Future Internet Enterprise Systems (FInES) Cluster

Position Paper
Annex I
Consolidation of Project Contributions

Final Version

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FInES Cluster Position Paper

Annex I: Consolidation of Project Contributions

Table of content

Note: the sequence of the project contributions is arranged according to the chronological order of their submission.

Contributions to Version 1.0 of the FInES Position Paper

1 SPIKE Project - Secure Process-oriented Integrative Service Infrastructure for Networked Enterprises

1.1 Project Summary

The purpose of the SPIKE project is to develop a software service platform for the easy and fast start-up of virtual business alliances. This platform will

- Enable outsourcing of parts of the value chain to business partners
- Simplify collaboration between the members of participating organisations through dynamically created and pre-defined business processes and workflows
- Achieve interoperability and integration between organisations of all sizes
- Offer generic solutions for inter-enterprise interoperability and collaboration through reference scenarios and guidelines for their use
- Have a special focus on security and trust

The aim of SPIKE is to research and implement a system that will bring flexibility to the collaboration between networked enterprises. Using SPIKE, enterprises can gain business opportunities with previously inaccessible customers and partnering organisations.

Components

To fully reach the desired goals, the platform developed will be easy to use, manage and integrate into the existing environment. The solution will encompass a semantically enriched service-oriented infrastructure including a virtual semantic service bus for workflow control, handling and transformation of messages. At the enterprise interface level, SPIKE will follow a collaborative process portal approach, capturing the user's working context and seamlessly transmitting it to other applications and services according to the current workflow. This will also enable integration of legacy systems via tailored portals and connectors.

Special focus: security

Special focus will be put on security issues. The solution will include an easy-to-administer security infrastructure for the networked enterprise, which will provide security services for service and workflow management.

Open source software

The potential of SPIKE will be shown in pilot deployments and use cases: a collaborative business alliance and two ready-for-use services in the networked enterprise.

The software project results will be free of charge. Furthermore they will be published under an open source license.

Because of its focus, the project will have an impact on organisations of all sizes that wish to collaborate with each other. To the extent possible, SPIKE will build upon existing open source software to make it a cost feasible option for small and middle-sized enterprises (SME) as well.

New business opportunities for SMEs

The base system and the infrastructure of the solution will be made available as open source software, which ensures low initial adoption cost. The deployment of open standards will reduce the lifecycle costs and provide a better return on investment (ROI) in the long run.

This will open up business opportunities, especially for SMEs. SPIKE is a collaborative project funded by the EC. The project is scheduled to end by the year 2010.

1.2 Contributions in relation to Context Analysis (Section 2)

Beginning in late 2008 and continuing since, global economy is faced with a serious decline of the anticipated growth rate of the international economies. Considered the greatest period of recession since the 1930s, the National Bureau of Economic Research in the U.S. has announced that the U.S. has been in recession since December 2007 [CNNM08]. For the Euro zone, the International Monetary Fund projects economies of the Euro area to shrink by 2.0 per cent [IMF09].

Reasons for this situation are manifold and are mostly sought in three areas: First of all, prices for food and oil soared, leading to an official discussion during the 34th G8 summit in Tokyo. Secondly, the real estate market in the world was faced with what was considered “the biggest bubble in history” [ECON05]. Thirdly, in February 2008, it was reported by Reuters that global inflation was at historic levels, with inflation in individual countries reaching 10- to 20-year highs [IHT08].

The SPIKE project holds the opinion that the current economic situation bears a great chance for a dramatic change in the competition with other companies. As can be seen from the problems for example the car manufacturing industry is confronted with, organisations are always in risk of being not flexible enough to cope with changing conditions and changing customer demands. It is therefore necessary to join cooperation’s with other companies, thus forming so-called collaboration networks. Since the terminology in this context is not entirely clear, a clarification of the individual terms used in the context of cooperation’s between individual companies – collaboration network, networked organisation, virtual organisation, virtual enterprise as well as extended enterprise – is depicted in Figure 1.

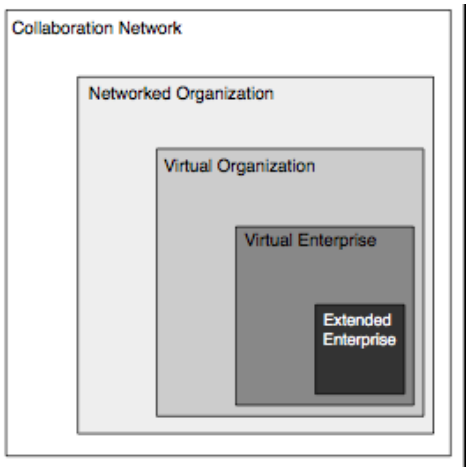

Figure 1: Definition of terminology, based on [CMA99] and [EE05]

In general, a multitude of advantages is contributed to collaboration networks. The predominant advantage is the opportunity to open up new markets because of domain-specific knowledge of one partner, which can be used in a more efficient way by other partners joining an alliance with this partner. Another advantage to be taken into account is the ability to use economies of scope (cost reduction by joint activities) or economies of scale (cost reduction by increasing a company's output). Furthermore, large projects may often require a critical size of the partner applying for such a project, which is achieved more easily when more partners are involved in a collaboration network.

With the aforementioned advantages of collaboration networks in mind, SPIKE aims at offering companies a direct benefit by providing them with means to cooperate with their customers, suppliers and even competitors, thus enabling them to jointly design, develop and

bring to the market products and services more quickly and at lower cost due to the lowered time-to-market.

Jim Zemlin, executive director of the Linux Foundation, holds the opinion that open-source software can help enterprises cut costs during tough economic times [Eweek08]. The SPIKE project shares this opinion. The nature of SPIKE as an open-source-licensed project will further allow companies to improve their cost situation as the product itself will be available free of charge, at the same time allowing new companies to enter the market. These companies can act as service providers, satisfying the needs of companies organised in networked enterprises by providing specialised services, which can be sought within SPIKE based on any criteria members of a networked enterprise may wish to apply (i.e., functionality, cost, security, quality, …).

The SPIKE project therefore considers the following factors as of utter importance for companies striving to successfully combat Current economic context:

- Flexibility to adapt to changing market situations quickly
- Ability to satisfy customers' demands quickly and effectively
- Creation of value-chain networks
- Free availability and easy adaptability of the underlying software infrastructure

From a ***technical perspective***, collaboration networks require good backing by tool support in order to minimise delays at the interfaces of individual companies and thus maximise efficiency of said collaboration networks. According to the research roadmap of the Future Internet Enterprise Systems (FInES) cluster, which is currently available in version 5.0, the FInES cluster targets at research of the following aspects: (1) Interoperability, (2) Future Internet and Enterprise Systems, (3) Knowledge-Oriented Collaboration and Semantic Interoperability, and (4) Science Base for Enterprise Interoperability. When discussing supporting tools for collaboration networks, all of these items come into mind. Within the FInES cluster, a significant number of projects target the factors which have been identified as important for successfully overcome Current economic context above, thus leading to the conclusion of a well-defined strategic focus of the FInES cluster research roadmap.

1.3 Contributions in relation to Vision of the FInES 2025 (Section 3)

The analysis above has shown that enterprise interoperability is a key factor to future success. It is therefore important to strengthen the position of enterprises willing to either join alliances formed using dedicated collaboration tools or to continue their participation in such alliance. Going beyond the current state of the art in the area of internet-based enterprise systems and projecting future research items until the year 2025, future research could be aggregated among the following axes:

- Policy Goals
- Business-Economic Scenarios
- Break-through Technologies

Beyond the economic crisis as outlined in section 2, global economy will furthermore be confronted with an emerging energy distribution problem arising from the global economy’s dependence on crude oil. With global oil in place declining continuously, oil prices have shown a continuous increase in costs over the past. At the same time, the effects of climate change as outlined in the climate study prepared for the UN Intergovernmental Panel on Climate Change in 2007 may become obvious, affecting environmental conditions of EU-located enterprises. Taking into account the external factors enterprises may be confronted with in the future, the state of the Internet 15 years ahead from now may be characterised by an evolution of the existing technologies. Thus, the SPIKE project expects amongst others the following hypotheses concerning future development regarding the ICT sector:

- Pervasiveness of the Internet, offering the ability to connect to any person at any location and any time, allowing enterprises to act solely on a virtual basis.
- Solely virtually acting enterprises will thus induce a combination of material and immaterial goods, leading to a dramatic change in users' behaviour.
- These criteria will thus also need a corresponding backing in the infrastructure of Future Internet due to a dramatic increase in bandwidth occupation and transformation from wire-based access to wireless access in order to satisfy both the availability and mobility requirements outlined above. At the same time, reliability in terms of the real-time aspects of the Future Internet may turn out necessary in order to meet demands of new-arising business models.

Based on these hypotheses, European ICT-centric enterprises may be faced with a radical change of their business models in the future due to the ongoing shift towards internet-based services and the emerge of new business models. Future enterprises may be organised in collaboration networks as outlined in section 2, thus raising needs for operational enterprise interoperability, which is characterised by interoperability on three layers:

- Interoperability on the technical level,
- Interoperability on the semantic level, and
- Interoperability on an organisational perspective.

1.4 Relevant external sources

[CMA99]	Camarinha-Matos, Luis M.; Afsarmanesh, Hamideh: "The virtual enterprise concept." In: Infrastructures for Virtual Enterprises: Networking Industrial Enterprises. Boston, Dordrecht, London: Kluwer Academic Publishers, 1999, S. 3–14
[CNNM08]	CNN Money: "It's official: Recession since Dec. 07", http://money.cnn.com/2008/12/01/news/economy/recession/index.htm?postversion=2008120112, last retrieved 2009-03-26.
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[Eweek08]	Taft, Darryl K.: "Financial Crisis Offers Opportunity For Linux, Open Source", Eweek September 30, 2008. http://www.eweek.com/c/a/Linux-and-Open-Source/Financial-Crisis-Offers-Opportunity-for-Linux-Open-Source/, last retrieved 2009-03-26.
[IHT08]	Plumberg, Kevin; Johnson, Steven C.: "Global inflation climbs to historic levels", International Herald Tribune, February 12, 2008. http://www.iht.com/articles/2008/02/12/business/inflate.php, last retrieved 2009-03-26.
[IMF09]	International Monetary Fund: "World Economic Outlook Update: Global Economic Slump Challenges Policies", http://www.imf.org/external/pubs/ft/weo/2009/update/01/index.htm, last retrieved 2009-03-26.

1.5 Project webpage

http://www.spike-project.eu

2 OPAALS Project - Open Philosophies for Associative Autopoietic Digital Ecosystems

2.1 Project Summary

OPAALS is a research Network of Excellence funded under the European Union's 6th Framework Program for Research and Development.

An open, global network, its main aims are to develop an integrated theoretical foundation for digital ecosystems research and a sustainable and open community of research. This is characterised by a radically interdisciplinary research agenda combined with the emergence of a new paradigm that requires the development of new ways of working across disciplinary boundaries, in particular between social science, computer science, and natural science.

The OPAALS network will support the on-going trend toward the extension of traditional disciplines into new disciplines. We are taking inspiration from the Open Source community process to create the conditions whereby an Open Knowledge community of research can form and grow. Because an open-source community is already forming around projects in the EU's Digital Ecosystems Cluster, our efforts will start from this common overlap and extend toward the natural, physical and social sciences through ever wider inclusion of academic and industrial partners who wish to collaborate on the research.

Theoretical foundation for digital ecosystems	Robustness, sustainability, and scalability of digital ecosystems and of their user communities
Integration of different disciplinary viewpoints	Methodologies for adoption of useful concepts from other disciplines
Initiate recursive, reflexive, and self-reinforcing knowledge creation and community building process	Scalability of OPAALS NoE into wider Open Knowledge community of research
Definition, construction, and visualisation of Open Knowledge Space Model	Long-term memory of OPAALS community, access, retrieval, reuse, collaboration, visibility, dissemination, community identity
Sustainable Open Source/Knowledge models	Maximise knowledge sharing and innovation among SMEs, free from IPR constraints
Dynamic P2P architectures for distributed long-lived transactions, accountability, identiy & trust	Enable automatic aggregation and combination of services in digital ecosystems
Context-dependent automatic code generation from natural language models	Lower ICT adoption barriers, raise software engineering implementation to architectural specification
Biological, mathematical and formal models for the conservation of autopoiesis in biological and software systems	Provide theoretical background and models
Theoretical foundation for digital ecosystems	Robustness, sustainability, and scalability of digital ecosystems and of their user communities

2.2 Contributions in relation to Context Analysis (Section 2)

The idea of the context analysis seems good. It provides hard-to-refute evidence that a deeper look at the foundations of the so-called free market economy is necessary.

The following analogy has been made:

	Theoretical	**Applied**
Social science	ECONOMICS	BUSINESS
Technology	COMPUTER SCIENCE	SOFTWARE ENGINEERING
Comment 1	More concerned with foundational questions and theory construction	More concerned with solving practical problems
Comment 2	Struggles to keep up with practical developments	Leads theory by 10-20 years

If the above analogy and comments seem plausible, albeit clearly an oversimplification, the implication is that 'applied' behaviour does not always necessarily follow from theory. In many cases the opposite is true. Therefore, to blame Hayek for the current credit crunch is simplistic, just as it is simplistic to blame Marx for the fall of the Soviet Union. The picture appears to be more complicated, but one possibly useful starting point is to accept that, in different ways, we all bear some level of responsibility. Hence, looking for a solution *together* seems like a wiser course of action than sliding into any form of polarisation.

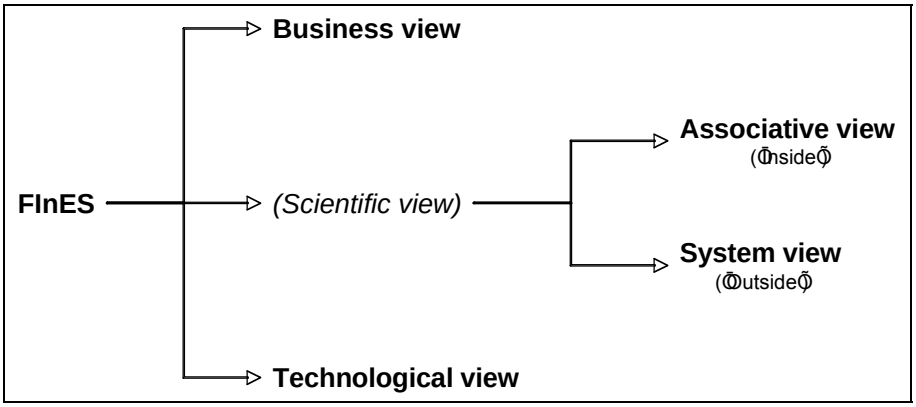
Hence I would advocate using this section to provide motivation to work together in new ways, across disciplinary boundaries, between theory and applied people, and between all the stakeholders: academia, business, government, civil society, and society at large.

2.3 Contributions in relation to Vision of the FInES 2025 (Section 3)

See above

2.4 Materials and preliminary results from the project relevant to the activity

Within OPAALS we are interested in developing a broad conceptual framework that can help interdisciplinary dialogue as well as communication and collaboration between theory and practice. The framework is meant to be explanatory, and therefore it relies on different theories, but it is also meant to be actionable, and therefore it relies on different methodologies. OPAALS think that this conceptual framework can help the FInES cluster as an analytical tool that will hopefully make it easier to understand the challenges we face and to propose solutions, actions, and policies aimed at promoting innovation and socio-economic growth. The starting point is to introduce the concept of reflexivity, which means awareness of our point of view. If we do that, the following classification of points of view seems relevant.



We should emphasise that these are far from mutually exclusive categories. For example someone in business may be working for a technology company, and vice versa. So the first

point is to realise that even within ourselves we carry different ways of looking at (in this case) enterprise systems in the internet of the future.

There is a deeper level of interdependence between these categories whose discussion requires some familiarity with the outputs of our research (see below for references). Here I can make only a few points that should be understood to be gross oversimplifications made for the sake of communicating some potentially useful tidbits:

1. The scientific view is purposefully shown to be split in two, to highlight an extremely important difference in how we make sense of the world. We are largely not conscious of what epistemology we employ when engaged in different kinds of cognitive activities, but the majority of human beings, especially from fields such as technology, the physical/natural sciences, or economics, tend to understand the world from an objectivist point of view, they tend to be 'outside' the object of study, which then becomes more easily conceptualised as a system. By contrast people from some currents within sociology and the humanities tend to be more conscious of them as they engage in interactions with others. This makes it more difficult for them to characterise the situation as a system, and tend to rely on the other hand on a more relativist or 'inter-subjective' epistemology, that is, a way of understanding the world which is more aware of the influence of our subjective perceptions.
2. It is an interesting point that *both* scientific views can be found in *both* the Business and the Technological views. Please see the references to explore this point further.
3. The long-standing objectivist-subjectivist debate is easier to deal with in extreme cases. For example, when dealing with physics, the objectivist point of view clearly has the upper hand. And when dealing with the evolution of language, the inter-subjective point of view has the advantage. But in the space of relevance of the FInES cluster it is not so easy to make such clear-cut distinctions. This is because technology has some 'hard' properties that make it similar to physics (mathematical formalisation, etc) and at the same time some 'soft' properties that make it similar to the evolution of language (e.g. the richness of software engineering programming languages and methodologies over the past 60 years). Something similar can be said about business, which must cope with hard 'bottom lines' in a way that must remain compatible with 'people management' or, perhaps a better term, team building.
4. Finally, the diagram can be understood at different levels of abstraction: structural, functional, and organisational. So, in fact, it may be useful to develop these three levels separately, and discuss in more details how the levels are related and how the various categories shown interact and interface at each level.

2.5 Relevant external sources

There are many reports from the DBE and OPAALS projects that one could read. These can all be found here: http://files.opaals.org/OPAALS/
The DBE Book is another source that built on the outputs of the DBE project:
Nachira, F., Dini, P., Nicolai, A. Le Louarn, M., León, L.R., (2007), "Digital Business Ecosystems", Luxembourg: Office for Official Publications of the European Communities http://www.digital-ecosystems.org/book/debook2007.html
Finally, the deliverables of the DBE project are here: http://files.opaals.org/DBE/

2.6 Project webpage

http://www.opaals.org/

3 SYNERGY Project

3.1 Project Summary

SYNERGY, a new 3-year European-funded Seventh Framework Research Project which commenced in February 2008, researches the knowledge sharing and collaboration support needs of stakeholders working collaboratively within partnerships based on Virtual Organisation (VO) business models. The project offers end user organisations an opportunity to participate in leading-edge research to address their unique requirements, to undergo a knowledge assessment of their collaboration needs, and the potential to pilot and test utility-based services developed during the project.

With the increase of knowledge and inherent higher need to work together in complex projects, accelerating adequate knowledge flows between partnering organizations has become critical. Today's business environment has become not only more complex and dynamic, it needs to act and react faster than ever before. Despite IT system efficiency improvements, the knowledge that resides with people is often not well connected, and systems are too static and not interoperable. Current systems are limiting since they do not provide services to allow the usage of up-to-date information that is available within teams or multiple organizational groups for faster or better decision-making and response to new business situations.

For example:

- How fast can you assemble and align partners to respond to a new tender?
- How fast can you initiate a new project involving multiple partners?
- How often does your team need to make a decision regarding a client or a new business opportunity, but the information needed is not in your system or is inconsistent or outdated?
- Have you had a recent failure where you could have reduced your risk levels if you had only been able to share your knowledge better and earlier?
- What knowledge are you allowed to share without harming the company's intellectual property or competitiveness?
- How do you know who has which connections with other partners or companies in a virtual organisation setting?

These questions all represent common business situations that are often encountered, but for which there is often no proper answer or system yet. From the conversations or meetings that take place regularly, new knowledge and insights are gained, but these are often not captured or shared effectively. Most often, such tacit knowledge gained from conversations and know-how remains in individuals' heads. The challenge here is how to search, combine, and select the right information using all these sources to collaborate better and to come to faster and better decision making to improve overall performance. For this, a more dynamic, adaptable knowledge management system for initiating, operating and terminating collaborative projects is sorely needed.

