to-empty of the supply chain for the variants going out of production. “The AITPL cluster’s mission is to bring these topics forward and to identify potential new strategies for further research in order to keep Europe’s manufacturing industry not only alive, but fully competitive and in a strategically leading position, thereby enhancing the prospects for employment in Europe. This includes the development of new disrupting methods and IT support as well as the promotion of new stabile networks. This will substantially include field studies, which investigate the real business needs, as well as the constraints, depending on companies’ product categories, enterprise structures and size, in order to ensure that the project results will lead to substantial improvements in the immediate future” (AITPL 2005).

The technological and research challenges, which were discussed during the AITPL cluster events, can be classified into the following main areas (Frederix, Jaronski, Friess 2006):

1. Development of intelligent products, which possess and collect relevant information during their “lifecycle” supported by Ambient Intelligence Technology.
2. Development of intelligent production processes which adapt themselves according to the request of the customer, the resources or the (intelligent) products
3. Development of new context-aware services and methods supporting AITPL.
4. Development of technologies and processes which lead to trust and confidence with respect to security, policy, privacy, IPR and legacy aspects.

5.1 Towards Intelligent Products

Intelligent products are automatically identifiable and in addition they own information about their history and their intended future, as well as potential alternatives for their future path. Historical information can minimize the risk and maximize the economic benefit of critical parts, e.g. in car, aircraft, space or protection products.

Today, significant economic benefit is lost in Europe as the exchange of parts is just decided because of time elapse or a number of use cycles. This is still not eliminating the risk that the part breaks for specific reasons before this exchange. A new generation of products will collect multiple sensor data and will use own intelligence to compute the risk of further use, delivering this information to actors such as senders or simply colour indicators. Such intelligence will also reduce the risk of counterfeits and hence protect the European product developers. Furthermore, it will allow a much more effective maintenance, and enable e maintenance of a broad set of products via mobile wireless devices and smart tags. This will again reduce the manual effort for the global service of parts (e.g. in industrial equipment) and thus give advantage especially to European exporting companies.

The lifetime of many products is limited not by wear and tear, but by the outdated software that is included. This is of high competitive importance, as the software value of products is increasing continuously. In a not too distant future, services will be common to update intelligent products at the customer site. Products with these features will be more successful, and they will also significantly contribute to the protection of the environment. In a longer-term vision towards 2020 when products will be online (Internet present), information exchange and thus updates and mass customisation of services offered by intelligent products, will be straightforward. Intelligent products will offer more value and better user experience throughout the entire product lifecycle, as well as enable manufacturers and service providers to respond faster and in a flexible manner to changing market demands. As a result of the combination of physical object and virtual/online services that can constitute an integral part of "product-service packages", the value of such products throughout their lifetime will be much higher.

The discussion also revealed additional characteristics of intelligent products like: self-management that enables products to manage their own characteristics, move and use. Attention was also drawn to the feedback of product information from the time period of product use to the phase of product design, the use and ageing of a product to recycling, and questions regarding environmental and safety issues.

Intelligent products present a new knowledge-based added value. The design of such products requires novel approaches like inter-organisational collaborative development and participatory engineering methodologies that aim at both products and intelligent services, which are bound with them.

5.2 Intelligent Production Processes

Today, mass customization is still not usual, but at the same time it faces its limits already. One of the major challenges in automotive industry is the extreme number of possible variants, where each customer change can have an impact on dozens or hundreds of components. The customer recognizes a limited set of options, only, and even he may not combine them, freely. The European industry would achieve world leadership by replacing mass customization with co-design, giving to the customer a high degree of freedom to change the product or its features. Especially, SMEs could operate successfully even on global markets, offering co-designed niche products (Auto ID Lab 2006).

High product variability requires new approaches to control production. It is expected that the approaches to "self-controlled production" under development will be a starting point, only. Totally new methods will be necessary to exchange knowledge among the single parts (using knowledge for its lifecycle) and the crowd that is represented by a product type, which needs to acquire knowledge from all the "experience" made by its members. Thereby, it is of vital importance to consider the mechanisms related to the entire supply chain. This also affects all types of planning and control systems as well as software maintenance in such highly distributed systems, including the need for new approaches to the modelling and management of highly distributed systems. In fact, today the knowledge about such highly distributed systems with separation of individual and collective experience is merely not existent, which limits current approaches to intelligent production systems, drastically. The nation, which first crosses this barrier, will have significant advantages for years with respect to their competitors from other continents.

