ISTAG in FP6

Working Group WG3:

"Research results exploitation"

WG3 final Report

September 2003

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Executive Summary

The IST (Information Society Technologies) Advisory Group (ISTAG) mission is to provide orientations for the implementation of the ICT research in the Community Framework Programmes and the development of the European Research Area in this field. ISTAG A Working Group (ISTAG WG3) was set up at the ISTAG plenary meeting of the 21/1/2003 in order to reflect and provide recommendations on the exploitation and impact of ICT research.

The Working Group mission

The mission has been identified as follows:

To provide recommendations regarding means to improve impact of ICT research in Europe in the context of the development of a European Research Area. This includes the means to design and implement ICT research and innovation strategies across Europe that facilitate the transformation of research into value for the economy and society.

An extensive literature exists today including national and European level reports as well as Commission green and white papers on technology transfer and exploitation of research results in Europe. They all converge on the capacity and the need in Europe to improve significantly research exploitation. The latest Communication of the Commission[1] on how to reach the 3% of GDP for research includes a whole set of measures that can help improve the exploitation of research results in all fields. The Working Group has focussed on recommendations for the ICT field taking into account the suggested measures.

The report is not intended to be comprehensive or exclusive in terms of all possible means to improve research impact but **focussed rather on specific recommendations** that the members of the group identified as important for the ICT field. For each of these recommendations, the members of the group have attempted to **provide concrete examples** based on their own experience. The recommended actions are targeted either at the definition and implementation of the IST priority in FP6 and in the next Framework Programme or are more aiming to external actors including industry and the member states.

[1] Communication of the Commission to European Council and Parliament: Investing in research: an action plan for Europe

Main recommendations and findings

- ***A focussed effort is needed to address technical and business complexity at the "system level"***

  Competition in innovative ICT is global and research is conducted worldwide and skills are starting to be available across the globe. **The competitive edge is more in the capacity to master not only technology building blocks but also their integration into "systems"** (platforms or environments) on which high value applications, products and services can be built. This is in general, a weakness in European research that translates into gaps between the building blocks and the applications. This gap needs to be filled in **with focussed research integrating the blocks as they become available.**

  Mastering the technology chain is not sufficient. Innovation is not in the technology but in its use. For that, the alignment of business and technical expertise is vital. **An early integration of business aspects (e.g. exploitation scenarios) needs to be done** as well during the research phase without limiting innovation and creativity. **The difference between ICT and most other research areas is that the technology adoption cycle can be very fast**. This adds new challenges to the mastering of the value chain from technology to exploitation, in business or society, and requires the systematic combination of expertise as well as iterative research-development-testing-validating processes.

  The new instruments in FP6, in particular Integrated Projects, aim at addressing some of the above challenges. The implementation following the first calls would enable an assessment of the degree to which this is achieved. The presence of system-level research areas in the Workprogramme and the calls is equally important. Proper **combination of strategic objectives** of the Workprogramme **into a system view project should be facilitated**. Evaluation should be revised to reflect the importance of system level and cross-disciplinary research. The first and last round in evaluation should concentrate on the strategic merits of the proposal. Some money should be allocated for proposals combining several strategic objectives.

- ***Building consensus around open standards and interoperable systems: What is new?***

  Consensus building and cooperation around common objectives (that are translated into open standards) are well recognised assets of European ICT industry. The example of the GSM success illustrates this clearly. **Today, the situation in various ICT fields is nevertheless confusing with "no or many" open standards available**. The danger is that proprietary systems become the only alternative for users and that market dominance of non European companies in fields such as operating systems expands further to emerging fields. This will not only limit innovation but weakens the current positions of European industry

  The means to help the emergence of consensus depend on each sector. There is no one method for standard developments and this should be addressed on a case by case basis. What is clear though is that by **bringing the different actors together and helping the building of shared ambitions and goals across industry, academia and public authorities,** success is highly possible.

Many forums in ICT exist today in a rather fragmented way. **It is often the case that several standardisation bodies, research forums and regulatory or other policy related forums work at the same time on a particular topic in an uncoordinated way**. More should be done to bring these closer together on a systematic basis in the main ICT fields so that technology development is closely articulated with standardisation, regulatory measures and deployment policies. The different actors can then agree together on technology and implementation objectives and roadmaps to achieve them. Consensus at European level helps enforcing European position and interests at the international level.

- ***Redirecting and better using public investments: Europe can do better with ICT***

ICT is essential for improving many public and general interest services in areas such as health, transport, security, education and learning, leisure and environment. It does not only increase the efficiency and quality of services of governments and administrations but also provides new services and applications. It also improves the interactions between governments and citizens. Public spending represents 15% of GDP in Europe and covers many such fields where ICT can bring significant improvements.

Governments should be therefore at the forefront of ICT adopters not only of established technologies and solutions but to steer the development of new ones. This is a more common practice in the US than Europe. In particular, public spending on defence in the US has played, and continues to play a key role in supporting ICT development and use**. Europe's public sector has the potential to develop critical mass of first users** in several ICT fields. **This does not require additional public financing but redirecting of existing spending** to increase efficiency and effectiveness.

The members of the Working Group **recommend that such investments take into account previous experiences, successes and failures, so that errors of the past such as in educational computers are not repeated.** One of the means to avoid such errors is to acquire or order novel ICT and applications **through competition and "technology neutral" approaches**.

