Collaboration@Work
The 2006 report on
new working environments and practices

October 2006

Information Society
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Collaboration@Work

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A great deal of additional information on the European Union is available on the Internet.
It can be accessed through the Europa server (http://europa.eu).

Cataloguing data can be found at the end of this publication.

Table of contents

Foreword

This report continues a tradition started by reports on telework which go back to 1995. Over time researchers have moved that field on into other areas, into new working environments and into collaboration at work. This report has changed over the years to parallel these developments, altering its title to the present one in 2003. There can be no doubt that the interests of the researchers and requirements of society and the marketplace will continue to evolve in the future, perhaps in ways which we cannot yet forecast. Now, in the passing from Framework Programme 6 to Framework Programme 7, is a natural time to take stock.

The current report serves the following aims. First, in not forgetting its roots, it is directed at the teleworking communities and associations who wish to be informed about the most recent developments globally in this area and in related areas. Secondly, it aims to celebrate the achievements of the research communities during the period of the Sixth Framework Programme for research (FP6), and to display the heritage of research results which have been and are being made available to future generations of researchers. Thirdly, it targets all those who are interested in reading about the directions in which the Commission sees the area to be moving, in policy and research strategy terms.

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1. Introduction

The past year has seen the period of reflection and contemplation following the rejection of the European Constitution by the French and Dutch publics. There has been increased debate about the direction in which the Union is and should be going, about the sort of society or societies which we want to have in Europe, about the political and economic models, about further enlargement, and about the impact of unstoppable globalisation on all these issues.

During this debate voices dissenting from the Lisbon Agenda have, however, rarely been heard. The importance of ICT in reaching the Lisbon and the Barcelona goals has not been put in doubt, even if everyone is now willing to admit that the Union will fail to achieve those specific goals by 2010. As a result, the Commission put forward a seven year financial plan for the next Framework Programme (FP7) which effectively doubled the funding to research while introducing an entirely new programme – the Ideas Pillar – with its associated European Research Council (ERC); more recently draft plans for setting up a European Institute of Technology (EIT) have also been presented to Council. However, there was also a period of acrimonious discussion on the overall budget for the Union, which has had a knock-on effect on the budget for FP7. In the end, there are to be increased funds made available for FP7, but the increase is not as large as the Commission proposed initially.

This means that much of what was written in last year's report on policy and research strategy matters remains equally or even more valid today. We can argue now, as we did then, but with even more reason now, given the failures *vis à vis* Lisbon, that there is a strong need for scientific research at the borders between ICT and other disciplines. In the New Working Environments Unit (NWE or INFSO F4) we have been involving researchers from the softer sciences, the humanities, more than anywhere else in the IST Programme, because our approach is the most user-centred. The objective remains one of enabling more innovative and productive work to be done by the appropriate use of technology, with the emphasis on the word "appropriate".

In Chapter 2 of this report some of the discussions on policy and research strategy from last year's report are updated and some new issues are raised. These sections have been provided by colleagues at the Commission, both within NWE and from other DGs, and by authors from outside the Commission.

One of the authors of this chapter was recently re-reading the 1963 lectures in which the celebrated Nobel-prize winning physicist Richard Feynman spoke as a scientist on societal issues. These lectures were published under the title: "What does it all mean?". In them he discusses science and society. He claimed no particular novelty in what he said at the time, nor has it dated over more than forty years. He reminded his audience that, when we talk about science, it is about a mix of three activities: applying the scientific method; building knowledge or scientific content; and applying that content as technology. In talking about this third aspect, technology, he said, in one of the opening paragraphs of his first lecture: "The most obvious characteristic of science is its application, the fact that as a consequence of science one has a power to do things. And the effect that this power has had need hardly be mentioned. The whole industrial revolution would almost have been impossible without science." What struck the present author is the support this sort of statement gives to the approach of the NWE Unit over the period of FP6. It is in the very best scientific research funding traditions to foster research which brings together groups capable of channelling the power of science – in the broadest sense of the term, to include the humanities – into applications aimed at driving the information revolution forward into the Knowledge Society.

In Chapter 3 readers can enjoy twenty country reports. In some of these contributions continuity with the ancestors of this report in the telework communities of the early nineties is still apparent. In most of them it is a topic which is discussed, but it is far from being the only topic. We feel sure that readers will, once more, enjoy reading this kaleidoscope of topical issues and activities on working in the information age from around the world.

In Chapter 4, the projects which have been set up during FP6 have all provided a two page history, updated from last year, for most, or as a forecast for those which are just starting. In last year's report the natural clustering between projects was described. This information is not repeated this time, but fresh clusters have emerged and are described in a number of the sections in Chapter 2. In particular, amongst the new set of projects arising from IST Call 5 there are several which concentrate on, or will make a contribution to, policy matters, and also a cluster of projects focusing on Living Labs.

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2. Policy Framework and Research Strategy

2.1. Introduction

The opening section of this chapter comes from the head of the New Working Environments research unit of the European Commission[1]. It describes the unit's policy approach and consequent research strategy and also illustrates one of the main implementation thrusts for this strategy which has emerged strongly over the last year: this is towards the establishment of a network of Living Labs.

During the last year, commitment to the Lisbon Strategy has strengthened while the disappointment in the failures of its implementation has hardened. The report of the Hampton Court Group of January 21, 2006, referred to elsewhere in this chapter, reaffirmed the central role of ICT in reinvigorating activities in support of this strategy. Within the European Commission there has been considerable further elaboration of two of the three key actions given in last year's report, namely:

- i2010: European Information Society 2010 aimed at fostering growth and jobs in the information society and media industries in particular
- Framework Programme 7 (FP7).

In the next two sections of this chapter, readers are brought up to date on activities in these two areas. Concerning the third, the Competitiveness and Innovation Framework Programme (CIP), at time of going to print it would appear that there will not be the support for the area of collaboration at work which was expected a year ago.

There follows a discussion of globalisation, a topic which is unavoidable in this context of growth, competitiveness and innovation, particularly when considering new methods of working in the information society. All of the contributions to this point in the chapter were written by colleagues in the NWE unit. There then follows a guest contribution concerning the market situation.

In preparing for FP7 there has been much industry led activity, often through the establishment of a European Technology Platform. This is something which the Commission's research Directorate Generals have generally been pleased to see happening, without wishing to be the instigator of such activities. Obviously, the NWE unit has been equally satisfied to see its own industry led initiative emerging from FP6 Call 5[2]. This initiative is described for us by the co-ordinator of a project which has been set up recently to pursue possibilities for the NWE area.

A number of successful proposals to Call 5, now become or becoming projects which you can read about in Chapter 4, concern themselves in significant part with the development of a reference architecture. Without this, research and development efforts on collaborative NWEs risk becoming fragmented. The contribution on this topic comes from one of the leading researchers himself.

The sections on the related topics of eLearning and eSkills, come from colleagues in the NWE unit with a guest contribution from DG Enterprise. There has naturally been considerable contact between DG INFSO and other DGs, such as Enterprise and Employment, concerning matters of common concern. This is again illustrated by the following contribution on New Work Paradigms, this time from a colleague in DG Employment.

New working methods, paradigms, environments using ICT are developing in manufacturing, an area in which European industry, particularly German industry, still leads the way world-wide. The next section discusses this area from global trends down to the detail of the contribution from projects running with the NWE unit. In these days of environmental disasters and global warning, over the last few years there has been a steadily increasing level of discussion of corporate social responsibility, and we include in this chapter an introduction to this topic. These two sections are reasonably naturally followed by one on Civil Protection and Crisis Management Collaboration. Once more this section takes the reader from research strategy to individual projects. All three sections are from colleagues in the NWE unit.

In the following section the European Space Agency tells us about itself as an example of "Best-Practice in European Collaboration". The chapter then closes with a final contribution from a colleague in the NWE unit on the topic of public procurement as a driver for innovation and new collaborative working environments.

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2.2. Linking CWE and Innovation in Living Labs

Drivers for growth and competitiveness

Europe has reinforced and refocused its Lisbon objectives in growth and jobs, based on the Kok report of

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[1] New Working Environments research unit ("NWE unit"): www.amiatwork.com
[2] FP6 Call 5: Integrating and Strengthening the European Research Area, http://cordis.europa.eu/fp6

2005[3]. This refocusing is directly reflected in the actions for i2010[4], and also in the objectives of the FP7.

The new strategic framework established by i2010 – European Information Society 2010 – promotes an open and competitive digital economy and emphasizes the role of ICT for innovation in the workplace and for the inclusion of all citizens in a cohesive society. This framework is complemented by the new Competitiveness and Innovation Programme and by its priority on ICT funding in particular.

Driven by trends towards convergence, the ICT marketplace will change radically. Two initial 'symptoms' of such inter-sector market transformations are: a) the recent increasing interest of large IT and software industries in entering the mobile and telecommunication market sectors and vice-versa; b) the decreasing profit margins in sales of hardware and software products and the growing costs of maintenance and management of IT and network infrastructures, which are pushing large IT and software industries to transform their core businesses into the provision of on-demand services.

Convergence from the service delivery perspective means increasingly delivery over dynamically changing, heterogeneous infrastructures and communication services built on them, where end-to end service delivery needs to rely on novel network architectures, including Grids, Web2, p2p, etcetera, utility-type architectures.

Such an evolving technological and market context creates unprecedented opportunities for Europe to close the competitiveness gap with the US in certain key ICT sectors and to face better the challenges posed by the emergence of potential new worldwide competitors and markets.

Europe must be prepared to react to these emerging cha(lle)nges, driven by a common vision and strategy, encompassing not just a specific business sector or research domain but an ecosystem of market actors across the whole value chain, public authorities and society at large. It is absolutely vital for Europe to capitalize on its strengths in such sectors as application and service integration, service provision, Grids, telecommunications, mobile and embedded technologies, and to be prepared for the next technological and market revolution.

Why new innovation processes are needed in the knowledge society

Living Labs are instruments for making the industrial innovation process more efficient and successful. The aim is to develop new markets and innovations by involving a critical mass of citizens as test users, contributors and innovators.

At the end of an innovation process, when launching a new service or product, companies are anticipating a fast and broad take up by the market. However, experience proves that new technology is not always appreciated by the public because of poor usability, access and design. Living Labs provide a new environment for industry to not only test prototypes at the end of the innovation process, but also to receive valuable feedback and new ideas for products and services, an environment that allows citizens to influence product development through close cooperation with companies.

Urban Development

In technically advanced city areas with broadband access there is a huge test user potential for products and public services. From an urban development perspective the aim is to create interaction between citizens and the city councils in order to develop services that make everyday life easier for the residents. Living Labs should also be seen in the light of an innovation system to facilitate the transformation of cities to the knowledge society in an efficient way.

Living Labs; what is the status?

There are a number of existing regional test beds and corporate test laboratories in Europe today but they are very different to the Living Labs which aim at reaching a much broader market than test beds do. Through a public private and citizen partnership and the fast deployment of broadband in Europe, there are many possibilities to engage a high number of market representatives, not only at the local level but at European and even the global level. Openness like open source makes it possible to integrate different kinds of technologies, test methodologies and business models. This integration contributes to the capacity needed for the Living Labs operations.

CDT Testbed Botnia (Luleå, Sweden)

Testbed Botnia brings stakeholders together to interact with its several thousand end-users. In the environment of Testbed Botnia researchers and companies conduct experiments on services and applications in a variety of social contexts. Environments include city centres as well as the more rural settings of northern Sweden. It involves researchers from various fields through the CDT cooperation.

www.testplatsbotnia.com

Living Lab Västervik (Västervik, Sweden)

Living Labs Västervik is a catalyst and a driving force in the development process that started in Västervik's municipality and Kalmar County to create a modern societal structure. In the near future the digital society platform will provide fundamentally and completely new conditions in which to develop organisations, stimulate

3   http://europa.eu.int/information_society/essentials/reports/kok/index_en.htm
4   http://europa.eu.int/information_society/eeurope/i2010/index_en.htm

new business and increase services for citizens and tourists in the entire municipality.

www.livinglabs.se

Crossroads (Copenhagen, Denmark)

Crossroads Copenhagen is a network of research institutions, private enterprises and public organizations built around the creation of entire new urban areas around Copenhagen. The network strives to strengthen the co-operation between companies and universities within culture, media and communication technology.

www.crossroadscopenhagen.com/index

Mobile City Bremen (Bremen, Germany)

In cooperation with Bonsai Deutschland Testmarkt Bremen GmbH, a subsidiary of the renowned market research and opinion polling institute TNS Emnid, the existing infrastructure was enhanced to create a test market for mobile applications. The acceptance and functioning of new products, services and solutions are investigated under real conditions. At the same time, Bonsai analyzes the effects of corresponding advertising and marketing measures focused on the Bremen test region.

www.mobilecity.org

Helsinki Virtual Village
(Arabianranta, Helsinki, Finland)

An entire suburb of Helsinki has been translated into an example of a future living environment. By integrating architecture and city planning with modern ICT solutions and services a unique environment has been created.

www.helsinkivirtualvillage.fi/

The Communications and Software Services Test (CASST) Centre (Waterford, Ireland)

The centre is a mobile communications test facility which provides a test bed for rapid development in co-operation with industry and research organisations.

22@ (Barcelona, Spain)

The 22@bcn, S.A. is a private municipal company, a Barcelona City Council corporation responsible for the management of municipal services and activities.

www.bcn.es/22@bcn/

In addition to these sites mentioned there is a set of large Integrated Projects funded by the European Commission, which target specific sectors as validating envi-

ronments. These sectors are engineering and design, creativity tools, rural Living Labs, service creation etc.[5]

For i2010 new actions are planned for the Finnish EU Presidency, namely the launch of a network of Living Labs, developing common methods and services, and sharing best practices on the industrial innovation process itself.

Living Labs in the CWE context: a technologies and paradigm shift

Looking more in detail at the wide technology base of collaboration technologies and platforms, we see the need for wide multidisciplinary integration, including the human sciences. The integration of CWE (Collaborative Working Environments) with other platform components leads to an entirely new approach, essential for our knowledge and service society, the emerging discipline of "Service Science".

This new wide discipline, together with a human centric, systemic approach in a highly dynamic ICT environment, suggests that innovations will happen in strongly parallel environments, closely similar to the "real world", built on a sufficiently large scale. These kinds of industrially interesting innovation environments are built by the Living Labs concept.

By way of examples, some functionalities of CWE are elaborated further in detail below, to show concretely the wide spectrum of research fields and development approaches which need to be alloyed together for future collaborative systems.

CWE is improving radically competitiveness by enhancing productivity and increasing creativity. Following recent studies this is done by increasing (spontaneous and dynamic) interactions across complementary disciplines, intensifying the cross-fertilization in the work process and streamlining the actual work by providing integration of the work, workplace and the worker on all levels.

For CWE the workplace has to respond strongly to the context, i.e. the work tasks and the persons involved, on a secure basis. Hence the identification and security architecture based on the context is one of the key technologies to be integrated. A person should only be authorized to work after his or her identity has been established; the workspace, including the background support, has to change according to the context.

In knowledge intensive workplaces knowledge management of essential information in various contexts is mandatory. This leads to augmented knowledge management, which presents the information and synthesis of knowledge/experience in a highly media-rich, visualized and, often, animated format. This is to ensure the right information at the right place while overcoming limitations in bandwidth from information systems to human brains, especially in critical situations.

[5]   http://europa.eu.int/information_society/activities/atwork/ projects/index_en.htm

Irrespective of the available infrastructure the CWE experience should have the same look and feel. Thus the scalability to different communication and equipment environments is an essence, including the scalability of the services provided by these multiple environments.

Considering affordability we need to take a close look at interactive games, now a mass-market, adapting the technologies to professional environments. Such games offer a similar dynamic interaction and presentation of complex data to that necessary in many work applications. Media-rich gaming environments provide a strong experience in group presence and group interactivity, which will be a critical success factor for knowledge work. This virtual group presence is also essential when we look closer at location-independent work, e.g. for rural and remote areas.

For many of the new applications seamlessness of communication and content is a prerequisite. Seamlessness is closely related to scalability in that it demands the same look and feel in different environments. Seamless, parallel multi-channel connectivity and data roaming is the technology needed. Another technology to be seamlessly integrated is the use of parallel asynchronous channels to transfer information and to synthesize it subsequently at the receiving end.

CWEs should know how to configure communication channels in a sufficiently performing and affordable way, based on the context (task and user preference) and without any active user interference. All the communication layers behind the global connectivity and the local connectivity should be invisible to the user. This means also that the intelligent workplaces must have internal configurations and status management, enabling the personalization of the workspace following the need of the user.

Functional structure

For CWE integration three separate functional perspectives have to be considered:
- Seamless connectivity across groups, in heterogeneous and dynamic, even ad-hoc environments
- Easy facilitation of the group collaborative environment, which is media rich, spontaneous and interactivity rich between people, knowledge repositories and artifacts (like robots).
- Easy-to use and spontaneity encouraging interfaces, following natural and context sensitive interaction (use media-rich interaction, natural interfaces, automatic gesture interpretation, visualization, engines supporting creativity etc)

For seamless connectivity in heterogeneous and dynamic environments the key technologies to be integrated and developed with collaborative-specific elements are:
- Mobile and fixed communication technology, providing both near range communication across the work environment and remote a media-rich connectivity of that personalised local work environment

- For many applications where no one high quality connection is available multi-channel communication is needed
- Technical roaming across networks is provided by the SOA, but for this domain more important is content and context roaming.
- Identity management/access rights in distributed real-time systems
- Distributed resource management (communication and hw resources)
- Location based context sensitivity
- Portability in addition to interoperability on technical and functional levels
- Underlying infrastructures: IPv6, SOA, XML, SOAP, Grid, P2P, sensor web, all towards utility infrastructure

For establishing and managing the collectiveness and group working environments the key technologies to be integrated and developed are: e.g.
- Semantic based Knowledge Management/ Extended Agents for heterogeneous information infrastructures
- Distributed interactive simulation and visualisation
- P2P communication in group context
- Real-time and faster than real time simulation for decision support
- Systems capturing organisational knowledge and learning (managing incomplete and asynchronous information from heterogeneous sources, using web services)
- Cognitive systems between humans and mechatronics artefacts (like office environment devices, service and industrial robotics etc)
- Group presence techniques
- Media-rich communication to enhance trust building process
- Group identity management, dynamic resource sharing across groups (content, IPR etc)

For usability and affordability the key technologies for CWE can be seen as:
- Visualisation through interactive intelligent multimedia surfaces, multimedia walls, tables other artefacts
- Context sensing technologies and systems (person, environment and task aspects)

Intelligent configurability/self-configuration of the work environment based on the context (who, where, what task), Bluetooth, RFID, NIR etc

The Way Forward

The key to collaborative business and working environments is systems integration, requiring new systems engineering approaches to controllability, robustness and stability of the connected, distributed and often real-time systems. Robustness and stability is an extremely tough requirement for professional environments, which have to have much better reliability and usability than, say, current office systems due to their time-critical and complex nature.

18Considering longer term strategic objectives, it has to be recognized that innovation in ICT and other technologies is not the whole answer. Systemic Innovation is essential. Systemic Innovation embraces:

- People - who need the skills and the will to strive for improvements,
- Processes - that need to evolve to become more effective as well as more efficient,
- Technology - that both drives change and enables New Working Environments.
- Policies – to enable the building of partnerships and critical mass, and to guide innovation and implementation.

Systemic Innovation will require new systemic instruments to implement innovation and build partnerships, such as the Living Labs concept, and will be judged by its successes in many dimensions. It must succeed in terms of increasing the wealth, wellbeing and reputation of the people and sovereign states of Europe; but it must not neglect the environmental impact - the price of localized economic success must not include global ecological disaster. Ultimately, Systemic Innovation must include innovation in the conduct of global competition. Finally, strategic intent and outline plans to realize this ambition must be elaborated.

There is a strong foundation on which to build. The 1995 vision of the year 2005 may have seemed over-ambitious and too futuristic at the time - but much of what is now regarded as commonplace simply did not exist ten years ago. The capability and performance of ICT platforms have increased and their prices fallen - today's domestic desk side "entry-level" system was the high performance mainframe of the mid 1990s that filled an environmentally controlled machine room. Ten years ago broadband in the home was unheard of - and many commercial users sent magnetic tapes by motorbike because it was faster and more reliable than the Wide Area Network of the day; but now we have Multimedia Home Platforms, delivering the "triple play" of digital television, voice telephony, and internet connectivity. Devices have become more portable with a wider range of functions: Electronic News Gathering no longer needs bulky specialist equipment - today's mobile phones can capture and distribute images around the world.

The proposed vision for the New Working Environment of 2015 may, at first glance, appear to be too futuristic and too ambitious. But lessons have been learnt from headline-grabbing ICT projects that have not lived up to their promise as well as from the many, usually unheralded, successes. There is a much greater insight into the importance of the non-ICT dimension in setting and achieving the ICT agenda. This ICT R&D agenda will not duplicate or usurp work outside its domain - but it will draw on and interact with other disciplines. By 2015, NWE will have completed its emergence from its chrysalis. It will be as unremarkable as public and private transport. It will doubtless have its critics; it will doubtless suffer deliberate and accidental incidents. But it will evolve and improve.

Provided that the planning for i2010 and research supported by the EU is progressing as expected the following illustrates best the concrete steps of the way forward.

- Europe is facing a competitive challenge where ICT innovation and deployment plays an important role, in economic, environmental and societal terms. According to recent studies the impact of work organization on creativity and productivity corresponds to 25% of productivity growth. CWE research is directly tackling this productivity issue.
- Experience Application Research, EAR[6] (e.g. Living Labs), is a human centric approach to innovation and deployment, including reorganization of work and business processes, investment in ICT skills, collaborative working methods, organizational design, mobile applications and new workplace concepts. This is highlighting the systemic (simultaneous societal and technological) innovation to achieve rapid deployment of the research results.
- A European Network of Living Labs captures innovation from a local, regional and national level and promotes European networks with a multi-stakeholder model, potentially with a global dimension, all completely in the spirit of the ERA.
- A Living Lab is a public/private partnership addressing the needs and requirements of industry in close collaboration with the public sector. It facilitates co-creation and innovation in a systemic way combining the technological and societal drivers.
- Precommercial Public Procurement is assessed as a new European instrument to bridge research results with rapid take-up and risk taking for innovativeness. This could be a strong funding instrument both for building and running the Living Labs, but also in the take-up of innovation developed in the Living abs environments.
- The European network of Experience Application Research Centers (EARC) will be established and developed from 2006 until 2010.

The EU initiatives of i2010 and the FP7 are important pillars in the overall path towards growth and competitiveness, but achieving the goals calls for a joint journey with all the stakeholders, both public and private. Let's do that together!

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6   ISTAG Report on Experience and Application Research "Involving Users in the Development of Ambient Intelligence", September 2004

2.3. i2010: A European Information Society for Growth and Employment

i2010
Information Space
Innovation & Investment in R&D
Inclusion

Introduction

i2010, "A European Information Society for Growth and Employment", is a strategic framework that promotes an open and competitive digital economy and emphasises ICT as a driver for inclusion and quality of life. There are three priorities for Europe's information society and media policies:

i) The completion of a **Single European Information Space** which promotes an open and competitive internal market for information society and media;

ii) Strengthening **Innovation and Investment** in ICT research to promote growth and better jobs;

iii) Achieving an **Inclusive European Information Society** that promotes growth and jobs in a manner that is consistent with sustainable development and that prioritises better public services and quality of life.

The main objective of the second pillar of i2010, Innovation and Investment, is to improve the competitiveness of the EU economy by closing the gap in investment in ICT research, innovation and adoption of ICT by businesses. The report of the Hampton Court Group of January 21, 2006 concludes that there is an urgent need to increase aspirations concerning innovation for job creation and growth across Europe. There is also an urgent need to undertake European-wide, national, regional, institutional, structural and financial changes that will facilitate the focused and innovation-based growth necessary for the global competitiveness of Europe.

The development of new working environments is of great importance for European industry's contribution in increasing jobs, growth and competitiveness, not only in terms of ICT uptake, but also in terms of innovation development. The core of innovation development is the ability to create value for people and stay competitive through access to larger customer networks and international markets.

Annual Report Actions

The i2010 has a list of actions for each priority. Two of the actions for 2006 - 2007 will promote industrial growth through new working environments with user-centric systems for new forms of competitiveness and innovation:

1. To coordinate existing and future Living Labs into a European Network of Living Labs in the concept of eWork, providing services of large deployment to the industry, bringing technology test beds into real life user environments as a large demonstrator on a PPP basis.

2. To accelerate the development of the value chain of eLearning and eSkills in a road map to increase knowledge potential in organizational and industrial/digital clusters in the EU.

Living Labs

The Living Labs concept as part of the i2010 Action Plan is expected to become a valuable asset for eBusiness stakeholders, who will be able to forecast market reactions for new products and services as they emerge. Living Labs are sustainable R&D environments and will contribute to maintaining a close collaboration between researchers from different disciplines.

Living Labs are instruments for making the industrial innovation process more efficient and successful. The aim is to develop new markets and innovations by involving a critical mass of citizens as test users, contributors and innovators. At the end of an innovation process, when launching a new service or product, companies are anticipating a fast and broad take-up of the market. However, experience proves that new technology is not always appreciated by the public due to poor usability, access and design. Living Labs provide a new environment for industry not only for testing prototypes at the end of the innovation process, but also for gleaning valuable feed back and new ideas for products and services, an environment that allows citizens to influence the product development through close cooperation with the company.

How does it work?

The innovation process will be carried out in parallel. The company will get access to a platform based on different disciplines like ICT technologies, test methodologies and a broad market that represents citizens as users or providers, on local, regional, national or international level. The company will test their products on the citizens to find out the market and take up potential. The citizens will be able to influence the product development by providing feed back on the products, contributing their own knowledge, opinions and user experience. The company has the opportunity to react on the feed back and modify the product or service in order to make it as user friendly and adaptable to the market as possible. Living Labs are also an instrument for citizens to provide new ideas, experiences, solutions and standards. The company and the citizens' co-operation will bridge research results and market reactions which will lead to smoother technology development and faster take up of products and services.

Existing Living Labs?

There are a number of existing regional test beds and corporate test laboratories in Europe today but they are very different to the Living Labs which aim at reach-

ing a much broader market than the test beds do. Through a public private and citizen partnership and the fast deployment of broadband in Europe, there are many possibilities to engage a high number of market representatives, not only on local level but on European and even global level. Openness like open source makes it possible to integrate different kinds of technologies, test methodologies and business models to contribute to the capacity needed for the Living Labs operations.

A European Network of Living Labs

As mentioned above, in the i2010 Communication and the first Annual Report on the European Information Society, a European Network of Living Labs is one of the actions for the second cluster for Investment and Innovation in Research. Living Labs have a regional importance for service and product development that requires good knowledge of specific local markets. However, a broad market with a high number of citizens as test users could influence technology development to a much larger extent. Citizens will be able to contribute and respond to new products and services and also to provide new ideas. A European network of Living Labs will be a strong tool for making the industrial innovation process more efficient and successful by involving citizens to contribute to and influence technology development.

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New Working Environments

2.4. New Working Environments Research Trends in FP7

Since the Third Framework Programme for Research, the European Commission has been active in the area of improving working environments to provide better access to work, increase competitiveness and help supporting sustainability policy.

Since the early 1990s, and driven by the technology revolutions in IT hardware and software technologies as well as by the accelerating process of convergence across an ever diversifying landscape of fixed and wireless communication infrastructures and protocols (broadband Internet, IPv6, VoIP, GSM/UMTS, WLAN/WIFI, WIMAX), the strategic focus of research activities evolved from the successful development of **telework** applications (FP3&4, 1990-98), with ICT-enabled worker flexibility of time and place, through **eWork** (FP5, 1998-2002), with research related to helping individuals improve the quality of their working lives and to helping companies operate more efficiently in trading goods and services, to **New Working Environments** (FP6, 2002-2006), which have brought new work paradigms with more diverse, context-sensitive forms of **work collaboration** in an Ambient Intelligence (AmI) technology landscape.

Location mobility, linked to the possibilities of increased connectivity anytime, anywhere, has been the first focus of FP6 emerging research. The growing tech-

nological capabilities steered a discussion on further aspects of mobility, including virtual and operational mobility, and mobility of interaction. Consequently, the aspect of networking and collaboration became more important.
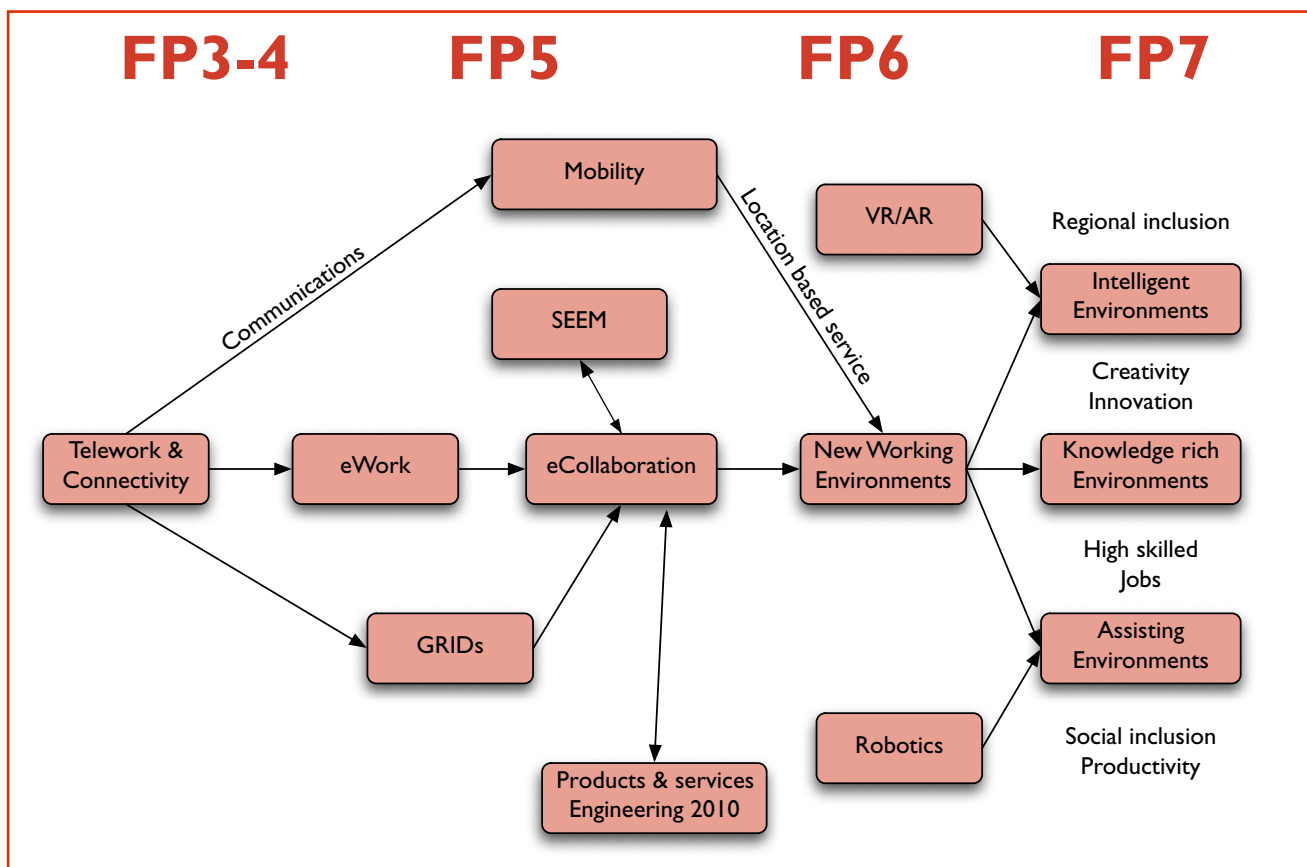
Strategy development in the area of New Working Environments has also been tackled by some ERA projects (eg. BrainBridges, Agrofood) and by three Priority 8 Research and Policy projects (Seemseed: European Electronic Information Market, BEACON: Broadband policy, and EACE: New working Environment Applications).

The new strategic framework established by i2010 – European Information Society 2010 – promotes an open and competitive digital economy and emphasises the role of ICT for **innovation in the workplace** and for the **inclusion of all citizens** in a cohesive society. This framework is complemented by the new Competitiveness and Innovation Programme and its priority on ICT funding.

Hence in the FP7 context, the current "New Working Environments" domain will lead to research in Intelligent, Knowledge rich and Assisting Environments.

The impacts of new and networked working environments (NWEs) and related developments at workplace, team and organisational levels have been looked at by the **NETWORK4VALUE study** that has addressed the opportunities and preconditions for sustainable development in knowledge societies, and provided input to ongoing strategy work at the European level.

Through applying an interdisciplinary research approach, which combines strategic future analysis based on assessment and projection of current developments with qualitative and quantitative in-depth analysis of NWEs, the network4value study has identified areas that require more research, and produced empirically validated roadmaps for the development activities:

- To explore potential technical and user centric foresight scenarios as well as potential future new working environments.
- To explore, define and classify the new phenomenon and compare it to existing known old working paradigms such as teleworking, etc.
- To draw together, synthesize and structure available evidence about the drivers and impacts of networked working environments.
- To evaluate to what extent existing statistics and data can be used to track these developments, to explore the need for new indicators and to develop a set of (existing and new) indicators to be used for continuous monitoring of the phenomenon.
- To identify the most effective EC-research policy tools to steer towards the adoption of new, networked working environments with the objective of sustainable development.

In general today companies have to sustain and create growth in dynamic, changing, converging and global markets and competitive environments. In order to achieve that, companies in particular need dynamic innovation processes and flexible structures capable of sensing and responding to market needs dynamically and by taking
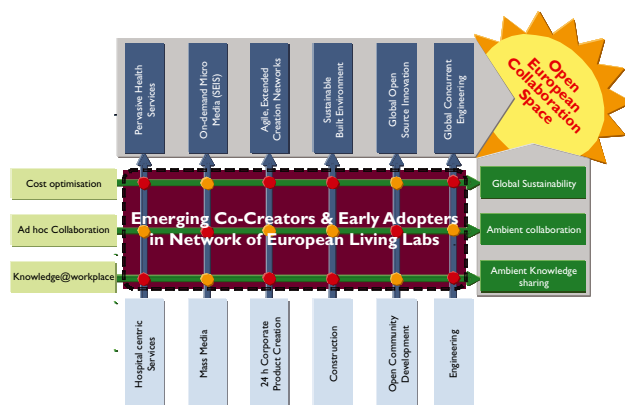
into consideration personalized needs and requirements. Networks, and their core components, networked working environments, are key enablers in this context. Further key value drivers are:

- Strategic alignment of intra and inter organisational network partners,
- Effective network coordination and network-wide process definitions,
- Leverage complementary knowledge resources in network to increase quality of outcome,
- Network wide deployment of collaboration and communication tool infrastructure,
- Effective performance controlling and quantifiable outcomes,
- Sustainable top-level support for NWE implementation and activation,
- Continuous people motivation, entrepreneurship and trained networking skills,
- Professional implementation and change management,
- Enhancement of capabilities of employees with technology.

In 2020, European organisations and companies, as well as society in general, will be endowed with the means to collaborate over time and space, both within and between organisations and communities. This capability will be essential for achieving flexibility and in order to be innovative by making the best use of the knowledge and competences available. Furthermore *ICT solutions will enable productivity and innovation through empowered and motivated people by facilitating new forms of work in manufacturing and knowledge intensive businesses.*

In 2020, Collaborative Environments will offer a seamless ubiquitous hardware and software infrastructure composed of resources providing a new blend of activity-oriented, context-aware flexible software services supporting patterns of natural human interactions, human to machine interactions and to collaborative gadgets and robotics, which all interact in a dynamic and proactive fashion.

ICT research is needed for seamlessly integrated hybrid (virtual and physical) goal-oriented, pro-active and culturally aware collaborative environments to enable productivity and innovation through empowered and motivated members of effective teams and communities, of practice and of interest, across domains and organisations boundaries.

Research elements focus on:

1. Developing an 'upperware' platform supporting a high level reference model for Collaborative Working offering a seamless ubiquitous infrastructure composed of resources that will provide activity-oriented, context-aware flexible pervasive software collaboration services supporting patterns of natural human interactions, also to collaborative gadgets and robotics.

2. Integrating ICT technologies into advanced tools for collaborative working designed for group usability and ensuring a better integration of workers and more efficient, creative and sustainable collaborative working practices in services industries and more traditional sectors. It will apply social computing concepts to become people and knowledge centric, not data-focussed.

3. Development of comprehensive context based, collaboration aware, pro-active and anticipative ICT solutions to support unstructured and multi-threaded collaboration activities and to reduce interruptions. These ICT solutions will be validated in real living laboratories following the Experience and Application research approach with an early user involvement in the development of the ICT solution for collaborative working.
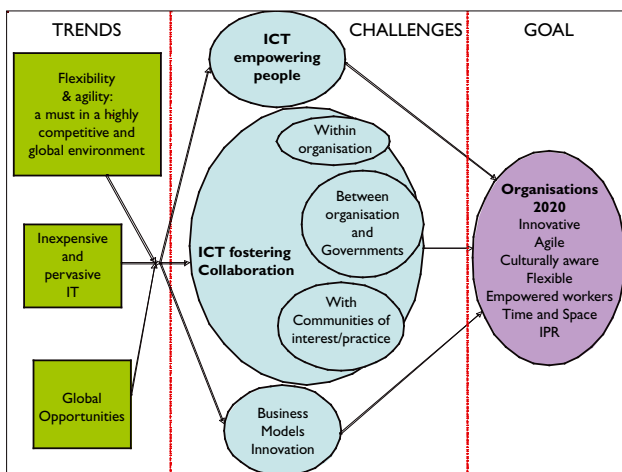
In 2020 digital factory manufacturing solutions will enable flexible production supporting customisation, and will integrate product development, manufacturing, sales and maintenance in single integrated collaboration environments across enterprise boundaries. Through virtual engineering it will be possible to reduce the number of full scale tests of products to one test based on the virtual prototype.

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New Working Environments

2.5. Globalisation as a Driver for New Working Environments

Globalisation requires companies to focus on the generation of better collaborative working environments. It is acting as a driver for constant increases in international off-shoring of research and development activities, thereby affecting the way companies are operating.

The globalisation of R&D is a multi-faceted process that can be measured in terms of scientific collaboration, joint ventures, flows of R&D investments, Intellectual Property Rights, flows of human capital, trade in R&D-intensive products and services. All these measures show that globalisation of R&D is steadily increasing.

Recent surveys are showing that China, India and Brazil are now, respectively, the first, third and sixth choice destinations for increased R&D investment[7]. However the effects of globalisation are not confined to R&D but apply equally to the approach which companies choose for becoming and staying competitive. Finding the correct responses to globalisation would benefit Europe because today, even for small companies, their "home market" is becoming the whole world.

User-friendly ICT collaboration tools combined with remote management techniques offer new prospects for borderless co-operation between corporations and skilled knowledge workers operating at a global level around the world. If managed well, new ICT human-centric collaborative working environments can reverse out-sourcing of R&D and create higher productivity with more employment and growth for Europe.

Competitive globalisation forces require companies to foster and implement new ICT media-rich collaborative working environments capable of making the best use of the opportunities arising in the new global knowledge-based service economy. Companies need to take more strategic advantage of new technologies, particularly ICTs, by integrating them better into their specific business processes in order to keep and improve their productivity and competitive standing in rapidly evolving, emergent global market places.

Driving productivity and growth upwards requires significant investment in human capital, intangible assets[8] and greater adaptability of the workforce, as well as stronger investments and use of Information and Communication Technologies (ICTs) across the economy.

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7   "Key Figures 2005 – Towards a European Research Area; Science, Technology and Innovation" – European Commission, Directorate-General for Research, Unit M2 Open coordination of research policies

8   Intangible assets: human resources, competences, skills, intellectual capital, creativity, innovation knowledge management practices, technology usage capabilities, organisational capacity, customer relation ship, IPR issues, brands and so forth.

There is currently a notable under-investment in research and development in ICT which emphasizes the need for greater incentives for companies to engage in innovation and R&D. Europe's innovation performance is also crucially dependent on strengthening investment and the use of new technologies, particularly ICTs.[9]

Globalisation forces require Europe to focus on how to create better opportunities for companies to establish and put in place new collaborative working environments driven by strong technological integration, uptake and usage of ICT, and applying a human centred approach, in order to reverse the off-shoring of ICT-intensive work to China, India, Brazil and other rapidly emerging new economies.

This approach follows the recommendations from the High Level Group chaired by Wim Kok 2004[10] on facing the challenge of raising the rate of growth and employment by catalysing the emergence of the knowledge economy in the context of globalisation.

It is also in line with:

- rethinking the European ICT agenda, as reported by the 2004 Presidency of the Netherlands[11]; namely, in its ten ICT breakthroughs needed for reaching the Lisbon goals by developing a strategic response to job migration to low-wage countries and by adopting strategies for improving ICT skills;
- the World Summit on the Information Society Tunis commitment 18 November 2005[12] to removing barriers to bridging the digital divide and stressing the fundamental role that the adoption of ICTs by enterprises plays in economic growth;
- the European strategy as reported by the independent expert group on R&D and innovation January 2006,[13] chaired by Esco Aho for creating a more innovative Europe, as discussed during the Hampton Court Summit ahead of the 2006 Spring European Council.

Upgrading to ICT-based, but human-centred, new collaborative working environments will enable greater exploitation of the opportunities offered by the forces of globalisation forces. Rather than seeing such forces as a threat, European companies will be able to take advantage of them to launch more innovative products and services, more effectively. This promises strong productivity gains as already evidenced by the rapidly evolving global knowledge-based service economy as it enters upon new markets.

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New Working Environments

2.6. Market analysis of the CWE area

Summary

New Working Environments are often considered to emerge from progress in technology. Although ICT provides a lot of new tools and infrastructure, and thus shapes the fundaments of collaborative working, it is the application of the technology and the organisational fit which are the keys to success or failure of collaborative settings. The following overview is aimed at providing orientation in the CWE area through a useful structuring and some initial assessment of the current state. It takes a look into applications, organisation and technology, three driving forces of collaborative working. The fourth one, societal impact, is dealt with elsewhere in this report.

Key Issues

Most recent surveys, with data gathered by the Economist Intelligence Unit[14] from more than 1650 executives worldwide, point out that towards the year 2020 the importance of effective collaboration will rise. Most of the survey respondents stated that the major source of competitiveness will become knowledge workers. Companies are foreseen to adjust IT spending, human resources strategies and organisational structures to achieve gains in productivity from knowledge work.

It appears to be worthwhile then to take a look at where we are starting from now. In order to better understand the state of the market, it is helpful to use a structured approach. The general question, what the fundamentals of collaborative working environments are today, breaks into three concerns:

- Application: what is collaborative working good for?
- Organisation: how to organize collaborative working?
- ICTechnology: which technological baseline is there, and how will it develop?

Exploring these areas helps in finding out where they can be combined most effectively into collaborative working environments for the future. Doing that in de-

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9 "Communication to the Spring European Council – Working together for growth and jobs. A new start for the Lisbon Strategy" – Commission of the European Communities. Communication from President Barroso in agreement with Vice-President Verheugen

10 "Facing the Challenge – The Lisbon strategy for growth and employment" – Report from the High Level Group chaired by Wim Kok, November 2005

11 "Rethinking the European ICT agenda – Ten ICT-breakthroughs for reaching Lisbon goals" – The Hague, July 2004

12 "Second Phase of the WSIS (16-18 November 2005, Tunis) - Tunis Commitment" – World summit on the information society, Geneva 2003 – Tunis 2005

13 "Creating an Innovative Europe" – Report of the Independent Expert Group on R&D and Innovation appointed following the Hampton Court Summit, January 2006

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14 The Economist Intelligence Unit (2006): Foresight 2020 Economic, industry and corporate trends - www.eiu.com

tail is beyond the scope of this spot analysis. It touches instead on a few topics which are considered of major relevance, leaving more extended investigation to further work.
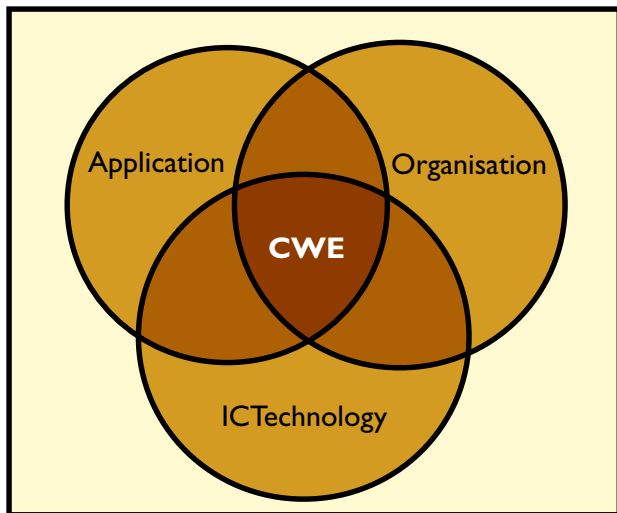
Application

Three categories of activities can be identified associated with collaboration at work: communication, i.e. the exchange of information; presentation, meaning the provision of content to others; and collaboration, the simultaneous acting of a working team. There are major differences in what sorts of working environments in general, and what kinds of tools and applications in particular, are required to support these activities.

Basically, collaborative working is to apply knowledge for competent action. A somewhat elaborated conceptualization of this has been suggested in a past publication[15].

Organisation

Collaborative acting needs to be organized according to the level of presence of workers, in terms of work, space and time. A basic approach uses three different settings: batch, meaning that workers act at different places and times; on-demand, that is people come together physically or virtually at the same time for collaborative work; and continuous, in the sense of an environment which is permanently accessible for communication, presentation or collaboration purposes. Obviously, there are many exemplifications of collaborative working which require physical and timely co-presence of workers. Others need co-presence in time, but not physically, or neither of these.

ICTechnology

Convergence of information and communication technology has brought about tools and techniques that

15 N. Jastroch (1999): The Information Age – Remarks on Basics and Implications, in: Multimedia – Innovating Telecommunications '99 – www.metcommunications.de

combine to provide the technical baseline for collaborative working. Fundamentally relevant are Broadband telecoms services, VoIP, 3G mobile communication, video and multimedia devices, LAN and WAN computing, desktop video conferencing, shared application software, protocols like the session initiation protocol SIP, and standards like MPEG compression or High Definition TV and video. Enhancements will arise from advanced process modelling and simulation systems. Progress in the field of human machine interaction, in areas like speech or gesture recognition, is expected to leverage breakthrough functionality of collaborative working environments.

The applicational and organisational fit of collaboration technologies into working environments is illustrated in the chart below.
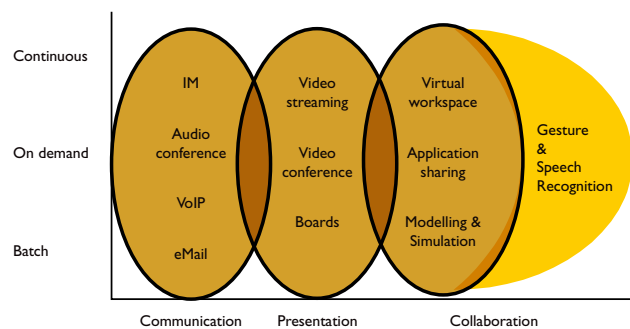
Collaboration Technologies

State of the market

As there is no such market segment as 'collaborative working environment solutions', any assessment of the state of the market is constrained to rather qualitative considerations and a couple of infrastructure indicators. Collaborative work in companies requires high performance technologies for bandwidth, high definition, quality of service, and reliability. For cross company collaboration, interoperability becomes an additional factor. In the societal environment, say for professional purposes for individuals, it is rather availability, accessibility, bandwidth, and compatibilty which enable collaborative working.

On the IT side, collaboration tools are becoming part of the commercial offerings portfolio of major global players as well as of a growing number of SME vendors specializing in this niche market. Those primarily supporting communication, like eMail, are quite established. Tools of the presentational type, for instance videoconferencing, and the collaborational type, e.g. for shared working on documents, are available now for desktop use. Advanced solutions for simultaneous working on shared applications, such as joint design and engineering, or modelling and simulation, seem to have only quite narrow markets as yet. Key technological issues for collaborative working systems appear to be

- full integration of voice, video, and application handling,
- the human-machine interface, and
- high bandwidth connections, especially in the case of cross-location or mobile collaboration.

The first one is expected to show significant progress in line with growth of the Voice over IP user base, which provides the potential market place. VoIP markets have begun to evolve with high double digit annual growth rates in subscriber numbers. Analysts forecast 250 million VoIP subscribers worldwide by the year 2011.

The second represents a field where breakthrough innovation still is a challenge. Knowledge work in collaborative environments is being hampered as long as human machine interaction is manual, by use of the keyboard or mouse. Once speech and gesture recognition are available with high performance, quality and reliability parameters, they will be able to provide this missing link between knowledge workers and their working environment.

The third issue is one of telecoms infrastructure. Only in recent years has deployment of high bandwidth telecoms technology taken pace. Proactive marketing of network operators and service providers fosters fast growth of the broadband user base. Annual growth rates of around 50% mainly in the DSL area make Europe keep apace with the US and Asian countries.

Growth of the broadband user base since 2001
(Broadband subscribers, '000)

	2001	2002	2003	2004	2005
France	618	1 696	3 658	6 751	9 957
Germany	2 338	3 370	4 573	6 966	10 997
Italy	441	1 024	2 494	4 719	6 778
Netherlands	653	1 122	1 919	3 191	4 160
Spain	542	1 310	2 234	3 447	5 066
Sweden	489	713	944	1 366	1 844
UK	349	1 365	3 211	6 246	10 072
China	971	3 379	12 111	26 726	42 684
Japan	2 828	7 805	13 596	18 630	23 093
South Korea	8 804	11 104	11 174	11 917	12 182
USA	11 214	18 251	26 426	36 008	44 932

Source: IDATE[16]

While this significantly supports the development of cross-location collaborative working environments, similar progress with respect to 3rd generation mobile telecoms will be necessary to pave the way for mobile collaborative working.

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2.7. Industry-driven Research Cooperation in Collaborative Working Environments

Introduction

The industrial vision of the CWE[17] research field expressed in this article is based on several sources of information, such as the *Report on industry-led FP7 consultations on New Collaborative Working Environments* (February, 2006), the *Workshop Report on Collaborative Working Environments in the Future Enterprise* (March, 2006) and the *Workshop Report on Collaborative Working Environments in Manufacturing* (March, 2006), among others[18]. The vision also encompasses discussions within the industry, setting priorities for the research agendas of main players in the CWE field.[19]

While many vertical technologies cover a wide spectrum of RTD activities in Europe, Europe is not addressing properly and systematically problems and challenges involving integrating technologies and application innovation through functional platforms. Consequently, Europe still remains behind other competitive economies. Europe is not exploiting its full potential to increase creativity and innovation nor productivity; **Europe is not reaching the goals set in Lisbon**. Despite the efforts and work carried out so far, several elements are still missing in the European approach. The sentence "where there's a will there's a way" indicates that most of the time our desire and motivation are the main drivers for reaching a goal. This human factor lets us see that citizens, users, workers, whichever term we want to use, are a prerequisite of the success equation. In the case of technology, humans are not only the initiators but also the receivers (technologies need to be validated and be useful for society). Even if this might be evident for all of us, European research has not relied on this human centric approach to face complex challenges: a technology-driven strategy has been at the top of the agendas.

CWE is different from most research fields. Let's look at the industrial initiatives set up so far in Europe (the so-called ETPs[20], such as e-Mobility, NEM, EUROP, NESSI, ENIAC, etc): all of them are focused on vertical technology sectors. This is necessary, but a horizontal layer is also fundamental from a high-level per-

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[16] IDATE (2005): The World Broadband Access Market – www.idate.org

[17] CWE stands for Collaborative Working Environments
[18] http://europa.eu.int/information_society/activities/atwork/hot_news/publications/index_en.htm
[19] Industrial companies that have contributed to define this vision on CWE: Atos Origin, IBM, NOKIA, Microsoft, Telefónica Móviles, Telefónica RTD, SAP, Fuji Xerox, Intel, Lucent Technologies, Siemens, Polska Telefonia, Volvo Aero Corporation, Thales, Ericsson, Bosch, Software AG…
[20] ETP stands for European Technology Platform

spective. Integration of technologies and related stand-ardisation efforts to achieve interoperability between technical solutions, systems, services and applications is one of the key factors. We have the different pieces, but we lack the integrated puzzle. No one has yet assumed the responsibility for the big picture. Nevertheless, this integrated approach requires complex capabilities that do not only fall within technical fields. More human-oriented research is needed.

Both the (1) integration approach and the (2) user-centric orientation are the special characteristics of CWE ("The problem with the technology is that it is technologically driven, but collaboration is human-centred", from the *workshop report on Collaborative Environments on the Future Enterprise, March 2006*). CWE seems to be the potential actor to put together the puzzle.

The Industrial Vision of Collaborative Working Environments

Current work paradigms very much aim at collaboration but tend to end up with specific negative characteristics such as incompatibilities between applications, data and usage patterns; a need for changes in the way people interact with each other and surrounding artefacts; communication problems derived from heterogeneous groups working together (different cultures, organisations, types of work); unresolved IPR issues, security and privacy and the need for a critical mass using the same tools in order to be productive. These well-known characteristics (problems) lead us to the desirable properties of the future CWE (**what we want to achieve**): ease of use, interoperability, scalability, service-oriented architectures, anyplace and anytime capabilities, high quality of service, security, etc. Further analysis shows which are the strong **drivers for industrial players** to invest in continuous research for future CWE:

✓ The connected nature of business demands the use of CWE.
✓ The increasing complexity of collaboration processes between different stakeholders can only be overcome with more advanced CWE that supports the flexible modularisation and orchestration of collaboration functions.
✓ The globalisation of businesses requires CWE to enable users to bridge time and space as well as cultural and organisational differences in a seamless way.
✓ The competitiveness of Europe relies on a knowledge-based economy. However the value of information can only be increased and processed through collaborative multidisciplinary processes and activities.
✓ Increased competition between organisations and nations is driven by cost reduction and revenue opportunities. CWEs will provide the platform for cost reductions through flexible process organisations, and go beyond that catalysing of value creation by collaboration, especially for services.

✓ Quality of life requirements demand CWEs that support users in a better and more flexible organisation of the work/life balance, including demographic and geographic factors.
✓ Europe is facing an evolution of the work force: changing demographics, aging pyramid, diversity, women, minorities, the gaming generation. CWE must be seen as a means of enabling the digital inclusion.

This investment has to be a common integrated effort at European level (also cooperating with appropriate international organisations when needed), since individual attempts have proven to be insufficient. According to an IDC[21] study, the size of the market of collaborative environments in 2004 was $1, 9 Billion. Western Europe had the largest market share with 41, 4%. These figures allow us to look at the future with clear optimism for European industry, but, are all the companies looking at the overall benefits of CWE as a contribution to their individual benefits? The lack of win-win thinking might endanger the success of the ambitions of this research area, which is still emergent, but not yet in the mainstream of enterprises. A preliminary description of some of the **interests on CWE confirmed by the European IT Industry** might be summarized as follows:

• **Telcos and mobile operators**: further research on how business models can help (mobile) organisational teams to operate on a European level.
• **Embedded (HW & SW) systems industry**: development of new collaborative "gadgets" making devices able to collaborate may have an impact on the whole industry. This may range from consumer electronics, to applying informatics in the home (domotics) to novel appliances and industrial control systems. The focus on collaborative workspaces makes this field especially important for the future of collaboration.
• **Enterprise application developers/ providers**: future collaborative applications will likely be based on the Service Oriented Architecture (SOA) paradigm. The existence of a reference model together with reusable components and systems will facilitate further work in this respect.
• **Systems integrators**: this group is presented as one of the main exploitators of the extensible common reference architecture to allow inter-working and to integrate all paradigms (P2P, client-server…) and ontologies for new collaborative spaces. This industrial group may gain substantial advantages for their work based on breakthrough in interoperability and security.
• **3rd party service and software providers** (of collaboration services): some opportunities envisaged for this group are based on software development kits for collaboration services, context adapted messages and SME-focused services.

[21] COMPETITIVE ANALYSIS: Worldwide Integrated Collaborative Environments, 2004, Mark Levitt, Robert P. Mahowald.

RTD Challenges in Collaborative Working Environments

Some of the RTD challenges on CWE highlighted so far by industrial organizations are presented here, though the list is not restricted to these proposals.

✓ **Cooperativity,** meaning by this the usability of a CE for a group and a collaborative process.

✓ **Context-oriented data mapping:** ability to present information with multiple methods and representations and to create audience specific views based on the different roles and IPR interests involved in a collaboration process.

✓ **Enabling of rapid context switching and content roaming:** systems that enable rapid context switching and that provide immediate awareness on the state of the affairs in a collaborative process.

✓ **Support for the life cycle of shared artefacts.** Current CWE focus on collaboration functions that are separated from the shared data.

✓ **Pervasive collaboration:** media other than the PC-based desktop: ePaper, augmented and mixed realities, ubiquitous and ambient technologies.

✓ **Synchronous & asynchronous cross domain communication/collaboration:** integration both working patterns.

✓ **Communities, including virtual communities of practice and communities of interest:** development of software which supports the creation, persistence and effective action within communities is needed.

Because CWE refers to a general integrated research domain but also deals with the user experience in specific working environments, additional RTD challenges related to the coverage of rural environments, manufacturing and engineering, aeronautics and automotive industries, etc are a must for this area.

Conclusions: the need for an Industry-led initiative in CWE

IT Industry representatives clearly state the need for further research on collaborative environments in FP7 (2007-2013) and onwards. Current solutions are far from competitive commercial products, standardisation is still in a very immature phase and real user-centred requirements have not yet been considered. In spite of some efforts in putting several multidisciplinary pieces together (societal, policy, organizational, business, technological challenges), the puzzle is still incomplete…but this gives us the opportunity to become a powerful and competitive knowledge-based society in the coming years.

The CLOCK project firmly defends the proposition that CWE as a research area is the opportunity for Europe to integrate those pieces of knowledge that no other research field is dealing with in a holistic manner and to overcome the barriers that have prevented Europe from creating the potential economical growth and value it obviously could. It is the European challenge; it is

OUR challenge. With this mission and these motivations in mind, **CLOCK is already working on an Industry-led initiative that will pave the way for that to happen**. We encourage you to join us and SHAPE YOUR FUTURE WITH US!

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2.8. A Common Reference Architecture for CWE

Introduction

The first IT tools helping individuals to collaborate at work have been computers, office applications and storage media, followed afterwards by local office networks, enabling mainly files transmission and shared repositories. The key revolution came with the success of the Internet by which multimodal communication between individuals, information/documents sharing and business portals over the Web have led to a basic global cooperative service infrastructure benefiting quite different communities.

Although the Internet worldwide experience has revealed the seeds of Collaborative Working Environments (CWE), we are still far from easy-to-use, ubiquitous and collaboration-focused services targeted to improve the efficiency, productivity and work-experience in different working scenarios.

Inspired by the Internet Service model, effectively designed and used during decades to innovate, develop and evolve interoperable worldwide-successful cooperative services, the OCA WG (Open Collaborative Architecture Working Group) will do research on the vision of CWE as a collaborative interoperable services model. Following this idea, the aim will be to define this service model, namely: "Common Reference Architecture", as a collection of standards on interfaces, data objects, protocols and APIs allocated into a layered structure.

It is important to note the "Common Reference Architecture" should not be understood as a traditional architecture, since its goal is not to describe a fixed structure for CWE software platforms. On the other hand, it should be considered as a meta-architecture creating a common language for collaborative services representation and description so that the collaboration aspects can be discussed. Thanks to a multidisciplinary approach to joint research, it will be possible to commonly define several interoperable collaboration services for almost all working scenarios. Besides this, those collaborative services specific to concrete working communities will be at least mutually interoperable and the coherent with the common ones.

The main working communities and scenarios expected to contribute within the OCA WG to research

on the Common Reference Architecture are rural & remote areas, e-engineering, e-professionals, automation & robotics workplaces and digital contents production.

Why is Interoperability a key goal?

If the collaborative services which are common to different working scenarios are designed and developed keeping interoperability as a main goal, the requirements coming from different communities will enrich the final result and, at the same time, the number of potential users will be dramatically increased maybe reaching the success critical mass. Obviously, some working scenarios will demand specific services or environments which are not required in others, but interoperability is still a benefit as they will be more easily combined within them and the common ones enhancing the service composition capability.

Based on this strategy, where the real value relies on public standards describing the collaboration service model, CWE business possibilities are much higher. As in today's Internet the users will be able to choose different technology alternatives, software platforms (proprietary or open source) and service providers (best effort services, quality guaranteed service providers, services aggregators, CWE providers).

## Requirements for a Common Reference Architecture

As described above, collaborative services interoperability will be the main requirement considered. Other secondary requirements, still to be discussed within the OCA WG, are the following:

- Flexibility: "The architecture (meta-architecture) must provide the choice". This statement means different technology alternatives and business models will be considered, the meta-architecture will be agnostic in both senses and will only define the interface points and common standards to enable the service itself.
- User-driven Technology strategy: the main flow of requirements will be top-down, meaning the working community drives overall requirements. A secondary bottom-top or "technology-push" requirements flow is also considered.
- Encapsulation of basic resources: to enable a common view of different scenarios the first step will be to identify basic resources and encapsulate them in standard and easy-to-exchange components.
- Virtual resources: means combining basic resources into a single virtual one.
- Orchestration vs. integration: high-level end-user collaborative functions are not to be obtained just by integrating basic resources. On the other hand, more complex processes are needed to orchestrate them towards this functional composition.
- Adaptability to the working environment and community: once the services are defined in a common and flexible way, there should be a kind of instantia-

tion methodology and/or process supporting those generic services to be customized to each specific environment and user community.

Initial proposal of a Common Reference Architecture

As a starting point to work on the collaborative services description or meta-architecture, the model depicted below has been proposed for discussion:
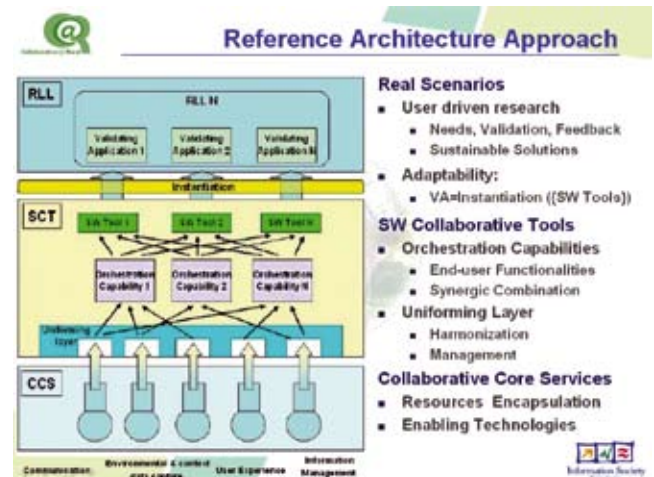
Emerging Ideas

A new model of Internet contents development is emerging. Present technologies enable the interactivity of users with a final set of documents or portal services provided by Web. The infrastructure is now being changed to enable the contents to be evolved by an iterative and asynchronous participation of dozens or even hundreds concrete community members.

An emerging idea for CWE is allowing each working community to build their own composition of basic collaborative services and features in a "Collaborative Service Space", in the same way blogs and wikis allow the users to create and evolve documents. According to this idea, the orchestration processes will be those combining the basic services and providing the necessary "glue software and processes" to have a working result after each CWE iteration triggered by one of the community members.

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Sources: NG-CWE Expert Group reports
        and discussions
        http://europa.eu.int/information_
        society/activities/atwork/work_
        paradigms/experts_group/
        index_en.htm

2.9. eLearning and eSkills

The second of the i2010 Annual Report Actions referred to in Section 2.3, the Investment and Innovation in Research cluster, are the links in the value chain called eLearning and eSkills.

The availability of adequate ICT skills is an important condition for the competitiveness of enterprises and the successful implementation of the Lisbon strategy. The development of e-business is increasing the demand for individuals with creativity and higher-level conceptual skills enabling enterprises to increase productivity and produce greater economic value. Improving the availability of ICT and e-business skills (e-skills) involves actions at EU and national level, in several areas: education, training, industry and labour policies primarily, but also in other domains such as immigration, global sourcing, taxation and research. Learning and training supported by information and communication technology (e-learning) is a powerful tool to increase the lifelong acquisition of relevant skills.

Background

The European Commission supported in the 90s the Career Space[22] initiative of 11 leading ICT companies and established an ICT Skills Monitoring Group in September 2001 with representatives of all Member States. The setting up of the European eSkills Forum[23] has been welcomed by the European e-Skills Summit organised with the Danish Presidency in October 2002 and by the Council Conclusions of 5 December 2002 on ICT and e-business skills in Europe. The objective is to provide an open platform to promote consensus building on e-skills issues and the resulting policy challenges.

All relevant stakeholders (industry, academia, unions etc.) as well as Commission services, CEDEFOP[24] and the OECD, were represented and contributed actively to the activities and conferences. Four working groups have been established focusing on supply and demand, social change, international dimension and public-private partnerships. A workshop on e-skills industry certifications was organised on 24-25 March 2004 in Brussels. The Forum delivered its synthesis report "*e-Skills in Europe: Towards 2010 and Beyond*" in September 2004. The report was discussed at the European e-Skills 2004 Conference organised in co-operation with CEDEFOP and the ICT industry on 20-21 September 2004. A Declaration was adopted supporting the analysis and the recommendations of the Forum, inviting the EU to adopt a comprehensive strategy for improving ICT skills and training and recognising that the way forward is through multi-stakeholder dialogue and partnerships for actions.

The way forward

The recommendations have been followed up by means of studies, projects, standardisation initiatives, development of statistical modules etc. An accurate picture of the supply and demand of e-skills is available and the ground has been cleared in particular for the development of foresight scenarios and a European e-competence framework. A major European benchmarking initiative on the policies and the initiatives in support of e-learning for enterprises has also been launched.

The Cambridge conference "*e-Business: The Way Forward*" of December 2005 confirmed that European enterprises see the **need for a long term EU agenda** to ensure adequate e-skills for the future across both workforce and population.

The achievement of this will require action at both EU and national level in a number of areas. These include education, training, industry and labour policies. But there is also a need for action in fields such as immigration, taxation and research. Above all, there is a need for co-ordination to ensure that actions pull together and that the initiatives of different stakeholders are encouraged. This requires planning and consensus of stakeholders in the long term and political commitment to enable the plans to be implemented.

There is a need to build on the momentum to foster synergy, to better channel efforts at all levels and facilitate initiatives of all relevant stakeholders. The goal is to ensure that Europe's workforce and population is adequately e-skilled for the future. There is a strong support from industry and social partners for this objective. The ICT industry confirmed the need to develop a long term strategic approach to e-skills and a number of leading ICT companies launched a European Alliance on Skills for Employability[25] in January 2006.

A Task Force[26] on the competitiveness of the ICT sector and ICT uptake was established by the Commission in June 2006, with e-skills and employability being one of its priorities. At the same time a new expert group on e-learning and e-skills composed of representatives of the relevant Ministries from the Member States was established to monitor on-going projects and advise the Commission.

The European e-Skills 2006 Conference[27] (5-6 October 2006, Thessaloniki) will be a key milestone. The outcomes of the conference will be used to prepare a long term strategy in Europe to ensure adequate e-skills for the future across both workforce and population. A policy communication and an action plan on "*e-Skills for Competitiveness, Employability and Workforce Development*" would be adopted early 2007. This would be followed by a complementary initiative on e-inclusion in 2008, which was announced in i2010.

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[22] www.career-space.com
[23] http://ec.europa.eu/enterprise/ict/policy/ict-skills.htm
[24] www.cedefop.europa.eu/

[25] www.e-scc.org/alliance/default.aspx
[26] http://ec.europa.eu/enterprise/ict/taskforce.htm
[27] www.e-skills-conference.org

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2.10. New working paradigms

In the last decades, the working environment and conditions have changed due to the growing influence of the introduction and use of ICT. The main drivers have often been the need to increase competitiveness in the short term and not always to improve the quality of work. This approach has had an important influence on the way **work organisation and working conditions** have evolved.

According to a recent Eurobarometer survey 2005[28] the European population using a personal computer at work (or at home for work) in general seems to appreciate the positive effects of ICTs at the workplace: ICT users are of the opinion that they carry out their job more effectively (87% agree), they have more skills in their job (85%) and experience more job satisfaction (63%). A slight majority also feels that ICT make it easier to combine work and personal life: 55% agree, but only a mere 51% of women.
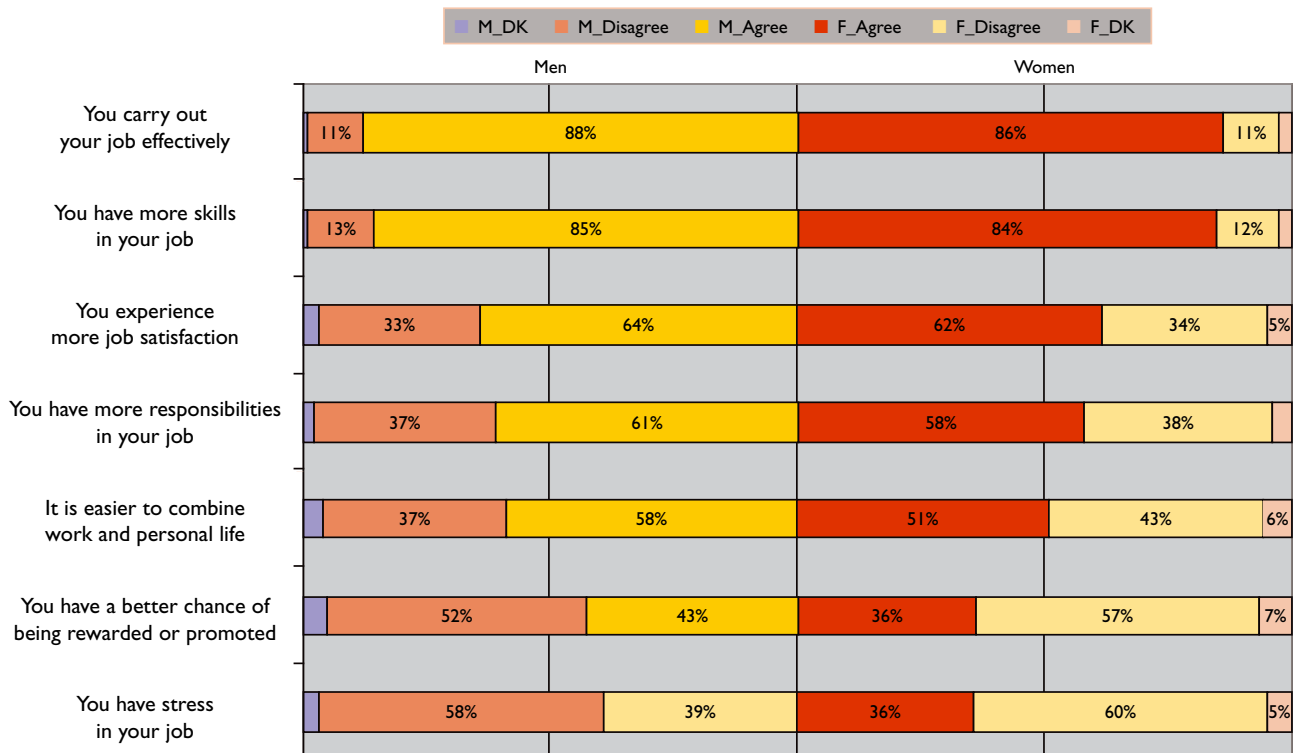
However a majority of employees does not see any benefit of ICT use for their career prospects: only 36% of women believe ICT improves their chances of being rewarded or promoted. Even though men seem to be in general more positive about the impact of ICT on their work, only 43% of male employees see a positive impact on their career. When asked whether ICT use at work reduces stress in their jobs, 59% disagree and only 38% agree with this statement.

