

INNOVATION PANELS – ICT

REPORT FROM THE 5TH PANEL MEETING

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SESSION I (part 1): Sectoral Innovation Panel on ICT

The main objective is to present and discuss the main research results of the Sectoral Innovation Watch project, and especially those (e.g. on ICT

trade) which have not been presented in previous panel-meetings. The findings are included in the sector report on innovation in the ICT sector.

Main Findings

ICT contributes significantly to economic and productivity growth in multiple ways. As a pervasive general purpose technology, investments in ICT and the increased use of ICT increase overall efficiency and productivity in all sectors of economy and society and in all regions and countries of the EU. ICT, as a sector, is, on many aspects, the most innovative sector of all in the EU. By increasing productivity throughout the economy and because it is also a growing sector in itself, the ICT sector has provided major contributions to economic growth.

The trend for the growth of the European ICT sector is towards an increase in the level of software and services (including developing and deploying more applications), but a reduction in the level of manufacturing of hardware. Because of the very short lifecycles in ICT, the sector is almost innovative by definition. Another characteristic of the sector is the high degree of globalisation of ICT markets and production.

The EU trade balance in ICT goods is persistently negative and increasingly positive for ICT services. We conclude that the more mature ICT products and services, with lower profit margins, are more likely to be relocated to off-shore locations, than new, innovative and high value added activities.

The ICT sector is, in many ways, the most innovative sector in Europe. Especially the share of employees with higher education is much higher than in most other sectors, with the highest share in the ICT service industry. Also the share of firms with in-house R&D and the share of firms co-operating in innovation with others is in ICT on average higher than in the other sectors. The ICT sector is also leading in terms of strategic and organisational innovation and developing new business models.

To draw some further conclusions, panellists state that it would be interesting to differentiate, in the European production, what is really manufactured by European companies, and what is produced by foreign companies manufacturing in Europe. However, data for this analysis comes out of macroeconomic sources and it is not detailed enough to make that difference explicit.

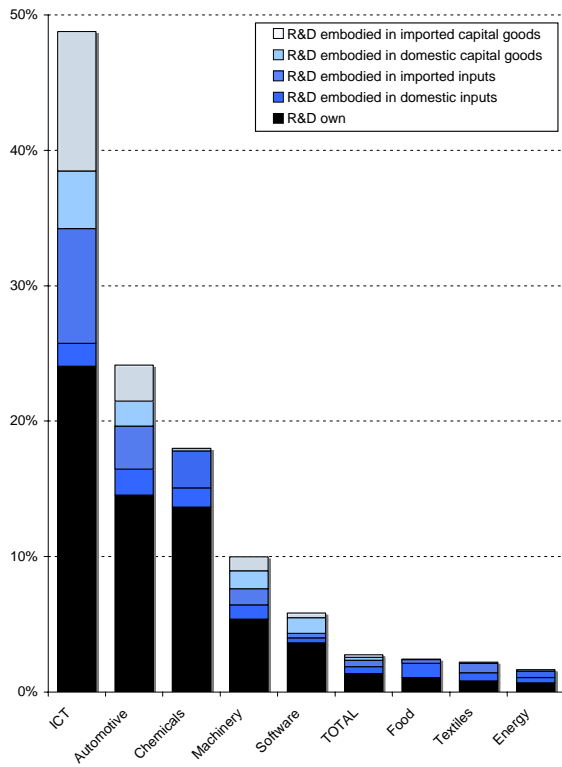
The table just below shows two key points regarding the evolution of trade of the EU with the rest of the world. First, the volume of export and especially import of ICT goods has increased more than for other goods, which indicates that globalisation of the EU ICT hardware sector has increased more than for other manufacturing industries. Secondly, the line at the bottom displays a sharp decreasing unit value of **imported ICT goods** since 1995, whereas the unit value for exports of ICT goods did not change that much compared to 1995. The difference in the unit values of import and export points to higher value adding activity in the EU, which can be based on a higher quality and innovativeness of EU ICT goods, but also on increasing imports of ICT parts and components which are integrated by European firms into their final products. The decrease of unit values over time is due to the notorious price erosion in ICT products.