- ***Support the exchange and mix of people and skills across industries and academia***

The best channel for technology transfer is "people". Intensive efforts have been deployed in the last 10 years to bring closer links in Europe between industrial and academic research in all technology fields. **There are many best practices in the ICT field that can be shared between the member states and the effort needs to be sustained and reinforced**. Success stories can be observed both in large EU countries with strong industrial bases as well as in smaller countries that have been able to draw industrial presence by the excellence of the research and the willingness to cooperate. **The group encourages even closer ties between industry and academia with for example on-campus industry-academia research labs.**

Equally important are the links between large and small companies that can benefit from each other. SMEs are an essential source of innovation as they have the agility to react and adopt novel ideas as they emerge. Several large companies are increasingly

establishing close ties with pools of SMEs around their core activities that they often nurture and support. The interaction should be balanced to be effective and should be generating win-win situations by which SMEs gain access to large clients and markets.

The mix of industrial development poles (large companies and SMEs) with research and technology poles and higher education institutions has been extremely valuable in ICT and was instrumental for building European strengths. **The experiences in areas such as microelectronics and communication systems are highly successful and need to be repeated in a more systematic way in other ICT fields.**

Indeed the Framework programme projects have been also instrumental to effective cooperation between industry (large and small) and academia across the Union. **There is a danger though that the new FP instruments create ghettos:** for large companies (IPs), academia (NoEs) and SMEs (STREPs). **SMEs, in particular, have various roles in the innovation process and can join in projects as they evolve**.

The ICT constituency can also make a better use of the Marie Currie fellowships of the EC Human Capital programme to support the exchange of young researchers between industry and academia across the Union. The scheme can be very valuable and does not seem to be exploited sufficiently by the ICT industry, in particular SMEs, and public research labs. In order to support as well the exchange of people between academia and SMEs, the funding schemes of Community projects can consider supporting up to 100% researchers (PHD students) hired by an SME for an EU project.

- ***More can be done to foster further the culture for risk taking in ICT***

It is essential to look at this particular aspect following the burst of the financial bubble. Ideas have developed during the 1995-2000 period that Europeans in general and researchers in ICT in particular have little or no interest in entrepreneurship and risk-taking in comparison with their transatlantic colleagues. **It is true that entrepreneurship and risk taking can be further promoted in Europe** but the big difference with the US is **mostly related to the financial and business environment** and not always to the underlying behaviour of European researchers.

Between 1995 and 2000, the US with exceptionally low interest rates (for a full employment period) has drawn immense flows of financial capital that was pouring into the technology field, in particular ICT, for its growth potential. This has generated the financial bubble of dotcoms and Internet that ended with the burst. **The haziness of the 1995-2000 period and the burst of the bubble do not affect the fundamental potential of ICT that is still a high growth field with many opportunities for European researchers and entrepreneurs.** To be able to seize these opportunities and transform technology progress into a sustained economic growth, more need to be done **to introduce a solid business and entrepreneurship culture**.

For that, the group sees the need to further develop initiatives such as networking, education and coaching that target potential ICT entrepreneurs (e.g. common business-technical campuses, "coaching" networks). The aim is to foster experience sharing, innovators-investors interactions and the high level mastering of combined business-marketing-technical skills. **Many such initiatives exist already such as the Investment**

forums supported by the IST programme and by member states. They should be pursued and further strengthened both at national and community level.

- ***New content value chains***

  Hindering the further development of digital technologies is the Content creation and delivery new value chains. The market value of the Content industry is shrinking every year as downloading and copying increase systematically. No law enforcement has been effective so far. This will endanger all new creation and the further development of the technology. **The WG has no immediate solution for that problem but dialogue platforms bringing the different actors together at an international level are essential** today to be able to identify what are the underlying new values in the business chain.

1 INTRODUCTION AND METHODOLOGY

The ISTAG WG commenced by identifying and analysing a list of roadblocks that undermine the exploitation of ICT research results in Europe. Some of these are applicable to all research fields but have specific features and importance in ICT. The list of all the roadblocks considered by the group is given in Annex.

In order to provide concrete recommendations, the WG has tried to address the roadblocks in the different ICT environments both, as they are currently and in the way they might evolve in the future. These included ICT in the home, the personal environment, the car, in learning, in health applications, on the move etc… This helped in elaborating the characteristics of the roadblocks and provided direct examples of their implications and the way to overcome them

After this first step, it was decided to concentrate on those roadblocks whose impact is likely to be more important taking into account the current and future ICT contexts. These have been grouped under 7 major themes:

- Bridging the gap at the research level: The missing "systems" layer in ICT
- Open Standards and interoperability: Increasingly dominant requirements across the value chain
- User involvement, the role of public sector as "first buyer": Europe can do better with ICT
- People as the key vehicle for technology transfer: The ICT case
- Entrepreneurship and risk taking in ICT: Is Europe really bad?
- Content/IPR protection: The threat for the digital industry
- Consumers needs and early involvement

Each of these is addressed in a chapter of this report. Recommendations were formulated for action at Community level, in particular in the Framework Programme, or for action across Europe in the Member States.

There are various possible impacts of a research activity. The most direct impact is on science and technology itself. Advancing scientific and technology know-how is a valuable outcome by itself provided that it has potential implications on society and economy. It is clear today that scientific and technology breakthroughs often emerge as a result of intensive and sustained research effort in a particular field exploring various avenues to address a specific problem. It is also clear that spin off results, not initially foreseen, are as important as (if not more than) those anticipated at the outset of a research action.