Initially the introduction of ICT was expected to bring greater opportunities to improve the return on skills. It was also thought to provide more autonomy, bringing more responsibility, creativity and collaboration between employees and to allow working in a flatter hierarchical model and with greater freedom from numerous control mechanisms. However the real trend in the majority of enterprises shows that the work in the knowledge society has evolved in a way that presents risks for the quality of working conditions. If these factors are not kept under control and taken into account in the re-organisation of work and the re-engineering of workplaces, the decrease of quality of work through uncertainties, stronger time pressure at work etc. generates more work-related stress with increasingly negative impacts on health, safety and well-being at work as well as on innovation[29].
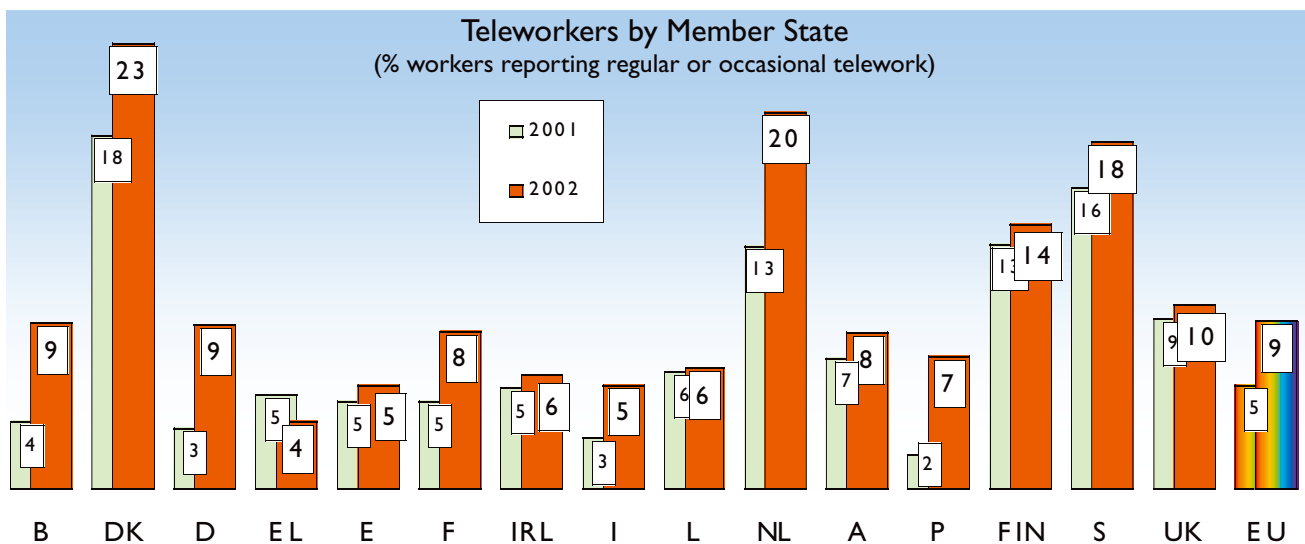
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[28] Special Eurobarometer 218 "Information and Communication Technologies and the workplace", Feb 2005 – Fieldwork November/December 2004

[29] "Health and ageing in the knowledge society: employment, social cohesion and e-health potential"; Working document of the High Level Group ESDIS, 2006

Impact of the use of ICT on your work

Base: population using a computer at work or at home for work.

Teleworkers by Member State
(% workers reporting regular or occasional telework)

Legend: 2001, 2002

	B	DK	D	E L	E	F	IRL	I	L	NL	A	P	FIN	S	UK	E U
2001	4	18	3	5	5	5	5		6	13	7		13	16	9	5
2002	9	23	9	4	5	8	6	5	6	20	8	7	14	18	10	9
								3				2				

Source: Eurobarometer, Oct. 01, Oct. 02

Working situations can be improved with the high potential which ICT applications represent. Nevertheless it is of utmost importance that the applications which are introduced are well designed in an ergonomically sensible way and that they are integrated into the working processes and fully take into account the way employees work (e.g. respecting their operational stereotypes).

Some examples² show that a well conducted approach to **adapting workplaces** through the efficient use of ICT must be based on a thorough multidisciplinary diagnosis of the initial working situation and conditions, the **analysis of user needs and the requirements of the enterprise**. In the planning phase, a **holistic view** helped to foresee changes in the workflow and their consequences for the initial situation, taking into account the changes at all levels (new competencies needed, modified working procedures, new necessary assistance systems, optimisation of the human-machine interface etc.). The implementation and evaluation has been carried out in close interaction with the personnel concerned. In this way a sustainable solution has been found **improving the motivation and competencies of the employees** as a major factor for the productivity of the company. At the same time a considerable amount of stress has been prevented, with all its consequences for workers' health and the economic results of the enterprise.

Therefore, when introducing ICT in the workplace and reorganising work, it is important not only to change specific elements with a view to short-term economic benefits, but to adopt a holistic view taking into account the whole working situation including the social elements and the balance with private life. Good examples exist and the elements which are transferable could be taken over.

Requirements from the demographic change

The demographic changes highlighted in the Green paper[30] put some important requirements on the work-

ing environment. One factor is the improvement of the work-life balance, another one the better participation and integration of older persons in the labour market and in the activities of society.

In order to improve the **work-life balance** within the perspective of the demographic change it is necessary to support the situation of parents as employees. Flexibility in space and time could provide efficient solutions for the work-life balance.

Telework is one possible solution. As ICT permits e-working from home or other remote locations it is a mechanism to reduce employee commuting and to promote family-friendly work practices.

For employers, there is evidence that family-friendly e-working arrangements are useful in helping to retain valued staff.

Solutions for flexibility time-wise could be provided through part-time work schemes or job sharing solutions. In particular the tools developed for collaborative working could be extremely efficient for both employees and employers if they are adapted with a holistic view to the specific situations of parents and their family constraints as well to those of the employers.

The Green book on demographic change reveals also the potential of a more active and healthier older population in Europe. This has consequences for the ageing workforce. To use the experience of older persons and to keep them active in work or in societal activities is not only important for employees and employers but also of benefit for the economy and society as a whole. Therefore, raising labour market participation has become a priority. To promote **active ageing** requires knowledge on the characteristics and requirements of older persons in order to rethink the way work is organised. This implies adapting work processes and tools to the changing age structure of the workforce as well as making working arrangements more flexible as the quality of jobs has an influence on the decision to stay in a job and in the labour market. For example the employment rate among older workers (55-64) in Finland has increased rapidly in recent years, (from 35% in 1995 to 50.9% in 2005). This rapid increase has been brought

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[30] Green Paper "Confronting demographic change: a new solidarity between the generations" COM(2005)94 final

about in particular also by attention to older workers' well-being in the workplace.

A particularly important issue in relation to technological change is the extent to which the ICTs used in the workplace are designed in ways that take into account the changes occurring with ageing. Both employers and the suppliers of workplace ICTs have key roles to play here. These issues have been under investigation in EU research projects.[31] [32]

In the perspective of work-related trends in the knowledge society, workers as they grow older may find their working conditions worsening (about 20% of computer users at work in the EU are aged 50 and above). Especially long hours of work, the intensification of work, time pressure and information overload are less compatible with their needs and lifestyle (EWON, 2001)[33] and are likely to have negative implications (empirica et al. 2005).

Consequently, in order to keep older workers in employment, it is crucial to design and adapt the ICT tools at the workplace to the workers' requirements. The research study by empirica specifies that in particular the following aspects need to be considered:

• Accessibility and usability of ICTs for older workers: The interactions between age-related changes in physical and cognitive functions and more specific characteristics of ICTs and ICT-based work are a central issue for the maintenance of the working capacity of older workers.

• ICT-based assistive technologies to support the ability of the older worker to carry out particular work tasks: Assistive technologies, ranging from low- to high-tech devices and systems can in particular provide supports for workers with physical or cognitive difficulties in the wider aspects of their jobs.

Both are areas that need more research attention in the future.

In summary, the following key aspects should be addressed to maximise the opportunities and minimise the risks for older workers:

• Organisation of ICT-related work to suit the needs of older workers ("calmer" technologies and "calmer" work)
• Design of ICTs to cater for age-related changes in perception, dexterity and cognition
• Exploitation of ICT-supported opportunities for age-friendly flexibility in work
• Exploitation of assistive technologies to support working capacity of older workers
• Equality of opportunities to acquire and maintain ICT-related skills and competencies.

It is evident that the use of ICT tools for the working environment and organisation can contribute efficiently to the improvement of the quality of work as well as to the solution of related societal problems high on the political agenda if they provide for enough flexibility and take into account the requirements of the various user groups.

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2.11. CWE in Manufacturing

Manufacturing is an industry where Europe has strengths in many sectors, and ICT supporting Collaborative Working Environments has been identified as an important enabler of both improved productivity and increased competitiveness in manufacturing.

The increasing trend of globalized distributed manufacturing relies heavily upon swift effective collaboration between disparate people, groups and teams, agility in enterprise, and acceleration of customization in world markets together with competitive ideas and products. This has great implications on European activities relating to the manufacturing industry, especially SMEs which are a mainstay of the economy and are facing greater intrusion of outside competitors that threaten their livelihoods. In this fast changing economic landscape, technologies and environments that both support and encourage collaboration are essential to make the best out of the European skill and talent base and to extend it still further such as to a vital impact on growth and competitiveness and, at the same time, help to foster a new climate of creativity that will spawn essential new innovations, to continue to support the economic and social life of all Europeans.

Economic changes have forced the larger companies to work in more strategic partnerships with local production and other companies near to local markets, or to form adaptable value networks evolving from the more relaxed supply chains. This means that relationships have to be improved between people with different activities across all parts of the product life cycle, within a company and its extended enterprise, across the whole network of company entities, as well as with customers and business advisors. It is essential to have trusted collaboration proactive and reactive activities and at the same time to protect intellectual property. By this means greater effectiveness, efficiency and high quality results should spur on competitiveness and generation of innovation.

A growing trend is that of a service provision whether it is design, logistics, production or other activity sector in the field of manufacturing. Basically resource capacity, time, expertise and quality of service are offered through may be a One-Stop-Shop, or through network formation processes in eMarkets or otherwise. This

[31] empirica et al. The demographic change- impacts of new Technologies and Information Society. Final Report, 2005
[32] Active@work: www.iccrs-international.org
[33] EWON (2001): Integration of the ageing workforce. Thematic paper presented to DG Employment and Social Affairs. European Work Organisation Network, November 2001. Online available at: http://www.dwp.gov.uk/asd/asd5/rports2003-2004/rrep200.asp (accessed August 2005)ì

service facility also needs very close collaboration between business partners and engineers, shop floor workers, marketing personnel and so on.

The view on the types of collaboration necessary depends on activities involved and what part of the product life cycle is considered, whether the industry is capital intensive or labour intensive, whether it is intra shop floor, intra extended enterprise, intra company in the network constellation, cross domain, inter academic institute and industry, inter ICT suppliers and manufacturing industry or involving the customer, and so on. It involves communication and collaborations between individuals, or groups, or transitional teams and between people located in different global locations, in different environments of factory, office, home, location of problem under discussion and so on. These communications can occur at any time in the now 24/7 world and have to be responded to in real time. It is a highly dynamic environment and requires the right skills and right tools to deal with it effectively and with the desired quality for all those involved in the collaboration activity.

An important contribution to collaborative working environments for engineering and design will be provided by the **CoSpaces**[34] integrated project. CoSpaces focuses on the development of organizational models and distributed technologies supporting innovative collaborative workspaces for individuals and project teams within distributed virtual manufacturing enterprises to establish effective partnerships, collaborate, be creative, improve productivity, reduce the lengh of design cycles and take a holistic approach to implementing product phases. This will be achieved through enhanced human communication, innovative visualization, knowledge support and natural interaction and aims to transform the current working practices to be more competitive in the global market.

Collaborative Working Environments in Manufacturing have been significantly improved through the application of Virtual Reality technologies. The automotive and aerospace manufacturing industries are both pioneers in the use of these technologies and their main focus has been on using virtualization to avoid the costs and time associated with constructing physical prototypes. The **INTUITION** network of excellence on *virtual reality and virtual environments for future workspaces* aims at establishing VR in the product and process design and serving as a roadmap for future evolutions and research activities in this area. The project focus is on the identification of user requirements and wishes and also new promising application field for VR technologies, while structuring and integrating research efforts in VR in Europe.

The application of Ambient Intelligence (AmI) Technology can also be considered as a key enabler to achieve advances in the collaborative working environment. The **AMI-4-SME** project proposes a new scheme for systemic innovation of industrial working environments in SMEs by deploying AmI potentials in daily operation.

They will develop and validate new models of business processes for flexible manufacturing, specifically tailored to the needs of SMEs, based on "Ambient Intelligence philosophy".

By fostering application of AmI and Knowledge Management Systems, the **InAmI** project will directly contribute to a promotion of human centred manufacturing concepts and by this will considerably contribute to a radical improvement of working conditions in manufacturing industry. The main objective of InAmI is to provide a breakthrough in CWE based on effective usage of advanced combination of Agent, Ambient Intelligence and Semantic-Based Knowledge Management technologies to support efficient collection and utilisation of information/knowledge relevant for the collaborative decision-making processes between sub-systems in the working environment.

Within the scope of collaborative manufacturing environments are also to be considered the natural languages involved, the jargon employed for different activities, multiple cultures involved for the different localities, as well as the product customs. As today's product quality has moved beyond functionality and usability to satisfying people's subjective and emotional lifestyle needs, this can only be achieved by breakthrough knowledge-based changes in the conception of products. It is the ambition of the **ENGAGE** coordination action to promote the use of Affective Engineering for industry and open the EU industry towards a knowledge based economy in the area of satisfying people's subjective and emotional lifestyle needs.

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New Working Environments

2.12. Sustainable growth in CSR driven collaborative work places in the global service economy

Sustainable growth is a cross cutting objective underpinning all Union policies, strategies and actions. In this context, the role of ICT is of particular importance for creating sustainable growth and employment. There is now good evidence that ICT s makes a major contribution to economic growth accounting for 40% of Europe's productivity growth and for 25% of EU GDP growth.[35]

ICTs have a strong potential for contributing to sustainable growth through accelerated technology devel-

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[34] see project stories in chapter 4

[35] European Commission, A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development, COM (2001) 264 final

opment, business innovation and structural changes.[36] However the sustainable use of ICT in itself will only deliver sustainable growth if systemic approaches are followed at all levels of policy-making by governments, civil society and businesses.[37]

Civil society and people and businesses have to be major actors in changing work practices in more sustainable ways through the necessary enabling technologies and smart regulatory frameworks. ICT-based services and new collaborative working practices enabled by remote working and videoconferencing can lead to major positive sustainable and wide impacts.

Mobile work can deliver positive contributions if this leads to a reduction of movement required and not just a decoupling of space and time.[38] New collaborative work models, flexible in time and place, with the greater use of shared workplaces and more work in local communities can restrict transport growth, but it has to be followed by appropriate structural changes in the work organisation within companies.

There are three major drivers from the ICT sector leading to technology –based sustainable growth and they are: acting in conformity with regulations, enhancing a company's good reputation and realising the efficiency benefits of their own technologies.

Business led initiatives show the merits of Corporate Social Responsibility (CSR) and triple-bottom –line reporting by European ICT industries.[39]

The first step is to apply better indicators to measure progress and impacts and thus develop the appropriate sustainable indicators in order to increase our knowledge and understanding of sustainability.

The SIBIS[40] project has produced a comprehensive approach to measurement within the Information Society. There is a growing trend for companies to want to measure and report not only on economic figures, but also on social and environmental aspects of business activity.

This is witnessed by initiatives like the Global Reporting Initiative[41] and by "sustainability" indexes being introduced by major stock markets[42] and by a European business campaign on corporate social responsibility.[43]

The ICT sector can take broader leadership in an integrated approach to Corporate Social Responsibility, because its competitive standing is dependent on high-skills, continuous learning and motivated creative employees showing innovativeness.

CSR is now recognised and well established, focusing on delivering social benefits, better inclusion in the labour market and improvement of working conditions where companies are putting systems in place which by assessing supply-chain management of suppliers and subcontractors go beyond pure economic figures.

Recently the ISO, the International Organization for Standardization has agreed to launch an International Standard for providing guidelines for social responsibility and it is planned to be published in 2008 as ISO 26000 and will be voluntary to use.[44]

The increasing interest shown in CSR and environmental reporting is the result of more attention being paid to areas other than financial information. Intellectual assets reporting is also designed to promote the companies' reputations in the wider market place, not only to specific stakeholders but also to the general public.

The Commission is pursuing its effort and its commitment to promoting CSR resulting from the Green Paper and a communication and the setting up of an EU Multi-Stakeholder Forum on CSR which is organising a review meeting with all stakeholders to develop the its scope and boundaries .

It was confirmed at the March 2005 Spring Council that the Commission recognises that voluntary business initiatives, in the form of CSR practices, can play a key role in contributing to sustainable development while enhancing Europe's innovative potential and competitiveness.[45]

European companies, by behaving responsibly wherever and whenever they operate, in accordance with European values and internationally agreed norms and standards, and because their long-term success is about making profits while caring about civic society and their employees' well-being, make their employees more loyal and committed to the wider societal goals of sustainable growth.

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[36] Hughes, B.B. and Johnston, P.D. (2005) Sustainable Futures: Policies for Global Development, Futures, Vol. 37, No 8, p. 813-831; Luukkanen, J., The Information Society and Dematerialisation, Visions of the Information Society Conference: EMPA, St. Gallen, Switzerland, 3-4 November 2005

[37] Pamlin, D. (2005) Eco-friendly actions, www.i4donline.net/aug05/strategicarea.pdf

[38] www.digital-eu.org

[39] Corporate Social Responsibility is defined by the Commission as: "Companies integrating social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis" COM (2001) 366 final.

[40] Statistical Indicators Benchmarking the Information Society, IST-26276. www.sibis-eu.org.

[41] www.globalreporting.org

[42] Dow Jones Sustainable Group Index (1999); FTSE4 Good (7/2001)

[43] www.cseurope.org

[44] www.iso.org/sr

[45] COM(2005)24 final

2.13. Civil Protection and Crisis Management Collaboration

The European Commission has been funding research in the past on natural disasters and civil or industrial hazards since the late 1980's, via its Framework Programmes for research and technological development. Until now, most of this research has focussed on the understanding of underlying processes and hazard assessment, trying, for example, to shorten the response time of civil protection services by providing forecast, early detection and warning systems. Recently, European Commission funded research, has followed more holistic approaches which go beyond classic early warning systems or hazard/vulnerability assessment, and more importantly address the entire risk and emergency management cycle.

In the context of risk and emergency management, research on new working environments could enhance collaboration and empower the crisis manager and the agents in the field. Efficient **collaboration**, **coordination** and **interoperability** of all actors are the key issues in disaster and crisis management; Information and Communication Technologies (ICT) can help to achieve high effectiveness in those matters.

One of the user requirements for IT systems in crisis management, repeatedly presented, is that those systems should be structured in a way that could allow decision makers at local level to directly access ("pull") information they seek rather than having to depend on –sometimes inappropriate- information being "pushed" to them. On the other hand, to be useful in a crisis or disaster an IT tool must be, although infrequently used, capable of being handled routinely: people tend to fall back on what they are comfortable with, particularly in a crisis.

It is true that standards ease interoperability, can foster increased information and lower costs. For example, **OASIS** Emergency Management Committee[46] is to develop XML specifications for enabling information exchange to advance incident preparedness and response to emergency situations. However, lack of common semantics between civil protection operators is an inhibitor for effective establishment and spread of standards and consequently for the use of IT tools.

Recognising the limitations of fragmented IT infrastructures, many governments around the world are seeking to transform their armed forces and public services, establishing more closely networked organisations that will deliver capability through the exploitation of information technology. These solutions aim to combine existing knowledge to formulate, design, develop, implement, deploy and support large system integration solutions, linking the widest possible range of individual platforms and subsystems into a single effective network.

So far in the 6th Framework Programme several NWE research projects have been trying to improve those infrastructures by providing advanced services in the front end (operational groups on the field) and back end (operation centres). Those services, in principle, consider the geographic location and distribution of the users and try to provide automatically optimum connectivity and important and necessary information in minimum time and with minimum burden for the civil protection agent on the field.

For example, the project **AMIRA**[47] is trying to improve the accessibility and resources available to support urgent and critical diagnostics and decisions that must be taken by mobile teams, or individuals. For this purpose **AMIRA** is developing a wireless, easy to use, intelligent, real-time diagnostic decision support application. The application can be accessed via multi-modal devices such as wireless earphone/microphone, PDA, mobile telephone, or laptop and gives the possibility to the operator to access seamlessly different types of knowledge. With simple queries it is automatically deducing which knowledge source is best suited to answer a specific question and thus provides high quality responses.
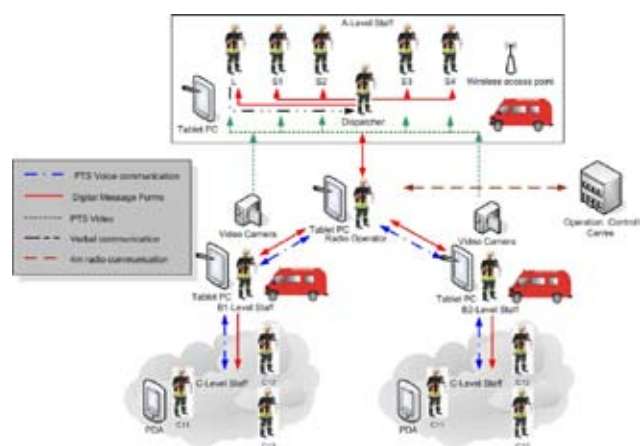
SHARE Principles

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[46] www.oasis-open.org/committees/tc_home.php?wg_abbrev=emergency#overview

[47] Advanced Multi-modal Intelligence for Remote Assistance, www.amira.no, FP6 511740. See all project stories in chapter 4.

Similarly to the project **AMIRA**, project **SHARE**[48] aims to provide critical multimodal communication support and information resources needed during the rescue operation. Push-to-Share is based on Siemens Push-to-Talk mobile technology, which offers members of a user group direct voice communication at the simple press of a button. In a similar way, SHARE aims to provide data services for advanced digital map navigation, multimedia indexing while using ontology-based knowledge management to its end users. An advanced system prototype will be extensively tested by the Fire Department Dortmund.

In most cases of crisis or disaster management communication and decision making needs to be assured as the traditional networks like GSM can be overloaded and there is no guarantee for dedicated private networks (e.g. TETRA) in every case. Project **POMPEI**[49] tries to tackle, amongst others, this problem. The proposed solution integrates P2P protocols, location and presence services and mobile workflow management on a state of the art mobile platform. The decision support is provided immediately through data collection/interaction from the mobile group of agents on-site. They can provide real time information, can be supported by services based on their location and presence and in some cases they can take control of the situation as information will flow not only to and from the control centre but also laterally in order to provide a comprehensive understanding of the situation as it evolves.

P2P network and the optimisation of work collaboration between back end and front end is also the scope of **WORKPAD**[50]. The project will use the idea of P2P in a 2-level framework for emergency scenarios: a back-end peer-to-peer community, that will provide advanced services requiring high computational power, data and knowledge and content integration, and a set of front-end peer-to-peer communities, that provide services to human workers, mainly by adaptively enacting processes on mobile ad-hoc networks.

The integrated project **LIAISON**[51] aims at providing end-to-end solutions for a wide range of mobile workers communities (Fire Brigade, Police, eMaintenance, Taxi, Waste Management) in their daily life, for seamless and personalised location services across heterogeneous networks. Several of its research challenges (e.g. providing high outdoor but also indoor localisation accuracy) are of particular interest for civil protection and crisis management. Test cases include users like the Italian Ministry of Interior, department of Fire Services, and UK association of police officers.

Another Integrated Project, **WearIT@Work**[52] develops new wearable mobile computing that supports workers in complex tasks while on the move and/or in critical environments. Partners include Paris fire service as well as makers of fire services and rescue equipments.

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2.14. ESA a Best-Practice in European Collaboration

The European Space Agency (ESA) is an excellent example of successful **European Collaboration**, or as said by Antonio Rodotà, ESA Director General from 1997 to 2003: "Building on the lessons learned from ESRO and ELDO, ESA has become an outstandingly successful model of European scientific and technical collaboration. Its contribution to the **development of a collective European space capability** has been fundamental. The Agency has played an important role not only in space but also in uniting Europe".

ESA, Europe's gateway to space, in its current form was founded in 1974 when its predecessors ESRO (short for European Space Research Organisation) and ELDO (short for European Launcher Development Organisation) merged. At that time it was constituted of 11 founding members but during the years it grew to include 17 Member States, about 1900 staff with a budget of about €3 billion in 2006. Its mission is to shape the development of Europe's space capability and ensure that investment in space continues to deliver benefits to the citizens of Europe. By coordinating the financial and intellectual resources of its members, it can undertake programmes and activities far beyond the scope of any single European country, in a word an example of **collaboration for creativity and productivity**.

ESA's job is to draw up the European space programme and carry it through. The Agency's projects are designed to find out more about the Earth, its immediate space environment, the solar system and the Uni-

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[48] Mobile Support for Rescue Forces, Integrating Multiple Modes of Interaction**,** FP6 004218, www.ist-share.org

[49] Peer-to-peer location and presence mobile services for managing crisis and disaster situations, www.pompei-eu.com

[50] An Adaptive Peer-to-Peer Software Infrastructure for Supporting Collaborative Work of Human Operators in Emergency/Disaster Scenarios, FP6 034749

[51] Location bAsed servIceS for the enhancement of wORking environment, http://liaison.newapplication.it

[52] Support of mobile work by wearable computing, www.wearitatwork.com

ESA is Europe's gateway to Space

verse, as well as to develop satellite-based technologies and services, and to promote European industries. ESA also works closely with space organisations outside Europe.

ESA's 17 Member States are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. Furthermore, Canada, Hungary and the Czech Republic also participate in some projects under **co-operation agreements**.

As can be seen from this list, not all member countries of the European Union are members of ESA and not all ESA Member States are members of the EU. ESA is an entirely independent organisation although it maintains close ties with the EU through an ESA/EC Framework Agreement. The two organisations share a joint European strategy for space and together are developing a European space policy.

The need to reinforce Europe's capabilities in space is becoming ever more apparent as Europeans rely on satellites for communication, navigation, monitoring the environment, developing innovative technology and increasing scientific knowledge. Beyond the development of joint initiatives between the two institutions, the EC has a major role to play in heightening political awareness of space and in ensuring a regulatory framework to support the development of space activities.

Recent joint initiatives include the European global navigation satellite system called Galileo, as well as the Global Monitoring for Environment and Security services, known as GMES, that was endorsed by ESA's December 2005 Ministerial Council in Berlin.[53]

ESA has the ambition to build a large European Space community, not limited to the level of scientific coordination, e.g., in space science (including planetology, deep space, sun) for which it has the broad intention of combining efforts at global level towards common scientific goals, but also with a strong focus on industrial wide development and cooperation between "space technology countries" (e.g., France, Germany, the United King-

dom and Italy) and the rest of Europe, as cooperation has been and is the only means to achieve large scale objectives for very costly and ambitious projects.

Specific programmes have been built to involve the "less mature space technology countries" in the space sector. This has been since the start of ESA a priority goal of the European Space Agency. In the last few years, we have seen the inclusion of Portugal and Greece, and recent programmes (e.g., via the ESA PECS, short for Plan of space collaboration activities for European Co-operating State, programme) have been built in ESA to prepare inclusion of central European countries (starting with Poland, Czech Republic, Hungary and Romania). The fundamental rules are:

(1) to promote the cooperation between industrial partners in the participating countries, and

(2) the just funding return in the country for the participating member states to the so-called "optional" programmes of ESA.

The cooperation principles among ESA member states and enlarged states are defined by the political (e.g., council) and programme management boards with the major ambition to generate one European space industry to enforce cooperation between the space industries in the larger countries and those yet to be put in place or developed in the smaller ones. On the technical side, **industrial cooperation is encouraged by a number of services**. E.g. the ESA-web site hosts an area reserved for European Industry called the **ESA Industry portal**[54]. This portal is set up to help European Industry to collaboratively do business with ESA and allows it to find relevant information, register as a potential provider, consult tenders, express interest for tenders, find contact information of other interested parties, etc.

ESA has considerable experience in managing smaller as well as very large technical projects within international programmes and sharing access to very important resources. As introduced above, e-collaboration is an essential aspect of ESA programmes. Some specific examples of "collaborative working environments" in ESA are given below.

The space system engineering and, more in general, the technology development programme

A good specific example of a collaboration platform aimed at "innovation to increase productivity", implemented, demonstrated and now operationally accessible in ESA and shared with other national research laboratories and space industry, is the CDF[55], short for Concurrent Design Facility. Concurrent (or collaborative) engineering is a systematic approach to integrated product development that emphasises the response to customer expectations. It embodies team values of coop-

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[53] More information about joint initiatives between ESA and the EC: www.esa.int/esaCP/SEMFEPYV1SD_index_0.html

[54] ESA Industry portal: emits.esa.int

[55] www.esa.int/cdf

ESA CDF Panoramic view

eration, trust and sharing, in such a manner that decision making is by consensus, involving all perspectives in parallel, from the beginning of the product life-cycle. As such, the CDF is a state-of-the-art facility equipped with a network of computers, multimedia devices and software tools, which allows a team of experts from several disciplines to apply the concurrent engineering method to the design of future space missions. It facilitates a fast and effective interaction of all disciplines involved, ensuring consistent and high-quality results in a much shorter time. This collaborative platform involves major European and international space industries.

The General Studies Programme (GSP)

It is aimed in particular at analysing strategic technologies. A reference human and infrastructure network developed recently to explore innovative concepts in emerging space technologies (in other words a model of Living Labs dedicated to space), is the Advanced Concepts Team[56]. The aim of the Team is to explore technologies for applications to future space missions by fostering cooperation and interaction between European research groups and organisations and providing specific solutions to cutting edge research problems.

The Corporate information services

(and, more generally, a few services within the ESA Operations directorate). ESA is a major European intergovernmental organisation whose establishments and facilities are distributed in various European countries (in particular, some facilities are for good reasons in remote areas, varying from close to polar regions in Norway, Sweden and Finland or in Antarctica, to some in the middle of equatorial areas such as Kourou in French Guinea). Among other infrastructure services, ESA maintains a dedicated operational VPN (Virtual Private Network), common office services and project management tools across all facilities. This collaborative infrastructure integrates various legacy systems to support effectively daily project and programme activities involving partners internal and external to ESA, in the various space fields (e.g. space science, earth observation, Galileo, International Space Station…)

Transfer of Technology, Spin-off and Incubators initiatives

Today, the achievements of space programmes have become so much a part of the economic, social and scientific scene that there is a tendency to undervalue their significance and the benefits associated with them. Through its technology transfer programme, the European Space Agency has recognised the importance of helping other areas of industry to benefit from space research, and of easing the burden on public resources by adapting space technologies systems, and know-how to meet the needs of the wider population of Europe. By moving technologies and know-how from the space sector to other sectors, companies can reduce the time scale and cost of developing new products. Technology transfer also reduces duplicated research and provides opportunities for professionals from a variety of industries to collaborate, increasing the overall effectiveness of Europe's scientific base.

Through technical agreements and political collaboration with regional development agencies that help companies to start up and grow and the local public offices to make better economic development plans, ESA offers an articulated and integrated system of services of pre-incubation (assistance in the pre-competitive phase) and incubation (accompanying during the competitive phase and until operational) so that ideas and projects developed by researchers, as well as experience with the production system, are transformed into a new company[57]. The most innovative aspect of the programme is to provide to selected start-up companies the economical and financial know-how of BIC Lazio in the business promotion sector, together with the technological competence of ESA. Although not yet implemented, a dedicated collaborative platform could better support the practical exploitation of the incubation services.

Specific ESA experience in supporting collaboration of science and application users

The case of THE VOICE, short for THEmatic Vertical Organisations and Implementation of Collaborative Environments[58], financed by the Agency's General Study Programme that delivered its final report in April 2006. The goal of the THE VOICE study was to investigate the understanding of requirements in selected Earth Science and Application communities, to design a generic Collaborative Environment for Earth Science-related domains and to proof this design by means of a prototypal infrastructure implementing innovative networked collaborative working modes. Some of the main study results and recommendations include:

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[56] www.esa.int/gsp/ACT/

[57] www.esa.int/SPECIALS/ESRIN_SITE/SEMFFVMZCIE_0.html
[58] www.esa-thevoice.org

- Different eCollaboration technologies can be used to improve collaboration in the Earth Science Domain, that has well-identified needs for organised collaboration at different levels, of which Web Services and Internet can be considered as the backbone
- The achievements in having defined a Service Oriented Architecture for eCollaboration make the THE VOICE architecture into a reference in the Collaborative Working Environment scene at European level
- The future application for results of THE VOICE must lie in the collaboration with wider reaching projects in ESA, EC and beyond aimed at the exploitation of communications, interoperability and standards to allow groups and organisations to work more efficiently

Specific ESA experience in supporting telecommunications

In the frame of the more specific Telecommunications Programmes, the User Support Office (USO) represents a consolidated mean of provision of shared information and promotion of cooperation. The USO[59] provides instruments and facilities to support start-up entrepreneurial initiatives to flourish in the space telecommunications business. It provides help with promotion, online information and training on how to work with ESA and a support environment that gives access to information and technical resources.

The User Support Office of ESA Telecom aims to:
- Increase the number of new small to medium-sized enterprises (SMEs) that take up initiatives set up by ESA
- Create a support environment that helps each project to achieve its goals
- Prepare the ground for access to the market after the completion of the ESA contract

The USO resources run with the project life cycle and centre on the following areas:
- Opportunities ensures that ESA Programmes are advertised in the participating countries so as to attract the interest of the largest number of potential candidates for new themes. Promotion operates through various information channels (the Web, exhibitions, publications). These media advertise and raise awareness of ESA Programmes and sponsored activities among the entrepreneurs that have a satcom-related business case.
- Training services are offered to new entrants and users that have not previously worked with ESA and are new to the satcom market. The training courses give general purpose introductory courses about ESA and its environment, funding schemes and initiatives, proposal preparation, contractual issues, ESA standards and project management guidelines, technical and regulatory and licensing topics.
- Project Support provides the means and resources to enable projects to meet ESA requirements. Such services include IT support with web resources (e.g., ESA Telecom portal, web-based collaborative environment, archiving environment) as well as a contact point for day-by-day problem solving.
- Expert Groups provide users with a structured environment that will host discussion themes that are common to the different projects. It addresses active projects but it can also play a role in educating and attracting other potential users.
- The Access to ESA Technical Assets element will provide a single point interface for the use of ESA procured satellite access slots and equipment as far as practicable.
- Local Agents are local points of contact available to users in the ESA Member States that support the USO initiative. Knowledgeable about ESA mechanisms and National Programs, competent in satcom business, Local Agents will operate to facilitate access to all the USO functions.
- Market Development Support promotes successful projects among the relevant user community and will eventually work to facilitate access to funding (e.g., venture capital and bank loans at preferential rates) and to business administration resources.

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[59] telecom.esa.int/uso

2.15. Public Procurement: a driver for innovation and new collaborative working environments

Procurement, and in particular technology procurement, is a key element in stimulating innovation in Information and Communication Technologies (ICT) and for fostering the rapidly evolving global knowledge economy. Public procurement today accounts for about 16% of GDP in Europe[60].

It is well-known that the 3% Lisbon target cannot be reached without a significant increase in business investment in R&D and innovation. The key barrier to investment in Europe is the lack of an innovation friendly market, e.g. because of the fragmentation of markets. Europe must gear up its internal market in a way which fosters a transition to the global knowledge-based service economy.

Adjusting and transforming procurement markets can help to drive Europe's competitiveness and will in a foreseeable future create new opportunities for EU businesses. Technology procurement has an increasingly important role to play in Europe in facilitating the research for, and the development and first-user deployment of, innovative technology-based products and services.

Such a market is important to the lead users who are prepared to take on the higher initial costs and risks involved in early adoption of an innovation. They can provide important feedback to the final development of the end product and service. In return they stand to gain by being better placed to learn to use and benefit from the innovation, and increase the chances of meeting their specific requirements. An early market of sufficient scale offers the potential for a higher return on investment and reduced risk. Proximity and local requirements are key features of such markets and relationships thus influencing the choice of R&D and business location.

Technology procurement is also a major tool for innovation because it can play a key role in stimulating progress in, and take-up of, ICT and in reinforcing the position of European industry in the ICT sector.

The recently published report of the Information Society Technologies Advisory Group (ISTAG) on "EU-Wide Initiatives" underlines the role of public procurement to support the deployment of new technologies and services and to stimulate innovation[61]. As argued above, more effective support can be achieved by revitalising and reframing technology procurement processes to trigger stronger take-up and thus support the fostering of technological innovation and knowledge society objectives.

However, at present, the lack of demanding and novelty-seeking customers who are willing and able to pay for upgraded, improved or novel services is a major barrier in the service and product innovation which companies find difficult to overcome[62]. Public procurement could be used to drive the missing demand for innovative goods and services, and new collaborative working environments are the natural home for innovators and for those who wish to benefit from such goods and services.

In the area of public procurement, new EU service directives have created improved opportunities for public authorities to purchase innovative solutions such as[63]:

1) Possibilities for technical and competitive dialogues between purchaser and supplier.
2) The facility to specify requirements in terms of functional performance or standards, which allows suppliers to deliver any technological set up which meets the needs.
3) Options to permit variants, thus opening up bids to alternative ideas.
4) Conditions that allow transfer of intellectual property to the suppliers allowing them to exploit their innovations in wider markets.

European companies applying new working environments can play the important role of catalysers by being the "intelligent developer" who is capable of producing potentially new solutions, and who can specify and manage such contracts.

The Commission has taken various actions to raise awareness and to spread good practice in this domain[64] but these are only the first steps – the real challenge is to apply these concepts in the areas of public purchasing at a European level and to explore ways of stimulating and catalysing a European coordinated demand through common standards, regulations and joint procurement.

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[60] For further information see http://europa.eu.int/comm/internal_market/publicprocurement/index_en.htm
[61] This document can be consulted at ftp://ftp.cordis.lu/pub/ist/docs/2004_initiatives_web_en.pdf

[62] Innovation in services – Issues at Stake and Trends, J. Howells and B Tether, INNO-studies 2001: Lot 3 (ENTR-C/2001), European Commission 2004
[63] Creating an innovative Europe – Report of the Independent Expert Group on R&D and innovation appointed following the Hampton Court Summit, January 2006
[64] Actions include an expert group report: Wilkinson R. et al, Public procurement for research and innovation, DG Research, September 2005, EUR 21793 and a handbook on raising the technological and innovative intensity of public procured goods and services and a recent study launched by DG Information Society and Media April 2006.

3. Country Reports

3.1 Introduction

Each year, when the Commission invites authors to contribute to this report, it does so without being able to offer any financial or other incentive, other than the knowledge that contributions will reach a large audience of interested readers. This has been enough, once more, to induce twenty authors, or groups of authors, to send us reports about their countries. Most of these reports concentrate on telework activities, as is traditional for this chapter. Many also include some discussion of the overall economic situation and of the labour market. Others write about ICT developments in general terms or go into particulars, such as eGovernment applications, or how the SMEs are affected in their country.

This year somewhat fewer country reports were received than last. However, the editing team feels sure that readers will not feel disappointed by this. There is a good spread of reports from around the world and there are two from countries not represented in last year's report: Poland and Turkey. Moreover, given size limitations for this report, having fewer country reports has the advantage that contributors have been able to develop some themes at greater length than previously; witness the Belgian report which dwells on the differences between mobile working and telework.

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ARGENTINA

Some statistical data

Number of Internet users by access point (2005)

Access point	Users	Total
Home	4,650,000	50%
Public place	7,560,000	50%
Work	2,800,000	28%
Educational Institution	320,000	6%

NOTE: total percentage is higher than 100% as there is a group of users that connects to the Internet from more than one access point (e.g., home and work, or work and public place).

Evolution in number of users and number of times being accessed - 2004-2005

Category	Dec. 2004	Dec. 2005
Times being accessed	1,600,000	1,950,000
Users	7,000,000	9.300,000

Evolution in type of access - 2004-2005

Type	2004	2005
Dial up by subscription	615,000	570,000
Dial up without subscription	445,000	466,000
Broadband	540,000	914,000
Total	1,600,000	1,950,000

Sundry indicators

Service	Dec. 02	Dec. 03	Dec. 04	Dec. 05
Fixed lines in service	7,708,600	7,745,600	7,782,600	7,864,700
Mobile lines	6,567,000	7,842,000	13,450,000	20,000,000
PC equipments	4,200,000	4,500,000	5,200,000	5,800,000
Homes with PCs			3,000,000	3,500,000
Homes with Internet Access			1,500,000	1,763,000

Source of statistical data:
Carrier y Asociados http://www.carrieryasoc.com,

The use of Internet in SMEs (Small and Medium-Sized Enterprises)

Statistics confirm that the Internet has become not only an everyday, but a vital, tool in Argentine SMEs. Both the high penetration in access (95% of surveyed companies) and the connectivity among office employees (96% of the employees included in this category use them) clearly show that the Internet is present in the daily work of these organizations.

Connection to the Internet

	Small[1]	Medium	Total
Yes	99%	100%	99%
No	1%	0%	1%
Total	100%	100%	100%

Type of access

	Small[1]	Medium	Total
ADSL	57%	52%	55%
Wireless	18%	16%	17%
Dedicated	8%	23%	15%
Cable Modem	9%	7%	8%
Dial up	7%	1%	4%
Satellital	1%	1%	1%
Total	100%	100%	100%

Bandwidth

			Total
Up to 128 KB			10%
256 KB			18%
512 KB			27%
1 MB			21%
More than de 1 MB			24%
Total			100%

Web Site trend

Web Site	Small	Medium	Total
Yes	51%	71%	61%
No	49%	29%	39%
Total	100%	100%	100%

Sales through Web Site

	Small	Medium	Total
Yes	5%	9%	7%
No	95%	91%	93%
Total	100%	100%	100%

Source: Carrier y Asociados http://www.carrieryasoc.com

The "Telework Commission" of the Argentine Labor Ministry www.trabajo.gov.ar

The "Commission for the Study of the Legal Framework of Telework", is still carrying out the study activities on development of Telework and related issues. Furthermore, it has made contacts with other countries in the region that are interested in this subject.

Additionally, with the intention of starting a debate on implementing Telework in different national and international environments, it has participated in various events. As per those events held within the frame of the WSIS, it should be stressed that this Commission is at present a member of eLAC 2007 (http://www.eclac.cl/socinfo/elac/).

At eLAC 2007, the Commission is in charge of the regional coordination of the TELEWORK group, which encompasses several countries like C0LOMBIA, CUBA, EL SALVADOR, NICARAGUA, the DOMINICAN REPUBLIC, URUGUAY, BRAZIL, AND CHILE.

The contact with ILO has also permitted addition to the agenda of this agency of such items as telework, its importance in terms of the development of work opportunities, and the analysis of the regulatory frameworks.

It is also important to emphasize that the experience of this Commission during the last three years have placed it at the forefront for this kind of initiatives in the region.

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La Asociación Argentina de Teletrabajo (AAT) www.aat-ar.org

The **AAT** is a non-profit organization created in 2001 and whose members are teleworkers. It carries out its activities in the region and at international levels by offering training seminars, and disseminates information related to new working methods, with special emphasis on the local development and job creation.

Any activity of the AAT is carried out through nodes. Some of the objectives of these nodes are to perform the necessary activities to develop the Organization, allowing members to experience a practice that takes them closer to new working methods, and generating an entrepreneurship network, whose services we can recommend to the rest of our members.

Apart from carrying on with its habitual activities, the AAT is currently implementing the Tedel Project (Telework and Local Development – www.tedel.org) in five cities of Argentina. This project will last two years and will be financed by International Development Research Center (www.idrc.ca). It mainly aims at starting a comprehensive process of change in culture and attitude in the target cities. The various scheduled meetings, group talks and public presentations related to the project that have been held in each city, as well the interviews given to local media make it possible to visualize the first favorable symptoms of TEDEL's impact on the different sectors of the population in these cities, especially on producers, businessmen, educators, civil institutions, etc. The existing telecenters located in the selected cities have already been contacted, and the majority of them have started taking diverse actions to get involved in the project.

Using Collaborative Tools at our Translation Node

At our Translation Node, we use Php Collab for our main translation projects. Since 2004, the translation team has been working on documents of different sizes and types like e-Collaboration, Cookbook, the SIBIS project, etc., apart from those documents and articles for our organization (AAT: Argentine Telework Association) and magazine. Under the supervision of a senior translator, the Node gathers translators and university translation students who collaborate as volunteers.

For the students this is an excellent opportunity to practice for their future professional career. For all of us, it is the application of new working methods. As we translate, we learn more about Telework and how to efficiently use the ICTs in our daily work.

Challenging?

Any project is a real challenge for us. However, the use of technology, coupled with the synergy we have developed within the team, allows us to enjoy our work. We are currently developing a style guide on the basis of previous work, which is also applied to any project to improve the output quality. Another useful tool is our glossary. As the translation process takes place, new terms are validated and added to our database. From our Node, we also aim at reinforcing the IT skills of our member with hands-on experiences. As a result, we can notice their personal development and a great improvement in the quality of translations in short time.

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Telework and Teletraining Center - Working Relationships Program, University of Buenos Aires www.caminandoutopias.org.ar

The creation of the Center was approved by Resolution No. 2069 in year 2000. Since that time, it has conducted informative seminars all over the country and abroad. This Center is working for the inclusion of youngsters, disabled people, vulnerable groups and those excluded form labor market in general. It publishes a newsletter named Teleworking. The Telework and Teletraining Center links social needs to those who can make decisions and formulate public policies.

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ICT Commission - Teleservices for the Information and Knowledge Society.

This is a permanent commission of USUARIA (www. usuaria.org.ar). It was created in September 2003 to gather together a community of teleworkers who wish to deliver services in our country and abroad. It promotes excellent and ethical behavior among its mem-

bers and facilitates the links among companies. It has been working with UNESCO since 2002 for the training of those interested in Telework who are living in the region. It is responsible for the development of the project Etis-Lac (Teleservice Export for the labor and social inclusion of Latin America and the Caribbean region), www.etis-lac.org.ar, which was approved by the IDRC (International Development Research Center).

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This report has been prepared by the Argentine Telework Association: info@aat-ar.org

Project reports

ETIS-LAC: Export of teleservices for the social and labor inclusion of Latin America and the Caribbean

Countries in our region have an intellectual capital that has been left out of the work market in the last decade. The Project wishes to create new non-traditional working opportunities, given that the region can provide simple, high added value tele-services. "Tele-services" being services (intangible goods or intellectual products) that are done away from the central office by teleworkers. This is why certain recommendations and policies for the export of teleservices must be considered that may promote the creation of jobs and work within basic economic parameters, rendering the region as a competitive one, but at the same time, establishing minimum rules of operation and hiring.

We have mainly considered autonomous workers (or micro-entrepreneurs) because, though they could eventually become Small Companies (Pymes), they have not yet achieved this status and therefore are not included in government export promotion programs in our region. Though the aim will be set on autonomous workers, it is possible that this information creates different contractual relationships in the future.

This Project aims at providing organized information and data useful for the governments of participating countries. The degree of collaboration to identify potential demand will allow us to demonstrate the political will to develop these activities. This investigation could well influence governments to include teleservices into National Cyber-Strategies.

This study will allow for the following **specific aims**:

1. Describe and identify the export telework services in Argentina, Costa Rica, Brazil and Colombia done by autonomous teleworkers.

2. Identify the potential demand of offshore teleservices
3. Document a case study of dislocation of tele-service job (phone answering service) in Argentina within the formal sector.
4. Suggest legal recommendations for international teleservice transactions.

Etis-Lac was presented by the Commission TIC of USUARIA and approved by the IDRC in August 2005

More information
www.etis-lac.org.ar

TEDEL: Telework and Local Development

A project by the Argentine Telework Association, (*Asociación Argentina de Teletrabajo*, AAT www.aat-ar.org), financed by the International Development Research Center of Canada, IDRC. (www.idrc.ca).

Aware of the impact and revolution that the introduction of ICTs (Information and Communication Technologies) had caused in people's lives, the ATA has expanded and developed the activities related to the research, analysis, and actions concerning strategies associated with telework and new working methods for development. Telework and new working methods represent a flexible type of work, mainly characterized by the development of people's duties far from the enterprise's physical environment and clients, thus requiring the use of such ICTs.

It is a new occupation activity approach that requires new competences in work skills: teamwork, advanced and complex knowledge, continuing training during the whole professional career, collaborative learning, and an innate or acquired curiosity to know what the new technologies can offer at the time the job has to be done. These new working methods have an impact on the knowledge society's definitive structure that will emerge in Latin American and Caribbean countries and take its part in social and development issues such as social equality, employment, education and human resources training, the new social groups that derive from the socioeconomic and technological transformation and the social associations that originate from it.

It has also been a concern of the ATA for some time to apply development strategies oriented to provide welfare, and improve and integrate the socio-economic functioning. If we observe local developments from a broad perspective that views them from several points of view, considering both the uncertain times we are facing and people's needs and expectations, it would be reasonable to understand local development as a process of cultural change that involves learning characteristics: "a strengthening process of actors that values the capacities of its owns communities and a reconstruction

process of solidarity bonds, and strengthening of Social Capital".

The key component of the project is the confluence of two processes:
− Local Development strategy
− The more consolidated dissemination of tendencies related to new working methods and telework.

The project called "TEDEL, Telework and Local Development" will be carried out in five communities of the Argentine territory: Benito Juárez, Buenos Aires; Fernández, Santiago del Estero; Villa Ángela, Chaco; 25 de Mayo, La Pampa y Belén, Catamarca.

Work Project Website: www.tedel.org

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BELGIUM

HIGHLIGHTS

• Steady but unspectacular progress in uptake of flexible work regimes using ICT.
• Broadband infrastructure well advanced but constrained by overall internet penetration.
• Strong regional initiatives to promote ICT take-up and telework in public and private sectors

Introduction

The debate on teleworking has been intensified over the past few years thanks to several surveys and projects depicting not only the growing demand by employees for a better work-life balance but also the flexibility and productivity needs felt by employers. Moreover growing highway congestion in several regions leads to an upsurge of interest in integrating forms of teleworking into policy discussions on the planning and implementing of mobility programs. Several companies did not wait for policy initiatives to integrate teleworking into their mobility plans, giving positive side-effects visible in the productivity, loyalty and sometimes the work-life balance of employees.

Nevertheless one cannot ignore the barriers preventing organisations from implementing or even discussing innovative forms of work organisation. Concerns about organisational culture, management and communication are being addressed, and are integrated in several training projects on how to implement telework.

Context: freeways and information highways

Belgium does not have so-called "natural factors" to stimulate teleworking (as well as the use of other online services), such as great distances between cities and a lack of infrastructure (e.g. highways, freeways). It is a

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small and densely populated country with an extensive road system: both cities and countryside are, at least in theory, easy to reach by personal or public transport. Belgium has, together with The Netherlands, the highest motorway density (Eurostat 2004). In practice, however, these days accessibility can no longer be dissociated from problems of mobility. The majority of the population (60%) go to work by car and are increasingly confronted with traffic jams in certain regions. Consequently, the total number of hours sacrificed to traffic jams has been calculated. In one year, about 8.3 million hours have been lost due to traffic congestion on freeways. This problem is mainly experienced in the Flemish part of the country. The freeways and approach roads of Brussels and Antwerp top the list of traffic jams (Belgium's 25 longest lasting traffic jams in 2002). From this, it is possible to work out the cost of congestion, i.e. the total cost of the time spent on traffic jams by commuters, businessmen and truck drivers. The total cost is estimated at 114,000,000 € for one year. The agony of queuing costs approximately half a million (460,000) euro per working day. The impact of traffic jams on the environment can also be calculated: 360,000,000 € (Logghe & Vanhove, 2004). Unless some drastic measures are taken, traffic congestion and its accompanying costs are expected to increase.

According to several recent surveys, mobility remains a major concern for both employees and employers, especially for those working in Brussels (65.5% of whom do not live in Brussels). This is illustrated in Antwerp where, since major transformations of the road infrastructure have started, mobility problems may positively impact the desire to experiment with telework. More than 60% of employees are willing to experiment with

telework in Belgium (Randstad, 2006). 54% of the Belgian people are convinced that home-based telework allows more efficient working (Manpower, 2005). eWork then appears not only as a way to escape mobility problems, but also as a flexible tool allowing a better balance of professional and private duties.

More encouraging news is that the use of the information highways is increasing. As far as the ICT infrastructure is concerned, a rise from 200,000 (February 1998) to 1,681,000 (June 2005) personal Internet connections can be observed (ISPA). Furthermore an increase of the Belgian Internet population has been observed of 7% in twelve months leading to 4.8 million internauts. Other sources suggest even higher figures (5.1. million, according to the Comp. Ind. Almanac). According to Eurostat half of the households have internet access, while 95% of the businesses are connected (Eurostat, 2006).

The number of broadband connections is growing at the expense of dial-up connections (BIM, Insites). Some 18% inhabitants have a broadband connection, which is more than the EU(15) average of 11.8%. However the increase is lower at 2.66% than the average increase of broadband penetration in OECD countries (3.26%) (OECD, dec. 2005). The percentage of broadband households as a proportion of the total number of the country's households varies in the EU: 41% in Belgium compared to the EU25 average of 23% (Eurostat, 2006).

Over the last two years slowing growth rates of broadband adoption have seen Belgium slip from a leading position to one trailing the Nordic countries and the Netherlands. If this current trend continues Belgium may see itself falling behind all of its neighbours including France, UK, and Germany in overall broadband penetration, bringing it in line with its overall internet usage. The dominant supplier of ADSL services charges approx 39€ per month for access which is slightly above the European average of 38€, whereas similar services from the UK and France are around 29€, and 26€ in Germany (Reuters). Although competitors exist, with some providing services for approx 30€/month, they have not made a great impact, taking approximately one third of the market. Most of the ADSL offers give download speeds in excess of 2mb/s, noticeably higher than entry level offers (512k) in some other countries. An entry level ADSL line in the UK and France can be as little as 15€ /month or less in the Netherlands.

Another important trump card is the degree of penetration of cable distribution in Belgium. It has approximately 3,800,000 subscribers to cable, and about 90% of the families are meant to have teledistribution (NIS, 2001). This becomes particularly important in the current commercialisation of interactive television, which can have important applications for both private and professional ends.

Although Belgium is part of the European middle group as far as teleworking is concerned, the phenomenon is situated at the crossroads of a number of social priorities making the interest in distance working particularly topical. Teleworking is not only suggested as a possible solution for problems of mobility, but also as a

lever for equal opportunities at the labour market for specific groups of the active population, and the search for a better balance between work and private life.

Belgium's mid-position

With 10.6% (or 437,000 teleworkers), Belgium is currently situated slightly below the European average (13%) (Empirica, 2002). 7.5% of the Belgian employees are telehomeworkers (EU-15 average is 7.4%; Empirica, 2003 based on SIBIS 2002). In the European Survey on Working Conditions, teleworking was examined as well. In the third report (2000) it is observed that approximately 2% of the working population works full-time at home, while 6% does so for at least one quarter of the working time.

Since the beginning of European measurements on teleworking in 1994, the teleworking population is said to have increased at 17% per year (Empirica, 2000). Supplementary telehomeworking, in particular, is rising. When one compares the results from 1999 and 2002, an annual rise of 39% is to be noticed for supplementary telehomeworking in the EU (i.e. from 2% in 1999 to 5.3% of the employees). Permanent or alternating telehomeworking has stabilised within the same period of time (from 2% in 1999 to 2.1% in 2002, Empirica 2003).

Despite Belgium's score in the EU still being on average (10.6%), the number of teleworking employees has doubled compared to 1997 when the proportion (formal and informal) was estimated at 5.3% (EU average 3.1%, cf. ETD). However, results of measurements and assessments tend to differ depending on the definition of teleworking and the method one applies. In 1996, for example, IDC estimated the number of Belgian teleworkers at 46,000, whereas JALA counted 30,000 teleworkers in Belgium. Three years later, ETD estimated the number of teleworkers in Belgium and Luxembourg at 250,000 (or 6.2% of the active population), which is a rise of 25% compared to the previous year. At that time, however, the average rise across the EU was estimated at 45%.

The share of 10% which is now put forward corresponds to the results from other research. The Eurobarometer, for example, counted 9.4% teleworkers in Belgium (4.9% of which are regular teleworkers and 4.5% are occasional teleworkers). Alcatel concluded that 10% of Belgian employees are teleworking today. Hence it is possible to confirm the estimation made by the Belgian Teleworking Association, i.e. about 10% of the Belgian working population (European Commission, 2000). According to the Empirica study, supplementary teleworking is practised most of all in Belgium (5.3%). Second and third place are respectively occupied by independent teleworking (2.5%) and mobile teleworking (2.4%). Permanent or alternating homeworking occurs less frequently (2.2%).

In a survey in Flanders (Walrave & Dens, 2003) it was observed that there are about 17.6% teleworkers among the Internet users. In the Walloon provinces 7% of the employees are said to have experience with teleworking. 13.4% of companies with internet access offer their employees the possibility to telework (4% in 2001), where 6.8% are planning to do so (AWT, 2002). Another type of research in both communities (Vandenbrande a. o., 2003) reveals a significant difference between Flanders (41.6%), the Walloon provinces (14.8%) and Brussels (52.7%) in the implementation of teleworking in companies.

Another survey shows that, at present, about 20% of the service sector in Flanders declares that is offers employees the opportunity to telework. 8% does not give any support to teleworkers (such as ICT) while 11% does. There are significantly more companies with more than fifty employees that offer teleworking possibilities (28%) than smaller organisations (Van Dongen, 2004, p. 68). Recent research shows that businesses are ready to invest more in teleworking projects. A survey among 500 Belgian companies (Insites, 2004) showed that 4 out of 10 firms want to invest in the implementation of teleworking or want to support existing teleworking projects in their organisation in 2005. On the other hand, a survey conducted among employees and managers in Flanders (Walrave & De Bie, 2005) shows that non-teleworkers and managers without teleworking experience in their company still have a lot of questions and doubts concerning teleworking.

It is difficult however to compare all this different data due to dissimilarities in the definition of teleworking, the investigated population and the applied methodology.

The concept of teleworking is becoming more frequently associated with mobile work and is even used as a synonym. Nevertheless, only a segment of the mobile workers can be defined as teleworkers who switch between various locations or who, thanks to ICT, also perform their tasks while being on the road. In a survey on the share of mobile workers Empirica observes that Belgium (26%) belongs to the middle group here as well, and scores slightly below the EU average (28%). Mobile work, however, is more broadly defined than teleworking. Teleworkers constitute one segment in the population of high-tech working nomads, for it is possible to telework from a fixed location (from home or from a satellite office, for example). On the other hand, nomadic work is also possible without ICT. These are a number of differences preventing the identification of teleworking and mobile work. An interesting observation is that, as far as mobile work is concerned, Belgium finds itself in the main group, whereas Scandinavia, the Netherlands, the United Kingdom and Ireland constitute the leading group.

Teleworking can also be defined in a very broad sense, encompassing every task which is not performed inside the company's four walls but is managed from within the company by means of ICT. This definition not only covers a company's own teleworking employees, but also the calling in of services from a distance offered by other companies (e-services) or self-employed workers ((fre)eLancers). When defined as such, one may conclude that 54.5% of the companies with more than 50 employees in Belgium apply some type of teleworking (Van den Brande et. al., 2003).

Besides keeping a record of the number of teleworkers (regardless of their definition), it is important to study which concrete positive or negative experiences they have. It is also interesting to examine whether or not there is growing potential for teleworking; whether non-teleworkers would be willing to consider any type of work from a distance, and the extent to which they wish to implement this type in their current work situation. Therefore a survey in Flanders and also Greece, Ireland, Italy and The Netherlands offers an overview of success factors and pitfalls when implementing telework (Walrave & De Bie, 2005, cf. www.tijdvoortelewerk.be/research.html). Also the attitudes and interest of non-teleworking employees and managers were sounded out.

Legislation

Following the signature of the European Framework Agreement (signed in July 2002), the Belgian social partners have adopted a collective agreement on telework the 9th November 2005 (in application from the 1st July 2006, www.cnt-nar.be/CCT/cnt-85.pdf). This legislation, the collective convention n°85, has been signed in the National Council of Labour and the agreement is settled at the inter-professional level. It is a compulsory legislation, not a recommendation. As with the European text, the goal is to set a framework for the practice of telework, and especially home-based teleworkers by protecting them from discrimination and by formalizing the employees' and employers' rights and obligations in terms of technical and financial support, training and reversibility of the arrangement.

This agreement offers minimum guarantees of rights of teleworkers. Besides the determination of the rights and obligations of teleworkers, other initiatives can also be taken to facilitate this form of work organisation. This is also translated in the advice and initiatives of employees' and employers' organisations.

The concerns of both trade unions and employer organisations have been discussed and published several times during the last years and are summarized hereafter.

- Teleworking has to be voluntary and reversibility of the teleworking situation is guaranteed.
- Trade union representatives supervise the introduction of teleworking in the context of the Committee for Prevention and Protection and the Works Council.
- Clear agreements are made and information is provided concerning all aspects of teleworking in the form of a teleworking policy.
- Equal pay, career options, training possibilities, access to company information and services etc.
- Alternate teleworking with working in the main office.
- Preserving the cohesion of teams and departments implementing teleworking.
- Include teleworkers in every aspect of the social and collective life of the company.

- Examining specific tasks, positions and profiles that are "teleworkable".
- Examining savings that companies can make by introducing teleworking.
- Respect for the privacy of teleworkers.
- Suitable solutions for measuring working time.
- Clear communication methods and work arrangements.
- Employer provides the teleworkers with the necessary equipment, accessories and training.
- Compensation for expenses home office (electricity, heating …).
- Communication possible between teleworker and trade union representatives.
- Development, refinement and/or clarification of legislation concerning health, safety at work, privacy and monitoring options.
- Awareness campaign concerning pro's and con's of teleworking types.
- Fiscal and financial incentives for companies introducing teleworking.
- Increasing the ICT-skills among employees by training and other support measures taken or organised by companies and the government.

In addition to the standpoints and advice from the social partners, projects were started by the government, various companies and other organisations to provide answers to the questions and concerns mentioned above. Below we provide a summary of a few initiatives to raise awareness of, inform about and support for teleworking (Walrave, 2005).

Belgian Teleworking Association (BTA)

The Belgian Teleworking Association (founded in 1994, www.bta.be) is a non-profit organisation with the objective of studying, encouraging and propagating all forms of teleworking in Belgium, and this in an independent manner. The BTA's membership constitutes a platform and meeting point for all socio-economic actors concerned with new ways of working, and is made up of small and large enterprises, public services and authorities, educational institutions, professional associations, employers' and employees' organisations and the media.

Together with Agoria (www.agoria.be) the BTA is publishing a telework manual dealing with human resources, project management, legal issues (especially the new collective agreement on telework) and technological aspects of teleworking.

"Working differently" unit of the ministry of the flemish community

The Flemish Government wants to adapt its working environment to the profile, culture and requirements of the organisation. The concept "working differently" is used at the ministry as an umbrella term for two complementary innovative trends in the work environment: innovative flexible offices and teleworking (homeworking and working at a satellite office). Interaction exists

between both trends. Working remotely reduces the need for workplaces at the base office. Conversely, a potential disadvantage of hot desking (disturbed and less concentrated work) is resolved by teleworking (Kenniscel Anders Werken – Ministerie van de Vlaamse Gemeenschap, www.vlaanderen.be/anderswerken).

The knowledge unit has both policy preparation and implementation tasks and an advisory function. For its policy preparation tasks, the unit develops a strategic vision concerning the further introduction of the "working differently" concept (flexible workplaces combined with teleworking) within the Flemish Government, and draws up recommendations for the best possible implementation of teleworking.

For its policy implementation tasks, the unit acts as an internal consultant for the preparation (project definition, feasibility studies, etc.), implementation and evaluation of projects. Here the supervision of coherence between the various complementary lines of approach needed for such a project (ICT, HRM, building management, etc.) is required. The unit is also the one place to contact for internal and external communication about the "working differently" concept. Finally, knowledge and experience is accumulated from the various activities (teleworking, office innovation, ICT possibilities, change management, etc.) and this information is made available to internal and external clients. Statistical data concerning teleworking within the Flemish Government is also collected, and a methodology is drawn up to support departments through the process of change.

e-Work award & e-Mama, e-Papa of the year

The e-mum and e-dad of the year award is an initiative to permanently support teleworking or e-working in Flanders, while bringing the actual experience of teleworkers to the public's notice. This initiative is intended to promote a better balance between family and work by learning from experience in practice. This is an expression of respect for the personal initiative and creativity that many mothers and fathers show in combining a family and career. Using new technology or new comfort services gives the e-mama or e-papa more time for the family and themselves. E-working plays a big part in this. Putting a number of individuals in the spotlight is intended to promote awareness of how the family and work combination can be used. Individual witnesses can then explain from practical experience what for them personally determines the success of their teleworking and the combination of work and family, with specification of any pitfalls. To give publicity to these important accounts, not only are an e-mama and e-papa chosen by a multidisciplinary jury of working women and men (www.e-wedstrijd.be), but also a company or institution is rewarded for its efforts in implementing telework.

Conclusion

Teleworking is quietly seeping into the business community and institutions. Sufficient uncertainties remain for both employees and employers to impede the struc-

tural and formal introduction of tele(home)work into many organisations. Despite this, teleworking is sometimes used in an informal way to enable certain flexibility in work organisation and the combining of work and family. This informal nature is an advantage for some because it can be introduced quickly, without additional costs or rights and obligations. On the other hand, this tacit acceptance of teleworking at organisations entails much uncertainty for employees and employers: which criteria are used to decide what work can be done by teleworking, who has the right work attitude, skills and traits to make a success of teleworking for all the parties involved: the employer, employee and the family.

The conversion of the European teleworking framework agreement in Belgium could see the start of a wide-ranging discussion about which perspective would be offered for teleworking, and how the different parties involved commit themselves to take further concrete action.

An important initiative to lower existing thresholds is being provided by a number of projects in Belgium that broach real issues concerning training, legal aspects, management, ICT and the return on investment of a teleworking project.

The further development of practical tools for the studying of the feasibility of a teleworking project for one's own organisation, step by step project development with measurement times and an evaluation after a trial period, the training of supervisory staff and teleworkers, and concrete arrangements in the form of a teleworking policy can all help to reduce the uncertainty. Such tools support the formalisation of teleworking at organisations based on clear and measurable arrangements, where sight is not lost of the fact that teleworking as a flexibility tool also facilitates adaptations to actual employee and employer needs.

Additional practical accounts from organisations that have introduced teleworking and teleworkers themselves, concrete research and the resulting advice may be able to win organisations over. But barriers still remain to be eliminated to meet this challenge. Teleworking indeed challenges important deep-seated concepts such as responsibility, autonomy, control, productivity and efficiency.

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CANADA

According to the Networked Readiness Index (NRI), which measures the propensity for countries to leverage the opportunities offered by ICT for development and increased competitiveness produced by the World Economic Forum in cooperation with INSEAD, Canada was in 6th position in 2005 up from 10th position in 2004. This reflects the extensive ICT physical infrastructure, a broadly supportive market environment and high levels of business and government usage of the latest technologies found in Canada.

Networked Readiness Index 2005

Countries	Score 2005	Rank 2005	Rank 2004	Evolution	
United States	2.02	1	5	Up	4
Singapore	1.89	2	1	Down	-1
Denmark	1.80	3	4	Up	1
Iceland	1.78	4	2	Down	-2
Finland	1.72	5	3	Down	-2
Canada	1.54	6	10	Up	4

Source: "Global Information Technology Report 2005-2006," World Economic Forum http://www.weforum.org/

Connectivity

In 2005, Canada achieved the highest overall broadband penetration of the Group of Seven (G7) industrialised countries and has one of the best-developed national broadband infrastructures in the world, using a range of network architectures and technologies. At the end of 2004, Canada was placed tenth in the world for DSL broadband subscribers. Broadband deployment continues to progress under active government encouragement, with 85% of Canadians now living in communities served by high-speed Internet access. A combination of affordable pricing, tiered services and capped bit charges have helped to drive the penetration of broadband services. The high penetration rate of PCs has also been a major contributing factor as is the previous high penetration of narrowband Internet access services.

Growth in residential broadband access has increased while the increase in dial-up accounts has slowed.

As of December, 2005 there were 21,900,000 Internet users in Canada - 67.9% of the population - a 27% increase since 2000 making Canada one of the highest rates of Internet usage in the world. Furthermore, Canadians are heavy users of the Internet, with around 90% of users using e-mail at least weekly. Growth in the number of Internet users in Canada, however, is starting to slow down with the number of Internet users aged 55-64 growing more than any other age group. Although the digital divide in Canada is generally closing, differences in ICT penetration between the lowest income and very high income groups persist. Income, education, age and geographical location continue to influence the use of on-line information and services.

Canadian Internet Usage and Population Growth

Year	Users	Population	% Penetration
2000	12,700,000	31,496,800	40.3 %
2003	20,450,000	32,050,369	63.8 %
2005	21,900,000	32,251,238	67.9 %

Source: "Canada Internet Usage and Broadband Usage Report," http://www.internetworldstats.com/am/ca.htm

Canada is at the forefront of e-governance initiatives. It ranked first out of 22 surveyed countries,[1] followed by the United States, Denmark, Singapore and Australia. Online services now account for 30% of all government transactions. With almost 600 million interactions between citizens and the federal government in 2004 – compared to 150 million in 2001 – e-government is now a key channel for the delivery of public services in Canada.[2] The Canadian Government On-Line (GOL) program launched in 1999 aims at e-enabling the 130 most commonly used Canadian federal government services. E-governance initiatives are also being implemented in provincial and municipal governments.

E-Work

While there is a high degree of connectivity in Canada, the telework trend, where workers work away from their normal place of work, usually from home, is not widespread. Approximately, 14% of the employee population in 2005 worked some of their time outside of their place of work. Nevertheless, those Canadians who do telework tend to do so for a greater proportion of their working week compared with those teleworking in the United States and Western Europe. Such workers can telework all their work time, or on an occasional or

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[1] Accenture 2005 e-Government Report, "Leadership in Customer Service: New Expectations, New Experiences." http://www.accenture.com/xdoc/ca/locations/canada/insights/studies/leadership_cust.pdf, 6 April 2005.

[2] eGovernment News, "Impressive e-government take-up in Canada," http://www.gol-ged.gc.ca, 8 April 2005.

ad-hoc basis. Most telework takes place a day or two per week.

While telework programs are not prevalent, over 80 per cent of companies in Canada offer some form of flexible work arrangements to reduce work/life conflict. "Flexiwork" and "timeshifting" allow employees fully flexible hours of work and often flexibility in where that work is done.

Outsourcing, or employment relocation, reflects a range of work relationships from outsourcing where a firm or individual provides services to another firm in a separate location, governed by some form of contractual agreement to geographically distant intra-corporate transactions where services are provided to one branch of a firm by another branch of the same firm. Outsourcing is a business strategy adopted by nearly 80 per cent of Canadian businesses in the manufacturing and transportation sectors, as well as in certain service sub-sectors.[3] However, most of this outsourced work is staying in Canada and preferred locations for outsourcers to source their work are within Canada or within close proximity (local or nearshore).[4] Another interesting trend is that offshore provider firms are establishing local offices in Canada.

While most of the telemediated employment relocation activity, for the professional, scientific and technical services, is clustered in metropolitan areas of Ontario, Quebec, Alberta, and British Columbia, which already benefit from large traditional business sectors, contact centres are more footloose. A study to identify locations in Canada where information technology enabled services (ITES) employment have recently grown found that the vast majority of this employment is located in Canada's metropolitan areas.[5] Call centres and customer service IT-enabled outsourcing activities are growing in remoter areas and in rural locations. While there is a trend of "metropolisation" of most jobs, sales and service IT employment are behaving similar to lower level manufacturing employment found in the decades from the 1960s to 1980. This type of employment was priced out of metropolitan and central locations, and either located abroad, or in remoter Canadian areas (often around large cities). While locating manufacturing jobs in peripheral regions in Canada has often proved elusive because of lower costs in developing countries, the need for socio-cultural knowledge for sales and service may mean that these jobs are more durable. However, this type of employment is occurring in Canada in the context of job stagnation in these occupations and rapid job growth in the more skilled administrative and service occupations.