Novel paradigms of production may be achieved through adoption of new knowledge-based approaches, like active knowledge modelling. In order to achieve given production goals, the last mentioned approach is built upon reconfigurable visual enterprise models, which enable representation and processing of complex dependencies between intelligent production processes, products and all resources, being technical or human. This visual knowledge-based modelling approach enables the reuse of production models and their components to form new dynamically reconfigurable production flows, and in consequence, supports flexibility and quick responsiveness to market demands.

5.3 New Context-aware Services and Methods

Today, the so-called "Digital Factory" is still poor, as it either gives an integration of production system data (typically, with inaccurate 3D information about production, and insufficient information about logical flows) or it is simply the VR representation of a factory, frequently with limited impact on the detection of planning faults.

Methods and services are required that ease the integration of product design, production system development, production ramp-up and manufacturing control. Full integration of these fields is unlikely in the next ten years (and might, if standardized, even block innovation). Therefore, the context-aware provision and scalable representation of information among the disciplines involved is essential, using traditional representations (tables, drawings) as well as VR and AR technologies. A significant reduction of the time-to-market (leading to higher profits and therefore the chance to produce in more expensive countries) can be achieved by integrating the different tasks of factory architecture, layout and media planning, material flow simulation, planning and control system customization in an intelligent, context-aware way, and by the provision of new kinds of services in this area. This could even strengthen the position of SMEs and VSMEs, which could offer clearly dedicated niche services for all kinds of factory planning solutions.

Today, many hindrances are seen in the lack of suitable standards or even terminologies. Therefore, the development of ontology and standards seems to be an important fertilizer. Potentially, new types of coordination activities could work across suitable R&D projects in order to establish first approaches to such standards.

5.4 Security, Trust and Confidence

There are many issues which are not solved (or not even recognized) in the AITPL area, which hinder new applications due to missing IPR, confidence and trust. Still, neither the ownership of information and knowledge stored within distributed elements is clear, nor the responsibility for correctness, security and

actuality. Therefore, initiatives, which lead to clear and accepted regulations for these issues will accelerate and fertilize all the topics mentioned above.

Securing engineering data during the whole product lifecycle is a demanding, three-dimensional task: technical, organizational, and legal. One needs to consider all three aspects when constructing consistent, robust and secure infrastructures that enable trust and confidence among the partners involved in the product lifecycle. Organizational and legal issues are relevant for the privacy of involved partners. Assurance of security is not a single act, but rather a process, as apart from already existing sources of threats, new dangers are constantly appearing that need to be correctly recognized and neutralized. The choice of the most adequate security framework for a particular product lifecycle heavily depends on the design and deployment domains of the product. This choice is also influenced by the fact that the organizations involved in a particular product lifecycle have their own legacy systems and are not always able to deploy particular new techniques without interfering with their existing solution.

Although the security issue requires significant attention, both in research and in the domain of the networked enterprises, there are still many R&D challenges that must be addressed during the next decade, like harmonisation between security and collaboration technologies, credible assessment of a security level, and seamless coordination among diverse security applications being deployed.

Assessment of a security framework through creation of a universal and (possibly) complete system for assessing the security level would help in establishing more secure product lifecycles (FLUID-WIN 2006).

5.5 Further Challenges

The primary goal of the use of AITPL research activities is to maintain competitiveness of European industries and thus be able to keep the respective employment in Europe. Related goals are reduced time-to-market and the efficient use of resources by increased knowledge sharing, the avoidance of unnecessary pollution of the environment and the improvement of safety and reliability in European working environments.

AmI technologies with novel intelligent product features will enable anthropocentric process automation, advanced knowledge engineering, as well as remote monitoring and maintenance of products. In particular, sharing engineering knowledge in design and development will be radically simplified. Standardized knowledge representations and techniques for protecting IPR on a “pay-per-use” base of knowledge modules will facilitate ad hoc co-operations and knowledge sharing. Management of collaborative networks will be simplified, including set-up extension and discontinuation of networks. New interdisciplinary partners will easily be able to join the network.

Secure collaborative engineering networks, which easily integrate new SMEs, are a long term goal, including facilities for finding the right resources (individuals, enterprises, systems), meeting the required constraints for a design and developing a target. Early design phases of the product lifecycle will be better supported with cooperation of manufacturer and supplier, analysis of requirements from different fields (technology, materials, economy, and business strategy), and an early integration of components based on models or executable specifications.

Many challenges in R&D need to be addressed successfully before the presented visions become an everyday practice. Approaches are required that combine different elements of ambient intelligence for new products or services. The resulting technologies should be in a stage where they can be applied in enterprises of any size, supporting completely new types of information management.