The focus was mainly on public actions and policies that can support the exploitation of research results in ICT. The conclusions present the findings of the group during the time allocated to this work. Some subjects might require further elaboration.

2 BRIDGING THE GAP AT THE RESEARCH LEVEL: THE MISSING "SYSTEM" LAYER IN ICT RESERACH

2.1 Mastering an increasing level of complexity

ICT innovations today are stemming from the combined progress in different ICT fields and often from combining ICT with other disciplines. With Computing and Communication capabilities becoming ubiquitous and flexibility/programmability introduced at all levels, the borders between software and hardware development, are totally blurred and technology layers are getting more and more encapsulated into increasingly complex systems. The increasing complexity does not only affect the technical value chain but also the business and exploitation channels of ICT products and services.

More than ever, research needs to be embedded as early possible in a full value chain development in order to enable the mastering of an increasingly complex chain of technologies and business channels. This is a key requirement for new business to be generated adding value to existing products and services. The competitive edge is in the capacity to master not only technology building blocks but also their integration into "systems" (platforms or environments) on which high value applications, products and services can be built.

Such a research is in general, lacking in European research in a focussed way, be it in the FP or at national level. This translates into gaps between the building blocks and the applications and brings an additional obstacle in transforming research results into business and societal successes.

This gap needs to be filled in with focussed research integrating the blocks as they become available. The new instruments in FP6 provide a means to address this problem provided that such research is also clearly called for in the Work programme.

Taking examples from the early stages of the Internet WWW-technologies, the first browser developed to render HTML documents and a related service infrastructure was possible with very limited amount of resources (both human and system resources). The first commercial browsers have been simple to develop because of the relative low complexity of representations and related protocols. The business benefit of distributed multimedia documents that can easily interlink various electronic documents was easy to sell, so the customer-base grew rapidly driving again the R&D to develop new functionality and services in that specific domain. Today's new browsing techniques and search engines need to be semantic rich for media spanning from text to sound and videos.

Examples of areas of research at systems/platform level include:

Open platform for mobile handsets: .Currently there are several mobile handset platforms composed of a defined architecture and operating system: Symbian, Smartphone, Java (J2Me), BREW,… These platforms are open to a varying degree. For Symbian only access to hardware is closed and for Smartphone and BREW practically everything is closed. Symbian is directed by a consortium of companies, while Smartphone and BREW are controlled by single companies. Java and BREW are virtual machines and they need an underlying platform, like Symbian. However, none of these platforms is 100% open. However, it must be recognised that the current situation is not only the result of a lack of research but due to commercial and economic considerations in the mobile market.

Open application framework for mobile systems: In order to encourage the development and deployment of applications and services, it is recommended to have platform agnostic mobile application framework. This would make services and applications independent of the underlying operating system. Related items for R&D are software tools for producing applications and services, XML, RDF, databases, security and mobile servers.

Services and applications for converging networks: Wireless Broadband data access can be done through 3G networks or WiFi networks. There are also other short and longer range radio technologies under development or deployment. All the different radio technologies need to function together. We need focused R&D on the various issues of convergence including value chain and service providers.

2.2 Combining skills

Mastering the technology chain is not sufficient. Innovation is not in the technology but in its use. For that, the alignment of business and technical expertise is vital. An early integration of business aspects (e.g. exploitation scenarios) needs to be done as well during the research phase without limiting innovation and creativity. The right balance needs to be found in each ICT research project or initiative so that exploitation scenarios are built incrementally as research evolves.

The difference between ICT and most other research areas is that the technology adoption cycle can be very fast. In many ICT research fields such as software technologies, interfaces or networking and communication systems the results can be exploitable rapidly provided that the right exploitation channel is identified. This adds new challenges to the mastering of the value chain from technology to exploitation, in business or society, and requires the systematic combination of expertise (technical, marketing and business) as well as iterative research-development- testing-validating processes.

Although these comments and needs are not new, many examples still show across Europe that more needs to be done today. In France for example, there are two different and completely separate “schemes” for studies that attract the French elite students: Management, marketing and finance schools on one side and engineering schools on the other side. Huge efforts are deployed today to build synergies between the two schemes that are delivered in completely separate settings. An interesting case is the “Plateau de Saclay” near Paris. Progressively, this initially rural space has been populated with more than 10 prestigious business and engineering schools that have moved from central Paris. Each was developing by its own with few or no collaboration between business and technical institutions. A huge effort is being invested today to create more synergies and cooperation but the task is not finished yet.

2.3 Recommendations

The Working group therefore recommends:

- That more research is supported at community level and in the member states integrating full value chain development. This includes long term as well as medium term research at the system level and should complement work in building blocks and applications. Examples of such research fields are provided above.

- Business cases could be developed on sounder basis in research projects than currently done. The closer a project to the market, the more precise and effective its business plan should be. This will require additional expertise in projects in order to anticipate customer expectations and needs. This expertise can only be built by creating closer ties between marketers and business professionals in companies with their own researchers or from academia.

  The issue is not so much to transform researchers into businessman unless they wish so but to combine skills in a project so that aspects like users and customers' behaviours are integrated at the earliest stages and incrementally as the project evolves. For instance, rapid feedback from relevant pilot customers/users could be essential for identifying price/performance trade offs as well as total cost of ownership. This can be embedded further into the evaluation process of the IST projects in FP6. Evaluators, depending on the target time-to-market of a project, should consider projects as a Venture Capital organisation would do.