There is a concentration of "high-skill" (i.e., software development, creative services) and "low-skill" (i.e., contact centre work, data processing) eWork clustered in Ontario, Quebec, Alberta and British Columbia. Growth in "low-skill" eWork in New Brunswick, Manitoba and Saskatchewan has been facilitated because of policy interventions and heavy investment in eWork infrastructure.

Canada, until recently, has been seen as a more favourable provider for US corporations compared to an offshore option. Cost is no longer the primary reason to select an offshore supplier. Until cost savings reached 50% or higher, the experience of the Canadian workforce and the availability of technical expertise were prime factors. However, this may be changing due to less favorable currency exchange rates, Canadian workers' lack of widespread fluency in Spanish and the call center industry's saturation and rising expense in Canada.[6]

Canada's strategy to address this uncertain future is capacity building. The federal government has a number of initiatives in place to move towards a knowledge-based economy. For example, an extensive network of 8,800 Internet community access sites throughout Canada receives over 34 million visits a year and many of these sites are becoming local economic development incubators.[7] These eCommunities are being mentored by a network of 12 "smart communities" and the resulting industrial clusters are attracting international investment and local entrepreneurship which is critical to retaining a highly qualified workforce.

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DENMARK

Part 1: Current ICT status in Denmark

IT Infrastructure
The digital infrastructure is an important prerequisite for citizens and enterprises for using new information and communication technology and services. Use of ICT in all of society is recognised as an important factor in contributing to sustaining business growth, modernising the public sector administration and for qualifying the Danish population for participation in the future global knowledge society.
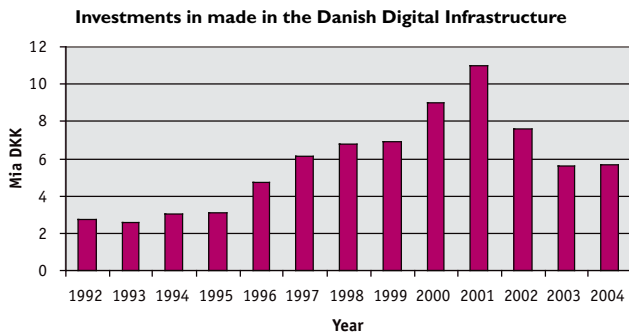
[3] Canadian Federation of Independent Businesses.(2000) "A Study of Outsourcing Trends in Canada." CFIB: Ottawa ONT.

[4] Gurstein, P., C. Mochrie and K. Wennekes (assisted by U. Huws). "A Preliminary Report on Canada's Competitive Challenges towards Advancing a Successful Global Sourcing Strategy," CATA: Ottawa, ONT., April, 27 pp.

[5] Shearmur, R. and Carron, M. (2004) "Agglomeration and Dispersion of High-order Service Employment in the Montreal Metropolitan Region, 1981-1996." *Urban Studies* 39(3): 359-378.

[6] Datamonitor, "Selling Canada as a nearshore option (Market Focus)" http://www.datamonitor.com, 23 March 2006.

[7] Industry Canada, "Canada's National ICT Strategy," http://www.wsis-smsi.gc.ca/act/en/ictStrategy.htm

Investments in made in the Danish Digital Infrastructure

A mapping of the broadband development in Denmark shows that a further development of the broadband infrastructure has taken place – this covers both geographical coverage as well as higher bandwidths. 98% of geographical Denmark is now covered with broadband.

Tele-service prices have declined significantly within the last 5-7 years and are still on a downward trend. This is especially true for mobile telephony, dial-up and ADSL.

During the years 2002 and 2003 we witnessed significant drops in the Tele sector investments compared to the record high level of 2001, where investments for almost DKK 11 milliard was made (EUR 1,48 milliard). During 2004 the downward investment trend has seemingly stopped.

Internationally compared, the Danish infrastructure is relatively strong. Denmark ranks at the top of OECD countries with a broadband coverage on 98% of the population. Furthermore, Denmark ranks at the top when in comes to broadband uptake among the population and enterprises. However, a very recent OECD report (Spring 2006) seems to indicate that this may have changed very recently. It seems that penetration of the very high-speed Internet connections has stagnated and other countries have overtaken Denmark. The OECD report only ranks Denmark fifteenth when it comes to broadband uptake. An explanation of this could be that broadband prices in Denmark are still quite high compared internationally, but it does also play a role that the recent OECD survey seems to have focused on measuring penetration of very high speed bandwidths. The penetration of this does not necessarily tell us anything about the general penetration of broadband lines if we define these as lines with a transmission capacity of at least 256 kpbs/second, which is faster than traditional modems and ISDN connections.

Recent developments

The major Danish electricity supply companies have almost all commissioned a large-scale roll out of fibre optics (photonics) broadband networks within their geographical supply area.

Adding the information together, electricity supply companies expect to offer fibre optic based broadband connections to ½ million households and enterprises within the next 2 years. If all the current photonics growth plans are realised it should be possible to offer photonics based connections to almost 1.2 million companies and households (there is 2.5 million households in

Denmark). The time horizon for the accumulated realisation of these plans is at least 10 years.

The main Danish Tele company – Tele Denmark Communications (TDC) – commissioned their own deployment of a fibre optics network. This is expected to cover roughly 100 of the largest city areas in Denmark. This is called the CityMAN project. Up until now, the initiative has been launched in the main city areas in Denmark. The initiative is primarily oriented towards business customers, including public authorities and local governments.

Concurrent with the deployment of fibre optics based development; a number of different actors are introducing wireless network access – FWA/WIMAX. Yet this is limited to the larger city areas, but further development plans has been formulated. There is still a long standing discussion whether the investments made in the deployment of fibre optics network will be rendered superfluous by the development of wireless technologies. However, it is argued that wireless technologies cannot today, and are not expected in a near future to be able to, transmit the amount of data that can be transferred by the photonics networks. Furthermore, some people living close to the antennas have expressed fear of possible long term health risks through being continuously exposed to radiation.

Electricity companies and number of persons potentially covered by their photonics broadband networks
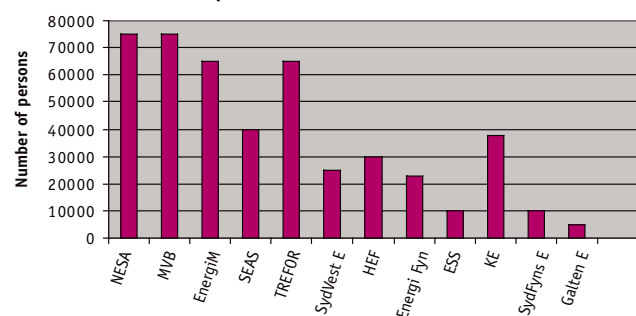
Citizens and IT

By 2005 79% of the Danish population had access to the Internet at home, compared to 75% in 2004 and 71% in 2002.

The most common purpose of Internet use is still Information retrieval and communication

In 2005, 33% of those that have used the Internet within the last month have used it for shopping for goods or services. Furthermore, there are 28% who have used the Internet within the last month, but not for shopping. If we add these together, we find that 61% of all Internet uses have used it for shopping. There is generally a positive relation between age, level of education and how prone they are to shopping on the Internet. It is mostly the young and well educated who use it for shopping.

The three most traded products on the Internet in 2005 are 1) travels, 2) general entertainment *(tickets)* and 3) clothing, leisure and sport equipment.

Use of Internet - purpose
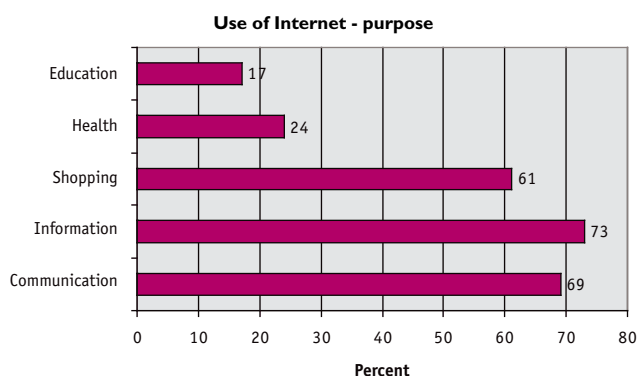
Enterprises and IT

Information technology is an important factor for Danish companies concerning production, organisation, customers and suppliers. The companies are also a central driver behind the development of the Danish information society.

Almost all Danish companies > 10 employees have PCs and access to the Internet – 82% have a broadband connection and the same number have their own company homepage. The development of both access to Internet and companies with homepages has stagnated in recent years.

52% of all companies have used automatic data interchange with other companies and/or the public authorities. One aspect that really has had an impact on this area is that the public sector in Denmark as of 1st February 2005 only accepted electronic invoicing. This decision is an integral part of the Danish Governments plan for creating a more effective public administration.

Electronic shopping is still increasing. 63% of all companies have made orders via the Internet *(57% year before)*. 35% of companies have received orders via the Internet (27% year before).

50% of all companies use ICT-enabled remote working. This is defined as companies having employees who regularly work at other places than the direct company premises and from these locations have access to the

internal company IT systems. This has increased by 5% compared to the previous year. Notice that this does not tell us anything about the actual proportion of Danish employees who are eWorkers – only the percentage of companies offering the opportunity to some group of their employees. ICT enabled distance work is most often found within the Finance and business service sector. There seems to be a relationship between company size and ICT enabled distance work – this is most often used by the bigger companies.

The public sector and IT

eGovernment is very often debated in Denmark. In recent years, a high number of citizens and companies have gained the opportunity for communicating digitally with government, counties and municipalities and an ever increasing number of services are made available digitally.

56% of public authorities received in 2004 25% of documents electronically. This is a significant increase compared to the previous year, where only 30% of authorities did so. Also communication in XML-format has increased – used by 9% of public authorities in 2003 and now by 16% in 2005.

However, the typical result in the public sector is that the average casework time has not been significantly impacted by the last 2 years e-initiatives. 63% of all public authorities report that casework time has not changed as a result of diverse e-initiatives, 34% answers that casework time has been reduced and 3% reports an increase.

For the time being, the development and deployment of eGovernment is following the clear existing strategy for digital administration 2004-2006. In this strategy it is assumed that the public sector is under pressure from different sides and based on this, the strategy identifies a number of priorities, which are collected in one common vision "Digitalisation of the public sector should contribute to creating a more effective and coherent public sector, characterised by focus on the needs of citizens and enterprises".

The main priorities are:
* The public sector should deliver coherent services to citizens and enterprises.
* Implementation of digital administration should increase service quality and reallocate resources
* The public sector should work and communicate digitally
* 4 Digital administration should be base don a coherent and flexible IT infrastructure. This seems to be very central to the present *(2006)* discussion in Denmark and in Europe in general. This is related to developing an IT architecture that can handle data interchange and communication that allows for data reuse between different administrations.

Each priority has a number of clearly specified associated quantitative and/or qualitative targets.

A very high number of initiatives and actions have been implemented to realise the strategy and it will soon be possible to evaluate the success or failure of the strategy. Currently it looks that most of the estab-

lished targets will be realised – especially the quantitative targets related to uptake. On the other hand, there seems to have been some problems related to establishing benchmarks for measuring satisfaction. Furthermore, it will be interesting if significant cost reductions have been realised. Some research shows, that this can be difficult as two systems are often maintained – the traditional paper-based and the digital service, thereby only offering an additional path to the service, which makes it difficult to harvest cost reductions.

In the first part of this paper, we have provided a general presentation on the ICT status in Denmark. In the following chapter, we will present the project "**Virtual Mobility**", which will provide information on how a project group is working in practical terms with assisting companies.

Part 2: The Virtual Mobility Project

What is virtual mobility?

Just a few years ago the term "distance work" was quite narrowly defined. The image it brought up for most Danes was one of secretarial work done on the computer in your own home.

Today when we talk about "distance working" we refer to a lot more than that. A wide range of jobs in fields such as computers, teleworking and consultancy can today be fitted into the category of distance work. Basically the term boils down to any job where the employee works outside the company residence and doesn't see the employer on a daily basis.

What do we want to look into?

Work-arrangements have changed considerably over the last 5 to 10 years. An increasing part of the workforce has moved some or all of their working hours from the company residence to their home address. This is the case not only in Denmark, but all over the world.

Up till now, primarily academic workers have had the opportunity to work on a distance basis. And most agreements concerning the planning of work-schedules regarding distance work have been made on an individual basis.

The main object for the Virtual Mobility project is research aimed to collect experiences about distance work and similar challenges in the Danish labour market.

All surveys show, that employees working home based – entirely or part of the time – tend to put in more hours that their colleagues performing their jobs on the company address. Still working from home has been considered a personal advantage for the employee.

This pattern of thinking might well influence the agreements being made between company and employee resulting in individual agreements favouring the company at the expense of the employee. Even though the Danish labour market is very well organized and few companies – and for that matter unions - have developed politics in the area of distance work yet, this kind of individual agreements could threaten the organized labour market. As a result the longstanding Danish tradition for problem solving on the labour market could, in a worst case scenario, ultimately be lost all together.

The objective for this project is to take a long tradition of collective bargaining and adapt it to the future labour market.

The means will primarily be to draw up a set of guidelines for Companies, employees and unions/organisations resulting in an ensemble of 3 guidelines based on experiences from various lines of work, various ways of organizing the job and various ways of leadership.

The result, that "Virtual Mobility" hopes to present by the end of 2006, is a set of guidelines focusing on ways to establish, work, manage, appreciate and profit fully from a virtual working place. The guidelines will be beneficial to both employee and company: to the former by securing reasonable work terms to the latter by securing a stable labour market.

At the moment the labour situation in Denmark shows an obvious mismatch. 140.000 people are unemployed while there are 140.000 vacant jobs – jobs that will in many cases remain vacant because the people who have the right competences to fill the jobs do not live where the jobs are.

Broadening the definition of distance work to make the term include other jobs beside academic ones could bring new solutions. It would meet some of the need – on one hand - for jobs for the unemployed, and - on the other – supply the manpower for the vacant positions.

To that effect The Virtual Mobility project conducts a survey to clarify how best to match the right person with the right job.

The project also looks into the impact of transport versus no transport on the balance between work and spare time.

The way the employee experiences the organisational culture doesn't in itself change just because he/she works from home. But if the organisation in general aims at a sensible balance between work and family life, working at home, considering the flexibility involved plus the lack of daily transport, may be an advantage or a help in making everyday life more consistent

Learning process

The new virtual employee begins by participating in a master-class focusing on both the technical part: technology involved in the job and data security and the more social aspects involving attitudes towards work, and relations with employer and colleagues.

The employee is being interviewed in the beginning, at the end and midterm to assure that both professional and social needs are met. Training and coaching is individualized to optimize the value received by the participant.

Four times a year the person(s) within each company responsible for the project will participate in a master class featuring prominent business-analysts and senior managers.

On an ad hoc basis the participating companies will in addition receive individual guidance, coaching and experience exchange.

Virtual Mobility
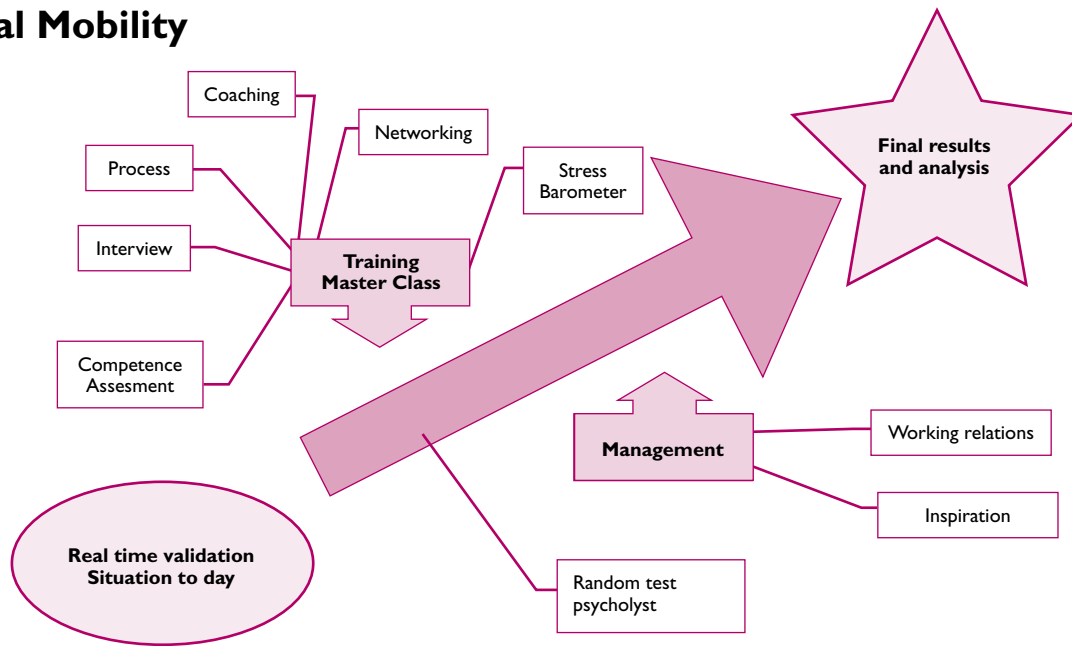
The learning process is illustrated by a graphic representation.

Headlines are: Situation today. Real-time validation, Final results and analysis, Training Master Class and management.

The graphic representation of the project plan shows the forward-acting shift from the situation today to the personal and cooperative development objective in relation to the employee. For purposes of identification and clarification a dialogue between the company (the management) and the employee, who is going to work at a distance, is needed.

Subsequently considerations of which supportive relations will be needed are necessary. This part depends very much on the people and the actual situations involved. Tools: Coaching, mentorship, participation in network and exchange of experience, preparation of project plan, plus opening and final interviews.

The virtual work relation speaks of the specific work conditions concerning virtual mobility, meaning the actual workstation and connection to the company. A number of recommendations concerning necessary consideration are included in an existing report.

The Weblog

In order to let the project benefit as much as possible from the participants individual experience, 16 people are, through a weblog, followed for 18 months on a daily basis.

Before the monitoring starts, they are all subject to in depth interviews about their work situation, and the impact of their work on family life and social activities.

Afterwards the participants commit themselves to log into a weblog every day to answer a few questions about the course of their working day.

The questions they answer refer both to their well-being – psychical as well as psychological, their efficiency and their relations to co-workers, management and family.

The results of this weblog – which is done anonymously – constitutes at the end of the monitoring period the basis material used to identify the benefits and problems that the employee as well as the employer will have to pay attention to.

The Participants

The consortium consist of TUCPartner/virtuel mobilitet www.virtuelmobilitet. The competences of the members range from projectmanagement, flexible learning, e-learning, jobdesign, personal management and communication. All competences are at university level.

From the very start, the project has benefited from much interest from some of the largest companies in Denmark – all of whom is taking an active part in the process. Among others:
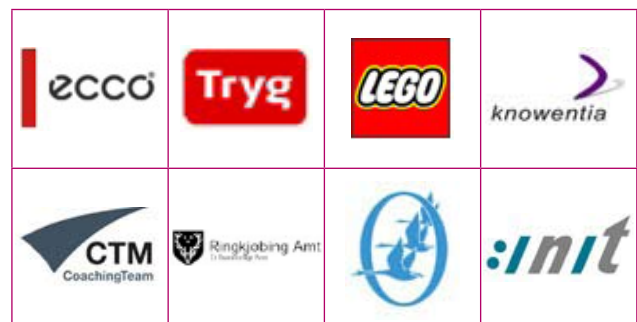
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ESTONIA

Summary

In terms of the information society, the year 2005 witnessed no slowing down in Estonia's rapid IT progress after joining the EU. The World Summit on the Information Society in Tunis proved that Estonia has taken the right steps on its way towards the information society by acknowledging that, in order to gain success, bare use of technology will not be sufficient – real impact is only achieved if the implementation of modern technologies is accompanied with the reorganisation of processes and a continuous upgrading of skills. These principles have also been taken into account in drafting the Estonian Information Society Development Plan.

Key issues

- Estonian Information Society Development Plan as a torch to light the way into a fully-fledged information society.
- Estonian state information systems as the backbone of the IT structure in Estonia.
- Implementation of advanced IT technologies with reorganisation of processes and continuous upgrading of skills.

Estonian Information Society Development Plan

The basic policy document in the information society field in Estonia is *the Principles of the Estonian Information Policy*, the current version of which is coming to an end in 2006. Consequently, a new strategy, that also takes into account the objectives and priorities of the EU information strategy i2010, is currently being elaborated by the Ministry of Economic Affairs and Communications. The implementation of the Estonian information policy is based on annual information policy action plans, which set out concrete activities, responsible authorities, expected outputs, and evaluation of finances. The priority fields of the information policy action plan 2006 are the following:

1. **Geo-information systems**: development of geo-information services so as to ensure their ease-of-use and to make digital cards available for all authorised users and other information systems.
2. **Document management and digital archiving**: increasing the share of electronic document management and launching digital archiving in order to ensure faster, easier and more convenient management of public business.
3. **Reorganisation of the population information system**: Pursuant to the Population Register Act, the register has to ensure the collection of main personal data of Estonian citizens and aliens, who have obtained residence permits in Estonia for the performance of functions of the state and local governments.
4. **Administration system for the state information system (RIHA)**: development of a new administration system for the state information system. RIHA will be an integral system covering all components of the state information system, administrating their metadata, providing services, and performing, to the extent provided by legislation, the administrative function of support systems.
5. **Development of social welfare information systems**: consolidating the performance of social welfare functions into an integral service-based system and improving, in co-operation with state agencies dealing with employment and health matters, the quality of service provision to citizens.
6. **ICT in education and research**: supporting the follow-up to the TigerLeap programme and the Tiger University+ programme, the Estonian Grid project, the Estonian Research Information System project and the Estonian School Information System project.
7. **eInclusion and broadband strategy**: ensuring for all Estonian citizens benefits related to the use of computers and the internet, and thus increasing Estonia's competitiveness and creating new jobs. This priority field mainly includes activities aimed at increasing the supply and availability of fast internet connections, while matters related to the demand-side are dealt with in other fields of the current action plan.
8. **eProcurement**: digitising the whole public procurement process, beginning from tender notifications to signing of contracts.

9. **Presentation layer for the state information system**: creation of a single point of entry that would ensure standardised access to e-services provided by the public, the private and the third sector, and would lead to:
   - improved quality of service provision by uniform and centrally provided e-services;
   - increased efficiency in the public sector as a result of the re-use of similar functions and the elaboration of a framework suitable for the standardised presentation of e-services.

10. **eSecurity**: development of a co-ordination mechanism for the management of IT security matters and organisation of respective co-operation. This priority field also includes awareness-raising activities in the field of IT security both for the public sector and for the whole society.

11. **eBorder**: joining the Estonian border control information system with respective EU systems.

12. **Co-ordination of the state IT policy and the respective EU co-operation**: ensuring that the co-ordination, implementation and monitoring of the priority fields set out in the action plan would be carried out in accordance with common principles.

13. **Electronic legal protection** is a set of projects aimed at the development of e-services for citizens and the creation of an ICT working environment for law-enforcement authorities in the jurisdiction of the Ministry of Justice and the Ministry of Interior.

14. **Digitalisation of cultural heritage** is a project integrating several sub-projects that aim at the protection and preservation of the Estonian cultural heritage and rendering it accessible for all by means of modern IT solutions.

15. **eHealthcare**: development of an intelligent patient-centred environment and creation of e-services that would enable the collection, processing and preserving of health-related information irrespectively of an individual's location, time etc.

16. **Environmental Register**: integration of environmental data into the register to an extent provided by legislation, updating the Environmental Register Act and ensuring the functioning of databases necessary for data exchange.

Estonian state information systems as the backbone of IT structure in Estonia

The Estonian state information system is regarded as a service-centred organisation, meaning that all operations performed by civil servants, entrepreneurs, citizens, as well as software are considered services. End users access services in a *common service space*. They are not interested in the organisation directly providing them the service, but in the service itself. Central and local government agencies, private companies, as well as third sector organisations, all provide services. The common service space allows individuals to represent, when using public services, both themselves and the company
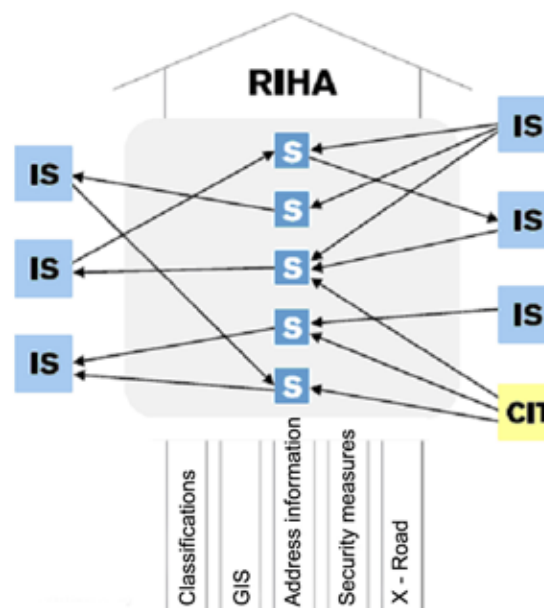
The state information system is based on support systems and is administered through RIHA. Information systems communicate with each other via services (S – service, IS – an information system, CIT – the citizen portal as a special guide to the information system)
Source: *Ministry of Economic Affairs and Communication*, Information technology in public administration of Estonia, Yearbook 2005

they work for. The logical components of the state information system are the following:

- information systems (both as service providers and service users);
- the administration system for the state information systems (RIHA) together with its services catalogue;
- the state-administered citizen IT environment;
- support systems and rules.

The architecture of e-Government in Estonia was developed in the framework of the X-Road project. The project was initially launched for linking Estonian state databases to the common data resource accessible over the internet. After the successful start of sending database queries and answers over the internet, the X-Road environment was expanded to send all kinds of electronic documents in XML-format securely over the internet. Furthermore, X-Road became the skeleton for all e-Government services.

The main backbone of the eGovernment environment is the X-Road network of distributed and central servers. The essence of the eGovernment is that different information systems communicate with each other via security servers (SS), which are built up as special firewalls storing all the messages in logs. In the eGovernment environment, information systems provide and also consume services. First, Estonian commercial banks provide portals with the authentication service for citizens. The authentication mechanism provided by banks is considered as trustworthy as that based on the ID card and valid for using eGovernment services. Second, some of the services are charged for and, therefore, a solution has been developed for paying these charges. Third, the banks themselves are users of data and e-

services and they are using this environment just like any other information system.

The X-Road centre is actually the heart of the eGovernment environment as all central servers of the whole network are connected and located in that centre. The Estonian Certification Agency (CA) is responsible for the developments related to the ID card, digital signature, and other PKI infrastructure elements in Estonia.

Direct communication between citizens and the eGovernment environment works over a set of communication portals: the Citizen Portal, the Entrepreneur Portal, and the Civil Servant Portal.

The year 2005 was the year of negotiations with various international projects and organisations. Discussions were held on using X-Road for the Schengen information system and eLink solutions of the IDA programme, as well as on launching pilot projects for data exchange with Swedish and Finnish population registers. X-Road is already now capable of authenticating all EU-25 citizens.
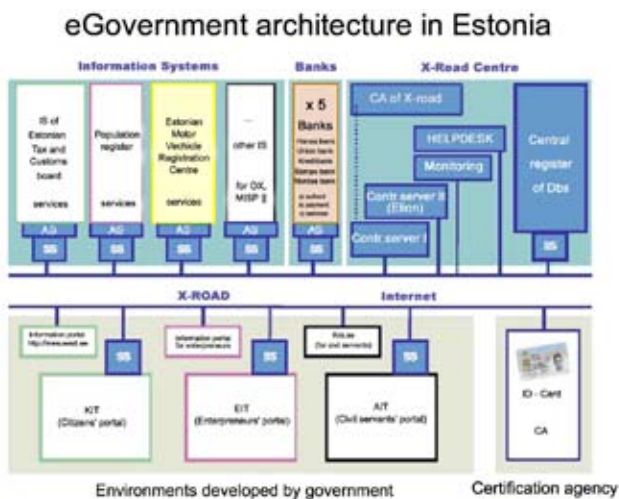
eGovernment architecture in Estonia

Source: *Ministry of Economic Affairs and Communication*, Information technology in pubic administration of Estonia, Yearbook 2005

Implementation of advanced IT technologies with reorganisation of processes and continuous upgrading of skills.

Estonia is not a greenhorn in using advanced IT technology in various fields of human activity and can be proud of its IT visiting card:
1. Estonia is one of the Internet bank leaders in the World.
2. Estonia is one of the pioneers in mobile phone applications.
3. Estonia is one of the most active IT industry sub-delivery suppliers in the World.
4. Estonia was the first country to use a fully electronic voting system to carry out the local elections.
5. Estonia is a country to offer to its citizens a chance to use for free a citizen's IT portal KIT and a common email address @eesti.ee.
6. Estonia was the first to inaugurate a paperfree e-covernment.

7. Estonia was the first to solve the problems of electronic identification, taking into use ID cards.
8. Estonia has the most advanced information infrastructure of any formerly communist eastern European state, and on June 28, 2005, the Estonian Parliament approved Internet voting for local elections in October 2005 and national Parliamentary elections in 2007.
9. Dubbed *E-Stonia* by some, Estonia has ranked near the top of the list of countries in putting the Net to practical use – ranking as high as No. 2 in Internet banking and third in e-government in a recent *World Economic Forum report*.
10. Estonia was among the top 2005 winners of *the Top 10 Who Are Changing the World of Internet and Politics* at the 6th annual Worldwide Forum on Electronic Democracy in Issy-les-Moulineaux, landing on the fourth place.

Concrete examples of success stories in the application of advanced information technology:
1. **ID cards**: the number of ID cards has exceeded the 900 000 limit. It means that among the population in the age range of 15 – 74 the percentage of ID owners is about 80% and among the entire population 61%. Starting from the year of 2002 the number of digital signatures has reached up to one million. The ID card has been used as electronic person identification already about two million times.
2. **Computer and internet usage:** Almost every other Estonian in the age group 15 – 74 has procured a home personal computer and the number of families with a computer has grown within the year 2005 from 32 to 40 percent. Half of the computer owners have bought the computer due to the wish of using it for the Internet communication. 81% of the families with a personal computer have an Internet connection, 73% use broadband internet, whereas ADSL (47%) is the most widespread type of internet connection, followed by a cable modem connection (26%) and dial-up (4%). The Internet based phone communication has shown a rapid growth from 4% in 2004 to 8% in 2005.

Types of home Internet connections
(% of those having a home PC)
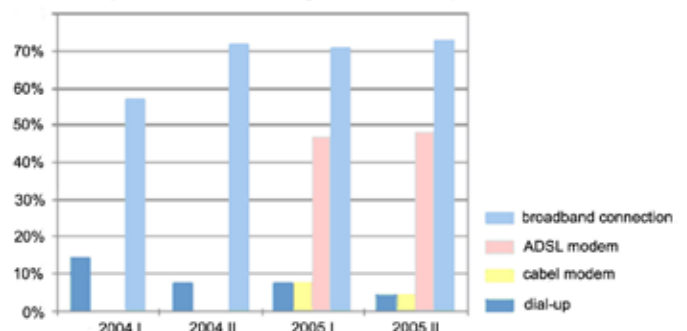
Source: *Ministry of Economic Affairs and Communication*, Information technology in pubic administration of Estonia, Yearbook 2005

3. Use of public e-services: Estonians consider public e-services easy to use: 66% of internet users surveyed in spring 2005 rated the user-friendliness of public e-services with *very good* or *good*. Estonians' satisfaction with public sector e-services is quite justified as according to the *Information Society Benchmarking Report 2004* Estonia ranks fourth among the EU-25 in terms of fully interactive services. The survey reveals that the majority of internet users find public sector e-services useful: the respondents mostly outlined that the use of e-services saves time (78%) and enables them to obtain necessary information from a state agency faster than usual (65%). 38% of the respondents found that public e-services enable them to save money. While in the first half of 2004, 15% of respondents used the internet for playing games, in 2005 the respective share was 34%. Although the share of eCommerce is still quite modest in Estonia (8% of internet users), it has doubled from 2004. Using the internet for phone calls is still relatively new, but the number of users has doubled over the year (8% used the service in 2005 and 4% in 2004), showing the growing popularity of the service. The number of companies connected to the internet is also on the rise. In April 2005, 75% of Estonian companies had an internet connection. Mostly broadband internet is used, whereas ADSL connection is the most popular. Merely 41% of the companies connected to the internet maintain a homepage, indicating that there is still room for development in this respect. The survey on the use of IT in Estonian companies also examined the use of public e-services and satisfaction with these. The fact that 93% of companies expressed satisfaction with public e-services shows that the implementation of ICT has facilitated business-to-government communication significantly. The areas of internet usage are expanding. Besides exchanging emails, searching for information and using internet banking, which are the most popular fields of internet use among Estonians, the use of the internet for entertainment also doubled in 2005. Unfortunately, the slow progress in teleworking penetration into the working habits

has continued, the percentage of teleworkers among all sorts of employees has increased only from 4% in 2004 to 5% in 2005. This rise was mainly achieved on account of elderly people (age group 50 – 74) having taken tertiary education courses.

4. International activities: In the information technology fair CeBIT in Hannover in Germany during 9 – 15 March, 2006, Estonia was represented with some unique IT applications. The objective of the Estonian exhibition was to show to the world how the applied innovative IT technology would help Estonia on the road of progress towards a fully-fledged information society. The ruling keyword for the exhibition was an ID card which is unique in the world and with various electronic applications. All visitors to the fair had the chance to get acquainted with the technical solutions of the e-voting system used in municipalities in the autumn of 2005. Additionally, visitors were shown e-government, e-police and GIS applications already in practical use and which have been the basic pillars for e-progress in Estonia.

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FINLAND

Key Issues

- High-speed and affordable broadband connections are becoming available to all Finns, including those living in remote areas.
- E-work renders working hours and work places more flexible especially among professionals.
- Even though practices in working life are to a great extent shaped by technological developments there is also a need for organisational innovations.

Since the year 2003 the Government Information Society Programme has been ongoing. The government appointed the Information Society Council to act as the negotiation and coordination body between the various actors in society. Under the Information Society Council there are seven sections, of which the Working Life Section is one. The aim of the Government Information Society Programme is to improve competitiveness and productivity, to promote social and regional equality and to improve citizens' well-being and quality of life through effective use of information and communication technologies.

The effects of new technologies on competitiveness are important. They increase productivity in all fields of society, and offer new earning opportunities for the providers of Internet-based products and services. The most important indicators of competitiveness in the information society are the speed with which new means

Internet use by specific purposes
(% of those having used the Internet in the last 6 months)
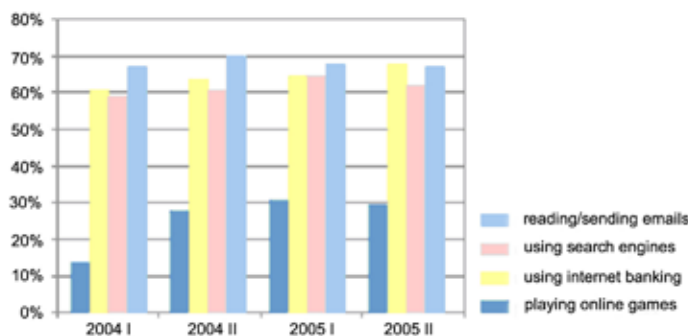
Source: *Ministry of Economic Affairs and Communication*, Information technology in pubic administration of Estonia, Yearbook 2005

of production are introduced and the global market share that is achieved by companies in new digital products and services. Development is progressing rapidly in Finland, but this is also the case in many other countries.

A central factor in Finland's development is that mobile devices using wireless technologies are becoming the most important platform for Internet access and Finland is one of the world's leading countries in developing user interfaces for these devices. The construction of a national telecommunications infrastructure and the development of telecommunications costs are largely in our own hands and, in these issues, advances are partly dependent on the actions of public authorities.

The national broadband strategy was launched in 2005

High-speed and affordable broadband connections are becoming available to all Finns, including those living in remote areas. Thus the focal points in broadband policy will be shifted towards connection quality and content development.

About 40 per cent of all households have a broadband connection, compared with about 15 per cent in spring 2003, and half of all Finns use broadband at home. In southern and western Finland, broadband connections are now possible for nearly all households. In some sparsely populated areas the availability is still below 90 per cent.

The regional availability of fixed network broadband for households has risen throughout the period 2003 – 2005 from about 75 per cent to over 95 per cent. The regional councils play a key role in promoting the availability of broadband. Strategies drawn up in cooperation between the regional councils and the municipalities have accelerated the provision of broadband infrastructure and generated public interest in broadband services. The growth and the price reductions of the broadband services have continued during the last year. The monthly broadband service charges of the major operators in the beginning of the year 2005 were as follows: 256 kbit/s 20 euro, 512 kbit/s 23 euro, 1 Mbit/s 29 euro and 2 Mbit/s 40 euro.

Challenges in working life

When improving competitiveness and productivity, IT applications are important, but enlightened company strategies and new forms of work organisation are crucial as well.

The collaborative development of workplaces and organisations is generally considered to be one of Finland's strengths. For example the Finnish Workplace Development Programme has been going on since 1996. However, not all aspects of Finnish working life have made satisfactory progress, and the problems manifest for instance in the quality of working life and a tendency towards early retirement. When the management of organisations and the ambiance of work communities fail to support innovative development, intellectual capacity is often left unused and the workload is distributed unevenly. Furthermore, balancing the demands of work and life outside of work is often difficult.

According to estimates by the Finnish Labour Administration, approximately one million

people will depart from the Finnish workforce between 2000 and 2015, which is almost half of the total workforce in 2000. Depending on the flow of immigration, the number of people entering the workforce annually will, from now until the end of 2020, be 10,000 to 15,000 less than the number of those leaving the workforce. Accelerating growth in productivity is a central way to compensate for the problems resulting from a diminishing workforce.

Sustainable development demands growth in productivity on a broader front. How to generate the necessary super productivity becomes a key question. A small country that has opted for knowledge intensity as its most central success factor can improve productivity through measures that improve the quality of working life and are targeted at the structures and direction of work. Some elements that contribute to the desired development include factors describing the social development of the work community, such as well-being at work, and lifelong learning, and factors describing the functionality of processes, such as the level of innovation, breaking of old boundaries and purposeful generation of value networks.

In connection with changes in working life there has been a great deal of debate about matters concerning work organisation and the nature and adequacy of work. The new work paradigm is often linked with flexible work, relocation of work in information networks, the work becoming increasingly information-technology oriented and the fact that knowledge work accounts for an increasing percentage of the total work input. Knowledge work is often of such a nature that it can be easily performed as e-work. The fact that many work assignments involve stages that lend themselves to e-work can be an important incentive for introducing new work organisation models.

Even though the practices in working life are to a great extent shaped by technological developments, there is also a need for organisational innovations. The Working Life Section of the Information Society Council

has suggested under the specific actions that, aside from technology, it is also necessary to invest in social, organisational and business innovations.

Flexibility in working conditions and mobile work

E-work has established itself as a practice for achieving multiple time-space flexibility by knowledge workers. More and more work is carried out at locations other than the actual work place. At one time or another over 40 percent of wage earners work either from home, on business trips, at the customer's place or at different locations of the same business. Employees with mobile work who do more than 10 percent of their work either outside the work place or outside their home consist of little more than 10 percent of the wage earners. One fourth of all wage earners also occasionally do their primary work from home. For executives in upper management, this portion is nearly 60 percent and for those in specialist positions in upper management this portion is approximately 50 percent. The most common reasons stated for performing primary work related tasks at home are the work schedule, the amount of work and the desire to do the work well. In four out of five cases the work completed at home is voluntary and does not result in special compensation. According to research the increase in work life flexibility has, as a rule, had a positive effect both for work organisation and employees. The increase of flexibility in work arrangements often brings employees up to a better wage level and enables them to engage in more meaningful and challenging work tasks.

Since the turn of the decade (2000) the trend of e-work has been an increase in the take-up of mobile e-work and multi-locational e-work, while traditional home based telework has declined somewhat in importance. According to the research "Challenges of mobile work" (2005 M. Vartiainen et al) the present state of mobile work is seen as promising. Development has occurred, even if it has been slow. The factors that have affected the pace are: mobile work does not concern everybody, there has not been a clear model and organisational attitudes have slowed down mobile work from becoming general. Mobile solutions are not necessarily genuinely in use in many companies. In the research a conceptual analysis of mobility was also made. It was proposed that mobility will be defined as a feature of an activity system which contains the components; subject, tool and the object of the task. This three factor unity forms the basic operational unit for mobile work which materializes in different operational environments or locations.

E-work policy

The national cooperation group on e-work (2003 – 2006) brings together representatives from different ministries, central labour market organizations and the Federation of Finnish Enterprises.

Even though ministries have recognized the potential of e-work as a means of improving productivity and efficiency in administration, practical applications have been on a small scale. Moreover, there have been few strategies regarding the systematic promotion of e-work. In the labour market, the most important issue related to e-work is the national implementation of the European Framework Agreement on Telework.

However, the national cooperation group has formulated a suggestion for national policy guidelines on e-work. In the guidelines e-work is linked into wide policy themes, such as working life, business and social policy, regional policy, and environmental and ecological themes as well. The focus is especially on the quality of working life and innovative work organisation, making working time more flexible, reducing the need to commute, and development of long term models for the estimation of sustainability at work, as well as in other social environments, and also in traffic and transportation.

Workplace development policy

Implementation of technology must be combined with social innovations such as new kinds of work organization. Often technology development programmes are mainly targeted towards front-line companies following the high- or low-road path while work organisation development programmes are targeted towards average or better-than-average companies following the high-road path or high-road wanna be's.

Programme-based workplace development has been undertaken in Finland since the early 1990s. The National Productivity Programme started in 1993, the Finnish Workplace Development Programme TYKE in 1996, the National Programme for Ageing Workers in 1998 and the Well-Being at Work Programme in 2000. All these programmes were implemented in cooperation between ministries and labour market and entrepreneurial organizations. They shared the aim of improving the competitive edge and wellbeing of the Finnish nation. The programmes developed and disseminated operating models and expertise which helped reinforce human resource development and promoted effective use of those resources at work. All sectors of industry took part in the programmes. In 2003 all the programmes were bundled under a new, shared 'umbrella'. This was named the Development Programme for the Improvement of Work, Productivity and the Quality of Working Life, TYKES.

The Finnish Workplace Development Programme TYKES (2004-2009) promotes the modes of operation of Finnish companies and other work organizations, with an eye to simultaneous enhancement of productivity and the quality of working life. This is called 'qualitatively sustainable productivity growth'. Development activity in the programme projects is based on cooperation between the management and staff of the workplaces concerned. In addition, TYKES promotes the dissemination of project results and expertise on workplace development.

TYKES is based on the view that the most effective way of generating new innovative solutions for working

life is close cooperation and interaction between work-places, researchers, consultants, public authorities and the social partners. The capacity of the different parties to join forces is, for a small country like Finland, a pre-condition for coping with the global economy. Success in the new competitive environment increasingly calls for workplace innovation.

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References

Towards a Networked Finland, The Information Society Council`s report, February 2005.
http://www.tietoyhteiskuntaohjelma.fi/
tietoyhteiskuntaneuvosto/en_GB/
information_society_council/

Matti Vartiainen (et al) (2005). (in Finnish)
The challenges of mobile work. Labour policy studies 269. Ministry of Labour.
http://www.mol.fi/mol/fi/99_pdf/fi/
06_tyoministerio/06_julkaisut/06_tutkimus/
tpt269.pdf

Uhmavaara, Niemelä, Kelin, Mamia, Malo, Koivumäki, Blom (2005) (in Finnish)
Is Work Flexible? Labour policy studies 277. Ministry of Labour.
http://www.mol.fi/mol/fi/99_pdf/fi/
06_tyoministerio/06_julkaisut/06_tutkimus/
tpt277.pdf

Web sites

The WORK-IN-NET Coordination Action (CA) will exchange and collect, analyse and spread information on existing national activities on work-related innovations, thus paving the way for joint, transna-tional initiatives in the future. www.workinnet.org

Finnish Workplace Development Programme
www.tykes.fi

FRANCE

Background information

We should probably focus more on progress in im-plementing the information society during the year 2005, than on general economic performance or em-ployment. Indeed, the figures for employment are not very good, with a two-digit unemployment rate, and very high percentages of unemployment for young peo-

ple[8] (22%) and for the ageing workforce (about 63%). All the economic figures[9] for France are available on the website of the national institute for statistics. This is also part of the recent progress! Indeed, eGovernment is a field which has performed very well in France with more than 300 projects under development. This is due to a general governmental effort to increase the country's broadband coverage (detailed maps[10] are available on internet) as well as online services such as:

- 11% of the taxpayers made their declaration online
- 20% of families who move have been using the service «change your address online»
- Almost 70 % of the certificates confirming that there is no outstanding loan on a vehicle (5 million a year) are delivered online through the téléc@rte grise service
- Half of French people living abroad request their civil status certificate using Internet
- Almost all criminal record extract requests are done on line (1,2 million of users)
- More than half of VAT is collected on-line (€ 80 bil-lions in 2005)
- More than 2/3 of declarations for recruitment are done online

France was lagging behind in the use of internet and has been catching up incredibly fast and becoming a leader in broadband coverage at a very affordable price. 50.5% of the population above 11 years of age is an in-ternet user and 8 out of 10 households using internet are using a broadband connection.

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[8] www.insee.fr/fr/ffc/chifcle_fiche.asp?ref_id=CMPTEF03310&tab_id=191
[9] www.insee.fr/fr/ffc/accueil_ffc.asp
[10] www.ortel.fr/

All the relevant figures are made public every year in July in the annual report of the French regulation authority ARCEP[11] (section "publications" of the website).

Similar progress is recorded for eCommerce. 57% of internet users declare themselves to be confident to buy online, and 39% are cyber-customers. A fully detailed report[12] with all the significant indicators was published by the Department of Industry in March 2006.

Key factors

The most important factor of the year 2005 in the field of new working environments is the implementation of the telework agreement[13] by the French social partners on July 19, 2005.

Another important and very useful step is the publication in January 2006, by the Forum des droits sur l'internet (rights on the internet) of an overview of the legal and law case[14] environment in France specific to the use of internet in the workplace and the work relation with the employer. It is a reference document.

The French national authority for personal data protection CNIL[15], has also been very active by:
• Publishing a practical guide for employers
• Implementing a new function in the organizations; the correspondent to the personal data protection
• Making a recommendation on the location of employee vehicles
• Editing a norm on the location of employee vehicles
Finally, the DIACT – the Prime minister country planning office- pursued actively its action towards the development of télécentres as described in the first example hereunder.

Three examples

DIACT : Interministerial Delegation for the Development and Competitiveness of the Territories

The French Government is trying again to develop telecenters and teleactivities in France. To reach this goal, it has taken two important decisions :

- first, as already mentioned in Collaborations@Work-2005, was to ask the "Forum des droits sur l'Internet" to produce a report on the status of teleworking in France

- secondly, to ask the Prime Minister's office "DATAR-DIACT", responsible for national planning, to launch a tender for developing telecenters and teleactivities in France

- finally, to ask Pierre Morel A L'Huissier, the French parliamentarian who proposes legisla-

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tion for telework, to lead a mission aimed at enhancing teleactivities in France and to solve the different difficulties that can stop their development

In 2004, DATAR-DIACT[1] has launched a tender and has received 40 projects for telecentre creation. DIACT is now working to fund them and to organize them as a network inside the "Réseau National des Télécentres"[2]. The RNT is, at national level, responsible for populating them with Parisian teleworkers, and each telecenter is additionally responsible for filling them up with local teleworkers.

In 2005, DIACT has launched a tender to help communities to develop telework activities. On the one hand it has required the CITICA company[3] to do a survey of the French telework market, and, on the other, it has asked a specialized company teletravail.fr[4] to set up local projects consisting of teleworking companies providing telework opportunities to inhabitants of poor, remote, or suburban, areas which can be eligible to the European social fund.

In 2006 DIACT and the "Réseau National des Télécentres" are working closely with Pierre Morel A L'Huissier and organizing telework workshops on all possible occasions, such as during the Nice and Aurillac meetings in May 2006[5].

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1   www.diact.gouv.fr/TIC
2   www.telecentres.fr
3   www.citica.com
4   www.teletravail.fr
5   Nice: www.assisesdunet.org ; Aurillac: www.ruralitic.com/
6   www.zevillage.net
7   www.sicler.com/sicler/2004/12/prsentation_du_.html

ZeVillage : a teleworker's village[1]

In 2004, Xavier de Mazenod created in Essay, without any funding, one of the first teleworking villages in France named Zevillage. Local politicians and the Sicler[2], an association specialized in the relocation of business activities in rural areas, supported the idea.

Zevillage aims at informing and motivating independent workers in the field of internet related activities, editing and graphical jobs to implement themselves in the village and develop synergies and business solidarity thanks to networking.

Located in Normandy, 180km from Paris, Zevillage is an interesting telework experience in a rural area proud of its natural and architectural heritage.

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11   www.arcep.fr/
12   www.telecom.gouv.fr/webmen/themes/eco/tbce220306.pdf
13   www.lexisnexis.fr/pdf/DO/teletr.pdf
14   www.foruminternet.org/telechargement/documents/dossier-travail-20060126.pdf
15   www.cnil.fr/

Vue de la rivière Vézone au centre d'Essay

Zevillage is located in a zone called « rural revitalization » and offers fiscal and social advantages to new and very small businesses.

Zevillage welcomes interested candidates; they are sponsored by a local councilor, an inventory of the property situation is ready for them as well as a meeting place for those who have serious and realistic professional projects. Since the start, about one hundred candidates have shown their interest and three independent teleworkers are now installed in Essay with their families. Three more families will join the team this summer.

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[1] www.zevillage.net
[2] www.sicler.com/sicler/2004/12/prsentation_du_.html

Steelcase – Workspace Future Research Europe

Interview with Catherine GALL.

Steelcase is a worldwide company known for office furniture. Globalisation is impacting the work process all over the world at a very rapid pace. Does this phenomenon influence strategic choices in Steelcase ?

The rise of a global knowledge economy has changed many aspects of organizational life almost beyond recognition, and is of course influencing Steelcase's corporate strategy in a significant way – both as an organization and as a provider of high performance workplace solutions.

As a company, Steelcase recognizes and totally embraces the fact that the workplace is evidently evolving in a distributed form to deal with the key drivers of the knowledge economy:

- the development of nomadic work styles and tools,
- the increase in collaborative activities as a way to create intellectual capital,
- the rise of employees' expectations for a better work/life balance
- the emerging issues and design implications of a workforce that now has four generations working in the office at the same time.

We use our facilities as living laboratories for workplace innovation. Our employees around the world and across business units are trying out innovative work styles, methods and tools at first hand, and the findings are shared on a larger scale with customers.

At the same time, our clients are asking us every day to support similar cultural transformations in their environment. Therefore our core strategies aim at developing unique insights on how and where people work, and embed the results as knowledge in our products and services. We conduct extensive research programs to understand how shifts in working culture help us to imagine new environments that recognize and respond to the emerging differences in life and work styles of the present and future generations.

The central question we are trying to answer is the following: when it seems that work can take place anywhere, why should anyone come to the office ?

Different cultures attach different values to space and work. This affects their rate of adoption of those work transformations as illustrated by several EU-funded projects presenting cases and figures.

What is the impact of mobility on office space management ?

The rise of mobile work has significant implications on workplace design and management. It opens the wider debate about the spaces (both physical and virtual) we will need for the future. With distributed workforces only accessing buildings periodically, the role of the built-in environment is shifting dramatically.

One answer sees the office as a means to express the culture and reinforce the values and beliefs of an organisation.

Another answer is that physical work environments, with the opportunities they provide for interaction, collaboration, knowledge transfer and communication, will form a vital element of the learning (knowledge) organization's infrastructure. Today, leading organizations are grappling with the problem of how to create this infrastructure for a dispersed workforce.

This leads to a new interpretation of the term "office", which goes beyond the traditional understanding of office spaces. The office, in this context, may be any public or private space used for working purposes.

Concluding remarks

Mobile work is about options, about choice for individuals. It is about constructing and managing one's personal and professional life out of a

potentially bewildering set of options. It is about using the city in new ways to make the most effective use of limited time and resources.

We are in a period of transition from the old rules and systems of organisation to those associated with the new knowledge economy. This period will be lengthy and uneven. In the near term, the increased social role of the workplace is likely to continue to blur the division between work and leisure. Some organisations are already acknowledging this blurring, and are looking at a "homing from work" rather than a "working from home" strategy (Culliford, 2001).

WorkSpace Futures is a corporate research activity within Steelcase chartered with finding and developing an understanding about evolving issues that will impact our business, our industry, or our customers. It is a multidisciplinary group composed of researchers in architecture, industrial design, interior architecture, user design, mechanical and electrical engineering, physics, ergonomics, business, and marketing.

In addition to this internal capability, Steelcase has created a worldwide network with other research partners. These include other industry research groups like technology companies, academic institutions, research institutions, universities, and professional practitioners in architecture and design. The network also includes collaborative exchanges with cognitive scientists, social scientists, and other specialists.

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GERMANY

eWork and New Forms of Work Organisation

Abstract
In Germany, multi-locational eWork continues to spread against a background of a growing need for more flexible forms of labour deployment. However, the potential of eWork to contribute to better a work/life balance and to increasing workforce participation (by women and older people) is not fully exploited yet. One reason is that many aspects of German society, as well as the country's regulatory system, still reflect a time when the (male) single owner household and lifetime employment were the norm – and everything else an aberration. A large number of policy initiatives – not all of which are well integrated into mainstream policy-making – aim to improve this situation. In addition, many companies and union initiatives explore innovative new ways of working which are sustainable – socially as well as economically.

Key issues
- Broadband uptake is fast, but growth rates have lately lagged behind those in many other EU countries.
- Widespread broadband adoption is likely to improve the feasibility of eWork and make it more attractive to employers and workers.
- …   In a situation of improving (and increasingly ubiquitous) network infrastructure, non-technical barriers to eWork uptake become more important. In Germany, the conditions for new ways of working which radically change traditional patterns of control and social roles remain far from optimal.

Infrastructure for eWork: The ongoing shift to broadband

In 2005, 54% of German citizens were estimated to regularly use the Internet (up from 50% in 2004), according to the European ICT Usage Household Survey. The share of households with access to the Internet was 62% in 2005 (2004: 60%). As in previous years, these numbers imply a slowing down of Internet diffusion in Germany – albeit at a high level, when compared to the EU15 average.

More important than overall Internet uptake figures is the development of broadband access. A number of studies commissioned by the public sector have shown that users of broadband – especially if it is unmetered, which has become the norm in Germany – are much more likely to make extensive use of the Internet including e-commerce, e-health and e-learning applications. Broadband Internet access has jumped from 18%

in 2004 to 23% in 2005. At the end of 2005, there were 10.7 million broadband connections in Germany, the large majority of which using DSL technology. However, while this increase may seem impressive, growth has been slower in Germany than in other EU Member States, which means that the country has lost its lead which it enjoyed when ADSL was first rolled out.

A forecasting study[16] commissioned by the German Ministry of Economics and Technology and published in March 2006 came to the conclusion that the total number of broadband users will grow from 15.9 million in 2007 to 24.3 million in 2010, of which 21.5 million will be private users. 62% of all Internet connections will be broadband by that year. The study also predicts that alternative access channels will become more important, such as digital television (2010: 2.1 million users), 3G mobile networks (1.5 million) and other technologies (1.5 million).

The same study also attempted to forecast the macro-economic effects of broadband-enabled eWork in Germany. In order to do so, the authors assume that between 2004 and 2010, 2.5 million workplaces will be converted into tele-workplaces[17] as an effect of the availability of broadband Internet. According to this research, the resulting aggregate cost savings amount to €2.2 billion in 2004, €4.5 billion in 2007 and €6.7 billion in 2010.

From telework to multi-locational eWork

Companies that offer their staff home-based telework for a major part of their working time remain a minority in Germany. Most home-based telework is based on individual solutions agreed upon in order to please valued workers and to bridge times in which (mostly female) knowledge workers with young kids require increased flexibility to remain in the job.

On the other hand, though, there is little doubt that work in Germany is gradually becoming less restricted by the traditional constraints of place and time. As pointed out already in 2003 by the SIBIS study[18], so-called multi-locational eWork has been growing strongly in recent years in Germany and across Europe, while home-based telework is diffusing only slowly. This process is likely to continue. A new study[19] by the UK-based Future Foundation comes to the same conclusion. It predicts that the share of teleworkers – using a definition which encompasses multi-locational eWorking – among the German workforce will grow to 81% by 2020. While forecasts such as this one are confined to the area of speculation, there is a growing consensus that the organisation of work in Germany will become more malleable and flexible – as this seems to be the only way to maintain productivity growth in the knowledge-intensive industries which matter most for the future.

The increasing demand for flexibility also implies that regulatory frameworks for new forms of work organisation such as telework tend to be rejected by German employers. The European Framework Agreement on Telework, signed by European social partners in 2002 in the form of a non-binding list of recommendations about how telework should be organised at the enterprise level, has not attracted much interest in Germany. This agreement is due for a review in 2006, the outcomes of which will determine whether the Commission will see the need for further action, i.e. issue a directive on regulation of eWork. German employer associations have asked their members to voice their protest against any further regulation in this area, which is seen as a threat to competitiveness.

The political environment for eWork and New Forms of Work Organisation in Germany

In 2005, the political agenda in Germany was preoccupied with questions surrounding the demographic challenge and how the social welfare system needs to be adapted in order to remain sustainable. Some activity was focused on how to make it more attractive for women to get children. Naturally, issues of work-life balance are at the core of this debate. Comparative research has found repeatedly that Germany offers much less favourable conditions with regard to the compatibility of employment and child bearing than other EU Member States – in particular neighbouring Netherlands and the Nordic countries.

One result is that the participation of women in the labour market is low. Moreover, the share of young, employed mothers taking a period of parental leave over a longer time – usually up to three years, which is what young parents are entitled to by German labour laws – is much bigger in Germany than in other countries – a

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[16] Fornefeld, M., Oefinger, P. and Braulke, T. (2006) "Gesamtwirtschaftliche Auswirkungen der Breitbandnutzung", March 2006, Bundesministerium für Wirtschaft und Technologie: Berlin.

[17] These numbers were derived from rough estimates by the Gartner Group, published in "Forecast: Teleworking, Western Europe, 2000-2010".

[18] www.sibis-eu.org

[19] The Future Foundation (2005) "The Future of Teleworking", www.futurefoundation.net/ publications.php?disp=155

survey[20] found that the average duration of parental leave is 27 months in West Germany, and 19 months in the parts of Germany which formerly belonged to the GDR.

In August 2005, the Federal Ministry for Family Affairs, Senior Citizens, Women and Youth (BMFSFJ) published a Prognos study which explored the macro-economic effects of enterprise-level activities to increase work-life balance, including telework and multi-locational work. The study took account of four main factors of macro economic importance which are directly related to work-life balance measures: labour supply, birth rate, productivity and social welfare expenses. A scenario was calculated according to which by 2020, 30% of the total workforce are reached by corporate work-life balance measures. The study found that labour supply will increase by 0.7% under these conditions; the birth rate will be 0.16 higher than otherwise; productivity growth per head (across the entire workforce) will be 0.1 percentage points higher; and there will be savings in compulsory health insurance amounting to 3% of total spending.

These findings supported the results of an earlier study[21] issued by the same ministry in 2003 which found that company measures that effectively increase family-friendliness of work arrangements (including home-based telework) do have a measurable, positive effect on business performance. This effect was found to be due to a reduction of recruitment costs for hiring and training replacement workers, which becomes necessary in the case of employees who take a longer period off for raising their children. Part-time work, flexitime and telework arrangements were also found to have a positive impact on motivation and absence rates.

The Federal as well as the governments of the *Länder* has started a number of initiatives to convince employers of the advantages of offering modern ways of working which increase worker-centred flexibility. For example, the Federal Ministry for Families, the Elderly, Women and Youth has set up a website to allow companies to calculate the return-on-investment for innovations in flexible, more family-friendly work organisation[22]. Another initiative is the Work & Family Audit of the Hertie Foundation which is a "management tool for business enterprises and organisations for the optimisation of a family-oriented employment policy". It aims at ensuring a strong balance between corporate interests and employees' concerns. In September 2005, the Federal Minister for Economics and Technology presented the results of last year's contest and awarded prices to a number of best-practice examples. In Baden-Württemberg, a best practice competition "Equal chances for women and men in the company" is being staged in

2006[23]. It highlights the importance of offering female employees flexibility in the choice of work locations and work times, and makes explicit reference to telework.

Telework and other New Forms of Work Organisation are also increasingly employed as a tool for the integration of disabled people in working life. In a new pilot project[24], the Federal Ministry for Health and Social Security is supporting a so-called "virtual integration office", which started work in all parts of Germany on 1 January, 2006. The project makes use of latest-generation ICTs to first supply severely disabled persons with digital literacy, and then to enable these people to take up a job as knowledge worker – made possible by eWorking from home.

Dealing with an ageing workforce: German companies take action

As a result of the demographic changes in society and the rapidly ageing workforce in Europe, companies will have to adapt their employment strategies in order to remain competitive. This holds true, in particular, for a country with very low fertility rates – such as Germany. Companies will soon be faced with a number of challenges for which appropriate corporate strategies need to be developed.

It is against this background that the initiative "Safe, healthy, competitive – the New Quality of Work" (INQA[25]) was launched in Germany. INQA is a joint project of the Federal Government, the *Länder*, social insurance institutions and the social partners. All members of the Initiative see the promotion of a new quality of work as an important task and a common challenge in the future. With their Initiative the INQA partners intend to bring together people's interest in positive, healthy and personality enhancing working conditions and the need for competitive jobs. The slogan is "Acting together – all partners within their own responsibilities".

The members of the Initiative are pursuing their goal in a situation of rapid structural change in the economy and the society where far-reaching societal concerns need to be addressed in the world of work. This requires: challenging job contents; co-operation between employers and workers on the basis of partnership; vocational training and lifelong learning; health protection and adjustment of working conditions to human needs; more flexible work organization; and better reconciliation of family and work.

The partners in the Initiative intend to prompt a broad societal debate on the future of work. Its aim is to increase public awareness of the issue and to obtain a consensus about types of work re-organization that are not only deemed necessary but also desirable by those concerned. This debate will support all players in defin-

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[20] www.u-asta.uni-freiburg.de/engagement/referate/soziales/kind/vaeter-und-erziehungsurlaub.pdf

[21] www.bmfsfj.de/Kategorien/Publikationen/Publikationen,did=11386.html

[22] www.erfolgsfaktor-familie.de

[23] www.wm.baden-wuerttemberg.de/sixcms/media.php/1106/Formular-Bewerbungsbogen2006.doc

[24] www.neue-arbeit.de

[25] www.inqa.de

ing priorities for their social and economic activities. It will help to clarify the need for new concepts of work design. Furthermore, the partners intend to develop joint concepts and measures to improve the quality of work, to be carried out by the partners on their own responsibility. In suitable areas of work design, procedures and instruments as well as examples of "good practice" will be collected and/or developed and disseminated. Many examples of industrial practice have shown how modern working conditions can be designed. INQA intends to spread the word about these examples, and to initiate co-operation.

Three German companies – Deutsche Bank, the financial service provider; SAP, the leading provider of corporate software in Germany; and Continentale, a medium-sized company in the insurance industry – belong to the frontrunners in the development and implementation of innovative strategies and working arrangements for older workers, an age-diverse workforce and the promotion of active ageing. As part of "Active@ Work", a project co-financed by the ESF Art. 6 programme[26], these organisations have developed innovative measures to address the above challenges. Implementation has started recently. Measures which are currently being implemented or close to implementation include the following:

- Create awareness among managers and staff members for the challenges of demographic change;
- Create awareness among recruiters to prepare them for more targeted and future-oriented recruiting;
- Support staff in taking more responsibility for their own personal development and for lifelong learning;
- Establish "employability" as a key pillar within personnel development;
- Spread practice of age- and experience-diverse teams;
- Set up newsletter on age-related health issues;
- Develop "x% job" and career models;
- Develop skills in management of age-diverse groups (management training);
- Establish working time accounts that stretch over longer periods of time ("lifetime");
- Stage workshops on Work Life Management for staff aged 45+;
- Offer individual coaching;
- Develop "Wellness Checkpoints" and health care / sports programmes;
- Improve what is offered for the care of the elderly.

Financial incentives for eWork

The State government of the Hessen region (which includes the Frankfurt area and has 6M inhabitants) is the only one which gives financial support for enterprises which implement teleworking. The scheme runs until the end of 2006 and is limited to small and medium sized companies located in one of Hessen's objective 2 areas, as defined by the European Commission for managing her Structural Funds.

Financial support is offered to the amount of 50% of investment costs, and up to a sum of €2500 per workplace and additionally €2500 for consultancy and planning expenses. Investments eligible for subsidies must be telework-specific and can include technological infrastructure, furniture, training and others.

The scheme is an attempt to foster the diffusion of IT-enabled new ways of working in parts of Hessen which have structural weaknesses. It is based on the recognition that teleworking and tele-cooperation have not yet found their way into the majority of small and medium-sized companies in the region, in spite of the benefits which have been demonstrated in user organisations.

In the meantime, the tax system will become less favourable for home-based eWorking from 2007 onwards. Today, expenses for a dedicated work room (i.e. a study acting as a home-office) can be deducted from taxable income as long as a minimum of 50% of the working time is spent there. From January 2007, such expenses will not be deductible anymore unless the home office acts as the "centre of the total occupational activity". However, this rule does not apply to computer equipment, the costs for which remain deductible.

Other actors

Public debate around modernisation of work in Germany tends to be overshadowed by structural issues such as changes to the unemployment benefit system and the statutory retirement age. On a smaller scale, however, discussion about new ways of working is lively. Parts of the German unions, in particular, take a very active role in the promotion of new ways of working, with a natural emphasis being put on socially sustainable forms of flexibility. Together with the industry initiative D21 and telephone providers T-Mobile and Debitel, Germany's service union Verdi has set up "OnFormA – Online Forum mobile Arbeit" in January 2006. The project aims to kick-start a broad public debate on the issue of modern, mobile ways of working. The objective is the implementation of a competence platform which will connect experts in the area with people who seek know-how and advice in questions related to mobile work – across all industries and regions[27].

While mobile work has long been neglected by social research and the public debate, there is evidence that the topic is of key relevance for an increasing share of Germans, and that work mobility is not without challenges. A recent study[28] commissioned by the Federal Ministry for Family Affairs, Senior Citizens, Women and

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[26] See www.activeatwork.net

[27] See www.initiatived21.de/

[28] Schneider, N.F., Limmer, R. and Ruckdeschel, K. (2002) "Berufs-mobilität und Lebensform – Sind berufliche Mobilitätserfordernisse in Zeiten der Globalisierung noch mit Familie vereinbar?", www.bmfsfj.de/Kategorien/Publikationen/Publikationen, did =5672.html

Youth explored whether mobile working and work-related mobility are compatible with family needs. The study found that 69% of "mobile workers" feel stressed by their working and living style, compared to only one in five among non-mobile workers. Only in 41% of all cases did mobile workers say that their mobile working and living style is voluntary.

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GREECE

The Greek Research and Technology Network (GRNET) supports the research and development of Information and Communication Technologies (ICT) within Greece and internationally, through the provision of its high-capacity networking and grid computing infrastructure, the strengthening of e-Learning & e-Business practices, as well as the participation in international research and education efforts. GRNET operates under the auspices of the Ministry of Development and is supervised by the General Secretariat for Research and Development.

Electronic business provides SMEs with the capability to extend their market penetration either by extending the reach of their marketing activities or by direct market exploitation. It also provides SMEs with the possibility to differentiate and diversify their operation at costs which may be comparably lower than traditional approaches. The overall effect should result in enhanced performance and economic growth.

The introduction of e-business can act as a catalyst for further development within the selected SMEs as this should develop their potential to innovate and be more proactive in the competitive environment in which operate.

The above reasons dictate the need for actions to be taken for the dissemination of e-business within the SME communities. In this context GRNET S.A. is the implementing authority of two large scale programs: The Training Support of the Program "Go-Online", and the e-Business Forum. Analytically:

Training Support of the "Go-Online" Program[1]

GRNET S.A. is the Programme Implementation Authority of the Training Support of the "Go-Online" program.

The scope of the Training Support of the Go-Online Program is to develop ICT skills to 50,000 Greek SMEs in order to adopt e-business practices in their daily operations.

The Training Support of Go-Online is a 22.3 M€ 5-year Program – funded by the EU Structural Funds, and consists of two action lines:
- Action Line 1: E-business Information Support Service to SMEs is being implemented by a single consortium which develops multimedia-training material, operates a web portal dedicated to e-business and runs a central help-desk as well.
- Action Line 2: E-business Training support to SMEs, is being implemented by 16 regional consortia which provide free training support at each participating SME's premises through e-business consultants who themselves have also received special training offered by regional Academic Institutions.

The aforementioned consortia consist of academic institutions, chambers of commerce and private companies. The Trainers can be young university graduates, high school tutors for informatics, business etc.

The beneficiaries of the Programme - Greek SMEs with up to ten employees and self-employed professionals, with less than 587,000 € annual turnover - are entitled to:
- purchase a PC and an internet connection (category 1), or
- purchase an internet connection and create an e-shop (category 2).

Reasons for the proposed methodology:

The methodology proposed is well proven in practice, given that there are already over 24.000 SMEs that have received training in the proposed methodological framework which has been in place since 2001.

It is also worth mentioning that in a workshop held on 15-16 of May 2003 in Salerno, Italy, entitled "Information Society as a Tool for Regional Development: Exchange of Best Practises at European Level", the "Training Support of the Go-Online Program", was selected as one of the "best practises" projects.

Moreover, an evaluation conducted by an international panel of experts, in the framework of the INSME Award 2005 for the category of "Initiatives, programmes and projects", carried out by intermediaries or their networks in the field of Innovation and Technology Transfer to SMEs", resulted in having the "Training Sup-

port of the Go-Online Program" ranked second out of eight candidates.

Results so far

- 65.000 + SMEs participate in the Programme
- 24.500 + SMEs have received at least one training visit
- 1.700+ active consultants
- 200 + promotional activities (workshops, info-days, media ads)
- 24.000 calls to the toll-free number of the Help-desk (801-11-466638, www.goonline.gr/helpdesk/)
- 56 electronic courses that relate to 32,5 hours of multimedia educational content
- "SME specific" portal[2]

Conclusions based on program's evaluation (Spring 2005)

- 20% increase in the use of ICT and 30% of the Internet, by the SMEs, after their participation in the program
- 80% of the SMEs that participated believe that they can utilize the knowledge acquired in the course of the program
- 70% of the SMEs were totally satisfied with the training support provided to them
- 70% of the SMEs were totally satisfied with the help-desk's services

The e-Business forum[3]

The e-Business Forum is a permanent consultation mechanism between the State, the business sector and the academic community, aiming at establishing useful measures for promoting electronic business in Greece. Executives from all business sectors participate at the Forum, together with experts from Universities and Research Institutions, the Public Sector as well as representatives of social partners and consumers. Until today, in working groups that have operated since November 2000, electronic business has been approached from various points of view: institutional, technical, business, economic, social and political. More than 1.500 experts have participated in these groups, while numerous events have taken place in Athens, Thessaloniki, Heraklion, Patras, Chania, Corinthos, Chalkida, Mytilene and Hios, aiming to highlight special issues concerning the digital economy and to sensitize businesses and consumers.