Moreover, with the high variability in knowledge work, the collaboration needs of knowledge workers vary per function or group. Who needs what type of information and by when? How does knowledge sharing currently take place and how is this knowledge applied? Assessing current knowledge sharing practices and knowledge workers? Collaboration needs is a prerequisite. Current user requirements need to be assessed to build an infrastructure and services to make future knowledge sharing and collaboration more efficient, able to evolve as new situations arise, and to meet real-time requirements with a dynamic and highly adaptive service-based support system.

The SYNERGY project aims to enhance effective knowledge sharing between organisations and to stimulate collaboration by developing a highly intelligent technological system based on collaboration patterns and knowledge flows. The goal is to enhance support of the networked enterprise in the successful, timely creation of, and participation in collaborative VO's by providing an infrastructure and services to discover, capture, deliver and apply knowledge relevant to collaboration creation and operation.

3.2 Contributions in relation to Context Analysis (Section 2)

Current economic context

1. It is necessary to recall that Current economic context and crisis are the result of market failure, beyond the scope of the wealth-creating parts of the European and world economies.
2. Whilst wealth-creating sectors are severely damaged by the economic crisis, the causes and remedies cannot be directly addressed by these sectors: this can be achieved only by change in the financial sectors, recognizing that the real economy is a relatively safe investment (i.e. relative to investment in ephemeral instruments invented to provide short term, imaginary turnover and profit), and change in regulation and political commitment to ensure that financial services are committed to direct support of wealth-creating industries as a matter of absolute priority over short term imaginary instruments.
3. It is therefore important to recognize that research to support enterprise management and operations, or even innovation, also cannot impact upon the causes and immediate remedies to the current crisis. These causes are out of scope. Further it is unlikely that enterprises focused on survival through the crisis will have the resources to seriously exploit research in the short term: but short term business myopia was the underlying causes of the crisis, and ***it is essential that the research community (any research community) retains a longer term vision and above all a medium term capability to support industry as recovery begins***.
4. This crisis, like all others recorded since at least the 16th century, will come to an end. Research in the FInES domain can have impact in supporting enterprises emerging from (or after) recovery begins, by providing the tools to respond to new markets, rapidly and effectively – and above all the ability recognize, assess and respond to risk in a new and rapidly changing economic and technological environment.
5. In this context the wealth-creating sectors are those which contribute to a value chain from raw material (commodity) provision, through value adding processes, to delivery of a finished product which is of value to an end user. In conventional economies we recognize largely mineral commodities as the raw materials in the chain, and physical processes as the value adding elements.
6. The concept of the Knowledge Economy recognizes that such physical wealth creation chains depend also on the intellectual capability to design products and manufacturing systems. As product life cycles are shortened, and the technological content of products explodes, the ability to design both products and their manufacturing systems become a major – in some industries, particularly in developed economies, the major – proportion of economic activity. In this context knowledge is considered to be itself a commodity, and there is a knowledge exploitation chain, which has an interesting duality with the conventional physical value chain. Seen in this light the knowledge economy is also based on wealth creation from a knowledge raw material.
7. Whilst enterprise requirements will have some influence on the direction of Future Internet development, it seems this will most likely reflect the interests of enterprises

providing internet infrastructure and services, rather than the needs of end-users of internet services, who lack (in the main) the technical expertise to evaluate design alternatives, and (because of the financial pressures noted above) the capacity to be involved in determining future requirements.

8. It is therefore, probably because no-one else will do it, the responsibility of ***the FInES Cluster to represent enterprise system needs in the development of the future internet, ensuring that enterprise systems can and do operate effectively on the emerging infrastructure***.

9. It is important to remember that the whole of the IT sector can be considered as a service sector rather than a wealth creation sector (although clearly this is not the case where IT content is embedded in products). IT has always been vulnerable to a tendency to create solutions to problems nobody had, and then to sell the solutions hard to recover investment, generate turnover and make profit. There is a disturbing similarity with the invention and trading of imaginary financial instruments here. FInES needs to take the role of ensuring that we address real needs with relevant appropriate research and application. ***There is a need to have a clear focus on end-user needs as these emerge in recovering economies***.

10. A SYNERGY view is that long term trends in organization and activity show enterprises focusing on core competences, and coming together to create collaborative value chains, and that there is no reason as yet to believe that these trends will change. This has been shown over many years, exemplified by, but certainly not limited to consortia such as Airbus in the aerospace sector, and collaborative new model introduction in the automotive sector (eg. Ford/VW, Rover/Honda/BMW, Toyota/Citroën, etc.).

11. These trends reflect a need to achieve increasing flexibility in rapidly changing market (likely to be magnified in the fluidity of recovering economies). A large scale monolithic enterprise value chain has too much investment in its technologies and products to respond rapidly; individual core-focused enterprises can either combine with others to bring together appropriate technologies to meet a market need, or can apply their technology to different products in different markets. ***There is thus a need for enterprise systems to support flexible collaboration between enterprises***.

12. Because of the increased emphasis on product design and development (as opposed to long term production) as noted above, these collaborations include enterprises whose core competence is in these fields as well as the manufacturing enterprises. In this way the knowledge economy and the conventional economy are combined, and competitiveness becomes dependent on both and there effective joint exploitation. ***We therefore need enterprise systems which handle both views of a wealth creation economy***.

13. The FInES Cluster already has a number of members from the wealth-creating sector, including SMEs who are already actively involved in using IT results coming from FInES Cluster projects to drive their business. This ranges from the support of Collaboration Pools in identifying business opportunities, and methods of selecting the best partners from the Pool to exploit the opportunity, through to support for the operational management of collaborative consortia, and the ultimate recording and reuse of knowledge derived from the collaboration. ***Current implemented systems are in preliminary phases, but there is reason for optimism if we continue to focus research on these newly understood requirements***. Further optimism is justified by the relative success of enterprises taking up these approaches despite the economic crisis.

14. A seemingly inevitable part of development of the future internet will be increased emphasis on the internet of things. Whilst the inherent limitations of this technology

are still only being fully recognized, enterprise systems have long been designed to respond to, and survive despite, inaccuracies in data. ***There is reason to direct research towards the integration and application of such uncertain information in enterprise systems of the future***.

Policy issues

See 2, 3, 4, 7 and 8 above.

Business issues

See 5, 6, 7, 10 and 11 above.

Technology issues

See 8, 9, 11, 12, 13 and 14 above.

3.3 Contributions in relation to Vision of the FInES 2025 (Section 3)

- Impact on the research domain of FInES

See 1, 2, 3, 4, 5, 8, 11, 12, 13 and 14 above.

- An outlook for European ICT

See 6, 7 and 9 above.

- The future of European Enterprises

See 5, 6, 10, 11 above.

With respect to the impact on the FInES research domain, considerations need to be given to the positioning of FInES in relation to:

- The Future Internet in general

See 7 above.

- FInES and the Internet of Things (and probably Internet of Services also)

See 7 and 8 above.

- FInES and enterprise policy

See 3, 4, 5, 6, 8 and 9 above.

- FInES and standardization

Standardization is a double edged weapon. It can have benefits in supporting interoperability (arguably to the benefit of end-users), but can also provide a block point in future research and development (equally arguably to the benefit of IT industry vendors). A SYNERGY view is standardization is most valuable when applied at one remove: that is, not in restricting the delivered content of applications and services, but in specifying the implementation methodology (e.g. through open systems standards such as OASIS).

- FInES and sustainability etc

SYNERGY does not take a view on this. This is not saying that we regard it as unimportant, but simply that it is out of scope.

3.4 Project webpage

www.synergy-ist.eu/

4 iSurf Project - An Interoperability Service Utility for Collaborative Supply Chain Planning across Multiple Domains Supported by RFID Devices

4.1 Project Summary

Today's competitive and demanding world of business requires new networked applications and services capable of interoperation across variety of business domains and organizations of all sizes. iSURF project will provide an intelligent collaborative supply chain planning network that will:

- Realize a knowledge-oriented inter-enterprise collaboration environment in which distributed intelligence of multiple trading partners will be exploited in the planning and fulfilment of customer demand in the supply chain.
- Develop a Semantic Interoperability Service Utility for achieving the semantic reconciliation of the planning and forecasting business documents exchanged between the companies according to different standards.
- Provide an open source smart product infrastructure for SMEs in order to enhance their capabilities of gathering product information through RFID devices, filtering and aggregating the collected data and putting them into a business context.
- Enable the definition and execution of inter-enterprise collaboration across wide variety of business domains through the Service Oriented Collaborative Supply Chain Planning Process Definition and Execution Platform.
- Wrap the existing legacy applications with semantically enriched web services to solve the technical interoperability problem during interaction with the underlying legacy business processes.
- Facilitate establishing transitory supply chain planning collaborations in case of exceptions. Dynamic visibility information will enable the European SMEs to be more agile, sustainable and responsive to the changes in the supply chain dynamics.
- Provide a Global Data Synchronization Service Utility in order to ensure the accuracy and reliability of master data used in the supply chain by developing standards based open platform for SMEs.
- Ensure the security and privacy of the real time visibility data gathered through

4.2 Contributions in relation to Vision of the FInES 2025 (Section 3)

- Standardisation of semantic specification developed for the Interoperability Service Utility
- OASIS semantic support for electronic business document interoperability

4.3 Materials and preliminary results from the project relevant to the activity

Interoperability Service Utility (ISU)

"iSURF eDoCreator 1.0 beta" tool, which is an Electronic Document Design and Customization Tool that allows creation and customization of UN/CEFACT Core Components Technical Specification (CCTS) based document schemas. With its Web accessible user interface, the users are allowed to work collaboratively.

The OASIS UBL committee plans to use our tool to generate their schemas for the upcoming versions of the UBL standard. We will have UBL teleconference on April 15th, where we will demonstrate the tool. You can find more details about the tool at the following URL:

http://www.srdc.com.tr/index.php?option=com_content&task=view&id=229&Itemid=

http://www.srdc.com.tr/index.php?option=com_content&task=view&id=229&Itemid=>177

Implementation of an ISU for "Electronic Business Document Interoperability

While the recent technological developments such as Web services has provided a degree of interoperability at the transport and the communication layer, the interoperability of exchanged documents is still a very difficult problem. One of the major efforts of the iSURF project is to use semantic information for transforming documents from one standard to another as a step to realize Interoperability Service Utility. For this purpose, the semantic representations of UN/CEFACT CCTS-based Electronic Business Document Artefacts are developed.

The aim of defining the semantic representations of UN/CEFACT CCTS-based Electronic Business Document Artefacts is to facilitate the development of tools to support semantic interoperability. The basic idea is to explicate the semantic information that is already given both in the CCTS and the CCTS based document standards in a standard way to make this information available for automated document interoperability tool support.

This methodology enables the explication of the semantics of CCTS based business document standards by defining their semantic properties through a formal, machine processable language as ontology. In this way, it becomes possible to compute a harmonized ontology, which gives the similarities among document schema ontology classes of different document standards through both the semantic properties they share and the semantic equivalences established through reasoning. However, as expected, the semantic properties of the CCTS based document artefacts help discovering only the similarities of structurally and semantically equivalent elements.

In order to handle the structurally different but semantically similar document artefacts, heuristic rules are developed describing the possible ways of organizing simple document artefacts into compound artefacts as identified in the CCTS methodology. Finally, the equivalences discovered among document schema ontologies are used for semi-automated generation of XSLT definitions for the translation of document instances. Currently tools are being developed to support this methodology. It should be noted that different representations and vocabularies will make it difficult (if not impossible) to harmonize the semantics of document standards. In other words, it is necessary to agree on a common way of expressing the semantics of document artefacts.

For this purpose, that is, in order to standardize the semantic specifications developed for the iSURF Interoperability Service Utility, a technical committee namely "OASIS Semantic Support for Electronic Business Document Interoperability (SET)" is initiated under OASIS umbrella (http://www.oasis-open.org/apps/org/workgroup/set/). The OASIS SET TC, aims to specify semantic mechanisms based on the work done in the iSURF Project in order to achieve interoperability among document standards based of UN/CEFACT CCTS used in B2B, B2G and G2G applications. The first meeting of this TC is organized on July 11, 2008, and Prof. Dr. Asuman Dogac is elected as the chair of the TC.

Currently, the SET Harmonized Ontology contains about 4758 Named OWL Classes and 16122 Restriction Definitions consisting of the following:

- All of the CCs/BIEs in UN/CEFACT CCL 07B
- All of the BIEs in the common library of UBL 2.0
- All of the common library of GS1 XML

- OAGIS 9.1 Common Components and Fields

The Harmonized Ontology expresses the relationships among the document artifacts of UN/CEFACT CCL, UBL 2.0, OAGIS 9.1 and GS1 XML according to SET specifications. The SET Harmonized Ontology is publicly available from http://www.srdc.metu.edu.tr/iSURF/OASIS-SET-TC/ontology/HarmonizedOntology.owl .

Related with performance, an issue that needs to be addressed is whether the gain in automation justifies the resources needed to develop the ontological representation of the document schemas. In order to reduce this cost, we provide the SET XSD-OWL Converter tool to create OWL definitions of the document schemas. This component converts a CCTS based document schema into OASIS SET TC OWL Definition and is publicly available from . It should be noted that, by conforming to a standard ontological representation and hence having all the document schema ontologies in a common pool, the users of the Harmonized Ontology only need to create a document schema ontology if it is not already in the Harmonized Ontology and benefit from all the existing connections when they do so.

4.4 Project webpage

www.srdc.com.tr/isurf/

5 COMMIUS Project - Community-based Interoperability Utility for SMEs

5.1 Project summary

There are 19 million SMEs within Europe, representing 99.8% of all registered businesses, and the economy depends upon their contribution to wealth creation and employment. Although SMEs have some strong advantages in flexibility and responsiveness, they face challenges in large projects where efficient and effective collaboration with others is required. Commius main objective is to support the SMEs with a zero, or very low-cost, entry into interoperability, based on non-proprietary protocols. Commius will build such an interoperability solution for SMEs, allowing them to reuse existing and familiar applications for electronic communication. The solution will be downloaded with an SME's consent using automated self-installation routines. Commius will hook into their email infrastructure and collaboration systems such as Microsoft Exchange. It will then proceed to establish interoperability agreements with the peers of the SME at the levels of system, semantics and even process. Semantic analysis of actual enterprise data and documents used within and exchanged between pairs of SMEs will form a core part of this process. The Consortium will validate results using 3 business cases: one business case comes from a technological district of SMEs; one from cross border interoperability and collaboration for European export and one from inter-enterprise resource

5.2 Contributions in relation to Context Analysis (Section 2)

Business issues

- highly competitive markets which change clue the crises
- company will concentrate on care competences
- focus on product differentiation and innovation

Need for new business models with special focus on SME´s

- Complexity in installation, usage and service of software tools
- High costs, not affordable, especially for very small enterprises
- Lack of flexibility with consequent failure to support the rapidly evolving, not fixed business workflow of many SMEs (this problem is even more relevant in a situation of a net of collaborating SMEs issuing a common service or a product)

Technology issues

- flexible business process networked business
- community enabled process social networking , build basic infrastructure to support am SME virtual community
- User centred products: A novel user centred approach to the design and the commercialisation of new products based on a community approach

5.3 Contributions in relation to Vision of the FInES 2025 (Section 3)

Business issues

Today companies of all sizes have to cope with highly competitive markets, where former entry barriers are no longer existent and the product and price competition increases steadily; furthermore, the present economical crisis will probably accentuate this situation.

More and more companies try to meet this challenge by concentrating on their core competences, which determine the need to cooperate with other companies to complete the value chain. Besides this classical core competence orientation, the permanent preparation to initiate or join new businesses will become a mandatory management task.

Another strategy developed by companies is focussed on product differentiation and innovation, but often products do not address real user needs, and companies tend to create new needs through market campaigns in order to sell their products.

Need for new business models

Within this context SMEs are facing a lot of competitive disadvantages due to their size, but they may react and adapt faster to the changed market situation, and test and more easily exploit totally innovative business models.

The new generation of ICT may support the enterprises in this process and create new opportunities, but for what concerns the SMEs, next generation of ICT needs to address the most evident barriers which prevent most of the EU SMEs from adopting innovative ICT:

- Complexity in installation, usage and service of software tools
- High costs, not affordable, especially for very small enterprises
- Lack of flexibility with consequent failure to support the rapidly evolving, not fixed business workflow of many SMEs (this problem is even more relevant in a situation of a net of collaborating SMEs issuing a common service or a product)

The present eBusiness area includes new services such as multimedia context distribution, shared virtual environment, geographic information etc. (see: Overview of business models for Web 2.0 communities, at http://www.alexandria.unisg.ch/Publikationen/31411). The new generation of ICT will create new business opportunities, new opportunities will rise if more powerful internet based connectivity and architectures are available (easy to use, ubiquitous, performant, adaptable to different user needs and devices, secure,....); therefore the potential for innovative business models needs to be explored.

IPR legislation needs to be revised according to the new business scenarios: for instance, who is the proprietor of a digital object created by a community? How can the demand of multimedia objects to download and share be met with fair compensation for the intellectual property?

Technology issues

We consider here three main lines concerning future Internet technologies which open challenging scenarios where (for at least two of them) relevant contributions from the project Commius are expected:

Flexible business processes

Classic business process modelling describes activities connected through various operators, languages for this include for example BPMN and EPC; due to the huge number of possible process variants, it is hardly possible to use only these languages for capturing flexible processes.

New approaches are suggested to cope with the complexity of the future networked enterprises which will be able to exploit a set of business services supporting collaboration and interoperability, based on the future internet connectivity. Ideally the business process needs to become interactive[1], and the business flow needs to vary and evolve according to the behaviour of the actors who cope with the external (market) requirements. Another approach may be based on a high modularisation of the processes[2], enabling easy reconfiguration and adaptation. The final objective of enabling flexible processes is to support inter and intra-organizational collaboration and the creation of new successful joint strategies to address new business opportunities.

Community enabled processes

Social networking within the enterprise is getting common, wikis and corporate blogs are often used within the enterprises, but frequently enterprises, especially large enterprises, tend to have a different approach from individuals and perceive more the threat of sharing information and experiences with their competitors, than the advantage of the collaboration in addressing common business challenges, SMEs often follows a different approach and it is common for groups of SMEs to collaborate and organize themselves to issue a common product or service. One challenge for the future IT is to build the basic infrastructure to support an SME virtual community with functionality such as

- defining and assuring a level of security which will match the mutual trust of the SME within the community;
- defining, collecting, semantically annotating and supporting the access to community generated and shared business knowledge;
- developing business oriented social software tools, such as: wikis and oriented communication and collaboration tools supporting flexible interoperability, interactive multimedia and 3D object creation and manipulation, inter-organisational agile workflow management.

User-centred products

Future scenarios, enabled by future internet technology (with the availability of highly performing networking infrastructure) may include a novel user-centred approach to the design and the commercialisation of new products based on a community approach.
In this scenario the active participation of the users' community in the product creation process supports the alignment between user expectations and needs and product specifications. The product cycle: consumer insight, conceptual design, product design, production marketing, is seen as a unique creation process where the user community is designing its own product and at the same time is marketing it.

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[1] for instance Jørgensen develops the concept of interactive execution of business processes. It is based on the principle of co-induction, in contrast to the automated execution, i.e. all process flows and behaviour patterns, which are not explicitly forbidden, are allowed [Jørgensen, H. D., Interaction as a Framework for Flexible Workflow Modelling. Paper presented at the Proceedings of the International ACM SIGGROUP Conference on Supporting Group Work, 200].

[2] Grief/Seidlmeier argue that flexibility of business processes can be reached through modularisation of processes and the decoupling of the resulting modules. This enables an easier re-configuration of processes and thus increases the flexibility of an organization [Grief, J., & Seidlmeier, H., Modellierung von Flexibilität mit Ereignisgesteuerten Prozessketten (EPK). Paper presented at the Geschäftsprozessmanagement mit Ereignisgesteuerten Prozessketten, 4. Workshop der Gesellschaft für Informatik (GI) und Treffen ihres Arbeitskreises „Geschäftsprozessmanagement mit Ereignisgesteuerten Prozessketten (WI-EPK)". from http://epk.et-inf.fho-emden.de/epk2005/epk2005-proceedings.pdf, 2005].