- Evaluation should be revised to reflect the importance of system level and cross-disciplinary research. The first and last round in evaluation should concentrate on the strategic merits of the proposal. This could be a short round concentrating only on this topic and with separate people than in the other rounds of evalution. These issues should be reflected in the interpretation of the evaluation criteria in the other evaluation rounds.

- Proper combination of strategic objectives of the Workprogramme into a system view project should be encouraged and facilitated. Some money should be allocated for proposals combining several strategic objectives.

3 OPEN STANDARDS: UNLOCKING BUSINESS DEVELOPMENTS ACROSS THE VALUE CHAIN

3.1 No one standardisation model fits all

If lessons from the past show that de-jure, government-imposed standards were not always successful in ensuring business developments, no standards or only proprietary de facto standards are hindering business developments and innovation in many new ICT sectors. From anarchy to monopolies, there are various sector-dependent models for standards and standardisation schemes that can help maximise business developments. As computing and communications become increasingly ubiquitous and ICT devices and applications networked and interlinked, open standards become instrumental for interoperability across the value chain.

The working group considers that the lack-of open standards[2] or the presence of too many standards, combined with inappropriate licensing schemes, is a major hurdle for successful

[2] "open" means non-proprietary, and either free from IPRs or licensable on fair, reasonable and non discriminatory terms

technology deployment. There are at least three cases where problems at the standardisation level occur:

- *"Deliberate" blockage by providers:* there are often deliberate blockage in standards bodies by a few market players who wish to retain the use of proprietary protocols, interfaces or platforms in the marketplace. This creates market fragmentation that is in most cases detrimental to the business at large.

- *Too many open standards*. convergence of the broadcasting, IT, computing, telecoms and content industries means that alternative standards for similar services are being produced by different standards organisations arising from the requirements of different market sectors. This is leading to non-interoperable implementations in the marketplace which is impeding take-up. Standards being over-specified and allowing too many options can have a similar effect leading to interoperability difficulties.

- *Genuinely missing open standards*: this is most common for research results where proper standardisation schemes are not built into the research work. It would be useful to analyse the reasons for missing open standards as this could lead to useful lessons on the attitude of relevant market players.

Europe can further capitalise on the capacity of its industry to build consensus around common objectives and approaches that provide win-win situations for providers across the supply chain, for customers and consumers. The means to help the emergence of consensus depend on each sector. There is no one method for building consensus around open standards developments this should be addressed on a case by case basis. What is clear though is that by bringing the different actors together and helping the building of shared ambitions and goals across industry, academia and public authorities, success is highly possible.

3.2 Examples abound!

There has been many cases in recent years where technology, infrastructure and devices already exist but no or little applications have been developed, or no or little business has been generated with the existing applications: e.g. WAP in mobile phone, interactive Digital TV. Missing elements that could stimulate the uptake include standard platforms for application development, standardised mechanisms for billing and payments, etc.

To illustrate the diversity of requirements, one can distinguish for example 3 environments: the PC, the Home and the mobile. In the PC, Microsoft has established a series of standards: Windows, IP, Pentium, Tomorrow Passport for security, Windows Media for content protection. These standards are established and we must take these into account when defining mCommerce and eBusiness standards environments. European initiatives should at least lead to a standard and open-to-competition environment in the areas of Home consumer and Mobile. These two environments are different but standards for example for application software platforms should be coordinated between these 2 environments. An important effort has been deployed by industry and in Community and member states programmes to address this issue. These could be capitalised on.

The case of mobile

The mobile market is evolving towards deployment of a myriad of applications that require use of network resources. Examples for network resources could be SMSC (Short Message Service Centre), MMSC (Multimedia Message Service Centre), Presence Server and User Profiles Server. Applications in areas such as mobile commerce, mobile entertainment, instant

messaging and other, require access to various network resources in order to utilise their full potential value to the end-users. What is missing is as a standard framework that will define the access schemes of multiple applications to multiple network resources. A focused R&D in this field may encourage successful progress in this area.

A key role can be played by the Open Mobile Alliance (OMA)[3]. OMA was formed in June 2002 and as of November 2002 includes 300 companies. The member companies represent the world's leading mobile operators, device and network suppliers, information technology companies, application developers and content providers. The representatives of the whole value chain are working together to ensure seamless mobile services for end-users worldwide. OMA aims at defining industry wide requirements, common architectural framework, open standards for enabling technologies and end-to-end interoperability.

Similar consolidation and mass creation initiatives, similar to OMA and applied to other IST fields could allow optimising and maximising the resources spent in the area.

The case of the Home Consumer (TV) market

Digital terrestrial TV is deployed differently in each country. The largest volume of digital broadcast is through satellite. Satellite decoders are proprietary for each TV operator and are not inter-operable. A European digital TV standardisation could cover satellite TV, terrestrial TV or both. What is still lacking despite the research effort at Community level, is te wide diffusions of an standard platform for the development of application software that needs to include a standard application programming interface and also content protection and a mechanism for billing collection. Open standards to enable much of this have been developed but are not used due to proprietary (monopoly) interests.

The case of an e-business framework

eBusiness is critical to Europe's competitiveness vis-à-vis the US and an open e-business framework, allowing a critical mass of customers and more interoperability is required. Many proprietary solutions and applications have been developed, but the level of interoperability is still weak. There are still numbers of competing standardization activities in this area, although there are some signs of consolidation for XML for business transactions around the ebXML initiative (UN/CEFACT and OASIS). However, new developments such as web services are tending to enhance market confusion. In Europe, CEN/ISSS is acting as a focal point on key eBusiness standards issues, and participation in its different activities should be encouraged, to strengthen European contribution to the global process.