In the framework of the e-Business forum, four annual surveys are performed, creating data on the penetration of information and communication technologies into Greece:

- On the use of Computers, Internet and Mobile Telephony in the Greek general population - conducted within a sample of 3,000 households

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[3] ebusinessforum.gr

- On the use of new Information and Communication Technologies in Small-Medium Enterprises - conducted within a sample of 1,800 businesses
- On the practices regarding the use of Information and Communication Technologies in the 1,000 largest Greek enterprises.
- On activities in Higher Education Institutions (HEI), Technological Education Institutions (TEI) and research laboratories around the country, which relate to electronic business.

According to the results of the "Research for the Technology and Information Society", the use of PCs and the Internet in Greece did not increase in 2005, while, on the contrary, the possession and the use of mobile telephones increased. More concretely, 27.3% (34.3% in ages 15-65) of the Greek population make use of a PC, while 19.5% (24.6% in ages 15-65) of the population utilized the Internet. Considering the above percentages, a general stagnation can be observed in the last three years. On the contrary, the possession and use of mobile telephones has reached the figure of 73.1% of the Greek population, continually increasing (69.4% in 2004 and 64.7% in 2003). The analysis of the use of PCs and the internet on the basis of gender, age, urban residence and level of education, shows that the use of new technologies is much more wide spread among the younger generations (15-34 years). In urban centres, this also applies to those with superior, high level education with greater numbers for men than for women. Electronic correspondence continues to constitute the main reason for use of the Internet (21.2%) followed by searching for information (17.6%) and information briefing in general (15.2%). 20% of Internet users have performed at least one purchase via the Internet. However a lack of trust in the security of economic network transactions serves as a constraining factor.

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ICELAND

During 2005, the Icelandic economy registered a GDP growth of 5.5%; it was 8.2 % in 2004. This increase is above the EU average and could be explained by Icelandic companies breaking out into the European market. Despite the fact that economy is blooming and ICT uptake by citizens, families and companies is amongst the highest in the world the penetration of eWork is still very limited in Iceland. In this report we will try to

shed light on why the popularity of eWork has not caught on in Iceland. We look at issues related to broadband penetration and investigate the political environment related to eWork.

During 2005 the labour force rates in Iceland were high i.e. (81.9%) for both sexes (16-75 years) and only slightly lower for women beyond child-bearing age than for men[29]. Unemployment is low in Iceland, less than 2.6 % in 2005. The average actual weekly working hours in 2005 were around 47. 8 hours a week for men and 35.6 hours for women[30].

Labour market rates and involvement of women in the labour market is high, both for married and for single mothers. 88% of married women participate in the labour force, so dual earning households are common[31]. Women in Iceland are also more fertile than women in many other European countries. In 2005 mothers still have on average more than two children (2.05)[32].

"In the year 2005, the prevalence of an Internet connection at home was most widespread in Iceland compared with other European households. That year around half of the households within the EU had access to the Internet whereas 84% of Icelandic households had access to the Internet. In the first quarter of the year 2005 88% of the Icelandic population in the age of 16–74 years had used the Internet during the three months preceding the interview. At the same time 52% of EU citizens were Internet users."[33]

The definition of eWork is not very clear to the employees within Iceland in general. When asked whether they telework many individuals may say "Yes" although when the company is asked its representatives would reply "No". Most of the teleworkers in Iceland are using this type of work-arrangement to increase flexibility and time in the office. Recent figures indicate that flexible

work arrangements are quite common in Iceland. These kind of arrangements are still far from being available to the majority of Icelandic employees. 28 % of Icelandic employees now say they telework compared to 23 % who said so last year[34]. The number of hours which individuals telework has decreased though. Now the average number of hours is 7 hours a week, down from 10 hours/week. Men are more likely to telework than woman (34% against 22%). Education also plays an effect when it comes to teleworking, 47 % of those that do telework have a university degree and 59 % have either a masters or Doctors degree whereas only 12 % of those that do telework have no degree from a higher educational institution. Another form of eWork is in socalled telecenters. Telecenters have been promoted by public means in a couple of places in the more remote areas of Iceland in order to support local labour markets and reduce migration to the capital area. The telecenters are few and are being used in few places Iceland, but in a very limited way.

Broadband

In April 2005[35] 84 % of Icelandic families had access to the Internet from home which is roughly the same figure as the years previously. Iceland now leads the OECD with a broadband penetration rate of 26.7 subscribers per 100 inhabitants (Figure 1)[36]. Although the figure is more or less the same, the access technology, and therefore the bit-rate, has increased dramatically. Of the families that now have Internet at home, 73% of them have an ADSL connection (up from 58%). This is basically accounted for by a move from a dial-up connection to an always-on connection or ADSL. According to figure 1, ADSL is the most used broadband technology in Iceland, whereas in Korea, Netherlands and Denmark the cable connection is also a popular type of broadband connection to homes.

Iceland ranked number four dropping from number two last year in the rankings of the Networked Readiness Index in *The Global Information Technology Report 2005-2006* published by the World Economic Forum. According to Augusto Lopez-Claros, *Chief Economist,* this result can mostly be contributed to:

Nordic countries maintain their positions at the top of the rankings, with Denmark, Iceland, Finland and Sweden in third, fourth, fifth and eighth places respectively. Nordic countries have registered consistently high ICT penetration rates and have occupied places in the top ten positions over the last five years. Their high rankings reflect the same set of factors that have propelled these economies to the top of the world competitiveness league. These factors include

[29] Atvinnuþátttaka, atvinnuleysi, vinnutími og fjöldi starfandi eftir ársfjórðungum 2003-2006 (www.hagstofan.is/?pageid=637&src=/temp/vinnumarkadur/rannsoknir.asp)

[30] idem

[31] Hagstofan, *Statistics Iceland (www.hagstofa.is)*

[32] idem

[33] Eurostat, Desember 2005 (http://europa.eu.int/comm/eurostat) Hagstofa Íslands and Nordic Information sociecty Statistics 2005. www.hagstofa.is/lisalib/getfile.aspx?ItemID=3733

[34] VR-blaðið (VR trade union) 5. tbl 2005, www.vr.is/Uploads/VR/vr_bladid/vrbladid_5tbl_2005.pdf

[35] Hagstofan, *Statistics Iceland (www.hagstofa.is)*

[36] *OECD Broadband Statistics*, December 2005 www.oecd.org/document/39/0,2340,en_2649_34223_36459431_1_1_1_1,00.html

OECD Broadband subscribers per 100 inhabitants, by technology, December 2005
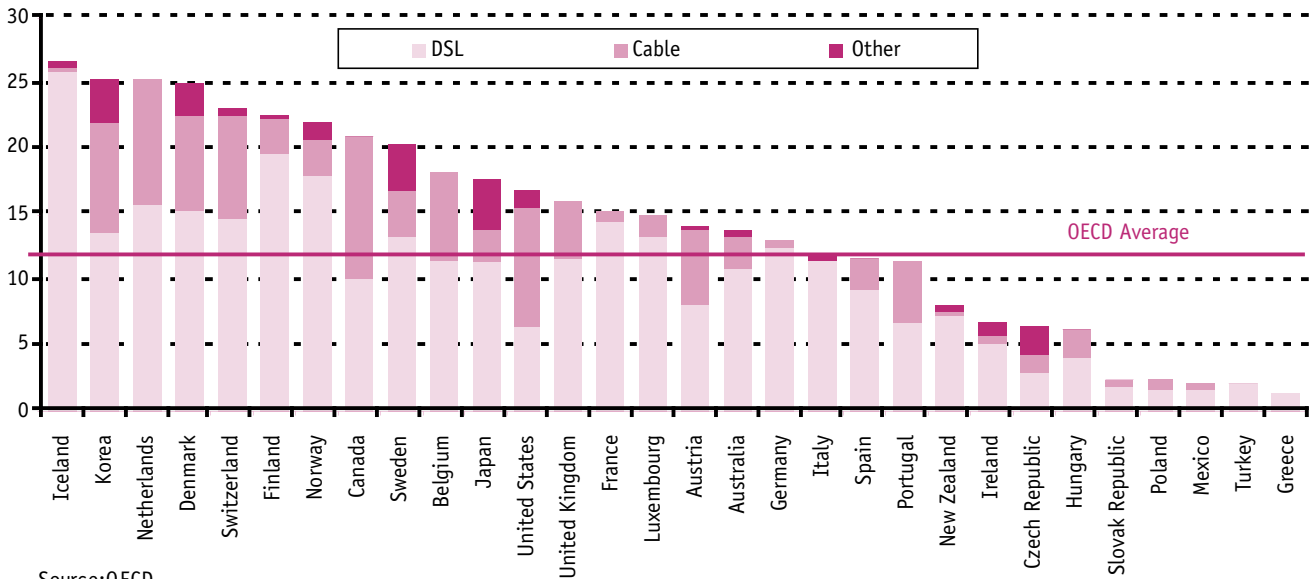
Source: OECD

highly developed educational institutions which have fostered a strong culture of innovation; transparency in government which has contributed to the emergence of a friendly climate for new business ventures; and a strong predisposition to adopt the latest technologies, in government, the business community and civil society.[37]

When looking at mobile phone use, the penetration in Iceland is even higher (Figure 2). The high penetration of mobile phone use gives further indication that the technological means for offering the possibility of eWork to Icelandic workers are readily available.

When examining the status of eWork in Iceland today, it is quite apparent that Iceland has to this date experienced a very low and slow penetration.

As noted above, Icelandic companies and Icelanders in general usually show great interest in new technology. Services or general information for eWorkers has not been developed. There are no services, webpages, or any other means to assist eWorkers in starting doing eWork, or conducting eWork. We also have no knowledge on how or to what degree companies in Iceland support, technically or in other ways, their staff in using eWork as means of executing their work. Furthermore, Icelandic companies in general do not keep records about eWorkers, nor the amount of eWork conducted by their employees.

Legislation and eWork

An EU framework agreement was introduced in 2002 and signed 5th of May 2006. The agreement is based on the EU regulation framework[38]. The impact of this frame-

work agreement has had a limited effect on take up of eWork with companies in Iceland up until now.

Another legislation action was also introduced in 2002. This legislation is closely related to a regional policy for distributed regions. The Icelandic parliament agreed on actions that should be taken over the period 2002-2005. One of the actions dealt (13) with teleworking. The main goal of the action is that all ministries and public institutions should have a telework strategy or policy, which states how employees within the ministries or institutions are able to partly or fully utilise the opportunities of flexible working by teleworking. The strategy should also include means by which the institution will be widely opened up to contracting work performed by self-employed teleworkers. The objective of this legislation is to create opportunities for people who live far away from their place of work to acquire a job where their education can be used, but at the same time have the opportunity to live where they desire. Many positions within ministries and the public institutions are by nature very suitable for teleworking. This kind of arrangements would

Figure 2: xDSL subscriber's connection 1999-2005[1], December 2005
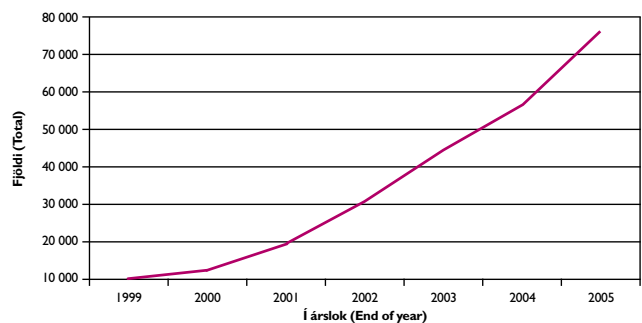
[37] World Economic Forum (2005) *The Global Information Technology Report 2004-2005* www.weforum.org/site/homepublic.nsf/Content/The+US+regains+first+position+in+the+rankings+of+the+World+Economic+Forum%27s+Global+Information+Technology+Report+2005-2006

[38] *Icelandic confederation of labour,* Alþýðusamband Íslands (www.asi.is/displayer.asp?cat_id=71&module_id=220&element_id=3768)

[1] *Fjarskiptamarkaður 2005* – IMG Gallup Iceland and Post and Telecom Administration in Iceland, www.pta.is/upload/files/IMG-Gallup-april%202005.pdf

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mean for instance that the employee would have to come to his or her office only 1- 3 days a week.

Both these initiatives were implemented three years ago, but the formal EU framework agreement was signed this year. To date the increase in number of eWorkers in the public sector has been very little which indicates that these initiatives have so far had very little effect.

Issues on the agenda in Iceland

In summary, Iceland is among the forerunners when it comes to ICT uptake but the interest and focus on eWork has been very limited, both in the private and in the public sectors. This limited interest could be explained by factors such as the traffic, which is not as much of a problem in Iceland as in many other countries and the distances between home and workplaces are not as great as in many other countries.

It is obvious that action to raise awareness of the benefits of eWork is needed, both in terms of raising the awareness of companies and the employees themselves regarding the rights and possibilities.

It can be concluded that the need for eWork is not as high in Iceland as in many other countries and the awareness needs to be raised.

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ISRAEL

ICT in Action for Better Education in Israel

On the average, Israelis spent the highest amount of hours online in March 2006 – 57.3 hours a month. The world average was 31.3 hours online in March[39]. Finland was in the second place with 49.3 hours, next South Korea with 47.2 hours, the Netherlands with 43.5 hours, Taiwan - 43.2, Sweden - 41.4, Brazil - 41.2, Hong Kong – 41.2, Portugal -39.8 and then Canada - 38.4.

To illustrate how this happens in Israel, following is one story about the leading ICT organization in education in Israel – The Center for Educational Technology.

CET – Where Technology and Pedagogy meet to create new k-12 Learning Environments[40]

Some 35 years ago the Center for Educational Technology (CET) was founded, with the vision to promote the education system in Israel through technology-based innovativeness. Ever since then, CET has been the pioneering force in introducing computers to schools all over the country and contributed tremendously to the successful implementation of technology in the k-12 system. From DOS-based computers, designed to help teachers to diagnose their students' scholastic progress to today's web-based fascinating learning environments, CET has been the driving force for harnessing technology for the benefit of pedagogy in Israel.

Most of Israeli schools nowadays are equipped with the necessary hardware and are usually connected to the internet. However, CET was the first to realize that without proper and relevant digital content – in the form of software, courseware, databases or digital libraries – these computers would soon become useless. CET has therefore invested most of its resources in the development and the implementation of computerized teaching and learning environments, taking into consideration 4 major assumptions:

- That a holistic approach must be taken, considering different aspects of school life, such as: school climate, infrastructure, teachers' skills, access to computers after school hours, etc.
- That these environments must address the true needs of the teachers and the students;
- That the new environments must meet 21st Century Labor Market demand and prepare students to the highly competitive information era;
- That without proper and intensive implementation the new environments will never be fully and effectively integrated in the classes.

As a non-profit organization, CET is socially deeply committed, driven by strong moral values and an inherent innovative approach. Having under its roof both pedagogical and technological experts, most of them holding master and PhD degrees, CET has been able to provide schools throughout Israel with state-of-the-art virtual platforms, interactive courses and distance-learn-

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[39] Source: comScore Networks USA
[40] www.cet.ac.il

ing environments, which have become extremely popular among teachers and students.

CET's innovative learning environments cover different subject matters and address both teachers and students of all ages, thus creating a pedagogical continuity and creating an across-the-board impact. A few examples:

TAMID – Teachers Virtual Campus. CET strives to improve the professionalism of teachers by developing ICT-based instructional tools and methodologies. Together with the Ministry of Education and with the Open University, CET has established the Virtual Campus for the professional development of teachers. Each year, thousands of teachers benefit from the advanced learning format offered by the Campus, which connects them to technology and to up-to-date information from academia and the field.

OFEK – A novel virtual environment for elementary school, which offers:

- Interactive rich media Learning Objects
- Content that is connected to the curricula and to national standards
- Assessment tasks, designed to closely follow students' progress
- Personal libraries for teachers and students
- A friendly administration system, allowing teaching staff to monitor students' work

Nachshon - Virtual Mentoring to Success. This unique model is based on a designated virtual platform through which outstanding university graduates tutor students at the ages of 15-18, who wish to improve their achievements in mathematics and in physics. CET experts provide the graduates with special teaching materials and train them through the virtual platform during the year. This model is especially designed for promising students from the periphery that need reinforcement in order to succeed in their matriculation examinations.

TENE - a combined media program, aimed at narrowing the literacy gap by imparting, prior to elementary school, the primary skills needed to acquire literacy abilities. The program is based on the use of various media: interactive cable TV programs, Internet, printed materials and videotapes and on significant parental and teacher involvement, creating essentially a comprehensive framework for the development of literacy skills. The dynamic and colorful internet site has become one

of most popular sites among children aged 4-7 and their parents and demonstrates a very a successful example of "Edutainment".

These and CET's other learning environments serve students from different sectors of Israeli society - Jews, Arabs, gifted children, children with special needs, new immigrants and others – on a daily basis. They have become an integral part of the way teachers and students teach and learn, in and out of school. It is expected that this process will be further accelerated in the coming years and that more and more advanced and rich learning environments will be in need. CET is there to recognize future tendencies and turn them into feasible and meaningful tools for students, teachers and schools.

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ITALY

Introduction

The goal of this report is to describe the current Italian situation with respect to emerging trends in telework and the key social and economic factors underlying these trends.

The Italian economy and innovation

The economic situation

The economic situation at the end of 2005 was less uniform than in the previous three years. Official data shows that a number of sectors (food and beverages, wooden and rubber goods, pharmaceuticals and building) are growing in terms of value added, production and employment while other sectors have experienced a drop in employment and slower growth. This is not really a crisis. What the figures reflect is a change in the positioning of specific industries (e.g. furniture, jewelry) in response to sudden shifts in demand. In telecommunications and finance, employment in the period 2000-2004 fell, while value added and production increased sharply (CENSIS 2005).

Looking at the general picture of the Italian economy, we can identify a number of rapidly growing sectors with a strong tendency to innovate. These include biotechnology, tourism, services and ICT manufacturing - all sectors which are increasing their turnover despite strong competition on world markets. But on their own, they are not strong enough to drive Italian economic development. To do so, they would need new forms of strategic organization allowing them to achieve the critical mass necessary to face domestic and international competition.

Innovation

Innovation is one of the key strategic priorities for economic growth and competitivity – and receives both

direct and indirect support from the European Union. To this end, the EU has created the European Innovation Scoreboard (EIS). The EIS compares different countries' innovative capabilities using a *Summary Innovation Index* (SII) – calculated as the ratio between innovation inputs and innovation outputs.

In 2005, as in previous years, the countries with the highest score on the index – Sweden, Switzerland, Finland and Denmark – came mainly from Northern Europe. Between 2004 and 2005, Italy improved its score, passing from 0.31 to 0.36. However, Italy's score is still below average for the original 15 member states. Considering the full set of 25 member states, Italy ranks 12th. In the sample of 33 states considered by the study (25 EU member states, USA, Japan, Iceland, Norway, Switzerland, Bulgaria, Rumania and Turkey), Italy ranks 17th.

Fig.1: Summary Innovation Index 2005
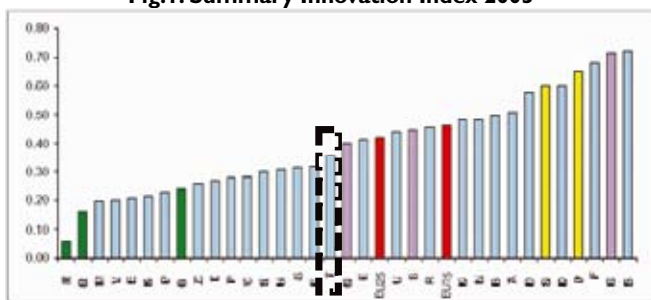
Compared to the 15 original member states, Italy continues to rank poorly in terms of the number of university graduates (11.6% of the population compared to a European average of 23%), The percentage of new graduates in science and engineering disciplines (7.4% vs. 13%) and the percentage of SMEs who cooperate with other SME's in innovative activities (only 2.7%).

If we look at short term trends (see Figure 2), we observe that Greece, Portugal, Cyprus, Slovenia and the Slovak Republic are rapidly improving their positions. Italy is also improving but more slowly.

Fig.2: Summary Innovation Index 2005 and changes in position during 2005
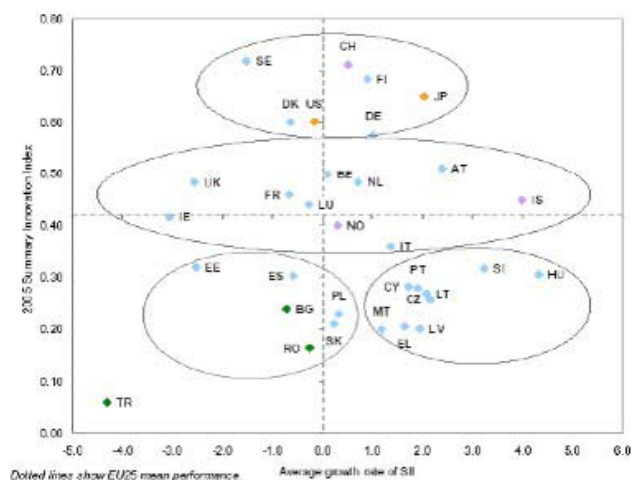
Reading from top to bottom and left to right, the four sets shown in Figure 2 represent: innovation leaders, countries with average performance, countries (such as

Italy) which are improving their performance, and countries whose performance has deteriorated. The four quadrants should be read as follows:

2. Slowing down	1. Moving forward
4. Going backwards	3. Gaining lost ground

The study also shows, however, that Italy is one of the countries which has done best in transforming innovative inputs – thanks to Italians' openness to innovation. A recent survey by Innobarometer[41] used a sample of 30.000 Europeans in the 25 EU member states, Rumania, Bulgaria and Turkey, to study Europeans' propensity to accept innovative services. The study showed that Italy and Rumania are the two countries whose inhabitants are most favorable to innovation.

It is interesting to observe the correlation between growth in the SII and leadership in particular areas of innovation. In many cases, the countries which do best in specific areas are those which are gaining lost ground on the overall index. For example, Italy (together with the Slovak Republic and Poland) leads the field in terms of the percentage of university graduates in scientific and engineering disciplines; it is also a leader in terms of broadband penetration (together with Ireland and Luxembourg).

It is clear that company and industry competitivity depends on innovation. However, this requires that research should have an adequate organizational structure, that it should be based on appropriate technologies and that it should have proper access to human and financial resources. Currently, Italy does not have this kind of capability. According to a recent study (CENSIS 2005), the main reason for Italy's backwardness is the lack of a private research sector. Elsewhere in Europe and even more so in the USA, companies play a key role in research and development. By contrast, Italian industry is dominated by small and very small companies which cannot sustain the organizational and economic costs. The majority of Italian companies take a short term rather than a strategic view of innovation. Only rarely do they work with other companies, universities, and technology transfer centers (CENSIS 2005). This shows up clearly in European Commission figures for company investment in Research and Development (Table 1).

According to this study, only 17 Italian companies are in the top 500 European R&D spenders. This places Italy in 8th place in the overall European ranking. Average expenditure per company is high – showing the predominant role of a small group of very large companies (Finmeccanica, ENI, Pirelli, Telecom). In terms of pro capite research investment, Italy ranks 12th in Europe. But in terms of scientific publications and citations it is 12th in the world (ISI Essential Science Indicators Web product, 2005). This suggests that Italy basic science infrastructure is functioning efficiently.

41 ftp://ftp.cordis.lu/pub/innovation/docs/
   innovation_readiness_final_2005.pdf

Tab. 1: European countries ranked by the number of companies in the top 500 R&D spenders. Source: European Commission, Monitoring Industrial Research, 2004.

Country	Number of companies in top 500 R&D spenders	Average expenditure per company (millions of euro)
1. U.K.	149	115
2. Germany	100	375
3. France	66	296
4. Sveden	44	146
5. Finland	28	176
6. Denmark	28	63
7. The Netherlands	22	315
8. Italy	**17**	**228**
9. Belgium	16	77
10. Austria	10	26

Italy's ability to innovate would be stronger if it were possible to create networks of innovation linking SMEs in different locations. This kind of "company clustering" could be a way of improving the competitivity of Italian industry, accelerating the stunted growth of Italian SMEs and resolving Italy's economic crisis. Only rarely are innovations introduced by Italian SMEs taken up by other companies in the same branch of production. According to a recent CENSIS study of innovation and collaboration in Italy's "industrial districts", "company clustering" is growing but still has very little real impact on SMEs. Where SMEs have succeeded in sharing costs, ideas and skills to create new services, these services make a significant contribution to innovation. In Catania and Livorno, for instance, respectively 41.9% and 56.7% of companies who have gone through the experience report they have acquired new skills. 26.6% of companies from Lecce and 38.6% of companies from Agrigento report they have been able to share their know-how. In brief, there is a clear perception of the benefits of collaboration, even though there are difficulties in using it as a growth and innovation strategy.

Technological penetration

Technology in society

Although Italy lags behind other European countries in innovation, it is in a stronger position as a consumer of technology. In Italy, demand for ICT products is driven more by the consumer market than by business. Even very innovative technologies have penetrated Italian society in depth. A recent CENSIS study (CENSIS - "Cittadini digitali", 2005) points to the central role of households as drivers of technology consumption.

In 2005 household expenditure for technology continued to rise. Many technological devices are no longer considered as luxury items but as basic household tools (Table 2).

Tab. 2: % of families owning specific technological devices. Source: CENSIS 2003-2005

	2003	2004	2005
Video recorder	78,8	85,0	84,6
Teletext	81,1	88,3	88,1
Mobile phone	89,0	93,0	90,3
Personal computer	51,3	67,9	68,5
CDRom	47,0	62,6	67,6
DVD player	21,1	45,5	59,9
Satellite or pay TV	20,5	23,7	26,9
PDA	-	6,0	7,9
Games console (Play Station, Nintendo)	29,0	31,0	27,2

As far as concerns use of Internet, growth in 2005 was slower than in the previous years (2003: 32.1%; 2004: 42.1% ; 2005:42.7%). One of the most interesting trends found by the study was the increase in the number of "*always on*" connections. In 2005, 17% of Italians (half of all Internet users) used Internet both from the office and from home.

The study goes on to show that it is mainly *always on* users (managers, young professionals who check their mail from airports and hotels, young people who buy books and book travel over the Internet) who are driving the demand for higher connection speeds and more hot spots. Between 2004 and 2005, the percentage of ADSL connections rose from 27.5% to 56.7%. The number of users using optical fiber connections tripled to 6,3%, and the percentage of users connecting via telephone and modem fell to 27% (CENSIS, 2005).

The increase in the number of fast connections has led to an interesting social phenomenon. One of the key trends of 2005, especially among young people, was the rise of social networking via the net: the use of Internet to make new friends and as a meeting place. Social networking applications make it possible for people with similar interests to meet, to exchange information and to provide each other with help and support. One of the most widely used platforms (*Linked in*) offers services for professionals on the labor market where networking and social contacts are particularly important. Many users use *Linked In* to look for customers or partners, to apply for jobs and to provide employers with references..

Technology in companies

ISTAT (ISTAT 2005) reports that, in January 2005, 95.6% companies with more than 10 employees owned at least 1 personal computer. 95.1% of companies with

10-49 employees owned personal computers. In companies larger than this the percentage owning PCs was higher than 99%. Use of personal computers is also rising. In 2005, the percentage of employees who use the PC at least once a week rose to 38.4% (2004: 36,4%). In large companies with more than 250 employees, this figure rose to 44.3%. Use of computers was particularly common in the North West (42,5% of employees) and in central Italy (42.7 %) (Figure 3).

Fig.3: % of employees who use personal computers at least once a week; percentage of users who use PCs connected to the Internet. Distribution by region. Source: ISTAT, 2005

Legend:
- Employees who use personal computers at least once a week
- Employees who use computers with an Internet connection
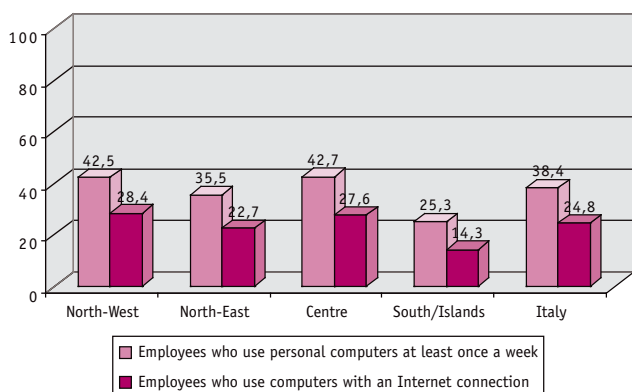
Internet connections are also becoming more common. In 2005, 24.8 % of company employees used *personal computers* connected to the Internet (2004: 21.5%). This data matches with other signs that companies are making more intensive use of ICT. In January 2005, 92.9% of companies with more than 10 employees and more than one computer used e-mail (2004: 84.4%). 95.9%o had an *Internet* connection (2004: 90.3%), 56.4% had their own *Web Site* (2004: 47.8%); 31.6% connected their office computers via an *Intranet* (2004: 30.2%); 12.8 % owned an *Extranet* (2004: 13.1%). The use of intranets and extranets is strongly correlated with company size. 83.5% of large companies (more than 250) own an intranet and 55.4% own an extranet. The equivalent figures for companies with 10-49 employees are 27.4% and 10.1%. (Figure 4).

Fig 4: % of computerized companies with more than 10 employees, owning an Internet connection, a Web Site, an Intranet or an extranet. Source: ISTAT 2005

Legend:
- Internet
- Web site
- Intranet
- Extranet
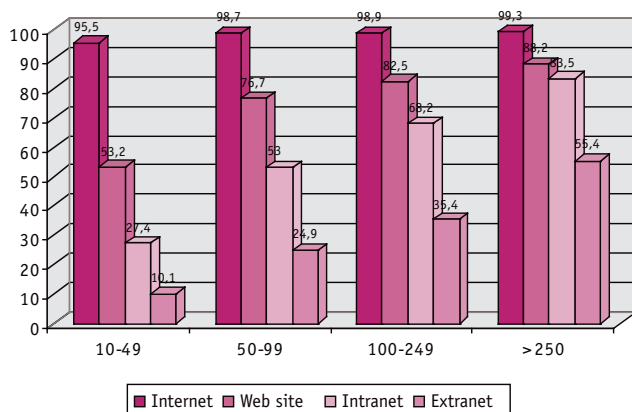
E-Mail and Internet connections seem to be equally common in all companies, regardless of location or sector of economic activity. In nearly all cases, penetration

has reached levels higher than 90%. As broadband connections become ever more common, traditional technologies (modem and ISDN) are becoming obsolete. In 2005, 59.3% of computerized companies had a broadband connection (2004: 52.2%). 30.4% used modems and 40.0% used ISDN (2004: 48.1%, 49.0%). Broadband connections are particularly common in companies with more than 99 employees and in companies located in the North. By contrast modems and ISDN connections are most common among small companies and in the South. Wi-Fi has not yet had a major impact. In 2005, only 7.8% of companies had Wi-Fi networks (2004: 7.5%). These are mainly concentrated in companies with more than 250 employees, 26.7% of which have adopted the new technology. In general terms it is mainly large companies that use the more innovative technologies such as broadband and Wi-Fi. Although broadband is now the most common technology for business connectivity, smaller companies are still tied to "mature" technologies. (Figure 5).

Fig 5: Computerized companies with at least 10 employees classified by number of employees and penetration of different connectivity technologies. Source: ISTAT, 2005

Legend:
- Wireless
- Modem
- ISDN
- Broadband
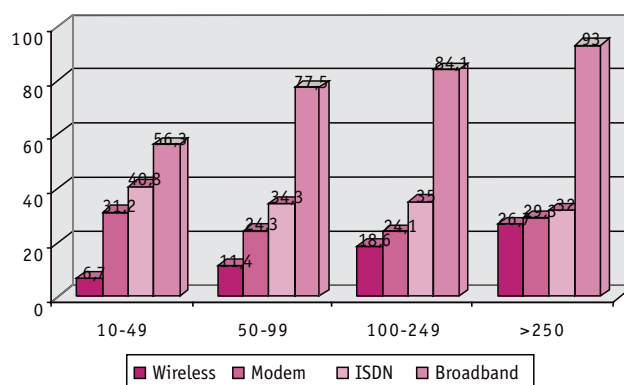
Although 2005 saw increased used of ICT by Italian business (especially large companies), investment in ICT is still low by European standards. According to CENSIS (CENSIS 2005), Italy ranks 18th in Europe for IT expenditure. The same report shows that Italian expenditure on IT amounts to 1.9% of GDP as opposed to a European average of 3% and a US figure of 3.8%. Expenditure in telecommunications adds up to 3.4%. A recent study by Assinform (2006), suggests that the Italian IT market is finding it difficult to take-off. The main difficulties seem to be a lack of investment and companies' inability to network and work together.

Technology in the government sector

According to a study of eGovernment by the European Commission, (eEurope 2005), Italy is in a strong position in this area. The study shows the percentage of services available on line (the eEurope 2005 indicator) and sophistication of these services. Calculations based on data from the Italian Ministry for Innovation and Technology (2006) suggests that 10 of the 20 services used to calculate the indicator are available completely on line. In 2001 only 3 services were online. In terms of the indicator, Italy's ranking has improved from 12th out of 18 European countries, to 8th. Between 2001 and

2004, its overall score improved by 38% - the 4th fastest improvement in Europe. Between 2003 and 2004 Italy improved its score by 8 points. This improvement was beaten only by Iceland, the UK and Norway. Improvements in other European countries such as France, Germany, Ireland and the Netherlands, were slower. Today, in Italy, 53% of the services used to calculate the indicator are online. This is better than the European average of 46% (Figure 6).

Fig 6: Services completely available online. Italy and EU average figures, 2001 - 2004. Source: EU, Calculations by Centro Studi MIT(2006)
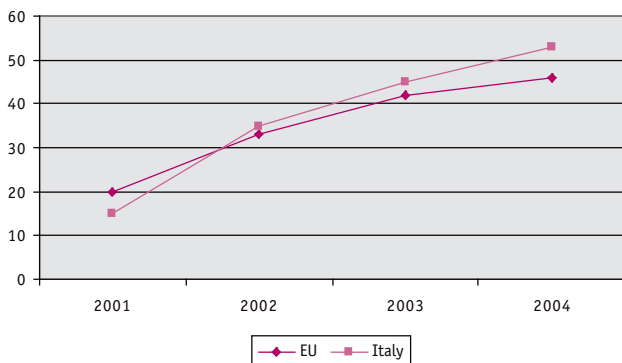
The data on the sophistication of services is equally encouraging. Here Italy ranks 11th in Europe – one position higher than in 2001. The improvement in this indicator amounted to 33%, the 6th fastest growth in Europe. Italy's score (72%) is exactly in line with the European average. Today, nearly all Italian services offer two-way interactivity (i.e. the possibility of downloading forms and filling them in online). By contrast, in 2001, Italy scored below the European average. In that year, Italy's score for sophistication of services amounted to just 39%, with most services providing only one-way interaction (Figure 7).

Fig 7: Sophistication of services. Mean indicator values for Italy and the EU. 2001 - 2004. Source: EU, Calculation by Centro Studi MIT(2006)
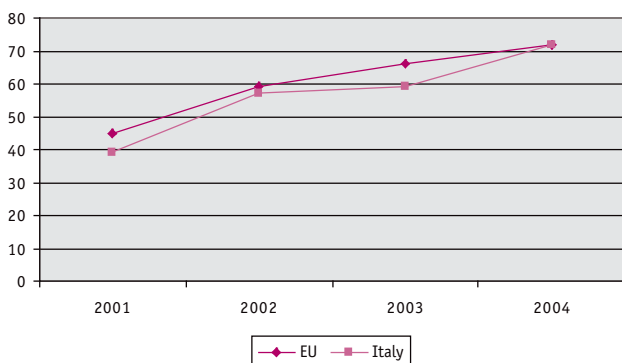
In Italy, online services are provided not just by central government but also by regional and local governments and other organizations offering services, products and solutions to citizens. Key services are offered by local health authorities (*Aziende Sanitarie Locali* or *ASL*), Chambers of Commerce and other autonomous organizations. Today, nearly all local health authorities have Web sites providing information to the public. However, online forms and more sophisticated services

are still relatively rare. Nonetheless, a number of health authorities are collaborating with central and regional government to offer innovative online services. One example is in *Lombardia* where citizens have a "Regional Service Card" allowing them to access services provided by family doctors, local health authorities, pharmacies, hospitals and outpatients departments.

One interesting possibility for the government sector, pointed out in the CENSIS report for 2005, is to exploit Wi-Fi technology. In the future, this could be used to provide a broad range of services for the citizen. This has been made possible by the abolition of regulations limiting Wi-Fi to public spaces and preventing the creation of public services targeting residential and business users. Today Wi-Fi is spreading rapidly in small towns and major cities, in rural areas and in areas with major social problems. The new technology receives enthusiastic support from local government. In all these cases, the goal is to break down the so-called digital divide, caused by the lack of broadband coverage. One example is the Municipality of Chamois in the Valle d'Aosta. Chamois has used a convention between ANCPI (the National Association of Small Towns) and a private telecommunications to create networks available to citizens at low cost. Other interesting offering have been created by Rome and by San Remo, which provide services to citizens and tourists through Wi-Fi installations in parks, on beaches etc..

The Italian labor market

Although there have been some recent signs of recovery, the Italian labor market continues to show signs of weakness, compared to markets in other European countries. This translates into an overall level of activity of just 62.9% (EU average: 69.6%) – the third lowest rate in Europe (CENSIS, 2006). The Italian employment rate (57.6%) is also one of the lowest in Europe. The position is particularly unsatisfactory from the point of view of gender equality. In Italy today, only 45.2% of working age women are in active employment (EU average: 55.7%) In terms of female employment, Italy ranks next to last in Europe. Comparing the actual situation on the Italian labor market with the Lisbon objectives, we find a 12.4% gap between the target for employment and the real figures. For women this gap widens to 14.8 percentage points (CENSIS, 2006). Given the general slowing down of the Italian labor market, prospects for improvement are poor.

ISTAT's survey of the Italian workforce for the third quarter of 2005, shows year on year growth of 0,3% (slower than the 1.0% growth registered by the previous survey). According to data from the Italian Ministry of Labor (2004), the number of jobs fell by 0.1% compared to the same period of 2004 (-0.5% for women's jobs, +0.2% for men's jobs). The survey also shows profound regional differences. In the North, the number of jobs increased by 1.1%. In central Italy it fell by 0.2%, the loss mainly concerning men. Jobs in the South fell by 1.8%, with most of the lost jobs belonging to women. These trends have discouraged those with poor pros-

pects on the labor market (prevalently women and young people) from actively seeking employment: between the 3rd quarter of 2004 and the same quarter of 2005, the number of those looking for work fell by 4.1% (4.6% for women and 3.5% for men).

A further factor we observe in the ISTAT and CENSIS surveys is a reduction in the number of the self-employed and of those employed on a part-time basis. In the past, these forms of employment represented an important innovation for Italian industry, showing workers willingness to accept risks (self-employed) and allowing new forms of work organization (part-time).

Telework in Italy

Italian eWorkers

In Italy, it has been apparent for several years that companies have a low propensity to use classical telework: work regulated by a special labor contract in which the teleworkers uses equipment provided by the company to do the work and to communicate with the office. A recent survey by ISTAT shows that only 9.7% of computerized companies with more than 10 employees use any form of telework. To the extent that it exists at all, telework can found in large companies: 53.6% of companies with more than 250 employees have external connections to their information systems. The equivalent figure for companies with 10-49 employees is 7.4% (Figure 8).

Fig 8: % of computerized companies with more than 10 employees that use telework. Classification by number of employees. Source: ISTAT, 2005
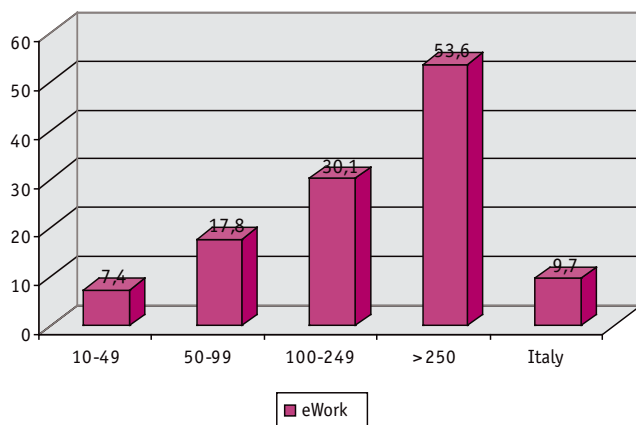
Most of the workers concerned are at a relatively low level in their companies and do work which it is easy to control at a distance (e.g. call center agents). Although this form of telework was originally presented as a revolutionary development, in practice it has proved incompatible with Italian industry's strong emphasis on SMEs and family firms. What has happened over the last few years is that new ICT technology has made it possible for certain kinds of worker (managers, consultants, sales representatives, insurance agents, investment brokers, and "intellectuals") to do more and more of their work "on the road", away from the office.

A steady improvement in computer skills and ever more intensive use of the Internet has led to the devel-

opment of "alternative" forms of work, in which workers use the Internet to communicate without the need for an office. A recent ISTAT survey shows that about 8% of young people between 25 and 44 use the Internet to make work-related phone calls and to participate in videoconferences. Most of these users do non-manual jobs and use the network to communicate, to look for information and for online services. Some of the most active users are senior managers, entrepreneurs, and professionals such as doctors and lawyers. The survey shows for instance that 12.3% of these users use the Internet to make phone calls or for videoconferencing. Among junior managers and lower-level office workers this percentage falls to 7%. The majority of heavy users (7.5% of the total user population) is concentrated in the North-West.

These trends go hand in hand with other changes in Italian workers' lifestyles. There is a growing trend to work outside regular office hours and an ever growing proportion of workers have unusual timetables. Data supplied by CENSIS (2006) shows that 33.8% of employees work "inconvenient hours" –working at home in the evenings, at night and during the weekends. Another 19.8% have experienced "extra-long" working days. These are particularly common in the service sector, where 40.8% of workers have had this experience, among sales representatives (64.3%) and in the intellectual professions.

A CENSIS study on communications in Italy shows that the number of habitual users of mobile phones has risen from 39.3% of the population in 2001 to 76.3% in 2005. This suggests the mobile phone has become a normal part of daily life. The way mobile phones are used has become more differentiated. While the very young use them more and more to make friends and to stay in contact, there has been a steady increase in the number of users who use it for work (in 2005 31.1%). Content analysis of *SMS* shows that 25.4% of messages are about work (Censis, 2006).

All this is made possible by the gradual penetration of communications technology into daily life, and users' increasing familiarity with high-tech devices.

Telework in banking, finance and insurance

One area where telework has been especially important is in banking, finance and insurance – a sector of the economy which has grown enormously in recent years. Recently ISTAT published a study of use of ITC in finance, insurance and banking companies with more than 10 employees. 99.4% of these companies own at least one Personal Computer. This figure rises to 100% for insurance companies and for companies with more than 49 employees. 98.4% of employees use computers at least once per week (99.1% in banking). The study, which refers to the period 2004-5, shows that 20.5% of the companies surveyed use telework. Among insurance companies this figure increases to 44.2%. Other companies use telework less frequently. 29.7% of the companies surveyed use the Internet for online training. As can be seen in Figure 9, online training is particularly impor-

tant in banking, where it is used by 40.1% of the companies in the study, and in the insurance industry (35.5%). In smaller companies it is less important. (Figure 9)

Fig 9: Computerized companies in the finance, banking and insurance sector with at least 10 employees: use of telework and online training. ISTAT, 2005
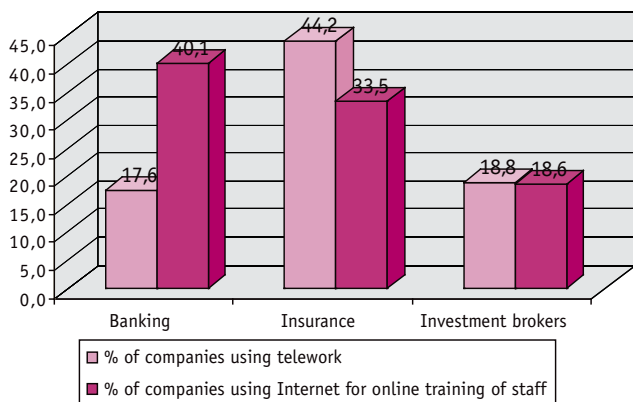
Telework and online training are most common in larger companies. The ISTAT survey shows that about half of the companies with 250 or more employees use online training, and that 42.6% use various forms of telework. (Figure 10).

Fig 10: % of computerized companies with more than 10 employees who use telework or online training. Classification by number of employees, ISTAT, 2005
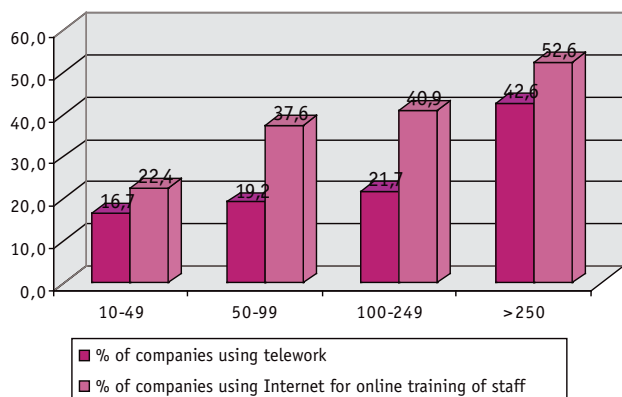
From a geographical point view, telework is most common in the North-West, where it is used by 26.9% of the companies in the survey. This figure contrasts with a mere 8.7% of companies in Southern Italy who use telework. (Figure 11).

Web sites
www.mininnovazione.it/
www.gartner.com/Init
www.welfare.gov.it/default
www.i-dome.com
www.idc.com/italy
www2.acnielsen.com/pubs/rfid.shtml
http://telelavoro.formez.it/index.html
http://europa.eu.int/italia
www.assinform.it
www.istat.it
www.censis.it

Fig 11: % of computerized companies with more than 10 employees who use telework or online training. Classification by geographical area. ISTAT, 2005
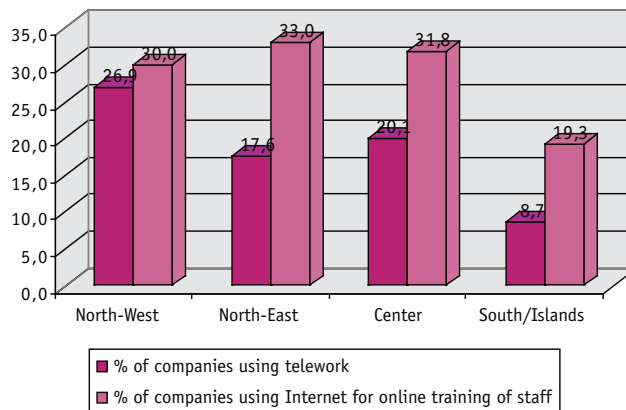
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JAPAN

Summary & Key Issues

Summary
The Ministry of Internal Affairs and Communications remains in the lead of the public push for greater telework. Corporate telework initiatives are also on the increase, supported by a series of initiatives including the publishing of a corporate telework, training for telework managers and an online skill self-assessment system for independent teleworkers.

Key Issues
- The Ministry of Internal Affairs and Communications' in-house pilot expanded
- Corporate telework programs increase
- Various telework support initiatives launched

Demographic statistics released in June 2005 reported a total fertility rate (TFR) of 1.29, the lowest figure on record. Moreover, a bulletin on the Population Census conducted in October 2005 placed the Japanese population at 127.757 million, a decline of some 19,000 on the

previous census and the first reported drop since statistics were first compiled in 1899. In line with these trends, the greying of the Japanese population continues apace, the number of people 65 years of age and over accounting for 19.5% of the general population in 2005 and the government's 2005 White Paper on An Aging Society predicting this proportion to rise to 26.0% by 2015 and 35.7% by 2050.

On the labour front, employment has picked up across the board with the improvement in the Japanese economy. Nevertheless, the Ministry of Internal Affairs and Communications' Statistics Bureau reported that the share of non-regular employees (part-time, temporary, contract employees etc.) reached 32.3% in 2005. Elsewhere, heightened concern over the working hours of regular employees has prompted the promulgation of the Law on Improved Work Hour Formulation, which went into force on April 1 of this year. In the face of a lack of visible improvement in regular employee work hours and a steady decline in the take-up of annual leave entitlements, the Law calls for the establishment of in-house Work Hours Formulation Improvement Committees, giving special dispensation to any resolutions made therein from the Labour Standards Act.

Ministry of Internal Affairs and Communications Continues to Lead

The Ministry of International Affairs and Communications (MIC) continues to lead the public sector push for greater telework.

In-house Pilot[42]

Following on from its initial six-person telework pilot in January-February 2005, the Ministry of Internal Affairs and Communications launched a second four-month pilot in October 2005 with twenty participants. The findings were released in April 2006, 83% of the participants being in favour of the pilot due mainly to the gains in concentration they enjoyed. Managers for the most part were also favourable, 64% saying they experienced no particular trouble in supervising subordinates.

Tab 1: Type of Activities Engaged in by MIC Pilot Participants (N=18)

Planning	20%
Supervisor/co-worker contact/coordination	15%
Research activities	13%
Reference materials/information gathering	11%
Writing/editing official publications	11%
Data entry/processing	10%
External contact/coordination	9%
Law/Directive planning/writing	3%
General coordination duties	2%
Licence-related activities	1%
Routine clerical/accounting/statistical duties	0%
International-related duties	0%
Other	5%

Telework Promotion Forum[43]

The Telework Promotion Forum was officially launched on November 10, 2005 by the four ministries involved in promoting telework: MIC; Ministry of Health, Welfare & Labour (MHWL); Ministry of Economy, Trade & Industry (METI); and the Ministry of National Infrastructure (MNI).

Other public sector initiatives include a home-based telework pilot by the city of Chikae Hachiman in Shiga Prefecture. Launched in April 2005, the pilot was conducted in two phases: April-July (3 participants) and August-November (4 participants). The final goal was the introduction of a standing program in April 2006. Telework training was also provided to the City's seventy public servants in September 2005.

More Activity in the Corporate Sector

A March 2006 article in Japan's leading business daily, the *Nihon Keizai Shimbun*, reports an increase in the number of corporate telework programs in Japan. Japanese companies have been notoriously slow to explore the possibilities of in-house telework, the local telework scene being dominated by independent teleworkers and so-called SOHO (Small Office Home Office) operators. Nevertheless, such well-known companies as Japan Telecom, Fuji Xerox, Matsushita electric Works, SS Pharmaceuticals, Janssen Pharmaceutical, and the Nichirei Group all now have programs in place.

Of especial interest is a program by Matsushita Electric Industrial, where some one thousand employees started teleworking in April 2006. Those eligible for the program are professionals involved in research, planning or legal affairs, supervisor consent being an additional condition. While the company already had a home-based program for child-care support, the aim of this company-wide initiative is to raise worker motivation. A further 4,000 sales staff are eligible for the company's Mobile Work program.

Various Telework Support Programs

2005 saw the provision of several tools aimed at supporting the greater diffusion of telework. First of these was a Guidebook for the Introduction & Running of A Corporate Telework Program, a joint effort by the four ministries involved in promoting telework (MIC, MHWL, METI and MNI).[44] (Figure 1, next page)

A second support initiative was conducted by the Japan Telework Association[45] in December 2005 and focussed on providing training to telework managers. Limited to fifty participants, the program included an overview on corporate telework trends and presentations on three in-house programs. This was followed by coaching and open discussion sessions.

The Japan Telework Association has also been involved in research on the effectiveness of home-based work

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[42] A full report in Japanese can be found at: http://www.soumu.go.jp/joho_tsusin/telework/pdf/telework_kakudai_houkoku.pdf

[43] http://telework-forum.jp

[44] www.mlit.go.jp/crd/daisei/telework/guidebook/guidebook.html (in Japanese)

[45] www.japan-telework.or.jp/index.html
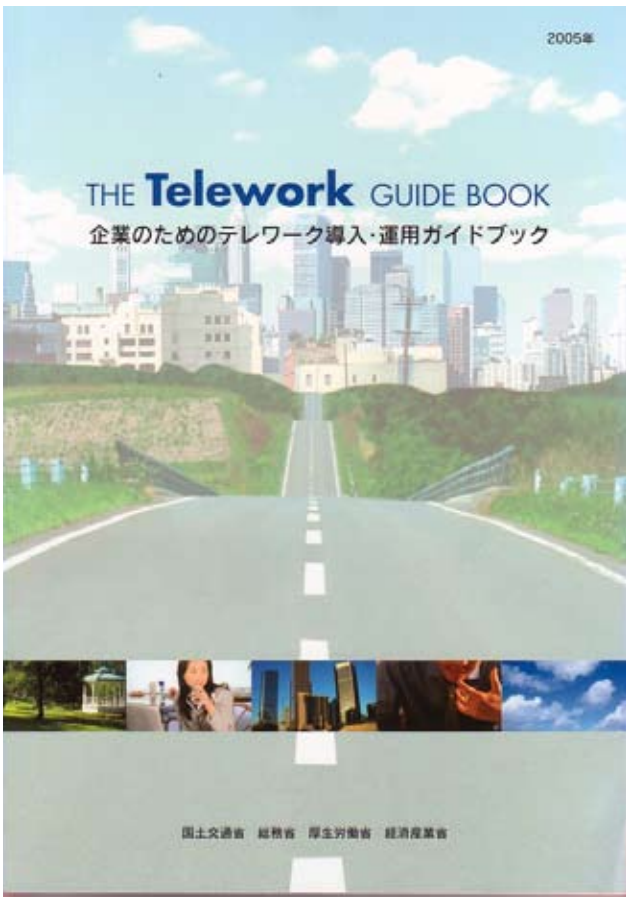
Fig 1: Cover of *The Telework Guide Book*

programs in some seventeen Japanese organizations (see list below). According to the four-month research project, positive impacts were found in the areas of worker productivity; worker health (fatigue/stress); worker time management; and solutions for physical working environment issues in the home.

Tab 2: Organizations Involved in the Japan Telework Association's Research Project

NTT Communications	Shiseido
NTT Software	The Nichirei Group
FM Solutions	IBM Japan
Chikae Hachiman City	Oracle Japan
Orix	Japan Telecom
Career Mum	NEC
KDDI Engineering & Consulting	Fuji Xerox
	Bennesse Corporation
Sun Microsystems	Libro Networks

A third innovative program is the Home-Based Worker Ability Assessment System provided by the Japan Productivity Centre for Socio-Economic Development (JPC-SED). This quasi-public organisation has been active in providing support for independent teleworkers mainly through its SOHO-Portal site. Launched on March 1, 2006 the "Your Strengths & Weaknesses" system allows individual teleworkers to assess their aptitudes on line by answering a series of questions about how they would respond to a prospective business order.

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LATVIA

Summary

The analysis of ICT penetration in Latvian households and enterprises on the basis of available statistical data shows a rapid increase of Internet penetration in households and negligible increase in enterprises. The analysis of Information Society policy of government shows that no direct attention is paid to development of eWork and telework. Nevertheless, the implementation of eServices included in the list for eGovernment stimulates the development of eWork and telework. Recent projects stimulating the penetration of eWork and telework are: implementation of electronic signature, creation of PIAPs in public libraries and training of disabled in ICT usage.

Key Issues

- Implementation of electronic signature promotes the development of eWork and telework
- Public Internet Access Points in public libraries help to overcome the digital divide of rural regions and stimulate the development of eCollaboration
- Possession of ICT skills and competences provides the opportunity for people with disabilities to integrate into life in society

Background on general economic and employment status

Latvia is a new EU member state situated in the north-east part of Europe on the shores of the Baltic Sea. Latvia's territory covers 64 689 square kilometres and the total number of inhabitants is 2,306 million. About one third of them reside in the capital city: Riga. Economically active are 62.2% of inhabitants.

After difficult years of transformation from a socialistic plan based economy to the free market in the last decade of the last century, Latvia now is in the phase of rather quick economic development. The main indicators characterising the development of the country are as follows: GDP growth was 8.5% in 2004 and 10.2% in 2005, inflation rate was 6.2% in 2004 and 6.9% in 2005, unemployment rate was 8.5% in 2004 and 7.5% in 2005 (Source: Central Statistical Bureau (CSB) of Latvia). In spite of quick GDP growth Latvia is still the poorest EU country: GDP per capita (in current prices) in 2005 was only 5506 EUR.

The rapid increase in the inflation rate in the last two years troubles the government because it forms a barrier for Latvia's plans to join the Euro-zone in 2008. Partly this increase is out of government control because it is caused by price increases for energetic resources (oil products, natural gas) which Latvia must import from other countries. The distribution of unemployment in Latvia is not uniform. Unemployment is higher in rural regions and lower in cities and towns. More exposed to unemployment are less qualified people, young people after graduating from school, and disabled persons. In recent years employment has also been affected by job seekers who are unemployed, as well as qualified workers and specialists with inadequately low salaries, in the old EU member states, which are opened to the labour force from the new EU countries. As a result, Latvia loses qualified labour force and gets into a situation where, on the one hand, there is unemployment while, on the other hand, there is a deficit of qualified workers and specialists.

Key factors affecting eWork development

The necessary precondition for the development of the Information Society in general, and eWork and telework as its constituents in particular, are a sufficiently well developed ICT infrastructure. In this respect Latvia is still lagging behind the leading countries. At the end of 2004 there were 27.9 fixed telecommunication lines per 100 of the population[46]. In recent years the number of fixed lines slowly decreases because people prefer to use mobile telecommunications. At the end of 2004 the network of the largest fixed telecommunication service operator Lattelecom[47] was 89.4%[48] (average percent-

age) digitised. In rural regions there are districts where the percentage of digital lines is significantly lower than the average. Therefore, the broadband Internet connection (xDSL) in principle is not available for a relatively large number of people. Furthermore, for many households in rural regions there is no hope that fixed network services will be available in the nearest future. With regard to Internet connection other solutions must be offered to these households. One possibility is to develop Public Internet Access Points (PIAPs). PIAPs can solve the problem of access for people with low income because Internet at home is too expensive for them. Another possibility is to use a wireless connection (radio-link or Internet through mobile). Services of mobile telecommunication operators cover all the territory of Latvia. Therefore the Internet through mobile on the bases of Blue Tooth or Infrared is available everywhere in Latvia, but with relatively low data transmission rate (GPRS). In 2004 the Internet through mobile was used by 16.8% but in 2005 by 39.6% of household (data of CSB). Altogether, recently the number of households with Internet connection has increased very rapidly.

Fig 1: Internet connection in households (%)
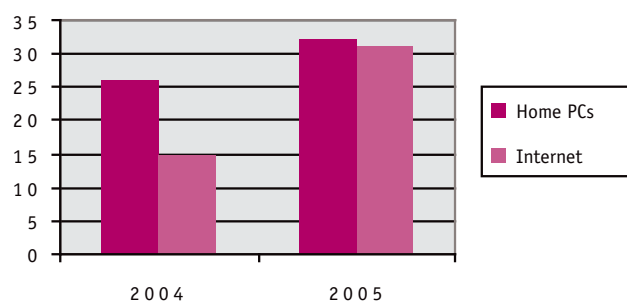
Source: CSB of Latvia (preliminary data)

Reasons for not having the Internet connection are different for different households.

As can be seen in table 1, people without children (singles and married couples) preferably do not want the Internet, but for families with children the main reason is the access price which is too high.

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[46] Source: Ministry of Transport
[47] Almost all fixed network with negligible exceptions
[48] Source: Ministry of Transport

	Have Internet access elsewhere	Don't want Internet	Equipment costs too high	Access costs too high	Lack of skills	Physical disability	Privacy or security concerns
All households	14.0	57.2	31.6	22.2	21.6	1.4	0.2
By type of household							
1 adult without children	8.5	68.3	22.3	22.3	24.8	3.1	0.9
2 adult without children	18.2	45.3	42.3	42.3	24.3	-	1.5
3 and more adult without children	22.9	43.8	35.8	35.8	7.8	1.2	2.7
1 adult with dependent children	31.4	27.6	49.3	49.3	13.2	-	2.3
2 adult with dependent children	16.9	28.0	56.0	56.0	14.5	-	6.7
3 and more adult with dependent children	18.2	45.3	42.3	42.3	24.3	-	1.5

Source: CSB of Latvia (preliminary data)

It has been expected that after liberalisation of Telecom market in January 1, 2003 the access prices will go down step by step.

The penetration of Internet in Latvian enterprises is still behind the EU average level.

Fig 2: Internet connection in enterprises with 10 and more employees
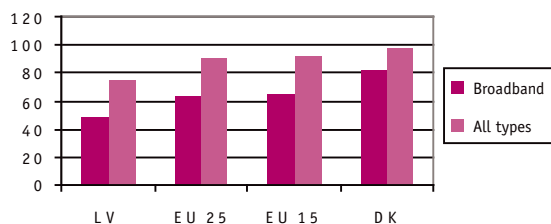
Source: Eurostat

The increase in the last year is negligible (in 2004 the broadband was in 47% of enterprises and Internet connection (all types) was in 74% of enterprises (Source: CSB)).

Up to now there was no public debate at governmental level and in society on the development of eWork, telework and flexible working conditions. The issues mentioned are not even on the agenda of the Secretariat of Special Assignments Minister for Electronic Government Affairs (SAMEGA) – the main governmental institution responsible for the development of Information Society in Latvia. At the same time eServices included in the list of eGovernment (12 for citizens and 8 for business) which are in the focus of Secretariat of SAMEGA promotes the development of eWork and tel-

ework. Statistical data on eWork and telework penetration in 2004 and 2005 are not available. For 2003 they are available from SIBIS[49] project.

Key projects on eCollaboration and eWork

Implementation of electronic signature, provision of public libraries with computers and Internet connection as well as training of people with special needs in ICT usage may be highlighted as key projects closely related to development and penetration of eCollaboration and eWork.

The legal basis for implementation of electronic signature is the "Law on electronic documents" approved on January 1, 2003. The deadlines for implementation of electronic signature were shifted several times. At the end of March 2006 the electronic signature was finally presented by the government. It was elaborated by fixed telecommunication service operator Lattelekom and Latvian Post. According to plans of government in September 2006 after a trial period the electronic signature will be available to all interested parties as a paid service. A special eSignature smart card and a reading device linked to the computer will be necessary in order to sign the electronic documents. It is clear that the penetration of electronic signature will depend on its price and number of eServices where it will be applicable. It is expected that the electronic signature will provide full transactions for many eServices offered by State institutions. Already today services like declaration of income taxes and reports to Central Statistical bureau need only electronic signature in order to be fulfilled completely electronically. The System of Electronic Procurement elaborated recently should be mentioned as another service where electronic signature should be applicable. A special institution - State Agency of Electronic Procurement was established for management of this system.

It should be noted also that Latvian commercial banks provide full electronic transactions through eBanks already for several years. They are using a different electronic signature from that offered by government.

The state-level significant project "Unified Latvian Library Information System", called also "Network of light", has been in progress in Latvia for several years now. It is conducted and supervised by the State Agency Information Systems of Culture. In the framework of this project public libraries of the State and local governments all over the country are provided with computers and permanent Internet connections. It is expected that by the end of 2006 already 97%[50] of public libraries will be linked to the Internet and the number of computerised reader places will have increased fourfold since the start of 2005. During 2006 the project is also being financially supported by the European Fund of Regional Development. The implementation of this project

49 FP5 IST Project „Statistical Indicators Benchmarking the Information Society", www.sibis-eu.org
50 Source: State agency „Information Systems of Culture"

is very important for inhabitants of rural regions. The majority of people in these regions have low income and are unable to pay for home access. PIAPs in public libraries allow them to overcome eExclusion and participate in eCollaboration. Besides this they can receive the necessary ICT help from librarians because the latter are trained in ICT usage.

The project Latvia@World is in progress since January 2005. It was launched by the Latvian Information and Communications Technology Association. The goal of the project is training and retraining of unemployed and members of other at-risk groups in ICT usage, thus giving them the possibility to join the labour market and more actively participate in social life. The project must be finished at the end of 2007. In order to achieve its goals, an ICT training programme was elaborated in the framework of the project. The programme is targeted at the development of the basic computer skills and competences necessary for accessing Internet resources. First, the training according to programme was piloted in Kraslava, Preili, Valmiera and Ventspils districts. Within the pilot project groups of unemployed as well as disabled persons were trained. For the disabled the project is of great importance because the number of available professions is rather limited for them. Telework and eWork are very appropriate for disabled and facilitate their integration into the life of society.

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MALTA

The Government of Malta is working towards the high employment-related targets set by the Lisbon Agenda. Raising employment levels is the most effective means of generating economic growth and promoting socially inclusive economies. The initiatives spearheaded by Government are being implemented within the context of the existing employment gaps between women and men, and the low employment rates of older workers. The employment levels of women, in particular, fall far below the European average and initiatives that address these areas are actively being sought and implemented. eWork can be used to sustain the labour market in that employees who otherwise are unable to spend the entire working day in the office are provided with the opportunity to work remotely and balance their professional life with their family and other commitments. eWork is a valuable tool for Government to:
- promote family friendly measures;
- increase the participation of women in the labour market;

- enhance as far as possible the status of disabled employees and facilitate their entry and opportunities for advancement in the Public Service;
- facilitate a longer working life, taking into account the aging population and the rise in retirement age.

eWork sustains Government policy of promoting equal opportunities by making it possible for whole segments of the population to enter the workforce or remain in employment. These include persons with special needs, persons who would otherwise not be able to work outside the home for extended periods and older employees.

In October 2005 a collective agreement was signed by Government and the Workers' Representatives wherein Government committed to "*continue to facilitate the implementation of existing flexibility measures and to further explore the possible introduction of other cost effective flexibility arrangements such as flexitime, job sharing and teleworking, as and where feasible and appropriate*".

A number of entities and organisations within Government and public entities have carried out studies or implemented some form of e-Work. The studies include one commissioned by the Office of the Prime Minister and conducted by the Management Efficiency Unit (MEU) on "family friendly measures" within the public sector. Another study was commissioned by the Employment and Training Corporation (ETC). One of the main objectives of this research was to evaluate the possibility that, and extent to which, telework could become a contributing factor in achieving these goals. The study included a report on the reforms needed for telework to become a feasible option for persons and organisations wishing to use it, a literature review, case studies, SWOT analysis, and recommendations. The research shows that people who telework in Malta include IT software developers or designers, academics, researchers, journalists, accountants, publishers, consultants, translators and sales persons.

The implementation of eWork is already underway in various guises within a number of organisations in Government control, either as a Pilot project or as an established method of work. In many cases these initiatives are, however, not governed by well-defined policies and procedures and the need was felt for guidelines within which eWork for Public Employees will be put into practice. Government is issuing a set of guidelines that

aim to encourage the take-up of eWork across the public sector. These guidelines are being drafted by the Ministry responsible for IT, which formed an eWork committee with representatives from a number of stakeholders in the implementation of e-Work. The publication of the eWork guidelines together with their implementation will be championed by the Government with a number of Business Associations who will be encouraged to promote this good practice among their members.

Malta's efforts to increase the take-up of eWork practices are being conducted within the ambit of the ambitious ICT Strategy that is driving the continuous advancement of the country's information society and economy. Coordinated by a Ministry responsible for IT, the strategy includes the implementation of various programmes that seek to increase the level of digital literacy and use of the ICT across society.

The percentage of population with a mobile phone continues to increase with 80.5% of the population using the technology as at March 2006. Broadband penetration stands at 12% of the population, while 46% of households have access to the Internet. The level of digital literacy in Malta continues to increase mainly driven by the Government's HelloIT programme through which basic courses on the use of computer, Internet and email are delivered in various community places, including schools, local councils and places of work. The latter is completed through a special programme where the Government has partnered with the business community to deliver ICT awareness courses to employees who are not knowledgeable on the basic use of technology. The Government participation in the programme is through the part-sponsoring of the tuition costs, the availability of hardware and the training materials as well the promotion of the programme to employees. The progamme is also extended to family members of the employees, who are also provided with the opportunity to attend ICT awareness courses and the place of work of their relatives.

A number of Community Technology and Learning Centers have also been set up. Non Government Organizations have been empowered to operate these centers through the provision of hardware, software, training, Internet connectivity as well as the part-sponsoring of the operational costs to run the center. Various ICT courses are offered by the NGO to their members and people living in the community. The centers provide access to broadband Internet enabling people living in the community to make use of the Internet. Internet access is also available through the Local Councils and public libraries, where access is through fixed computer stations as well as through wireless technology. The wireless access provides the opportunity for people with a wi-fi enabled device to work using wireless technology at the Internet centers of their Local Council and the Public Library.

The eWork programme coupled with the other initiatives that seek to increase the use of technology across society and economy, are key elements in the country's holistic programme that ensures that the op-

portunities inherent by the continuous technological developments translate into a tangible improvement in the lives of people.

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POLAND

Background on economic and employment status

Poland's economy has been strengthening since the end of 2002. In 2003 GDP growth stood at 3.8% (against 1.1% and 1.4% in 2001 and 2002 respectively), and in 2004 it reached a record level of 5.3%. The year 2005 brought a slight decrease of the growth rate (to 3.2%), but that is the result of comparing the year's economic activity level with the very good results of the previous year (additionally improved by the effects of accession to EU). Nonetheless, the growth of GDP in 2005 kept increasing from quarter to quarter, and other economic indicators (e.g. capital investment, domestic demand, inflation, import to export rate, unemployment level, etc.) showed that the situation has been actually improving. The latter indicator, the unemployment rate, even though it is still well above the EU average, was steadily falling throughout 2005 and reached 17.6% in December (compared to 19.0% a year before and more than 20% in 2003). The number of employed persons has risen for the first time in the last seven years.

Warsaw at sunset   © A.Ziółek (www.ziolek.pl)

In 2005 the country's budget deficit accounted for ca. 3% of GDP and the public finance deficit equalled 3.3% of GDP. The Polish currency was stronger than both the dollar and the euro. Interest rates fulfil the Maastricht criteria, as does the inflation rate (for the first time since March 2004).

Current ICT status in Poland

According to results of the latest research on the usage of ICT in companies and households published by

Table 1: Mobile phones, computers and Internet access in Polish households (2004-2005)

	Mobile phone	Mobile phone with Internet access		Computer		Internet	
	2005	2005	2004	2005	2004	2005	2004
Total	62%	23%	19%	40%	36%	30%	26%
Dwelling place							
Cities over 100 000 citizens	68%	32%	26%	49%	44%	40%	34%
Towns up to 100 000 citizens	62%	22%	18%	40%	39%	32%	28%
Rural areas	55%	16%	13%	30%	25%	19%	15%
Income group							
Monthly income > 7200 PLN	95%	59%	41%	86%	73%	71%	68%
Monthly income 3361 - 7200 PLN	89%	48%	35%	77%	69%	67%	54%
Monthly income 1441 - 3360 PLN	72%	26%	22%	48%	43%	37%	30%
Monthly income < 1440 PLN	44%	14%	10%	*21%	16%	14%	12%
"Kid factor"							
Families with children	78%	-	-	56%	-	38%	-
Families without children	55%	-	-	33%	-	27%	-

Poland's Central Statistical Office[51], in 2005 some 40% of families owned computers and 30% had access to the Internet (the same indicators for enterprises reached 93 and 87% respectively). The share of households with at least one person owning an internet-enabled mobile phone increased from 19% in 2004 to 23% in 2005 which, in practical terms, equates to over 500,000 new households.

The accessibility of ICT equipment and services depends significantly on disposable income, dwelling place and family size. 71% of Poland's most wealthy households use Internet in comparison to only 14% of the poorest ones. A similar disproportion may be noticed in the case of usage of computer equipment and mobile phones. Equally visible is the difference between the urban and rural areas – the latter being especially disadvantaged with regards to Internet accessibility. An interesting relationship between the number of children in a family and its ability to make use of ICT can be seen; the younger generation clearly encourages their parents to purchase equipment and services. Exact numbers, stemming from the GUS's research, are presented in table 1, above.