Trade of EU25- with Rest of the world, 1995=100	2002	2003	2004
All exports of goods			
Volume	125	132	138
Unit value	138	128	134
All imports of goods			
Volume	129	136	143
Unit value	145	137	143
Export of ICT goods			
Volume	140	156	184 ↓
Unit value	134	118	112 ↓
Import of ICT goods			
Volume	188	184	205 ↓
Unit value	91	79	53 ↓

Source: Eurostat

As for **innovation**, it can be concluded from many results from this Innovation Watch project that that ICT is the most innovative sector in the EU of all those included in the Innovation Watch project. See, for example, Figure 1 which is taken from one of the last research papers that has not been discussed in one of the panel meetings before. It shows that ICT firms are the most R&D intensive in terms of own R&D, but also in terms of R&D embodied in the machinery and components or services they import or buy on domestic markets.

Figure 1: Intensity of R&D and R&D embodied inputs across EU sectors



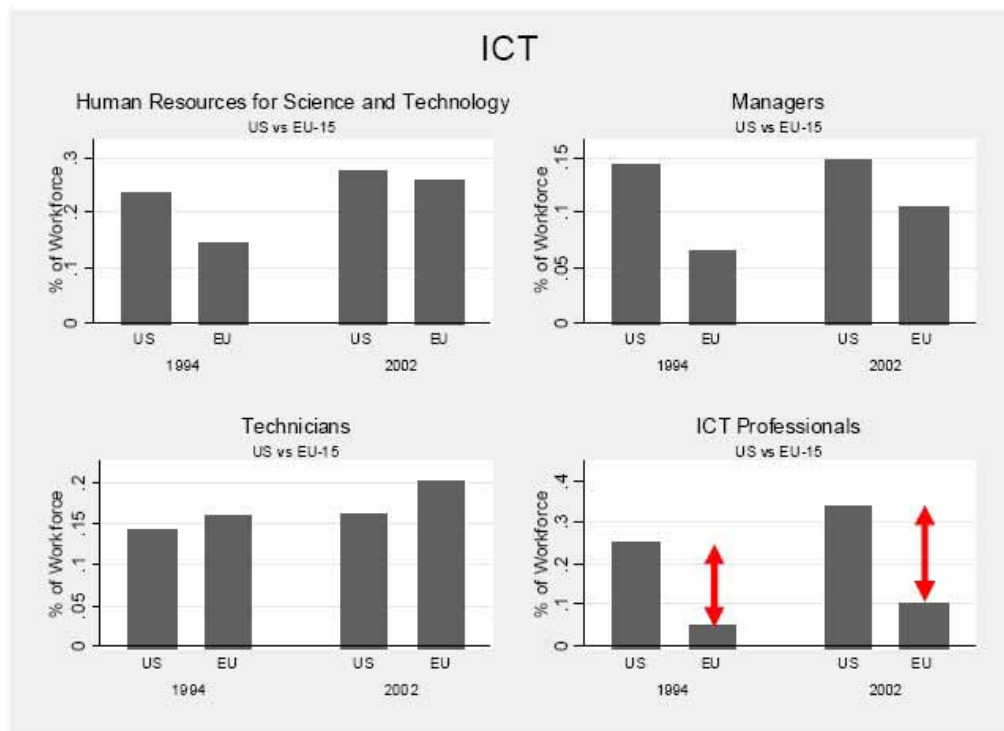
Source: OECD ANBERD Data, NIFU-STEP Calculations 2007

The encircled figures in the table below show that **external information sources** are used more in the ICT industries than in the other sectors.