3.3 The Standardisation process: a brief survey

The 3 European Standards Organisations (ESOs) formally recognised by the EU are CEN, CENELEC and ETSI. ETSI allows direct membership and participation by industrial players who have the most interest in deploying the standards once developed. This is also now the general rule in the ICT parts of CEN (CEN/ISSS) and CENELEC through open workshops.

[3] OMA is founded on four key principles:

- products and services are based on open, global standards, protocols and interfaces and are not locked to proprietary technologies,
- the applications layer is bearer agnostic (examples: GSM, GPRS, EDGE, CDMA, UMTS),
- the architecture framework and service enablers are independent of Operating Systems (OS),
- applications and platforms are interoperable, providing seamless geographic and inter-generational roaming.

The result is that consensus building in the ESOs is as fast as it is in industry consortia, and is more open and available to all interested parties, including notably the consumers.

Globally, the ITU provides an open environment for standardisation, and allows direct membership and participation by industry (as Sector members). It has speeded up the development of standards through the Alternative Approval Procedure (AAP) which allows new standards to be developed and approved faster than in many fora and consortia, although these can be delayed or blocked by the concerted interests of major players, for example by one member state acting on behalf of its own industry interests. On the other hand many fora and consortia, once held up as examples of how to get new standards developed quickly, can get entrapped in a morass of vendor interests and it can be difficult to get standards developed that meet a wider set of industry and consumer needs.

3.4 Recommendations

- Sustain and strengthen the support to interoperability and to open platforms development (incl. free standards licensing schemas) in particular with R&D projects implying the development and adoption of open standards that work horizontally. Examples include platform agnostic mobile application framework and tools for middleware and application development where links with standardisation, including consortia such as OMA in the mobile area, need to be fostered. This could be done either by funding the participation of project partners in standardisation bodies or by supporting the presence of representatives of standardisation bodies in projects.

- Develop mechanisms by which the different actorsare able to agree together on research and technology implementation objectives and roadmaps. These would lead to initiatives combining research activities with deployment actions. It is important to have the roles of the different funding sources and government interventions (regulatory or financing) clarified at the outset. Such mechanisms can only be effective if they are set up at the European and even international level.

  Creating forums, processes or dialogue platforms by which the above can happen is a task where public authorities have a key role. Many such forums exist today in a rather fragmented way. It is often the case that several standardisation bodies, research forums and regulatory or other policy related forums work at the same time on a particular topic in an uncoordinated way. More should be done to bring these closer together on a systematic basis in the main ICT fields so that technology development is closely articulated with standardisation, regulatory measures and deployment policies. The Commission can be active establishing such processes whenever there is sufficient industrial interest and technology is mature enough (e.g. next generation personal networks, home platforms or platforms-agnostic mobile application frameworks). It should be recognised that consumers are key players in these processes and consumer representation should not be hampered by lack of resources.

- Open source software seems very effective in breaking monopolies of proprietary systems. It introduces a new means to help develop de-facto standards that have built-in openness. The success of Linux as an alternative operating system is a clear example for interoperability at the servers' level. The role of open source in the innovation process can be further elaborated in new or other working groups.

- Improvements could be also brought in standardisation bodies such as ensuring that:
  - standards are developed in an open and transparent process open to all key players, including industry, consumers and regulatory authorities,
  - standards should ideally be free of IPR concerns, but if this is not possible any IPR should be licensable on fair, reasonable and non-discriminatory (FRAND) terms,
  - standards are driven by industry, but European user and consumer requirements must be fully reflected. This can be achieved by full participation in the European process of the three ESOs, with their links to global activities, as well as by adequate European involvement in global consortia.

4 USER INVOLVEMENT, THE ROLE OF PUBLIC SECTOR AS "FIRST BUYER": EUROPE CAN DO BETTER IN ICT

4.1 Early big buyer in ICT: The public sector can have a key role

Public spending in the EU represents around 15% of GDP and covers many fields where ICT can be applied. ICT is essential for improving many public and general interest services. It does not only increase the efficiency and quality of services of governments and administrations but also provides new services and applications. It also improves the interactions between governments and citizens.

Areas like *e*Government, *e*Health, and *e*Learning are high on the political agenda. First steps towards the modernisation of public sectors have been achieved but the big challenges are still ahead. The role of ICT will become even more important with enlargement, demographic changes and with new security needs. It will enable to respond to new needs in areas such as health, transport, security, education and learning, leisure, environment, etc

Governments should be therefore at the forefront of ICT adopters not only of established technologies and solutions but of new innovations. This is essential in order to both validate these new solutions and to stimulate further developments.

This seems to be a more common practice in the US than in Europe. In particular, public spending on defence in the US has played, and continues to play a key role in supporting ICT development and use. Actors like DoD, NIH and DoE have played an important role in the USA either as big purchasers or as the suppliers of financial means or in giving prescriptions to others so that they can act as purchasers. There are several examples of innovations developed for DoD that has turned into a civil, profitable business (not the least being Internet).

In Europe, these public actors in practice seldom have used their power to act as the big purchasers they are or when they do, it is done only at national level and does not represent a critical mass. This represents a clear weakness in Europe and often leads to missing opportunities of transforming ICT breakthroughs into business and societal successes. The weakness spreads across the economy. In particular, companies hesitate to develop new businesses using ICT for sectors strongly influenced by public financing or public sector activity. Companies directly or indirectly dealing with governments become increasingly conservative, which makes half of the economy an unfavourable area for new businesses growth.