In the case of Polish enterprises, the level of usage of Information Technologies is generally high, and therefore no apparent disproportion between the years 2004 and 2005 may be noticed. According to the research, last year some 93% of enterprises used computers in their everyday work, and 87% had access to the Internet (c. f. Fig. 1). It is worth mentioning that in 2005 the percentage of the companies that connected through a modem decreased by almost one tenth (to 43%) in comparison to 2004. At the same time the usage of broadband connections increased more visibly – from 28% in 2004 to 43% in 2005 (c.f. Fig. 2).

Fig. 1 Usage of computers and Internet by Polish companies (2004-2005)

- Use of the computers by the entrepreneurs
- Use of the Internet by the entrepreneurs
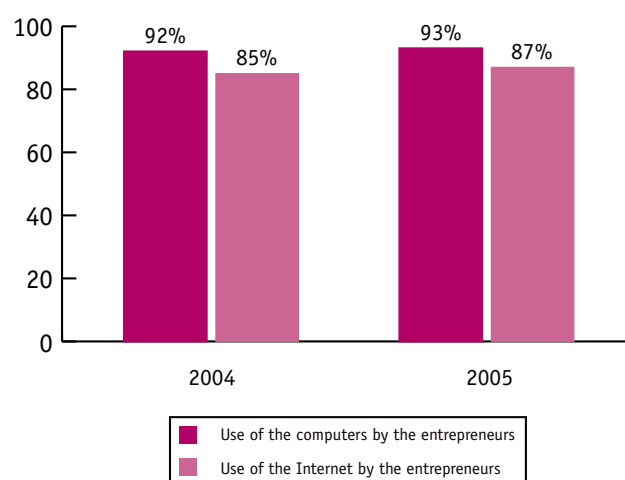
These statistics show the positive direction in which the Polish economy is heading. Markets enter a more advanced phase of IT development, and Polish ICT structures enable an easy and relatively inexpensive shift to internet-based business models such as outsourcing services or collaborative electronic markets. However, awareness raising and education are still the decisive factors for the further development of ITC-supported work and business.

Awareness and usage of e-work

According to the SIBIS research results from 2003, Poland was below the EU-15 average in terms of the number of teleworkers (8% vs. 13%). It was, however, above the average for Newly Associated States of 5.5 % (c.f. Fig. 3). Since that time we may have observed certain improvements in the general awareness of e-working and its perception by employers and employees, backed

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[51] Główny Urzad Statystyczny, GUS, www.stat.gov.pl

Fig. 2 Proportions between broadband and narrowband access to the Internet among Polish companies (2004-2005)

broadband access
modem
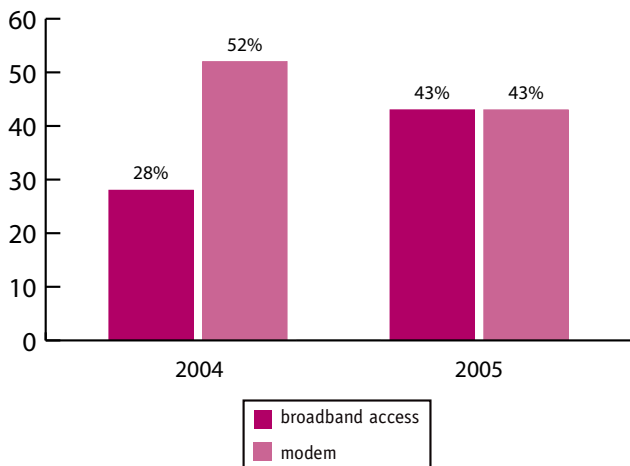
by a number of government and non-government initiatives. The latest research, undertaken within frames of an ESF-funded project "Telework: A country-wide program of promotion and training for entrepreneurs"[52], shows that the number of teleworkers has risen to ca. 16%. It is interesting to recognise a number of findings from this research which may enable a more detailed classification of e-working in Poland.

Fig. 3 SIBIS research results (2003) – percentage of teleworkers in the total number of employed

* = excludes mobile teleworkers
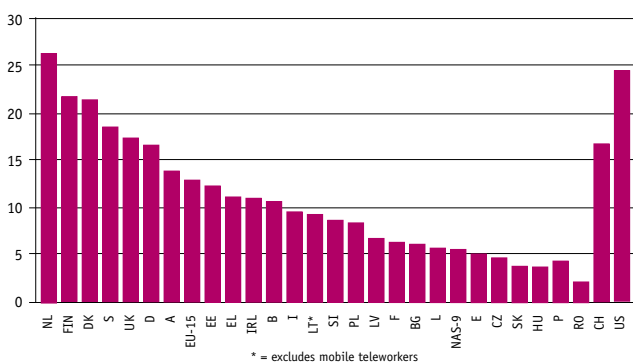
First of all, it is important to mention that in Poland the most widely used term for ICT-supported forms of employment which are (partly or entirely) executed away from the office is "teleworking". It has been put into official documents and reports, and it is often referred to by organisations active in the area. It may be argued, however, that it should be replaced by "e-working" (which is, on the other hand, compliant with EU terminology) since the common understanding of the word "teleworking" is incorrect and too narrow in Poland. According to the research results, almost one fourth of the respondents considered it as a "work by means of a phone" (supposedly also because the prefix "tele" is generally linked to a "telephone" rather than ICT). This was in spite of the fact that, before the poll,

respondents had been informed about the project's scope and objectives; thus, it only shows that there is still much need for raising awareness.

Teleworking in Poland is a relatively new concept. In almost half (43%) of companies which have introduced it the process began between one and two years ago, and 25% launched it no earlier than five years ago. The most popular kinds of jobs that are being undertaken in the form of e-working encompass among others: financial services, computer graphics design, accountancy and legal services (detailed results are presented in Fig. 4).

When asked about the place of teleworking, the respondents usually mentioned their home (69%) or client's premises (41%). Barely 2% indicated a telecentre as their place of work. It is reassuring that, despite all the concerns related to job security of persons who may want to e-work, the research showed that in almost half of companies (43%) e-workers were employed on a regular basis (with either indefinite or fixed-term contracts). Some 30% were self-employed, and only around one fourth had civil agreements with their (sometimes – numerous) employers.

The research additionally focused on the advantages and disadvantages of teleworking that entrepreneurs have observed after its introduction. More than two fifths of them indicated that the competitive position of their company had improved (44%), they had been able to decrease the office space needed (42%), or they could employ people who lived far away from the company premises (40%). 30% said that work efficiency had increased (mainly due to changes in the way the result assessment was done), and 27% observed financial savings (also due to lower administration costs and decreased red tape related overheads). Among disadvantages the employers mentioned e.g.: dependence on ICT (31%), problems with IT security (29%) and provision of adequate support to e-workers who felt lonesome (27%), limited confidence in employees (27%), and the high prices of telecom services (25%).

Fig. 4: PARP research results (2005) – tasks undertaken by teleworkers
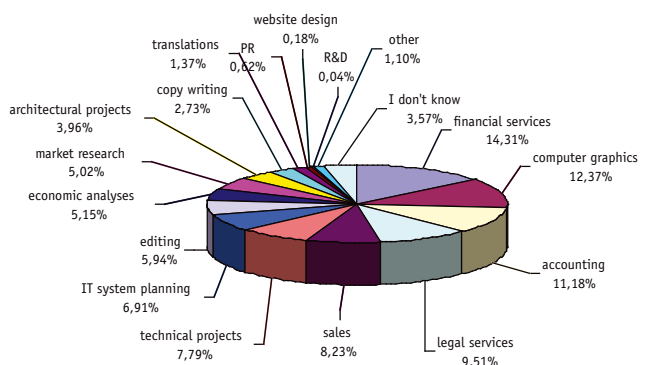
What were the reasons for companies not to introduce teleworking? One of the most often given was that a company was active in an area which was, according to its management, not appropriate for e-work (49%). A slightly smaller number of respondents admitted that they had not thought about it (30%), or that the organisation of work in their company did not allow it (21%).

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[52] Project no. 38/PARP/2.3b/2004, being executed under the umbrella of the Polish Agency for Enterprise Development (PARP), more information at: www.telepraca-efs.pl

Only 12% complained about insufficient information being made available.

Inclusion of e-work in Poland's development strategy and legislation

All key documents containing strategic objectives setting Poland on its way towards the Information Society, like "e-Poland" or "Strategy for Informatisation" do include e-working (or teleworking, as it is often referred to in Polish official documentation) as one of the key elements of an action plan for counteracting digital exclusion. e-Poland Strategy for the years 2004-2006 set plans for establishing a formal framework for the introduction of teleworking, support for creation of telecentres in rural areas and making telework a means for economic development of the regions. In the strategic plans for informatisation, e-work is considered

- (in the short term, i.e. till 2006): as a tool for decreasing the unemployment rate (which responds to the statistical low mobility of Polish workers) and enabling professional inclusion of people who, for various reasons, cannot undertake 'traditional' full time jobs (like young mothers, handicapped persons, etc.);
- (in the longer term, i.e. till 2013): as a natural direction towards which employment in the Information Society is going to evolve, and as such it should be supported by appropriate legislation and state-run measures independently from bottom-up initiatives that are to appear (local communities, NGOs, etc.).

Nonetheless, even though e-working is recognised as a key element of the country's strategic approach, the current Polish Labour Law does not include a definition of e-work, and therefore it does not specify the rules concerning it. However, experts vary in their opinions on the need for major changes in the current legislation. It is often argued that e-working may be introduced on the basis of the existing regulations. They allow for a flexible indication of place of work (e.g. home or telecentre) and working time (by using a task-related time management) in the contract. Since e-working is not explicitly recognised in the Law, it is clear that other aspects, like e-worker's rights and obligations, that are often a subject of major concerns both from the point of view of an employee and of an employer, should also be defined in the same way as those concerning 'traditional' workers. On the other hand, it is also indicated that, apart from the Labour Law, there exist a series of supplementary regulations (related to e.g. safety or social insurance) which do not take into account the specifics of e-working; in their case a similarly flexible approach is much less applicable.

Following the signature of the EU-level framework agreement on telework in 2002, Polish social partner organisations began working on a national inter-sectoral agreement. In 2005 the working group was joined by representatives of the government who proposed legislative support. It is expected that the work is going to result in an accord which will constitute a basis for future legislative regulations. The draft agreement reached

by mid-2005 encompasses among others the following issues:

- e-working may be introduced only following formal bilateral agreement between an employer and a would-be e-worker;
- e-working introduction should not be imposed on an employee, even temporarily , (based e.g. on the existing regulations which enable an employer to arbitrarily change the employment conditions for a limited period of three months);
- an employee who has not agreed to e-working cannot be discriminated against in any way (including redundancy or change of employment conditions – especially salary);
- the right to return to a previous work arrangement during a period of three months following the start of an e-working agreement for both e-worker and employer.

Some experts express other doubts on the current e-work situation in Poland, e.g. an almost complete lack of trade union organisations in small and medium enterprises, which might result in inadequate legal protection of employees. Other important aspects which are being indicated include: ways of protection of sensitive data being processed on behalf of a company by an e-worker and responsibilities of parties, e-worker's privacy and monitoring, sharing the costs of e-working equipment, etc. Lack of such regulations, or at least of an agreed framework "code of practice", might contribute to creating a situation where an employee bears most of the risks associated with the introduction of e-working.

Examples of e-working projects and initiatives

There are a number of measures and initiatives that have taken place or are being executed in Poland that promote and facilitate the introduction of e-working. One of the earliest projects of this kind was run by the State Fund for Rehabilitation of Disabled Persons (PFRON). It was a pilot project called "Telework", and it focused on trainings for handicapped persons to enable them to find and undertake work (in the second stage of project's execution). A 'by-product' of this initiative, a website called "Internet for Disabled", is still available at www.idn.org.pl.

Another project that was completed, but the outcomes of which are still available and in use, was entitled FlexWork. It was funded under the 5th Framework Programme, and aimed at assisting business advisors in supporting small and medium enterprises in competing through flexible working. A major part of its results may be downloaded (also in Polish) from www.flexwork.eu.com.

An on-going initiative, that has already been mentioned before, is the "Telework. A country-wide program of promotion and training for entrepreneurs" project co-financed by the European Social Fund and overviewed by the Polish Agency for Enterprise Development. It aims at wide promotion of the teleworking concept through a number of regional conferences and

training activities, and preparation of guides and models appropriate to conditions in Poland. More information on this action is available at www.telepraca-efs.pl.

Since 2005 another project, ENTER ("Partnership for telework, entrepreneurship and equality in a workplace"), has been executed under the umbrella of the EQUAL programme. Its objectives include the organisation of training activities on e-working for 800 entrepreneurs, market research, and launching an e-working living laboratory that is to organise, run and monitor a series of representative e-workplaces throughout the country. Among the project's results there will be e-working best practice guides and blueprints for the implementation of this type of work in different kinds of Polish enterprises. More details on the project are available at www.enter-telework.org.

There are a number of other initiatives taking place in Poland that at least partly focus on e-work, e.g.: ELASTAN project[53] (aiming at promotion of flexible workplaces, including e-workplaces, and protection of companies' intellectual capital), TELEPRACA[54] (that supports e-employment of persons with physical disabilities whose qualifications should be adapted to the requirements of the Information Society and market economy) or ADAPTUS.PL[55] (which has an objective of increasing productivity of SMEs through introduction of teleworking).

Prospects

Successful introduction of e-working requires not only the use of more or less advanced technological devices and services, but also a significant change in the organisation and character of labour. Getting in contact with customers, clients, suppliers, business partners, or just colleagues working at other locations of the same company by means of ICT (be it a mobile phone, e-mail, tele- or videoconference, or any other means of electronic communications) opens up new opportunities – both for companies and for employees. It can improve the effectiveness of work and reduce costs in companies, enhances their responsiveness to market demands, and allows access to otherwise unattainable expertise or skills. In the case of employees, it enables them to save time that is often being wasted while commuting, and may facilitate balancing work and family life, increasing their satisfaction.

Polish entrepreneurs have been getting more and more aware of the benefits resulting from the adoption of e-work in companies. So have entrepreneurs. The take-up of e-work may have been slower than expected, but the inclusion of the topic into national development strategies and growing interest from various organisations allows us to look optimistically towards future developments. Especially with regards to the possibilities that have been created after the EU accession for the

Polish knowledge workers who may be not so eager to follow in the footsteps of their compatriots who are now working abroad as plumbers in France or bricklayers in England, but would rather engage in e-working for companies based in Ireland, Portugal or any other country in the world, while staying in Poland with their families.

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SLOVAK REPUBLIC

Introduction

The Labour Code, adopted on 1 July 2003, created conditions for a more flexible labour market and introduced new, non-standard forms of employment for the first time. According to this Labour Code eWork belongs to a home-working form of employment (some Slovak studies categorize home-working and eWork under "atypical" forms of employment). Thus, at least one precondition for eWork, the legal framework, has been achieved in Slovakia. To a great extent these changes in legislation were enforced by changes in the national economy, including the impact of globalization, technological development, an overall pressure on competitiveness, but also by the changing attitude of workers, who at various stages of their life want to harmonise their work with family life, education etc.

eWork on the Slovak Labour Market

Amendment to the Labour Code in 2003 created conditions for development of home-working in the Slovak Republic. eWork as a part of home-working was enabled by a relatively fast development of ICT usage, the number of PCs and Internet connections to households. Despite this, the number of eWorkers is still low. Studies[56] and www.tele-work.sk conducted in this area, report 1.6 – 3.0% of eWorkers (from all employees). However, these numbers still have to be taken with a grain of salt, since the methodology employed by these surveys regarding eWork was not standardised in the past (the first study of this kind was conducted in 2000). These studies indicate that, while employees are well inclined towards this flexible form of working, eWork (or in this case rather e-collaboration) prevails mainly in the category of self-employed persons and not amongst the full time employees of a company. Job positions like those of programmers (coders), technicians, purchasing agents and accountants, or in personal customer serv-

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[53] More information at
www.proinwestycje.pl/Konferencje/english/elastan.htm
[54] See www.telepraca-equal.pl
[55] See www.adaptus.pl

[56] Hanzelová, E., Kostolná, Z., Reichová, R.: Atypical Employment in Slovakia: Past and Recent Trends. Bratislava Centre for Work and Family Studies, April 2005. (Hanzelová, 2005)

ices or marketing are most frequently represented among the eWorkers – although in a majority of cases this is rather more a flexi-work (i.e. combination of traditional and eWork) than a pure eWork arrangement.

The following factors have had some influence on development of eWork and flexi-work, respectively:

- Information Society development in Slovakia;
- Preference of actors on the labour market (employers, employees) to make use of eWork possibilities;
- Legislative framework;
- Projects and initiatives in the area of eWork (significant part of them funded from EU sources).

Brief Description of Information Society Development in Slovakia

According to the survey carried out by the National Office of Statistics[57] in 2005, 38.5% of households have a PC (this percentage is higher for those families where at least one member of the family is younger than 16 years – in this group 49.6% of households have a PC). 23.3% of households in Slovakia have access to the Internet - but only 15.2% of them have broadband. The price of Internet connection was identified in the survey as the most important barrier to the Internet penetration (36.7% of those respondents who do not have Internet access indicated this as the barrier).

When comparing these numbers with the EU25 (Internet access – 48% and broadband penetration in households - 23%), Slovakia is still significantly lagging behind.

Attitude of Employers and Employees to eWork

According to the Centre for Work and Family Studies, which belongs under the Ministry of Labour, Social Affairs, and Family[58], general awareness of eWork is in an early stage of development[59]. Therefore, one of the objectives set by the Centre for Work and Family Studies is to convince SMEs that it is not necessary to "control their employees" throughout the whole duration of their working hours. The existing business culture is one of the main barriers to eWork adoption in Slovakia. According to Mr. Vladimir Sirotka, President of the Slovak Association of Small Enterprises, most companies in Slovakia "want to see" employees at their working place and to have them under control. The companies prefer standard, full-time job positions and traditional organization of work with staff time tracking in the company against evaluation of their work results. They do not prefer, nor will they even accept, other forms of work (e.g. part-time, eWork etc.). Companies are simultaneously afraid of employees misusing data provided to them, and of reducing working "morale" and performance.

On the other hand, the possibility of eWork is demanded by several groups of (potential) employees, e.g. people with family responsibilities (i.e. taking care of children, disabled or elderly family relatives), the disabled etc. According to several personnel agencies (e.g. Hill International, Bratislava; Globium), companies are not experienced in this area, and for this reason they offer no or very limited possibilities of eWorking for these groups of people. Subsequently this leads to a disparity between offer and demand. According to the survey[60] carried out by the office of the Košice Self-governing Region[61], the demand for eWork in the above-mentioned groups is about 33%. However, only about 2% of companies were ready to offer eWork positions for them. A similar situation also pertains for other groups of employees - for example, the largest job search portal Profesia.sk[62] offered only two positions for home-workers from a total number of 6,838 positions posted by companies on the portal (as of May 21, 2006). Demand for (pure) eWork, according to the survey realized by the portal Profesia.sk, is about 72% and 6% would prefer a combined form. The survey was realized on a sample of 720 respondents.

Nevertheless this situation is beginning to change in some aspects. For example, Slovak companies have already started to offer remote access to their information systems for employees. According to the Slovak e-Business Industry Research Project[63] (http://ebiz.tuke.sk/ebizen), in the machinery industry 23% of companies offer their employees remote access to their information systems and 25% of companies in this sector are planning to invest in implementing remote access. As can be seen in Fig. 1 and Fig. 2, the size of the companies also plays an important role.

Another issue closely related to eWork is the image of home-working among the general public. For many years "working from home" has been almost a synonym for fraudulent activities (like pyramid games, fake companies offering high salaries only after being paid an advance by potential employees – who then find out that the company does not exist at all etc.). These activities

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[57] www.statistics.sk/

[58] www.employment.gov.sk/mpsvrsr/internet/home/index.php?lang=en

[59] Hanzelová, 2005

[60] Košice Self-governing Region: The research of specifics within the labour situation of people with family responsibilities in Košice region, 2005. Available at http://kosice.regionet.sk/NR/rdonlyres/9BDEE739-B5A4-47C9-AA42-63E345900ECF/0/Vyskum_specifik.pdf (only in Slovak)

[61] http://kosice.regionet.sk/kskweb/english

[62] www.profesia.sk/en

[63] Slovak e-Business Industry Research. The project supported by the Agency in Support of Science and Technology, Contract No. APVT-20-030504.

Fig. 1: Remote access for employees according to the size of enterprise.
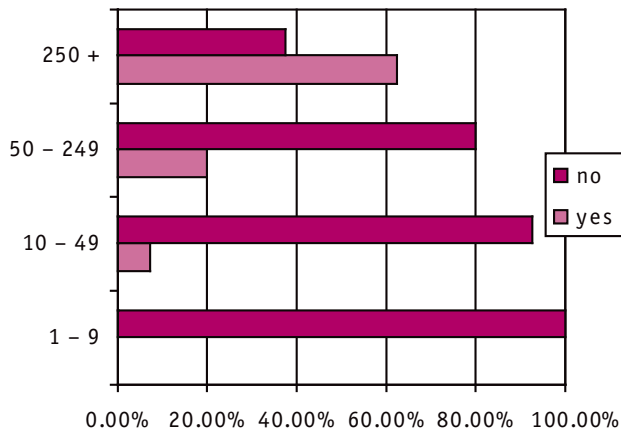
Source: Slovak e-Business Industry Research Project.

Fig. 2: Plans to invest into remote access for employees.
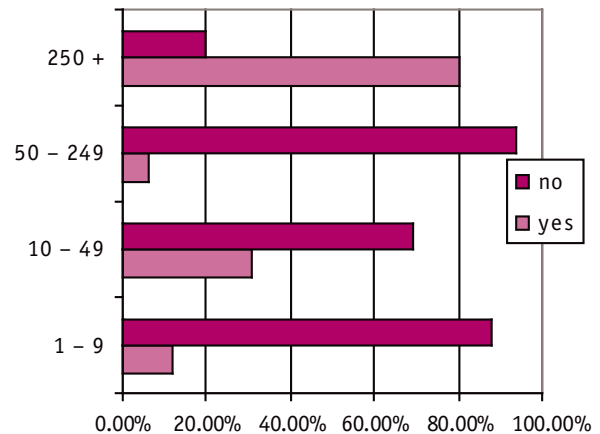
Source: Slovak e-Business Industry Research Project.

have had quite a devastating effect on the image of eWork in society.

Legislative Framework

According to the Slovak legislation, §52 of the Labour Code applies to eWork as a special type of home-working. Contracts for eWork have similar terms as traditional employment contracts except for the place of work. For home-working, the Labour Code requires a permanent contract and the work has to have an exclusively eWork character. eWorkers do not have a right to payment for overtime work, working during holidays, nights or for working in an unhealthy environment. Furthermore, if the home-worker is not able to deliver work because of a blackout of electric power, their PC crashing, the wrong materials, or non-delivery of necessary materials, they have no right to a compensation for the lost time. Other clauses of the Labour Code apply to home-workers to the same extent as to traditional employees (including, for example the duty of an employer to provide home-workers with food-tickets - up to the amount of 48.95 SKK per day (approx. 1.23 EUR) as tax deductible expense).

Projects and initiatives in eWork development

For last ten years only a few studies in the eWork area were carried out in Slovakia. In 2006 two projects were identified which are specially focused on eWork.

Project "Tvoj dom – tvoj podnik v e-urópe" (Your Home – Your Business in E-urope) [64] is funded within the EQUAL Programme and is focused on implementation of eWork in the Trencin Region. Within this project, a pilot research study on the state of the art in eWork adoption among companies and employees in Slovakia is being realized. The study should identify key issues and

needs for successful eWork adoption. Results of the study will be benchmarked with the situation in Poland, Italy, and Spain, i.e. countries of origin of other project partners (the results of the study should be available at the end of May 2006).

Project ELITE [65] is funded within the Leonardo da Vinci Programme. The ELITE project is aimed at the development of the capacity of enterprises to introduce and manage tele-working, training their workforce, and raising awareness of tele-working in order to speed up the process of its implementation. This aim will be achieved through development and delivery of training courses based on a distance learning methodology, handbooks for SME managers, a comparative study on web-based collaborative environments for tele-working, the identification of good practices and future oriented best practice models on Tele-working. The project consortium will also organize workshops and information days on tele-working.

As far as the involvement of the government is concerned, a really visible initiative for increasing awareness in the area of eWork is still missing.

Conclusions

As illustrated above, eWork in Slovakia is still in its beginnings. Although at present, the disparity between offer and demand is quite large, it seems that the situation could be changed in the near future. Companies in Slovakia are starting to use flexible forms of eWork and offering remote access to their information systems for their employees. This could be perceived as a first step towards eWork in the industrial sector. On the other hand, these initiatives should also be supported by governmental initiatives, since eWork is considered as an important tool for increased effectiveness and competitiveness.

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[64] Additional information on the project can be found at the project web site www.tele-work.sk

[65] For more on the ELITE project see the project web site www.elite-project.sk

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SPAIN

The Information Society in Spain

It is very difficult to compare the situations of countries in developing the Information Society because of the different indices that have been used by different organizations. The five indices most commonly used to give the relative position of Spain with respect to the 25 countries that compose the new, enlarged, European Union are:
• IAD
• NRI
• eReadiness
• ISI
• KEI

The main conclusion to be drawn from Figure 1 is that, regardless of which index is chosen, the relative position of Spain varies very little.

According to these indicators, the Nordic countries (Sweden, Denmark and Finland) are the leaders in the

Fig. 1: The best 30 countries in each synthetic index

	IAD 2002	NRI 2004-2005	eReadiness 2005	ISI 2004	KEI 2005
1	Sweden	Singapore	Denmark	Denmark	Sweden
2	Denmark	Iceland	U.S.A.	Sweden	United Kingdom
3	Iceland	Finland	Sweden	U.S.A.	U.S.A.
4	South Korea	Denmark	Switzerland	Switzerland	Finland
5	Norway	U.S.A.	United Kingdom	Canada	Australia
6	Holland	Sweden	Hong Kong	Holland	Holland
7	Hong Kong	Hong Kong	Finland	Finland	Canada
8	Finland	Japan	Holland	South Korea	Germany
9	Taiwan	Switzerland	Norway	Norway	Denmark
10	Canada	Canada	Australia	United Kingdom	Norway
11	U.S.A.	Australia	Singapore	Hong Kong	Switzerland
12	United Kingdom	United Kingdom	Canada	Australia	France
13	Switzerland	Norway	Germany	Singapore	Japan
14	Singapore	Germany	Austria	Austria	Belgium
15	Japan	Taiwan	Ireland	Germany	Austria
16	Luxembourg	Holland	New Zealand	Belgium	New Zealand
17	Austria	Luxembourg	Belgium	New Zealand	Spain
18	Germany	Israel	South Korea	Japan	Taiwan
19	Australia	Austria	France	France	Italy
20	Belgium	France	Israel	Taiwan	South Korea
21	New Zealand	New Zealand	Japan	Spain	Singapore
22	Italy	Ireland	Taiwan	Israel	Ireland
23	France	U.A.E.	Spain	Ireland	Hong Kong
24	Slovenia	South Korea	Italy	Italy	Iceland
25	Israel	Estonia	Portugal	Portugal	Israel
26	Ireland	Belgium	Estonia	Slovenia	Estonia
27	Cyprus	Malaysia	Slovenia	Czech Republic	Portugal
28	Estonia	Malta	Greece	Hungary	Luxembourg
29	Spain	Spain	Czech Republic	Chile	Slovenia
30	Malta	Portugal	Hungary	Greece	Poland

Source: Telefónica. Figures from July 2005

development of the Information Society in Europe. Following them are countries such as the United Kingdom, Holland or Germany. Spain is located among the final positions for the EU 15 and above the recently incorporated new members. This places Spain at around the 25th position in the world. Considering change on previous years, Spain has improved in one index (the eReadiness Index) and worsened in two others (the Network Readiness Index and Information Society Index). Although its significance is difficult to quantify, a rough estimation allows us to place Spain's level of development at approximately 80% of the leading countries. With all due caution, given difficulties in interpreting this data, it is still worth pointing out that, although the situation in Spain is not the best possible, the distance that separates it from the best countries is not excessive.

The Current Situation

Internet usage

Frequent internet usage by the Spanish population is still quite low, as can be seen in Figure 2. Only 20% of Spaniards access the Internet on a daily basis, although in fact more than 41% have done so in the last three months. The situation is a long way from the final objective and justifies a detailed analysis of the causes. The main reasons for not having access to the Internet in households are "not interested", "not needed" and "don't know how to use it". Significantly these responses are generally given in households with older people; on the other hand, the "don't know how to use it" reason is not common in households with young people. This is due to the fact that the majority of young people are Internet users. Finally, as a point of interest, it is

Fig. 2: Internet users (SPAIN) (% of people)
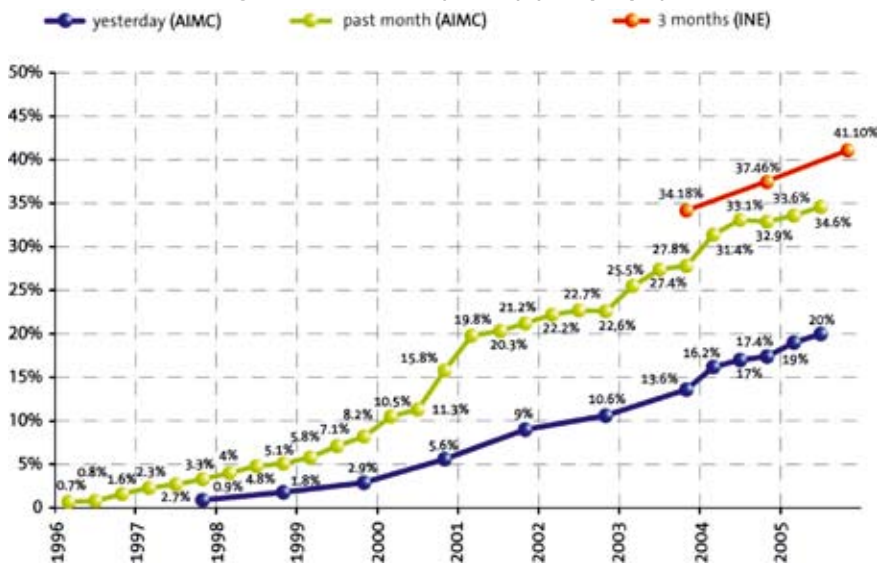
Source: Telefónica. Figures from July 2005

worth mentioning the importance of "lack of time" in single-inhabitant homes.

Another barrier to the expansion of internet usage is the fact that the proportion of people that consider having Internet access at home as unnecessary, has remained fairly constant in recent years. The same occurs in the business world, where the proportion of those that do not have an Internet connection and do not perceive any benefit in it, increases significantly.

On the other hand, studies show that among those who do have access to the Internet the percentage of people that perceive any benefit has increased notably. All in all, although it may be difficult to make the decision to have Internet access, experience demonstrates to users its usefulness.

The groups with the greatest number of occurrences of "lack of interest" and "lack of education" are shaped by the socio-cultural determining factors of age and level of education. The greatest differences are produced in the latter variable: whilst 86% of university graduates access the Internet, only 12% of people with lower levels of education do so.

Broadband in Spain

2004 has been the definitive year for the transition of Spanish web surfers to broadband. During 2002, 2003 and the beginning of 2004 there was a slow reduction in the number of narrowband users whilst number of broadband users rose progressively until the transition was realised at some time during the first quarter of 2004 . From this moment on, there was an abrupt fall in the number of users of narrowband and with it, the definitive popularisation of broadband. If in terms of users the jump was made in the first quarter of the year, in terms of homes the transition took
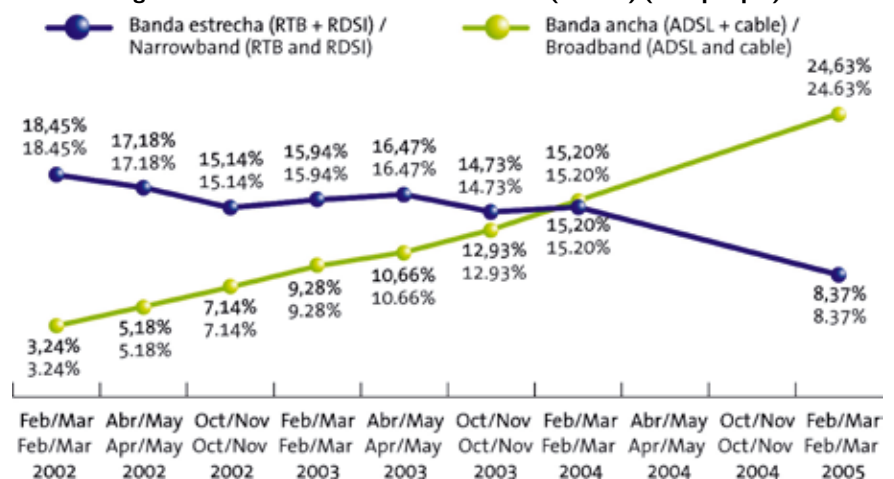
place some time during late 2004 and early 2005. During 2005, solutions based on unbundled local loop, instead of using the line sharing service, emerged among broadband operators. This occurs mostly in areas of greater density of population, whereas in other areas use of the line sharing service is nearly total. This has allowed the ADSL market to be streamlined with a significant increase in offers with a variety of specifications and features. Put into perspective, a progressive evolution has taken place.

e-Entertainment

2005 has been a year of irruption of consumer electronics in the Information Society, as in Figure 4 and discussed below. With it, a tendency towards the digitalisation of entertainment, which has been building up over recent years, has been consolidated. In the case of Spain, in recent years, this process has predominantly been limited to digital photography. In this sense, linked to digitalising data and handling digitalised data, including photographs, video and music are considered an integral part of the Information Society concept and services.

The report for 2003 had already identified e-entertainment as an opportunity for introducing people to the Information Society. It was considered that digital versions of entertainment would easily attract citizens in the same way as occurred with analogue versions. In particular, in Spain, where a large section of the public are not interested in using Information Society services, entertainment constitutes a way to "hook" these citizens and to accustom them to using technology. If 2004 was the year for the popularisation of digital cameras, 2005 was the year for Internet services for photographic development. Until then, the large photographic development chains (with one or two exceptions) remained at the margin of these services. 2005 was also

Fig. 3: Use of broadband and narrowband (SPAIN) (% of people)

Source: Telefónica. Figures from July 2005

2004 and before	2005	2006 and future
Popularisation of digital cameras	Online photograph development services	
	Popularisation of digital MP3 players Online Podcasting music shop services	
	Popularisation of digital television with digital resolution	Terrestrial Digital Television (TDT) Mobile handset television (DVB-H) High definition television (HDTV)
Popularisation of mobile telephony. Miniaturisation of handsets	Convergence of mobile handsets: photographic and video camera, MP3 player, etc. Blackberry type handsets	UMTS
	New generation of handheld games consoles	New generation of fixed games consoles
PC used mainly for office IT functions	Popularisation of laptop PCs	PC as Media Centre

Source: Telefónica. Figures from July 2005

the year of the MP3 players, the portable music players that store data in hard drives or solid-state memories. The most representative example in Spain is the range of Apple iPod players. New services have emerged via Internet as a consequence of digital music and the popularisation of these devices, in the same way as happened with photography. The most representative case is that of the online music shops where it is possible to purchase music in digital format. Thanks to this sales format, the total value of music sales in the world has gone up.

Current price levels are sufficiently low for sales of widescreen format televisions to exceed those of traditional televisions. Spain is not a stranger to the phenomenon and sales of this type of television are increasing; sales for 2006 are also predicted to be higher than for traditional televisions. In Spain, this increase in sales coincides with the recognition earned by Terrestrial Digital Television at the end of 2005. The arrival of television for mobile telephones is expected in 2006 after pilot tests carried out in 2005. Endorsement of high-definition televisions is expected in a more distant future. The world of the mobile telephone underwent a process of technological convergence in 2005.

Fig. 5: Presence of personal computers in the home house-holds and Internet access (SPAIN)
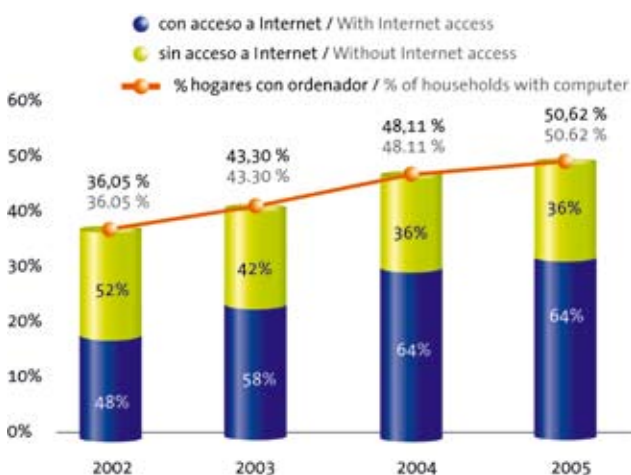
Source: Telefónica. Figures from July 2005

It is now usual for shops to stock middle range handsets that include cameras with a comparable resolution to digital cameras (although without their imaging technology) or music players in MP3 format. For the upper range of the market, the success story of 2005 has been the handset that incorporates E-mail, the most well-known example being the Blackberry handsets. In the field of games consoles, 2005 saw the introduction of a new generation of handheld consoles, the most representative example being the Sony PSP console. Its main novelty is that it is aimed at a market segment that is older than the usual users of this type of console, with a focus on the graphics aspect and its multimedia content player functions.

Finally, the personal computer and its innovations emerging during 2005 remain to be discussed. This device has had a traditional use tied to office IT tasks and access to Internet services through a navigator. Its introduction into the home is to a great extent linked to the arrival of the Internet, as is shown in Figure 5 Nevertheless its growth has come to a halt in the past year along with the percentage of homes with a computer that have an Internet connection. During 2005 the fall of laptop computer prices to levels only slightly above desktops has meant that a good part of computer purchases were of this type. According to IDC figures, in the first quarter of 2005 42.4% of PCs brought to market in Spain were laptops. However the proportion is still small in Spanish homes, given that until 2004 the usual purchase was of desktop computers. Laptops are purchased both as a primary computer because of the advantages of its size, and as a secondary computer for homes in which usage levels of the terminal are high. For next year the appearance in Spanish homes is foreseen of a new format of personal computer, the media centre PC, which acts as storage for digital content generated at home such as photographs, video, television recordings, etc.

Keys for the future of the SME

The effects of ICT use on business

The use of new technologies in a business is fairly dependant on both the size and industry to which the business belongs. In the case of Spain, as can be observed in Figure 6, there are significant differences between industries, particularly in the case of the micro-enterprise. While 7% of SMEs can be classified as unconnected, in the case of the micro-enterprise the figure rises up to 37%3. At the opposite end of the scale, while 19% of SMEs can define themselves as integrated, the figure descends to 10% in the case of micro-enterprises. These figures vary somewhat depending on the industry: the hotel and catering industry has the highest percentage of unconnected companies with 69%, followed by retail businesses with 53% and transportation with 39%. The

Fig. 6b: Process of introduction of ICT to micro-enterprises by business sector (SPAIN) (% of micro-enterprises)
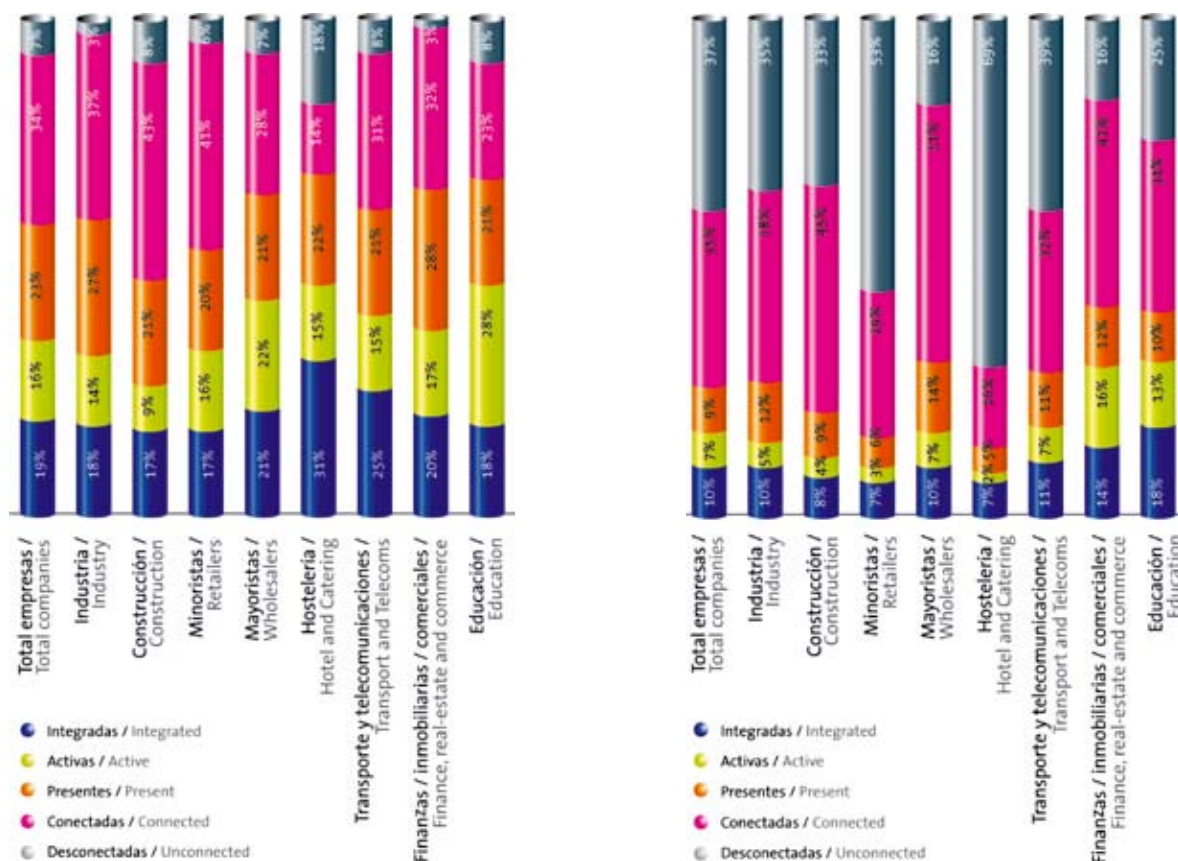
Source: Telefónica. Figures from July 2005

fact that these industries are fairly representative in the Spanish economy is grounds for understanding the relative backwardness shown by Spain.

As far as the market penetration of broadband is concerned, the main differences between industries are apparent once more in the micro-enterprise. The financial, real-estate and commerce industry is the most active user with 75% of its micro-enterprises connected to the Internet through some kind of broadband technology. Once again, the hotel and catering industry and retail industry are last in the list, with figures of 23% and 34% respectively.

eWork in Spain

In Spain companies are adapting new methods of organization and working, such as increased flexibility in working time, but eWork practices only occupy 4.9 % of Spanish personnel, while in the EU has an average of 13 %. The adoption of eWork practices must be stimulated, by establishing a climate that favours efficiency in organizational change, by encouraging companies to provide training to personnel and by ensuring that staff has a major involvement in all the aspects of the company, including the organisation of the work.

Nowadays, in Spain there are approximately 5,000 eWorking centres. In the last five years over 2 million users have used these facilities to integrate ICT into their personal and professional lives and more than 50,000 workshops and training courses have been given by these centres and eWorking networks.

The importance of the eWorking networks is indisputable since they are the instruments that introduce the Information Society to the Spanish population. They have turned into the tools of the different governments to reduce the 'digital divide' between citizens and the social aspect of their activities is of enormous value. After five years of experience, the move from an industrial society to a technological one would not have been possible without the intermediation of these networks.

In September 2005, the meeting that took place in Extremadura, is considered historical, as it was the kick off of the Spanish National Community of eWorking centres. The community aspires to cover all the centres in Spain and provide a platform for intensive communication and collaboration. It builds upon the regional networks that have been created in recent years.

Two of the regional networks which are the founders of this national network are:

1. Nuevos Centros del Conocimiento

The NCCs (New Knowledge Centres) of Extremadura are public spaces, offering free and democratic access to the Internet. They are endowed with enough computer equipment so that citizens and the social, economic and cultural organizations can know, practise and experience the opportunities that the technologies are generating and can generate in the region. In these

The EWorking network of Spain

Websites	
General information	www.teletrabajo.es
Spanish Asociation for eWorking	www.aeat.es
Resources for enterprises and eWorkers	www.canaldeteletrabajo.com
The eWorking network of Spain	
Red de Telecentros de Asturias	www.asturiastelecentros.com
Programa Kzgunea, Red Vasca de Telecentros de Acceso y Formación en Internet	www.kzgunea.net
Xarxa de Telecentrs de Catalunya	www.xarxa365.net
Teletreball.net	www.teletreball.net
Comunidad Fesinternet	www.fesinternet.net
Red de Cibercentros de Castilla y León	www.cibercentroscyl.es
Guadalinfo, Andalucía	www.guadalinfo.net
Nuevos Centros del Conocimiento de Extremadura (NCC)	www.nccextremadura.org
Instituto Tecnológico de Aragón-Programa Labora	www.ita.es/ita/
La Rioja. Fundarco. Cibertecas	www.fundarco.org
Cantabria SI. Red de Telecentros de Cantabria	www.cantabriasi.org
Red de Telecentros Rurales	www.telecentrosrurales.com
Red de Centros de Internet de Castilla-La Mancha	www.ibarataria.org/revision/index.html
Red de Ciudadania de Foz	www.fozredecidada.org
Red Conecta	www.redconecta.net
Red.es	www.red.es
Edonostia.net	www.edonostia.net

spaces, the users carry out activities for their technological training in a playful, collaborative and committed way. www.nccextremadura.org

2. Red Telecentros Asturias

The eWorking network of Asturias is a public and free service for all citizens financed by the Regional Ministry of Economics and Public Administration through its Directorate General de Modernisation of Information Systems, in collaboration with the municipal authorities of the villages where these centres are located. Their aim is to facilitate public access to the internet, thereby favouring the democratisation of access to the Information Society services, as well as to provide Digital Literacy for those groups that have a high risk of digital exclusion. www.asturiastelecentros.com/

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SWEDEN

The Swedish economy is recovering strongly after the hard initial years of this millennium. Productivity in the industry is increasing again – now even stronger than years before the disastrous year 2001 which was fateful to many businesses, especially in the ICT industry.

The employment rate in Sweden is just above 77% of the workforce (citizens in the age range of 20 – 65 years) and the unemployment rate was 5,5% in 2005. The growth in GNP in 2005 was 2,5%.[1]

ICT in Sweden

Sweden is still highly ranked when it comes to use of ICT and e-readiness. The access rate to computers and broadband at home is among the highest in the world. The Internet is used for an increasing number of services and the Swedish people are still regarded as very open-minded to new technology. Therefore, the take-off time for new ICT products is comparatively short in Sweden.

> "Sweden is one of the two or three leading countries in the world when it comes to new technologies. If you're curious about new trends, just come and take a look at Sweden" *   *Steve Ballmer, Microsoft*
> * Invest in Sweden Agency, ISA

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[1]   Statistics Sweden, SCB

Especially in the area of wireless communication Sweden keeps a leading position. Ericsson is the most well-known actor in this field, but the Swedish wireless industry includes about 500 companies in different sectors. The development of wireless ICT knowledge is supported by a number of research institutes and universities that are important contributors to the leading position of Swedish wireless. This has attracted a number of foreign companies to establish R&D and competence centres in Sweden. [2]

Examples of foreign investments in the Swedish ICT sector:

China: Huawei Technologies, Hutchison Whampoa, ZTE Corporation
Finland: Nokia
Germany: SAP, Siemens, Infineon Technologies
India: SHYAM
Japan: MIC, NEC, Sony, Yokogawa Electric
South Korea: LG Electronics, Samsung
UK: Vodafone, CSR
US: HP, IBM, Intel, Microsoft, Oracle, RSA Security, Sun Microsystems

ICT-jobs in Sweden

But voices have been raised warning against too much self-confidence. According to Sif - Sweden's leading white-collar union - we cannot take it for granted that the successful Swedish ICT sector can hold its position in the future. A recent investigation among executives, other key actors and 1650 employees at 20 ICT companies reveals that 70% of the employees are worried about the future of the industry. 37% of the respondents are of the opinion that Sweden has been loosing ground for some years and the leading position the country used to hold is fading.[3]

Sif explains the pessimistic view of the ICT workers by pointing out three key factors:

- Sweden's lead in technical knowledge has been reduced
- Nobody takes on the role of pushing ICT development in Sweden today
- Off-shoring and off-shore outsourcing of R&D functions to low cost countries

According to Sif, the future of the Swedish ICT industry depends on how well Sweden manages to provide
- Qualified competences
- An innovative business climate
- Supportive political leadership

Also the Confederation of Swedish Enterprise – the Swedish Employers Confederation – is concerned about the withdrawal of jobs and competence from Sweden. The number of employees abroad in Swedish owned multinationals has increased by nearly 80% since 1993. During the same period the number of employees in Sweden has decreased by 18% in these companies. Today, close to 1 000 000 employees are working abroad in Swedish owned business groups, while about 500 000 work in Sweden. Twenty years ago the relation between the number of employees in Sweden and abroad was the reverse.[4]

Telework in Sweden

In the area of teleworking Sweden also used to be one of the pioneer countries. Already at the beginning of the nineteen eighties, experiments on teleworking and neighbourhood work centres took place in Sweden. In the mid-nineties teleworking was investigated and debated exhaustively and at that time media kept on reporting how ICT solved problems for people and organisations. The new way of working was often held up in the media as the smart way of working – supported by the fact that three ministers in the Swedish government were part-time teleworkers.

Today, the media interest for teleworking is low – resulting in few articles and non-existent debate. There are no political ICT heralds to bring out the benefits of ICT and new ways of working. These subjects are not in focus in today's political agenda. Not even when it is obvious that the ICT industry is an important part of the Swedish economy and that the leading role of the Swedish ICT companies has to be maintained if they are to continue to be successful in global markets in the future.

Nevertheless, with the introduction of new technologies and new services in mobile networks, telework - mobile telework especially - seems to increase. Access to Internet and e-mail via the mobile phone facilitates new groups to work from home, as well as customers, from hotel rooms, air ports or when on the move.[5]

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[2] Invest in Sweden Agency, ISA
[3] Sif: Framtidens IT-jobb – Kista, Budapest, Bangalore, Peking
[4] www.ekonomifakta.se
[5] Telia Trendspaning 2006

Cross-border e-work

The fact that Swedish owned companies remove ICT-jobs to other countries worries the Swedish unions as well as the Employers Confederation. Countries in Eastern Europe, and more recently in China and India, have successfully attracted Swedish ICT companies. According to Sif, it is alarming that the relocation of jobs goes very fast and includes sometimes very qualified jobs within technical R&D. The survey Sif made a year ago indicates that in many companies the number of R&D-workers abroad will have doubled within one year. The union expects that this tendency will also include new sectors of the Swedish economy in the near future, for example Energy, Forestry and Finance.

This development is expected and will include many countries in the industrialized parts of Europe and the US. To get access to growing overseas markets, companies also have to locate production there. Often there are advantages to locating R&D close to production, so there are strong arguments to locate parts of those functions to the new markets as well. Lower costs and access to qualified competence are additional arguments.

Actually, this development is a key element in globalisation. Product markets become global, technical knowledge becomes global and also labour markets become global. ICT plays a key role in this development as it reduces the disadvantage of distance. In the globalised world, reliable and cost effective communication systems are important facilitators. ICT brings people in dispersed organisations together. This 'virtual proximity' offers new opportunities for collaboration between knowledge workers, but it also challenges traditional organisational thinking, management styles and manners of collaboration. Collaboration between colleagues in different counties and different cultures fosters mutual understanding and eventually reduces the differences in cost level, legislation and work conditions between countries.

This is, we hope, one of the positive aspects of globalisation.

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Useful websites:
Invest in Sweden Agency   www.isa.se
Ekonomifakta   www.ekonomifakta.se

TURKEY

International competition has become more dependent on information as globalization has stepped up in the last quarter of the 20th century. Survival in an environment that depends on information requires rapid changes in organizational structures and perceptions. This transformation, which is triggered by developments in information and communication technologies (ICT), affects the economy and all other aspects of daily life, and compels countries to find new ways that are beyond traditional approaches and definitions.

The success of this fundamental transformation is closely connected with the redefinition of governmental organization, working and decision-making processes in accordance with the needs of information society. This includes development of learning systems, technical and legal infrastructure, and economic policy tools. Since the early 1990s, there has been an increase in the efforts to transform into an information society in most of the countries. These efforts have been driven essentially by economic and social necessities.

Turkey has speeded up her efforts to transform into an information society by joining eEurope+ together with other candidate countries. Despite there having been little progress in the past, soon after the eEurope+ Initiative, Turkey started a new program, eTurkey Initiative - almost identical to eEurope+ - gathering different projects under one umbrella. Since the eEurope+ Action Plan in June 2001, Turkey has embraced the common goals and priorities of other EU member and candidate countries. Through coordination among all stakeholders and public consultations, the Turkish Government is striving to make sure public institutions, civil society organizations, and citizens are aware of the potential benefits of an information society. Along with other coordination activities, eGovernment lies at the core of these efforts. Bearing in mind that the recent public administration reform studies are at the top of the Government's agenda, eGovernment has been given greater emphasis than before.

In the past, instead of according to strategically defined national priorities, information society projects were carried out according to the needs and priorities of each organization. This did not prove to be a very successful approach. Therefore, all information society activities needed to be coordinated in such a way as to ensure increased economic value and social welfare and be carried out in a participatory manner. Projects should have concrete goals and be prioritized according to the needs of the society as a whole.

Technology Diffusion to Businesses

The Under-Secretariat of Foreign Trade (UFT) aims to enable the diffusion of information technologies among businesses, unions of exporters, and the public and private sectors. UFT includes an eCommerce Working Group responsible for the diffusion of information technologies and co-ordination of activities relating to eCommerce. The basic tasks of the government concerning eCommerce were stated in reports as follows:

- Establishment of the necessary technical and administrative infrastructure,
- Construction of the legal infrastructure,
- Reinforcement of electronic commerce through new measures,
- Adaptation of national policy and practices to international norms.

The aim is to carry out eCommerce activities through an eCommerce Portal. By the end of the project, it is expected that the whole Turkish business community, including SME's, will be well-equipped with the information and infrastructure necessary for eCommerce applications. The Small and Medium Industry Development Organisation (KOSGEB) has established an internet portal for SME's to enable them to find partners in EU and to communicate with them through Kobinet Eu On-line Project KOSGEB.

eGovernment in Turkey

Although stand-alone eApplications have been underway for some years in different public institutions such as MERNIS, VEDOP, and MEBSIS, an integrated eGovernment approach that incorporates those separate applications has only recently been put on the governmental agenda. With the launch of e-Transformation Project in November 2002, a new integrated approach has been adopted. Until recently, policy-making and coordination in eGovernment issues has been quite vague. This has resulted in the neglect of some important issues such as interoperability, one-stop shop portals, access channels and so forth.

Government On-Line, Government as Model Users

Tax Offices Automation Project VEDOP

VEDOP has started as an automation project in tax offices all over the country. As one of the largest IT implementations in government, the Ministry of Finance, has initiated this project in 1998. The Turkish tax system includes a variety of different tax types with different periods of collection. A typical taxpayer has to hand over more than 30 tax returns and declaration forms annually. This requires taxpayers to make their way to tax offices and submit their tax returns almost 3 times a month. This results in large amounts of individual circulation in the tax offices and the employment of a considerable number of personnel for front desk operations. Approximately 2,500,000 taxpayers are expected to transfer 70,000,000 tax returns annually using VEDOP in

the first three years of implementation. The Internet Tax Office web site was established within VEDOP to allow taxpayers to follow-up their status in the tax office, check their account balances and find information on regulations and updates. The Ministry of Interior, through a project called the ILEMOD Project, aims to record provincial inventory and to audit and monitor investments in provincial and rural areas. The Project will provide several benefits, some of which are:

- Making the necessary information available when creating ministry policies,
- Sharing this information with other ministries, administrative bodies and citizens,
- Making projections using past information,
- Specifying primary provincial needs,
- Preparing long term social and economical maps of Turkey,
- Preparing reports and documents about privileged areas for development on the basis of sectors, organizations and areas,
- Providing coordination between provinces about investments,
- Efficient utilization of resources under unexpected situations or when a disaster occurs.

Central Census Management System (MERNIS)

MERNIS is a project that transfers all identification information on citizens from 923 district centres into electronic form, permitting immediate updates and changes to be made in a secure way. The services that MERNIS provides are:

- Building a central population database by integrating population databases in districts,
- Providing a unique ID number to every Turkish citizen,
- Using this unique ID number to get and send personal data online between public and private information systems,
- Providing more reliable data on population statistics,
- Making the service faster by safely sharing the data with other government institutions,
- Decreasing bureaucracy, bringing the government and the citizen closer.

eGovernment Gateway Project

With this project, a technological infrastructure that will enable online provision of government services to

the business community and citizens will be established. A common platform for identity management and on-line payment will also be built. 19 pilot services will be made electronic in the first step and other public services will be integrated over this gateway when they are ready to be provided electronically. Bag-Kur is one of the social security institutions in Turkey providing service to employers. The institution is carrying out several eGovernment projects aiming at the automation of relations of the institution with pharmacies, health institutions and financiers. Ministry of Justice National Judicial Network Project (NJNP) The Project establishes an electronic network covering all Courts, Offices of Public Prosecutors and Law Enforcement Offices together with the Central Organization of the Ministry of Justice. The project has the main objective of realization of an information system to create an effective and less-bureaucratic justice system for every interested party; citizens, attorneys, prosecutors, judges, etc. When the project is fully completed, all the judiciary processes, including the trial, stages of Supreme Court of Appeals and State Council, return from the Supreme Court, conclusions, judicial decree execution and transmission to the Office of Records of Convictions, would be transmitted to electronic environment. Total number of courts and agencies that are going to be users of this information system will be around 70.000. Currently the system is used by 3,000 users. Lawyers' offices and citizens also have access to information concerning their individual cases. All bureaucratic procedures and formal writings are carried out electronically, thereby avoiding delays and reducing mistakes, especially those related to codes of procedures, as well as ensuring some degree of transparency. The Ministry of Industry and Trade is establishing an "Industry Portal" to integrate all of its units and processes electronically. With the project, the ministry aims to provide fast and high quality services to citizens, industry organizations and merchants.

The Undersecretariat of Customs (UFT)

is the coordinator of the project, "eDocuments in Foreign Trade". The basic component of this project is the Inward Processing Permission Certificates under the responsibility of the UFT. In Turkey, firms apply to the UFT, filling out Inward Processing Permission Certificates, which are in the form of paper documents. With the "Project of Monitoring Inward Processing Permission Certificates", the UFT will take steps forward in paperless trade. In the context of Inward Processing Regime, this project is aimed at transfering all operations to electronic form. On completion of this project, the following services will be available:

- Receiving firm applications securely through the Internet (convenient with the utilization of technologies such as digital certificate, electronic signature),
- Evaluation of electronic certificates by experts,
- Filing all information related with the certificate in a central database,
- Processing the documents by Exporter Unions via intranet,
- Enabling the firms to monitor their processes online,

- Monitoring all movements related with the certificate. UFT and Exporter Unions, authorized by Inward Processing Regime to carry out various processes, will be able to use the system on-line and the system will be integrated with the Customs Automation.

Undersecretariat of Customs Customs Modernization Project

The automation efforts that have been carried out in Undersecretariat of Customs aim to modernize the Customs Administration and to make it more effective and efficient. The administration had experienced some challenges, including increases in trade volume and changes in types of traded goods, complicated by smuggling. Thus, it became necessary to modernize Customs Administration using computer technologies. Therefore, the project was initiated to establish a modern organization. The Customs Modernization Project aims to solve problems, to eliminate unfavourable practices and to automate all customs transactions. With the completion of automation, foreign trade statistics have been updated immediately and all customs procedures have been carried out effectively and efficiently, paper-based customs procedures and rigid bureaucratic rules have been reduced and all customs procedures have been simplified. Objectives of the project are as follows:

- To provide better service to the trade community,
- To ensure uniform implementation of customs legislation,
- To ensure more effective human resources management,
- To ensure more effective and rapid production of foreign trade statistics,
- To ensure more effective tax collection,
- To ensure selective but more effective customs control,
- To enable customs formalities to be carried out in a computerized environment.

Social Security Agency Social Security eFiling for Employers Project (e-Bildirge)

e-Bildirge is a portal, which enables employers to send the insurance premium documents of employees via internet and to make accrued cost payments via automatic payment or internet banking. This new application enables employers to monitor their accrual-revenue information and past debts from anywhere in the world or Turkey without going to local insurance management offices and paying any fees. It also makes possible for the employer to acquire the necessary document, which shows their debt condition, in a very short time. Since the entry of the services of insured employees is made monthly, it is possible to monitor their service span accurately. Financial transactions related to social security payments are carried out in electronic environment with this project. e-Bildirge is operating since May 1, 2004 in all over Turkey covering both public and private institutions.

Turkish Standards Institute Turkish Standards Institute (TSE)

provides all its stakeholders with information on international standardization by publishing International

and EU Standards as Turkish Standards. On the other hand, TSE also provides fast and easy electronic access for its customers and all those making use of its services. In TSE's eApplications framework, there exists four major projects concerning standard preparation, standard selling, laboratories and certification schemes. These are:

1. **Standard Flow**

    The objectives of Standard Flow project are:

- Controlling and monitoring the standard preparation phases,

- Providing a fast and effective framework for standard preparation issues. In this project the phases are arranged according to the standard preparation stages of ISO and an electronic system is constituted which contains all stages of standard preparation process from constructing a technical committee, technical evaluation, technical study, photocopy and technical drawing to judgement process of technical board of directors and assignment of standard's validation date. The system also holds all details and information concerning the workflows, work loads, and delays in the phases, etc.

2. **StandardNET**

    With the StandardNet project a fast and time independent access to Turkish Standards is provided for all users and customers. This system has an archive of more than 18,000 Turkish Standards and a Document Management System which enables creating a unique format for Turkish Standards. Also, a modern approach is put forward for subscription processes and updating of documents. Moreover, the users are also provided with the opportunity to receive emails about status modifications of standards (like revision, withdrawal, etc.).

3. **TSELabNet**

    TSELabNet provides an information system which is accessible over Internet and which contains the process stages, process sequences and other required data belonging to the samples delivered to TSE for experiment or product certification. With TSELabNet project transparency of experiment processes is provided.

4. **TSEBelgeNet**

    For product suppliers and/or importer companies, TSEBelgeNet provides an electronic TSE Certification scheme working over Internet. This system also covers eCertificate issues.

Government Programmes to Promote or Encourage eProcurement and/or eInvoicing

Government Supply Office Electronic Sale Project (e-Sale)

The Government Supply Office (DMO) has been serving with its 22 regional offices as a centralized public purchase institution in Turkey. DMO has more than 1,100 supply types in 203 different categories. With the e-Sale project, an important step has been taken, by transforming all the catalogue purchase services to internet environment. DMO aims to be a model user in the government sector and also to have the largest sale portfolio of the country. With the e-Sale project, all the purchase services, which have been managed traditionally by paper, phone, and fax, had been transformed to electronic environment and the entire purchase process has been realized over internet. As well as order and shipment processes becoming much faster and communication costs decreasing sharply; human resources have also been used much more efficiently and effectively with the new system. Also, the scope of the office has been enlarged and a system, which is equally reached from all regions of the country, has been established.

Public Procurement Agency

Electronic Public Procurement Platform

The objective of Electronic Procurement Systems is to support fundamentals and formalities to be observed in the process of public procurement while promoting basic principles by making use of information and communication technologies and to realize procurement transactions at minimum work load and cost expended by buyers and sellers. Electronic Procurement Systems can reduce the cost of the procurement process in duration, effort and economy of both buyers and sellers at the rate of two thirds and when operated properly it can save up to 20% of the public procurement budget. Hence, erroneous or divergent interpretation of regulations in public procurement process by buyers and sellers, causing wrong or corrupt practices, are widely eliminated. The Electronic Public Procurement Platform is a web environment in which administrations and suppliers are brought together and all documents related to tendering process can be exchanged securely. Administration will send their tender notices together with tender documents to the Electronic Public Procurement Platform and suppliers who are registered to the Electronic Public Procurement Platform will be able to read and download tender notices and documents.

Development of Supplier's Database related to suppliers who want access to the Electronic Procurement Platform and read/buy tender notices and documents will be developed. Tender notices could be electronically mailed to registered suppliers according to the line of business that they deal with. A Supplier Database will be developed 3 stages.

Table 1: Internet-Computer and Broadband Penetration Rate (2002–2005)
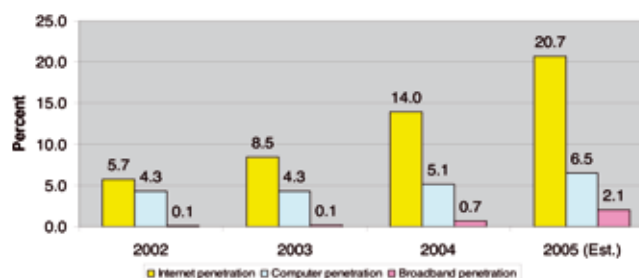
Source: "Türkiye Bilgi Toplumu Faaliyetleri" by Recep ÇAKAL

Table 2: Availability of ICT devices in households (%)

	Proportion of households having ICT devices			Proportion of households having devices for Internet access		
	Turkey	Urban	Rural	Turkey	Urban	Rural
PC	11,62	16,11	3,74	5,86	8,39	1,40
Laptop	1,13	1,60	0,30	0,74	1,05	0,18
Handled computer	0,14	0,22	-	0,08	0,12	-
Mobile phone	72,62	79,86	59,91	3,21	3,76	2,25
Television (including satellite dish, cable TV)	97,74	98,97	95,59	0,05	0,08	-
Games console	2,90	3,75	1,40	0,02	0,02	-
Any of the above	98,35	99,40	96,51	8,66	11,62	3,46

Source: Results of the ICT Usage Survey on Households and Individuals, 2005 by SIS (State Institute of Statistics)

Table 3: Proportion of households by types of Internet connection (%)

	Turkey	Urban	Rural
Modem (dial up access over normal telephone line) or ISDN	52,27	54,31	40,21
DSL (ADSL, SDSL etc.)	19,27	21,59	5,57
Other broadband connection (e.g. cable, UMTS, etc)	1,09	1,27	-
Mobile phone over narrowband (WAP, GPRS, etc.)	37,04	32,31	64,98

Source: Results of the ICT Usage Survey on Households and Individuals, 2005 by SIS (State Institute of Statistics)

Table 4: Proportion of Internet use by place (%)

	Turkey			Urban			Rural		
	Total	Female	Male	Total	Female	Male	Total	Female	Male
At home	27,64	33,60	24,96	30,22	36,21	27,32	14,19	14,29	14,16
At place of work (other than home)	43,28	40,53	44,52	44,28	40,59	46,07	38,06	40,09	37,45
At place of education	8,77	15,82	5,59	8,87	15,20	5,80	8,25	20,39	4,64
At other peoples' houses	7,17	9,67	6,05	7,62	10,07	6,43	4,86	6,68	4,32
Internet cafe	36,62	23,42	42,57	34,56	22,94	40,18	47,37	26,97	53,45
Other	1,54	1,37	1,61	1,44	1,42	1,45	2,03	1,05	2,33

Source: Results of the ICT Usage Survey on Households and Individuals, 2005 by SIS (State Institute of Statistics)

Table 5: Computer and Internet use by the labour force status in the reference period ([1]), (%)

	Total number of individuals			Computer user			Internet user		
	Turkey	Urban	Rural	Turkey	Urban	Rural	Turkey	Urban	Rural
Regular employee	10 254 722	8 253 094	2 001 628	36,74	39,01	27,40	29,79	31,94	20,90
Self employed	6 841 359	2 922 176	3 919 183	11,78	22,38	3,88	8,43	15,95	2,82
Unpaid family worker	4 307 992	533 829	3 774 164	6,58	29,54	3,33	4,94	23,99	2,24
Housewife	12 147 803	8 803 822	3 343 981	2,98	3,68	1,12	1,53	1,85	0,68
Unemployed	2 238 336	1 824 732	413 604	27,50	29,10	20,43	22,86	24,39	16,11
Retired	2 605 470	2 042 344	563 125	6,08	6,88	3,20	4,70	5,55	1,65
Student	2 421 987	1 912 587	509 399	64,50	68,50	49,48	54,19	59,25	35,18
Other	7 360 993	4 042 319	3 318 673	12,89	17,08	7,80	10,00	13,54	5,69

([1]) Reference period: For this survey the reference period is 6-12 June 2005.
Source: Results of the ICT Usage Survey on Households and Individuals, 2005 by SIS (State Institute of Statistics)

Table 6: Computer and Internet use by the labour force status in the reference period (¹), (%)

	Total number of individuals		Computer user		Internet user	
	Female	Male	Female	Male	Female	Male
Regular employee	2 078 647	8 176 075	51,80	32,91	42,39	26,58
Self employed	995 431	5 845 928	5,70	12,82	3,19	9,32
Unpaid family worker	3 012 389	1 295 603	1,75	17,80	1,15	13,73
Housewife	12 147 803	-	2,98	-	1,53	-
Unemployed	658 229	1 580 107	32,40	25,46	24,51	22,17
Retired	440 267	2 165 203	11,98	4,88	9,22	3,79
Student	1 030 558	1 391 428	60,11	67,75	47,95	58,81
Other	3 863 960	3 497 033	9,01	17,19	6,62	13,73

(¹) Reference period: For this survey the reference period is 6-12 June 2005.
Source: Results of the ICT Usage Survey on Households and Individuals, 2005 by SIS (State Institute of Statistics)

Table 7: Activities of individuals on the Internet (%)

Purposes	Turkey	Urban	Rural
Communication	**78,23**	**78,91**	**74,69**
Sending / receiving e-mails	66,84	68,58	57,78
Telephoning over the Internet / Videoconferencing	11,36	12,40	5,90
Other (use of chat sites etc.)	40,39	39,34	45,85
Information search and online services	**90,16**	**90,34**	**89,18**
Finding information about goods and services	43,31	43,83	40,58
Using services related to travel and accomodation	14,25	15,63	7,07
Listening to web radios/watching web television	28,18	28,22	27,95
Playing or downloading games, images or music	43,58	42,64	48,46
Downloading software	22,81	23,73	17,97
Reading/downloading online newspapers/news magazines	55,77	56,58	51,55
Looking for a job or sending a job aplication	10,57	10,83	9,19
Ordering and selling of goods and services, banking	**15,95**	**16,99**	**10,54**
Internet banking	12,90	13,57	9,40
Other financial services (e.g. Share purchasing)	2,95	3,23	1,46
Purchasing/ordering goods and services (excl. Shares/financial services)	5,59	6,13	2,75
Selling goods and services (eg. Via auctions)	1,07	1,23	0,23
Interaction with public authorities	**39,97**	**41,58**	**31,56**
Obtainin information from public authorities web sites	37,64	39,12	29,93
Downloading official forms	10,65	10,93	9,14
Sending filled form	6,02	6,05	5,91
Training and education	**30,71**	**32,16**	**23,15**
Formalised educational activities (school, university etc.)	26,83	27,93	21,05
Post educational courses	7,22	7,96	3,38
Other educational activities related specifically to employment	4,37	4,80	2,14
Health	**22,97**	**24,39**	**15,55**
Seeking health-related information	22,38	23,86	14,64
Making an appointment online with practitioner	0,50	0,60	-
Requesting a prescription online from a practitioner	0,02	0,02	-
Seeking medical advice online from a practitioner	1,86	1,93	1,47

Source: Results of the ICT Usage Survey on Households and Individuals, 2005 by SIS (State Institute of Statistics)

eCommerce

This section provides a brief overview of current issues affecting electronic commerce in Turkey. The history of electronic commerce, types of industries using eCommerce and an overview of current IT infrastructure provides for a well rounded perspective on this growing media.