Information source	Share of all innovative companies	Share of innovative ICT companies?
Own enterprise	85.1	89.4
Other firms	20.4	25.3
within group		
Clients	74.9	83.4
Suppliers	76.2	74.7
Trade fairs, exhibitions	74.0	79.0
Competitors	66.4	71.3
Conferences, Journals	64.4	77.5
Universities	27.8	40.2
Research institutes	20.7	23.2

When comparing **jobs and skills** in the US and EU-15, it may be concluded from Figure 2 that, while other occupations have reduced their gap between 1994 and 2002, in the case of ICT professionals, the gap has remained the same, if not widened.

Figure 2: Innovation performance across the EU

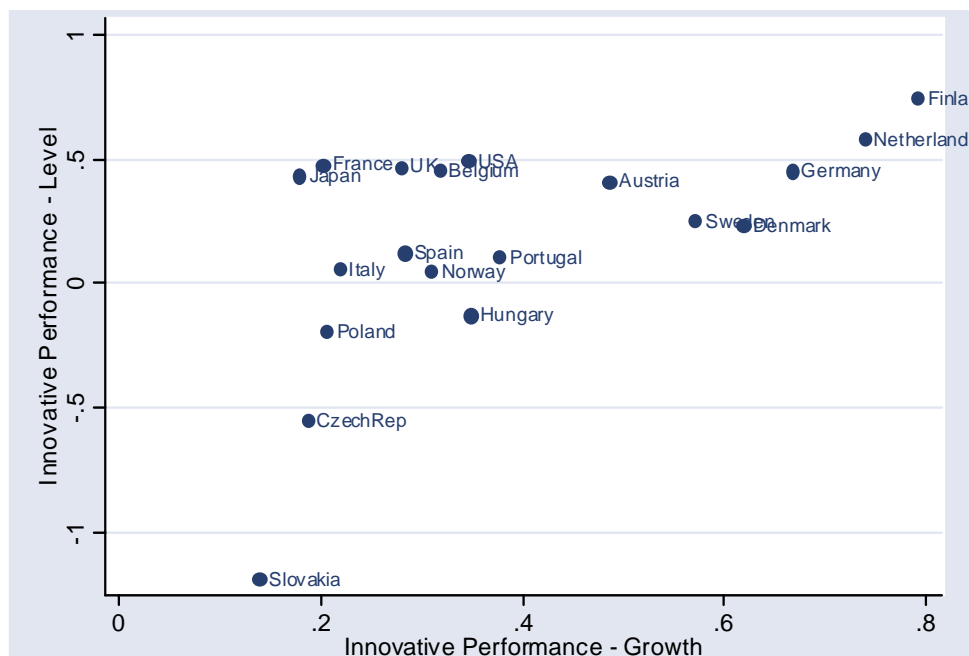


In this figure, occupations are defined based on the International Standard Classification of Occupations (ISCO)¹. **Managerial** occupations are defined as those covered by ISCO Major Group 1. **Technician** occupations are defined in terms of ISCO, in this case, the ISCO major group 3. Information and Communication Technology Occupations (**ICT professionals**) are defined as an aggregate of Standard Occupational Classifications: ISCO 213 (computing professionals), ISCO 312 (computer associate professionals), ISCO 313 (optical and electronic equipment operators) and ISCO 724 (electrical and electronic equipment mechanics and fitters). This aggregate provides a useful proxy for the level of ICT activity in a sector and the relative intensity of ICT.

Based on Figure 3, Finland, The Netherlands and Germany seem to be the most innovative European countries concerning ICT.

¹ <http://www.ilo.org/public/english/bureau/stat/isco/isco88/major.htm>

Figure 3: Index of innovative performance (ICT)



Discussion

The report does not address the well known **pervasiveness** of ICT in other sectors. This report looks at innovation in the ICT sector and, as such, it is claimed to be the most **innovative sector**. A possible message for policymakers should stress that it is not only due to its pervasiveness and indirect impact on innovation in other sectors that the **ICT sector needs specific attention**, but also for the direct contribution of the ICT sector itself to innovation and growth in Europe. Emphasising the pervasiveness and general purpose nature of the technology, and focusing on the importance of ICT for innovation in other sectors, should not lead to neglecting the importance of promoting innovation in the EU ICT sector itself.