4.2 Learning from the past: Successes and failures

Governments have the potential to develop rapidly a critical mass of first users of technology. They are ideal "first buyers". This does not require additional public financing but redirecting of existing spending which in the long run will lead to less public spending through efficiency and effectiveness gains. Public procurement should be therefore more systematically applied not only to acquire state-of-the art technologies that can help improve public services but even more to order new technologies that do not exist yet but that can be developed.

One has to be cautious though and make sure that mechanisms take into account previous experiences, successes and failures, so that errors of the past such as in educational computers are not repeated. One of the means to avoid such errors is to acquire or order novel ICT and applications through competition and "technology neutral" approaches.

Different policies for public big buyers in different Member States makes it also difficult for companies to develop business strategies for the parts of the European market that are strongly influenced by public financing. Coordination of member states ICT deployment activities such as in the eEurope initiative can be essential to avoid fragmentation, create critical mass of use and benefit from scale-factors. This can be coordinated also with research activities in the context of ERA so that there is a continuum between RTD and its uptake. Pilot actions aligning research initiatives with public sector spending at a European scale would be commendable.

It is important that public investors do not act as protectionists by favouring domestic companies, because this would be the end of European business in the long run. But if public purchasers and public procurement-regulations take into account the important role they could play as first/early actors they could open up for a potential rising market on a European level.

Four elements are essential in a public procurement policy aimed at developing the role as big buyers, in order to contribute to a potential rising market using new technology:

- *Perseverance.* Things takes time, every new movement or technology introduction must be seen over a relevant time perspective.

- *Predictability.* Commercial actors must be able to predict the actions taken by big purchasers to foster a readiness to invest in new technological innovations.

- *New actors.* Regulations and procurement-policies must be designed in a way that makes it possible for new companies and SMEs to compete and/or cooperate with large and well-known companies.

- *New technology.* Public purchasers should act to support, but not subsidize, the use of new technology to stimulate more efficient solutions.

In several Member States, there are national programs for promoting a 7 days/24 hours – policy for public service. By setting up targets and promote actors to contribute, a new market could emerge. In UK for example one target is to make all government services available electronically by 2005.

4.3 Early Policy makers' involvement, avoiding the catch-22 situation

Technology for technology will not solve the issues and there is a need to transform the back office, the processes and methods in the public sector in order to reap the benefits of ICT.

There is here a risk of ending up in a catch-22-situation. For example: there are new technology and new innovations that could be used to make education in schools more efficient, but the curricula is not adjusted to the new technology and therefore entrepreneurs and investors avoid to invest in new businesses. Ministries of Education would like to support new technology in schools and to allocate public financing for this purpose but they do not know how to do it and are not able to adjust the curricula until they feel safe with the new use of new innovations. *Caught up in a catch-22-situation, the result is uncertainty.*

This is a problem in many countries world wide but in Europe this is an urgent problem because innovators and companies have to deal with 25 different curricula/policies and that of course reinforce the hesitation.

Involvement of Policy makers in initiatives aligning R & D activities with deployment and adoptions actions would be essential at the earliest stage possible. Early involvement and dialogue with the institutions that are responsible for policies and regulations could set aside impediments that otherwise would appear as unexpected problems and extend the time for the new technology to be introduced to the market.

One successful example are the EMINENT-conferences organised by the European Schoolnet, where a true exchange of views and ideas between policymakers, researchers and people from the Commission are taking place about ongoing and coming projects. This could be further strengthened.

4.4 Recommendations

- Develop pilot actions aligning RTD activities and ICT deployment initiatives in the public sector in areas such as health, security, environment, education and transport. The aim is to trigger public interest in new (existing, under preparation and projected) ICT based solutions. These should involve at the outset all actors as appropriate including policy makers, industry and researchers.

- Early big buyers' strategies should be benchmarked. "Early-big-buyer-strategies" in ICT that have been carried out in different member states and for different public investors should be investigated and compared. The aim is to understand what kind of strategies – if any – is most successful to stimulate technology adoption and new businesses.

- More coherence between different funding mechanisms related to IST (structural, FP, innovation) should be pursued, combined to more co-ordination of deployment and take-up initiatives (e.g. Galileo - an interesting case of joint initiatives with however difficulties for matching funds).

5 EXCHANGE AND MIX OF PEOPLE AND SKILLS ACROSS INDUSTRIES AND ACADEMIA

5.1 Multidimensional mixing of people and skills

Intensive efforts have been deployed in the last 10 years to bring closer links in Europe between industrial and academic research in all technology fields. This is if course essential for a two way exchange of knowledge: Academic research results to industry and industrial

requirements and needs to academia. What is more useful as well is the ability to build together shared research objectives and approaches.

There are many best practices in the ICT field that can be shared between the member states on such effort that need to be sustained and reinforced. Success stories can be observed both in large EU countries with strong industrial bases as well as in smaller countries that have been able to draw industrial presence by the excellence of the research and the willingness to cooperate.

Equally important are the links between large and small companies that can benefit from each other. SMEs are an essential source of innovation as they have the agility to react and adopt novel ideas as they emerge. Several large companies are increasingly establishing close ties with pools of SMEs around their core activities that they often nurture and support. The interaction should be balanced to be effective and should be generating win-win situations by which SMEs gain access to large clients and facilities.