Information Technology – The infrastructure needed for Electronic Commerce

Turkey's Information Technology market (IT) is anticipated to reach $3.4 billion in 2003-- up from the $2.9 billion projected for year-end 2002. The market is dominated by the hardware sector, driven mainly by PC purchases. Currently there are 4.5 million personal computers in Turkey and nearly 4 million Internet subscribers. The Turkish IT Market contracted by 22 percent in 2001 as Turkish consumers and companies cut spending across the board due to the economic crises, insecurity about the future of the economy and political uncertainty. IT equipment buyers remained cautious regarding technology purchases and systems acquisition and held off procuring new equipment. The IT market reflects a high price elasticity of demand for most products and neither brand-name technology nor technologies with long life-cycles have a guaranteed comparative advantage when the bottom line sales price remains the overriding purchasing decision factor.

Industry sources predict that 2003 IT industry growth will again rebound to a healthy 30.9 percent. Companies are experiencing a return to consumer confidence and as the current government continues on the road to economic reform, lower deficit spending and lower inflation rates will have a positive effect on the business climate. According to an OECD 2001 report on information and communication technology (ICT) expenditures, Turkey spends less than 1.5 percent of GDP on IT hardware, software and IT services. According to the same report, Turkey lags most major OECD countries in IT intensity (IT spending as a percentage of GDP). Increased spending on telecommunications infrastructure, bringing computers to schools on a rural education initiative, and increased corporate investment will lead to greater spending in the Information Technologies sector.

A Historical Review of eBusiness in Turkey and the Internet

As noted above, Turkey lags substantially behind Europe and the United States in having developed a broad market for IT equipment and services as a function of Gross Domestic Product. The history of eBusiness development in Turkey has been one of a long and slow evolutionary process. Turkey's universities were first to realize the first Internet connections, with the Middle East Technical University (METU) having established the first connection in 1994. METU continues to be the only location for domain name registration in Turkey (.TR). Given the Telecommunications law at the time, all communications had to be provided by the government owned Turk Telekom. Turk Telekom established its first Internet backbone in 1996 and all Internet service providers were required to utilize the Turk Telekom (TTnet) infrastructure. This arrangement resulted in significantly high fees for Internet connection at relatively slow connection speeds. Due to this monopoly situation, access to the Internet was expensive for most Turkish consumers. As Turk Telekom moves to privatization, connection rates should decline and the number of Internet subscribers should increase.

There are nearly 4 million Internet subscribers in Turkey. The largest user group is in the 35 years of age and under group, which is consistent with local demographics where the majority of the Turkish population is of middle age and 27.8 percent of the population is under the age of 15 (CIA World Fact Book 2002). It is Turkey's 20-35 age group which is most comfortable with the Internet and accepting of information technologies. Uses of the Internet include e-mail, research, on-line chat, personal banking, computer games, job searches, and B2B and B2C eCommerce transactions.

Turkey's major Internet service providers (ISPs) are Superonline and Garanti Net. Two large Turkish banks—Yapi ve Kredi Bank and Garanti Bank, established these ISPs.

Internet subscriptions are easily accomplished through credit cards and application forms. Major ISPs, such as Superonline, Garanti Net and Turk Net, have established dealership programs where "Internet boxes", containing dial up software on CD-ROMs, are sold at local computer stores. These boxes allow the consumer to get instant Internet connection. Prices vary between USD 18.95 to USD 35.00 for one month of unlimited access. Each Internet service provider also provides an e-mail account to the consumer upon registration. Currently it is estimated that there are over 4 million Internet users in country.

Broadband

A "Broadband Strategy" is currently being prepared by the State Planning Organisation (SPO) within the "Information Society Strategy". With this strategy, coverage of broadband infrastructure is intended to be enlarged so as to cover rural areas and socially/geographically disadvantaged regions.

2005 Action Plan of eTransformation Turkey Project includes a comprehensive study that directly targets developing broadband access. Policy-makers, telecom operators, regulators, equipment vendors, and NGOs are going to take part in this study. Bridging digital divide, service provision, and eInclusion with the help of broadband access would be essential steps in transforming the whole society. Therefore, a sound approach in broadband deployment taking into account technical barriers, economic viability and sustainability, and public policies, will constitute the fundamentals of broadband strategy.

eBanking

The majority of eCommerce transactions in Turkey are in the field of Internet banking. Local industry sources report that nearly 70 percent of all electronic commerce transactions are in on-line banking and financial services. The concept of having Internet banking in Tur-

key is popular given the very high cost of maintaining physical bank branches throughout the country. Most commercial banks expended between USD 100,000 and USD 200,000 to develop their infrastructure. The large commercial banks involved in eBanking include: Is Bank, Garanti Bank, Yapi ve Kredi Bank, Ak Bank and up and coming Oyak Bank. Apart from increasing customer service, the commercial banks realized that the transaction cost was substantially less for Internet banking than the traditional brick and mortar enterprise of the past.

Other eCommerce Business Activity

Apart from the significant on-line banking segment of the Turkish eCommerce industry, Turkish companies in food delivery, books/CDs/entertainment, clothing, and consumer products are also active in promoting goods and services via the Internet. The majority of commercial sites were developed without focusing on IT integration of overall corporate operation and instead focused on order taking and transaction clearance. Turkish eCommerce companies generate only a small percentage of gross revenue from electronic transactions.

Government of Turkey measures to improve the IT and Internet environment

Government of Turkey IT initiatives

The Government of Turkey has several Information and Computer Technologies (ICT) projects underway. The Ministry of Education has begun deploying computing facilities with broadband connections to 75,000 schools in Turkey as part of a rural education initiative. Likewise, the ministries of Health, Justice and the Treasury/Revenues division are all implementing information systems. The Ministry of Industry is focusing on improving eCommerce awareness among small and medium sized enterprises. The success of these efforts will depend on greater interagency coordination, funding, and infrastructure hurdles already mentioned earlier in this report.

Intellectual Property Rights Protection

The articles on software and digital transmission of law on the Intellectual and Artistic Works has changed in order to achieve harmonisation with the Bern Agreement, WIPO Copyrights Agreement, Council Directives and TRIPS Agreement. With these new articles, the scope of the Law is extended and software and databases are taken under protection. Moreover, a legal infrastructure on IPR which is completely compatible with EU legislation is being prepared.

Electronic Signatures

The act on electronic signatures was implemented in 2004. With this act, it is stated that qualified electronic signatures produced according to the identified procedures will have the same legal impact as handwritten signatures. Related secondary legislation has also been completed by the Telecommunication Authority as mandated by the Law. Three electronic certificate service providers have been authorized as of November 2005. One of these is the "Public Certificate Center" which is

the responsible body to provide electronic certificate services to all public institutions. The Center was established with a Prime Minister's circular and it is mandated that all public institutions needing electronic certificate services will acquire this service from the mentioned body.

Customs and Customs Rulings affecting eCommerce

Customs valuation

The Government of Turkey assesses an import duty of 3.5 percent for software imports from the United States and third countries. The duty is levied on the CIF value of the products as noted in the commercial invoice. Products purchased on-line and imported to Turkey would have an assessed duty rate commensurate with the product's country of origin and its corresponding harmonized tariff schedule number. Products downloaded from the Internet or from e-mail attachments having a declared value are exempt from duty, however, eCommerce companies must still report earned income and be assessed for corporate taxes resulting from electronic commerce.

Customs Rules Changes

The Government of Turkey is taking steps to improve the eCommerce environment having made recent changes in customs regulations easing the importation of small packages and shipments into Turkey, especially improving the business climate for B2C transactions. Additionally, commercial banks are offering Internet Point of Sale (POS) support, which makes payment by credit card simpler.

eGovernment Projects

200 projects, 386 M USD budget allocated in 2005 for central government projects

Important eGovernment Projects

- eGovernment Gateway – tendering completed recently
- Central Census Management System (MERNIS)
- ID Sharing System (KPS)
- Tax Offices Automation Project (VEDOP –Tax Declaration and Payment)
- Social Security eFiling for Employers Project (e-Bildirge)
- Electronic Public Procurement Platform
- Customs Modernisation Project (GIMOP)
- Police Computer Network and Information System (PolNetincluding passport application, vehicle investigation, on-line denunciation and many other applications)
- National Judicial Network Project (UYAP)
- MONE -Broadband access to schools
- MONE –PC purchase option for teachers with affordable pricing
- MONE -Computer-aided Education(through NGO partnership)

OECD

- eGovernment Peer Review, to be presented by Mr. Nilsson

EU Programs
- eEurope+, eEurope2005, eContent, IDA, IDABC, i2010
- EU 20 Basic public eServices
- 12 services delivered to date
- 53% in terms of service level

References:
1. e-Transformation Turkey Project: Turkish Case for eGovernment
2. OECD IT Policy Questionnaire
3. Results of the ICT Usage Survey on Households and Individuals, 2005
4. "Türkiye Bilgi Toplumu Faaliyetleri" by Recep ÇAKAL
5. e-Transformation Turkey 2005 Action Plan
6. eEurope 2005 Action Plan
7. OECD Country Paper, SPO-ISD

For further Information on the Information Society Technologies:
http://www.bilgitoplumu.gov.tr/eng/documents.asp

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4. Project stories

4.1. Introduction

Compared to last year, readers should note that the following project stories have been added, all arising from IST Call 5, Strategic Objective 2.5.9, Collaborative Working Environments:

	TABLE OF NEW PROJECTS ON COLLABORATION@WORK		
type	**project/note**	**topic**	**target**
IP	**C@R** [1]	Collaboration@Rural: a collaborative platform for working and living in rural areas	Use CWE to catalyze rural development
CA	**CLOCK** [2]	Challenges of Collaborative Working Environments	An industry-led initiative on CWE.
CA	**CoreLabs** [2]	Co-creative Living Labs for CWEs	Initiate a European Network of Living Labs.
IP	**CoSpaces** [2]	Innovative Collaborative Work Environments for Individuals and Teams in Design and Engineering	Collaborative workspaces within distributed virtual manufacturing enterprises
STREP	**CoVES** [2]	Collaborative Virtual Engineering for SMEs	Fast Collaboration & Decision Making in a Global Business for SMEs
STREP	**DiFac** [2]	Digital factory for Human-oriented Production	A CME using VR and AR (M = Manufacturing)
IP	**ECOSPACE** [2]	eProfessional Collaboration Space	Seamless, dynamic and creative collaboration for e-Professionals by 2012
STREP	**inContext** [2]	Interaction and Context Based Technologies for Collaborative Teams	Adaptive and pro-active services anywhere, anytime, anybody, any device.
IP	**Laboranova** [1]	Collaboration Environment for Strategic Innovation	Innovation through CWE supporting disruptive ideas, fuzzy knowledge, and nonlinear workflows
SSA	**OpenFutures** [2]	Future Centers as Collaborative Working Environments	Promote Future Centers as CWE for innovation.
STREP	**POPEYE**	Professional Peer Environment Beyond Edge Computing	Mobile P2P computing for collaborative work.
STREP	**ROBOT@CWE** [1]	Advanced robotic systems in future collaborative working environments	Integrate collaborative robotic systems as active agents within working environment clusters.
STREP	**WORKPAD** [1]	An Adaptive Peer-to-Peer Software Infrastructure for Supporting Collaborative Work of Human Operators in Emergency/Disaster Scenarios	Developing an innovative P2P software infrastructure for emergencies/disasters

Notes:
[1] At time of going to press on 30/6/2006 these proposed projects are still under negotiation;
[2] At time of going to press on 30/06/06 the contract has not yet been signed for this proposed project.

AMI@Netfood: IST technologies for agri-food and rural environment

The objective of the AMI@Netfood project is to support the implementation of the Information Society Technologies (IST) Research Priority and Framework Programme, providing a long-term vision on future trends on Scientific and Technology Research oriented to the development and application of Information and Communication Technologies (ICT) to the European agrifood industry and rural development domain.

The current situation of the agri-food and rural sector in terms of markets, develop-ment and competetiveness and the specific impact that rural activities have in society, added to the potential positive impact of new ICT technologies, has given rise to new challenges.

During the analysis stage, the AMI@netfood consortium has selected the most relevant challenges, which could be addressed through further implementation of ICTs:

- Support the European Agri-food industry, especially SMEs, to be a **world wide leader** in the supply of **high quality and safe food products**.
- Increase the **level of involvement** of consumers in the agri-food value chain by means of the wide adoption of relevant IC Technologies and applications.
- Increase the areas in which European citizens find ICT assisted **collaborative working environments** by extending them to the agri-food industry and rural domain.
- Open **new business opportunities** for the European ICT industry through the development of new applications and tools to support the European agri-food and rural sector.
- Contribute to triggering the investment in **ICT and telecommunications infrastructure** by creating new business models tailored to the rural areas.
- Make Rural Europe a **more attractive place to live, invest and work**, promoting knowledge and innovation for growth and creating more and better jobs.

AMI@Netfood Project has selected the most relevant research needs in the area of Information Technologies applicable to agri-food industry and rural development. The research needs have been documented in the form of a **Strategic Research Agenda** (SRA) as a key tool to support European Policy Makers in the definition of their long-term strategy.

The Research Agenda takes into consideration the intrinsic nature of both sectors, and it has been developed in compliance with current European Legislative and Governmental guidelines, other related projects and existing Technology Platforms in related areas.

The current draft SRA has to be validated and refined. This process is presently being implemented through seminars, workshops and interviews, involving major sectoral stakeholders and AMI@netfood constituency.

Four key research guidelines supporting agri-food and rural development

For the accomplishment of selected long-term challenges, from the perspective of Information and Communication Technologies (ICT), future European research policies should follow a specific path focused on the performance of several Research and Technology Development (RTD) activities. Among a number of potential activities discussed within the AMI@Netfood constituency, **four specific RTD domains have been selected as those most appropriate to be developed in order to give adequate support to the sector.**

The selected RTD programmes describe the strategic priorities in ICT which will most likely contribute to the development of the domains in the medium to long term.

- **ICT applications for the complete traceability of agri-food products and services throughout a networked value chain.**

  This means further research and development of applications and tools that facilitate communication and co-operation between agri-food industry stakeholders.

  These solutions will make possible new management models of food supply chains/networks, promoting collaboration and knowledge exchange.

- **Promotion of collaborative activities in agri-food and rural areas.**

  Innovative ICT tools (the so-called Collaborative Environments) are needed to support new ways of collaboration among groups in industry and among the organised industrial groups and wider communities. For the agri-food industry, perhaps more than any other industrial sector, it is essential to arrive at synergies between stakeholders through collaboration activities.

  New Collaborative Environments are also needed to radically enhance capabilities of rural inhabitants leading to an improved quality of life, a revalorization of rural settings and an integration of the innovation processes in rural activities, mainly oriented to agri-food production.

- **ICT applications supporting the management of natural resources and rural development creating value for citizens and businesses.**
  Addressing a multidisciplinary area including the development of sectoral-specific ICT (tourism, marketing, eServices), these will be specific applications to improve quality of life in rural areas, and ICT applications and tools to support detection, observation and management of natural resources.
- **Innovative ICT applications in rural areas using broadband infrastructure.**
  Research and development of inexpensive scalable technologies to support communications, the development of applications supporting rural IT deployment and the performance of Socio economical and politically oriented studies focused on technology implementation in rural areas.

European Joint Activities

One of the key project objectives is the design of a set of activities to promote cross regional cooperation among different European Regions.

The project has defined several joint activities in the scope of each of the RTD domains described in the SRA. These Joint Activities, once validated; will be used as pilot experiences to enable the implementation of common actions in several EU regions with similar interests and requirements.

Making SRA widely applicable through extensive validation

Once the draft SRA is available, extensive validation processes need to be completed before it can be of wide application throughout the EU. The SRA validation process is going to be carried out in fourteen European countries, in different workshops involving relevant policy, research and industry stakeholders from Agri-food industry and rural development domain.

AMI-4-SME Systemic Innovation for SMEs Approaching new ICT potentials

Based on an initial analysis of SME innovation needs concerning 5 business cases in Germany, Ireland, Poland and Spain, a first concept is being realised for AmI technology support and methodology, enabling industrial SMEs and technology vendors to identify ICT potentials for collaboration in Extended Enterprises.

Ambient Intelligence (AMI) technology is oriented to surround people with electronic environments, sensitive and responsive to their desires. It offers a multitude of process innovation possibilities for the manufacturing industry and it is promising a revolutionary next step for radical innovation of the whole industrial working environment. Furthermore, AmI enables realisation of new interaction paradigms and collaborative working environments for the human worker. It facilitates collaboration between humans themselves as well as with their infrastructure, such as machines on the shop floor or existing IT systems (e.g. ERP, PPC, CAD).

AMI-4-SME aims at realising a new scheme to exploit this – systemic innovation of industrial collaborative working environments by enabling SMEs to transfer the potential of AmI into daily operation. Besides the pure technical dimension, the RTD activities address development and validation of new models of business processes for flexible manufacturing, specifically tailored to the needs of SMEs, based on an "Ambient Intelligence philosophy", asking: What can be achieved by AmI Technology in the SME reality?

To ensure practical relevance of project results and to create real industrial experiences, two paradigmatic and typical scenarios were selected for application of AmI technology and systemic innovation in order to ensure high reusability and adaptability of the envisaged solutions for SMEs:

- Advanced manufacturing control, for dynamic reconfiguration of (geographically) distributed assembly and manufacturing processes and lines;
- Innovative approaches for maintenance facilitating multi-stakeholder involvement.

These scenarios and mixtures of them are presented by five project business cases, helping to realise AmI technology prototype solutions (AmI-4-SME Building Blocks), facilitating AmI implementation in manufacturing SMEs as well as preparing the market for ICT/AmI vendors.

Moreover, focusing on the human actor requires the consideration of heterogeneous cultural behaviour patterns and environments as well as including diverse competencies from industrial SMEs, RTD and ICT development. Hence, the project involves EU partners from Germany, Ireland, Poland and Spain as well as global partners from e.g. Australia and Korea.

AmI as Enabler for Improvement

The basic assumption of AMI-4-SME is that the realisation of new AmI based environments will stimulate new needs and have the potential to radically re-organise work in industry, bringing considerable benefits, such as employee motivation, flexibility, productivity, cost efficiency, performance and robustness, and thereby providing a breakthrough in the competitiveness of European SMEs.

Empowering the technology end-user

As a key objective, AMI-4-SME aims at the realisation of an approach which will enable SME end-users (representing "non-experts in AmI technology"), to identify most appropriate AmI technologies for a human centred business improvement, not requiring any expertise in AmI technologies. However, this statement implies a dilemma.

To overcome this dilemma an '**AmI reference model**' for manufacturing industry and related '**AmI features**' were elaborated. The AmI features represent a solution-independent formulation of the potential for AmI technology offered to the human operator when interacting with their ambience. They must be expressed in a form understandable by non-experts, defining WHAT an AmI system can offer, but not HOW it will be achieved.

5 Business Cases for Test and Validation

AMI-4-SME incorporates 5 Business Cases (BC), where AmI features will be used in SME environments (i.e. building blocks based on mobile multimodal devices, smart tags and speech recognition). The BC1 and BC5 are an application of the new Reference model concept for advanced production control, while BC2 and BC4 focus on Maintenance. BC3 is a combination of both models:

- BC 1: Dynamic reconfiguration of Build to Order driven assembly processes with high product diversity in an Extended Enterprise environment.
- BC 2: Improvement of maintenance services for control systems.
- BC 3: Dynamic re-configurability of highly precise measuring systems at the end-user site to facilitate product multi-applicability & enriched maintenance services.
- BC 4: Optimal design for maintenance and logistics services.
- BC 5: Design driven dynamic reconfiguration of manufacturing lines.

Project Rational – The Work Plan

Based on technology potentials and refined AmI reference models, the business cases will be analysed in detail and will serve as key references to derive SME innovation needs (i.e. which technology and AmI functionality is most promising for SME environments).

Moreover, AMI-4-SME applies an incremental prototyping approach, starting with concept prototypes as key reference for specification and development of the innovation methodology and AmI solutions (building blocks). Subsequently the implemented early and full prototypes will be tested and assessed in the described business cases (i.e. real shop floor environments). Finally, three business cases will serve as demonstrators, open for public interest facilitating the understanding of both technology as well as reengineered processes – "a new organisation of work", enabled by applying methodology for systemic innovation in SMEs.

AmI Products & Services for the SME Market

AMI-4-SME ICT vendor partners are keen on an answer to the question: "How does one penetrate the SME marketplace with innovative AmI solutions?" Since it is fairly clear that technology is only an enabler which has to be combined with new ways of organising work, this requires a translation of AmI features into business terms such as benefits and profit.

On the one hand, ProDV, Softronica and Telefónica see strategic market possibilities in using the AmI building blocks to facilitate the reuse of their know-how when enhancing their products and services. On the other, they want to support a strengthening of innovation culture in European SMEs by an innovation methodology, as a pathfinder for exploiting technology potentials, generating a demand for their expertise.

The envisaged RTD Cluster

The project will provide cross-sectorial industrial participation, targeting knowledge communities of SME users, RTD and ICT vendors leading to development of long-term visions for the future of manufacturing. Opportunities for potential cooperation and experience exchange are sought. Initials contacts have been made to other projects.

International Cooperation – IMS Dimension

Manufacturing has to incorporate both global competition as well as global cooperation, to find new markets and to learn from the best. Therefore, in the scope of the IMS Programme, AMI-4-SME, in cooperation with the InAmI project, aims at a global cooperation with partners from Australia, Korea, Japan and US.

AMIRA: Advanced Multi-modal Intelligence for Remote Assistance

The goal of AMIRA was to significantly improve the accessibility and resources available to support urgent and critical diagnostics and decisions that must be taken by mobile workers, operating individually or in multi-discipline collaborations, at their point of intervention in an event.

What's the problem?

In AMIRA, a 'mobile worker' is considered to be any person who performs the majority of his/her work at a distance from their employer's premises, yet needs access to information and back-up support at the point where they are undertaking their work.

Our mobile worker may have to diagnose the source of a problem. It may be a rarely experienced problem, or at least something he/she has not seen before in either training or experience. The criticality of the situation may range from simply one of time to a life-threatening emergency. In order to identify and resolve the problem encountered, such an operative needs access to multiple sources of information, provided in a meaningful way via a mobile processing and communications device with at least speech input and possibly a hands-free kit to connect to an interactive system. No such intelligent, intuitive system currently exists.

What's the goal?

The business idea behind AMIRA was to provide just such a solution. That is relevant and reliable time-critical information at the point at which it is needed.

What's the challenge?

The technical challenge faced by AMIRA was to develop a set of reusable components using search, reasoning, speech dialogue technology and collaborative working techniques that can be used to create a variety of applications for use by mobile workers operating in safety or business critical situations in the field. To achieve and prove the validity of this goal, a wireless, easy to use, intelligent, real-time diagnostic and decision support application for the mobile worker was created, accessed via multi-modal devices such as wireless earphone/microphone, Tablet PC, PDA, mobile telephone, or laptop computer. Application must be capable of being used across a diverse range of disciplines and sectors where multi-modal assistance is required at the point of intervention in time- safety- or business-critical incidents.

Building on the work and results of current and previous RTD projects, AMIRA widened the applicability of advanced search and reasoning technologies making it possible to access these through both a speech and visual dialogue interface.

Using Knowledge Assets

In order to provide powerful assistance for decision-making, different types of knowledge sources must be accessible. These types include experience-based knowledge that documents solutions to specific problems, as well as more general descriptive or training documentation to support decision-making and implementation. From this perspective, AMIRA represents a seamless combination of structural CBR (CaseBased Reasoning) and full-text search. In this context, an intelligent information access system should be able to function seamlessly with different types of knowledge, automatically detecting how to process a query and what knowledge source is best suited to answer a specific question. These requirements can be addressed by different types of knowledge sources corresponding to different ways of combining structural CBR and full-text retrieval results. In particular model-driven CBR retrieval, hybrid CBR/full-text retrieval, and model-driven full-text retrieval.

The AMIRA Vision

The AMIRA vision actually incorporates four innovative technologies for supporting mobile workers: CBR, Full-text search, Speech Dialogue, and CSCW (Computer Support for Co-operative Work). Whereas the reasoning and search components deliver the intelligence of the system, the speech component provides the end-user interface enabling the mobile worker to access the information and knowledge retrieved by the 'intelligent' components of the system, and the CSCW components provide the support for collaboration. Speech Dialogue is just one example of the 'communication' clients for AMIRA, which will work with other types of clients, such as Touch-screen tablet PCs, PDAs, Mobile 'phones, or Laptops.

The various components do not act separately from each other. One of the key aspects of AMIRA lies in the development of integration methods sufficiently powerful to reconcile the incompatibilities in data types and representations between the different reasoning and search components, and to use the incoming / outgoing speech component.

The AMIRA Scenario

The overall AMIRA scenario depicted below shows the interaction between the technology components. The top layer represents the dialogue mechanism, which could be a speech dialogue system (SDS), a hand-held PDA, text message via a mobile 'phone, a laptop or other interactive communication device. Acting as moderator the CSCW component (the second layer) manages agents based on the other technologies. These agents offer different competencies, such as searching or voice recognition. They could also be humans offering their expert knowledge. AMIRA allows such experts to interact concurrently with the mobile worker via his/her own Internet-based computer .

SDS	PDA	Tel	Other clients	**A**
CSCW				**B**
Search Engine	Case-Base	Real-Time		**C**
Data Sources			Model(s)	
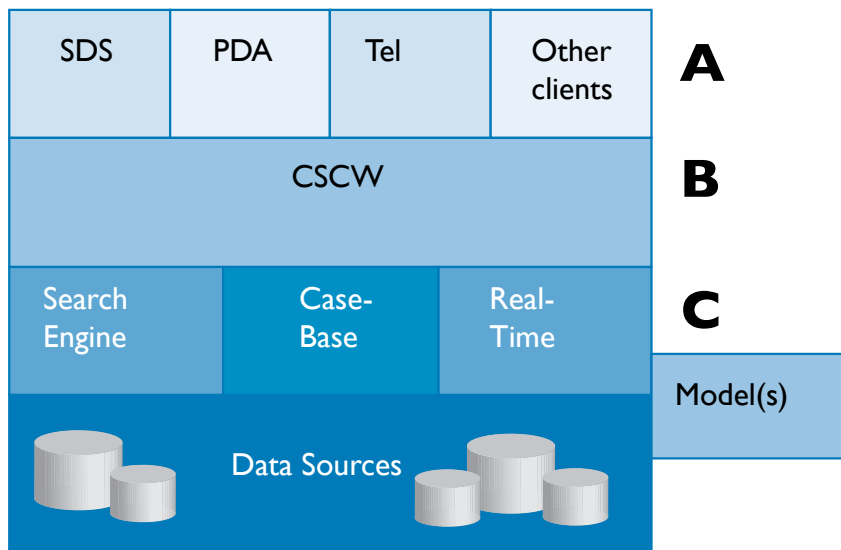
Manual repositories

A - User Agents:
Generate requests from input
Present response
Drive dialogue

B - The Moderator:
Dispatcher
B.logic for interpreting response
Sort, merge responses

C - Information Agents:
Process, structure and index data
Respond to requests

BEACON: Societal and economic implications of broadband

The objective of BEACON is to address the socio-economic impact of broadband access and use on public service provision (e-Government) and its potential enablement of new forms of work (e-Business, e-Work). The results will assist policymakers when defining, updating and monitoring policies related to broadband enabled services.

BEACON provides policy-oriented research that addresses the fundamental objectives of the European Union in relation to the potential socio-economic impact of broadband access and use. The project examines how broadband access, services and applications can assist the European economy in facilitating new ways of working and trading as well as improving public service provision including e-government services.

Research at a European level was required to enable sufficient expertise and insight into the broad and complex topic areas ranging from expertise in broadband markets and technologies, to eGovernment, eWork, eBusiness eContent and policy analysis and development skills.

Scenarios and policy recommendations

As a result of BEACON the team developed four scenarios of the broadband future. Figure 1 below shows the scenarios with the iNetWorked Society highlighted in green. This scenario is the closest to reflecting what achieving the i2010 strategy would look like.
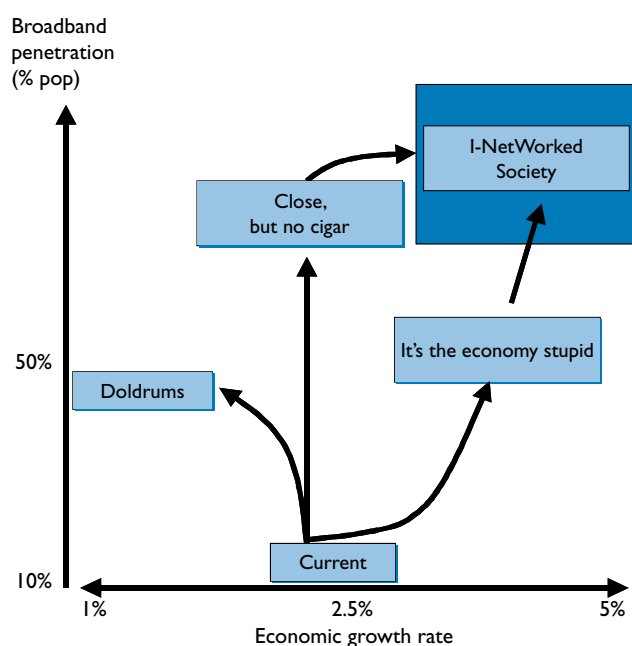
The team developed a list of key indicators for each scenario and these are explained for each thematic area (eBusiness, eGovernment, eWork, eContent and broadband access and use). Full scenarios are provided in deliverable D3.1 on the website.

The final step was to create the Broadband Policy Support Tool and Recommendations. As part of this exercise a comprehensive review of broadband policies and policy instruments in relation to the thematic areas was undertaken. The main research for linking the scenarios to the policy development is shown in Figure 2.
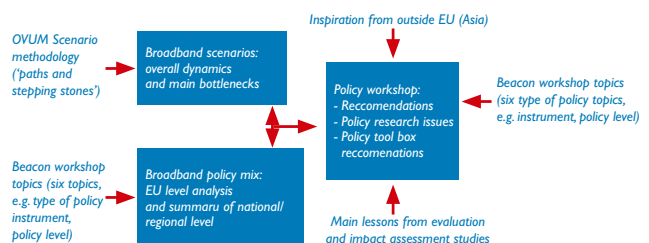
A policy taxonomy was developed and this is shown in Figure 3 below.

Policy instrument category	Government provision and/or production e.g. goods, services, infrastructures)	
	Financial instruments	Tax incentives
		Subsidy, open ended
		Subsidy, closed ended
		Guarantee, e.g. loans
		Other
	Regulation strong	General laws and regulations
		Specific decisions
	Regulation light	Coordination-self-regulation
		Coordination-co-regulation
		Agenda and priority setting
		Clarification and guidelines
		Provision of general information
	Demand aggregation and (innovative) procurement	
	Non intervention	

The taxonomy was explicitly designed to enable matching between scenario outcomes in terms of focusing on bottlenecks and opportunities and the available policy options.

Policy recommendations and policy research issues are provided in the final deliverable D4.1. In total we make twenty one policy research recommendations and identify fourteen issues for possible future policy research.

Contribution to the State-of-the-Art

BEACON has contributed to furthering the broadband policy research base in the following ways, it:

1) defined a comprehensive vision of what the European Union could look like in 2010 if the i2010 ambitions are achieved in the iNetWorked Scenario
2) created plausible futures which connect broadband developments and their enablement of new applications and services to a future ambient intelligent environment
3) developed a set of policy recommendations for future broadband policy design and implementation relevant to the possible future conditions outlined in the scenarios
4) created a new policy support tool that will help policy decision makers at EU and national level to monitor, assess and update policies.

The Team

The BEACON consortium has four partners who each bring a special topic expertise to the team.

Ovum is the co-ordinator and brings the broadband market and technology understanding.

TNO also has broadband expertise but also brings the learning in e-Business and e-Government.

Dublin City University is very experienced in the area of content development as well as the social aspects of the digital divide.

University of Aarhus specialises in the area of computer science and is running the case studies to show how broadband can enable better collaborative working.

As a result of BEACON all the partners have a much wider understanding of the impact broadband can have on public services provision and facilitating new forms of work and trading and the resulting public policy implications. This learning may facilitate further research and understanding for the partners.

BEANISH Building Europe-Africa Network for applying IST in the Health care sector

The BEANISH initiative brings together governments, universities, private sector and NGOs to strengthen and extend an existing Europe–Africa collaborative R&D network on health information systems. Capacity building on health information use as well as Open Source Software technologies helps building sustainability.

The overall goal of BEANISH is to build networks of research and development between and within countries in Africa and Europe on practical applications of IST in the health sector. The concrete objectives are linked to:

(i) **Strengthening Health Information Systems in Africa.** By improving the informational basis of health care decisions, the project will support on-going efforts to address current health problems such as HIV/AIDS. Developing human resources on producing and using relevant information for decision making is a key issue.

(ii) **Collaborative development and application of Free and Open Source Software for health.** Technology transfer from North to South is fraught with problems. Appropriate application of IST in Africa will depend on local participation and capacity. Each individual country in Africa may lack capacity and resources to take full advantage of IST. By joining forces between Europe and Africa through collaborative network building, BEANISH aims at developing appropriate cutting edge Open Source Software for Africa.

(iii) **Sharing "best practices" and capacity across countries.** South Africa has made major achievements in developing their district based health information systems. Following a "South-South" model for technology transfer, BEANISH is "transferring" models, processes and software from South Africa, which was one of the first nodes in the HISP network, to other countries in the region.

BEANISH which is formally a WITFOR (World Information Technology Forum) project was proposed by EU-African partners and IFIP (International Federation for Information Processing). The project partners come from Norway, Sweden, South Africa, Botswana, Mozambique, Tanzania, Malawi, and Ethiopia.

Europe has a strong research base in e-health and there can be mutual benefits arising through co-operation between Europe and Africa. However, given the contextual differences, for example related to infrastructure, economy and culture, European solutions and know-how need to be sensitively reworked and appropriately translated to the African context. Best practices,

learning and workable ISTs need to be shared and further developed across African countries within a regional framework.

The project envisages strengthening the European research and development domain within open source ISTs and global software development.

History

The BEANISH project takes as its starting point the existing global R&D on HIS for developing countries under the framework of **HISP**. HISP was initiated in 1994 by University of Oslo researchers in collaboration with the University of Western Cape and the health authorities of South Africa. This collaboration has contributed to the development of an open source district based software application (called District Health Information Software – **DHIS**), as well as models and processes which have successfully been implemented as the national standard in South Africa. These best practices are now in various stages of adaptation, testing and implementation in Mozambique, Malawi, Tanzania and Ethiopia.

Strengthening health information systems

Capacity building is crucial on several levels: To stimulate increased use of routinely collected information for local decision making, to build local capacity for open source software development and maintenance; and to supporting ongoing in-service training of health personnel. In all partner countries training is offered to health care personnel from various levels, from the national

Fig. 1 Information is usually registered manually in books, here it is also transferred to computer.

Fig. 2 Analysis and interpretation of routine health data for decision making during a BEANISH course.

Ministry of Health to the individual health facility. The training focuses on understanding the need for and potentials of the information that is routinely collected and reported to the authorities. The courses aim at stimulating local use of information, which is facilitated through the DHIS software. For instance, various analytic reports and graphs can be produced, enabling improved decision making based on updated local information. Training comprises both courses and on-site facilitation and operational support during and after implementation, and an objective of BEANISH is to institutionalize these courses.

Free Open Source Software for Health

Design, development, and sharing of the open source IST application **DHIS – District Health Information System**, is central. The current version 1.4 is free and open source, but utilises the MS Access database, which requires the MS Office license. To accommodate also other users, BEANISH is now developing a fully Open Source, platform independent version of the DHIS based on JAVA frameworks. This development work is carried out by a global team of software developers in the BEANISH teams in Norway, Ethiopia, South Africa, Tanzania, and Mozambique, as well as allied teams in Vietnam and India, where the new version is piloted.

Collaborative Research Network

South-South-North collaboration is central to the project. For instance, the project partners in South Africa and in Mozambique are supporting Botswana, while the Tanzanian and Mozambican partners take part in the activities in Malawi. The focus of this collaboration is on software development as well as customization and implementation, on conducting training and on development and dissemination of educational courses in the application of IST in public health. A PhD and Master's degree program in public health informatics is a crucial building block in creating a global research network. The students are significant contributors on the ground level in conducting and supporting development and implementation as part of their Master and PhD work. The resulting reports, theses and research papers are central mechanisms to disseminate learning within and outside the HISP network.

BrainBridges: Collaborative technologies and environments enhancing the seamless creativity process, leveraging the full European potential

BrainBridges will result in a co-ordinated strategic European research programme in the area of Collaborative Working Environments (CWE) and enabling technologies.

CWE unlocks the potential for job creation, productivity, creativity and innovation of multi-cultural Europe and will be a major factor in strengthening and maintaining the Union's future competitiveness in the global marketplace.

To accelerate CWE development is therefore imperative to fully lever its potential and establish an optimal European research fabric.

By uniting a critical mass of key regional and national funding organizations, research and industry players, including New Member States, BrainBridges assures its ability to develop a truly pan-European Research Area pilot for CWE.

In order to deliver a co-ordinated European research programme providing a solid common basis for policy-making and programme co-ordination, BrainBridges will build:

- a sustainable community dedicated to knowledge exchange and the establishment of a co-ordinated European CWE research programme
- a suitable networking infrastructure including an IST Collaboration Platform

- leverage of the potential of available scientific excellence and its industry relevance

This will be achieved by systematically gathering and analyzing knowledge on a regional, national and European level, regarding the current structure of CWE research funding as well as multi-disciplinary CWE research issues.

Project objective and state of the art

The project will achieve its goal by bringing together regional and national research funding organizations, key research organizations and key industry, to define and develop such a coordinated programme in CWE and supporting technologies.

The European opportunities in the Collaborative Working Environments area represent a multitude of possibilities.

> 'With the start of the new millennium, there has been a recognition that most of the productivity increases will come from INTERPERSONAL productivity'.
>
> *R Sayler (2002)*

In order to give full leverage to this, there is a need to achieve scientific leadership in the CWE area. This in its

It's about Bridging Brains which creates Innovations...

Do it yourself ...or together

...and innovations are done by people – not by systems!
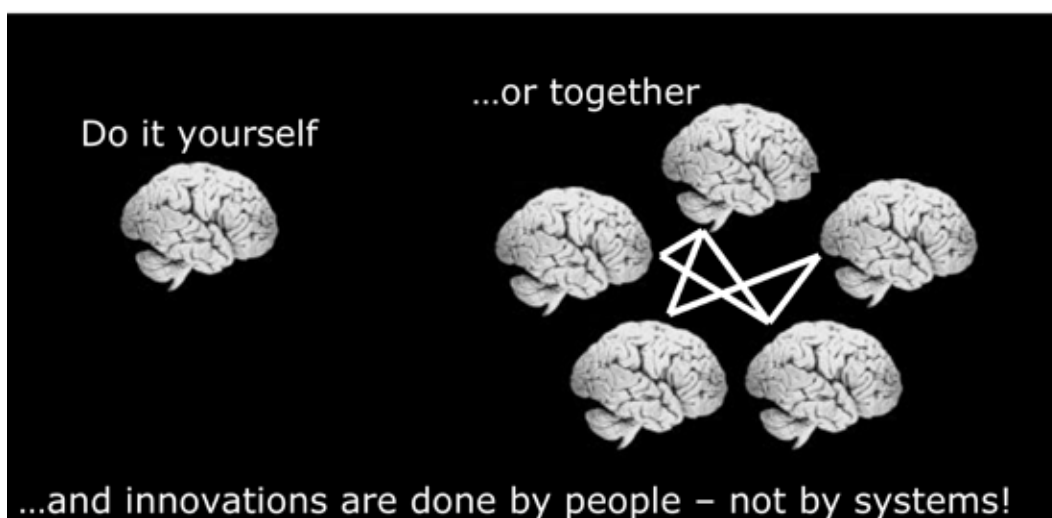
turn can create a new EU industry, delivering those technologies, applications and services to the wider society. Once the full potential given by the solutions is utilized, productivity will be boosted.

The main objectives planned by the BrainBridges project are therefore to deliver:
- a sustainable community of organizations that exchanges plans and information on the topic, supported by a public IST research portal.
- a mechanism to lever available scientific excellence and industry relevance.
- a common basis for policymaking and forming of co-ordinated programmes.
- a co-ordinated European research programme on collaborative working environments.

The BrainBridges project is a first step in achieving these wider objectives in the CWE area.

Results to date: The BrainBridges project have recently started with information collection from each partner country about:
1) Collaborative Working Environments (CWE) initiatives/programmes in Europe and,
2) European R&D organizations active in the area of CWE

The reason for European action and funding:
1) In order to pave the way for a new European CWE industry, there is a need to co-ordinate regional, national and European CWE research activities to create more impact.
2) The outcome of the project will be valuable information for the creation of a European Technology Platform in the CWE area.

BrainBridges

At a glance: BrainBridges

Collaborative technologies and environments enhancing the seamless creativity process, leveraging the full European potential

Project co-ordinator:
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Partners: Centre of Distance-spanning Technologies (SE), University of Bremen, Bremen innovation Agency (DE), European Space agency, ICT Turku (FI), Centre of Knowledge and Innovation Research (FI), Waterford Institute of Technology (IE), Ministry of Higher Education, Science and Technology, Researchers Association of Slovenia (SI), Technical University of Madrid (ES), Klaipeda Science and technology Park (LT), Riga Technical University (LV), Interdisciplinary institute for Broadband Technology (BE), Madeira Tecnopolo SA (PT)

Duration: Feb 2005 – Aug 2006

Total cost: € 605,818

EC funding: € 599,886

Strategic Objective:
2.3.6.3 Accompanying Measures, towards a European Research Area

Project Identifier:
FP6-2004-IST-3-015982

C@R: A collaborative platform for working and living in rural areas

C@R aims to boost the introduction of Collaborative Working Environments (CWE) as key enablers catalyzing rural development.

The main vision of the Collaborative Working Environments Unit of the EC, DG INFSO (defined through multiple and diversified works, such as the Rural@Work family of AMI communities) on the e-Rural is: **"to develop Information Society in rural areas, to foster European development and integration, to increase competitiveness of European companies, to stem rural depopulation and to diversify income and employment opportunities in rural areas"**.

"Rural" Europe accounts for 80% of its land by area and 22% of its inhabitants. **Rural development** is not only about a competitive European agriculture, but is now focusing more an more on meeting the expectations of citizens in rural areas, aiming at a deeper integration of the rural communities into modern society and promoting economic development.

The C@R main challenges are:

- To provide a collaborative platform for rural communities, defined in cooperation with other Collaborative Working Environment communities
- To demonstrate the use of the same platform integrating various tools for various rural user communities
- To promote the user centric Open Collaborative Architecture (OCA) in the industrial, new business opportunity and emerging rural sectors, demonstrating its affordability and usability
- To develop a common methodology for Rural Living Lab developments and assessing benefits of results
- To play an assistive role to Policy Makers addressing which EU policies are needed for Innovation and Rural Development in 2010

To achieve this priority objective C@R will advance on the specification, development, test and validation of a powerful and flexible worker-centric collaborative platform that will significantly enhance the capabilities of rural inhabitants both **@work** and **@life**, thus leading to a better quality of life and a re-evaluation of rural settings.

Description of Work

From the technical standpoint, C@R will organise the work in three layers: **Collaborative Core Services - CCS** (layer 1), **Software Collaborative Tools - SCT** (layer 2) and **Rural Living Labs - RLL** (layer 3).
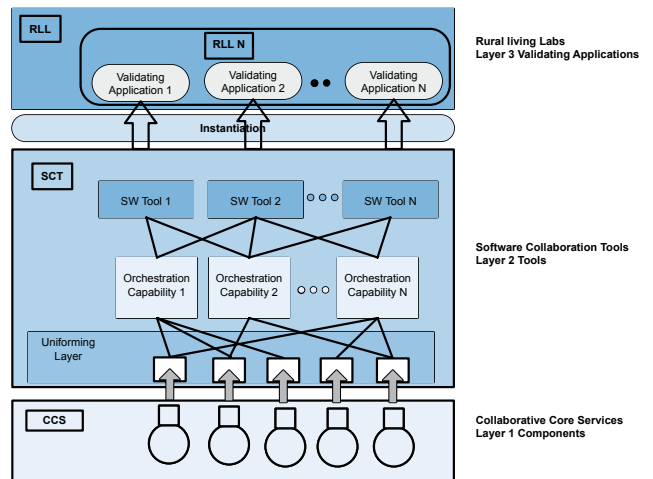
Layer 1 will encapsulate all core services and resources (networks, sensors, devices, software modules, localization sources, etc) in reusable software components.

A key piece of C@R framework is the upper-layer service architecture, or **C@RA**, which combines layer 1 components synergistically, orchestrating them into high level capabilities seen as a set of high level software tools at layer 2.

C@RA will be highly customizable in the sense of providing mechanisms to incorporate any proprietary or open solutions, and any standard.

This approach will permit C@R to substantially contribute to the definition of a user-centric **Open Collaborative Architecture (OCA)**.

C@R layer 3 will articulate Rural Living Labs as innovative research instruments involving rural users. The RLL user-oriented methodology will guarantee to meet the highly specific rural users' expectations and will provide mechanisms to gather technical requirements for
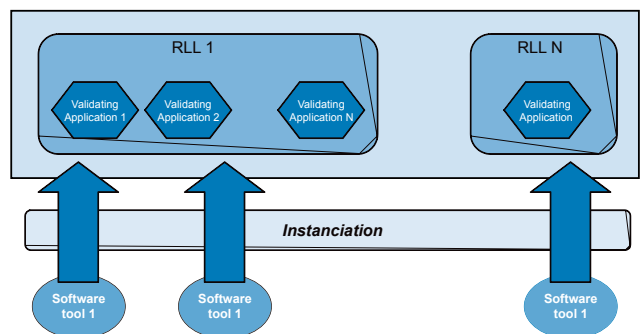
the C@RA. Several innovative scenarios with an expected high impact on rural development have been selected to enable a later validation of the C@RA.

C@R will go further than an evaluation of collaborative technologies in the rural economic and social contexts by proposing a structured methodology to assess the impact of the technologies developed on rural development indicators, and by supporting policy responses at national, European, and global levels.

C@R is structured in inter-related blocks of activities (see figure bellow), the first three corresponding to the construction of the 3 architecture layers, plus **Block 4**, called **"Systemic and Sustainable Use of Results in C@R"** that is focused on policies and strategic plans development for dissemination and exploitation of C@R results. This block will also boost C@R potential impact on regional, national and EU policies for rural sustainable development.

Finally, **Block 5** corresponds to the overall project management activities.
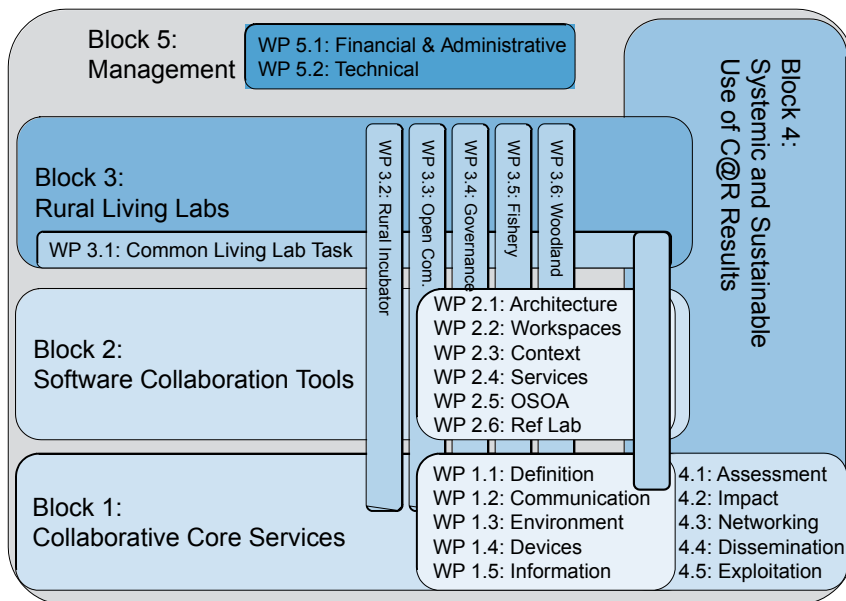
Conclusion

The leading principle of C@R is **inclusion** in the widest sense: **to enable people in remote and rural Europe to fully participate in the knowledge society as citizens and as professionals.**

CASCOM: Context-aware Service Co-ordination in Mobile P2P Environments

CASCOM's main objective is to develop, implement, validate, and trial an intelligent, context-aware agent-based service coordination infrastructure for innovative Semantic Web service discovery, composition, and execution across mobile and fixed peer-to-peer service networks.

The essential approach of CASCOM is the innovative combination of agent technology, semantic Web services, peer-to-peer, and mobile computing for intelligent peer-to-peer mobile service environments. The services of the CASCOM environment are provided by agents exploiting the CASCOM coordination infrastructure to operate efficiently in highly dynamic environments. The CASCOM intelligent peer-to-peer (IP2P) infrastructure includes efficient communication means, support for context-aware adaptation techniques, as well as dynamic service discovery and composition planning.

CASCOM will implement and trial value-added support for business services for mobile workers and users across mobile and fixed networks. The vision of the CASCOM approach is that ubiquitous application services are flexibly co-ordinated and pervasively provided to the mobile users by agents in dynamically changing contexts of open, pervasive environments.

For end users, the CASCOM system provides seamless access to semantic Web services anytime, anywhere, and using any device. This gives freedom to mobile workers to do their business whenever and wherever needed. For network operators, CASCOM aims towards vision of seamless service experience providing better customer satisfaction. For service providers, CASCOM provides an innovative platform for business application services.

The project will carry out highly innovative research aimed at providing a framework for agent-based data and service co-ordination in IP2P environments. CASCOM will integrate and extend existing technologies in areas such as agent-based mobile computing, service co-ordination, and P2P computing in mobile environments. A generic, open IP2P service environment with its agents and co-ordination mechanisms will be prototypically implemented and deployed in CASCOM mostly as open-source software enabling instant take-up and use within European and world community.

In general, it is expected that the outcomes of CASCOM will have significant impact on the creation of a next-generation global, large-scale, intelligent, service environment. The state of the art of European and world knowledge in areas related to the deployment of services in open systems will be advanced both by research results on methods for service provision, discovery, composition and monitoring, and by the prototype of an open IP2P service environment in the context of nomadic computing which will be deployed.

Technical Approach

Software agents will be a key technology in addressing the challenges of CASCOM. IP2P networks provide an environment for agents to collaborate as peers sharing information, tasks, and responsibilities with each other. Agents help to manage the P2P network complexity, and they will improve the functionality of conventional P2P systems. Our innovations in this domain will concern *the development of context-aware agent-based semantic Web services, and flexible resource-efficient co-ordination of such services in the nomadic computing field*.

Service co-ordination mechanisms can be applied to multi-agent systems to improve their efficiency. Although this may be accepted on a conceptual level, the combination of agents and P2P environments certainly deserves more innovative research, especially regarding nomadic environments. In CASCOM, we will investigate *mechanisms for service discovery algorithms for dynamic IP2P environments*. The problem of service co-ordination can be split into several sub problems: discovery, composition planning, execution monitoring, and failure recovery. CASCOM will advance the state of the art by carrying out innovative research on how these problems can be solved in IP2P environments. Especially, CASCOM will provide *flexible and efficient matching algorithms to be performed in large scale and resource limited IP2P environments*. Further, CASCOM will develop *plan-*

ning mechanisms that establish plan fragments directly on top of the service directory to solve this problem.

So far, application scenarios have been specified and formal UML-descriptions for all scenarios have been generated. Moreover, the underlying conceptual architecture for IP2P networking as well as the components and methods for the service co-ordination and composition have been defined and partially developed. An integrated demonstrator will be evaluated during trials with end-users.

Consortium

- **DFKI** brings to CASCOM its expertise in application oriented research and development of agent systems, knowledge on service discovery and mediation.
- **TeliaSonera** has significant experience in data communications, nomadic service provisioning, mobile devices, and agent technology in nomadic environments.
- **EPFL** brings its expertise in matchmaking and directory services for Web services, for planning service composition, and for the execution monitoring and failure recovery.
- **ADETTI** will provide its expertise on personal agents, dynamic service representation, discovery and composition, adaptive situation aware mechanisms for the service discovery, and trust building mechanisms.
- **UNIBAS** has experience of medical informatics and health information systems. Also, UNIBAS has experience in service composition, validation of composite services, and reliable infrastructures for the service execution and processes to CASCOM.
- **FRAMeTech** has expertise on agent-based infrastructures taking into account various aspects related to service co-ordination taking security and privacy issues into account.
- **URJC**'s expertise in CASCOM is in the fields of agent systems and knowledge modelling. URJC's experience in knowledge models, organizational models, and coordination models benefit significantly the consortium.
- **EMA** will bring to CASCOM its knowledge and expertise of pervasive emergency healthcare, for the research and development of the CASCOM solutions.

CLOCK: Challenges of Collaborative Working Environments

What is CLOCK?

CLOCK, Challenges of Collaborative Working Environments, is a European Commission FP6 funded Coordination Action responsible for analysing the feasibility of an **Industry-led Initiative on Collaborative Working Environments (CWE).**

CLOCK is identifying **future research in this field** and paving the way for the setting **up of a large constituency** that would allow Europe to obtain a competitive position in collaboration technologies and to shape **the future of CWE in the Seventh Framework Programme of the European Commission and in future initiatives**.

The main objective of CLOCK is to develop a framework for CWE services, software and systems that are **key future elements of collaboration** doing so **by bringing together the main stakeholders**.

CLOCK is developing a roadmap for CWE by **coordinating groups of experts** to **strengthen European industry** operating in the knowledge based economy.

CLOCK links strongly to the **EU Policy Actions in i2010**.

CLOCK Objectives

- To perform a **technology watch and set up an International observatory** on Collaborative Working Environments covering research and deployment
- To develop an **Industry-led Networked Research Strategy** within which the main CWE-related initiatives will be synchronised and coordinated
- To **identify the key players** for the future of CWE by setting up an **Integrated Research Initiative** in this area
- To define a **CWE roadmap for FP7** supporting both the Lisbon and the i2010 Policy objectives (including an RTD agenda that covers technical aspects as well as other multidisciplinary approaches such as business and industrial interest, social, cultural, organizational and policy related challenges)
- To look for complementary public & private financial schemes to foster the recommendations suggested by CLOCK, **assuring not only the viability of the actions, but also their sustainability**.

Background and motivation

Over the last decade we have witnessed a gradual transformation in the organizational structure and daily operations of Enterprises driven by lower costs stemming from innovations, better usage of the Internet, and emerging pervasive computing technologies. Enterprises are leveraging the Internet reach to establish better channels of communication and collaboration with partners, dealers, distributors, retailers and end consumers in the demand chain. However, there are still many process inefficiencies of communication in the value chain. There are tremendous challenges for ensuring online collaboration for many services, processes, transactions and operations over the Internet. Businesses need strong incentives and mechanisms to trust other businesses in open networks, or in the transformation of business activities, contracts and trusted transactions and relationships. Businesses collaborate and communicate with other businesses or individuals for many reasons. They are also depending on smaller businesses in the value chain to supply finished and completed products or parts that can be easily assembled or aggregated at a low cost.

This project aims to build a constituency of the key players in CWE in Europe in order to define the roadmaps required to make CWE a 'touchable' enabling technology. The deployment opportunities provided by European research infrastructures can make CWE issues recognisable and provide the challenge of a large-scale and multi-jurisdictional real world environment in which to validate CWE research results.

Focus will be given to collaborative working environments as a key driver for creativity and innovation in a single EU market and a catalyst in the achievement of global objectives such as growth and jobs. In order to achieve this, CLOCK will drive the concept of collaborative working environments and related enabling technologies, both across European Framework Programmes, and as a global issue. Two main points motivate this work:

- First of all, the **need for defining an upper layer of middleware capable of coping with the main RTD challenges which concern collaboration**.

- Secondly, **collaboration is very much related to different application domains**. In contrast with other technological fields, collaboration means a systemic approach of different disciplines, technical and not so technical. This brings to the ground an actor that has been forgotten in many cases: **the user**. Having this in mind, many representative scenarios have been defined in this area to highlight the relevance and impact of collaboration technologies to these

working and living environments. Some of them are: collaborative media industry, engineering, e-professionals, remote and rural settings and environments where interactions between artefacts take place (for example, human-robots interaction).
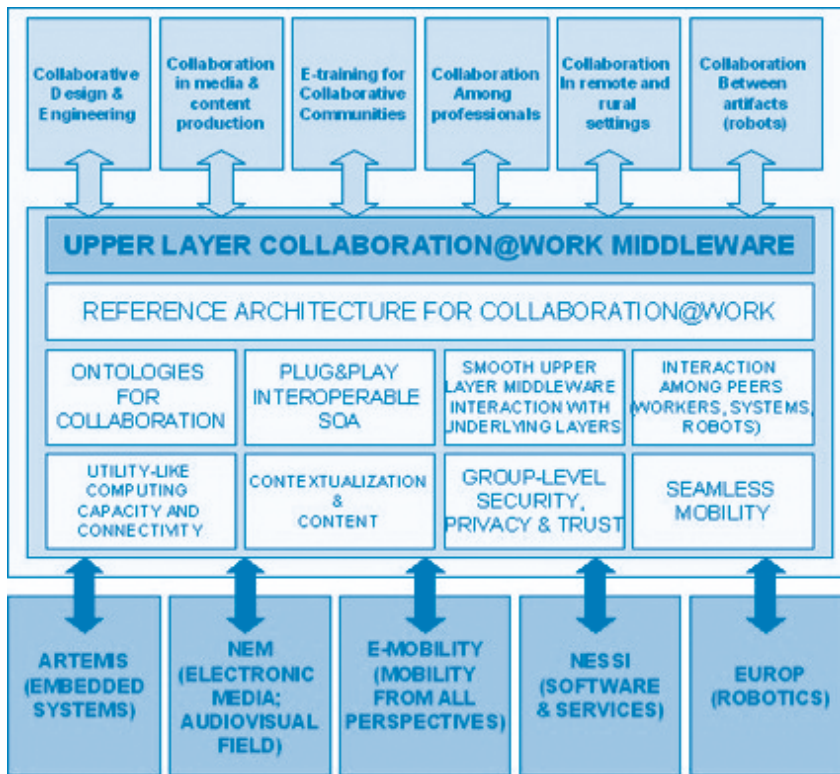
Relationship between the central technical block (upper layer middleware) and the validating scenarios

COMIST: Integrating NMAS organisations within IST eWork innovation networks

COMIST objective is to stimulate, encourage and facilitate NMAS research organisations and SMEs' participation into European Union IST research activities, through their engagement and involvement in existing European Ambient Intelligence at work (AMI@Work) family of communities.

Creating an effective European Research (and Innovation) Area "ER(I)A" is a major objective of the Commission, and at the same time a major challenge. The main issues currently faced by the European countries are the fragmentation of research communities, both on national and on EU levels, and the insufficient links between academic and business worlds. The recent addition of 10 new member states has worsened both the issues. The COMIST project aims to increase the participation of NMAS organisations in IST activities according to a systemic innovation approach. The project focus is on strengthening the NMAS innovation system in the area of New Work and Business Environments and building strong integrative networking relations with IST.

Addressing pan-European Innovation cycles through the AMI@Work communities

The working method of the COMIST project is explicitly inspired to that initiated by the MOSAIC project in the constitution, launch and operation of the AMI@ Work family of communities. These communities act as breeding grounds for innovation in bringing together the relevant organisations and stakeholders for the purpose of starting up "innovation cycles". The COMIST targets are NMAS SMEs acting in the manufacturing, agro-food and logistics sectors. The AMI communities facilitate innovation at the crossroads of the "horizontal theme" Knowledge@Work, Collaboration@Work, Mobility@Work and SEEM@Work communities with the "verification environments" such as Engineering@ Work and Rural@Work. In order to fully address the Pan–European interests , COMIST expanded the set of AMI communities by introducing the Logistics@Work community and reinforced the agro-food component of Rural@Work.

Enabling the integration

The Community involvement method to increase the participation of NMAS organisations in IST activities implies the completion of four main activities:

Aligning the role of NMAS organisations in Innovation Networks

The project pursues a strategy of strengthening the position of NMAS organisations in innovation networks, focusing on collaborative work and business in selected sectors of crucial importance for NMAS. Focus is on systemic innovation as innovation requires not just technological innovation but organisational, structural and policy innovation as well. General actions concern identification of key actors in systemic innovation, mapping of competencies, classification of innovation perspectives, and identifying the prospects of alignment of IST with national research programmes. Specific actions concern best practice analysis in the intended sectors, study of interesting scenarios, and definition of requirements for the future research projects.

Building a Network of Communities

The project realises a network functioning as "breeding ground" for innovation and collaboration. These communities represent extensions of the ones currently constituting the AMI@Work family, so as to take full advantage of the AMI Communities launch work carried out so far. However, in order to put NMAS organisations in the condition to be prime actors in the communities (and not feel as second-class members), an intense preparation work is foreseen for them together with the possibility to introduce community specialisations on

Communication, awareness, event organisation

Effectiveness of communities is somehow proportional to the number of experts, professionals and stakeholders they actually involve, and to the degree of knowledge sharing about the opportunities offered by European and national research programmes. In order to pursue both these goals, it is necessary to activate communication channels and organise initiatives and events to reach the widest audience and bring together all relevant stakeholders.

Establishing a consortium-building infrastructure

The fourth operational objective is to provide the widest population of interested organisations with a suitable infrastructure to match collaboration demand and offer, and help constituting consortia for the preparation of research projects at any scales. An eRegistry function is made available to individuals of the AMI communities to provide them with the information relevant to their organisations. This information can be used to set-up consortium and joint projects.

> ### Success Story:
>
> The results of Call 5 CWE strategic objective are demonstrating the effectiveness of COMIST in including NMAS countries. Four IPs and a Co-ordination action aimed at the launching of the European Network of Living Labs, have been awarded to the self organised teams having the roots of their ideas within the communities' discussion.

The COMIST consortium

COMIST has brought together a core team with strong track record in community building, mobile working and networked businesses RTD for both New Member States-Associated Candidate Countries (NMAS) and other Member States. Partners have coordinated and are participating to a series of roadmap projects and network activities under FP5 and FP6.

Additionally, this approach is supported by all AMI@Work communities elected chair and vice-chair acting as Associated Members to contribute as facilitators to the various communities activities. The strength of the consortium lies also in partners' ability to link up with and bring together important players and communities from a number of FP5 and FP6 projects, roadmap projects, thematic networks and networks of excellence, and to link with national initiatives for collaboration.

CoreLabs - Coordination Action for initiation of a European Network of Living Labs

CoreLabs overall objective is to initiate a European Network of Living Labs. This will be accomplished by means of coordination activities where assets and capabilities from several projects and Living Labs initiatives are merged and integrated.

In the i2010 Communication and the first Annual Report on the European Information Society, a European Network of Living Labs is one of the actions for the second cluster for Investment and Innovation on Research. Living Labs have a regional importance for product development that requires good knowledge for specific local markets; however a broad market with a high number of citizens as test users could influence technology development to a much larger extent.

A European network of Living Labs will be a strong tool for making the industry innovation process more efficient and dynamic by involving citizens in development of new services, products and societal infrastructures.

The objectives of the project are:

- To identify, coordinate and share best practices in the validation approach of ongoing CWE initiatives
- To establish a sustainable community of key stakeholders from a multi-disciplinary, European (EU, national, regional) perspective to initiate a coordinated approach to Living Labs
- To measure the impact of Living Lab approach within the identified initiatives
- To establish a "Living Labs" Certificate and develop a roadmap and policy recommendations for the widespread adoption of the Living Labs concept
- Promote the widespread adoption of the Living Labs validation approach
- Define harmonized methods and tools to support involvement of citizens to increase ICT usability and usefulness.
- Establish a European network of Living Labs

The Living Lab´s approach

Living Labs are "functional regions" where stakeholders have formed a Public-Private-Partnership (PPP) of firms, public agencies, universities, institutes and people

> **A European Network of Living Labs – for human-centric innovation**

all collaborating for creation, prototyping, validating and testing of new services, products and systems in real-life contexts. Such contexts are cities, villages and rural areas as well as industrial plants.

- Real-life Living Labs are superior to "closed Labs" in virtually all aspects; Living Labs stimulate new ideas, provide richer contexts of concrete R&D challenges, and it becomes natural to perform early and continuous validation (not just prototype-testing at the end). Concepts are developed in full-day (user) contexts (users are not viewed as "workers", "patients", "travellers" or "citizens" separately).

Network of Living Labs

A European Network of Living Labs changes fundamentally the role of public services and agencies; they become partners in international R&D and innovation. They become active agencies for innovation, not only locally but also more widely in Europe. Moreover, this should be done through open collaborative innovation platforms where public agencies cooperate with local, European and global firms as well as local and European and international universities and researchers.

A key-milestone of this recently started project is the launch of an initial European network of Living Labs, in context of the IST-conference 2006 in Helsinki.

What is innovative?

The Living Labs provide a new environment for industry to test prototypes and ideas, an environment that allows citizens to influence the product development through close cooperation with the company.

The innovation process will be carried out in a step by step manner. The company will get access to a platform based on different ICT technologies, broadband and a broad market made up by citizens as users, on local, regional, national or international level. As a first step in the innovation process the company will test their products or conceptual ideas on the citizens to find out the market and take up potential. As a second step the citizens will be able to influence the product development by providing feed back on the products through contributing with their own knowledge, opinions and user experience. As a third step, the company has the opportunity to react on the feed back and modify the product in order to make it as user friendly and adaptable to the market as possible.

Our mission

   CoreLabs will conduct co-ordination as broadly as possible among European private, public and civic stakeholders towards establishing a coordinated European programme of Co-Creative Living Labs for a New European Research and Innovation Infrastructure.

CoSpaces: Innovative Collaborative Work Environments for Design and Engineering

Developing organisational models and distributed technologies for collaborative workspaces for individuals and project teams within distributed virtual manufacturing enterprises enabling effective partnerships, innovation, improved productivity, and reduced design cycles.

Introduction

Ambient Interfaces and the research domain of Ubiquitous Computing represent a third wave in computing. This paradigm shift is characterised by the integration of our increasingly complex technological landscape with the environment we occupy, while removing our perception of the computer in the tasks and activities we undertake. In practice the nature of these ambient interfaces range from the simple, such as devices that notify users of events by extending the computer interface into the workplace environment, through to the complex, where intuitive interface technologies such as optical tracking and gesture recognition are used to provide the user with the ability to directly manipulate highly visual information sets without perceiving the underlying technological infrastructure.

The evolution of IT over the past 20 years has led to the development of individual CAD/ CAE workstations. While the computational power available to Engineering professionals has grown exponentially, the collaborative dimension of the workspace has been largely under developed. CoSpaces will provide an evolutionary path towards new and more collaborative work environments. Users of CoSpaces technologies in manufacturing and design, in cooperation with their suppliers, will be able to configure their own collaborative workspaces and utilise ground-breaking innovations in context-aware interfaces, natural interfaces, and "human-centric" workspaces supporting a range of collaboration scenarios and product lifecycles.

Objectives

The CoSpaces project addresses three scientific and technological objectives:
- Evaluate collaboration at individual, team and enterprise levels, and develop collaboration models emphasising applications of problem solving, creativity, participatory and knowledge based design in innovative collaborative work environments;

- Create an innovative distributed software framework that will support easy creation of collaborative work environments for distributed knowledge workers and teams in collaborative design and engineering tasks;
- Validate the distributed software framework for creating different classes of collaborative working styles required for collaborative design and engineering in the Aerospace, Automotive and Construction sectors.

Expected Impact

The research advances in CoSpaces will push the state-of-the-art of collaborative work environments in several key areas:
- New collaboration models addressing the development and deployment of collaborative technologies that empower workers and teams and having a strong human factors and business focus.
- A practical collaborative software framework for supporting dynamic organisations that are executing complex processes in order to produce complex products.
- Uncovering and addressing real-world constraints and barriers to bridge the gap between industrial engineers and scientific researchers in collaborative working.
- Industry workspaces and interfaces based on deploying virtual interface technologies, leading to more practical and usable interfaces for real-world problems and users.

CoSpaces Software Framework

The CoSpaces software framework will support the easy creation of collaborative work environments for distributed workers. It includes a Foundation Platform to provide core services and high-level Collaboration Tools that support seamless and natural collaboration among distributed workers and teams.

Industry Workspaces

Three workspaces will be developed for validating industrial applications from the Automotive, Aerospace and the Construction industries:
- Distributed Design Workspace will address ad-hoc and scheduled collaboration between distributed, multi-functional design teams. Collaboration through

fixed installations and mobile environments will be considered in this workspace.

- Co-located Design Workspace will address how ad-hoc and planned meetings between co-located, multi-functional design teams could be supported, providing enhanced immersion, visualisation, interaction, mobility and flexibility.
- Mobile Service Workspace will address generic challenges in supporting mobile site workers to collaborate with remote experts during the realisation or the support phase.

Roadmap Implementation

CoSpaces focuses addresses the vision developed by the *Future_Workspaces* roadmap project involving over 100 key players from a multiple disciplines and defining a 10-year European Vision for future collaborative working environments and scenarios. CoSpaces will initiate a programme of activities to implement this 10-year European vision for the benefit of European business, workforce, and society.

Collaborative Workspace Applications	Distributed Design Workspace		Co-Located Design Workspace		Mobile Service Workspace	
Collaboration Tools	Group Management Tools	Dynamic Service Management Tools	Adaptable Ambient Interfaces	Advanced Communication Tools	Knowledge Support Tools	
Foundation Platform	Distribution and Communication Services	Trust and Security Services	Dynamic Process Management, Synchronization	Group Identification and Traceability	Transparent Resource Management	

CYBERMANS: Cybernetic Manufacturing Systems

The CyberManS project addresses the IST–NMP1 joint call, which has the aim of developing "Integrating Technologies for Fast and Flexible Manufacturing enterprise". The project will perform pre-competitive research to develop both advanced ergonomic tools and IWADs (Intelligent Work Assistant Devices), to improve the flexibility and cost effectiveness of flexible production stations.

Flexible manufacturing is highly dependent on manual production operations due to the lower specific investment costs involved, the faster decisional processes involved, and the faster/simpler training of staff compared to hard automation. Despite the well-known advances which have occurred over the last 30 years in the areas of robotic automation, most companies are today finding that the greatest challenge in the current international market place is that of optimising the manual production stations, and thus of optimising the work of the production staff. From a European Union perspective, the present European situation regarding manual operations is unsatisfactory from the economic and ergonomic point of view. Several issues must be addressed in order to make production activities flexible enough to cope with the evolving international market.

The overall research objective of the CyberManS project is therefore the development of an approach to workplace optimisation design which is based on new person-machine methodologies. The main optimisation criteria will be related to the human performance, human health, and manufacturing flexibility. The research activities of the CyberManS project are all directed towards the achievement of two main product outputs:

1) A software interface for work activity simulation which includes a database, ergonomic criteria, costing criteria, a simulation tool and a virtual reality function.
2) An intelligent work assistant device (IWAD) for manual production tasks.

Outputs

Intelligent work assistant devices (IWADs) based on mechatronic technology are one of the most promising methods of improving the flexibility and cost effectiveness of manual production stations, particularly of flexible production stations. These devices, which operate in the grey area between traditional manual workstations and fully automated/robotized workstations, are based on the concept of cooperation between hu-

> **IWADs for flexibility improvement of the manual production processes**

man workers and machine workers. For European industry, the availability of efficient IWADs may be the key to containing production costs and maintaining technological leadership. The design, development and application of IWADs is a topic which the CyberManS project consortium believes is critical to EU industrial success in the international marketplace.

A software interface for early-stage ergonomic evaluation of flexible manufacturing will be developed as an integrated tool within the CyberManS research project, either by incorporating a workplace module within ergonomic simulation software, or by incorporating an ergonomic module within workplace simulation software. This phase of the CyberManS project will enhance an existing computer-based virtual human model. The calculated outputs of the virtual human model will be used as inputs for a software tool which will aid the evaluation of flexible manufacturing stations. The combination of the virtual human model and the software analysis tool will permit early ergonomic assessment in a mixed reality setting.