Tools are envisaged to support a collaborative, community based design of a product which will:

- support a product co-design process through interactive and expressive content creation where both the enterprises and the end-user communities are involved;
- ensure that the final product will be driven by the expectations and the requirements of all the different actors involved;
- optimise and make more effective the product conception and design cycle across the whole value chain of the companies.

5.4 Project webpage

www.commius.eu

6 CoVES Project - Collaborative Virtual Engineering for SMEs

6.1 Project Summary

As successful SMEs extend their reach and scope in a globalising world, they face the challenge of maintaining the agility, creativity and decision speed that is their key competitive strength: Key personnel like managers or specialist engineers are increasingly on business trips and thus not available for idea generation, problem solving or decision making. Paradoxically, this problem of remote collaboration is currently further exacerbated by the growing use of more enterprise and productivity applications by SMEs such as CAx, PDM, ERP, or groupware systems: These systems and their data is usually not available remotely and thus people “on the road” do not have the basis for meaningful collaboration and decision making, introducing delays, quality problems and lost opportunities.

The objective of the CoVES project is to develop a flexible collaboration environment including access to rich data and applications for nomadic professionals and partners targeted towards SMEs. To this end the project will

- Define new working models and functionalities for effective (mobile) collaboration.
- Develop a flexible and open service integration architecture that allows wrapping of enterprise applications and integration of collaboration services
- Develop a user centric client concept especially for mobile devices
- Implement a pilot system geared towards the engineering domain through a user driven development methodology in two living labs.
- Align with and extend existing standardisation initiatives in the mobile application domain.

Appropriate for the innovations targeted, the project combines in its 34 month workplan a system design methodology for architectural components with an iterative, user-driven living lab approach for the collaboration functionality and environment design.

Related to the target market, the consortium itself combines innovative technology provider SMEs and representative user SMEs with the expertise of leading research institutions at the cross-road of mobile applications, collaboration systems and enterprise applications.

6.2 Contributions in relation to Context Analysis (Section 2)

See below

6.3 Contributions in relation to Vision of the FInES 2025 (Section 3)

Business issues/requirements concerning with a special focus on SMEs

Short communication and decision paths always have been some of the strongest competitive advantages of SMEs. All members of the development team for example can sit together in a large office or at least on the same floor, and the management is inherent part of this. Also collaboration with partner companies and customers has benefited from close proximity. Ideas, new information and problems could be discussed ad hoc around a table.

However, the reach and scope of many SMEs has stretched considerably to national, European or even global business relationships. While this allows new opportunities and growth, the core advantages of flexible collaboration and fast decision making are suffering immensely: key personnel like managers or specialist engineers are increasingly on business trips and thus not available for idea generation, problem solving or decision making.

Beside the support of **internal business processes within the SMEs**, basic issue of SMEs concerning future ICT support is the support of ICT solutions to support mobility. Relevant processes to be supported are the following:

Manager on Business Trip: Despite being away for several days, he must guide the engineering team, be accessible for fast decision making, and interact with customers or partners if required. This must be based on current data like engineering designs and calculations, project status, and real-time interaction with the team even in small time slots between meetings, on the train or in the airport lounge.

Engineer on Remote Site: Engineers or other technical specialists must install or maintain equipment at customer sites. They require access to latest information, but must also collaborate with colleagues to solve problems and with management for decision making.

Virtual Team Collaboration: Professionals do not only need to collaborate with their colleagues at the "home base" but are engaged in inter-organisational and freelance teams for joint opportunities.

Paradoxically, this problem of remote collaboration is further intensified by the growing use of more engineering and enterprise applications by SMEs such as CAx, PDM, ERP, or groupware systems. These systems and their data are usually not available remotely and thus people "on the road" do not have the basis for meaningful collaboration and decision making, introducing delays, quality problems and lost opportunities. Furthermore, **today's fragmented software systems mostly are not appropriate for collaborating SMEs as an extraordinary effort concerning costs and implementation is necessary. Future tools have to-be pragmatic solutions that are suitable for SMEs to support them in their day-to-day collaboration also while being on the move**.

Technological issues

The existing collaborative engineering software tools include various bottlenecks and barriers in CE. One bottleneck is the **lack of integration** of the collaboration tools, particularly the ease of use and the integration into the work environment, e.g. the CAD work environment. For the success of a system it has to be simple and intuitive to use as well as being integrated into the CAD work environment.

Another barrier is the **incompatibility of tools and the lack of standards** of tools. Most standards for Computer Supported Collaborative Work (CSCW) are old, e.g. T120 or H.320/H.323. This is a problem for audio/video conferencing because today much better compression methods are available. Therefore the compatible systems need higher network bandwidth and have worse picture and audio quality.

Furthermore, the **ad-hoc ability of collaboration tools** is principally missing. Synchronous tools are mostly avoided because of long term preparations to manage technical and organizational arrangements (e.g. teleconferences).

Using **heterogeneous product data management** (PLM/PDM) systems is identified as a barrier in collaborative engineering. Typically, in collaborations every partner has his own system from different vendors. For involved persons it is very complicated to get the most actual data from every partner. This problem is even bigger if other kinds of systems additionally are used in parallel. For example necessary data partially could be stored in ERP and PPS systems or all of the managed data have to be synchronized throughout every used system.

Engineering and manufacturing enterprises today in general have gone beyond the simple mode of working through supply chains. One of a kind product delivery has prompted the need for one-time collaboration of different organisations to consolidate and synergise their dispersed competencies in order to deliver a desired product or service. This naturally has an implication not only in the way information (related to the to-be-delivered product or service)

is exchanged and shared, but the way in which secure, quick to set-up, transparent (to the end-user) and non-intrusive (to the normal ways of work of an individual/organisation) ICT is used for this purpose.

Some essential ICT requirements are listed below:

- Quick set-up: Once a VO is initiated, it is necessary to have in place as quickly as possible and as easy to configure as possible an ICT-based collaborative engineering environment for the VO. This should preferably take a matter of hours and at most some days. Where possible, configuration of the environment could be on the basis of pre-defined templates from previous projects.
- Reliance on standards: Reliance on standards can never be over-emphasised. Standards enable the true sharing of data between not only different applications, but also different organisations. Where proprietary systems do not provide data structured in accordance with current standards, interfaces/components need to be provided that provide a translation/mapping mechanism.
- Ease of use: The collaborative engineering environment must be easy to use. This is necessary, as there is little, if any, time to train the users of the environment (many coming from different organisations). Where possible, users should be in the position to be able to customise the interface to their own personal needs, requirements and context.
- Integration with legacy tools: Individuals use their own legacy tools for data creation, analysis and decision-making. They use the collaborative engineering environment mainly to share common data and services. Integration with legacy tools (through appropriate interfaces) can enable users to automatically send and retrieve relevant data through their configured contextual interface in the collaborative engineering environment. This allows a user to interact with and access data across heterogeneous and distributed data/application sources through his/her interface to the collaborative engineering environment.

One major finding of the CoVES project for future developments was the development future software systems based on mashup technologies instead of complex service-oriented architectures (SOA), specially in case of software system for SMEs and with regard to the requirements quick set-up, easy to use, integration of with legacy systems etc.

6.4 Materials and preliminary results from the project relevant to the activity

From the CoVES requirements analysis, today's fragmented software systems mostly are not appropriate for collaborating SMEs as an extraordinary effort concerning costs and implementation is necessary. With CoVES a pragmatic and open solution is in development that is suitable for SMEs to support them in their day-to-day collaboration also while being on the move.

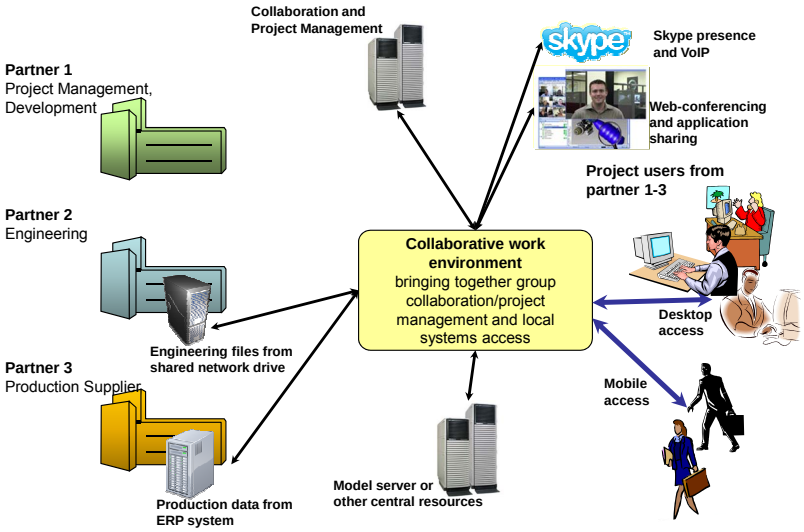


Figure 2: Usage scenario for collaborative work environment

Summarized this solution will be:

- Easy to use, practical and cheap,
- Full access to all company data and information (e.g. calculation data, status, figures, reports, CAD-Files) while being on the move as well as options for making comments and marks,
- Possibility for sharing data and information with a shared desktop for simultaneous viewing,
- Documentation of drawings of parts and modules (in the sense of change, version management functionalities, e.g. for cabling, piping, etc.) and history functionality to track changes,
- Supports flexibility and creativity,
- More transparency concerning costs, time and effort,
- Basic knowledge management functionalities,
- Fast, efficient procedures and working methods for collaboration (i.e. concepts of VO etc.),
- Support the day-to-day work in the context of optimized collaboration (team and project coordination, communication and management, communication and data exchange with customers and suppliers, functionality for customers to access the status of order fulfilment, accessing online status, tracking etc.).

The CoVES project aims to provide the above functionalities in a manner that will support nomadic engineers in their work. This is enabled through efficient data/application mobilisation supporting online/offline access on mobile devices and presented in context through mashups.

Architecture concept for a collaborative (mobile) engineering environment

Traditional Enterprise System Integration vs. Mashup Concept

Taking the scenario of Figure 2, building a collaborative working environment can be understood as an enterprise system integration project: different systems like group and project management, communication tools, a central project model server, but also local resources at the different participating companies have to be integrated.

Most architecture approaches in this situation use service oriented architecture (SOA): Basic applications make their data and functionalities available as services – typically webservices – which integrating applications access. These applications process the data or make it available to users through their own user interface. This approach has been developed especially in the context of enterprise systems such as ERP and SCM-Systems. The underlying requirement has been the automation of data exchanges (e.g. inventory data, order data) in well defined business processes. Even though webservices have standardised some of the interface elements between systems, interoperability both in terms of functionality APIs and data semantics remains a major challenge that even many major projects could address only in a very limited way, and if so only in well defined application and process domains.

The requirements in a collaborative engineering situation are somewhat different: Engineers as knowledge workers need to access typically very complex data or knowledge such as drawings or product models, simulations, material databases, or production configurations that are distributed among the participating companies and related to the project at hand. Additionally, many engineering project in an SME context last only a few months, seldom longer than a year. Therefore there is an even bigger need for continuous reconfiguration of the working environment. In such situation, a traditional SOA-based enterprise system integration approach is not promising at all.

Recent Web 2.0 mashup and widget portal concept developments offer a rather different architecture approach: Different applications offer their data and functionality as widgets or webpages that are meshed up to intelligent applications. A very simple example are housing agents' sites that combine address information directly with the satellite image of Google maps, with the only required setup being an automatic encoding of the address in the link calling the map. All functionalities of the map are available within the widget like zooming, scrolling, etc.

Similarly, a collaborative working environment can be set up by combining widgets and sections fed by different base applications that are combined and connected according to certain project business logic, but not through complex webservices integration. This approach resembles closely the working approach of engineers or knowledge workers in general, whose primary concern is the availability and easy access of different information, not a high degree of automation.

Enterprise System Integration	**Collaboration Environment**
• Well definable, low to medium complex processes	• Very complex knowledge representation and exchange
• Value from automated exchange of limited, well defined data between systems (e.g. orders, inventory)	• Value from access to complex information across boundaries
• Challenge: data and process interoperability between systems	• Challenges: complex, little structured coordination/ communication processes Human great interoperability bridge
• Services great interface and automation approach	• Meaningful, contextualised mashup of modules great human support

Table 1: Comparison architecture requirements

Mashup architecture

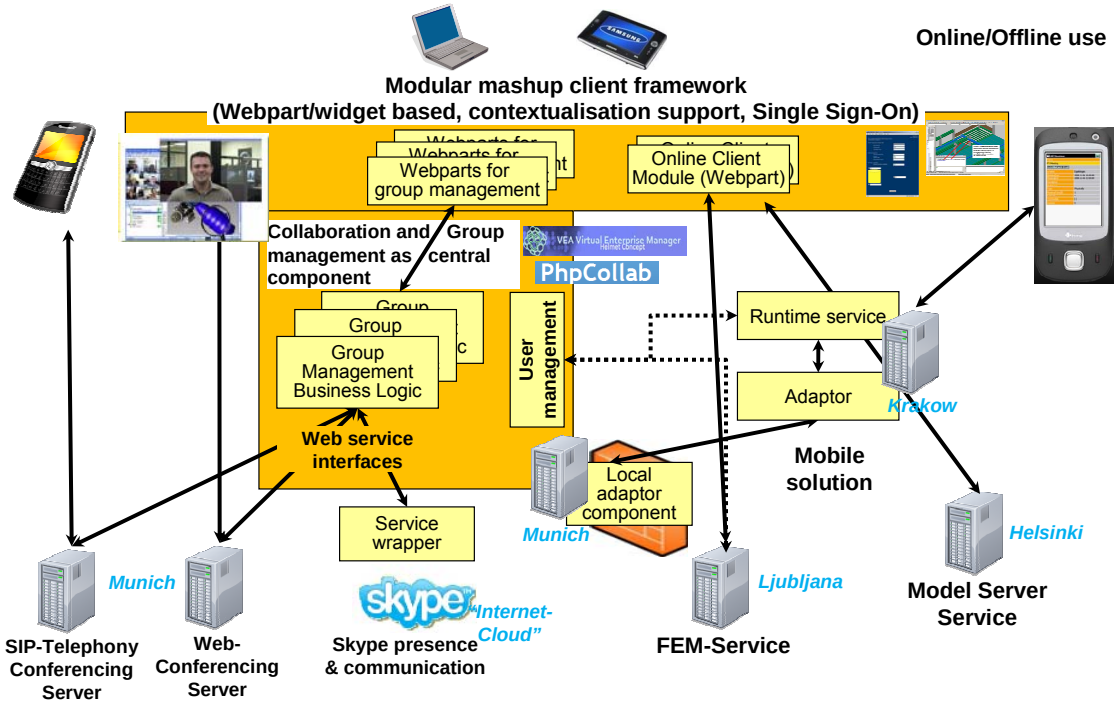


Figure 3: CoVES Mashup architecture

Figure 3 presents the CoVES mashup architecture: The central part of the architecture is the collaboration component. A characteristic of the CoVES environment is the usage of existing collaborative web platforms with some small changes. These web solutions typically have functionalities for the management of projects, tasks and calendars. Furthermore they manage files, project partners and customer information. For communication needs, it integrates with instant messaging like Skype and web conferencing. All of these services can be used with an online connection to the internet and a web browser. The collaboration component either provides already the mashup extension or can be extended with little effort.

The other base systems of a project environment provide modules into a mashup framework. These modules can be widgets or webparts, i.e. web elements that can be rendered into an existing webpage. Through Ajax technology, they can provide complete mini-applications without the need of the surrounding webpage to refresh its content. A second possibility are complete subsections of the environment provided by an own client module of that application.

Specific mashup architecture challenges and solutions

While mashup approaches have found considerable spread in public websites and the general consumer market, adoption in the business domain has been rather slow. We see three main reasons for this situation: availability of mashup modules of business applications and local data resources, business logic and intelligence in the mashup, and access, authentication, and security management. These areas are addressed in the CoVES architecture framework:

Enabling business applications and local data resources towards mashup

Few business applications provide own, complex widgets or interfaces that can feed such modules. Additionally in the SME scenario presented above, applications and data resources are often local to the individual company, which does not have the infrastructure for serving as a server to complex SOA architectures.

As a solution, the CoVES partner Logotec has developed the required technology consisting of several elements that make such resources available both for the mashup architecture and for use offline and on mobile devices:

- A local interface and adaptor connects to resources (e.g. shared network drives, application databases or to APIs of enterprise systems) and tunnels them through the local firewall with minimal configuration.
- An application configurator supports the fast, sometimes even automatic definition of modules for mashup and mobile use. The modules can encapsulate much standard functionality such as searching, editing data, generating new items, etc.
- A runtime service serves the modules, respectively provides synchronisation for offline use.

Business logic and intelligence in the mashup

Current widget frameworks have very limited intelligence or business for combining different elements into a coherent view. Basically, the user has to configure each element individually to make sense for him personally. The user in a collaborative working environment has only benefits if different resources are connected meaningfully and consistent for all users: e.g. when he works in a certain project context, a widget should show him directly the related files in a local network file share, not that he first has to navigate through several folder levels before he finds the right elements. Similarly, data entered in one part of the environment should filter or even update the data in another module.

Of course, mashup does not allow a similar breadth and flexibility of functionality as a full SOA-Architecture. However, few parameters can typically give already sufficient context to a module that it can filter the data or present it to the user fitting to his requirements. E.g. a small configuration can link specific folders of the local network drive to certain tasks or workpackages. When the user works on the task, the task ID in the URL link would trigger presenting the corresponding folder.

The CoVES project will define a number of useful integration and context parameters for the “communication” between the widgets and the environment.

Access, authentication and security management

Client side scripting and mashup has been looked at critically for security reasons, and so far no standard security framework for such applications has been developed. We see the user management in a project environment largely centralised to the group management application, which provides the integrative environment. Roles defined for the project determine the access to the different resources meshed into the environment. Two mechanisms are used for this: The Logotec technology can connect directly to the database of the group management system (similarly to the connection to local resources) and retrieve online the respective access right settings. Another possibility is regular synchronisation of user data via web services.

The final decision about the authentication and security management is currently still open. Three basic mechanisms are currently evaluated for practicability and security threats:

- Creating individual sessions for all systems mashed up: When a user browses the first time in the environment calling a module, the providing system checks whether an own session exists with the user. If not, the system tries to authenticate the user itself ideally against an external authentication provider such as OpenID. If the environment passes the current ID to the module, authentication can become relatively seamless.
- Passing a security token to the external module which contains in an encrypted format authentication and other parameters.
- A security handshake via standardised web services that would confirm the identity of the user.

Mobile architecture

Mobility is one of the key requirements for the collaboration environment of managers and employees in SMEs, because they are often on business travels and cannot access the company's information infrastructure. Digital files and other data are not available outside the enterprise system architecture for these people. This has two consequences. Whilst travelling business people have limited access to the most actual data for their own business, e.g. they cannot see actual information about the client projects. Second, there is no common data basis, if they discuss with the project partners on mobile phone.

To allow mobile and offline access, the basic mashup integration architecture of CoVES is extended towards mobile and offline access. This extension of the architecture is shown in Figure 4. The technology used to provide widgets and modules from different base applications provides as core feature mobile versions of these modules with fully automatic data synchronisation between the mobile device and the base application. This mechanism is also used to mobilise core functionality of the collaboration and group management system as long as it is data driven.