The mix of industrial development poles (large companies and SMEs) with research and technology poles and higher education institutions has been extremely valuable in ICT and was instrumental for building European strengths. The experiences in areas such as microelectronics and communication systems are highly successful and need to be repeated in a more systematic way in other ICT fields.

Indeed the Framework programme projects have been also instrumental to effective cooperation between industry (large and small) and academia across the Union. This adds an important dimension in the flow of the knowledge and should be maintained. There is a danger though that the new FP instruments create ghettos for large companies (IPs), academia (NoEs) and SMEs (STREPs). This is to be avoided in order to maintain and improve the sharing of knowledge across the Union and the rapid exploitation of research results and novel ideas where ever they emerge. SMEs in particular have various roles in the innovation process and can join in projects as they evolve. In particular many SMEs see value in contributing to the medium term research towards the development end. Links between the framework programme and the Eureka clusters which are normally more downstream, can be helpful in that respect as well.

5.2 The best vehicle for technology transfer: People

One of the best channels of technology transfer from academia to industry and vice-versa, is of course the transfer and exchange of people. This should be implemented both ways so that industrialists make the academic world (research and education) benefit from their experience and to make industry benefit from knowledge acquired in public research labs.

There also, there are many experiences that can be shared by the member states with very successful schemes implemented across the Union such as support to do PhDs in industrial labs, support for leaves for industrialists to take positions in Universities and joint industry academia research labs. The latter is a new phenomenon that seems to be highly successful. There are very often done at national level apart from the Community programmes such as Human Capital.

In that respect, the ICT constituency can also make a better use of the Marie Currie fellowships of the EC Human Capital programme to support the exchange of young researchers between industry and academia across the Union. The scheme can be very

valuable and does not seem to be exploited sufficiently by the ICT industry, in particular SMEs, and public research labs. In order to support as well the exchange of people between academia and SMEs, the funding schemes of Community projects can consider supporting up to 100% researchers (PHD students) hired by an SME for an EU project.

There are many cases of US university professors having one (or more than one) company developed with their research themes. This is not common in Europe. Until very recently , it was even forbidden in France for a public researcher or a professor to have shares in a start up company. The "law for innovation" in July 1999, changed the rules and authorized such situation where a public researcher can have share in small companies (spin off) and can play a significant role in that company even if he/she keeps his/her position in the research lab.

The experience of mobility from public research labs to industrial organisation and vice versa is sometimes difficult to recognise in term of career progression. One of the best examples is the case of the PhD value for young engineers in Europe. (The three years experience of a PhD is very difficult to recognise and people usually have to start at the same salary than the younger ones who don't have the equivalent of research experience)

5.3 Recommendations

- Encourage and inform the ICT constituency to use of the Marie Currie fellowships of the EC Human Capital programme to support the exchange of young researchers between industry and academia across the Union. The scheme can be very valuable and does not seem to be exploited sufficiently by the ICT industry, in particular SMEs, and public research labs. This should include many different kind of exchanges (short term journey, common projects, PhD Students, etc.).

- Investigate and implement schemes supporting the mobility of people from industry to the research labs: short stay of some months in a public lab, part time work as associated professors or associated directors, share of PhD thesis supervision, etc.

- Explore the possibility of funding in Community projects up to 100% researchers (PHD students) hired by an SME for an EU project.

- Ensure that the current instruments in FP6 in particular IPs and NoEs are used to favour collaboration between all constituencies including large companies, SMEs, academia as well as public sector users. Establish more links with more downstream programmes like the Eureka clusters should be established. Use these instruments in particular Networks of Excellence to support the exchange of people between SMEs and Large Corporations, as well as research and industry. This should be articulated with the use of the Marie Curie fellowship.

- Promote mechanisms for better recognition (in terms of career progress) and measurement of the value (in monetary terms) of periods of work exchange between industry and academia could be identified as well as means to valorise the double branches people management system (technical and management branches) .

6 ENTREPRENEURSHIP AND RISK TAKING IN ICT: HOW GOOD IS EUROPE?

6.1 Is there an attitude problem in Europe?

Europeans in general and researchers in ICT in particular are considered to have little or no interest in entrepreneurship and risk-taking in comparison with their transatlantic colleagues. It is true that entrepreneurship and risk taking can be further promoted in Europe. The difference with the US is often related to the financial and business environment and not always to the underlying behaviour of European researchers. SMEs are still the largest employers in Europe and far ahead of most other industrialised region including the US.

Between 1995 and 2000, the US with exceptionally low interest rates (for a full employment period) has drawn immense flows of financial capital into the stock markets and to support merger and acquisitions activities. Pulled by these large exit markets, Venture Capital was pouring into the technology field, in particular ICT, for its growth potential. Enormous amounts of financial capital were at the disposal of researchers in the US to start new companies. All this has generated the bubble of the dotcoms and Internet for which creativity and innovations were more in the business plans than in the real business that is behind. The burst followed. The upsurge in entrepreneurship took time to spread into Europe for many structural reasons but was caught up by the burst of the financial bubble.

The burst of the bubble do not affect the fundamental potential of ICT that is still a high growth field with many opportunities for European researchers and entrepreneurs ; but more need to be done to build a solid business and entrepreneurship culture. This is increasingly challenging and require an effort on the public and private side.

There are regions in Europe (e.g. Northern Italy) where a few decades ago entrepreneurship was pervasive. But at that time it was relatively easy to put a business together because the level of expertise required was rather low both from the technical viewpoint (e.g. machine tools etc.) and the business viewpoint (e.g. salesmanship). Today's situation is completely different, particularly for ICT. Technologies and systems are often more sophisticated and business models are complex (see chapter 2).