6 Conclusions and Future Perspectives

Summarizing, the FLUID-WIN research topics were related to several upcoming business and research fields in the areas of integrated use of advanced ICT (ambient intelligence) in the product and service life cycles, management of production networks, interoperability, financial and payment systems and e-business.

FLUID-WIN participated to the EC cluster activities and in particular promoting integration with the FP6 IST project cluster of Ambient Intelligence Technologies for the Product Lifecycle (AITPL Cluster). This cluster was used for research input and dissemination in a wider scale. The FLUID-WIN project promoted comparison of results and synergies in exploitation and dissemination activities among the EU projects. Conferences and workshops were organized, where the project actively contributed from its commencement date, supporting the preparation and presented the project results, as far as those were available with respect to the project's time plan. To discuss with the academic research community and summarize the research needs and challenges the following conferences have been visited and various contributions to ERA realized:

- The "Workshop on Ambient Intelligence Technologies to Enhance the Product Lifecycle (February 27, 2006, Brussels)
- AITPL Forum at 12th International Conference on Concurrent Enterprising ICE'06, 27.-28.June 2006, Milan (France)
- IRMA Conference "Managing Worldwide Operations and Communications with Information Technology", 19.-23. May 2007, Vancouver (Canada)
- 13th International Conference on Concurrent Enterprising, ICE'07, 4.–6. June 2007, Sophia Antipolis (France)
- 4th international Conference on Interoperability for Enterprise Software and Applications, I-ESA'08, 26.-28. March 2008, Berlin (Germany)
- NATIONAL AND REGIONAL ECONOMICS VII, NRE'08, October 1-3 2008, Herľany (Slovakia)
- International Workshop in Collaborative Systems and Information Society, Cluj-Napoca, October 10-12. 2008 (Romania)
- AMIF 2008 – Ambient Intelligence Forum, October 15 – 17, Czech Republic

As the result of two workshops, the "Workshop on Ambient Intelligence Technologies to Enhance the Product Lifecycle (February 27, 2006, Brussels) and the AITPL Forum (June 28, 2006, Milan) the book [5] (Rabe, Mihok 2007) was published.

FLUID-WIN took part at the "ERA Co-ordination Initiative in the field of Networked Enterprise" - an ERA Coordination Study, launched by the DG INFSO unit D4 (Networked Enterprise & RFID). The study focused on the field of Networked Enterprise and targeted to facilitate the networking among the EC, national and regional policy makers and key stakeholders and improve the coordination of the related research policies, programmes and joint activities conducted at European, national and regional level. FLUID-WIN supported this study in several ways and through different channels. Information on the AITPL cluster and FLUID-WIN research has been provided and TUK took part in the on-line consultation. The project's contribution supported the preparation of "the Comparative analysis key findings" – in the concept of the "Future Enterprise".

7 References

1. AITPL (2007) Ambient Intelligence Technologies for the Product Lifecycle. European Project Cluster, http://www.rfid-in-action.eu/aitpl, visited 05.11.2007
2. Frederix,F., Jaronski,P., Friess, P. (2006) Workshop on Ambient Intelligence Technologies to Enhance the Product Lifecycle. Workshop report, 27 February 2006, Brussels. http://www.ve-forum.org/default.asp?P=402&obj=S1764, visited 05.11.2007
3. IST Advisory Group (2001) Scenarios for Ambient Intelligence in 2010. Report, ftp://ftp.cordis.lu/pub/ist/docs/istagscenarios2010.pdf, visited 05.11.2007
4. IST Advisory Group (2003) Ambient Intelligence: from vision to reality. Report, ftp://ftp.cordis.lu/pub/ist/docs/istag-ist2003_draft_consolidated_report.pdf, visited 05.11.2007
5. Rabe M., Mihók P. (eds.): New Technologies for the Intelligent Design and Operation of Manufacturing Networks, Results and Perspectives from the European AITPL Project Cluster, Fraunhofer IRB Verlag, Stuttgart , 2007, ISBN 978-3-8167-7520-1
6. ERA Coordination Initiative in the field of Networked Enterprise, NETWORKED ENTERPRISE ERA, European RTD policies, Available at: http://www.networked-enterprise-era.eu
7. Rabe M., Frederix F., Mihók P., Pawlak A., Challenges in Advanced ICT Technology for the Product Lifecycle, in Rabe M., Mihók P. (eds.): New Technologies for the Intelligent Design and Operation of Manufacturing Networks, Results and Perspectives from the European AITPL Project Cluster, Fraunhofer IRB Verlag, Stuttgart, pp. 185-192.
8. Kostelník P., Sabol T., Mach M., APPLICATIONS OF SEMANTIC TECHNOLOGIES IN AMI, AMIF Forum 2008, Hradec Králové, October 2008, invited keynote talk.
9. AITPL - The Ambient Intelligence Technologies for the Product Lifecycle Cluster, Available at: http://www.ve-forum.org/apps/pub.asp?Q=1271