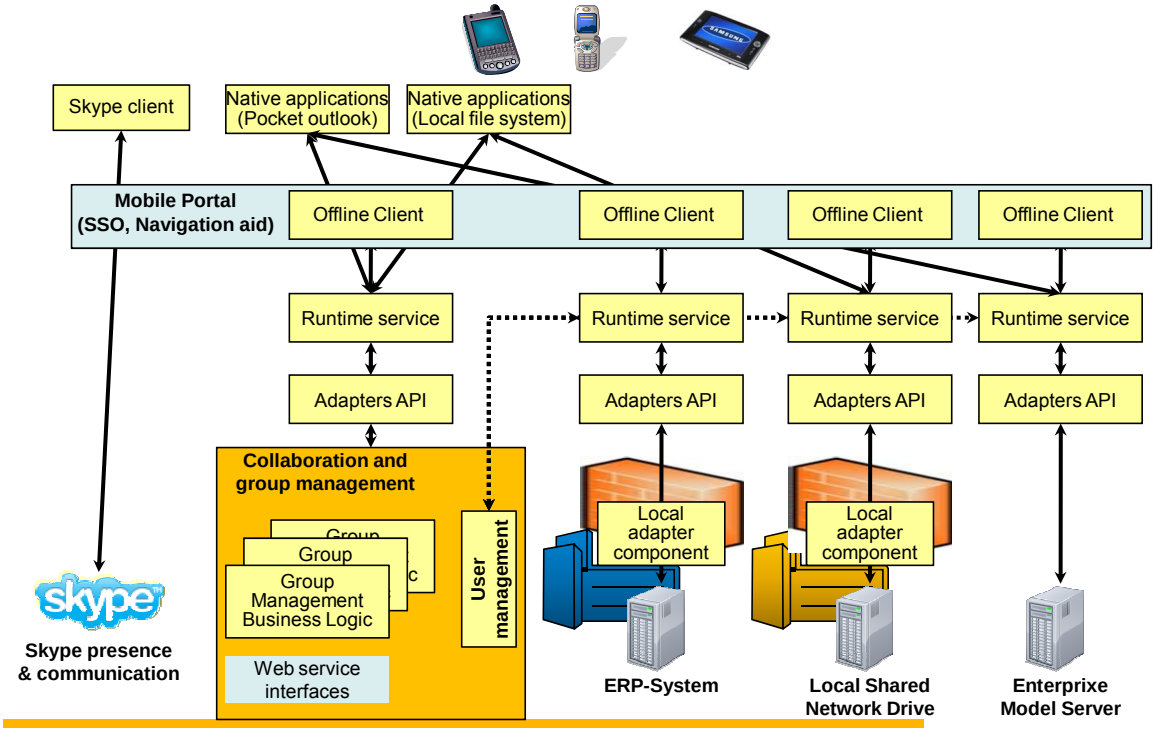


Figure 4: Mobile and offline architecture of CoVES

Due to different technologies of the mobilised modules and the small screen size on mobile devices, the mashup of different modules has to be reduced to a more portal type integration: From a central screen and single-sign on environment, different client modules can be called. Of course, synchronous communication or complex graphical applications require special mobile clients.

With the mobilization service client applications are created which can be used on any mobile device with an actual Microsoft Windows operating system: Pocket PC (typical, representative mobile device), high level smart phones and notebooks. In the CoVES environment these applications enables access the information in the collaboration platform and other connected systems even if the device is offline. In this case, data can be still used, which was downloaded and cached before. The user is able to modify the data or generate new entries. When he connects to the internet, the applications in the CoVES environment synchronize their data with the original data sources and transfer all modifications in both directions automatically. After that, the information on the server and on the mobile device is the same.

Today, there are many open source and commercial collaboration platforms available. The CoVES environment differs in some specific characteristics from them. Table 2 shows an overview about the differences.

Typical collaboration platform	**CoVES environment**
Platform becomes new user interface	Usage of the former user interface, the platforms operates more in the background
Management of its own data, original data is copied to the platform	Data is managed in the original (dispersed) source location
Synchronization with the original data possible only after integration projects	Synchronization of events, tasks, contact, emails by default, other data easily and inexpensive
Platform solutions are preferred used instead of existing solutions (CRM, PDM, DMS, ERP, etc.)	Make most important parts of your existing IT solutions available for other collaborating partners.
Offline access to the platform not possible	Offline (+synchronization) possible
No access by mobile devices	Access by mobile devices by default
Focused on larger companies:	Focused on small and medium companies:

• expensive, large, "perfect" projects
• deep integration between existing systems preferred
	• fast implementations, low cost
	• more focus on access than on integration:
	  • from outside the company
	  • for other collaborating partners
	• integration focused on users' experience and not on integration between different systems

Table 2: Differences of typical collaboration platforms and the CoVES environment

Main difference between the CoVES concept and other existing systems is the intentional renunciation of a deep integrated solution. CoVES tries to reuse most of the existing solution, including the databases as well as parts of the user interfaces, and integrates them into the environment. Therefore integration project are much faster implemented with less resources and costs. This is one of the main advantages, especially for SMEs, who would not pay for expensive integrations.

The reuse of existing application has several more advantages. The whole data stays in their originally systems. Typically, users need to upload data into a collaboration platform. Thereby the data is managed in different systems at the same time and the synchronisation is a big problem. In CoVES the original databases are still used and just the access is managed with the environment. So there is only one set of data. Additionally, people use the user interfaces of their familiar applications. The environment makes the usage just easier, for example by realizing "Single Sign On". CoVES project does not implement its own collaboration functionalities. Furthermore, existing applications are used for these aspects. In the CoVES project two different collaboration platform, phpCollab and VE-Forum, are integrated as examples.

Another big difference of CoVES is the support of mobile computer devices through the environment. Applications can be created for different clients. They also enable the use of the application even if they are not connected to the internet. The synchronisation process is implemented in the environment and is easy to apply. In summary, CoVES focus on SMEs. It can be used in a single company to enable the mobile access to data. Or it assists in collaborations of several SME to realize a collaboration environment with all necessary existing applications plugged-in. In both cases the companies rely on their existing solutions.

6.5 Relevant external sources

Title: Tools to Support Collaborative Mobile Work Practices Author: Burak Sari, Gordon Sung, Robert Sparnaaij, Felix Akaret in: Conference Proceedings, ICE2008 - 14th International Conference on concurrent Enterprising, page 3-10, ISBN 978 0 85358 244 1, Centre for Concurrent Enterprise, Nottingham University Business School: Nottingham, 2008.
Title: Requirements for collaborative VE for SMEs with special focus on mobility aspects Author: Mehmet Kürümlüoglu, Jochen Eichert, Judith Finger, Abdul Samad Kazi, Burak Sari in: Conference Proceedings, ICE2008 - 14th International Conference on concurrent Enterprising, page 499-506, ISBN 978 0 85358 244 1, Centre for Concurrent Enterprise, Nottingham University Business School: Nottingham, 2008.
Title: Collaborative Virtual Engineering for SMEs: Technical Architecture Author: Jerzy Dryndos, Abdul Samad Kazi, Dirk Langenberg, Herrmann Löh, Rainer Stark in: Conference Proceedings, ICE2008 - 14th International Conference on concurrent Enterprising, page 507-514, ISBN 978 0 85358 244 1, Centre for Concurrent Enterprise, Nottingham University Business School: Nottingham, 2008.
Title: From Machine Drawings to Model-based Collaborative Virtual Engineering Author: Abdul S. Kazi, T. Ristimaki, O. Balkan, M. Kürümlüoglu, J. Eichert, J. Finger in: Conference Proceedings, ICE2008 - 14th International Conference on concurrent Enterprising, page 515-522, ISBN 978 0 85358 244 1, Centre for Concurrent Enterprise, Nottingham University Business School: Nottingham, 2008.
Title: How to Drive Innovation in Collaborative Engineering Work and Working Envi-ronments - A Living Lab Approach Author: Hermann Löh

in:	Conference Proceedings, ICE2008 - 14th International Conference on concurrent Enterprising, page 523-530, ISBN 978 0 85358 244 1, Centre for Concurrent Enterprise, Nottingham University Business School: Nottingham, 2008.

6.6 Project webpage

www.coves-project.org

7 K-NET Project - Services for context sensitive enhancing of knowledge in networked enterprises

7.1 Project Summary

The objective of K-NET is to explore the fundamental problem: how different services to manage social interactions in a networked enterprise can be used to enhance knowledge and knowledge management (KM) services. The key hypothesis of K-NET is that the context under which knowledge is collectively generated and managed can be used to enhance this knowledge for its further use within intra-enterprise collaboration. By extracting the context under which the knowledge is generated in a network (e.g. goals, teams, temporal and spatial aspects), it is possible to enrich it to be more effectively used within future work. In order to explore such hypothesis, the project intends to answer several problems: how to efficiently monitor/trace a process of generation/usage of knowledge in the network so that this knowledge can be re-used for future work; how to extract context from this process; and how to enrich the knowledge generated with extracted context to support knowledge sharing in future network activities. By solving these problems, K-NET will allow the development of new services to manage social interactions allowing to effectively monitor the (collaborative) knowledge generation/usage processes (specifically addressing knowledge provided/contained in 'smart' devices), services to automatically extract context from such processes and enrich the knowledge, and KM services applying extracted context to support use of this knowledge in the network, with special emphasis on knowledge representation services (considering e.g. IPR and privacy issues). These services will open new business opportunities for networked enterprises to provide new products/services. K-NET will develop generic services, applicable across different domains, and specifically explore new business opportunities in manufacturing and engineering SMEs. Three demonstrators of the application of new services in real industrial environment and their usage for new business models will be provided.

7.2 Contributions in relation to Context Analysis (Section 2)

The current global scenario faced by all regions in the world is strongly masked by the current financial crisis. However, giving a wider look in time and space on the situation, the general condition is much darker with: uncertainty about the human impact on climate; problems with future availability of basic resources like water, food or energy; growing pollution and waste management; social breakdown; war and terrorism and, of course, the financial and economic crisis. So, in an attempt to analyse the context of the crisis that companies are facing, the first question to put should be: **Are all these aspects coincidental or just several viewpoints on the same structural crisis?** The answer to this question will determine if it is possible to solve each of these aspects separately or if the society has to face the problem as a whole and redesign the way the future society and its economy are to be built.

Even common census thinking is able to establish several interconnections, some already observed in the past, between the several mentioned aspects of the crisis. Growing pollution and climate changes is affecting the availability of water and food; social breakdown arises from unemployment and insufficiency of basic resources; armed conflicts emerge mainly around the last oil regions in the world; migrations are generating social tensions; etc.

In the need for isolating major aspects that cascade affects all others, the rate of depletion of resources is the best candidate and this is mainly established by the way we have been doing business nowadays.

Thus, the second question would be: **Is the solution, for emerging from this global crisis, business as usual?** The book from Ted Trainer, *Renewable Energy Cannot Sustain a*

Consumer Society[3], has its abstract on the title. Although we can see its vision as quite catastrophic, he makes a clear assessment that the hopes we put on renewable energy, simultaneously solving the energy depletion and the environmental impact problems, are well overrated for our lifestyle in the developed societies. However, he writes: "…we could easily have an extremely low per capita rate of energy consumption, and footprint, based on local resources - but only if we undertake vast and radical change in economic, political, geographical and cultural systems."

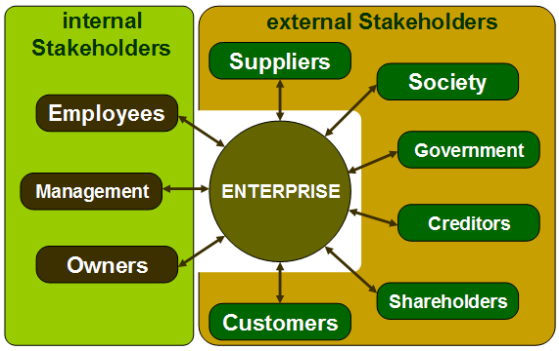
One could say that the decision towards this new society lies primarily on policies driven by governments. It is not! Of the world's largest 100 economic entities, 51 are corporations and 49 are countries[4]. So, this is mainly business, even because part of the political decisions are influenced by the best interest of companies and corporations as identified sources for populations welfare. Thus, the society has to rethink the way we have been conducting business and pursuing economic growth.

Critical times are always opportunities on public acceptance to make things differently. If we are to expect some rationality arising from the crisis, we would say that companies best fit to prevail should be capable to create something that others recognise as **value**. However, this cannot be made against our main source of sustainability, i.e. the planet we are living on.

7.3 Contributions in relation to Vision of the FInES 2025 (Section 3)

The previous paragraphs have presented a context analysis of the current world crisis as an interconnection of several aspects that derive from the lifestyle from modern and developed societies and the way companies have responded to those so-called *market needs* in the past. Value creation, within a sustainable context, was identified as the essential factor for prevailing out of these nebulous times.

The question arising at this point is then: **Should the economy stop growing (whatever its meaning) to reach sustainable balance?** We answer: not necessarily! But the society has to break the compromise between sustainability (economic, social and environmental) and the creation of wealth. It has to go from the creation of financial value, economic value added or other measures driving stock price performance towards measuring and managing all stakeholders' value, some of them quite abstract, i.e. towards **sustainable value creation**. Because company's impacts on all stakeholders are often unintentional, it faces risks and opportunities that managers can no longer afford to ignore. All stakeholders mean all internal and external stakeholders of an enterprise, including employees, suppliers, customers, government but also its shareholders (Figure 5). This is the so-called *doing well by doing good* approach described so well by Chris Laszlo in its book[5].



[3] Ted Trainer (2007) *Renewable Energy Cannot Sustain a Consumer Society*, Springer 2007

[4] Sales: Fortune, July 31, 2000. GDP: World Bank, World Development Report 2000.

[5] Chris Laszlo (2008) *Sustainable Value: how the world's leading companies are doing well by doing good.* Greenleaf Publishing (UK) *and* Stanford University Press (US).

Figure 5 – Internal and external stakeholders as value creation targets.

But if companies focus on shareholder value, disregarding the value for stakeholders, their viability can be jeopardized by several **risks** of negative reactions, including: customer de-selection; pre-emptive regulation; loss of market share; reputation damage; fines and penalties. This is true even if they go across some *greenwashing* process with short-term positive impact in marketing.

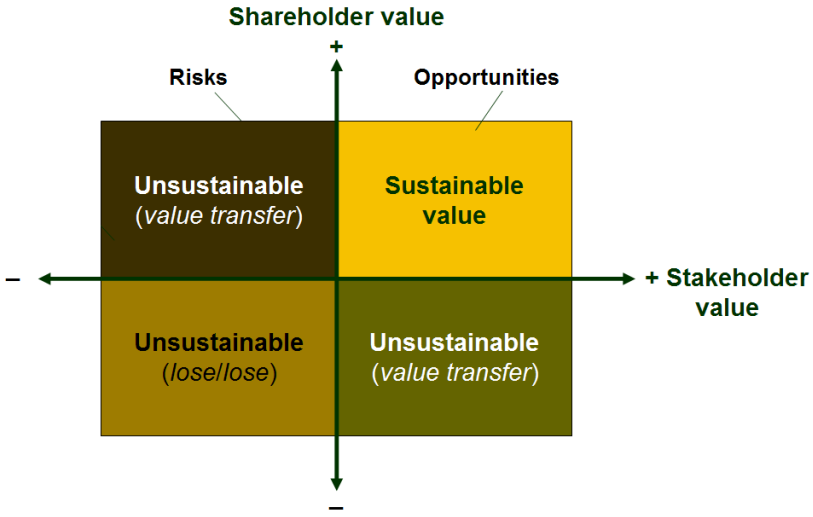


Figure 6 – Sustainable value framework[6].

On the other side, there are new **opportunities**[6] that arise when value creation has in mind both shareholders and stakeholders, such as: enhanced reputation; product differentiation; motivated employees; reduced costs; entry new markets (Figure 6).

If we are to expect that the economy goes toward the creation of a breakthrough value creation opportunity (Figure 7), characterised by innovation and whole-system design, companies will expect from our scientific community to **provide methods and tools to support cross-functional, cross-company, cross-sector knowledge-based collaboration and interoperability.**

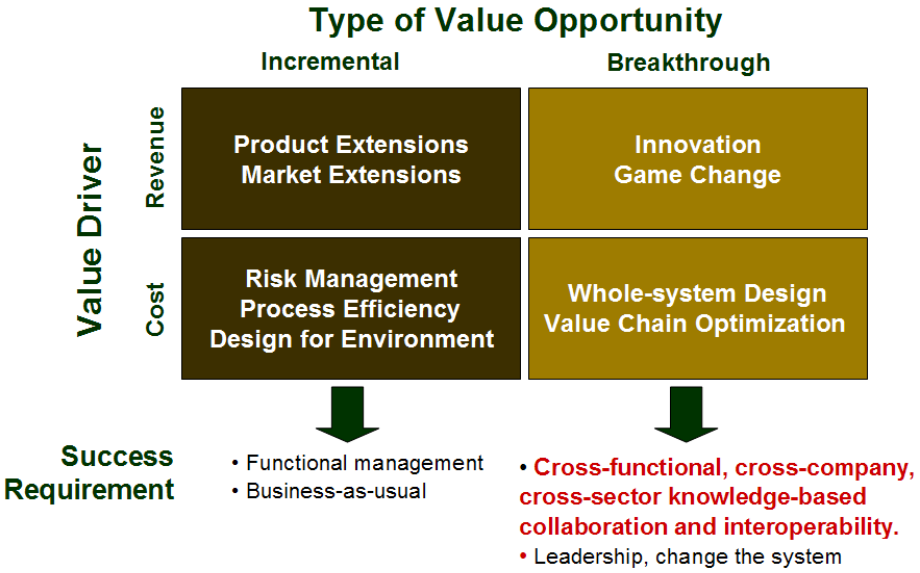


Figure 7 – Breakthrough value opportunity[7].

[6] Chris Laszlo (2005) *The sustainable company.* Island Press.
[7] Blu Skye Sustainability Consulting (http://www.bluskye.com/).

As knowledge sharing and knowledge creation have been identified as the past and present generations of Knowledge Management Systems, for the future of knowledge management it is necessary to explore and emphasize its impact on people, organizations, and society in terms of value creation. Current research[8] confirms that effective knowledge management leads to value creation with potential to increase and sustain organizational innovation. Referring again Figure 6, it means going from the left side to the right side of the sustainable value framework.

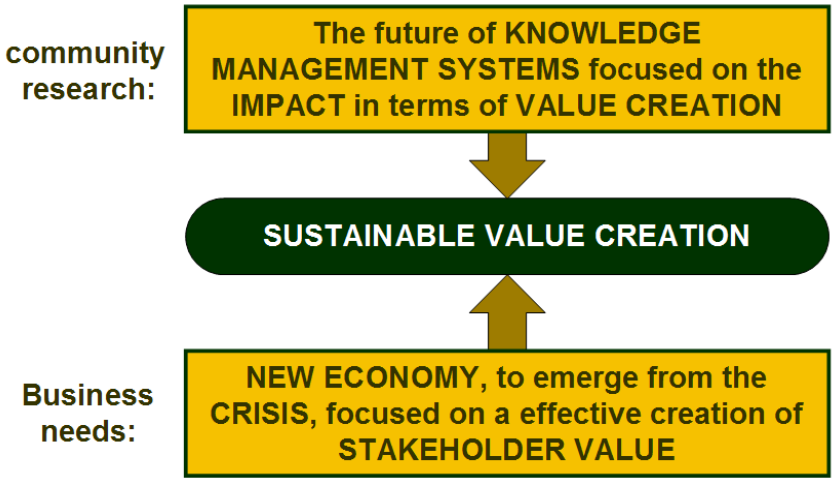


Figure 8 – Sustainable value creation as meeting point between research and business needs.

In particular, sustainable development is hampered by the inability of making sense and exploiting effectively the large amount of knowledge generated by individuals across teams, projects, and organizations[9]. Sustainability related knowledge may take several explicit forms, but it is also inherent in human actors' skills, interactions, experiences, and lessons learned. Sustainable value creation is grounded in the appropriate combination of human networks, social capital, intellectual capital and technology assets, facilitated by a culture of change.

To conclude, we defend that **sustainable value creation** is the meeting point between business needs and our community research as depicted in Figure 8.