There is also a stock of experience that member states and also companies can share on spin-offs creation (through benchmarking / best practice identification). This helps develop "intra-preneurship" and support technology deployment. Example of BT ; where spin-offs are created with a support of a specific department - 50% belonging to BT ; 50 % to VC - 3 years later spin-offs can be either reintegrated or the BT share can be sold, the benefits being invested in BT research…). This is a good way to encourage internal competition in large companies (competition organisations, prizes, free coaching for potential managers, etc.)

6.2 Recommendations

- The group recommends to support further the networking, education and coaching initiatives addressed to potential entrepreneurs amongst researchers and engineers. The aim is to enable experience sharing, researcher-investor interactions, building complementary skills or fostering cooperation between people with complementary skills.

  Many of such actions have been launched in the member states targeting in particular the ICT constituency. The same applies to Community level with initiatives such as the Investment forums. More needs to be done, however, building on experience of the past.

7 CONTENT PROTECTION AND IPRS

Hindering the further development of digital technologies is the Content creation and delivery new value chains. No law enforcement has been effective so far. Although no solution is provided by the group to the extremely hard issue of Digital Right Management and content protection, it still considers that the fuzziness of the current situation is a major hurdle for the further development of the content industry and for the uptake of advanced Information and Communication technologies not only by the media and audiovisual industry but also for all services.

The problem is broader as the various IPRs protection and patenting policies by firms are also factors for blockage and hinder technology uptake. For example, exploitation of IPR (patents) is often in the hands of an IPR department whose performance is measured by the revenues generated by that department's patent portfolio. This creates a need for short-term returns that badly affects the effectiveness of the licensing in creating the business.

The WG has no immediate solution for that problem but dialogue platforms bringing the different actors together at an international level are essential today to be able to identify what are the underlying new values and rights in the business and consumer chain

8 CONSUMERS NEEDS AND EARLY INVOLVEMENT

People are diverse : the mental skills or interests of a young newly graduated engineer may be different from an accountant, graphic artist, older citizen, young child or care worker. The increasing number of elderly people will result in a large population with a wide range of experiences, abilities and special requirements. There is a growing need for a range of products and services that can be fitted for all but with different types of usage.

Designing for the diversity of all potential users, not just a simple single theoretical average, reduces costs and improves accessibility, adoption and ease of use for everyone. This is particularly relevant for the social ambition of information technology to support independence and social inclusion notably for elderly and disabled people. However, there appears to be a lack of visible enthusiasm for, or interest in 'design for all' as a concept outside the disability field.

In addition, it is not easy to predict the adoption of technology by consumers. Video communication is a good illustration : the added value to audio communication is clear, however many people do not want it because talking from a distance is one thing, seeing (and knowing that one is being seen) from a distance is something completely different.

The requirements, behaviour and interest of potential consumers should be better considered when the concepts of a new system are first being developed. Capturing the diversity of user requirements lays a solid foundations for a successful design but is a real challenge for the ICT industry. Effective involvement of users at a very early stage is difficult to implement. It is not just a matter of having the opinion of one or two users but making sure that whatever is done responds to an actual or a latent need.

The information and communication technology seems to, more than other areas, invite users to play a pivotal role in research and development. This can be done mainly by empowering

people and enabling them to be associated in research rather than only in the subjects of the research. Therefore it's crucial that new technologies be developed with the participation of users or innovations to be tested early on a large and realistic scale. This will allow us to learn more from the users or consumers and to develop solutions further (in terms of feature, usage, business value).

The group recommends the promotion of early users and consumers involvement in research initiatives. This includes studies aimed at developing methods for a more efficient consideration and involvement of users as well as at developing centres where people (including disabled and elderly) can experiment with new technologies and innovative services.

Annex

The initial full set of RoadBlocks that were identified by the group as relevant obstacles to the IST research exploitation is the following:

Roadblocks	
	Entrepreneurship and financing
RB1	Entrepreneurship culture is not fostered enough.
RB2	Capital market behaviour is too much conservative (failures are not understood properly)
RB3	Lack of seed market makers (big buyer), like e.g. DoD, NIH, and DoE: The role of public investment in stimulating technology adoption and deployment.
RB4	Missing support for SMEs to exploit beyond EU scope
	Partnership, industry-academia links
RB5	Exchange of people between research and industry is lower than in US
RB6	Interchange between SMEs and Large Corporations is typically low
	Lack of market consideration in research activities
RB7	Research results are not coupled to a full value chain development
RB8	“Focused” research in Europe is not strong
RB9	Lack of innovation for business applications
RB10	Lack of user applications that make good use of the basic technologies and the "Middle-ware" between
	Standards, openness and regulation
RB11	Lack-of or too many standards (open) is often a hurdle for deployment in critical mass
RB12	Missing of enabling service development platforms (e.g. an API for mobile communication)
RB13	Missing appropriate licensing scheme
RB14	Lack of Content/IPR protection and digital rights management regulations to preserve value. Lack of ad-hoc decision making in enterprise/organisations regarding IPRs, often leading to stifle technology deployment and future business benefits
RB15	Missing support precise advice
RB16	Lack of consideration of need and interest of users in new technology and early involvement of key actors (e.g. policy, decision makers and end-users)

These initial RoadBlocks have been incorporated and those considered of highest priority have been treated in the main chapters of this report.

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