The panellists questioned how important it is for innovation to keep ICT hardware production in Europe, hardware manufacturing showing a decrease, while software and services displaying an increase. The reduction in hardware may be caused by some European companies that perform R&D (in hardware) in Europe, but they licence to manufacture in South Asia. *To what extent is that a problem? Does it matter if production*

is outside Europe and the design is here? So far, it is a matter of scale-intensity and knowledge intensity. However, the important questions are: *Is the European ICT industry able to move from producing boxes to software and services? Keeping design in Europe and manufacturing far away, is that sustainable?* Some panellists claimed that the knowledge of how to manufacture remains important for innovation in software and services

It seems that the **off-shoring process** may have the following phases: First hardware manufacturing. Then, development (which is many times closely related to manufacturing). After that, some research. And finally, marketing.

For panellists, Europe has a long-standing tradition of **creativity**, but it is clear that creativity needs constant fostering.

Besides that, there are ample differences between hardware, where there are **lifecycles** of several years and software and services where it can be as short as 3-6 months.

The **semiconductor** sector seems to be in a particularly difficult position and it is not clear whether there is any room for innovation in the industry in Europe. It seems that leaving this technology, even at research level, may impede further advancements in the future.

ICT industry is in close connection with the **content industry**, but the whereabouts of the content sector in Europe is not clear.

There is some uneasiness at the pace Europe is proceeding with **standardisation**.

ICT is moving so fast that **education** cannot keep up with it and the normal syllabus cannot evolve with the technology. For that reason, life-long learning is especially important in this sector.

ICT is important in generating **new business models**. For example, it is claimed that 80% of the R&D in ICT is done in open source community: research is done in communities. In Europe, compared to the US, a larger part of the R&D on ICT is mostly funded by the **public sector**. Panellists declare that, contrary to common perception, the statistics show that European companies invest a larger part of the budget of universities than their American counterparts.

When evaluating ideas to provide funding for ICT products or services, correct **identification of innovation** is a key issue in some cases. In public programmes, for example, evaluators tend to be mostly academics due to possible conflicts of interests if they are from private firms.

There is a controversy on whether **patents** which come out of public funding and are not used should be freed to the public. A study has shown that there may be up to a ten-year period between profits and patents. Panellists also mention the recent initiative by some companies to make some of their patents public.

A recent movement, under the name of **responsible partnering**, also tries to make the maximum beneficial use of public R&D.

SESSION I (part 2): Sectoral Innovation Panel on ICT

Main Policy Recommendations

The ICT sector report includes the recommendations based on all the work-packages of the project and previous Sectoral Innovation Panels (SIPs) as well as some additional sources. The recommendations in the report have been grouped into three issues: research, human resources and European integration. The panellists added a fourth: financing.

Financing is a main, critical issue to foster innovation in the ICT sector: *finance should be first*. The EU is addressing mechanisms to improve the financial part: financing or its lack is a major constraint to innovation. Business angels and venture capital are needed at the earliest stages. There are many possible schemes: helping by reducing taxes for the time the money is kept in the business (as in the UK), making it easy to move benefits from one start-up to another (as in Finland).

Another issue to look at and, if possible, to improve, is **cross border financing** of innovation.

It is difficult in practice to **convince CEOs** about the convenience of investing more on innovation/research instead of marketing, where the results may be more immediate. Innovation is seen as risky and risk is always the major barrier for CEOs. It is important to address measures that help by balancing risks with rewards.

The problem in some cases is the concept of **networking**: in order to play a significant role to promote knowledge diffusion of innovation, innovators have to be in the right position.