7.4 Project webpage

http://140.203.154.228/K-net/index.jsp

[8] Vorakulpipat, & Rezgui, (2008) *Value creation: the future of knowledge management*, The Knowledge Eng. Review.
[9] Wetherill, M., Rezgui, Y., Boddy, S., Cooper, G. (2007). *Intra and Inter-organisational knowledge services to promote informed sustainability practices*. Computing in Civil Engineering 21(2), 78–89

8 SUDDEN Project - SMEs Undertaking Design of Dynamic Ecosystem Networks

8.1 Project summary

Contemporary markets require dynamic networks of collaborating organisations. Effective collaboration inside such networks motivates optimisation during planning and flexibility at enactment time, yet these two strands are treated separately at present.

This project focuses on SME suppliers within automotive ecosystems, aiming to empower them to collaboratively design and coordinate supply networks. This will be made possible by a novel approach which integrates collaborative optimisation and last-minute responsiveness of supply chains in an easy-to-use software prototype. A methodology for automotive supplier profiling and development will be created to support the implementation of the approach.

The underlying theoretical model uses principles of activity coordination and meta-management to deliver two key contributions. Firstly, innovative and emergent compositions of value-adding activities and services are made possible by separating abstract requirements for activities such as transportation or packaging from providers such as logistic suppliers. Secondly, responsiveness to last-minute changes of customer needs or transport disturbances is provided by postponing the allocation of providers to abstract activity requirements till the last possible moment, and continuously monitoring and improving the effectiveness of the supplier allocation.

To facilitate the uptake by typical SME users, visual models of supply processes, services, allocation policies, and partner profiles will be created to balance needs for formal semantics and ease-of-understanding. An agent-based infrastructure and formalised contract mechanisms will implement emergent service bundling and service-provider coalitions. Systematic value-based bid evaluation will be used, and simulated evaluations will feed into SME development using role profiling. Allocation mechanisms and evaluation criteria will be continuously adapted to marketplace changes and real-time information from mobile devices.

8.2 Contributions in relation to Context Analysis (Section 2)

European enterprises are currently faced with accelerated increase of complexity of the products they manufacture and the services they provide. Automotive suppliers have to incorporate microprocessors and cameras into parts which were previously purely mechanical such as rear-view mirrors and bumpers. This leads to corresponding increase of both complexity and price of manufacturing infrastructure and processing machines, for example small car garages are now forced to invest into sophisticated and expensive computerized testing and tuning stands.

This increase of complexity is strongly pronounced in terms of supporting information technology, for example car dealerships are now allowed to sell cars from more than one supplier, and this forces them to interoperate with a number of incompatible supplier systems. Technology push is very influential in the overall increase of complexity, with new standards and buzzwords being invented by IT suppliers on a daily basis.

SUDDEN aims to address the technical complexity and support enterprises in forming sustainable and competitive supply networks by using intelligent reasoning over semantically tagged business process and product models. The expense of investments in new technology is shared by collaborating enterprises within dynamic supply networks, where different partners specialize in narrow aspects of delivering a complex product. Long-term development and sustainable growth is supported by ecosystem-wide on-the-job learning activities, supported by transparent access to information about past experiences and successful solutions.

The enterprises supported by SUDDEN are hidden from the underlying complexity of the intelligent reasoning technology, since they only access the system through over-simplified web interfaces. This is consonant with the ongoing trend for enterprises to outsource not only the management of IT but the IT itself (the concept of Cloud Computing).

8.3 Contributions in relation to Vision of the FInES 2025 (Section 3)

Current economic context/crisis
Increase of complexity in terms of both business output (e.g. car components are becoming increasingly complex) and of the supporting structures and resources needed to provide this output (ranging from production infrastructure to financial arrangements and structures). Increasing IT complexity is an important part of this picture, steering businesses to outsource not only the management of IT but the IT itself (the concept of Cloud Computing).

(Potential) developments of Future Internet and particularly Future Internet based enterprise systems
The shift to outsourcing IT leads to an increasing uptake of the "software-as-a-service" model, where the software needed to support business operations is delivered when needed from the "Cloud", using web service-based technologies as a core component of the Future Internet-based enterprise systems. Moving Semantic Web concepts to the domain of web services promises to empower end users to specify and procure the enterprise software services they need at the point of this need.

Research landscape of FP7 and preparation of the ICT Work Programme 2011-2013
The move to Future Internet-based Enterprise Systems brings with it additional conceptual and technical complexity, and one of the strongest research challenges should be to abstract this complexity and make the Future Internet truly "democratic", opening it to the millions of European SMEs who do not have dedicated IT staff, and are not interested in technology developments per se, but only in the way these developments can help them achieve competitive advantage and sustainable development.

Enterprise perspectives and enterprise centric
Superimposing complexity of the Future Internet technology layers on the complexity inherent in inter- and intra- enterprise processes makes the issues of complexity management and supporting end users in managing this complexity to achieve technology-supported sustainable development even more challenging. Intelligent software technology can use semantically-enriched descriptions of enterprise services and processes to provide pro-active support for technology-naïve users and thus achieve sustainable development of concrete parts of the European economy, such as automotive manufacturing.

8.4 Project webpage

http://www.sudden.biz

9 COIN Project - Enterprise Collaboration & Interoperability

9.1 Project summary

COIN Vision: “By 2020 enterprise collaboration and interoperability services will become an invisible, pervasive and self-adaptive knowledge and business utility at disposal of the European networked enterprises from any industrial sector and domain in order to rapidly set-up, efficiently manage and effectively operate different forms of business collaborations, from the most traditional supply chains to the most advanced and dynamic business ecosystems.”

COIN Motto: “Enterprise Interoperability and Enterprise Collaboration are the two sides of the same COIN”.

COIN Mission: The mission of the COIN IP (http://www.coin-ip.eu) is to study, design, develop and prototype an open, self-adaptive, generic ICT integrated solution to support the above 2020 vision, starting from notable existing research results in the field of Enterprise Interoperability (and made available by the whole Enterprise Interoperability DG INFSO D4 Cluster and specifically by the projects ATHENA, INTEROP, ABILITIES, SATINE, TRUSTCOM) and Enterprise Collaboration (and made available by the projects ECOLEAD, DBE, E4 and ECOSPACE). In particular, a COIN business-pervasive open-source service platform will be able to expose, integrate, compose and mash-up in a secure and adaptive way existing and innovative to-be-developed Enterprise Interoperability and Enterprise Collaboration services, by applying intelligent maturity models, business rules and self-adaptive decision-support guidelines to guarantee the best combination of the needed services in dependence of the business context, as industrial sector and domain, size of the companies involved, openness and dynamics of collaboration. This way, the Information Technology vision of Software as a Service (SaaS) will find its implementation in the field of interoperability among collaborative enterprises, supporting the various collaborative business forms, from supply chains to business ecosystems, and becoming for them like a utility, a commodity, the so-called Interoperability Service Utility (ISU). The COIN project will finally develop an original business model based on the SaaS-U (Software as a Service-Utility) paradigm where the open-source COIN service platform will be able to integrate both free-of-charge and chargeable, open and proprietary services depending on the case and business policies.

COIN Scientific & Technology Objectives:

- To design and develop a secure, pervasive and intelligent generic service platform (GSP) to host Baseline and Innovative COIN services for EI and EC and make them available under innovative on-demand, utility-oriented business models.
- To consolidate and stabilize the ICT results of both EC and EI FP6 research into some EC/EI Baseline Services (free or charged; open-source or proprietary) and to make them available to SMEs thanks to existing integrated collaborative platforms.
- To further enlarge, extend and improve the Baseline Services, by developing other more Innovative Services in the EC and EI fields, which could take into account the most recent and promising technology challenges (e.g. Web 2.0, semantic web, space computing) and put them at service of EC and EI purposes.
- To represent a pathway to convergence for EI and EC, by integrating under an innovative ecosystem of business models called SaaS-U (Software as a Service-Utility), the most prominent stakeholders involved in EI and EC.
- To demonstrate, experiment, trial and assess the project results into 6 test cases in Aeronautics (Spain), Automotive (Slovenia), Aerospace (Italy), Pulp & Paper (Finland), Healthcare (U.K.) and ICT (Hungary), implementing different

collaboration forms (supply chains, collaborative networks, business ecosystems) and expressing different interoperability needs (business and knowledge oriented).

9.2 Contributions in relation to Context Analysis (Section 2)

NOTE for the editors: This chapters are to be considered as work in progress.

The Interoperability Service Utility (ISU) in COIN: business perspective

"It is out of doubt that the financial crisis will reduce the IT investment capability of all enterprises: in this perspective, large enterprises will have an IT budget comparable with the current budget of the medium enterprises and so on. SMEs will probably have NO budget for IT investments. SaaS, Cloud computing (or our COIN SaaS-U and Service Parks metaphor) could mitigate such an impact together with well focussed PPPs to help both enterprises to decisely outsource IT and IT industry to renovate their offer."

AND

How COIN and the SaaS / Cloud model can less the pain of the Financial Crisis?

IDC is updating it's forecast for a further increase of the SaaS model for 2009 !

http://www.btwholesale.com/pages/static/News_and_Briefings/Industry_News/18990916.html

http://cloudcomputing.sys-con.com/node/777114

How Good Is the Financial Crisis for Cloud Computing Providers? The disruptive vectors of the market will be among the highest growth sectors in 2009: IDC.

The relative size of the SaaS market is estimated to increase as a result of the financial crisis.

Some references on the subject are reported here below:

http://gadishamia.wordpress.com/2008/09/30/can-the-financial-crisis-help-saas-companies-in-the-long-term/

INDUSTRY NEWS. 26 January 2009

SaaS Uptake Boosted by Financial Crisis

The market for software-as-a-service (SaaS) is to continue expanding despite the economic crisis that has bought many other technology sectors to a standstill. That is according to a new report from IDC, which suggests that these harsh financial times will actually stimulate sales via SaaS, as vendors market their offerings as zero-capital-expenditure alternatives to on-premise applications. What's more, the research company predicted that buyers will tend towards the easy-to-use nature of subscription services which gauge current use rather than future capacity. Therefore, it actually improved its 2009 forecast, estimating that SaaS will grow by 42 per cent this year over 2008, up from its initial prediction of 36 per cent. Robert Mahowald, director of SaaS research at IDC, claimed that the general slowdown across IT sectors is making businesses "bearish" about their short-term investment capabilities. "SaaS services have benefited by the perception that they are tactical fixes which allow for relatively easy expansion during hard times," he added. Last week, analyst Aberdeen reported that SaaS usage is viewed as a long-term solution by 75 per cent of best-in-class companies.

The COIN SaaS-U is COIN's interpretation of the business case and ownership aspects of the ISU (as differentiated from other possible interpretations of and work on the business and economic aspects of the ISU). It is researched within COIN WP6.2.

WP6.2 is concerned with the following problem statements: (1) How can EI/EC services be sold as a utility, rather than as an adjunct to a commercial offering? (2) What would be a viable pricing model for technical functionalities delivered as services? (3) Who would be the

ISU business partners and what kind of partnership arrangements would be appropriate? (4) Who would (should) own and/or operate the ISU?

The application of the utility paradigm to business models for ICT services beyond the communications layers is new, as are business model considerations for services as an infrastructure for enabling enterprise innovation (note: WP6.2 has developed the tentative "plug-switch-tap" metaphor to denote the transition from the past product oriented application centric paradigm to the present service oriented SaaS/SOA paradigm to the new innovation focused, service infrastructure as utility paradigm). WP6.2 is expected to make advancement in these areas, including providing the value proposition, scenarios for innovation, and potential business models for the ISU ("SaaS-U"). It will seek to answer: are those business models feasible, particularly in relation to the COIN integrated solution? If the research conclusion yields a negative answer, it will seek to identify the critical points of business model failure, and under what circumstances and conditions those critical points could be mitigated.

9.3 Contributions in relation to Vision of the FInES 2025 (Section 3)

The Interoperability Service Utility (ISU) in COIN: technical perspective

The ISU Grand Challenge has been an inspiring concept for the COIN project 2020 vision, for its Generic Service Platform and for the SaaS-U business model. From a technical viewpoint, the COIN GSP will be a service infrastructure (an example of an ISU) which will allow collaborative enterprise to access EI/EC services as utilities.

- The overall vision of the EI Research Roadmap and the ISU Grand Challenge in particular inspired the COIN 2020 Vision.
    - The COIN 2020 Vision interprets the ISU as comprising a set of EI/EC services (service offer), which meet the requirements of collaborative enterprises (service demand).
    - The COIN project researches, develops and experiments with prototypes, methodologies, tools and services, which, given the limited scale of our test cases, will demonstrate the feasibility of the COIN 2020 vision. This is built into our two-cycle workplan lasting till end 2011 (first prototype, final prototype).
    - The full implementation of the COIN vision is foreseen to occur in 2020, when the FI-IOS infrastructure will be available on a large scale, supported by as well as enabling viable business models, and underpinned by a set of governance-management policies; all within the realisation of a certain Future Internet vision which is expected to fully emerge in due course.
- The COIN GSP is an example of the ISU infrastructure, defined in accordance with a set of design principles, for optimising the provision and innovation potential of value added services for the benefit of enterprises.
    - **Design Principles**: the COIN GSP is compliant not just with the general ISU principles (low-cost, universal access, guaranteed, not-controlled, IT agnostic) but also with the ISU design principles: like the "end-to-end" argument, the open standards adoption principle, the knowledge integrity and semantic transparency principle, the uniform environment for utility and value added services facility, the scalability, reliability, stability, interoperability and backward compatibility principles. A clear formulation of these principles is part of the research of COIN.
    - **EI/EC Services**: COIN is focusing not on the whole spectrum of possible FI services, but just on those services supporting the collaboration and the interoperability of enterprises. Our assumption (and one of our most critical research issues) is that some of them could become also a commodity and be

provided as utility (COIN focus), we are also studying and developing a future business context (COIN scenario) where not just EI/EC services are present, but also advanced professional on-demand software as a service in the so-called Service Parks (based on advanced data-application centres architectures like Cloud Computing, and providing enterprise applications – ERP CRM SCM GIS HIS - but also business services like e-commerce, e-tourism, utility computing, payment & security) and pervasive dispersed constellations of services also user-generated provided by the so-called Service Galaxy in the open IOS. We however expect these concepts to be further developed and refined in the coming years; the future business context to be developed within COIN should be a valuable contribution in this respect.

- **Collaborative Enterprises**: In order to validate the ISU for meeting the needs of collaborative enterprises, COIN is focusing on three collaboration forms investigated by previous FP6 projects (supply chains, collaborative networks and business ecosystems). For each of these, COIN will firstly adapt services and tools from previous projects as example value added services, constituting different Collaboration Platforms corresponding to the collaboration forms (baseline). These Collaboration Platforms will be further extended, customised and demonstrated in relation to three specific business scenarios (c-PD, c-PP and c-PM, innovative services). The extension and customisation will involve additional external value added services and the fine tuning of value added services, for meeting the needs of the business scenarios. The different collaborative platforms will access the COIN GSP (as an example of the ISU) through the generation of a service request, using the conceptual framework and formal language of the SESA (Semantically Enabled Service Architecture) we chose for COIN (the WSMO framework). In addition, the COIN GSP can be accessed directly by other collaboration forms, by single software applications or even by the human user within a single enterprise.
- **GSDP**: As already mentioned, the Global Service Delivery Platform has emerged as a key concept in the ongoing discussion of the FIA FISO working group. The COIN GSP could be interpreted as an example of a GSDP, targeting EI/EC services (service offer) and collaborative enterprises (service demand) (COIN focus). On the consideration of the above two issues all the SP3 WPs are oriented and focussing their respective research (semantic web services descriptions, pervasiveness-scalability, security, intelligence). However, it is obvious that the COIN GSP is and will be strongly influenced by the on-going debate and future research streams (ICT call 5, objective 1.2 bullet a) about the GSDP concept: **G**lobal and pervasive federation of heterogeneous platforms; **S**ervice and different granularity and abstraction levels; **D**elivery and integrated service delivery and engineering environments; **P**latform and co-existence of IT-mobile-content, domain specific-generic, professional-user oriented platforms. It remains to be seen the extent to which the ISU concept could be applied and elaborated in relation to these technology requirements. COIN will contribute towards reaching a conclusion.

The Interoperability Service Utility (ISU) in COIN: policy perspective

Improving the awareness and research & development of ISU in COIN

The policy aspects in COIN are addressed by the COIN Policy action Plan, whose main objective is to correlate the research work conducted within the COIN project with European Commission Policies' objectives and the overall re-shaped objectives of the Lisbon strategy, with a view of:

- providing suggestions and recommendations to Policy Makers for facilitating the adoption of the COIN service platform model at wide European level, and;
- removing at the same time possible barriers which can hinder the direct industrial and commercial adoption of COIN results and relevant Enterprise Interoperability and Collaboration elements.

The first actions of the COIN Policy Action Plan were devoted to establish the context and the background relevant to the COIN Project, thus identifying the main Policies and relevant areas which can be relevant with respect to COIN project results and implementation, together with the initial identification of the stakeholders and policy makers that will be relevant to the adoption of the project results.

As far as the ISU is concerned, COIN is aimed at promoting the following policy-related activities.

Improving the awareness and research & development of ISU in COIN

- ISU awareness and RTD among the COIN IT providers.
  - The Baseline EI/EC services have been collected and developed quite independently of the ISU (i.e. 2020 vision, GSP and SaaS-U). This was done on purpose, for establishing continuity with the past research activities, which predated the ISU. The challenge here is to re-interpret the baselines in the ISU light. This will be done in WP3.5.
  - The Innovative EI/EC services first specifications (M12) have been developed with the clear message of service distribution among on-premises applications (collaborative networks), IT specialized parks (clouds) and open IOS (galaxy) under current SaaS business models (switch-like). As soon as the SaaS-U will be more clearly defined and exemplified, also the Utility (tap-like) concept and relevant utility infrastructure could become central in the advanced innovative EI/EC services specifications.
  - The Baseline GSP contributions have been selected and integrated with a clear message of usage by enterprises and enterprise networks in particular. Again the adopted model is typically the on-demand switch.
  - The Innovative GSP services will be able to implement the tap-like model with a seamless mixing of heterogeneous services beyond the current composition-by-sequence model. This aspect is perhaps not fully understood by the SP3 constituency.

Based on the previously mentioned actions envisaged to align the COIN current development work to the ISU main objectives and vision, the COIN Policy action plan will be updated in order to:

- Capture additional research needs to facilitate the exploitation of the ISU paradigm, built on the existing COIN concepts;
- Identify some actions which may be needed at policy level in order to facilitate the wide dissemination and adoption of the ISU business concepts.

Message: we have identified some actions which are intended to improve the awareness of the ISU concepts in the IT and end-users COIN constituency, and to re-direct aspects of the research work in line with these concepts. The COIN technical coordinator is committed to implementing such actions in next technical (e.g. WP3.5 Kick off) and end-users (e.g. WP6.4 Cross Teams) meetings and follow-up actions, with the support of the WP6.2 leader (IC Focus), the SP Leaders, and the main partners of COIN who have high resource allocation (after TXT, in the order of ATOS, ISOIN, UIBK, SOLUTA, VTT and JSI).

The Interoperability Service Utility (ISU) in COIN: users perspective

The vast majority of registered businesses within the EU are Small Medium Enterprises (SMEs). This combined with the rapid growth in emerging country R&D centres has led to a fragmented generation and use of innovative products and services over a wide cultural and geographic base.