Contribution to policy developments

The demographic development in the EU is generally leading to an increasing number of elderly employees. This forces a stronger orientation towards the needs of elderly employees when designing workplaces. If elderly people are supported by specific ergonomic devices, they will be able to perform their work at least as well as younger workers. The social impact will also be high if the level of manual work is maintained and remains competitive in comparison with emerging countries.

Additionally, keeping elderly workers within the company retains an extensive knowledge and experience to be utilised for the good of the company and the workforce in general.

Strategic impact

Independently, future hybrid automation has a potentially significant impact on the economy by creating a new market for manufacturing technologies. Corre-

spondingly the improvement in employee working conditions will have a relevant beneficial effect from the standpoint of society:

- supporting the optimisation of the existing workplaces in order **to reduce** the consequences of musculoskeletal disorders and **improving the overall quality of the final product**;
- orienting the (re) design of the production line using ergonomic concepts in order **to improve the standards of manual work**, to increase efficiency of processes and to increase the flexibility of production.

The CyberManS project will be able to make a significant contribution in reinforcing competitiveness, economic growth and sustainability on society of the project is potentially extensive.

Conclusion

The research will be based on surveys of flexible production stations in industrial settings, and on the experimental testing of relevant person-machine interactions in laboratory settings. The research will draw heavily on the fields of human factors, cognitive psychology and medicine. The scientific principles involved will be explored and developed directly through actual use of technological demonstrators. In order to provide sufficient technical expertise to achieve the project outputs, the assembled CyberManS project consortium includes 11 partners who operate in the European automotive, automation, ergonomic and university sectors. The consortium represents an important cross-section of the European Union advanced manufacturing sector. Therefore, the CyberManS project provides both an important research opportunity and a vehicle for industrial change within the EU..

DiFac: Digital Factory for Human-Oriented Production System

DiFac project wishes to develop an innovative Collaborative Manufacturing Environment (CME) for next generation digital manufacturing where new advanced technologies such as Virtual, and Augmented, Reality will be used with three main objectives: product design, prototyping and manufacturing, as well as for worker training.

A **digital factory** represents a persistent hybrid community in which a rich virtualized environment, signifying a variety of factory activities, will facilitate the sharing of factory resources, manufacturing information and knowledge, and help the simulation of collaborative design, planning, production and management among different participants and departments.

DiFac aims at the development of an innovative Collaborative Manufacturing Environment (**CME**) for next generation digital manufacturing. The DiFac CME will be used as a framework to support group work in an immersive and interactive way, for concurrent product design, prototyping and manufacturing, as well as worker training. It will provide support for data analysis, visualization, advanced interaction and presence within the virtual environment, ergonomics analysis, and collaborative decision-making.

Within the DiFac CME, a systematic representation of product and process knowledge in a mixed 3D collaborative manufacturing environment will be provided to the user.

Six components:
- Group Presence Modeller
- Immersive Integrator
- Collaboration Manager
- Prototype Designer
- Factory Constructor
- Training Simulator

will be seamlessly integrated into a new solution for collaborative digital manufacturing activities, for example, aiming to help work teams collaborate on the analysis of a product design, share information, evaluate testing results, manage knowledge and make decisions about development issues…

DiFac is an SME-driven STREP and its actions will target European SMEs and empower them to improve their position in the world market by providing advanced services and tools using state-of-the-art technologies.

Why DiFac

The future of manufacturing plant is represented by a distributed, collaborative working environment which requires seamless and natural collaboration amongst workers, machines, suppliers and customers. To apply collaboration to manufacturing, the structure and methods of collaboration should be studied, the guidelines for collaborative manufacturing environments should be provided and the collaboration tools and media should be identified and elaborated. Beyond the common collaboration technologies for distributed design and manufacturing based on networked collaborative decision-making and project management, *Virtual Reality (VR) technologies are leading to remarkable breakthroughs in enhancing collaboration in manufacturing, from the development of digital mock-ups and virtual prototypes, to production simulation, maintenance and training.* As this future digital manufacturing focuses on distributed group work and possibly remote individual collaboration, *core collaborative services and ancillary tools in the context of group presence, visualization, interaction, decision-making and knowledge management are strongly needed to support collaborative manufacturing activities among work groups and individual workers.*

DiFac strategic impact and benefits

The target is to provide a tool that will be able to support collaboration between different sites and users during design, prototyping and manufacturing through an interactive environment with the aim of meeting the challenge of delivering better quality products and services. The use of such a technology will definitely lead directly in *reinforcing competitiveness in the European industry* and *solving societal problems* since it will provide the following benefits:

- *Increased Efficiency.* Team members will be able to collaborate anytime, making faster decisions and gaining approvals instantly. Reduction of information gaps within working groups by providing intuitive content and intuitive tools for participating in evaluation, design and engineering processes (e-inclusion or VR-inclusion) will be achieved.

- *Reduction in Complexity.* The employees will be able to work seamlessly together, and to extend communication and collaboration beyond their organizational boundaries.

- *Reduction in Physical Mock-ups.* The DiFac environment will allow testing ideas on digital (virtual) configurations, employing advanced paradigms of

immersive interaction and collaborative work without having to rely on large numbers of physical mock-ups or experiments and tests. This will also result in a significant reduction in materials and processes necessary for the physical prototypes production, having an indirect impact to the ***environmental protection.***

- ***Enhanced Organizational Intelligence.*** The information will be collected and organized in a single place. New members will be able to view all the history and information very fast and to start working with the other members in less time, thus improving productivity.

- ***Develop Stronger Relationships.*** The project will be an opportunity to improve cooperation and to develop strong relationships among industries, research centres, SMEs, universities, vendors, the business community and the public.

- ***High Skilled Employment.*** The novel methods and tools to be used in the DiFac environment development will require highly qualified jobs based upon the necessity for new engineering and IT skills that will support the intelligent design procedures, using high-end simulation technology and knowledge-based approaches to decision making instead of semi-empirical methods and physical testing.

- ***Better working conditions.*** As a result of the above, employees will have the opportunity to work with advanced support tools that will make their lives easier and safer. Just as examples, expert assessments of the quality of behavioural simulations, either in nominal situations (ergonomics experts) or in exceptional situations (crisis experts) could be used as performance indicators in this area.
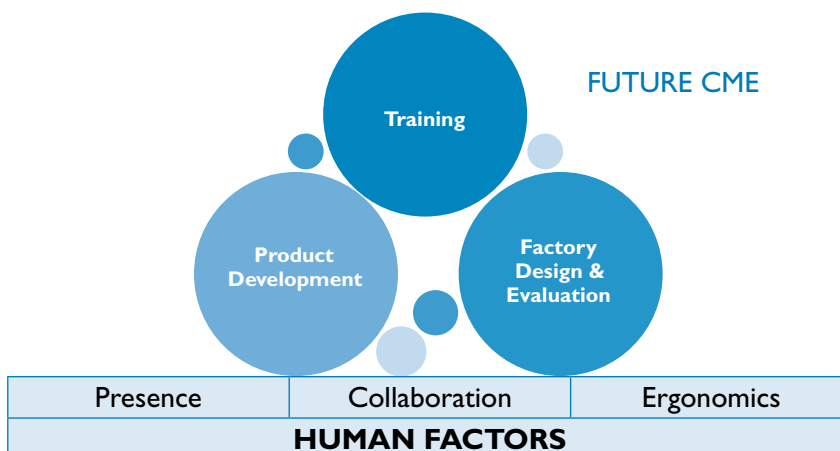
EACE – Expediting Adoption of e-Working Collaborative Environments

EACE, investigates the dynamics, potential, and impacts of the ICT advances in the emerging research area of Next Generation Collaborative Working Environments (NGCWEs), aiming to feed the policy making process and to support the EC policy makers. Currently there is a large amount of ongoing research in Europe into ICT technologies for the development of new e-CWEs yielding innovative and advanced collaboration tools.

EACE examines the new possibilities offered by ICTs and their potential to bring innovation through new collaboration structures and patterns of P2P communication. In particular, EACE thoroughly studies the:
- dynamics of new collaboration structures and the patterns of P2P communication
- socio-economic benefits and the implications of their dynamics in the current and future EU-level policy developments

EACE Objectives

The high-level objective of EACE is to provide recommendations for accelerating the adoption of e-CWE, in the context of the general European policy developments (e.g. i2010, European Employment Strategy). In more detail, the following specific objectives are pursued by the project:
- O1 – Consolidation of the theoretical framework of human collaboration
- O2 – Prediction of collaboration patterns based on the theoretical framework
- O3 – Development of a proof-of-concept prototype for the predicted collaboration patterns
- O4 – Assessment of existing good practices - technology perspective
- O5 – Assessment of existing good practices – empirical / user perspective
- O6 – Extraction of potential policy improvements by contrasting theory and existing practices
- O7 – Consolidation of current policies and priority actions
- O8 – Development of new policy and priority action framework based on EACE findings

> **There is a growing need to investigate further the dynamics of ICT in NGCWE in order to feed the policy making process**

Related European Initiatives

The project builds upon the work produced by EC funded initiatives and research projects (e.g. AMI@Work communities, SEEMSeed initiative, Network4Value, Mosaic, Comist, BrainBridges, MobiLife, BEACON, etc.) and the consortium has extensive expertise in the:
- analysis of e-Working Environments requirements and the influence of behavioural, organisational, technological, regulatory factors in human oriented systems
- ICT technologies for Collaborative e-Working Environments.
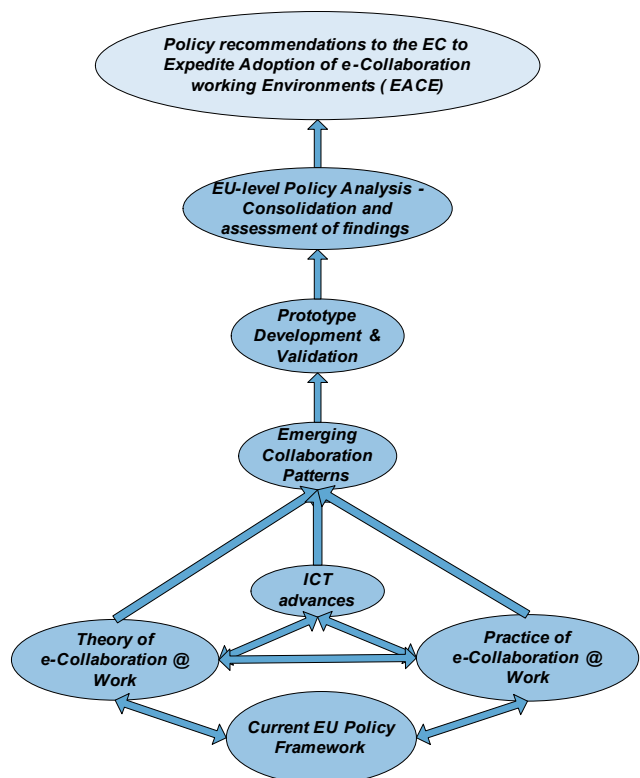
EACE conceptual schema

EACE Research Areas

EACE conducts research focusing on the domain of NGCWEs aiming to improve the understanding of:
- the behavioural, organisational, socio-economic, and regulatory factors that influence the adoption of e-collaboration tools at the workplace
- the role and influence of patterns in the value creation processes of the eCWEs
- the existing trends in the development of human-oriented systems, for eCWEs

- the requirements for the development of modern collaboration tools utilising the CWE theories and technologies which have been developed
- the implications of the above factors in future policy development

MERMIG J2EE Collaboration Platform

A central part of EACE is its proof-of-concept approach: the collaboration patterns that emerge from theoretical and empirical research are validated prior to their transformation into policy recommendations.

In this respect, the resulting collaboration patterns will be first validated against the existing MERMIG Advance Collaboration Platform (www.mermig.com), offered as Open Source Software (OSS).

Having already an easily configurable collaboration platform in place, the EACE project team will set up real-life pilots within a reasonable time-plan, within the project duration.

EACE Expected Outcome

The main findings of EACE will contribute to the identification of priority actions and to the design of the respective CWE policies. The development of appropriate priority actions and policies draws heavily on a substantial agenda of research issues, which lie within four broad active research areas: "theoretical foundations of human collaboration", "empirical good practices in collaboration at work", "application and assessment of theoretical foundations in NGCWEs" and "capitalise assessment into necessary policies and priority actions".

A robust Policy Framework is required to "govern" the various theoretical approaches, the huge number of ICT Tools, and the diversity in Collaboration at Work patterns.

EACE online Open Community (www.eace-project.org)
Since, 21 March 2006, the EACE online Open Community is available for public access. This virtual Community aims to serve as an online network of all actors that have or may have an interest in the field. Through such a living network, views can be exchanged and policies can be further elaborated. This is expected to result to a valuable contribution to the European Policy Framework and the future development in the field. The Open Community operates through EACE collaboration platform, providing a user workspace supporting discussion forums, digital libraries, virtual meetings, and chats between field experts.

At a glance: EACE

Expediting Adoption of e-Working Collaborative Environments

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Partners: European Dynamics SA (GR), ED (GR), Netherlands Organisation for Applied Scientific Research (NL), TNO (NL), Fraunhofer Institute for Open Communication System (DE), FhG (DE)

Duration: Jan 2006 – Jul 2007

Total cost: € 747,306

EC funding: € 465,000

Strategic Objective:
POLICIES-3.5 Information Society Issues

Project Identifier:
FP6–2004–SSP–4 -022585

ECOSPACE – Innovation in Collaborative Working Environments

ECOSPACE pursues the vision that by 2012 every Professional in Europe is empowered for seamless, dynamic and creative collaboration across teams, organisations and communities through a personalised collaborative working environment.

ECOSPACE has four main objectives:
- The **definition of innovative work paradigms** through the analysis of eProfessionals and their related organisation.
- The **design and development of an open standards**, service-oriented architecture for complementary and similar systems.
- A **collaboration upperware and services** to enable seamless and instant collaboration among knowledge workers in group forming networks, beyond organisational boundaries.
- The **creation of new tools** that simplify the complexity of collaboration in dynamic work environments and which enable users for creative and knowledge intensive tasks.

ECOSPACE will result in new working paradigms and metaphors for eProfessionals, a user-centric platform enabling the interoperability of innovative collaboration tools and services.

It will empower users to easily build-up and deploy on-demand virtualised and knowledge rich collaborative

> **New working paradigms and metaphors for eProfessionals**

environments that will free the user from information and communication overload. Beyond this, it will enable users to concentrate on interpersonal creativity and will dramatically increase interpersonal productivity. The ECOSPACE project also addresses the emerging research field of Knowledge Connection which is a key element to better support creativity.

Designed as a three-year programme, ECOSPACE deploys a systemic approach built on matrix based organisation with horizontal technology push activities and vertical application pull activities. Vertical validating applications apply a Living Lab approach within 3 application areas. They act as breeding grounds for innovation; they prepare the broad acceptance of the results, and create open business opportunities for new generic or sector-specific products and services.

Mission

ECOSPACE's mission is to create and deploy an eProfessionals collaborative working environments which improves the state of the art in online collaboration and in social activities support. ECOSPACE will augment productivity by sharing knowledge created by single, group or community efforts.
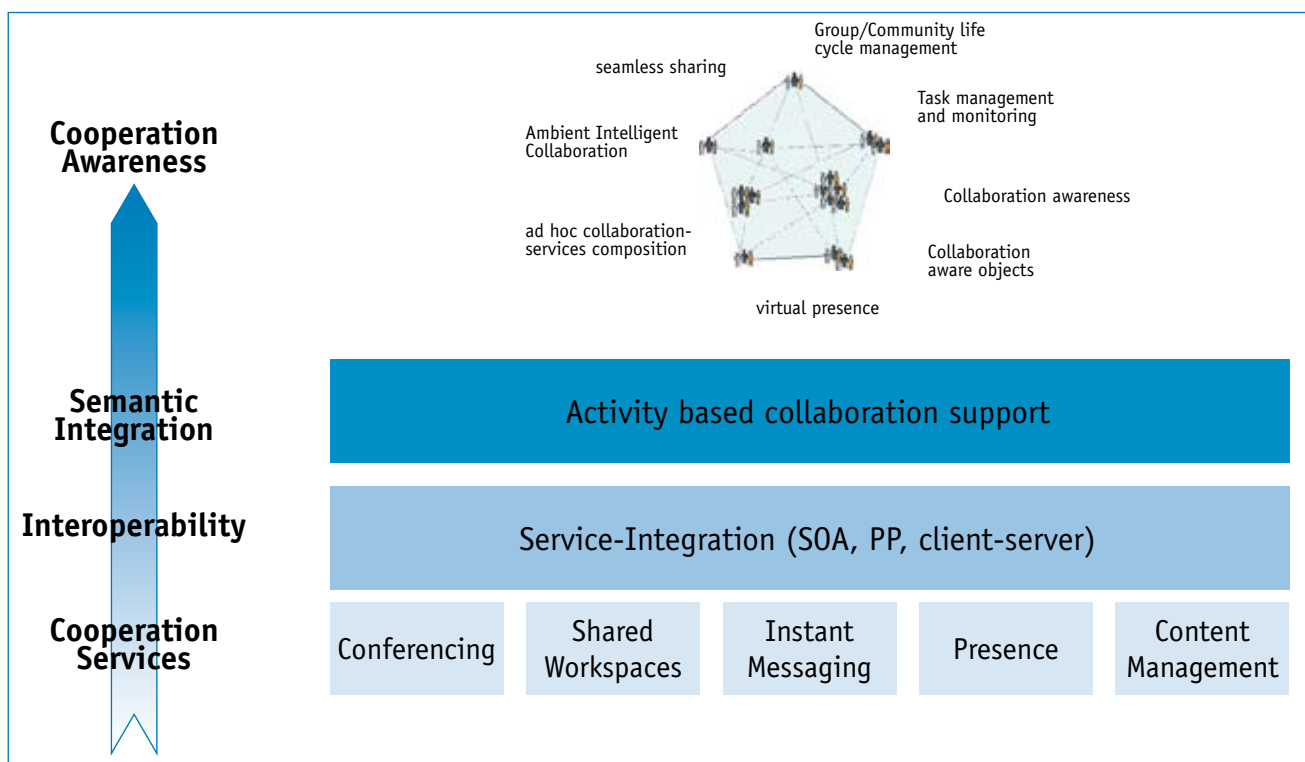
The ECOSPACE platform will provide an infrastructure that will change not only eProfessionals' ways of working and collaborating, but the general way we interact and work with each other. The user-centric interoperability approach encourages the maximum of creativity in using whatever collaboration tools are available while safeguarding against monopolistic approaches and restrictive structures.

To achieve that mission, ECOSPACE is composed of groups and individuals from partners with dedicated expertise such as creating innovative concepts and methods for collaborative work, collaborative platform architecture design, and development of collaboration services and collaboration tools as horizontal technology push. The orthogonal vertical application pull is achieved through validating applications, organised into a living lab innovation and evaluation, such as Project Management lab, Media lab, and Professional community lab.

ECOSPACE results

- **Collaborative platform prototypes** including architecture, implemented collaboration middleware & services as well as extended existing collaboration tools and new collaboration tools integrating both asynchronous and synchronous aspects. This collaboration environment will enable knowledge workers, and especially eProfessionals, to network together easily, to form groups and professional virtual communities for stimulating creativity and innovation while increasing productivity.
- **A set of three living labs** and experimental results for different business sectors driven by Atkins, De Agostini, and FIT/EsoCE-Net, as well as demonstrations and training material. A body of documented experience and methodological know-how gained in their application domains.
- **A dynamic community** that adopts the results of ECOSPACE and continues to extend them according to their needs using a developers' forum provided at the project web-site.
- **A collaboration platform reference architecture** and the corresponding upperware enabling the interplay and interoperability of collaboration services and tools in a collaboration environment as well as business process management, mobile and wearable computing. This result will be contributed to standards and will foster the seamless cooperation of users within and between organisations, teams and communities.

eLOGMAR-M: Collaborative web-based and mobile solutions for maritime transport logistics

eLOGMAR-M, a Coordination Action project, builds on the results of three successful predecessor projects which created innovative solutions for port and logistics transport management. The next step for e-LOGMAR-M is to customise these solutions for mobile actors using maritime transport applications.

The major aim of the project is to gather and co-ordinate activities in the field of IT and Communication solutions (web services, GPRS and WAP/WML mobile services, simulation, technologies for information systems design, virtual reality) with maritime and logistics applications. The maritime freight route "Baltic Sea feeder ports – Western Europe hub port (Hamburg) – Mediterranean ports – Chinese ports" is selected as the subject of investigation and demonstration.

One of the main objectives is to set up a collaborative partner pool, which unites organisations from different countries (Germany, U.K., Finland, Greece, Poland, Lithuania, Latvia, Estonia and China) operating within the selected transport route. The partner pool has been created by means of integrating electronic information resources (databases, information systems, web-sites and portals) of the participating organisations in a collaborative work environment.

Another important objective is to define new work methods for mobile actors in logistics and maritime areas (traders, resellers, railway carriers, shippers, consignees, insurers, agents, forwarders etc.) by providing them with advanced mobile services, such as WAP over GPRS, PC-connected Web surfing and mobile e-mail and chatting.

The China connection is provided by Chinese companies (China Harvest Development and Hope Software in Beijing).

A set of collaborative activities will support the main objectives of the project:
- Definition, organisation and management of joint initiatives;
- Organisation of conferences and workshops;
- Setting up of expert groups;
  Exchange and dissemination of good practice.

Scientific and technological goals

The major goal of the project is to create a dynamic, collaborative working environment, or "virtual pool", between different partners operating along the selected maritime freight route. This pool unites the information management systems, databases, Internet web-sites and portals of the partners and allows for the provision of new services and new work methods for the mobile actors involved. The whole system is highly dynamic in that other organisations can join the virtual collaboration space at any time and information resources are regularly updated.

Although some of the companies operating along this freight route are competitors, the advantages that co-operation can bring the different target groups are very considerable. For example:
- Forwarding companies, which represent owners of goods (manufacturers or buyers) can calculate a start-to-finish transportation rate and optimise the logistics supply chain by using dedicated information systems and databases.
- Shipping lines (deep sea and feeder lines) – can increase cargo flows and improve the quality of their services by delivering goods on time;
- Terminal operators can decrease storage and processing time by better planning cargo transportation;
- Freight brokers will increase their profits by involving a wider range of user groups dealing with freight transportation.

Collaborative working and information openness can create a positive image of the services on international transport routes and of the participating partners. The united information space allows partners to better control and accurately forecast the whole transportation process.

Project Stages

The project is implemented in three stages corresponding to the objectives stated in the box below:
- **Identification** (Objectives 1-3): study and analysis of technologies and systems along the selected maritime freight route with regard to business processes, m-services, e-work and IT-solutions, legislation, regulations and standardisation
- **Integration** (Objective 4): assessment criteria and user requirements have been formulated in order to select the most appropriate solutions and systems for best practices. Results of the identification stage and of the Internet-based interactive web-site as supporting tool will be used at this stage. The process of staff training will be taken into consideration;
- **Demonstration** (Objective 6): samples of the Internet-based resource pool with easy access for mobile actors along the selected freight route will be presented.

The results of the identification and integration stage have been posted at the eLOGMAR-M website and are publicly accessible. The main result of the demonstration stage, an Interactive Web-Portal as a platform for dynamic collaboration along the freight route, is currently in its final stage of development and will also be made available through the eLOGMAR-M website.

At a glance: eLOGMAR–M

Web-based and Mobile Solutions for Collaborative Work Environment with Logistics and Maritime Applications

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Duration: Sep 2004 – Sep 2006

Total cost: € 1,371,771

EC funding: € 949,600

Strategic Objective:
2.3.2.6 Applications and services for the mobile user and worker

Project Identifier:
FP6-2003-IST-2-511285

eLOGMAR-M Objectives

Objective 1: Study and analysis of logistics and maritime transport processes

Objective 2: Study and analysis of m-services, e-work, information and simulation systems

Objective 3: Study and analysis of legislation and regulations as organisational basis to create a virtual networked pool

Objective 4: Create the opportunities for the training of specialists in maritime logistics and quality management systems

Objective 5: Create an Internet-based Interactive Web-site as a gateway for potential network partners and customers

Objective 6: Develop a demonstrator of an Internet based collaborative work environment with mobile access

ENGAGE: Designing for emotion

ENGAGE is bringing together research & design and industries in the field of design & emotion to create a knowledge community and to make the best use of both current and future knowledge. Emotional Design involves capturing the subjective and emotional needs of consumers and endowing products to incorporate them. Sharing knowledge and know how in this field can increase the competitive strength of European companies.

For most companies innovation is costly and the failure rate when introducing new products is high. 40% of the time they fail in the marketplace (Hultink, 1997). Although functionality has always been, and will remain, an essential precondition for product satisfaction and market success, various developments point out the increasing importance of familiarity with a product as a driving force for acquisition and use.

Incorporating emotional user needs into the design process can increase the likelihood of using or buying products and services, from cars to household appliances, from health and safety products to clothing.

A need for coordinating knowledge in the field of design and emotions

Currently many methods and tools have been developed to implement soft user needs into product design. However, the interaction between researchers and practitioners is very low and the body of knowledge that embraces design and emotions is not well defined or standardised.

A group of 21 partners from 9 different European countries have set up a strong consortium, with representatives from SMEs, corporations, technological institutes, universities and other types of organisations. The ultimate objective of ENGAGE is to open EU industry up to a knowledge-based economy in the area of satisfying people's subjective and emotional lifestyle needs by:
- Bringing together research, design and industry in the field of Emotional Design through the creation of a knowledge community
- Gathering a large collection of tools, classifying them and assessing their fitness for application in product design
- Identifying gaps in existing knowledge and future research opportunities.

> **"Quality" has moved beyond functionality and usability to satisfying people's subjective and emotional lifestyle needs**

Those goals will be met through the creation of a knowledge community focused on the exchange of information and experiences in the development and use of methods and tools for emotional design.

Achievements so far

The first 20 months of work have seen a lot of backroom work. The most prominent outcomes are the following:
- A report on the state of the art has been written, summarising the views of over 20 experts about the current situation of the field of design and emotions and future scenarios.
- 4 events have been organised, and 6 more are in the pipeline, in which attendants have been able to discuss a variety of topics, to learn about tools for designing for emotion and to interact with researchers and practitioners, both experts and new to the area.
- The collection of tools for emotional design has been started. Members of the ENGAGE knowledge base will have access to this repository, in which 200+ methods and tools will be documented, classified and assessed. A first batch of 32 methods and tools is currently available, and during 2006 additions are expected to be made constantly.
- The monthly ENGAGE newsletter has been issued regularly. Individuals wishing to receive it only need to sign up at the ENGAGE website (http://www.engage-design.org) and request to receive the bulletin.
- We have also developed a first website to host the ENGAGE knowledge community, including the tools repository and various communication means. A new and attractive site is being worked on and is expected to be ready in autumn 2006.
- An intense and ongoing dissemination effort is being made a) to give publicity to the field of design and emotion, providing examples of good practice and showing use of methods for emotional design, and b) to give exposure to the project's results. In this line, ENGAGE has merged with the Design & Emotion Society (D&E). This strategic move has allowed both organisations to share resources and dissemination efforts during the course of the project. Additionally, by integrating with D&E we have secured the continuity of the ENGAGE knowledge base once the funded project is over.

Upcoming actions

The remaining part of the project will gather a great portion of
- The third, final and most important conference to be organised throughout the project, the ENGAGE Open Event #3, will take place in Lund (Sweden) on September 25th. This international, one-day symposium will gather a great number of experts from different parts of Europe to discuss about design, emotions and methods & tools to practice emotional design.
- Additionally, 6 other events of national scope will take place throughout 2006 in France, Germany, UK, Spain, The Netherlands and Sweden. As well as those, 4 workshops will take place in June in Delft (The Netherlands), in which groups of experts will assess and evaluate the gathered methods and tools.
- By March 2007 we will have produced a report summarising the views of the members of the ENGAGE knowledge community and serving as an agreed basis of the current scope, language, circumstances and ambitions that rule our field of knowledge.

The driving force

The 21 participants from 9 countries who are driving ENGAGE are a representative group of the existing approaches to design and emotions in Europe, ranging from SMEs to researchers, and from industrial designers to university professors.
- Spain: Instituto de Biomecánica de Valencia (Coordinator), Permasa, Calzados Hergar
- UK: Leeds University, Loughborough University, Procter & Gamble
- The Netherlands: Technical University Delft, the Design & Emotion society, Philips Research
- Sweden: Chalmers University of Technology, Lund University, Linköpings University, The Interactive Institute, Volvo Technology, Electrolux, STFI-Packforsk.
- Germany: Fraunhofer Technologie Entwicklungsgruppe.
- France: Université de Technologie de Compiègne - GRADIENT.
- Italy: Università degli Studi di Palermo
- Slovenia: University of Mariboru.
- Turkey: Middle East Technical University

Vacuum cleaner. © Electrolux

eu-DOMAIN: Ambient intelligence service networks facilitate organisational mobility

eu-DOMAIN provides an innovative European ambient intelligence service platform, interconnecting people, devices, buildings and information resources in an interoperable network, thus opening up new ways of working in collaborative working environments.

Every day, more than 10 million Europeans work outside their normal work space. eu-DOMAIN will allow actors, organisations and content providers to offer advanced interconnectivity services to these mobile users, thus enabling them to access virtual workspaces wherever they need to work, intelligently accessing all the information repositories and physical devices they need..

Ambient intelligence at Work

The services can be made location and context sensitive in order to provide targeted decision support. The location information will be provided by various position services whereas the context sensitivity will be provided by automatic interaction with the surroundings using intelligent devices.

Much focus will be given to multi-cultural interaction for diverse collaborative groups as well as societal acceptance and regulatory and policy issues of operating the eu-DOMAIN services. Focus on usability and intelligent interfaces will aim at alleviating issues of computer illiteracy.

The eu-DOMAIN results will make a clear contribution to the achievement of the i2010 Action Plan as the eu-DOMAIN platform can be used in a broad range of industrial, government, healthcare and other citizen centred applications. eu-DOMAIN will dramatically improve mobile workers' ability to deliver quality services, increase the competitiveness and visibility of their host organisations and generally improve the quality of life for Europe's citizens – for example:

- Small and medium-sized enterprises (SMEs) will be able to get their web enabled products to the market faster by renting access to a dedicated and easy-to-deploy strategic platform
- Individuals will benefit, economically and socially, by using eu-DOMAIN to interact more efficiently and effectively with all types of organisations
- Governments, especially in the healthcare and social services areas, will be given a platform for delivering public services directly to citizens' homes with enormous potential for improving quality and reducing costs.

Innovative user scenarios

Two innovative user scenarios have been developed to demonstrate the system's potential:
- In the field of **industrial pumps**, the basic product function of a pump will shift from simply moving fluids to become an integral, maybe even crucial, part of the customer's networked solution.
- In the **health care** field, a variety of new clinical methods and devices are available from various healthcare providers, each offering their services to an informed patient - sometimes in competition, sometimes in co-operation – as part of their self management program.

Collaborative working opportunities in the industrial services sector

Today's environment puts a great deal of physical and mental distance between product companies and their customers. Product companies thus need to look at how they can improve their ability to speak directly with their customer or product.

Networked products and devices is about enabling certain environments to be connected and operating together in an efficient manner. Services and products will utilise the embedded intelligence that resides in the networked devices in combination with the ambient intelligence provided by the eu-DOMAIN infrastructure to support completely new value added services.
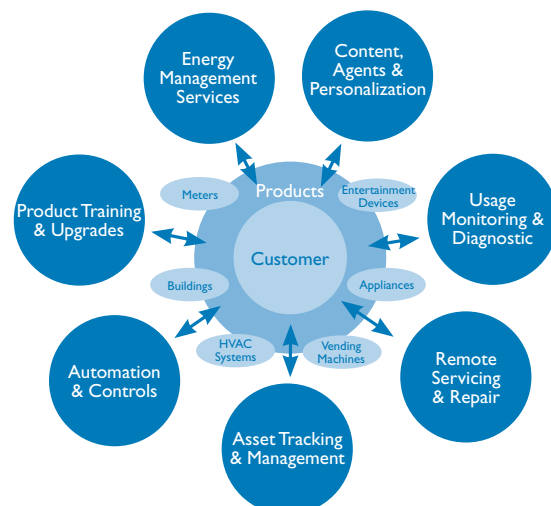
New services from networked devices.
Source: Harbor Research, Boston, June 2001.

By having remote access to their products, product companies can begin to change the nature of their working processes. Companies will increasingly engage as information brokers and service providers. They can start to offer a range of new services such as assisted installation and commissioning, remote diagnostics, repair and maintenance, energy management, asset optimisation, and information management.

The figure below illustrates some possible new services from networked devices:

Sustainable business models

An important part of the eu-DOMAIN project is the development of realistic and sustainable business models for all types of users and Service Providers. The business models have been developed using the concepts of value nets, dynamic value constellations and value modelling to identify new business opportunities for Content Providers, Service Providers and Service Aggregators. Specific emphasis has been put on defining, identifying and measuring value creation and to identify new business opportunities for SMEs. The business models are being validated as part of the overall platform validation.

Industrial services sector

Industrial services companies can increase their business value by introducing new services that add value to their products. In developing sustainable business models for industrial services, the eu-DOMAIN project focuses on remote online access to an industrial installation with additional support for scheduled maintenance and installation.

The eu-DOMAIN platform provides mobile Field Service Technicians with direct access from their mobile terminals to both the control centre of the installation and to back-office repositories with product documentation, maintenance records, workflow procedures, etc.

The ability to combine information from several sources allows for the creation of precisely targeted workflow instructions adjusted to the actual service. Product companies can thus dramatically reduce service costs by a continuous and remote monitoring of the installations.

Identifying new value activities, value objects and actors, it has been possible to develop new sustainable business models for all actors.

Healthcare sector

In the healthcare sector, focus has been on supporting self-management of diabetes patients by offering remote monitoring and context aware personalised feedback via eu-DOMAIN.

With remote monitoring, patients will not only become more mobile, but they will also be able to manage their condition more efficiently. Improved and efficient self-management can reduce risks of hospitalization and thus reduce the over proportional cost burden this group of patients represents in the healthcare system.

The business model further allows for the illustration of the cost/benefit of remote monitoring made possible with the eu-DOMAIN service platform.

InAmI: eCollaborative services for the manufacturing and assembly industry

InAmI will explore how a combination of existing technologies, namely ambient intelligence and semantic-based knowledge management, can promote collaboration to support industrial installations and manufactured products. Industrial experience will be collected in Portugal, Germany and Spain.

InAmI aims to develop an innovative methodology and platform to support collaborative working environments in the manufacturing industry. The objective is to enable an optimal use of industrial manufacturing installations and manufactured products. InAmI will provide methods and collaborative services that will support especially collaborative decision-making in industry.

Manufacturing companies need to improve competitiveness and strengthen market position. This pressure demands strong collaboration from all actors involved in the product or production value chain. However, manufacturing industry is still missing the necessary support, in methods and tools, to achieve efficient collaboration strategies.

Background

To remain competitive, organisations have to decide what their core competencies are. Manufacturers outsource the development of parts of their products to suppliers, requiring collaboration with the suppliers during the development process. Suppliers are becoming responsible for complete subsystems of one or more of their clients' products in certain application areas. Moreover, manufacturers try to ascertain how their products are used, in order to improve them, obtaining information to create services. In summary, manufacturers see themselves needing to develop strategies to establish tight collaboration with all actors involved in the supply and value chain.

eCollaboration

InAmI is focused on *eCollaboration*: collaboration among individuals engaged in a common task using electronic technologies, to provide services supporting access to relevant information and knowledge through a common interface for different agents along the production process. The project's rationale consists in a human-centric approach, involving all the actors interacting with a product: parts or machines suppliers, producers, service providers and customers. This approach is based on an effective use of information and knowledge, in virtual and/or distributed environments, i.e. for all actors in the extended enterprise.

InAmI Results

The InAmI project will produce the following exploitable results:
- **InAmI methodology** on how to set the most appropriate collaborative working environment in manufacturing companies.
- **InAmI Collaborative Platform** for efficient creation of new and update of existing collaborative services to support assembly and manufacturing systems and products.

i) InAmI Methodology

The InAmI methodology will provide an innovative approach on how to apply a combination of ambient intelligence and semantic-based knowledge management technologies integrated in manufacturing processes and products to provide services and support decision-making through all actors in the extended enterprise. The methodology will be addressed to vendors of assembly and manufacturing systems, end-users (i.e. manufacturing companies), service providers and consumers.

The methodology will serve as guidelines for companies, especially for manufacturing extended enterprises, which intend to apply the new approach to provide collaborative services based on the InAmI platform. However, it will be applicable for companies which do not want to apply InAmI system but intend to improve collaboration.

ii) InAmI Collaborative Platform

The **InAmI Collaborative Platform** (ICP) is based on the effective collection of information and knowledge into a *knowledge base for collaborative work*. This common but distributed repository will be the main source of information and knowledge for the platform. It will enable a proper structure to store all knowledge related to ambient intelligence, assembly and manufacturing systems, products and collaborative services.

A set of *semantic-based knowledge management tools* is necessary to support acquisition, capture, retrieval and presentation of knowledge. This toolbox includes: ontology creation and maintenance, context-sensitive search, case-based and rule-based reasoning, knowledge acquisition, modelling and presentation, and context-sensitive acquisition of ambient intelligence information.

> **InAmI is based in a human-centric approach involving all actors of the extended enterprise**

The platform needs general functionality and services to support collaborative work in manufacturing environment. The *core collaborative services* provided by the ICP will enable the efficient collaboration, ensuring a human-centric approach. These include: resource discovery, team composition, product/process knowledge provision, ambient intelligence information provision, collaboration call, collaboration traceability, and communication services.

Besides enabling the creation of new services, the ICP comprises of three *collaborative application services*: collaborative reconfiguration of assembly and manufacturing systems and products, intelligent monitoring and collaborative problem solving.

Business Cases

The user driven approach of InAmI is ensured by three business cases, involving one manufacturing company, two vendors of assembly and manufacturing systems, one network services provider and one control systems provider.

i) Business Case 1

Business case 1 considers relations between a manufacturing company and its clients, regarding product improvement and associated services. By creating collaboration between the company's departments and with clients, a better knowledge of product and production behaviours will be possible. This insight will provide means for improved after-sales services and to reconfigure products.

ii) Business Case 2

In business case 2, the service and control suppliers intend to establish a tighter collaborative relationship with the industrial clients and among themselves, to improve services currently available. The objective is to use current services offered by the control provider, with the added value of human-centric, collaborative processes in the ICP. Another issue is the interfacing between InAmI and the middleware of data-collecting tools, namely the one from the control provider.

iii) Business Case 3

Business case 3 resides in a time-sensitive context, where a machine vendor intends to provide intelligent monitoring and maintenance support. For this, collaboration between the machine vendor and the clients' maintenance departments must be set, so that services are flexible and work according to the different clients' needs, regarding strategy and maintenance.

inContext - Interaction and Context Based Technologies for Collaborative Teams

Context-aware relevance-based pervasive services support dynamic collaboration of knowledge workers in multiple team configurations – adaptive and pro-active services anywhere, anytime, anybody, any device.

Knowledge workers are increasingly engaged in various projects at the same time, requiring flexible collaboration. New forms of teams emerge that feature dynamic interaction patterns currently unsupported by existing software services. Teams of a virtual, nimble, or mobile/nomadic kind evolve and merge to reflect the vibrant nature of human interaction.

To enable efficient collaboration amongst team members and effective participation of individuals in multiple teams at the same time, collaboration environments need to exhibit capabilities for large-scale interaction, peer-to-peer communication, and loose coupling in a trusted serviced-oriented way.

inContext strives to enable dynamic collaboration by exploring new techniques and algorithms for pro-active service aggregation, context-aware service adaptation and service provisioning.

Project Objectives

inContext's contribution will be twofold. On the one hand, new techniques and algorithms for mining human-to-human and human-to-service interaction patterns provide the foundation for providing relevant services at the right place and time. On the other hand, a new generation of services no longer merely reacts to changes in a collaborative environment but anticipates transitions and adapts accordingly. To this end, relevance-based context representation models and methods for context-coupling and enrichment allow for autonomic service adaptation and provisioning.

The focus of the inContext project lies on the following four key innovations.

- **Dynamic interaction patterns: mining and algorithms.**
  As dynamic interaction processes cannot be determined in advance and should not be restricted by rigid workflow models, a set of interaction patterns are investigated to be applied on the fly. Analyzing asynchro-

nous, computer mediated conversations and information flow of intra- and inter-team collaboration regarding who (involvement, dynamic participation), how (team topologies), when (communication flow), where (distribution), what (artifacts and services) and why (motivation and goals) will reveal the underlying work patterns to identify best practices.

- **Context representation, transformation models and reasoning techniques.**
  Services need to be context-aware to provide the relevant functionality at the right place and time. Thus, suitable formalization and representation techniques will allow modelling of context in highly dynamic collaborative environments. In addition, transformation models reflect a team's transition from one form to another. Finally, context reasoning techniques enable contextual knowledge extraction from existing information. Here, the right context structure (e.g., context hierarchies) serves as a basis for fine-grained access and distribution of context information.
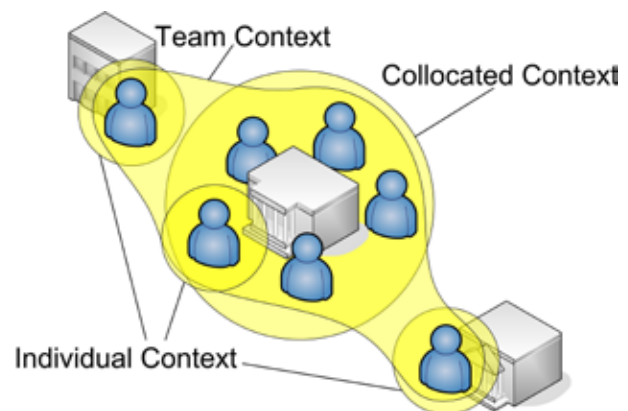
- **Relevance-based trusted context service provisioning techniques.**
  Based on a context model, new algorithms can select relevant services already in advance resulting in pervasive collaboration services. Amongst other requirements, such a model needs allowing for formalizing relevant context types under certain conditions. Hence, a reliable set of suitable services constitutes the basis for autonomic service adaptation and aggregation.

- **Autonomic service adaptation: Context learning, coupling, and enrichment.**
  Algorithms aimed at context learning empower services to recognize situations, artefacts, roles, people and places. They are bundled with situation-aware mining techniques to extract the relevant context information. In addition, context is coupled with time and location

> **Relevance-based service aggregation and provisioning are key to improved human collaboration**

constraints to improve these algorithms, while combination of individual and team contexts enriches the overall service provisioning process. This enables pro-actively adapting services to increase the responsiveness of individuals and teams.

Impact and Exploitation

InContext will have a significant impact on businesses as knowledge workers greatly increase their efficiency and effectiveness through better integration and improved quality of teamwork. Furthermore, process awareness enables organizations to improve their risk assessment and management possibilities. Increased flexibility of ad hoc processes empowers a large section of the society to create virtual organizations and communities. Relevant service provisioning reduces time-to-team and time-to-work while increasing productivity because of fewer irrelevant interruptions. Furthermore, best practices identified and on-going work pattern monitoring support dynamic collaboration. Finally, the Pervasive Collaboration Services Reference Architecture serves as a testbed and foundation for further projects and prospective products.

Team Forms and Characteristics

	Nimble	Virtual	Nomadic/Mobile
Vision and Goals	Strongly Shared	Shared	Not Shared
Team Coupling	Tight	Loose	None
Time span of Existence	Short-lived	Project Dependent	Unknown
Team Configuration	Flexible	Stable	Dynamic

INTUITION: Network of Excellence on VIrtual Reality aNd VirTUal Environments ApplIcaTIONs for Future Workspaces

INTUITION's major objective is to bring together leading experts and key actors addressing all major areas of VR in Europe, including Industrial representatives and key Research Institutes and Universities, in order to overcome fragmentation, to structure and support Research, and to promote VR establishment within product and process design and evaluation.

Virtual Reality is one of the emerging key technologies for future Working Environments having multiple applications in training, evaluation, assembly or engineering design & development scenarios. Strongly dependent until now on IT technologies, VR technology introduction in industrial applications has been done in an unorganized way, lacking long-term vision. The technology has evolved providing the user with advanced interaction options through innovative devices or menus while enhancing the feeling of user presence within Virtual Environments.

While solutions for the migration of huge CAD models within VR systems are getting more reliable, numerous applications using VR set-ups have proliferated. Such a vastly evolving field makes it difficult to keep up with all novel developments and applications. To make this even worse the lack of knowledge transfer from research labs to industry and the limited number of collaborations among the academic and industrial communities has been posing another barrier to further developments.

To overcome these barriers the links within the VR community (including research, academic and industrial sectors) should be strengthened by allowing experts to interact with each other and get in touch with all recent developments. To overcome fragmentation a roadmap towards future initiatives and developments should be defined based on the establishment of a common framework and a common understanding of technology potentials and limitations.

Objectives

A number of activities will be carried out in order to establish a common view on the current status of VR technology, and on open issues and future trends. Thus the INTUITION Network aims to:

- Systematically acquire and cluster knowledge on VR concepts, methodologies and guidelines to provide a thorough picture of the State of the Art and provide a reference point for future project development;
- Perform a review of existing and emerging VR systems and VE applications, and to establish a framework of relevant problems and limitations to be overcome;
- Identify user requirements and wishes and also new promising application fields for VR technologies.
- Overcome fragmentation caused by high technology costs and stand-alone research effort;
- Integrate VR resources, equipment, tools and platforms and to work towards their networking and common use;
- Create a Joint Programme of Research on VR/VE technologies and their application to Industry and Society. Create and follow Research roadmaps;
- Design and give training courses to researchers as well as to key personnel on the use and development of VR technologies, application and tools;
- Structure and integrate the research work on VR technologies by creating virtual complementary teams all over Europe avoiding overlaps and internal competition;
- Work on interoperable solutions and to suggest possible ways of implementing them in a variety of industrial and societal applications.

INTUITION Vision

In order to overcome fragmentation INTUITION will aim at creating a Permanent Structure which will be an umbrella, or a home for all European user, research and development teams. This will allow them to homogenize the R&D market both in Europe and worldwide, and to facilitate collaboration in a structured way. In addition it will allow the exploration of other, non-European, Markets through a common "Virtual" VR Lab., supporting in this way European competences and innovation in the field of VR and VE applications. One of the goals is, of course, to make Europe the world's leader in the sector. This "Virtual" Organisation will be based on sharing distributed resources, infrastructure and knowledge through common tools, libraries, protocols, standards and certification mechanisms allowing an equitable, transparent, constructive, and affordable access of all its partners to the common resources.

> **"INTUITION will work towards structuring the VR European Research Area (ERA)"**

Network organisation

INTUITION is organised vertically in four different Clusters of activities focusing on Integration, Research, Spreading of Excellence and Management respectively. Horizontally the Network partners are formed into Working Groups which are focusing either on application oriented VR fields or in generic technology aspects.

The Network is strongly influenced by industrial visions and objectives. This is assured through the existence of the Advisory Board, consisting of industrial partners, which validates the Network results and guides its work programme. In addition a Forum has been setup for external organisations with the participation of numerous user companies which interact with INTUITION Network and assist in reaching a better understanding between users and developers

The Network management and administrative activities are handled by the Network Management Committee composed of 13 Network partners, of which one is the Network Coordinator, ICCS.

INTUITION Forum

The Forum is an organisation of selected key organisations from all over the world that is in close contact with the INTUITION activities. By becoming an INTUITION Forum member, an organisation will be able to:

- Participate actively at INTUITION Working Groups which carry out the most important activities of the Network related to Research
- Be the first to know about INTUITION results;
- Get in touch with a number of deliverables (not necessarily public);
- Become a member of INTUITION e-Forum and take part in VR related e-discussions;
- Receive invitations for INTUITION events and be able to participate with a reduced fees to a number of INTUITION events;
- Receive the INTUITION newsletter (every 3 months);
- Build synergies through the Network and be the first ones to be contacted in case external collaboration is required;
- Be able to propose research ideas to INTUITION and obtain INTUITION support for probable future initiatives and research initiatives/ proposals;

Apply for the INTUITION Forum at: http://www.intuition-eunetwork. net/forum.html and subscribe to our newsletter at: http://www.intuition-eunetwork.net/index.php?page=newsletter

Laboranova: An environment supporting the strategic early phase of innovation

How do you manage work that must end in unexpected and positive results? Not with existing management paradigms! Laboranova will go beyond and create a new way of working. Thinking, collaboration and decision-making will build on disruptive ideas, fuzzy knowledge, and nonlinear workflows in the Laboranova environment.

Rationale

Innovation has become the main source of competitive advantage for European companies in the globalised economy. Existing collaborative working environments (CWEs) mainly focus on supporting traditional working paradigms of linear workflows involving clear tasks and knowledge structures.

However, in order to achieve continuous strategic innovation and thus create persistent competitive advantage, organisations need to increase their capacity for carrying out open-ended and nonlinear problem solving involving a wide participation of people in knowledge-rich environments. This must be supported by the next generation CWE's, which in turn requires new paradigms for managing the knowledge transfer, the social dynamics, and the decision processes involved in the front-end of innovation.

The goal

The goal of Laboranova is to create this next generation of collaborative tools. Laboranova will change existing technological and social infrastructures for collaboration and support knowledge workers in sharing, improving and evaluating ideas systematically across teams, companies and networks.

Laboranova will do research to develop and integrate models and tools in three specific areas, the three pillars in the project: ideation, connection and evaluation. These pillars will be leveraged by advanced game methodologies in order to improve collaborative work processes.

By integrating these efforts the results will be innovative collaboration approaches and organisational models for managing early innovation processes, software prototypes and the integration of the isolated models and tools into a collaborative innovation platform.

The project will collaborate closely with industrial players. Some will serve as living labs and give strong user input, while others will be partners in the commercialisation of the project results.

Laboranova Vision

The vision is to enable knowledge workers to share, improve and evaluate ideas systematically across teams, companies and networks, thereby increasing the innovative output of organisations far beyond performance levels today.

The project will accomplish this through an ambitious RTD programme, which will result in new information network technologies supporting the three most important pillars in strategic innovation. That is: to connect to the best people around and make optimal use of their competencies; to improve ideas through truly collaborative workflows that will raise our cognitive capacity; and finally, continuously to evaluate the ideas produced by using prediction markets and decision support systems.

Each pillar will be addressed through an iterative process of research, design, test and re-design. Game processes will be addressed as a horizontal dimension going through all elements.

The different applications will be integrated into a shared collaborative innovation platform by employing appropriate infrastructure integration consisting of middleware, interfaces, overarching work processes and shared standards. Demonstration activities with end-users will be conducted through dedicated living labs, working as disruptive sites for innovative work and organizational change processes.

Ideation

The first pillar of the programme explores systematic work processes that lead to innovative concepts. Clear thinking and focused work is needed when developing new ideas. The goal is to drive divergent exploration, to accelerate sense making of new ideas and to augment the cognitive capacity of workers involved in innovation. Technologically the focus will be on actual workspaces and tools where knowledge workers manipulate visual representations of the knowledge involved. Central to these tools will be interlinked 2D visualisations of concept and knowledge structures. Advanced game dynamics will be used to shift perspectives and explore unpredictable solutions which normally don't come to our minds.
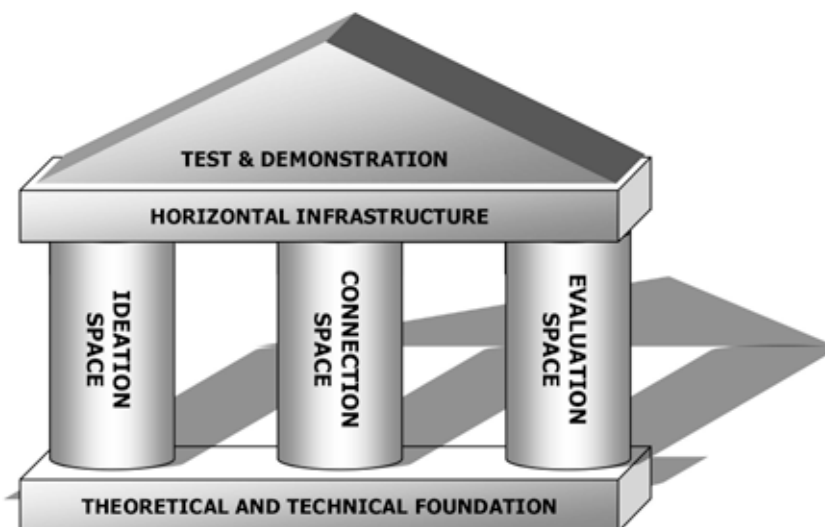
Connection

The second pillar will explore methods for cultivating the random connections and interactions among people and concepts that lead to inspiration, open teamwork, and disruptive idea generation. The goal is to create new

systematic drivers for knowledge exchange and network formation. One of the project's hypotheses is that it is possible to infuse game-like mechanisms into organizations and knowledge communities in order to drive motivation, interaction and cross border knowledge creation. We will both develop diagnostic tools that map individual and group behaviour and game-mechanisms that motivate people to change existing patterns of interaction in order to create productive random knowledge encounters and shape cross border trust relations.

Evaluation

The third pillar will explore new paradigms for broad participation of knowledge workers in the evaluation of innovative ideas. This will support transparency, knowledge transfer, and better grounded decision making in organisations. Into the evaluation space developed in Laboranova, people can put their ideas on internal prediction markets and thereby explore and participate in a collaborative evaluation process. The participants can bet on the success of ideas using virtual stocks representing future events and the price will be a function of transactions representing individual probability-estimates of the event happening. The result will be a prediction market that aggregates knowledge from many individuals in order to involve a broad base of insight in the evaluation of new ideas and concepts.

LIAISON: Location bAsed servIceS for the enhancement of wOrking enviroNment

LIAISON aims at providing to a wide range of communities of mobile workers (Fire Brigades, Police, eMaintenance, Taxi, Waste Management) end-to-end solutions for seamless and personalised location services across heterogeneous networks, in their daily lives.

LIAISON is an integrated project co-funded by the European Commission under the 6th Framework Programme call on Applications and Services for the Mobile User and Worker.

Realised through a user-driven approach, the LIAISON solution covers all the potential needs for professional mobile services: Police, Fire Brigade, Waste management, Taxis and e-Maintenance, contributing to the Location Based Services in all Europe.

LIAISON is answering to increasing market demand by integrating numerous existing standards and techniques, by bringing a set of emerging underlying technologies to the required maturity for professional usage. The system capabilities will be enhanced through innovations resulting from EGNOS and Galileo as well as the newest telecom techniques.

Furthermore, LIAISON will exploit synergies between the numerous and heterogeneous applications needing accurate and reliable solutions. Such an approach will be consolidated through new business models that will secure the sustainability of the services and applications.

Benefits

The LIAISON solution will enable:
- Significant improvements for mobile workers in terms of working environment, security and safety due to seamless access to information;
- Improvement of private and institutional efficiency and services through evolved working methods based on mobile resources usage;
- Consistent recommendation for harmonisation of working regulations in Europe, in particular, the E112 directive;
- A contribution to be made to building European excellence in the mobility markets to balance current USA dominance of patents, products and services in LBS technologies and solutions;
- Generalisation and exploitation of the project results through standardisation, strong involvement of industrial partners with strategic business interests in the market targeted.
- LIAISON Services

LIAISON aims to overcome the drawbacks of the state-of-the-art solutions by pursuing a set of added-value services to be made available in a ubiquitous manner (indoor and outdoor), anywhere and anytime.

LIAISON relies on open multimedia terminals using non-proprietary platforms capable of hosting a variety of applications needing generic (communication, localization, itinerary computation) and specific (site maps) functions and contents in order to offer numerous innovative features:
- indoor 3D visualization and tracking
- dynamic site mapping
- dynamic POI
- indoor route guidance
- emergency assistance
- context awareness billing
- multilingual translation

LIAISON Test Cases

The elaborated solutions are intended to prove that the integration of existing technologies is possible and of high value to users, whereas they gain no benefit from the isolated, non-interoperable components they have today.

To achieve this aim, test cases have been defined within the scope of the LIAISON proposal following users' current requirements. Through these test cases the performance and usability of the system are assessed. In this context six possible scenarios have been identified, which are grouped according to three solutions, i.e. an Alpha, Beta and a Pre-operational solution, each validated by a set of test cases involving the respective users communities.

Technical Approach

The LIAISON end-to-end solution targets mobile workers ubiquitously in order to meet indoor and outdoor performance requirements. These include service availability, integrating and merging location technologies (A-GNSS, inertial MEMS, triangulation) into heterogeneous networks (GPRS, UMTS, TETRA and WLAN) to provide ubiquitous location services.

The LIAISON solution consists of the following elements:
- Terminal Handset: the integrated wearable device brings together communications capabilities (GPRS/ UMTS + WLAN), underlying technologies (A-GNSS,

inertial MEMS) and a set of applications (3D indoor tracking, dynamic POI, multilingual presentation).
- Network Elements: the necessity to have such elements depends on the communications and location technology used.
- LBS Platform: provides applications and services gathering all the software processing and data management tools to provide these applications.
- Location Server: is responsible for selecting and hybridising the best positioning technology depending on the context.
- Remote Control Center: this provides applications for central control (fleet management, emergency services, POI search, tracing, tracking, etc)

LIAISON contributes to improve the European Workers socio-legal environment

By providing an insight into socio-legal aspects of the implementation of location based services in the workplace, the LIAISON project is helping the business community in adopting geo-localisation technologies without risk provided both employers and employees respect the emerging regulatory rules and legislation. Intrusive technologies may induce a further blurring of the borders between private and professional life and generate a tendency towards rejection from the workforce or from the social partners. Regarding private life in the workplace, LIAISON has anticipated the arguments and is giving practical advice for a successful introduction of new devices and practices. Recent recommendations to the French National Authority CNIL are a concrete example of LIAISON's contribution.

At a glance: LIAISON

Location bAsed servIceS for the enhancement of wOrking environment

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Duration: Sept 2004 – Feb 2008

Total cost: € 19,960,753

EC funding: € 11,000,000

Strategic Objectives:
2.3.2.6: Applications and Services for the Mobile User and worker

Project Identifier:
FP6-2003-IST-2-511766

Mobile IN: Harmonised Services over Heterogeneous Infrastructures

MobileIN defines and develops advanced, future-proof, personalised harmonised services for the mobile user and worker by taking full advantage of heterogeneous service infrastructures (Intelligent Network Services, Mobile Network Services and VoIP Services).

MobileIN specified and developed a state-of-the-art open framework for service creation and execution in multi-domain environments that in conjunction with open, scalable service access points is able to demonstrate the sophisticated applications developed in a composite IP-PSTN-PLMN-WLAN environment.

Telecom operators seek for new ways to preserve their existing services infrastructures, which are already a major source of income, and to exploit them in the next generation networks, by offering additional value added services.

This can be accomplished by offering existing and next-generation customized and personalized services in combined IP, WLAN and mobile (GSM/GPRS/UMTS) environments to meet the demands of today's emerging service architectures.

MobileIN targets these problems by designing a modular and scalable architecture for the delivery of value-added services to mobile, PSTN, WLAN and IP-based clients. The figure below depicts the entities used in the MobileIN scenarios during the trials.

The MobileIN Service Creation and Execution Framework (SCEF) is where the MobileIN services are created and executed.

Application Servers are where the MobileIN Applications are placed, located on the top of the MobileIN SCEF. The Communication Server hides from the applications the details of communication with the network elements.

The MobileIN IN Open Access Gateway (IN-OAG) is an Open Access Gateway that provides interfaces to the IN Core components. The gateway supports the 3GPP 29.198 series of 3GPP OSA APIs in order to provide open, secure interfaces to SCP, SSP core IN components for service triggering and extraction of user-related information.

The MobileIN PLMN Open Access Gateway (PLMN-OAG) is an Open Access Gateway that provides interfaces to mobile Core components. The gateway supports a set of 3GPP OSA APIs in order to provide open, secure interfaces to gsmSCF and other core components. The APIs enables the service provider to trigger PLMN CAMEL components for service logic execution (e.g. gsmSCF, gprsSSF etc.).

The SMS Gateway constitutes a low-volume SMS gateway supporting an air interface with the SMSC using a GSM module. The SIP server is being used for the realisation of SIP calls using SIP-based mobile terminals.

The Loc@Cel is a location server provided by PTIN destined to obtain geographical position of mobile units. It offers several location methods for 2G (GSM), 2.5G (GPRS) and for 3G (UMTS).

At the network level there are three different network environments that will be provided by the operators in the project: Wireless LAN environment, Mobile/CAMEL Network and PSTN/IN Network.

Service Example: My favourite Pizza

A user wants to order a pizza in his area. Instead of going through the telephone directory and searching for

Fig.1: Mobile IN Architecture and distributed Test-Bed
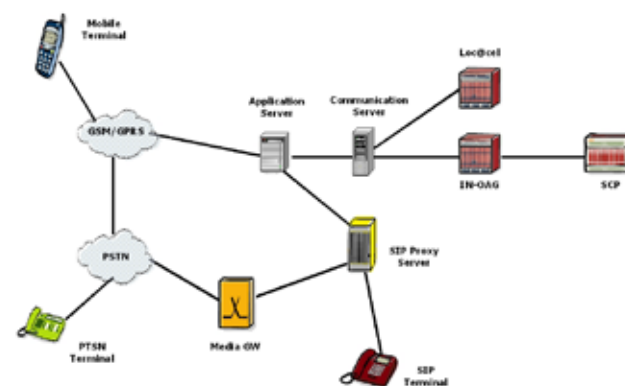
Fig.2: Network components involved in "My Favourite Pizza" service scenario

all the local Pizza delivery houses in the area he decides to use his new mobile phone application called "My favourite Pizza". Based on his location, his mobile phone screen displays a list of Pizza Houses in his area. The user enters his preference and his mobile phone creates a normal GSM call to the Pizza House selected.

The following figure depicts the architecture and the network components that will be used towards the realization of the "My Favourite Pizza" service scenario.

One of the critical design parameters of this service was to display in real time the points of interest on a map at the application server. After starting the service on his mobile device, the user gets a selection of e.g. 3 Pizza restaurants nearby depending on the user's location, as depicted in Fig.3.
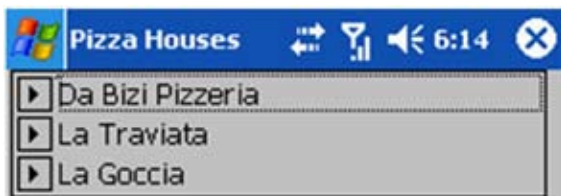
Fig. 3:"My favourite Pizza" mobile terminal application (screenshot 1)

The next step in the service is to select the preferred restaurant and to establish a call to make an order.

Fig.4:"My favourite Pizza" mobile terminal application (screenshot 2)

Other services developed and successfully tested in practice include solutions for Location based Mass calling, Location based billing, UPT/Parallel Ringing and Proximity ('Make a new friend' service).

MobiLife: Applications and Services for the Mobile Users

The strategic goal of the MobiLife Integrated Project in IST–FP6 is to bring advances in mobile applications and services within the reach of users in their everyday lives by innovating and deploying new applications and services based on the evolving capabilities of 3G systems and beyond.

Rationale

People today take part in varying social contexts and play different roles in their everyday lives. MobiLife addresses the need to manage todays complex lifestyles by offering facilities and tools to support communication, and share information and time with others. Future communication environments may give new possibilities to do this, but also new challenges due to increasing heterogeneity of technological environments, user needs and expectations.

Research Challenge

The research challenge of MobiLife is to address the multi-dimensional diversity in end-user devices, available networks, interaction modes, applications, and services. To deal with this complexity and reach its strategic goal, MobiLife researches, with a user-centric approach, context-awareness, privacy and trust, adaptation, semantic interoperability, and their embodiment in novel services and applications matching key use scenarios of everyday life.

User Centricity and User-Centric Design

MobiLife's User-Centric Design (UCD) approach with several iterative steps – scenarios, mock-ups, probes, prototypes –has had effects on several levels:

- It has generated **clear improvements to applications**. This is perhaps the most visible, and also expected, result of the UCD activities in the project.
- It has **helped the developers to prioritise and structure technical work** and manage their workflow and workload.
- It has generated **new understanding related to the enabling technologies**.
- There has been a **significant amount of learning on personal and organizational levels, related to end user orientation and UCD management**.

By spring 2006, MobiLife has performed user studies and field tests with over 200 end-users in several European countries with fruitful feedback and results.

In addition, the project itself is a new opening for user centricity. MobiLife size and structure are atypical to traditional UCD – the early experiences of MobiLife related to management of end-user orientation should be of interest to the European research community.

Architecture and Technologies

MobiLife **architecture** has reached the third step in the refinement process towards the final specification. Beside the detailed interface specifications, major refinements of the MobiLife service infrastructure concern a detailed lifecycle analysis, a business model impact analysis, and the description of the interface between MobiLife and the IP Multimedia Subsystem (IMS). The main functions in the revised architecture are: Privacy and Trust Function, Personalisation Function, Context Awareness Function, Group Awareness Function, User Interface Adaptation Function, Service Usage Function, Service Provisioning Function, and Operational Management Function.

On **multimodality** technology, many developments have been made to complete the components available to application developers. Multimodal input is now transparently offered to applications, a device and modality description language has been created to improve the device discovery process, several new modalities have been added and user interaction has been improved. On **personalisation** technology, the recent outcome has been to integrate learning and reasoning with the profile management. This enables any application to get recommendations tailored to the user through a consistent interface, any number of learning and reasoning algorithms being called transparently.

Control of **privacy and trust** in MobiLife applies a model closely related to security. The integrity of a MobiLife system consisting of hardware, software and user is checked and frozen at start-up. A so- called trust engine is used to ensure that policies are checked before any user data is given out. The trust engine contains a policy decision point close to the user making a request, and a policy enforcement point close to the sensitive data that is accessed. Additionally, visualisation of privacy and group management information has been addressed through multiple approaches.

MobiLife Context Management Framework (CMF) represents the MobiLife approach to discovery

of, exchange of, and reasoning with contextual information, in such a way that it can easily flow from one provider to multiple consumers and from multiple providers to one consumer. CMF enables a wide range of context-aware MobiLife applications that are aware of the user's (or group's) context and proactively adapt to it. Related to CMF, MobiLife has researched, e.g., different ontologies and reasoning methods, while exploring their feasibility through applications and demonstrations.

Applications and Services

MobiLife has developed applications to show what can be achieved using the MobiLife technologies and architectural components.
- **Multimedia Infotainer** displays news to the user in a context-aware and multimodal way.
- **Wellness-Aware Multimodal Gaming System** takes advantage of the personalisation improvements to provide tailored training plans.
- **FamilyMap** application provides help to parents on the road with their children.
- **TimeGems** suggests to users potential activities within related groups, taking into account availability of group members and preference in activities.
- **MobiCar** is a group and context-aware car sharing application.
- **ContextWatcher** makes it easy for an end-user to automatically record, store, and use context information. Check the MobiLife web page and download the application for yourself!
- In **Personal Context Monitor**, ECG (electrocardiogram), heartbeat, and acceleration are used to monitor the physical status of the user, exploiting the HeartPod sensor box developed by the MobiLife partner NEOS (under commercialisation).
- **Proactive Service Portal** uses contextual reasoning to proactively offer services to the mobile user.

Deliverables and Dissemination

MobiLife's revised web page contains not only many of the project deliverables as downloadable versions, but also lots of other material (presentations, software, events, publications, etc.).

MobiLife as part of the Wireless World Initiative (WWI)

WWI was established in 2002 to lay foundations for the long-term future of global wireless communications. WWI contains a series of large Integrated Projects in FP6-IST covering a broad range of research topics for the development of wireless communication technologies for systems beyond 3G, including services and applications (MobiLife), platforms (SPICE), networking (Ambient Networks), new radio interfaces (WINNER) and end-to-end reconfigurability (E2R). The Initiative is made up of more than 100 partners with the majority of the global players in wireless communications from the manufacturers, operators, academic and national regulatory agencies domain as well as SMEs. See more from www.wireless-world-initiative.org.

At a glance: MobiLife

Life goes mobile

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Duration: Sep 2004 – Dec 2006

Total cost: € 17,289,542

EU funding: € 9,700,000

Strategic Objective:
2.3.2.6. Applications and services for the mobile user and worker

Project Identifier:
FP6-2003-IST-2-511607

MuLiMob: Multilingualism & Mobility

MuLiMob aimed to enhance multilingual and multicultural services and applications for mobile users and workers by making the most of Europe's multilingual and multicultural diversity.

MuLiMob used the multilingual diversity of Europe as a mobile market amplifier by constructively addressing multilingual aspects of marketing, technology and content. MuLiMob focused on the independents, which have the most real impact on the market in its current state and with the current cultural and multilingual production framework. Independents were given the tools, knowledge, insights and routes to partnerships they need.

MuLiMob displayed the potential of multilingualism in the mobile environment, in terms of methodology, technology and business models.

MuLiMob worked at lowering the barriers that limit deployment in the mobile market and at increasing interoperability and openness. This was done by empowerment and by uniting the music and mobile worlds, thereby answering a current strong need.

MuLiMob enhanced the awareness of the wireless community about multilingual and multicultural mobile services and applications issues. Digital communication, including blogging as well as major events gathering actors from the two sectors and interviews with high level experts in the sectors, kept the project team up to date with the very rapid evolutions of these sectors.

MuLiMob stimulated a rapid take up of innovative ideas within the whole mobile value chain for user-friendly and cost effective multilingual services for mobile users and workers. This was achieved through meetings and discussions with the main actors of the sectors at fairs, workshops and conferences, and by personal interviews.

MuLiMob identified the points and problems that need further research, applications and solutions. The real challenges for the future were identified as well as the opportunities. Both the content and the music industries need to adapt to the considerable changes they are facing.

Results as follows can be found on www.mulimob.org:

Studies in the multilingual and mobile music sector

Seven public deliverables, including high level offline and online content (of around 600 pages, fixed and mobile images, music, graphics…) were well-received:

- Two fundamental reports establishing the most important multilingualism and mobility issues in technology, marketing and communication.
- A central report presenting the guidelines for better multilingualism in mobile music services.
- Fifty five reports and studies analysed.
- A set of comprehensive questionnaires conceived, translated and distributed
- Published guidelines and position statements, carefully listened to in the mobile and music industry.
- Two final reports synthetically presenting the achievements of MuLiMob during the whole project and paving the way to its future.
- New research trends identified and major companies coming to us to investigate them.

Discussion and awareness of the issues and the ways to handle them:

MuLiMob presented and led discussions in more than 150 fora blogs and expert workshops:

A conference and networking event was organised with a very high level panel and over 120 trend setting professionals in attendance.

Dissemination was not only in Europe but worldwide, thanks to MuLiMob's dynamism and networking to other multilingual regions such as Canada, China, Israel, Latin America, Malaysia, South Korea, Switzerland, the UAE, the USA, etc.

Every week, we received several mails requesting information about the project and subscription to our newsletter, from all over the world.

Communications, ideas and white papers were published in the music and mobile sectors, but also in the research world, the media and the institutions, covering all interested sectors.

Several partnerships developed in Europe to increase the visibility of the work.

There were 11 e-content and IST projects exchanges and partnerships

More than 40 articles appeared on MuLiMob in the electronic and paper press and media.

MuLiMob physically participated and made its voice heard in 25 major mobile, multilingualism and music professional events.

Interviews, meetings and discussions were held with more than 150 experts worldwide and more than 3000 contacts made.

> **Mulimob used the multilingual diversity of Europe as a mobile market amplifier**

More then 500 personal top-level professional company contacts were made by email or phone for MuLiMob questionnaires.

Around 70 European companies answered our questionnairesof which 48, from different levels in the mobile value chain, answered carefully.

A global guru was closely linked with MuLiMob.

Tools and methods adapted for the work:
- A 21 language coherent and dynamic website of more than 100 pages.
- A report and presentation of the conference and its impact.
- Two videos produced: one presented in high level EC China event in Beijing and another at the conference and networking event in London.
- A tool in the form of a grid to present findings schematically, but to the point.