Mobility of researchers is also especially important. A seamless way to go (temporarily or permanently) from public research to private firms and vice versa is considered important to foster innovation. Besides that, it is also important to ease geographical mobility so that researchers can move from one place to another.

As the *ICT sector report* is more than one hundred pages long and includes many new elements, the **panellists commented** that they would have liked having it still earlier to arrange some additional time to read it more carefully.

Probably one of the main results of this kind of research would be to know how to materialise innovation. A possible help would be to make a

comparison among the different funding schemes, although it is always going to be difficult to identify the right measures (those that were more effective) and adapt them to your environment. This effort has already been done within the project, but many national programmes did not have an evaluation.

Panellists see the benefits of a specific sector report, one that mainly addresses sector specific issues, but it is also important to show the pervasiveness of ICT in other sectors, and its impact or effect on innovation in the other sectors.

In the final report, it would be advisable to have a hierarchy of recommendations including actions to go from the status quo to a better state.

The current report marks a lot of emphasis on patents and should be more on trademarks and copyrights.

SESSION II: MAIN ISSUES on ICT

This session covers **four main topics on ICT at the European level** that were initially discussed in the afternoon meeting and further developed on the web by participants in the panel during the following days.

Financial Support Mechanisms

The overall objectives are to develop financial mechanisms to support and encourage investment in innovation and to modify cultural biases with regard to innovation induced risk. That leads to the following recommendations:

- Develop fiscal mechanisms to support and encourage investment in innovation
- Increase liquidity through a range of linked public/private activities
- Implement fiscal incentives: roll-over schemes facilitating reinvestment or transfer from one start-up to another, to encourage Angel investors.

R&D tax credit 'Taper relief' on Capital Gains Tax or similar schemes to encourage long-term expenditure in R&D by reducing capital gains taxes by reference to the length of time and amount the firm invests in R&D. Tax relief on share deals in early stage growth companies

- Develop funding mechanisms to encourage early stage investment funding including: new seed-funds linked to business incubators financed by public-private partnerships; support for secondary market launch; simplifying the regulatory requirements or providing 'agency support'
- Modify cultural bias to risk. Introduce EU wide entrepreneurship educational programmes at all levels: a range of entrepreneurship programmes targeted at specific age and interest groups; incentivise schools and universities to run entrepreneurial programmes; introduce 'business clubs', business plan competitions, etc.; develop and provide contact, e-learning and social network based teaching
- Address cultural bias and fear vis-à-vis failure/bankruptcy;
- Strengthen support for start up companies: implement Senior business person support system in all EU countries.

Future competences in Europe

The most recommended policy issues concerning human resources to enhance innovation in EU ICT industry are:

- Provide appealing science and technology educational programs to attract more European students
- Organise European "Science & Tech Olympic games" to promote development of top-quality education programs
- Harmonise Diploma levels and possibility to tailor education, including mandatory international training
- Promote the effective use of (ICT) technologies to provide flexible and life-long learning
- Organise a European Science fair system starting at the age of 7
- Integrate entrepreneurial project work into educational system to foster entrepreneurship on a learn-by-doing basis

- Promote cross-disciplinary projects including those that integrate business teaching with science and engineering and teach the management of risk and risk levels
- Stimulate mobility of highly skilled people between academia and industry
- Introduce a “merit scheme” promoting a change in career
- Develop a EU-level harmonised policy of principals to attract international highly-educated people/researchers.