The introduction of the COIN ISU presents opportunities to address, particularly with reference to SMEs:

- Greater visibility and access to innovative services, which allows SMEs to address the financing of end user mass customisation and the creation of complex services with shortened Service Life Cycles.
- Move away from traditional licensing models with associated Maintenance and Support costs.
- Accessibility to wider range of critical assets such as Services, Products, Knowledge and Experts with reduced interoperability constraints.
- Creation of services linked more closely to the business end user, rather than a compromise 'plug and play' product/service.
- Potential development of SME driven intermediate markets where businesses can operate between the COIN GSP and end user collaboration space, addressing the growing concern of:
    - Emerging Markets undercutting current EU pure 'in house' product and service development
    - Short Product/Service life cycles reducing future ROI on pure 'in-house' developed products and services

Improving the awareness and research & development of ISU in COIN

- ISU awareness and RTD among the COIN end-users
    - The first requirements elicitation and collection process was based on serious games in order to stimulate the creativity and innovation potential of our end-users regarding EI/EC services (WP6.1). During the process, we observed that EC concepts, being closer to the business view, have been better understood by our end-users including the breakthrough innovation potential of these concepts; while EI concepts, being closer to the IT view, encountered less success and internalisation. This also justifies our choice not to involve the end-users in the requirements specification of the GSP, which on the one side it is clearly an IT infrastructure with no applicative value, and on the other side it will be totally hidden to the users, who will interact with it through the respective Collaboration Platforms (or applications or portal of value added services). However, now that the first COIN integrated prototype will be implemented and made ready for demonstration (and the GSP is a fundamental part of it), it is absolutely necessary to explain to our end-users that the business scenarios they will be running are dependent upon the availability of our ISU infrastructure.
    - The COIN 2020 vision and SaaS-U business models and value proposition (as soon as they are available) need to be carefully explained and exemplified (plug-switch-tap) because such paradigms will drive our experimentations and pilot applications.
- ISU awareness and actions in impact creation
    - Dissemination: The ISU and SaaS-U concepts are currently being disseminated in the research and scientific community (e.g. the FI Assembly) through

presentations, interventions and papers (e.g. “From SaaS to SaaS-U” paper to FIA Prague. Action#6: Intensify the ISU dissemination efforts towards the IT European industry (e.g. via NESSI ETP) and the policy makers (e.g. via ICT Policy Support Program addressed by our annual Policy Action Plan)

- Training: As soon as our ISU implementation becomes more consistent, it is our intention to prepare and diffuse the relevant multimedia training material.
- Exploitation: as soon as SaaS-U business models and value proposition are ready, joint and individual partners’ exploitation plans will need to be revisited and possibly revised in light of the findings.

Message: we have identified some actions which are intended to improve the awareness of the ISU concepts in the end-users COIN constituency, and to re-direct aspects of the research work in line with these concepts. The COIN technical coordinator is committed to implementing such actions in next technical (e.g. WP3.5 Kick off) and end-users (e.g. WP6.4 Cross Teams) meetings and follow-up actions, with the support of the WP6.2 leader (IC Focus), the SP Leaders, and the main partners of COIN who have high resource allocation (after TXT, in the order of ATOS, ISOIN, UIBK, SOLUTA, VTT and JSI).

9.4 Project webpage

http://www.coin-ip.eu/

10 LEKTOR Project -– Legal knowledge transfer accelerator for SME cluster and digital business ecosystems

10.1 Project summary

LEKTOR was a SSA of the IST programme of FP6. As such, it was part of the DBE cluster. The LEKTOR idea stemmed from the need of SMEs, in particular those that have no legal department or in-house lawyer, to know about Does and Don'ts when doing business on the Internet or when using ICT for business purpose. New opportunities through technology engender new responsibilities. SMEs do not need to become lawyers but they (and eventually, all that are active in an on-line environment) must enhance their legal knowledge so that the balance between advantages and potential infringements can be kept.

The result of the project is www.lexelerator.eu, a functioning Web 2.0 platform that provides easy information on key legal issues, and provides knowledge exchange tools for all active in e-business.

10.2 Contributions in relation to Vision of the FInES 2025 (Section 3)

Conclusion from this project that might be of interest for FInES:

With regard to SMEs:

- Any technology must be easy to use or best, users should be already familiar with it (e.g. Wiki tools known from Wikipedia et al.)
- Any content must be easy to find and aggregated to the needs of SMEs (or whoever the end user is)
- Any technology must be easy to maintain if actively used by SMEs
- Any service must be "marketed" with a long-term perspective as uptake is progressive

With regard to content:

- Content must be relevant to the business in question (ideally contribute to the "bottom line")
- Content must be "translated" into layman's language when dealing with specific topics such as legal issues
- Topics considered "difficult" such as legal issues are best accessed in the native language of the user

General conclusions on the use of ICT by SMEs and the Future Internet:

- The Future Internet will be dominated in the long-term by "digital natives". That will help the up-take of tools of whatever technical kind. It is important, though, to bridge the transition phase, until let's say 2020 when most business persons will still be "digital immigrants". For this purpose, easy-to-use, self-explanatory tools, or tools similar to those known in other contexts (e.g. social networking) will be successful for EI and E collaboration.
- The content available and created daily on the Internet could help enterprises considerably in accessing and exchanging knowledge, thus increasing their collaboration and eventually, their competitiveness. Despite of the constant development of Web techniques, content aggregation (e.g. business intelligence) and its targeted customisation is still the main challenge.

- The regulatory environment. We are faced with two opposite phenomena: The search for new solutions, e.g. new business models, customised services etc. vs. the clinging to traditional (and high-valued) rights such as ©, data protection and privacy. The balance between these two will be critical for the success of the Future Internet. Example: The recent infringement procedure of the European Commission against the UK for behavioural adverts.
- The regulatory environment is part of the business or socio-economic environment and must support it. Thus, it is a major challenge to involve legislators outside their narrow scope of the law to understand the opportunities and mechanisms of the "new knowledge society" and take these into consideration when revising existing or drafting new regulations.

10.3 Project webpage

http://www.lexelerator.eu

Comments to Version 1.0 and Contributions to Version 2.0

11 COMMIUS Project - Community-based Interoperability Utility for SMEs

For Version 2.0 of the position paper following comments and contributions have been made for the various chapters:

Chapter 2 - Context Analysis

Economy context

- Perhaps we should also mention the problem of unemployment and the role which ICT and FI may have to support creation of labour intensive business opportunity, directly though the development of ICT products and services, and indirectly to support new value creation and new business...

Chapter 3 - Vision: Future Internet based Enterprise Systems 2025

Taking account of environmental and energy issues

- ICT and FI in particular may play an extremely important role in this field. They, as mentioned, may support more efficient and environmental respectful production processes, but FI may also support new products and product distribution paradigms based on information dissemination to raise awareness and encourage environmental respectful behaviours, based on the creation of new digital and virtual objects which have far less impact on the environment. Examples are:
    - printed newspaper vs. digital newspaper (today situation),
    - face to face meeting vs. video conference and on line collaboration (today situation, even if not yet as common as it could be),
    - real travel vs. virtual tourism (future scenario),
    - Internet services to support the small local production vs. large long-distance transported goods (somehow already existing scenario).

Promoting user-centred products, services and tools

- To be underlined that this approach, based on a vision where several subjects (including the end-users) collaborate in the creation of a product, facilitates the "group of SMEs" more than the large enterprise which typically follows a more traditional and rigid approach.

Chapter 4 - The FInES Cluster: Proposals

Vision Statement of the Cluster

FInES will be more and more easy-to-use, inexpensive, interoperable, and secure: a set of cheap and necessary commodities for all the enterprises (such as in the past were "paper and pen", though a certain amount of IT elementary education will be required for the SMEs), which are addressing real user needs.

Enterprises which adopt FInES tools will experiment evident product and productivity improvements and new commercialization opportunities. Key concepts to address in order to achieve these goals are: *user-centred SW, complexity hiding, and flexibility*.

Tools with gradual complexity increase will be deployed over the basic interoperability tools, with seamless evolution from simple and inexpensive to more and more complex, sophisticated and expensive tools. These tools will allow increasing the value of enterprises'

assets, managing and reusing the large amount of knowledge generated, delivering tangible return on investments. Key concepts are seamless *evolution* of the *software* and *adaptation* to the user needs.

The customisation process will be largely automated, and users will not perceive the problem of customising the tools according to their specific needs, of interfacing different standards and accessing different services and data sources. Key concepts are *auto-adaptation through learning capability and networked search and retrieval*. Semantics and knowledge management will of course remain the enabling technologies.

IT will complete the migration from the old, single user, localised software concept, to community-oriented, shared, distributed services. From the old concept of physical SW program located in your PC to a virtual service available on the net, from the static one-dimension object (the doc file) to the dynamic multidimensional object (multimedia shared objects evolving in the net). In this context FInES tools will support the evolution of the traditional single enterprise organisation into a networked organization of interacting enterprises, which, supported by a "digital eco-system", will act as a business community, and will address the new business perspectives opened by the future IT scenario. FInES tools will leverage the points of strength of the cluster of medium and small enterprises vs. the large enterprise.

Key concepts are *collaboration, social software and community*.

The ICT tools will support and contribute to the creation of virtuous business models, which take into account environmental and social aspects. The goals are:

- The improvement of the quality of products and services and of the efficiency of the production flow involving the end-users and all the stakeholders in the production process;
- take into the right consideration parameters such as environment protection, labour creation and social inclusion.

Key concepts are *user-centred products, green economy and inclusion.*

Scope of the Cluster

Of course the major scope of the cluster should be to support the achievement of the vision statement, which is mainly technological, but, in the light of the current crisis and with the overall objective to encourage the evolution towards a new knowledge-based economy, involvement of all the stakeholders (institutions, academy, industry, and policy makers) need to bee sought.

Priorities for the Cluster

Define the roadmap to address the main challenges identified:

- Managing diversity and flexibility in enterprise networking,
- supporting user-centred production and products,
- addressing SME needs,
- addressing the underlying scientific challenges,
- supporting inclusion and social aspects.

Chapter 5 - Recommendations

Evolve the interoperability concept: from taxonomy and standardization to diversity and evolution, from interoperability of data and process to interoperability of knowledge. The main objective to be addressed should be to generate new knowledge through cooperation (more than sharing knowledge among enterprises).

Knowledge-oriented collaboration remains one fundamental factor The main challenge to address is leveraging the diversity (and richness) of the knowledge (EU countries have many diverse scientific and cultural approaches and a huge number of small enterprises with many different business models and traditions), creating new knowledge and value innovation in the business.

Create new social software platforms for enterprises. Two main perspectives should be addressed:

- Communities of users who communicate and interact with the enterprises for the design of new successful products, addressing real user needs. The users will become part of the production flow, interoperability is not restricted among the enterprises but include users' groups, and, beyond interoperability, collaboration and co-creation is enabled. Market analysis and customers insight will not be separate initial moments in the product creation but they will be part of a collaborative process: the users will contribute to the creation of their own products.
- Communities of enterprises which collaborate in a highly dynamic environment, sharing trust, experience and knowledge, generating new knowledge and assets and enabling new business models.

Promote virtuous business models

The enterprises need to be conscious of the impact of the business, beyond economic aspects, on society and environment. FInES need to support efficiency in the production cycle and provide decision support systems to take into account all these aspects. Moreover FInES need to support and encourage the creation of totally digital products, removing where possible the need for physical support, and provide internet services able to favourite communities of local producers and consumers, avoiding long distance products (manly produced and distributed by large companies). FInES shall also provide the enterprises tools to raise awareness and to facilitate participation of the user communities in the creation and acceptation on new sustainable products and to encourage behaviours more respectful of the environment.

Address SMEs

ICT in support of SMEs' business is still an open issue. The main barriers still to be addressed seems to be:

- Restricted financial resources: FInES tools need to have very low costs of installation and maintenance.
- No expertise in ICT: Interoperability tools need to be easy to use, easy to install and configure.
- Market of SMEs is highly segmented, and SMEs typology is very diverse: FInES tools need not to impose predefined standards and models, they need to be flexible and adaptable.
- Lack of elementary ICT education: ICT educational programmes and initiatives need to be further promoted.

12 ImportNET-Project - Intelligent modular open source platform for intercultural and cross-domain SME Networks

Chapter 5 - Recommendations

Research Recommendations

The development and manufacturing of complex products in a global environment implies collaboration across cultures and scientific/engineering domains. Cultures might be not only national or country-based, but can vary between different enterprises. Thus "enterprise

culture" should be viewed as an additional cultural dimension next to national culture. The insufficient consideration of cultural and psychological aspects leads certainly too unnecessary increase of development and manufacturing time and cost.

Therefore research should include next to IT-centred research also interdisciplinary projects bridging the gap between IT providers, engineers, psychologists etc. The area of truly interdisciplinary development and manufacturing has great research potential which still has to be exploited.

Further, when considering complex products, research should not be limited only to the development and manufacturing phases, but should cover the entire product lifecycle starting with the product idea down to maintenance and recycling.

Another vital point is better integration of customer requirements and feedback in the product lifecycle. Future IT systems should be able to capture not only the factual input from the customer, but also be able to evaluate the emotion which the customer associates with the product. These systems should automatically dispatch and structure the customer input to the right person at the right time and in the right form. E.g. customer feedback about product failures from the usage phase should be automatically dispatched to the correct tester, manufacturer, developer or product planner. Research challenges here are as well the representation of (engineering or technical) data to the customer in a convenient, easily understandable way, as also the correct dispatching of the data to the right developer or manufacturer in the right form, which varies depending on the cultural and professional background of the people involved.

Knowledge is produced and used only by people. IT systems provide should advanced means not only to manage the knowledge, e.g. by storage and retrieval functions, but also should facilitate the capturing of knowledge and its useful representation to people. New interaction concepts should be developed to support an intuitive; people centred approach to interaction with semantically rich product lifecycle data.

13 K-NET Project - Services for context sensitive enhancing of knowledge in networked enterprises

The contribution to 'Chapter 4- The FInES Cluster' is as follow:

The FInEs cluster has the ultimate goal of helping the European enterprises and businesses not only in surviving but growing in a sustainable way. The objective is to enable enterprises to have full and easy access to the latest internet-related technologies, which will allow them to create sustainable value. Companies will be able to use the future internet to fully implement knowledge-based businesses, contributing to the next generation knowledge society and implementing the necessary infrastructure to support free movement of knowledge. The technologies being developed in the scope of this cluster will always take into account environmental and energy issues, which will support enterprises in creating sustainable value.

The main scope of the cluster is to be a front window for the EU-funded research being developed in the technical domain of the future internet, under the motto that its results represent much more that the sum of the individual projects. FInES is an intermediary between the RTD projects (with their respective test cases) and a widespread European business audience. The cluster should have two main priorities:

- support the affiliated projects in disseminating their RTD achievements, and
- represent the affiliated projects in standardisation organisations.

In order to fulfil the first priority, the cluster should focus on describing the RTD work of the affiliated projects, highlighting results and interconnections. The cluster should be responsible of finding a way to "sell" all the affiliated projects in a harmonised way, without constraining

their individual scientific work towards a specific unique path. Additionally, the cluster could organise several dissemination events (e.g. large workshops, demonstration fairs), whenever projects' results are available for real demonstration, focusing on a business audience. Since it is very difficult for the projects to organise events with large audiences to demonstrate individual results, the cluster could represent an extreme added-value.

Regarding the second priority, the cluster could collect any standardisation-related work developed by the projects and present it in appropriate organisations.

14 OPAALS Project - Open Philosophies for Associative Autopoietic Digital Ecosystems

Main comments have been made concerning chapter 2 and chapter 3.

15 INTEROP-VLab

General comments

We understand the importance of this document, and also the difficult task of addressing such a vast cultural, technological and scientific area, such diverse issues, in a relatively succinct way, having in mind a large, heterogeneous readership.

The document is well organized and structured, the prose is clear and, to our opinion, and the important issues have been addressed. There are, however, margins to improve the document. To this end, we try to formulate some suggestions, briefly listed below.

- The report, that largely addresses the key issues, is probably too uncritical. The large majority of the addressed matter (from a seamless accessible infrastructure to sustainable business, from knowledge economy to virtual organizations) has been around us for long time, extensively elaborated in documents of various nature, in meetings, workshops, white papers, special issues of important scientific journals, etc. Despite this, they are still important and valid. But probably the report should try not to skip the difficulties encounters in the past, indicating that such themes are still problematic and, even more valuable effort, trying to indicate why today we have better chances than in the past to achieve effective results.
- Another point is that some key issues are addressed in generic terms, leaving much to the intuition of the reader (e.g., digital immigrant or native, ambient personalized environment, crowd-sourcing, WYSIWYG Enterprise). Naturally, it is not here the place where to elaborate on important technical and complex notions; however, it is advisable, for some terms and topics, to spend a few additional words, to better focus and to be more specific. One suggestion here is to add, may be at the end of the document, a glossary with some explanatory text.
- The placement of the addressed topics can be improved. And grouping contiguously similar topics it will be easier to achieve a more compact prose (see below in Specific comments for more details).
- As anticipated, we largely agree on the content but it is advisable to introduce some criticisms and caveats on the actual possibility of achievement (but we understand that, for political reasons, it is opportune to show a certain degree of optimism, or even positivism.) Some considerations on the main difficulties encountered in the past are advisable. Probably, they are positioned at a higher level with respect to the 5 content categories analyzed in Section 2. The main difficulties are not at a technological level [even investment in the implementation of new technologies and concepts are slow because the ROI is often not demonstrated by the IT vendors. Therefore the launching of sell of new products is often slow and can have 10 years delay. This leads to a important aspect of the economic level], since technology offers

largely more than what has been adopted, not so much at economic level, seen the amount of money spend for ICT. Probably, the main problems come at socio-cultural level. The resistance to innovation is as old as humanity. But this problem that today can be addressed with different and more effective means is largely underestimated, and very often overlooked in documents and reports. Here the FInES report could provide a useful contribution.

- Following the previous point, in the document there is the need, in Section 2, to add a subsection on problems of a socio-cultural nature and how innovative ICT solutions can cope with them (expanding the reference to the innovation culture present in Section 3, and moving it to Section 2). Generally, the resistance to changes is originated in the dominant groups (from within an enterprise until the political class and the Society at large) trying to preserve privileges to the detriment of the majority, and the common interests. For instance, the Web 2.0 technology (and the socio-cultural "crow-sourcing" paradigm), if correctly enhanced and applied, could represent a means to contrast what just reported.
- One of the critical points for the majority of ICT project is the actual impact on the real world and on the production systems. A more concrete attention to the impact that new solutions will have on the real economy is highly advisable. To this end, besides the KPI, that may reveal how good a technical solution is, it is advisable to propose the KII (Key Impact Indicators) to measure how good a solution could be for the adopters.
- When referring to user-driven or business-oriented innovation, it is advisable to elaborate better to avoid misunderstandings. Innovation is a complex process that cannot be achieved simply shifting the attention towards the customer (or the stakeholders). Innovation emerges from a joint effort, that must include customers, users, stakeholders, etc. (that give "sense" to the innovation, and provide the "proof of the pudding") but the real thrust remain in the hands (and the heads) of S&T people.

More specific comments

The organization of the document is well structured, in particular the Section 2, organized in 5 subsections (Contexts). However there is problem of placement of the reported topics. For instance, the knowledge issues mentioned under Policy could placed under Technology and/or Science, while the regulatory framework (for user-generated content) under Business could be moved under Policy. Again, the reference to a more democratic Europe, reported under Science, could be moved under Policy.

In the sight of drying up the prose, the multiple references to innovative business models (enterprises, virtual enterprises, networked enterprises, etc.) could be compacted and moved under Business.

- The technical content of the document could be improved, expanding the dedicated subsection. There are several references to the emerging new technologies, but in the documents they are simply mentioned and reported sparsely and unspecifically. For instance, organizing the addressed topics in more systematic way, from the design phase (e.g., the role of modelling) to the runtime (business) phase (e.g., new control theories and business intelligence methods), from the component elements (e.g., IPv&, sensors networks, SaaS) to more aggregate systems (the future ERPs, CRM, PLM). Furthermore, a special attention should be devoted to the interplay of the business and ICT cultures, and what technological solutions will support their future collaboration in the future.
- It is useful mentioning the renewed interest in simulation and measurement methods, so important to keep enterprises under control and drive change programs.

Furthermore, new emerging disciplines, form Econophysics to Social Network Analysis and (why not?) EI Science Base could be mentioned.

- Finally, to support the "shrinking" of the document, it might be possible to compact the Economy and Business contexts in one single subsection of Section 2.