Multilingual content deliveries:

A high level demo was produced, including ideas for multilingual services, video and music, available online and on mobile devices.

MulLiMob was a multilingual and multicultural collective learning experience for the team.

23 Press Releases were sent all over Europe

A banner was especially created for the MuLiMob event and distributed online to raise awareness

A brochure, posters and leaflets were created for festival and fairs distribution throughout.

A special database was developed to rationalize the online communication process

MuLiMob also subscribed to the French CNIL to protect the rights of web surfers.

5 enthusiastic and experienced SME's animated the project:

- Musiwave Paris:
  A leading European mobile music and entertainment service provider operating in 18 countries across Europe, Oceania and through Asia with its subsidiary in Hong Kong.
- RandomOne, Barcelona:
  A specialist in mobile marketing communication, creating new concepts and developing user-oriented services software.
- PlusConnect Telecom, Wireless Around People, London:
  A wireless industry networking entity, organising conferences all over Europe with fields expertise in mobile applications and technologies.
- Crammed Discs, Brussels:
  A creative cosmopolitan and multicultural independent music label, publishing, distributing and promoting artists from all over the world in over 30 countries.
- Hélène Abrand Consulting, Paris:
  The conceiver and pilot of the project, a new media international consulting company working with the institutions, the media and the creative industries, working with Europe, but also Asia, America and Africa.

At a glance: MuliMob

Multilingualism & Mobility

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Duration: Sep 2004 - Dec 2005

Total cost: € 534,996

EC funding: € 534,996

Strategic Objective:
2.3.2.6 Applications and services for the mobile user and worker

Project Identifier:
FP6 - 2003 - IST - 2 - 511483

OpenFutures – Future Centers as Collaborative Working Environments

The objective of OpenFutures is to accelerate the innovation, dissemination, and use of Future Centers as collaborative working environments, by creating an easily accessible, open source "operating system" describing how to set up, run and continuously improve such Future Centers.

What are Future Centers

Future Centers (FCs) are facilitated user-centred collaborative working environments (CWEs) which help organisations prepare for the future in a proactive, collaborative and systematic way. They create and apply knowledge, develop practical innovations, bring citizens in closer contact with government, and connect end-users with industry. They are used by government organisations to develop and test citizen-centred, future-proof policy options with broad acceptance by stakeholders. They help businesses to increase customer-driven, user-centred innovation and the quality of new products and services.

Why an OpenFutures Project

We believe that the Future Centers can be a major contributor to growth and innovation – at European, national and local level, in business as well as the public sector. We aim to systematically facilitate the wide adaptation of FC concepts in a wide range of Collaborative Working Environments

The OpenFutures Exploration Journey

OpenFutures project explores Future Centers and other future-oriented collaborative working environments from four perspectives:

> **"Now change the perspective. Look forward instead of backward and the creation of value is revealed to exist in the future, i.e. the time line and your management of the future "space" from the next few seconds to eternity".**
> *(Leif Edvinsson)*

A possible conceptual frameworks for Future Centers. OpenFutures is exploring several alternative frameworks.

- **The Organisational Perspective** - how do organisations establish, run and improve FCs? How can they integrate FC concepts into organisation strategy and structure? How does an organisation create value through Future Centers?
- **The Methodological Perspective** – which facilitation and thinking tools can be used in future-oriented CWEs to enhance collaboration, future orientation, out-of-the-box thinking and "from-ideas-to-action" processes?
- **The Physical Perspective** – how does the physical design of a Future Center impact innovation and collaboration capabilities?
- **The Technological Perspective** – how can advanced information technologies assist in enhancing the impact of Future Centers (e.g. through creating and linking virtual FCs)?

OpenFutures Outcomes

We will conceptualize and then package the learning from some 50 FCs and other future- oriented CWEs into an open source "Operating System". This is a practical guide and resource for working with FC concepts, intended for people working in existing centers, and for people who want to introduce a more systematic user-centred future orientation to their organisations through FC concepts

Moreover, the OpenFutures project serves as a "mini Future Center" for the CWE community.

What do Future Centers and other future oriented CWEs do?

From ideas into Action – FC activities

- Identify long term opportunities and threats
- Create images of the futures – and catalyze their realization.
- Encourage new thinking, unexpected ideas, discontinuity.
- Prototype new ways of work.
- Enhance internal innovation.
- Challenge conventional thinking, accepted strategy, and basic assumptions.
- Explore and work with multiple perspectives.
- And more…

Future Centers in Practice – Some Examples

OpenFutures is currently putting together a database of some 100 FCs and other future oriented Collaborative Working Environments. Here are some examples:

MindLab (Ministry of Economic Affairs, Denmark), Momentum (Regional Idea House, Denmark), Royal Mail Innovation Lab (UK), The Country House (Ministry of Economic Affairs, the Netherlands), PISGA Be'er Sheva (Education, Israel), Skandia FC (Insurance, Sweden), Ericsson Future Center (Telecom, Sweden).

People in action at some of the Future Centers mentioned above
(Illustrations and photos: R&A Dvir, copyrights 2006)

At a glance: OpenFutures

Future Centers as Collaborative Working Environments

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Inspirator: Leif Edvinsson

Duration: May 2006 - Apr 2008

Total cost: € 628,000

EC funding: € 628,000

Strategic Objective:
2.5.9 Collaborative Working Environments

Project Identifier:
FP6-2005-IST-5-033652

P2P Location and Presence Mobile Services for Managing Crisis and Disaster Situations

Integrate P2P workflow presence and collaborative work services and extend mobile smart phone OS platforms to allow the implementation of new working methods and increase the operational capabilities of mobile emergency response workers.

The potential for change

Smart phones and portable devices of the present have a multitude of capabilities that can be better exploited if organised appropriately in case of an emergency

The project proposes a new paradigm where decision support is provided immediately through data collection from the mobile group of workers who are already on-site. They can provide real time information about the effected area (e.g. image and data feed), they can be supported by emerging services (such as location and presence) in their reactions and – provided with the proper working methods – they can undertake immediately control of the situation and respond.

Information will flow not only to and from the control centre but also laterally in order to provide a comprehensive understanding of the situation as it evolves.

The project objectives

The project aims to develop an integrated architecture and a mobile applications suite for advanced services, to assist mobile teams of safety/security and emergency workers. The work will concentrate on designing, developing and demonstrating in practice mobile services and appropriately adjusted or new working models that exploit transparently the full potential of the available and emerging mobile technology in a highly critical application domain.

The solution proposed will take into consideration and interface with currently available as well as on-going work (through major European projects)

The principal objective is to provide personnel working on-site with the appropriate tools in terms of mobile equipment, applications and protocols and operating procedures in reaction to emergency situations

> **POMPEI will change dramatically management of emergency situations in a micro-scale**

From the technological point of view the project will have an impact on the evolution of the following important technological areas:
- Collaborative work models
- Location and context aware computing and presence services.

Scientific & Technical objectives

The project aims to define and validate peer-to-peer workflow architecture and mobile applications for emergency and disaster response that integrates P2P protocols, location and presence services and mobile workflow management on a state of the art mobile platform. It focuses on developing software and computing technologies that are reliable, pervasive, interoperable and adaptable to accommodate the new applications and services, encouraging the development of open standards and open source software.
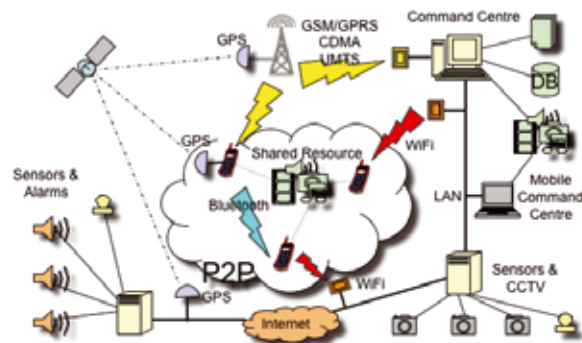
Generic architecture of the system

In particular:
- develop a hybrid collection of protocols to be used in a peer-to-peer fashion to enable communication and co-operation between workers of an emergency response unit
- develop a location-aware interface/framework that can be used to interact under ubiquitous computing principles in a mobile, unpredictable environment to provide location-aware service and optimisation based on the location information. Furthermore, the network should be transparent in terms of the transport medium or location of peers that could be identified by a unique tag.
- design a flexible model of workflow - work design that delegates responsibilities dynamically in emergency teams. Interaction with other teams and reporting relationships to supervisors should be defined in a flexible/fault tolerant way.

- validate the above architecture in crisis management scenarios in two pilots involving an international airport and electricity company under conditions of man-made and natural disasters.

Innovation

The project will carry out innovative inter-disciplinary research and development into the areas of:
- Dynamic, mobile and peer to peer workflow management in crisis/disaster situations
- Integration of location, presence and data (CCTV) based services in a mobile workflow management architecture
- Transparent communications network support and optimisation of available resources by procedures for the traffic distribution over the different available networks
- Interoperability among the considered systems and technologies

Outcomes and Target markets

The project intends to produce a prototype in terms of software and also new procedures and methods that will provide a comprehensive work model for the principal response patterns of the mobile operators. The technological platform proposed relies on mobile phones, aiming to exploit the rapid advances in the underlying hardware and firmware (dictated by the mass market demand) in one or more niche markets.

Primary market
The primary target market comprises safety and security services firms operating in Europe and worldwide. The project results will be packaged as services intended for specific vertical market segments (international airports, large public and private organizations, banks, industrial complexes etc) since they have similar but also different needs.

Secondary market
The secondary market includes complementary security services activities, such as ambulance services, private correction facilities management personnel, where operational procedures need to be appropriately redesigned and updated.

POPEYE - Simple and reliable computing environments for collaborative work

In the general notion of virtualised working environments, POPEYE addresses mobile Peer to Peer (P2P) and ad hoc groups, where fixed infrastructure is not a prerequisite, where virtual communities can emerge spontaneously and share data with the appropriate quality of service (persistence, synchronisation, security,...).

POPEYE aims at providing significant steps ahead in the growing area of mobile P2P computing for collaborative work. POPEYE complements this comprehensive support with the management of context information providing smart personalization in order to achieve a richer experience for mobile device users using mobile P2P systems.

The paradigm: the virtual community:
- For business or leisure activities
- New opportunities for professional and citizen collaborations

The supported behaviours:
- opportunistic ad hoc networking: meet and join
- spontaneous networks: set-up quickly working groups

Enable creative usage of networked portable devices	Dependable and secure, suitable for professional usage
without the need of supporting infrastructure	with or without relying on an infrastructure
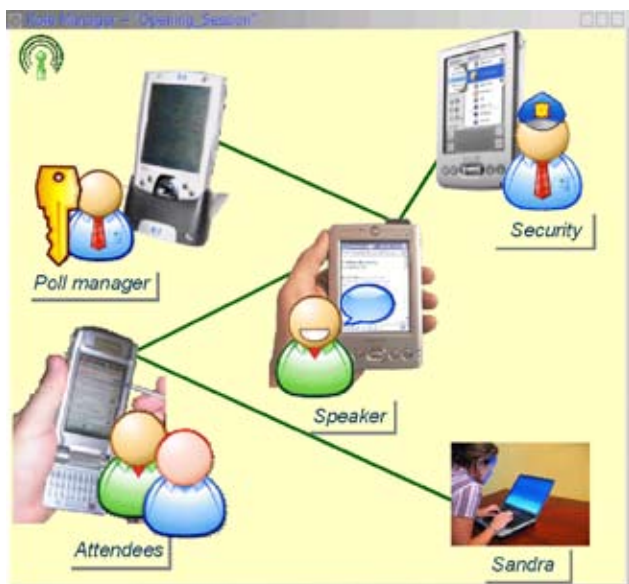
Combination of standards and open source approach:
- stimulating innovation
  - within and outside of the consortium,
  - during and beyond the project's duration,
- ensuring sustainability of the POPEYE developments, beyond the project's duration,
- ensuring value for the industry (as open source does not imply that software is free).

POPEYE infrastructure assessment:
- selected mobility-enabled peer-to-peer e-collaboration applications,
- two demonstration events are planned.

Why is POPEYE research necessary?

Despite the huge success of various P2P applications over the Internet, P2P technology research has given little attention to specific issues related to mobile environments. The most important characteristics of mobile environments in addition to the need for roaming are: the limited capabilities of mobile handheld devices, the diversity of the communication links, the high variability of the surrounding context of the user and their varying quality.

Most existing P2P systems inherently assume rich connectivity and vast storage space that are indeed features of most desktop computers and fixed infrastructures.

What is POPEYE technical focus?

- Design an integrated **overlay networking architecture** that combines the stability and performance of infrastructure networks (when available) with the flexibility and spontaneous character of mobile ad hoc communications.
- Design and implement a **communication platform** that exploits cross-layer functionality down to lower-level protocols to provide efficient **P2P management and communication primitives**. A key feature is its "network and terminal awareness", allowing adaptation in accordance with the underlying physical links, network availability and local device resource constraints. Several P2P issues are already, though

only partly, addressed by "conventional" middleware, so we intend to base our work on existing products, e.g. JXTA and Microsoft-P2P, which will be extended to introduce additional mobility and pure ad hoc communication support.

- Design and implement higher-level **context-aware, secure and personalised core services**. Based on the P2P middleware platform, core services are designed and developed to simplify application development. In the frame of spontaneous virtual communities/groups, users' preferences are exploited to **publish, discover** and **access** or **deliver** information within the P2P network in a targeted and personalised fashion. User preferences combined with ambience information, such as time, location, user activity, and peers' presence, enable applications to propose automatic actions, such as joining or leaving a group and publishing or subscribing to some particular type of information, under user control.

What is POPEYE link with the user community?

The link with the user community is ensured by the dedicated POPEYE User Group, which is composed of:
- the consortium members themselves throughout the duration of the project as they will be the first community to experiment,
- peer to peer networks experts belonging to the entities in the POPEYE consortium but not directly involved in the POPEYE research work,
- experts belonging to other project consortiums where a cooperation agreement exists,
- experts belonging to the communities where POPEYE is involved under an External Collaboration scheme (e.g. OCA WG, AMI@Work,…).

PRIME - Using Serious Games to Boost Business Managers' Experience

The main objective of PRIME is to give business professionals a learning environment where they can experiment with new ideas. The project involves 13 partners from Norway, Portugal, Germany, Italy, Switzerland, Israel, Greece, Hungary, Denmark, Austria, and Bulgaria.

Background

In the past, serious gaming has been applied only partially into the business domain, providing semi-interactive case studies based on pre-written storylines, relying on discrete choices, and dealing essentially with training and/or coaching. The complexity of the collaboration, risk taking and negotiation activities intrinsic to work environments, in particular in the global manufacturing business context, raises interesting innovation challenges, which makes the serious games approach attractive.

Achievements

PRIME is committed to the creation of an innovative system and methodologies that enable the following breakthroughs:

- Allowing safe experimentation for decision-making about radical innovations or major changes without the associated risks in real life.
- Empowering the managers with more confidence to embark on an innovation process in the "real world", thereby enhancing the innovation culture of the enterprise.
- Increasing the adaptability and flexibility of the enterprise in a multidisciplinary, multi-stakeholder collaborative environment.

The European manufacturing industry has been seriously declining due to the lack of a culture of innovation, entrepreneurship and creative management required to achieve attractive added value products able to successfully compete with:

- The increasing competition from low-wage countries;
- The outsourcing and off-shoring trends to access lower labour rates;
- The brain-drain phenomenon due to a stagnant economy.

PRIME will strongly contribute to generate and sustain a new empowered management community motivated to achieve, and go beyond the i2010 objectives.

Benefits

Developing new products, new technologies, business models, or new working processes involves high levels of financial, technical, safety, and commercial risks. These risks are extremely difficult to predict in advance. As a result, innovative solutions that might be highly successful in terms of return on investments and job creation are never developed. It is recognised that the European business management community is suffering from lack of leadership, entrepreneurship and risk taking ability. This led to the current policy environment driven by the Lisbon 2000 and the i2010 initiatives aiming to drive the social culture changes required to achieve the vision of Europe as the leading knowledge society. PRIME is committed to having a major impact in this challenging scenario by reinforcing:

1. European competitiveness through "training" of professionals in various expected or unexpected scenarios so that they are better prepared to face similar situations whenever they should happen in real life;
2. Economic growth by allowing optimisation of business operations through simulation and evaluation of alternative scenarios on the one hand and through continuous training of involved professionals on the other, thus enhancing a culture of innovation in Europe;
3. The sustainability of business profitability and employment by empowering all the stakeholders to a more specific employment of knowledge and a risk taking attitude enabled by PRIME.

The Consortium

The PRIME consortium consists of 13 partners from 11 European countries, namely Austria, Bulgaria, Denmark, Germany, Greece, Hungary, Israel, Italy, Norway, Portugal, and Switzerland. There are 5 academic and 8 industrial partners covering different academic disciplines and industrial branches.

Scientific and Technological Objectives

The main S&T objective of the PRIME project is the design and implementation of the Virtual Business Environment (VBE) integrated into current work environments, thereby creating a new work environment. This is comprised of the following core technological aims:

- The development of the VBE, supported by an extensible simulation model in the context of manufacturing strategies;
- The support for ubiquity, thus allowing access to the VBE from anywhere and anytime;

- The design and development of intelligent artificial stakeholders;
- The creation of agents that support the user.

The main scientific objectives are consolidated into the following:
- The development of the PRIME methodology that facilitates the integration of VBE in existing work environments;
- The analysis and evaluation of the usability of PRIME.

Project Results So Far

Six months into the PRIME project, much of the design has been developed, including the gameplay, graphical interface, and parts of the simulation model. Up to month 12, the focus will be on refining these elements and implementing the Alpha release of the PRIME game.

The figure below presents a draft user interface for the screen layout when working with one site.

Fig 1: conceptual example user interface of the PRIME game, outlining the navigation view of the virtual world

SHARE – Supporting Rescue Forces with Mobile Data Services and Multimodality

The SHARE project is developing a Push-To-Share mobile architecture that provides critical multimodal communication support for emergency teams during large-scale rescue operations. The project is in its second year now and a system prototype which is already very advanced was presented at CeBIT 2006 in Germany.

The SHARE project is developing a Push-To-Share advanced mobile service that provides critical multimodal communication support for emergency teams during large-scale rescue operations and disaster management. At present, emergency forces use half-duplex channel walkie-talkie technology and are restricted to simple push-to-talk voice communication. All the status information, reporting and documentation for decision making are processed manually. With the introduction of the new service, rescue operations will benefit enormously from sophisticated multimodal interaction and on-line, onsite access to data services providing up-to-date operation status information, as well as details concerning aspects of the emergency, such as location and environmental conditions.

Specific innovations that are developed by the SHARE project include:

- Mobile system architecture design that enables digital, multimodal communication using Push-To-Share technology

- Robust speech and image processing under extreme conditions

- Interactive digital maps with linked multimedia status information

- Structuring of required information using situation-dependent ontologies and multimedia data indexing capabilities

The first prototype of the SHARE system was demonstrated successfully at CeBIT 2006 and will be evaluated at the Fire Department Dortmund in summer 2006. The first review meeting took place in Sankt Augustin, Germany, at the Fraunhofer Campus in November 2005. The rating of the project given by the reviewers was very good. Currently, the consortium is working on the final prototype comprising all functionality intended for the SHARE system. One next step will be the optimization of the mobile network set-up in the working environment of the rescue forces.
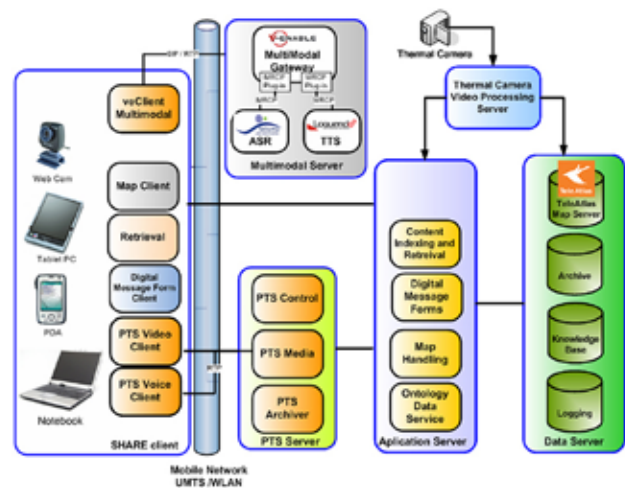
SHARE Data Services

Data Services are available on mobile devices like tablet PCs or PDAs which replace walkie-talkies and which are connected over a mobile network. The application services offered to fire fighters are the following: a digital map service with annotation functionality and LBS, Push-to-Talk audio communication, Push-to-Talk video communication, digital message form communication, automatic indexing of audio/video/text messages and a multimedia retrieval service. The knowledge base which contains an ontology model of typical large-scale rescue operations is located in the core of the system along with a multimedia archive which stores all communication messages together with their descriptive metadata.

As one example of a service offered to fire fighters, the digital map service allows users, amongst other things, to navigate in the map, load aerial views, add graphical and text annotations to the map and switch on and off layers. All information added to the map can be shared with the other participants in the operation to allow cooperative working.

Another example of the services offered is the multimodal GUI of the retrieval service. By voice or keyboard input the user can select different search parameters like media type, communication group, time or keyword and can then search the digital archive on server side for multimedia messages that fit the search parameters. The search results are displayed as a list on client side with additional metadata. At the press of a button the audio/video streaming process for a message can be started. The audio monitor automatically displays audio messages which contain certain keywords critical to the operation like "chemical incident" or "alarm".
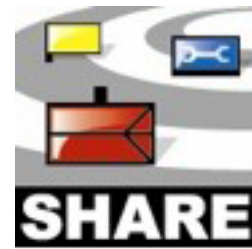
Push-to-Share System Architecture

The figure on this page shows a sketch of the system architecture with its main components, interfaces and end devices. The system architecture follows the concept of the service oriented architecture (SOA) which mainly makes it possible to flexibly model workflows by using collections of application services. These services are remotely accessible over communication protocols like SOAP or SIP (session initiation protocol).

Mobile Network Support

The SHARE system consists of several servers permanently communicating to a set of clients which are spread throughout the operation area. The servers are either located at the mobile operation control centre or at the central fire station. In the first case a mobile network (WLAN, WiMAX) will be set up on-site which connects the clients to the servers. In the second case a public UMTS network would be used to allow access to the servers.

There are some requirements which have to be fulfilled by the underlying mobile network to guarantee full support for the mobile communication and information services used in SHARE.

The services rely on: network coverage of several square kilometres, quick establishment of the network environment to avoid a delay of the rescue operation, sufficient bandwidth and acceptable delay, especially for the communication services PTS Voice and PTS Video. Also important is high security, high robustness against a complete breakdown of the system and high robustness against disturbing environmental factors. Currently, we are evaluating different network scenarios using WLAN, WiMAX and UMTS in order to be able to make a qualified selection of the underlying network technology fitting the above mentioned requirements best.

Conclusion

The first prototype of the SHARE system is available and was presented at CeBIT 2006. One next step is the evaluation of the system in the working environment of a fire department. Feedback from fire fighting exercises will help to develop a real-world system which offers valuable mobile information services to fire departments in Europe.

SIMS - Supporting Innovation of SMEs in Mobile Services and Applications

SIMS supports the evolution and development of the market for Mobile Services and Applications for the citizen. The project assists SME developers of these services and applications to innovate and strengthen their companies to compete globally. Project partners are drawn from Ireland, Poland, Spain, Sweden, and the UK.

SIMS is a Specific Support Action project funded by the Commission of the European Communities within the IST Priority of the Sixth Framework Programme for Research and Technological Development.

The project focus is on small and medium sized enterprises (SMEs) that develop innovative mobile services and applications (MSAs). They are well known for generating the creative user oriented MSAs that business and society need and want. However, in common with many SMEs they face significant challenges as they develop and mature. The aim of the SIMS project is to stimulate the development and use of mechanisms to support their innovation activities.

The project has confirmed that SMEs represent a significant segment of the MSA market and has identified key issues and challenges facing them.

SIMS Background

The market for services and applications for the mobile user and worker is developing rapidly, giving rise to excellent prospects of wealth creation by a large number of firms across the EU, most of them SMEs. These firms act as both suppliers and consumers of innovative services, enhancing the leisure and working lives of citizens, and opportunities exist for them to take advantage of local, EU-wide and global demand.

While all SMEs are presented with innovation opportunities, an important factor for the MSA sector is the push towards Ambient Intelligence, where firms face significant challenges in innovating to match market opportunities. Measures need to be taken that will support the competitiveness and sustainability of these hi-tech innovative companies, the MSA-SMEs, across the EU. The provision of this support is a concern at national, regional and pan-European levels

> **Firms face significant challenges in innovating to match market opportunities**

MSA Arena

The figure below illustrates the relationships between the key players in the MSA arena.
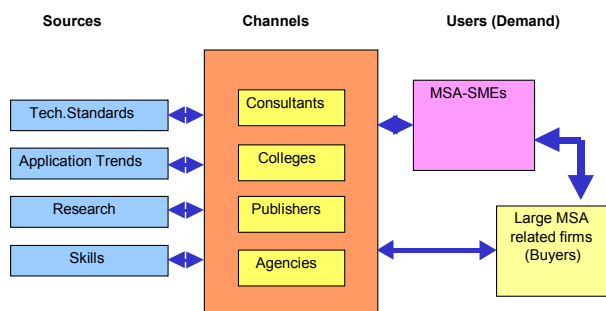
These players are:
- the buyers of MSAs, including mobile network operators (MNOs), mobile service providers, enterprises and suppliers of mobile network infrastructure;
- sources of the primary information and other resources needed by innovating MSA developers;
- channels that collect the outputs of the sources and make it available to users in a condensed/filtered/augmented form;
- MSA developers, of which MSA-SMEs form a subset.

Scope

SIMS addresses the varied circumstances of MSA-SMEs in all parts of Europe, including the New Member States. It considers many avenues that can be taken to improve innovation, with special attention to the way FP6 and FP7 can be suitable enablers.

Project Process

The SIMS project is addressing the following tasks:
- Engage with stakeholder representatives;
- Identify players and their challenges;
- Highlight significant factors and special SME needs;
- Define a roadmap of initiatives;
- Identify opportunities;
- Create awareness of challenges and opportunities;
- Propose and evaluate selected developments;
- Prepare to prolong the impact of SIMS

Key early findings

The project has investigated the challenges, trends and opportunities that face MSA-SMEs as they seek to innovate. It has examined their key knowledge requirements and their use of external sources and channels to support innovation. Our research across five European markets highlights the following early findings:

- MSA-SMEs represent a significant segment of the European MSA developer market;
- Many MSA-SMEs are very small organisations (up to about 25 staff) with limited funds for research activities;
- Many take an increasingly formal approach to product development, and recognise the value of knowledge management systems in addressing innovation challenges;
- Standardisation and regulation would be welcomed by MSA-SMEs, provided that innovation is not stifled as a result;
- Great importance is attached to relationships with other players in the supply chain.

Key challenges for MSA-SMEs fall into a number of areas:

- technical: eg multiple mobile platforms, lack of technical information from MNOs and manufacturers;
- commercial: the relationship between MSA-SMEs and buyers, chiefly MNOs, and the availability of funding;
- innovation: achieving a balance between innovation and product delivery, and identifying the window of opportunity for a particular product or service.

Expected impact

This project is seeking to address the issues and improve the situation by formulating a set of integrated recommendations for the stakeholders to adopt. The aim is to creatively package the output of SIMS for easy access and use via the web and other media.

Recommendations

Key recommendations for MSA-SMEs and sources of innovation support are published on the web site www.sims-eu.com.

The recommendations relate to Market, Collaboration, Partner Programmes, Industry Associations and an on-line forum for information and knowledge sharing, a prototype of which may be found at www.msaforum. eu.

SNOW: Services for NOmadic Workers

SNOW makes possible the production and exploitation of multimodal e-manuals and documentation for mobile operators. It tackles two challenges: How to create and organize the content of multimodal documentation in an efficient and device independent way? How to access and use the documentation through robust interaction modalities in work situations?

The targeted impacts of the SNOW technologies are:
- Efficient operations through direct access to instructions, procedures or know-how, at any location.
- Reliable traceability through on line capture and access to technical facts from the operational field in any work situation.
- Improved work conditions through robust interaction modalities with user accepted field computer or e-assistant.
- Faster fixes for hardware and software failure through expertise projection on the field.
- Increased overall performances of staff deployed and increased quality of operations as a result.

SNOW addresses the production and exploitation of simple or complex multimodal e-manuals.

It fits the requirements for the demanding use case of aeronautic maintenance where mobile workers rely on procedures and often face tight time constraints for achieving high quality operations.

SNOW approach for mediated workers

SNOW is focused on manual worker support:
- The worker often needs both hands free to accomplish his or her tasks. Paper based documentation is not easy to consult during operations and standard devices like a mouse or keyboard are not usable at the workplace.
- SNOW proposes to use the most appropriate modalities according to the situation to interact with e-manuals with a specific attention on voice and gestures. SNOW integrates a multimodality manager for

> **SNOW results are useful whenever nomadic workers need to access to remote information or expertise in the field on work situation**

taking advantage of input and output modalities suited to the mobile industrial context.
- The number of available mobile devices is growing everyday ranging from smart phones and personal data assistants to ruggerised tablet PCs through combinations of head sets and near to eyes displays.
- SNOW proposes to author and model e-manuals with a clear separation between the content and the rendering hints. As a consequence, the e-manuals can be adapted and rendered according to available device capabilities and modalities. With SNOW "You author once, and use information anywhere, anytime, with any device". Standard ISO and W3C based languages XTM-P and 3DML are supporting this approach.

SNOW use case

Maintenance operators equipped with appropriate multimodal client devices access a maintenance portal and procedure databases. While working and without interruption, the operators are able to use the proposed information or services. They can use speech or gesture recognition features to control the system through a wearable microphone and camera. The process instructions are given in graphical, textual or spoken forms according to the device output capabilities. A wireless connection gives them direct online access to the server. In case of disconnection, they can use pre-fetched data stored in the device. When needed, they can quickly contact experts or team members and dialog with them using annotated pictures in addition to an audio connection.

SNOW architecture overview

The proposed architecture supports a wide variety of client devices and is based on existing standards and protocols. A back office authoring environment has been designed for setting up multimodal procedures and tiling multimodal user interfaces. Online, the architecture consists of three elements: databases, servers and clients. A database contains maintenance process documents based on XML Topic Maps (XTM-P) that are rendered according to predefined rendering templates described in Device Independent Markup Language (D3ML). The user annotations and session logs are also stored in databases.

The server adapts the XTM-P documents to the targeted clients according to the D3ML templates. The Ad-

aptation Manager is used for tailoring the Web pages to the clients and they are enriched with information for the multimodal features of speech or gesture recognition as well as speech generation.

The client user interface is rendered by a multimodal Web browser. Maintenance information can be output in graphical, textual or spoken forms. The Integration Manager handles the different input modalities. For use in harsh environments, a special audio-filtering option was developed.

A VoIP functionality is provided for contacting remote experts.
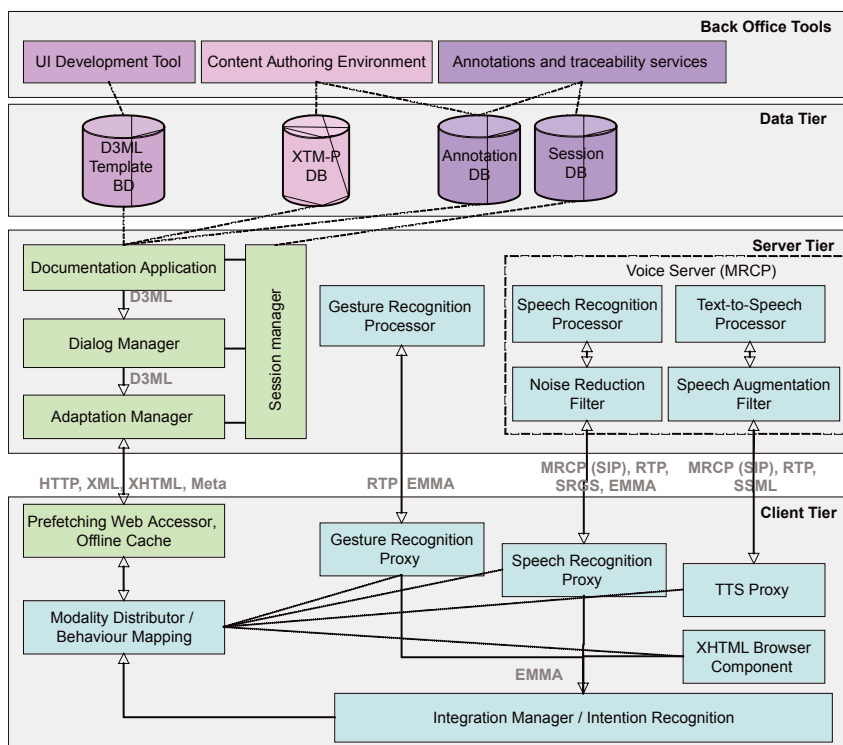
SNOW architecture

SNOW services

With SNOW, we propose the following services that can be used for building mobile multimodal documentation based applications:

- Documentation Services: the multimodal and device independent description language D3ML was developed together with an authoring environment and an infrastructure for mobile access. XTM-P based storage of maintenance procedures allows easy reuse of electronic documentation.
- Knowledge Management and traceability Services: within the architecture provided, annotations can be reused by the author for extending or improving maintenance documents. In addition, session related data can be used for tracing and logging the execution of maintenance procedures.
- Multimodal Interaction Services: we developed a hand-free speech I/O and gesture recognition interface for harsh environments to overcome environmental restrictions.
- Communication Services: we provided a simple collaboration solution for contacting remote experts and for exchanging information with them in the field.

ULTRA: Ultra portable augmented reality for maintenance applications

The project ULTRA aims to apply augmented reality techniques to handheld-PCs in order to aid the mobile worker in the field of industrial maintenance and services.

Augmented reality is an ideal technology for industrial service and maintenance applications. Through the use of a 'near-the-eye-display', a service technician is able to see digital information overlaying the real scene, which, for instance, demonstrates the step by step repairs that need to be carried out.

The ULTRA system is a light and compact system that applies augmented reality techniques to handheld PCs. ULTRA offers a comfortable and unobtrusive solution that integrates augmented reality functionalities with near-the-eye-display, wireless connection and remote support over integrated mobile phone.

The application areas of the ULTRA system span multiple domains, such as the maintenance and support of complex machines, construction and production, and edutainment and cultural heritage. ULTRA aims to play a significant role in pushing the current limit of the existing mobile augmented reality technologies.

The ULTRA concept

The ULTRA system is based on the novel "AR-on-demand" principle, which aims at providing real-time AR overlays on images, rather than continuous real-time see-through augmentation. The "AR on-demand" concept is particularly suitable for augmented reality applications on small devices with limited capacity such as PDAs.

The mobile user, namely the on-the-field technician, takes an image of the machine he is working with. This image is calibrated either per user interaction on the touch screen display of the PDA-unit or automatically through computer vision based registration algorithms. Afterward the image is augmented with a real-time graphic animation demonstrating the maintenance instructions. The augmentation process occurs locally on the PDA-unit. The user may also use the tele-consultation module to communicate with the remote expert. The remote expert can alter the augmentations the user viewed in order to further clarify some steps using the authoring tools. The remote expert sends the new

ULTRA enables the efficient production of electronic 3D- manuals and on-site augmented reality support of mobile workers

content to the user to be displayed on the PDA-unit. The PDA-unit is equipped with a monocular near-the-eye-display, that doesn't obstruct the natural view of the user and offers a maximum comfort due to its light-weight.

The content is created offline (prior to the use of the system) using the ULTRA process and the 3D authoring tools.

ULTRA Benefits & Competitive Advantages

ULTRA is a complete, innovative and economically viable system for augmented reality maintenance applications. The ULTRA system is built upon the current state of the art and provides the following solutions:

- Visualization and rendering core based on the standard library "OpenGL ES". The goal of the ULTRA implementation is to introduce high level rendering concepts to handheld PCs.
- High level graphics on handheld PCs. The 3D rendering engine developed for the ULTRA system is particularly performant and flexible in order to enable the implementation of a large spectrum of usage scenarios.
- Augmented-reality runtime system. The ULTRA run time system will integrate traditional multimedia players, the new 3D real-time rendering engine and augmented reality functionalities.
- Tele-consultation with augmented reality capabilities. The innovation of the ULTRA project relies on the on-line authoring of the images sent by the mobile worker.
- Workflow editor/engine and template based authoring tool. ULTRA aims at developing an optimized system for quick and easy editing of electronic AR manuals.
- Near-the-eye-display. The ULTRA near-the-eye-display is based on new high-tech materials and integrates additionally a camera and earphone. The integration is particularly compact and robust, suitable for industrial applications.

Usage scenario 1

The service technician equipped with the ULTRA device arrives at the location of a faulty command machine in order to perform the necessary maintenance actions. He captures an image of the machine and performs some preparatory tasks, i.e. image calibration actions.

The image calibration comprises the selection of a series of simple points on the captured image with the PDA pen. After the calibration is finished the technician browses on the maintenance task list of the specific machine and selects the type of maintenance he is about to perform. He wears his near-the-eye-display and the earphones and says "Go" in order for the first presentation to start. As soon as the first step of the task is over, he immediately performs it himself. Once he is ready he says "Continue" and the presentation of the second step begins. The presentation consists of 3D animations and text overlaid on the captured pictures accompanied with audio explanations

Usage scenario 2

A novice service technician is about to perform the repair of a switchboard. As soon as he arrives in the location of the switchboard he switches the ULTRA system to the tele-consultation mode and contacts the remote expert. The remote expert guides him to capture the correct picture and performs remotely the necessary image calibration. Subsequently the technician on site wears the near-the-eye-display and watches the steps of the maintenance task as they are projected on the captured image in the form of 3D animations, texts and audio descriptions. When the presentation is over he begins the repair of the switchboard. The technician is constantly observed and assisted by the remote expert who receives a live video feed through the integrated camera of the ULTRA device.

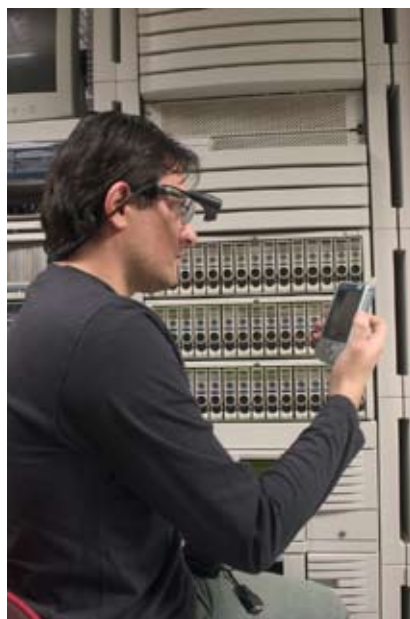fig. 1: Virtual instruction overlaid onto the command machine

fig. 2: The ULTRA user equipment

wearIT@work: Empowering the mobile worker by wearable computing

For wearable mobile computing a new paradigm supporting complex tasks with a minimum of active human-machine interaction is developed by wearIT@work. Mobile professionals keep their attention focused on the work environment supported by valuable information provided by LivingLab solutions of wearIT@work.

- The real break-through in **wearable computing** is still awaited; only a few solutions have been an economic success.
- As the way of working is drastically affected by wearable computing **user acceptance** is a key issue.
- With the four application domains of **healthcare, production maintenance** and **emergency response** most important sectors of Europe's economy are addressed.
- Opportunities are created in Europe, with its high labour costs, since **productivity and quality of life** are increased by the unobtrusive information provisioning solutions of wearIT@work.
- **New business** for the technology providers, systems integrators and consultants are generated.
- **Standardization activities** based on the open wearable computing platform and software framework have a significant effect after the project ends.

The wearIT@work approach

Through **workplace studies** and **design workshops** in **LivingLabs** processes are studied at the end users' sites. Prototypes are designed and evaluated together with the end users. Every one of the project's partners is involved in at least one of the application domain oriented LivingLabs.

Based on the **know-how** brought by the partners to the project – e.g. the belt computer QBIC - and results of the first innovation cycle – e.g. an interaction wristband - a **techno-logy repository** and a collection of **demonstrators** were set up. Possible **take-up actions** are being promoted during road shows in 2006. With the **IFAWC** (International Forum for Applied Wearable Computing) a scientific community building process around the project has been established.

> **A new field of business is expected to evolve based on the project's results.**

A new generation of optimised **collaborative man-machine interfaces** was developed, with body-near context detection and innovative input and output devices, and will be marketed already at this stage of the project. Further **hardware** and a first version of the **software framework** are available.

Hardware Platform

The **open wearIT@work hardware platform** consists of a core wearable computing unit, input and output devices, general peripherals, and sensor and communication subsystems. The platform provides the end-user with seamless access to heterogeneous networks and allows the integration of different sensor devices for context detection and for human computer interaction devices reflecting the working environment requirements.

Software Framework

The **open wearable computing software framework** (OWSF) is based on the common hardware platform which is of great importance both within and beyond the project since it impacts the exploitation of wearable computing solutions in general.

The addressed standardization pushes developers of devices, components and systems.
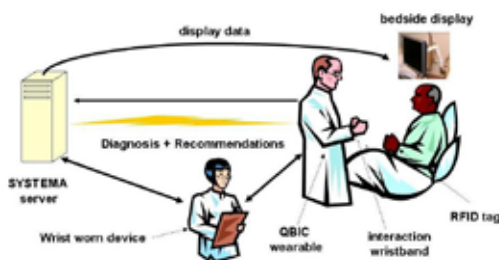
Besides a service registry and high level services the OWSF covers core services such as context awareness, communication, I/O, and security.

Systems integrators and consultants develop their businesses based on the OWSF.
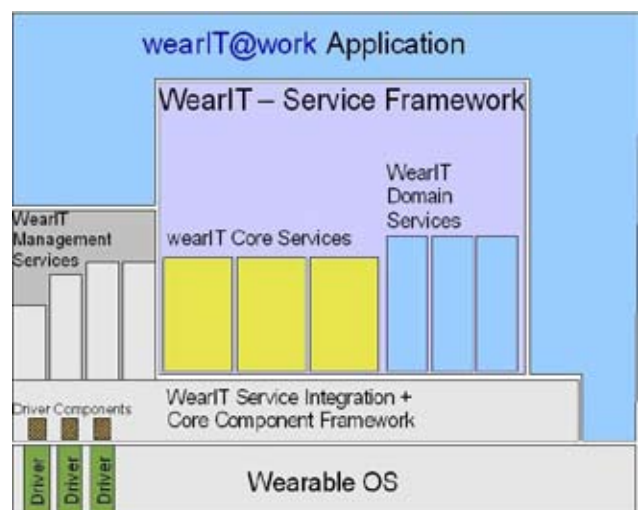
Demonstrators

In the first innovation cycle wearIT@work developed six demonstrators working together with the end-users, one for the healthcare, one for the maintenance pilot, and two each for the production and emergency response pilots which were developed and evaluated. The **demonstrators** showed that the integration of information technologies in nearly every working process can be mostly based on commercial-off-the-shelf components.

However, HCI and context detection require specially designed components and were therefore tailored to reflect user requirements. **Technology experiments** were used to validate proposed solutions for the forthcoming innovation cycle. A **technology repository** of wearIT@work hardware and software components and solutions as developed for the demonstrators was set up and is intended for use beyond the lifetime of the project e.g. for the take-up actions.

Standardization

The **Open Wearable Computing Group** (OWCG) was established by the project and prepares the ground for a paradigm-centered standardization body coping with the different aspects of wearable computing in an interdisciplinary fashion by bringing together developers, integrators, users, policy makers, associations, etc. Different work groups or special interest groups concentrate on: e.g. Wearable Computing hardware, software and applications, user, organizational and educational aspects.

Standardization is necessary for collaboration on the spot, without overheads; the OWCG will increase awareness beyond the wearIT@work project, facilitated by its strong industrial consortium.

> **wearIT@work results exploitation**
> A take-up action with a preliminary road show is set-up to foster the exploitation of project results and create the awareness for the solutions for collaboration on the spot, without overhead from wearIT@work.

An Adaptive P2P Software Infrastructure for Emergency/Disaster Scenarios

WORKPAD is a STREP Project with top-level scientific partners, some industrial companies and a user partner, which investigates an adaptive Peer–to–Peer Software Infrastructure for Supporting Collaborative Work of Human Operators in Emergency/Disaster Scenarios

The Workpad project aims at building and developing an innovative software infrastructure (software, models, services, etc.) for supporting collaborative work of human operators in emergency/disaster scenarios. In such scenarios, different teams, belonging to different organizations, need to collaborate with one other to reach a common goal; each team member is equipped with handheld devices (PDAs) and communication technologies, and should carry on specific tasks.

The main objectives and research activities

The project will investigate a 2-level framework for such scenarios: *(i)* a back-end peer-to-peer community, providing advanced services requiring high computational power, data & knowledge & content integration, and *(ii)* a set of front-end peer-to-peer communities, that provide services to human workers, mainly by adaptively enacting processes on mobile ad-hoc networks. The Consortium consists of a complementary set of top-level scientific partners, a world-leading industrial company, very focused SMEs and a user partner capable to take up Workpad results (i.e., Calabria – Homeland Security Department]). Such a Consortium composition guarantees the successful execution of the project as well as the widest exploitation of its results.

Contribution to the European research Area

The Workpad project exploits technologies related to P2P architectures for adaptive mobile workflow management and data integration in the context of emergency scenarios. This aspect is consistent with the focus of IST 2005/06 Work Programme Objectives on the future generation of technologies. Moreover Workpad investigates basic research issues in important areas (P2P oriented architectures, ad-hoc networks, mobile geo-collaboration) belonging to the demanding field of New Collaborative Working Environments, and applies

such results to specific scenarios, considered very important for EU and national policies. Finally, Workpad interfaces with other technologies and applications, among which analysis and recovery management methods after disasters and emergencies, and the use of geo-information in P2P architectures, and geo-referencing methods and applications.

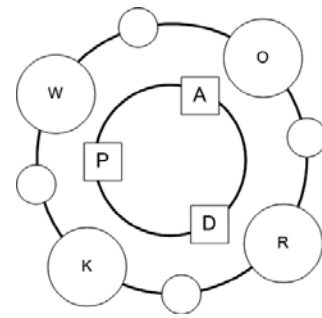## Key issues and research questions of WORKPAD

The Workpad project distinguishes between a *back-end* peer-to-peer community, providing advanced services requiring high computational power, and a set of *front-end* peer-to-peer communities, that provide services to human workers:

- The back-end community is comprised mainly of static/traditional computers, possibly arranged in a GRID, that interact in a P2P fashion. Such services, coarse-grained, require integration of data & knowledge & content. The interesting aspect is that the community is inter-organizational (each peer belongs to a certain organization) and each system is enabled to act as service provider, requestor, or integrator. In particular, the integration should be dynamic, flexible, and non-intrusive.
- A single front-end community comprises of the operators of a team, equipped with mobile devices, connected in an ad hoc and peer-to-peer fashion, that carry on a process, in which the adaptability to connection/task anomalies is fundamental.

In order to support such a complex scenario, from the provision of data & knowledge & content to front-end teams to their process executions, different research problems must be addressed:

- Devising a 2-layer peer-to-peer architecture, including both the back-end peers and the front-end teams.
- Investigating novel basic techniques for P2P data & knowledge & content integration, to be exploited on the back-end.
- Investigating novel adaptive and context-aware techniques for cooperative work and workflow management among mobile devices on the front-end, with attention to usability issues.
- Investigating how to exploit and leverage geo-referenced information that plays an important role both (i) in the dynamic building of the back-end integration system and (ii) in the adaptive process management on the front-end teams.

- Devising appropriate solutions around emergency communications, wireless communications and robust link (i.e., connecting front-end and back-end) networks (e.g., satellite-based, TETRA-based, etc.), as they are key elements in helping emergency services respond in extreme situations.

P2P semantic link with other centres, to be dynamically set-up for integration & inter-organization coordination purposes

Semantic links with other external sources

Web

Centre, that provide data & knowledge & content

WORKPAD P2P Back-end

Robust and reliable communication channel (link)

MANET of devices
- each device offers services
- the coordinator device enacts the team process

At a glance: WORKPAD

An Adaptive Peer-to-Peer Software Infrastructure for Supporting Collaborative Work of Human Operators in Emergency/ Disaster Scenarios

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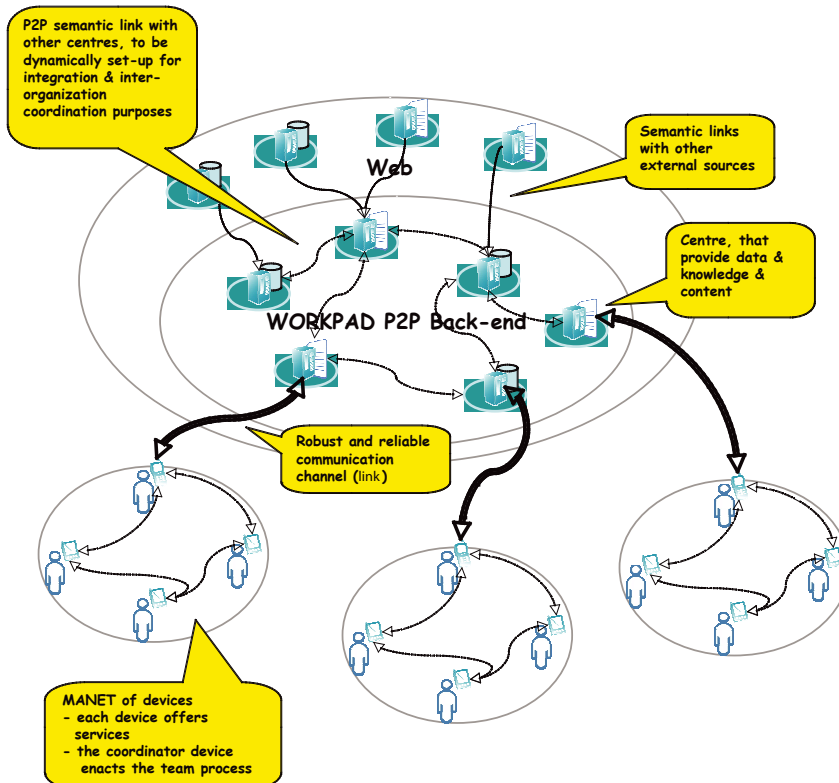
Duration: Sep 2006 – Aug 2009

Total cost: € 3,164,410

EC funding: € 1,850,000

Strategic Objective:
2.5.9 Collaborative Working Environments

Project Identifier:
FP6-2005-IST-5-034749

Subject to contract.

WORKS: Work organisation and restructuring in the knowledge society

WORKS is an Integrated Project with 17 EU and Accession State partners which investigates in a comparative perspective the major changes in work in the knowledge-based society.

Taking account of the global forces and of the regional diversity within Europe, the project will investigate the evolving division of labour within and between organisations and the related changes at the workplace. The implications for the use of skills and knowledge, for flexibility and for the quality of work, as well as the impact on occupational identities, time use and learning of individuals will be investigated in a comparative perspective. The role of the social dialogue and of the varieties of institutional shaping in Europe will receive particular attention.

The main objectives and research activities

Taking account of the global context and of regional diversity within Europe, the project will: integrate knowledge on changes in work in the KBS (knowledge-based society); analyse existing quantitative data based on the identification of best practice indicators; carry out organisational case studies to provide windows into the restructuring of value chains; carry out qualitative research at the individual and household level in order to analyse the quality of work, time use, learning and occupational identities; identify relevant institutions and policy trends in the areas work regulation and industrial relations.

Contribution to the European Research Area

There is a clear added value in carrying out the project at a European level. The approach to the analysis of work organisation and quality of life, first, takes as a starting point the recomposition of economic activities at international (European or global) level and, moreover, is comparative in investigating different institutional contexts. The research will cover the variety of European national economies, labour markets and welfare systems in view of developing policy recommendations.

WORKS will develop activities beyond the project by establishing a global reference group to compare European developments with those elsewhere and to identify the niches of European regions in the new global division of labour in the knowledge economy and by involving the social partners and other policy stakeholders.

Contributions to an integrated ERA include the development of methodologies for comparative qualitative research into work organisation and of methods for forecasting future trends; the training of researchers. Gender mainstreaming is included in all aspects of the project.

Key issues and research questions of WORKS

The project will focus in particular on new forms of work organisations that will be analysed taking account of global value chain restructurings and regional institutional contexts. Four thematical issues are at the core of the research:

Changes in work organisations from the perspective of global restructuring of value chains

Changes in work organisation can only be understood fully in the context of a global restructuring of value chains, entailing a simultaneous decomposition and re-composition of sectors, organisations and labour processes. A complex array of drivers of these restructuring trends can be identified: the globalisation of markets, the liberalisation of trade, the development and spread of new information and communications technologies, the deregulation of labour markets and the public sector.

Changes in use of knowledge and skills and different ways of achieving flexibility

These changes in work organisation and at the workplace are accompanied by (and in some cases enabled by) the codification of skills and knowledge leading simultaneously to new forms of flexible and autonomous 'knowledge work' but also to new forms of Taylorism. This can result in a dual process of decomposition and re-composition of skills and occupational identities and to different ways of achieving flexibility.

Changes in the use of time and occupational identities and implications for the quality of life of individuals

Because work organisation is shaped interactively both by structural forces and by the agency of individuals at a local level, it is necessary to combine the study of organisations with the study of individuals. The ap-

pearance on the labour market of new groups and the changing patterns of labour market behaviour are decisive factors for the social impacts of changes in work, which affect groups differently according to their specific social positions, gender, ethnicity, age, educational background and other social variables. Occupational identities are blurring, professional trajectories more uncertain and individuals are confronted with the need for a different time use. These changes can have a deep impact on the quality of life.

Social dialogue and the regional institutional context

The 'knowledge-based society' cannot be seen as a single undifferentiated global entity. Regional and national institutions continue to contribute to distinctive trajectories, thus rendering it necessary to carry out comparative research and develop explanatory models for differing regional development paths and to consider what this means for the European context.

How to achieve this?

The ambitious research objectives of WORKS will be achieved through a comprehensive and coherent programme of research involving several disciplines (sociology, economics, organisation analysis, labour studies, psychology, gender studies, political science) and carried out by 17 expert researchers from 13 European countries. The research programme of WORKS encompasses four key pillars and three horizontal dimensions.

The four key pillars are:
- 'theories and concepts' aimed at innovating theories and concepts on changes in work;
- 'quantitative research' valorising existing statistics by setting up secondary analysis on existing survey data and contributing to the European convergence of surveys;
- 'qualitative research' carrying out case study research combining organisations, individuals and the institutional context;
- 'research on policy, institutions and the social dialogue' comparing changes in work from a regional perspective.

The three horizontal dimensions are:
- training initiatives: developing training for researchers on comparative research;
- going beyond: involving the scientific community beyond the project through dedicated initiatives during the project's lifetime;
- gender mainstreaming: applying gender mainstreaming throughout all aspects of the project.

Annexes

5.1 Annex 1: European RTD Project Sites

Acronym	Title	Website
AMI@NETFOOD	Development of Long-term shared vision on AMI Technologies for a Networked agri-food sector	www.ami-netfood.com
AMI4SME	Ambient Intelligence Technology for Systemic Innovation in Manufacturing SMEs	www.ami4sme.org
AMIRA	Advanced Multi-modal Intelligence for Remote Assistance	www.amira.no
BEACON	The potential socio-economic impact of broadband access and use on new forms of pan-European trading, collaborative work and advanced public service provision	www.ovum.com/beacon/
BEANISH	Buildind Europe-Africa collaborative Network for applying IST in Health care sector	www.ifi.uio.no/beanish
BrainBridges	Collaborative technologies and environments enhancing the seamless creativity process, leveraging the full European potential.	www.brainbridges.info
C@R	Collaboration@Rural: a collaborative platform for working and living in rural areas	not available yet
CASCOM	Context-Aware Business Application Service Co-ordination in Mobile Computing Environments	www.ist-cascom.org
CEEC IST NET	Supporting IST Organisations from Central and Eastern Europe	www.eu-istcommunity.net/
CLOCK	Challenges of Collaborative Working Environments	www.clock-project.eu
COMIST	AMI@work - COMmunities stimulating participation of NMS and ACC organisations in eWork and eBusiness related IST activities	www.mosaic-network.org/comist
CoreLabs	Co-creative Living Labs for CWEs	www.corelabs.eu
CoSpaces	Innovative Collaborative Work Environments for Individuals and Teams in Design and Engineering	www.cospaces.org
CoVES	Collaborative Virtual Engineering for SMEs	
CREATE	Creative processes for enterprise innovation	www.createproject.net
CyberManS	CYBERnetic MANufacturing Systems	www.crfproject-eu.org
DiFac	Digital factory for Human-oriented Production	www.difac.net
EACE	Expediting Adoption of e-working Collaborative Environments	www.eace-project.org
EC-BRIDGE	EU-Chinese forum on eWork, eLogistics, Research networks and Broadband solutions for mobile user and worker	www.atosorigin.com
ECOSPACE	eProfessional Collaboration Space	www.ip-ecospace.org
eLOGMAR-M	Web-based and Mobile Solutions for Collaborative Work Environment with Logistics and Maritime Applications	www.elogmar-m.org
ENGAGE	Engineering Emotional Design	www.engage-design.org/
eu-DOMAIN	Enabling users for - Distance-working and Organizational Mobility using Ambient Intelligence service Networks	www.eu-domain.eu.com
EUROPEAN IST	Enhancing the participation of research organizations from Associated Candidate Countries to the 6th Framework Programme	www.european-ist.net
Finance-NMS-IST	IST Financial Training and Web Portal for NMS	www.finance-helpdesk.org
GET IN	Getting Small and Medium-sized Enterprises from Candidate countries To INcrease participation on IST projects	www.getin-project.com/

Acronym	Title	Website
InAmI	Innovative Ambient Intelligent Based Services to support life-cycle Management of flexible Assembly and Manufacturing Systems	www.inami.eu
inContext	Interaction and Context Based Technologies for Collaborative Teams	www.in-context.eu
INTUITION	Network of excellence on virtual reality and virtual environments applications for future workspaces	www.intuition-eunetwork.net
IST Academies	IST Academies for new Members States and Accession Countries	
IST World	Knowledge Base for RTD Competencies	www.ist-world.org
IST4BALT	Information Society Technologies Promotion in Baltic States	
Laboranova	Collaboration Environment for Strategic Innovation	www.laboranova.com
LIAISON	LocatIon bAsed servIceS for the enhancement of wOrking enviroNment	http://liaison.newapplication.it
MobileIN	Harmonised Services over Heterogeneous Mobile, IN and WLAN Infrastructures	www.ist-mobilein.org/
MobiLife	Mobile Life	www.ist-mobilife.org
MOSAIC	Mobile Worker Support Environments: Aligning Innovation in Mobile Technologies, Applications and Workplaces for Location-Independent Cooperation and Networking	www.mosaic-network.org
MULIMOB	Multilingualism and Mobility Specific Support Action	www.mulimob.org
Network4Value	Study	
OpenFutures	Future Centers as Collaborative Working Environments	www.open-futures.net
POMPEI	P2P location and presence mobile services for managing crisis and disaster situations	www.pompei-eu.com
POPEYE	Professional Peer Environment Beyond Edge Computing	www.ist-popeye.eu
PRIME	Providing Real Integration in Multi-disciplinary Environments	www.alfamicro.pt/prime
ROBOT@CWE	Advanced robotic systems in future collaborative working environments	
SEEMSeed	Study, Evaluate and Explore in the Domain of the Single Electronic European Market	www.seemseed.net
SHARE	Mobile support for rescue forces, integrating multiple modes of interaction	www.ist-share.org
SIMS	Supporting Innovation of SMEs in the Mobile Services and Application Supply Business	www.sims-eu.com
SNOW	Services for NOmadic Workers	www.snow-project.org
SOCQUIT	Social Capital, Quality of Life and Information Society Technologies: Evidence-based dynamic modelling support for the IST Priority	www.socquit.net
STAR-NET	Support to Associated Countries and New Member States	www.project-starnet.com/
ULTRA	Ultra portable augmented reality for industrial maintenance applications	www.ist-ultra.org
wearIT@work	Empowering the mobile worker by wearable computing	www.wearitatwork.com
WORKPAD	An Adaptive Peer-to-Peer Software Infrastructure for Supporting Collaborative Work of Human Operators in Emergency/Disaster Scenarios	not available yet
WORKS	Work organisation and restructuring in the knowledge society	www.worksproject.be

5.2 Annex 2: Glossary

3G Third generation mobile and wireless communications

AET (Asociación Española de Teletrabajo)
Spanish Telework Association.

AFTT (Association Française de Teletravail et des Téléactivités)
French Telework Association.

Ambient Intelligence (AmI)
The concept of ambient intelligence provides a vision of the Information Society where the emphasis is on greater user-friendliness, more efficient services support, user-empowerment, and support for human interactions. People are surrounded by intelligent intuitive interfaces that are embedded in all kinds of objects and an environment that is capable of recognising and responding to the presence of different individuals in a seamless, unobtrusive and often invisible way.

AR Augmented reality

Broadband
Generally data transmission speeds in excess of 1 Mbps. Contrast modem speeds of 28.8Kbps and an ISDN channel of 64Kbps.

Browser
The software used to display HTML pages on the World Wide Web. Netscape's Navigator and Microsoft's Internet Explorer are the world's most widely used browsers.

BTA Belgian Telework Association

Cable modem
A device that interfaces between coaxial cable television/voice channel and home computing equipment. Holds the potential for providing high speed Internet access.

CAD Computer Aided Design

CAMEL Customized Applications for mobile network enhanced logic

CBR Case-based reasoning

CME Collaborative Manufacturing Environments

CRM Customer Relationship Management

CSR (Corporate Social Responsibility)
The business contribution to sustainable development and CSR is a concept whereby companies integrate social and environmental concerns in their business operations and in their interactions with their stakeholders on a voluntary basis. CSR is

complementary to other approaches of ensuring high environmental and social performance in an ongoing learning process for companies and stakeholders.

CSCW (Computer Supported Cooperative Work)
The software tools and working methods used to support team work, especially virtual teamwork (q.v.). It includes the use of computer conferencing, electronic 'white board' systems and use of Intranets. A more popular, though restricted, term is groupware (q.v.).

CWE Collaborative working environments

Cyberspace
A term used to describe the imaginative "space" where people communicate electronically using email and other online services, normally over the Internet. The name was originally coined by William Gibson in his science fiction novel Neuromancer to describe the "world" of computers, and the society that gathers around them.

Desk Top Conferencing (DTC)
Video conferencing where communication is from computer-to-computer, rather than remote video camera to local monitor.

Digital economy
Characterisation of the new global economy dominated by digital infrastructures, i.e. electronic or digital networks based upon ICT infrastructures and especially the Internet. (See also network economy).

DRM Digital Rights Management

eCommerce
Sales and purchase of goods or services over telecommunications networks, notably the internet.

EDI (Electronic Data Interchange)
The exchange of structured electronic messages (such as orders or invoices) over special telecommunications networks to replace paper transactions.

eEurope
An initiative by the European Union to accelerate the development of the knowledge economy, operating from 2000 to 2005.

eGovernment
The use of information and communication technology in public administrations combined with organizational change and new skills in order to improve public services and democratic processes and strengthen support to public policies.

EGNOS (European Geostationary Navigation Overlay Service)
Satellite navigation system under development with three geostationary satellites and a network of ground stations. It will become operational by the end of 2005 and is a precursor of Galileo (q.v.)

eWork
Work practices making use of information and communication technologies to increase efficiency, flexibility (in time and place) and the sustainability of resource use.

Extranet
A network using Internet protocol, that allows external organizations, such as suppliers or customers, access to selected internal information. In essence, it is an Intranet (q.v.) which gives external users restricted access (for example using password protection) to particular information through the firewall.

EURON EU robotics research network

FP
European Union Framework programme for research; e.g. FP6 is sixth FP for period 2002 – 2006 (www.cordis.lu).

ftp (File Transfer Protocol)
The process for transferring binary files (e.g. documents or software) across a network.

Galileo
A constellation of 30 Medium Earth Orbit (MEO) Satellites (includes 3 active spares) supporting a Global Navigation service. This will, in time, permit the development of various Value Added Services. (www.esa.int/esaNA)

GPRS
General packet radio service for intermediate generation of 2.5G frequency bands, used in mobile and wireless communications.

Groupware
A class of computer software that allows several users to collaborate through sharing information. Computer conferencing and group decision support systems are types of groupware.

GSM
A European standard for cellular phone digital communications. Allows mobile phones to be used in countries across Europe and certain other parts of the world (over 130 in total).

HTML (HyperText Markup Language)
The code used on WWW pages to instruct the browser how to display the text.

http (Hypertext Transfer Protocol)
The protocol used to transfer information across the WWW. It indicates that the information is encoded in HTML (q.v.).

i2010
An initiative by the European Union which is focussing on information, innovation and inclusion in the knowledge economy, launched in 2005.

ICT (Information and Communications Technology)
A generic term that covers both information technology (computer hardware and software) and telecommunications equipment and services.

IN Intelligent Networks

Information Society
The term adopted the European Commission to indicate a society where information is a key component of economic and social activity. Citizens, both consumers or workers, use information intensively.

Intelligent Agent
A piece of software using artificial intelligence techniques that operates autonomously using a set of rules. A common type of agent is one that roams the Internet and searches out information. Other types filter incoming information and messages for items of relevance to particular users.

Internet
A network of computer networks, estimated to be around 10 million world-wide. Any computer can join the Internet and exchange information, provided it makes an appropriate physical connection and operates the TCP/IP protocol. See also Intranet and Extranet.

Intranet
An internal Internet. In other words an internal computer network that runs the Internet Protocol (TCP/IP). Most Intranets have a computer 'gateway' to the wider (external) Internet and deploy a 'firewall' to prevent unauthorised access to a company's information.

IPR (Intellectual Property Rights)
Rights to intellectual material, normally in the form of content on electronic networks, where it can be difficult to control copying and use without the IPR holder's knowledge and/or permission.

IPv6
Internet protocol, version 6, which significantly extends the web address space and provides extra functionality on quality of service, security, simplified network management etc.

ISDN (Integrated Services Digital Network)
Services that allow sharing of multiple devices on a single line, e.g. telephone, fax and computer access to online services. Basic rate ISDN service (ISDN-2) consists of two 64kbps digital communications channels, while primary consists of 32.

ISP (Internet Service Provider)
A supplier of Internet services including access. Originally distinguished from IAPs (Internet Access Provider) since they provided the major back-bone connections between countries, and sold on bandwidth to smaller local IAPs.

IST (Information Society Technologies) Programme
A European Union research, technology development and demonstration programme under the Fifth Framework (1999-2002) and Sixth Framework (2002-2006). The IST 6th Framework Programme includes the area of IST for economic challenges and the subarea of new working environments.

IT (Information Technology)
Strictly speaking it is only computer hardware and software not including telecommunications equipment and services (cf. ICT), but is often used synonymously with ICT.

J2EE Java 2 platform, entreprise edition

J2ME Java 2 platform, micro edition, suitable version for mobile devices

LAN (Local Area Network)
A network that connects computer together within a small area, usually a single office. Facilities such as printers and disks can be shared. Many LANs have gateways to connect their users to external services such as the Internet.

LBS Location-based services

Markup language
A markup language combines text and extra information about the text. The extra information, for example about the text's structure or presentation, is expressed using markup, which is intermingled with the primary text. While the idea of markup language was originated from text document, there is an increasing usage of markup languages in areas like web services (http://en.wikipedia.org/wiki/Web_service) etc. See also WAP / WML (q.v.)

MPEG (Moving Picture Expert Group)
A group that defines compression standards for video (moving) images, notably MPEG-2. MPEG-4 defines images in terms of objects and their attributes, making it easier to manipulate audio-visual objects remotely over networks.

NAS (New Accession States)
The 3 countries negotiating accession to the European Union: Bulgaria, Romania, Turkey.

NC (Network Computer)
A computer that relies on a computer network for its ongoing operation and software, which is downloaded as required.

NEDO
New Energy and Industrial Technology Development Organisation, a major Japanese research funding agency.

Network economy
Characterisation of the new global economy dominated by networks, i.e. multifarious nodes and connections in contrast to hierarchical and otherwise controlled economies. Normally means the electronic or digital network based upon ICT infrastructures and especially the Internet. (See also digital economy).

NTF (Nederlands Telewerk Forum)
The national teleworking association in The Netherlands

OECD Organisation for Economic Co-operation and Development (www.oecd.org)

P2P Peer to peer

PDA
Personal digital assistant – a lightweight, hand-held, generally pen-based computer used as an organiser for personal information, may be combined with mobile or wireless technology to provide a mobile office.

PLMN Public Land Mobile Network

QoS Quality of Service

RISI (Regional Information Society Initiatives)
Part of the Article 10 of the Structural Funds.

SEEM Single European Electronic Market

SIP Session Initiation Protocol

SIT (Societa Italiana Telelavoro)
A national society for teleworking in Italy.

Social Partners
Organized representatives of labour market interests such as employers associations' and trades unions.

SOHO (Small Office Home Office)
Defined by marketers as a segment of buyers with common characteristics. This is a small office, that may be part of a person's home. The amount and size of equipment used is generally lower than that in large offices, and users more cost sensitive.

SME (Small to Medium Enterprise)
In European Union terms this is defined as an enterprise which has less than 250 employees, is less than 25 per cent owned by large companies, and has a total turnover of less than 40 MECU or annual balance sheet of less than 27 MECU. This definition dates from 1996, and replaces and earlier definition that included enterprises less than 500 employees. It includes medium, small (less than 50 employees) and micro-enterprises (less than 10 employees).

Sustainable Development
Development that meets the needs of the present without compromising the ability of future generations to meet their needs. Sustainable development is as much directed at governments as it is at business and society and as such is a broader concept than social responsibility initiatives which is solely directed at businesses.

TCA (Telework Association)
The biggest telework association in the UK, although its roots are in the telecottage movement and its full title was previously The Telework, Telecottage and Telecentre Association.

Teleactivity

A generic term, not widely used, to include all types of teleactivity that are part of telework, teletrade or telecooperation. Examples of teleactivities are teleshopping, telebanking, telemedicine etc.

TETRA Terrestrial trunked radio

TWI (Telework Ireland)
The professional association of teleworkers in Ireland.

UMTS (Universal Mobile Telecommunications System)
The third generation mobile standard that supports speeds up to 2 Mbps, and designed as a successor to GSM. Its name is slightly misleading in that one of its aims is to provide seamless services to users across both fixed and mobile networks.

UPnP
Universal plug and play – an industry forum with the objective of enabling simple and robust connectivity among stand-alone devices and PCs from many different readers.

VHE Virtual Home Environment

Videoconferencing
The use of camera (with microphone) and monitor to allow visual communications over a high-speed communications link (typically 1Mbps or higher) instead of proximity face-to-face communications.

Virtual Communities
Communities that have been developed around an area of common interest, and use online techniques to sustain themselves.

Virtual Organization
An organization of various independent members that operates cooperatively (and may have been created) without the constraints of space and/or time.

Virtual Teams, Virtual Teaming
The concepts of virtual working applied to a work team. Members of the team work at different locations and use teleco-operation methods to progress their joint work.

VoIP Voice over IP

VPN Virtual private network

VR Virtual Reality

W3C
WWW consortium made up of a group of companies in the wireless market, whose goal is to provide a common markup language for wireless devices and other small devices with limited memory.

WAP / WML
Wireless Application Protocol / wireless markup language, based on XML and used to create pages to display on handheld wireless devices.

Webcasting
Broadcasting live video and audio data over the Internet. For example, speeches and talking heads from conferences can be received by Internet users over the ordinary telephone network in real time.

WWW (World Wide Web)
The collection of HTML pages that reside on Web servers across the world.

XML
Extensible markup language used for the interchange of data elements (documents) on a web page.

For further information, please contact:

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