“One Europe”

Several barriers to enhance innovation in the European ICT sector relate to the lack of European integration:

- *Create one EU market:* To fully exploit the potential of ICT to address the grand challenges Europe is facing, a *genuine/true SINGLE market* approach is Europe’s only option, because investments will not come about if markets remain fragmented
- *Speak with one voice:* Addressing the grand challenges that Europe is facing also requires a holistic policy approach to those grand challenges (healthcare, energy efficiency, security...), integrating the efforts of all relevant EC Directorates-General concerned
- *Develop one research area:* Also in the domain of ICT, Europe's R&D efforts have so far been scattered over a variety of programmes at Community level (ICT part of FP7), intergovernmental level (ICT clusters of EUREKA) and national and regional levels. In this respect, the recently established Joint Technology Initiatives (JTIs) in the ICT domain (ARTEMIS for embedded computing systems and ENIAC for nanoelectronics, for example) are really major steps forward, as for the first time Community and national resources will be combined into single programmes to co-fund industrial R&D and establish a true European Research Area (ERA) in the domain of ICT.

The new Treaty – once ratified – will for the first time provide a legal basis for the European Research Area. Nevertheless, based on our recent experiences in the difficult process of establishing the ICT JTIs within the institutional constraints and legal complexity of the European Union, we sometimes wonder whether the EU has the right instruments

at its disposal to create a true European Research Area. The current institutional system seems caught in itself, paralysed by the political necessity to avoid mistakes rather than managing risks. For Europe to become a better place for research and innovation in the future, the risk that is inherent to these activities should be better taken into account in the Financial Regulation applicable to the general budget of the European Communities and its Implementing Rules

- *Think global, act European:* With Europe as a home market, ICT products, applications and services should be developed with global markets in mind. This requires a more international approach to teaching ICT skills, whereas at the same time full advantage should be taken of Europe's multicultural and multilingual capabilities
- *Improve standardisation processes:* The efficiency of ICT standardisation processes in Europe needs to be improved. However, it is beyond the scope of our project to come up with more detailed recommendations
- *More innovative Public Procurement:* As public procurement in the EU amounts to 16 % of total GDP, public administrations can play an important role in fostering R&D and innovation by acting as launching customers of innovative ICT solutions. The recent Communications on the Lead Market initiative and on pre-commercial procurement of R&D services are important steps forward. These novel concepts now need to be put in practice.

Better valorisation of research

The current problem is not the lack of ideas or basic research but the insufficient commercialisation of research results that determines Europe's position in the worldwide ICT market.

The objective should be to transform ideas into marketable products and services and thus, unfold the full innovation potential of the European ICT sector through a better valorisation and exploitation of research results.

All that results in the following policy recommendations:

- Foster an entrepreneurial culture at universities through student companies, spin-offs, bringing entrepreneurs to universities
- Foster demand-driven public-funded research through focused thematic

platforms which integrate research institutions, companies and public authorities

- Increase efficiency in utilisation of collaborative large-scale R&D projects results by developing and implementing suitable IPR arrangements in case of non-utilisation of project results. Access to idle results should be granted against terms and conditions to be agreed
- Because of the integrated nature of hardware, software and services, in order to strengthen Europe's current position and to ensure its future competitiveness in the ICT sector - especially as regards its design and service sub-sectors - Europe needs to perpetuate its ICT design and manufacturing knowledge irrespectively of the off-shoring of ICT hardware production. Without ICT manufacturing knowledge, it is difficult to fully exploit ICT research results.

Conclusions

- There is a current concern that manufacturing is, slowly but continuously, leaving Europe. For ICT, this heavily affects the semiconductor industry. It would be important to know whether this should be allowed to happen or, if not, something should be done to prevent it.
- A possible benefit of the ICT sector is trans-disciplinarity, but the difficulty in policy making is to combine interests from different DGs, units and so on. How can we get ICT to move into those other sectors to help them and at the same time keep our core knowledge?
- Human resources: New curricula that take into account up-to-date technologies should be developed. These curricula should be more flexible. Immigration, including also from new member states, can supply the jobs and skills that are needed.
- Above all, Europe must develop a culture promoting innovation and enterprise.
- The rhythm of standardisation is very slow; the whole process should

be sped up.

- For the European ICT sector it is important to develop global markets that can be used in an optimal way. For example, helping SMEs access global markets.