Further chapter specific comments and contributions have been made.

Chapter 2 – Context Analysis

Policy context

- This is not new, but anyway still important. To learn from the crises the manufacturing is a stable basis for the economy. Investments in a simplified configuration of manufacturing processes together with their supply chains and extended to the whole product life cycle will be an investment in the competiveness of Europe on the globalised markets. Availability of information and knowledge concerning the products have to be available on demand to increase productivity and quality of the production as well as improve maintenance services. Therefore the future internet should provide information acquisition and reporting services pluggable into existing IT architectures.

Business context

- In front of unforeseen events (as a global crisis) enterprises respond by bolstering their agility and flexibility and collaborating to become resilient networks.

Text contribution:

Trust, safety and security are key values in the business world, meaning that without them it would be really hard to promote new and more complex businesses models taking advantage of future internet enterprise systems. Safety as guarantee of service/product availability, security as protection against intruders and trust in the overall resulting system are necessary for promoting these new businesses paradigms. Therefore, the future internet enterprise systems should provide accurate levels of trust, safety and security to all business participants in order to allow contracts and market transactions to take place.

Technology context

- Technologies are required to shorten the distance between the customer needs and the provided services and IT solutions. A step in this direction is the design of customer adopted IT architectures including compatible services from different vendors. Allowing to select the required functionally on demand from an wide range of offered services.

Text contribution:

The development of context aware and autonomic applications will provide enterprises and specially SMEs facilities for adapting dynamically to changes in the context and environment in order to offer the best suitable service and product at each instant. These capabilities will provide them an important competitive advantage in the global market.

Additional context have been defined:

Social context

Another important thing to consider is the social context that will have to face enterprises, including SMEs, in the future as the market where they have to provide their products and services. So, the most relevant considerations about social context are: the increase of multiculturalism and the progressive ageing of the European society. Thus, solutions that do not consider these aspects can have high probabilities of not reaching their expected goals.

Immigration and the income of new countries to the EU project are increasing the already existing multiculturalism inside the EU. Moreover, this multiculturalism is a key aspect at the each time more and more globalised market. Thus, the IoF and how the enterprises make use of it should provide support for multiple languages and consider cultural differences, giving to all users a comfortable experience when accessing it in order to be competitive.

The continuous process of ageing of EU population is a challenge that should be also considered when developing the underlying technologies in the IoF. Therefore, problems of accessibility for aged people should be overcome in order to ensure that a growing group of the European society is not excluded, decreasing the enterprise market and overall letting them outside the market. Moreover, the Ambient Assisted Living (AAL) and related services should be developed in order to ensure the viability of our health and care public systems in the future.

Then the future internet enterprise systems should consider these social context aspects and others like ensure the access for disabled people, in rural and/or undeveloped areas, the lower class, unemployed for ensuring its success without consolidating existing exclusions and/or promoting new ones. Another important social aspect that should be incorporated is the awareness of the internet of ethic factors and privacy.

Europe is an ageing society, where the number of elder people is rapidly increasing. At the same time, immigration has been and will continue to be high. This creates an environment where social inclusion of people with varying background becomes ever more important. IT in general and the Future Internet for Enterprise Systems in particular, can play a key role for supporting this inclusion. For example, novel forms of work organisation supported by mobile and Web 2.0 technologies can enable elder people to stay longer in working life. Another issue is the increased demand for personalization required by younger generations, which will require flexible and customizable IT solutions (this issue is discussed in the section "Technology context" but primarily from a technological point of view).

Chapter 3.1 Impact on the research domain of FInES

Supporting Future Internet and FInES via standardisation

- The positive impact of open standards on new economic opportunities in eBusiness is recognised everywhere. New evolving standards provide support to guide the development of innovative services and service oriented architectures.
- Indeed, it has not been observed that standards have caused a barrier to R&D efforts. Moreover with a guard band of common concepts defined for instance via advanced reference frameworks, open standards can support R&D organisations with new structural concepts, semantic categories and advanced metrics.
- Standardisation can be valuable when it specifies a future oriented reference open standards based framework and the implementation methodology that is not restricting the delivered content of applications and services.
- Such open standards will improve the collaboration capability and interoperability of internet based enterprise networks and, hence, reduce the planning risk and offer operational cost reduction for the business user

Chapter 4 - The FInES Cluster: Proposals

Vision Statement of the Cluster

- Establishment of a coherent but dynamic EI Science Base to allow derivation of predictably effective solutions for enterprise interoperation and collaboration;
- Continued leadership of ICT technology – can we refer to the early discussion of provision of interoperability through what we now call services? We should remember that EI did not just take the role of a potential user of service technologies

when they were proposed elsewhere – EI was one of the early research domains to propose the potential value of service delivery, and so has some claim to credit for the innovation of SOA (along with others of course, but EI's claim is as valid as anyone else's).

Scope of the Cluster

- Risk analysis (for collaboration)
- Collaboration knowledge application technologies – developing from current (Call 1 for example) research(initial research was contracted in Call 1 (3 years ago) in the knowledge that it was a new area and would lead to applicable technology in the 5-10 year time frame), including for example ad hoc event driven collaborative processes; distributed knowledge bases, etc..
- Business service innovation is about analysing, designing, decomposing, and synthesizing business services. Novel opportunities for business service innovation exist thanks to the emergence of SaaS solutions that offer convenience and scalability as well as independence in time and space. One major issue deals with process models for business service innovation, i.e. methods and guidelines for the service innovation process. Another major issue is about the value network perspective, i.e. how to align business service innovation with business models including several actors participating in co-creation of value.
- Understanding the Interactions between IT and Physical Business Processes. In many enterprises, such as railway companies, appliance manufacturing firms, power transmissions companies and pharmaceutical businesses, value creation includes processing of the physical world. Significant effort has been spent on understanding the relations between IT and the social business processes in the enterprise. However, with the emergence of the Internet of Things, also the physical business processes will require IT alignment. There is frequently a good understanding of the physical process per se, supported by oftentimes established models of the physical entities, physical forces and their relations. But in order to allow the alignment between business and IT, it is necessary to also understand the interactions between the virtual and the physical worlds.
- Social Software for Business Process Management. Many social software systems are primarily designed for providing a forum of interaction between users without any goal-oriented intentions, with examples as Facebook and Twitter. However, other social software systems aim at the production of specific artefacts, thereby inviting users to participate in goal-oriented activities. Such systems enable social production, where production is realised not through market mechanisms or hierarchies but through voluntary contribution between actors in networks, with typical examples as Wikipedia and SourceForge. Social software systems (SoS) for supporting social production face many of the problems addressed by business process management systems (BPMS), as both need to coordinate and manage goal-oriented work activities carried out by several actors. However, SoS and BPMS provide widely different mechanisms for achieving this coordination and management of work. One research direction is to investigate how organisational processes can be supported using BPMS complemented with design principles and mechanisms from SoS.
- New Value Analysis of the Future Internet. As is highlighted in the Value Proposition for Enterprise Interoperability, there is a need for a suitable analytical framework that can help managers, financiers and other stakeholders to accurately identify and predict the (potential) value associated with investments in the Future Internet. Indeed, the current techniques for value analysis provide little support for investments in value innovation through the Future Internet. They are still very much based on traditional assumptions of creating value, i.e. through scale benefits and efficiency

gains and via investments with predictable results. Such techniques are biased towards competition in established markets and do not encourage exploration of new business opportunities. A new generation of analytical techniques – a New Value Analysis – is needed to adequately support that type of investment in the Future Internet. In particular, because the key to value is increasingly about innovation, what is needed is the move from a deterministic to a probabilistic approach to investment in the Future Internet.

- Enterprise Modelling based on the Internet of Things. With the proliferation of cheap sensors heralded by the Internet of Things, it will become possible to gain a better understanding of the workings of the business than ever before. Instead of relying on month-old management reports for the making of business decisions, much information could be available in real time. The gathering and consolidation of such information in dynamic enterprise models supporting business management would allow significantly improved decision making.

Priorities for the Cluster

- Maintain ownership and enthusiasm for support of enterprise systems in the future internet, building on the achievements to date and consolidating where research gaps remain.
- Ensuring that EI technologies remain in scope. Enterprise systems are not just about management-speak.

Chapter 5 - Recommendations

Research recommendations

- Consolidate a science base for EI – this is the springboard for EI in the Future Internet even beyond the internet of things as we reach for the internet of processes.

16 Raphael Giesecke, Helsinki University of Technology

Regarding the crisis and a possible impact of FInES Raphael Giesecke is unhappy with the 'problem statement'. Is it that FInES can (and should) contribute to the analysis of the crisis (e.g. what is the crisis about) or rather make suggestions on the following:

1. Crisis causes (and how to prevent a next crisis?)
2. Crisis prevention in general (e.g. how to prevent a crisis different to this one?)
3. Crisis fighting (now that it materialized - what to do in the short, medium and long term?)

All of these from a FInES point of view, obviously.

The following suggestion has been made for the position paper:

The role of knowledge interoperability in supporting the future economy

Launching the discussion, Rui Neves-Silva asked for advice on how the [FInES] community can contribute to facing the crisis. In his opinion, today's major problems climate change, resource depletion, financial chaos and social systems breakdown may well be linked to each other – e.g. of the world's 100 largest finances, 51 are business cooperation's, but only 49 are national economies. So the target should be to move from shareholder to stakeholder value, and apply knowledge management as a key enabler for value creation.

Following a short overview of selected other contributions:

Market and business are increasingly regarded as a social phenomenon, with new users being connected, informed and active, leading to new products, through a network of enterprises, linking individuals and the public. The related new business models, allowing products

focused on real user needs, with faster development cycles, need to be assisted by new ICT, which are internet based and developed with active participation of the users' community.

An objective would be one single semantic knowledge space, initialized by gathering human knowledge in Wikipedia, advancing from computer knowledge to workflow representation, assisted by computational semantics.

In terms of software, there is a need for agile software products, involving new software development techniques by new developers. Also, flexible interfaces between stakeholders are needed, as well as the need to embrace uncertainty.

Regarding ecosystems [in a very broad meaning], there is a need to improve the tangible and intangible resource use within ecosystems. Knowledge interoperability is regarded as driver for value creation within the ecosystem. The systems must also encapsulate the social dimension. Finally, there is a strong need to develop leaner ecosystems and thus reduce the trial-and-error consumption [of all kinds of (natural) resources].

Knowledge interoperability as such is to support the conversion of complexity into "understandability", while maximising both transfer and recoverability.

17 Ricardo Goncalves, UNINOVA

Chapter 2 - Context Analysis

Scientific context

1. Motivations for EI as a science

Enterprise Interoperability (EI), as a key player for FInES, is a well established applied research area, studying the problems related with the lack of interoperability in the organizations, and proposing novel methods and frameworks to contribute with innovative solutions for EI problems. However, in spite of the research developed so far, nowadays it was not established yet the scientific foundations for EI. This is a deficit recognized by the EI research community, disabling the generalization and complete reuse of the methods and tools that have been developed. Among the scientific domains recognized by the international community the following subjects were identified by the authors to be within those that might contribute for the EI scientific foundations: system complexity, network science, information and web science.

As information systems in enterprises and organizations evolve and become more complex, the need for interoperable operation, automated data interchange and coordinated behaviour of large scale infrastructures becomes highly critical. Lack of interoperability would disturb creation of markets and will diminish innovation and competitiveness. Apart from being a technical issue, interoperability challenges also appear in the enterprises at organizational and semantic level, underlying the need for patterns and solutions that support the seamless cooperation among ICT systems, information and knowledge, organizational structures and people.

Enterprise Interoperability (EI) is recognized as a high-impact productivity factor both within the private and the public sector, affecting the overall quality, yield time and cost of transactions, design and manufacturing operations or digital public services. Up to now, the principal tools for targeting the above challenges appear as the various standards that try to govern information systems development and operation. Such standards are usually linked with specific market sectors, application areas or technology trends, thus having a limited time span, a static nature and quite often different interpretations by technology vendors and users.

However, in spite of the research developed so far, nowadays it was not established yet the scientific foundations for EI. This is a deficit recognized by the EI research community,

disabling the generalization and complete reuse of the methods and tools that have been developed.

2. FInES challenges

The substantial changes described above also increase the importance of scientific research to support our critical assessment and control of them, and to explain (?) how we make sense of them from an economic, political, business and technological perspective that remains balanced and enhances the quality of life.

Crucial questions must be asked to ourselves, and answers will depend largely on research:

How do we keep the economic engine alive? The engine of economy is growth, but to re-engineer the engine so that growth becomes sustainable and clean, needs innovation in terms of developing technologies that sustain this type of growth.

How for instance will change what it means to be "an organization", "a team" and "a product" and "an employee"? We need to reassess our ideas about "collaboration" and "decision making" and develop more sophisticated views on how one builds trust and commitment in an increasingly virtual world. We also need to develop approaches to assess benefits and profits that do not only take the perspective of the single enterprise, but also look at the consequences for the network as a whole. This needs to occur with appreciation for different industries, different types of companies, and different types of employees. Will all citizens and workers win from the Future Internet, or will some also loose? How will ICT and the FI improve our ability to address global challenges related to for instance the energy crisis, global warming and the stark divide between rich and poor? Is it likely to make life in Europe more democratic or will it make Big Brother scenarios more likely? Such questions merit scientific research beyond what it offered by the engineering fields alone. Some projects already take such a more integrative perspective on developments of the Future Internet, including most explicitly the OPAALS project.

18 Anton Lavrin and Miroslav Zelko, Technická Univerzita v Košiciach

Forming a new cluster should make provision for continuity with strategies declared in original clusters in "Networked Enterprises" area. Inspirational was particularly the strategy documented presented as "Enterprise Interoperability Research Roadmap". Implied concept of new cluster offers ongoing research in thematic area "Generic Modelling Research Challenges" with aim for example to simulation of distributed processes and virtual organisations creation with relation to the current development of GRID technologies. From this point of view a new platform can contribute to eScience conception about eDevelopment complementary concept and such a way to create a cross-platform for innovative enterprises development, which can enable for instance "delivering customized R & D" with accordance to needs of enterprises.

Technological platform and business context of EInES requires pointed and complex research in "trust and security" area. This area is sensitive mainly for development of Internet based Enterprises system for SMEs community.

For example "Trust analysis research within European SMEs" executed within SEAMLESS project solution demonstrated apart from:

- Important SMEs sensitivity to problems of "Trust" in the framework of B2B relation
- Successful cooperation networks were visible mainly within SMEs cooperation on regional level

Nowadays it shows that just regional networked (virtual) organisations are robust enough and so resistant against current economical crisis impacts. Stated knowledge indicates a "bottom-

up" strategy for IES development in SMEs environment or a virtual cooperation within SMEs activation.

In conclusion let us warn of that the FInES successful mission in European R&D environment needs a synergy with strategies presented in relevant European Technology Platforms. For example relation to SMART technologies, mobile technologies, intelligent embedded systems or intelligent manufacturing systems and so on.

19 Javier Vázquez Salceda, UPC

- As this is supposed to be a position paper, not an extended report, I will avoid giving extensive inputs on all the things that could be mentioned there, but focus on ideas that I feel are not reflected.
- As one of the aims is to have a paper of around 10 pages, one (obvious) thing to do is to be efficient with the space in the position paper, avoiding the repetition of ideas. Currently the document has some repeated content between sections 2 and 3 (e.g. on page 2, section 'Policy context', the first two paragraphs are both reappearing on pages 6-7.
- On page 1 it is mentioned that this document builds on the achievements and reports from the EI cluster. Would be good to extend this to the achievements and reports of the DE cluster, especially on the need of (safe) environments to foster SME usage of ICT in their business processes.
- In several parts of the document it is mentioned the important role that Regulatory Frameworks will have in this future internet. But I think it is not enough to sit down and wait for the regulatory frameworks to adapt to the needs of the Digital Enterprise environments:
  1) The only way to ensure that regulatory frameworks evolve in the right direction is to create some interdisciplinary (technical & legal) groups that regularly look at existing status of the FI technologies, potential opportunities undermined by the (current) regulatory framework, identification of dangerous trends, and proposed modifications tot he frameworks
  2) Regulatory Frameworks will not be able to operate in the digital arena if technological mechanisms are not put in place in the FI to support, at least, auditing, arbitration, fair trade and so on. In fact these mechanisms may be even required to make users and SME's feel confident on to usage of the electronic environment, as they will perceive that some of the rights they have in the real world are also monitored and enforced in the Digital world.

20 TAHI – Interoperable Applications for the Smart Home

Scope of the FInES Cluster:

While the general scope of this cluster is for interoperability between enterprises, because of the closely aligned work on the Future Internet, the Internet of Things and the Internet of Services, the cluster has a remit to be fully inclusive of services to things in business, commercial and residential premises and in the network communications that support their connectivity.

The Cluster therefore should include measures to ensure that we will be able to provide interoperable services into business and residential premises and to be able to use existing resources.

To do this the cluster should commission/recommend work to examine the requirements for such service delivery in the form of Interoperability Frameworks and for the building blocks that will allow easy development and configuration of new and innovative services using both existing resources and additional devices and equipment.

The cluster already is acknowledging the requirements of assisted living and energy efficiency. It must be acknowledged that there will be a multitude of new and innovative services that support both these sectors that must also support security and privacy and will need to draw on resources from multiple sectors (often without the necessity for new devices and infrastructure).

Research Recommendations

There should be research into

- the what the whole interoperability framework across the scope of the cluster needs to contain,
- the high level requirements for such interoperability and that for the tools to create, implement and manage services from enterprises to systems in premises and for applications within premises.
- there should be requirements for its implementation by a rational toolkit of methods, tools and modular software (Methods that can be made standard as European Norms (ENs)).

Priorities of the Cluster

There should be a high priority to identify common and necessary requirements for interoperability across the wider scope of the cluster. These will include identifying:

- the requirements for identification and unique identity (global or relative),
- the requirements for discovery of any interoperable object,
- the requirements for configuration of any object with access rights for configuration,
- the requirements for management of any object with access rights for configuration,
- the requirements for object access, safety and security,

Policy Recommendations

These recommendations and priorities need to be firmly established and should form the basis of firm European Standards for Enterprise and for services into the whole scope outlined above. This will help remove the danger of multiple projects producing multiple and varied solutions in this space. Therefore this work is urgent.

Note: that TAHI is already working on a High Level Interoperability Framework Requirements Specification for what objects, devices, equipment, systems and (possibly) service components must deliver in order to enable interoperability. This will be introduced as a CENELEC Workshop Agreement CLC CWA WS 4 IFRS on July 7th 2009.

21 LEKTOR Project -– Legal knowledge transfer accelerator for SME cluster and digital business ecosystems

Chapter 4 - The FInES Cluster: Proposals

The wealth of information in this paper can be distilled to three main challenges that the FInES cluster must address and try to solve:

- CHALLENGE 1: Urgent behavioural changes are needed Environment/energy-aware behaviour of enterprises is crucial for sustainability, not only in ecological terms but also in socio-economic terms. But behaviour is not easily changed, (business) culture and education play a role and must be addressed as well. Technological development can provide tools to support this cumbersome process and may make this change easier and more acceptable to all.

- CHALLENGE 2: Urgent awareness of a holistic approach involving cross-stakeholder cooperation and engagement
  The cooperation of actors that historically do not play together is a difficult task. Examples are: decision-makers and entrepreneurs; researchers and industry; lawyers and researchers and technicians and decision-makers and consumers; industry and consumers; etc. However, the interlinkage became evident in the crisis situations of the past decade and is furthered by the Social Web that creates cross-overs hitherto unseen. Any new research agenda must take this interlinkage into consideration to avoid an unbalanced development of Europe's and the world's economy. This goes far beyond this cluster but should become a key message for the vision towards 2025.
- CHALLENGE 3: Urgent understanding of needs of enterprises and shaping research accordingly
  This challenge is by no means new yet unsolved. A prerequisite is a common communication base that both sides are willing to invest in. New social networking tools adapted to the immediate needs of enterprises might help to find solutions easier than in the past.