8 Appendix 1: A Roadmap Statement for AITPL

This statement was prepared by the AITPL project cluster, encompassing projects CATER - CE RFID – CODESNET - E4 - FLUID-WIN - ILIPT - MAPPER - NetWms - P2 - SPIDER-WIN - Traser – V-CES - VERITAS - X-CHANGE. It was discussed in different cluster meetings and finalized in the form given here at a meeting in Athens (06.02.2008). The content was provided to the CERP consultation process as well as to the consultation procedure of the Enterprise Interoperability Initiative.

The European AITPL initiative, grown from the successful collaboration of 17 R&D projects, follows the vision to provide the European community with modelling technology to cover the overall life cycle of a product, with a clear focus on the business and control processes. The key challenge faced in this context is the quick, ubiquitous and seamless interaction of such processes, considering both company-internal as well as< cross-enterprise interoperability.

In terms of European economic power and competitiveness, this vision addresses the strength of the European Economy that is substantially based on relationships among enterprises. Together, these enterprises constitute agile networks, which are able to react to market demands in shortest time. This success can be kept, only, if the networks establish and maintain smooth communications which are not disrupted, neither during the life cycle of the product nor when crossing enterprise borders. Thus, it is indispensable to lift the manufacturing chain to a new level of excellence, providing novel models and methods for product configuration, for supply network management from raw material to the consumer, for the control of the supply network material capability, for maintenance and operation of the product, as well as for the re-use of material at the end of the product's life cycle. Consequently, the seamless interaction of processes in agile networks requires to bridge the gap between the product life cycle phases for instance between product development and production, both company-internal and cross-enterprise, as well as closing the loop between two product generations.

The heterogeneity of agile networks in conjunction with the limited capabilities of SMEs demands for transparent, efficient, and flexible supportive mechanisms. Potential approaches are seen in the broad definition of objects, which can be clearly described but also adapted for information exchange within the network. Many different means can be exploited for information exchange and processing, such as classical data processing (e.g., referred to by bar codes), distributed services (e.g. SOA and Web services), and intelligence directly attached to the products transmitting information on radio or optical frequency bands. Thus, the smooth and barrier-free use of the most suitable technology is promoted, which can significantly differ within one single network, depending on local constraints.

This approach requires novel collaboration procedures, which especially exploit the research promoted by the European Community in the area of networked enterprises and Interoperability. Recent research was guided by a process perspective, where product information is shared, for example, as part of the ordering process, the product-design process etc. between enterprise systems and services. However, the need for product lifecycle management empowered by unique instance identification calls for an object perspective in the retrieval, sharing and management of information, representing a paradigm shift for enterprise systems. Each object should be interchangeable in these heterogeneous worlds, leading to the notion of an Internet of Objects, where the information can be online or bound to physical entities, synchronous or asynchronous (potentially leading to different states of the same object at the same point of time). The challenge ahead is to integrate these two perspectives and ensure a seamless interaction between the Internet of Objects and the Internet of Services, opening up new horizons for interoperability and collaboration in a networked environment.

9 Apendix 2: Sample Workshop Programme

As an example for the workshops conducted, this annex presents the programme of the Ambient Intelligence Technologies for the Product Lifecycle (AITPL) Forum Milan, Italy, 28 June 2006, which was performed within the framework of the 12th International Conference on Concurrent Enterprising (ILS'06).

09:00–10:30	Welcome and Opening (Chairs) Opening Speech Industrial Statement
11:00–12:30	Presentations from AITPL Projects SPIDER-WIN, CO-DESNET, FLUID-WIN, PABADIS-PROMISE
14:00–15:30	Roadmapping the Future of Ambient Intelligence Applications and Technologies for the Product Lifecycle Chairs: Markus Rabe, Florent Frederix, Peter Mihok
14:00–14:05	Introduction (Markus Rabe)
14:05–14:15	Summary of the results from AITPL "Towards the FP7" Workshop in Brussels, February 27 (Markus Rabe)
14:15–14:40	Identification of key research groups in the topic area and further known international, national or regional research
14:40–15:05	Amendment of "technological challenges list"
15:05–15:25	Discussion of priorities / major roadmap steps
15:25–15:30	Wrap-up
16:00–17:45	RFID Research: Perspectives and Challenges Chair: Florent Frederix
17:45–18:00	Conclusions (Forum chairs)