Figure 9 shows the evolution of working culture that corresponds to the above mentioned challenges:

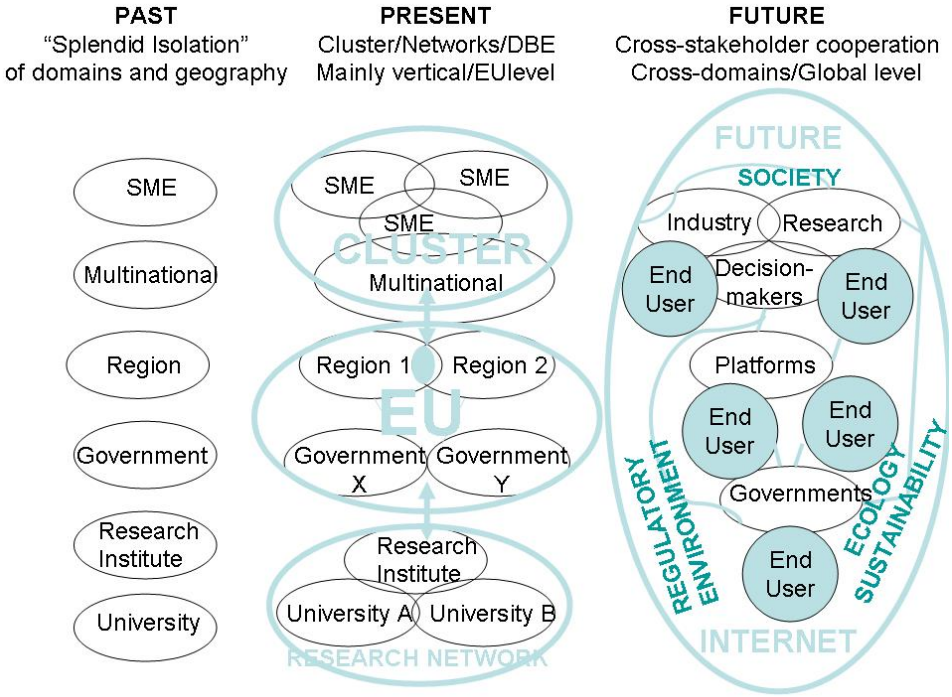


Figure 9 – Evolution of Ways of Working.

22 Dirk-Michael Harmsen, DMH Consulting

In my view, the statements within the paragraph "Taking account of environmental and energy issues" on page 13 of the FInES Cluster Position Paper underestimate the dangers arising from climate changes. Since the publication of the "Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report DRAFT COPY 16 NOVEMBER 2007" everybody must be aware that the emissions of greenhouse gases (inter alia CO2) must be reduced on a much faster scale than many governments and enterprises are willing to accept.

Please make stronger statements about the dangers of climate changes as pointed out in the "Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report", e.g.:

1. "Continued GHG (Greenhouse Gas) emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century" (see p. 6).
2. "Anthropogenic warming could lead to some impacts that are abrupt or irreversible, depending upon the rate and magnitude of the climate change (see p. 13).

These dangers of climate changes will certainly affect human civilization if insufficient measures are taken to reduce as fast as possible the emissions of greenhouse gases.

23 Stephen Pattenden, Telemetra

It seems to me that the scope of the group is predominately focused on Business to Business interoperability, whereas that vast majority of applications in future will also engage with people and devices in their homes. This is to a large extent what the IoT is all about and I think the boundary between B2B and B2C and the applications that might work in the home space is very indistinct. The extension into the much more fluid world of the Smarthouse by applications that will add value to businesses is only now being explored with Energy Efficiency and Smart Metering and with Assisted Living. These urgent applications are the driver for much else.

As you know, TAHI has been working in this area since we see the major barrier to what is could be a €500Billion or greater market per year for Europe (most of it new GDP) is the lack of interoperability in this space.

TAHI is working to prepare a high level framework specification of what systems must have in place and what must be considered when taking enterprise applications into the SmartHouse space especially since in the near future every home in Europe will potentially be a SmartHouse.

Comments to Version 2.0 and Contributions to Version 3.0 of the FInES Position Paper

24 COMMIUS Project - Community-based Interoperability Utility for SMEs

Improvements have been made concerning the wording in chapter 2 - Economic and Business Context.

25 OPAALS Project - Open Philosophies for Associative Autopoietic Digital Ecosystems

The following suggestions for the modifications of the Scientific Context section have been made. The point is to make the text a little more specific and concrete, i.e. 'actionable'. Of course feel free to edit or filter as you see fit. The suggested new text is:

According to one project contribution, the complex, multi-faceted and multi-scale structure of socio-economic actors, agents and institutions makes it very difficult to identify causal links that apply reliably to different regional, national or cultural contexts. This is the big problem of policy-making. It is suggested that there are, however, some 'meta-characteristics' which, when shared by different socio-economic systems in different contexts, lead to similar indicators of stability and productivity. These meta-characteristics relate to issues of governance, transparency, accountability, and democratic processes. The role of scientific research could therefore be to advance our understanding of this correlation, for example:

- By expanding the specialised languages we use in different domains of activity in order to build 'bridges of understanding' between the many different stakeholders. This point refers both to interdisciplinary understandings when researchers from different backgrounds attempt to work together towards a common goal, as well as to the different ways problems and challenges are posed by academics vs. people in business, engineering, and policy-making. Good intentions to work together are not necessarily sufficient, and it generally helps to acknowledge explicitly the differences in viewpoints, modes of expression and, of course, priorities. For example, although these are clearly oversimplifications, academic researchers in social science tend to overemphasise analysis and mapping over synthetic conclusions and actions. Academic researchers in technology tend to emphasise publications over implementation. On the other hand, business, industry and policy people tend to reach conclusions and actions too quickly. All contributions are needed, but a healthy balance must be reached between different understandings and priorities.
- By integrating social science research with technology, policy, and economic/business model development. This refers mainly to methodologies of qualitative and quantitative empirical data gathering. Whereas the latter is very familiar to economists and policy-makers, the former is more common in academic and sometimes market/product design research, but it is increasingly recognised as an equally effective way to gain valuable insights for policy development. In both methodologies, the aim is to build an in-depth understanding of the challenges and opportunities of a particular context for policy intervention, technology development, and new business/economic models, be that at the regional/geographical level or industrial/sectorial level. Qualitative research tends to involve in-depth interviews and participant observation, so that applying such methodologies necessarily involves dialogue and collaboration between different stakeholders, thereby kick-starting the very multi-stakeholder processes that appear to benefit successful innovation.

26 SPIKE Project - Secure Process-oriented Integrative Service Infrastructure for Networked Enterprises

Several comments and change recommendations to various chapters have been made.

27 INTEROP-VLab

Beside several comments to various chapters, Interop-VLab proposed the following:

Chapter 5.1 - Policy Recommendations

Add further Policy Recommendations

Standardization

In order to provide the background necessary for allowing the collaboration and cooperation of multiple systems in the Future Internet it is necessary to promote the adoption of standards at multiple levels. Then, the process of defining and adopting standards should be encouraged and promoted from public administrations, SME's associations in order to go an step further in establishing common languages that enable SME's and society in general to obtain the maximum benefits of the future Internet enterprise systems through closest collaboration.

Ensuring Quality in the "Future Internet based Enterprise Systems"

In the Internet of Services, promoting and assuring the quality of these services becomes a key point for its correct establishment and large adoption and acceptation by society. Then, it is necessary to set up the relationship among process, product and service. Therefore, it is necessary to have an appropriate way for defining the quality requirements of services, and ways of verifying and validating the quality in the Internet context. For sure, in this model the already existing quality certification authorities should play an important role.

Chapter 5.2 - Research Recommendations

Further evolution of the Interoperability concept

Add the following text:

It should also be addressed the study and analysis of enterprise interoperability as a whole and in its three domains (ontology, enterprise models and technologies). In fact, it should be developed one step further in order to facilitate the collaboration among existing systems – promoting collaborative business processes –, the build of systems of systems and finally the Internet of services. This interoperability study and analysis will include the definition and promotion of interoperability standards, business modelling and the software development based on model driven interoperability. Moreover, it is necessary to go on in the study of the interoperability applied to different sectors as: e-Governance, e-Procurement, e-Learning, e-Commerce.

It is also necessary to promote the use of ontologies as formalism for structuring and annotating the information that is published in Internet, facilitating the interoperability. Moreover, this will provide support for the development of semantic search engines, facilitating the process of searching information in Internet, providing therefore more efficient searches.

Future enterprises and ICT adoption

Add the following text:

In order to ensure this ICT adoption, specific effort should be put in Distributed Collaborative Environments providing facilities for SME to collaborate. So, models and methodologies for distributed development and/or collaboration should be provided in order to take advantage of all the possibilities that the Internet of the Future will provide to enterprises and users.

Moreover, in order to make Internet more democratic allowing SME's, especially micro enterprises, it will be also necessary to promote the study and implantation of resource virtualization and cloud computing. Their promotion will permit these SMEs, which usually can not invest enough money for having their own systems and manage them, to access resources provided by other entities on demand for their information systems.

Add further Research Recommendations

Enabling Safety, Security and Privacy in the "Future Internet based Enterprise Systems"

The policy recommendations about Trust, Safety, Security and Privacy should be done in parallel with research on those fields. Therefore high availability and fault tolerance of applications deployed and accessed through Internet should be continuously improved, supporting more dynamic environments due to wireless networks and mobile devices. Then, the study of replication and reconfiguration solutions for these scenarios should be encouraged and supported. This is a basic aspect in order to ensure that the internet of the future would be widely used; otherwise constant service interruptions will avoid its expansion.

Enterprise businesses need appropriate levels of security in order to take place, for this reason the future internet enterprise systems should provide mechanisms for ensuring security in an integral way. Then authentication, authorization, control, data protection, intellectual property rights protection and certification should be considered in an holistic way for guaranteeing to all internet users the necessary level of security for their transactions.

The future internet of enterprise systems should provide mechanisms for ensuring the privacy of user's personal data. These mechanisms have to let the user define who can access its personal information and which set of its personal information. Moreover, this also should provide facilities for managing this privacy when third entities participate in the process.

Promoting social integration through the Future Internet

It is necessary to promote the definition and use of standards for accessibility and usability, in order to avoid exclusions of handicapped persons and facilitating and improving the experience of the users (digital native or not) when using this Internet.

Moreover, multiculturalism should be supported through internationalization and defining a set of standardized icons for multicultural environments should ensure an appropriate context for providing world wide interfaces.

"Future Internet based Enterprise Systems" as a System of Systems

Reference architectures and methodologies for developing and managing systems of systems should be provided. The idea is to combine already existing systems in order to obtain new systems that provide more functionality and performance, in other words a higher added value, than simply the sum of their parts. So, having reference architectures and methodologies will facilitate their implantation in the future Internet of enterprise systems. This vision aligns with the need of research in the Interoperability and Collaborative environments.

Software as a Service

The promotion of the Software as a Service paradigm will allow the alignment of the software development with the Internet of Services vision.

Self Adapting Future Internet

Research on the autonomic and context awareness computing will provide self-managed applications that can adapt to environmental changes will improve the QoS provided to enterprises and end users, configuring themselves to fit best the new necessities. Besides, it will provide to the enterprises and users new services and business processes when combined

with other existing technologies (i.e. wireless sensor networks, geographical and positional information systems). It should be remarked that the development of geographical information systems and position systems will allow the development of services that are context location aware.

Sustainable Future Internet

Research on green computing emphasizing the computing resources efficiently should be promoted in order to maximize the protection of the environment and reducing the contributions to the global warming. This green computing includes several aspects as energy use, virtualization of resources, return of investment and regulatory compliance among others.

28 Raphael Giesecke, Helsinki University of Technology

Below the comments are listed:

1. Viewpoint

For this review I take the viewpoint of a typical SME without own R&D: How would they feel when reading the position paper ("the document" in following)? Thus the document should be rather short, crisp (down to the point, no repetitions, no academic terms without definition) and guiding – if not helpful. Also, clear statements about SMEs and their future (in FInES) are to be discovered easily.

Additionally, I checked the document in the context of knowledge management, including knowledge transfer, in the current and future ICT work societies.

2. Detailed Comments and Change Proposals

Please check the attached position paper as such for specific comments, corrections (some typos) and proposals for change in Word Track Changes modus. I also changed the language to UK English (it was US in some parts). The MS Word file properties need to be updated. They still refer to e.g. Value Proposition.

3. Document Evolution

The document looks like being complete in that sense that the (sub-) sections have been filled with tangible and (mostly, except section 5.2) complete content. The contributions show the maturity of the FInES community. The editors have done a tremendous job in adjusting the many individual inputs into a smooth reading experience. Congratulations!

4. Document Structure and Logic

The structure as proposed in the outline proofs to be meaningful and the sections' succession logic makes sense – with one exception: section 3.1 Impact on the Research Domain of FInES. Being integrated in the vision chapter, the reader builds up expectations indeed related to a future scenario – and is instantly disappointed with section 3.1's scope.

I would recommend either to make section 3.1 an own major section (3), or integrate it into section 2, while as well rising the sub issues in section 2 to sub sections, like this:

2 Context Analysis

2.1 Economic and Business Context

2.2 Policy Context

2.3 Social and Societal Context

2.4 Technology Context

2.5 Scientific Context

2.6 Change of context impact on the Research Domain of FInES [former section 3.1]

This would as well make the table of content look more balanced (all major sections divided into sub sections).

5. Repetitions and Placement of Content in General

I truly think that the consequential flow of sections can spare us the all too many repetitions (especially in paragraph beginnings). Trusting the inherent flow, I am sure that the reader will remember the context while reading the vision, and the vision while reading the recommendations. There is no need for repeating. Also, I would encourage the editors to take on the very tough challenge to re-edit the document into a consistent "say things once, and in the right place" version. Here are three examples:

5.2 Define once
The FInES stakeholders have been defined in multiple parts of the document – and quite often in a slightly different way. I took liberty to define the stakeholders once, in section 1, and delete all further definitions.

5.2 Recommendations in the Context Section
I would expect the context to be written rather sober, as (indeed, as the title says) analysis of the current situation. However, contrary to this expectation the context section is littered by several dozens of recommendations (check for keywords such as requires, should be, will have to, will be, take […] into account, must etc).

5.3 Context in the Recommendations Section
Several paragraphs start with (rather voluminous) introductory statements, which are far from being recommendations. Not only do they distract and fatigue the reader, but also every now and then they present new contextual (sic) evidence.

Concluding I suggest to revisit sections 2 (including section 3.1) and 5 and move all context to section 2 and all recommendations to section 5. And this sentence by sentence (sic).

Some text can be deleted (see document attached).

6. Trimming the Document

As stated in the editors' note the document should be (and will be) shortened, still. As this job of condensing about 20 pages into about ten seems very tough, I take liberty to make a proposal how to "weight" the sections:

Section	Target number of pages
1 Introduction	1
2 Context Analysis [incl. section 3.1]	<3
3 Vision: Future Internet based Enterprise Systems 2025	>3
4 The FInES Cluster: Proposals	1,5
5 Recommendations	>3,5
Total	<12

In detail:-

- Section 1 should be limited to one page – otherwise it will be out of proportion for a ten page document.
- Section 2 can be condensed in two ways. First, follow the advice above (paragraph 5). Second, I think this section was a perfect idea to act as a catalyst for the section 3-5. Without section 2 it would have been close to impossible to write the rest of the document. It certainly helped in the knowledge café sessions. However, now that the catalyst has "done its job", I feel no severe need anymore to present the context very

broad and detailed. Note that readers have been "spammed" with crisis analysis reports for several months already. The emphasis needs to be on visions now. If there are severe cuts to be made, then in this section 2.

- Section 3 is important for the reader to get their minds adjusted about a likely future scenario. So the vision needs to be detailed enough not to be superficial. One question however is, whether we should stick with one scenario, or develop several scenarios? The section 3 at the moment "drifts" towards the one scenario idea – however section 5 shows that some authors may (wish to) draft different scenarios – as they end up with different (even opposite) recommendations.
- Section 4 seems to me very solid and stable – I would not change it.
- Section 5 is very heterogeneous in quality (see my comments in the document attached). The whole introduction can be partially integrated to other sections – and the rest of the introduction can be deleted.
- Section 5.1 is good as it is, also in length. Section 5.2's first four paragraphs and the last one are rather hollow – they mostly repeat contextual material. So again here is plenty of room for cuts.

Beside the comments above, comments and recommendation for the various chapters have been made. Concerning the text, following changes have been proposed:

Chapter 5.2 - Research Recommendations

Seizing the innovation potential presented by change

A challenge is to bring all these perspectives together in the R&D of future technologies and solutions. Among others, enterprise systems of the future will be leaner, more adaptive, flexible, portable, delivering value beyond economic value and driving innovation that meets a broader set of business objectives.

A new notion of "enterprise" and "enterprise network"

Discussions in the FInES Cluster have challenged what is to be understood by an enterprise, an enterprise network, as well as related concepts. There is a strong opinion that future enterprises will be motivated to work together in new ways, across disciplinary boundaries, between theory and applied people, and between all stakeholders. Suggestions have been made to acknowledge the role of enterprise culture in enterprise collaboration, as an additional cultural dimension next to national culture. It has also been expressed that enterprise networks of the future are quintessentially knowledge networks, where knowledge is considered to be itself a commodity, with a knowledge exploitation chain that is in duality with the conventional physical value chain. R&D is needed to deepen these investigations and arrive at evidence-based conclusions.

Defining and developing "Future Internet based Enterprise Systems"

There is a broad sentiment that future enterprise systems should be able, by interaction, to adapt to new perceived user needs. These new design solutions should also foster the participation of all relevant stakeholders, with special emphasis on customers/consumers, and providing means for accountability and responsibility. Several technical challenges have already been proposed in connection with developing future systems . The systems and the associated R&D challenges must be better defined, with a clear target and verifiable value proposition for future enterprises.

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In the direction of providing a vision and solid directions to the Future Enterprise research, the position paper needs to put more emphasis on the following points:

- *Social Media in a Business Context*: Web 2.0 social media (Blogs, Social Networks, Social Bookmarking, etc) has radically revolutionized the way people communicate with each other, voice their opinions, generate content and have impact on other "physical", "legal" and "web" entities. The lessons learnt from this experience should guide a relevant quest on behalf of the enterprises in order to exploit the Web 2.0 buzz: simplicity, openness, extroversion, reusability and new channels of interaction and decision making, instead of creating more and more complex and sophisticated middleware applications and interfaces accessed only by an enterprise and its selected customers / suppliers.
- *Enterprise 2.0 and Enterprise Mash-ups*: Novel design and implementation principles exploiting the Cloud Computing and Future Internet capabilities are currently about to emerge allowing to cover the long tail of enterprises' needs and to provide more agile, individual and heterogeneous applications and services in a shorter time. However, such Enterprise Mash-ups require that the public data is available at any time by anyone interested and enforce the adoption of a new Enterprise2.0 philosophy that opens up their systems in order to synthesize mashed-up, added value services.
- *Novel architectures and standards for seamless interoperability*: As cross-company collaboration evolves into a major business activity, new systems and standards should allow for interoperability of enterprise systems and processes. This enablement must encompass capabilities of "interoperability by design", "automated interoperability" and "seamless interoperability", by means of minimizing needed time, effort and overall cost of enterprise IT investments.
- *Sustainable Business Ecosystems*: Enterprises need to seamlessly collaborate across their borders with other enterprises, governmental organizations and banking institutions in compliance with an adapted, future-looking regulatory framework. The interoperability and collaboration requirements depicted in corresponding Service Level Agreements (SLAs) need to be dealt with on a long term ecosystem- and community-driven basis and not on a specific enterprise's opportunity-driven basis. Furthermore, in order to include the SMEs in such an ecosystem in equal terms with larger corporations that have more advanced infrastructures, testing and simulation facilities offered to them in order to assess their applications, simulate their future operations and changes impact and generate real competitive advantage appear as a worthwhile track for future research in the field.