May/2004

84

ISSN: 1025-9384

The IPTS REPORT

EDITED BY THE INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES (IPTS)
AND ISSUED IN COOPERATION WITH THE EUROPEAN S&T OBSERVATORY NETWORK

As we go to press:
Plan underway to shut down the IPTS REPORT

CEE:XV/18

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

ENGLISH VERSION

ABOUT THE IPTS REPORT

The IPTS Report is produced on a monthly basis (except January and August), by the Institute for Prospective Technological Studies (IPTS) of the Joint Research Centre (JRC) of the European Commission. The IPTS formally collaborates in the production of the IPTS Report with the European Science and Technology Observatory (ESTO), a group of prestigious European institutions, of which the IPTS is also a member. In addition to articles produced in-house, the IPTS Report also receives contributions from other colleagues within the JRC, as well as from experts and specialists outside the Commission.

The IPTS Report is published in four languages. All editing and reviewing takes place in English and translated versions are produced in French, German and Spanish. It publishes articles it deems "prospectively relevant" in a number of areas, including information and communications technologies, regional development, innovation and technology policy, skills and training, biotechnology and the life sciences, methods and foresight, etc.

The focus of the IPTS Report is on articles that explore issues that are either not yet on the policy-maker's agenda (but are likely to be there at some point in the future) or are underappreciated aspects of issues that have already come to policy-makers' notice. Quality assurance is provided through our multi-stage drafting and redrafting process, based on a series of interactive consultations with outside experts.

In addition to the limited-circulation print run of the IPTS Report, all current and past articles are available on-line from the IPTS website at http://www.jrc.es/home/report/report_main.html. We also produce and distribute an electronic newsletter to inform readers whenever a new issue of the IPTS Report is published (to subscribe, visit the subscriptions section of the IPTS Report website, or send an email to listserv@listserv.jrc.es with the words "subscribe IPTS-REPORT" in the body of the message).

PREFACE

Dear readers,

After more than eight years of putting together this journal, we have been told that there is a plan to shut down the *IPTS REPORT*, for reasons that are not entirely clear-cut (if cost is the issue, we have made numerous drastic cost-cutting suggestions; indeed the re-launching, cost-cutting process that began recently, was interrupted by the new shutting-down plan).

Whatever the outcome of future deliberations, we are grateful for your support over the years, those of you receiving our ~6000 subscriber copies, and those responsible for the nearly 80000 monthly hits on our WWW version. Thanks to your careful reading and your suggestions, we have been able to make improvements along the way and establish a journal whose reputation has continuously grown over the years. It has attracted contributions and praise from President Prodi, from ministers and members of parliament, from Nobel prize winners and members of Academies of Science – who have abided by our demanding multi-draft editorial process, for no compensation other than to contribute to this journal.

The IPTS REPORT has received kudos from policymakers and scientists. It has been used as a platform by influential scientists and academies of science, and has been placed in academic courses' reading lists. On the other hand, its usefulness has been praised by policymakers, it has been quoted by Commissioner Busquin – to whose services the IPTS belongs - and was even distributed to member-state delegations in the June 2003 EU summit, vindicating our unrelenting pursuit, often against the odds, of analytical rigour as well as of a policy-oriented emphasis.

The above are strong indicators of our success in reaching our target policymaking audience, as well as the scientific community which often advises policymakers. Beyond this however, we also launched over the years, reader surveys, the last of which was handled by external evaluators, and was completed early last year. In terms of reader appreciation and according to the external evaluation (here "target group" refers to policymaking circles):

The readers classify themselves professionally as "in policy advice (60%), involved in policy making/implementation (30%) or in academic research (10%)".

"Target group customers amongst questionnaire respondents were very appreciative of the Report and do not seem to want it to change much."

"The ratings suggest a high level of appreciation by all customer groups in the **utility and relevance** of the Report. The target group [...] believe more strongly than others that it is policy relevant and give greater support to the emphasis on S&T related developments and impacts."

Also from the aforementioned external evaluators' survey:

- 94% found it easy to identify relevant articles and extract pertinent information.
- 82% (85% among the target group) rated the value of time spent reading the report as "High" or "Very high".
- The approximate readership is 3.9 persons per copy among the respondents.
- Nearly one half (44%) keep the copies themselves; 30% place them in a library.
- There was strong support for the present frequency of publication.

Most interestingly, and setting to rest any potential concerns about meeting the cost of publication, the external evaluators' survey found that close to 30% of the readers would accept considerable subscription fees, and the readers indicate fees varying from less than a hundred to a thousand Euros per year or more, with average values of ~400Euros/year. Let us note here that we have been told in the past that charging for the *IPTS REPORT*, though apparently feasible in the light of demand, would not be administratively practical.

Finally the external evaluators benchmarked it within a field of broadly similar journals chosen by the evaluators. *The IPTS REPORT* ranked first or second in almost all attributes (thought-provoking, concise, easy-to-understand, multi-disciplinary perspective, techno-economic balance).

Particularly important for the character of the journal and its target audience, is that it ranked first in being 'analytical in a non-academic manner'. This is exactly what we set out to achieve: offer analytical, policy-oriented articles, not merely descriptive, project-presentation information, in a rigorous but not academic manner; respecting the readers' intelligence without demanding that they be already aware of all the terms, formulas and acronyms, experts usually take for granted.

Once again, thank you for your support over the years.

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MAY 2004

EDITED BY THE INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES (IPTS)
And issued in Cooperation with the European S&T Observatory Network

PUBLISHED BY THE EUROPEAN COMMISSION
Joint Research Centre
ISSN: 1025-9384
Catalogue Number LF-AA-04-084-EN-C
LEGAL DEPOSIT: SE-1937-95

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EDITORIAL

Prof. Dr. Norbert Kroó, *Secretary-General, Hungarian Academy of Sciences, Member of the European Research Advisory Board - EURAB*

On the 1st of May 2004 Hungary – together with nine other countries – returns to Europe where it belongs. My dream to be part of this family goes back to 1972 when I started to work for the European idea in the European Physical Society, an organisation in which I had the privilege of serving as President in the first half of the nineties.

Our membership of the EU has been preceded by more than 10 years of long and sometimes difficult development, which I am sure will continue after accession.

The same is true of research and development. Our international cooperation in this area has always been strong and could not be blocked by the oppressive political system. But after 1990 these contacts could be institutionalised. We joined CERN, EMBO, ESRF, and ESA in different forms, and on the basis of a special agreement participated already in the Fourth Framework Programme (FP4). In FP5 we were already partners with practically full rights, not to mention FP6. We are also participating in the European fusion research programme, including JET and ITER.

The most important thing the 1st of May will bring for us is a solid perspective. Our R&D policy will be closely linked to that of the Union where the Lisbon and Barcelona objectives should be the main guidelines. In a family everybody should see what she or he could offer the others. That is why this is an issue we will concentrate on as a member of the European family. I believe that our drive for excellence, based on our scientific traditions, on a special style in problem solving determined by language and social environment is an asset for Europe too. So is our research capacity in spite of its continuing funding limitations. The possibilities offered by the Structural Funds may ease these financial problems by contributing to the development of the research infrastructure in the new member countries.

We hope to strengthen our contribution to the activities of European research institutions, understanding that membership of them involves an element of European solidarity too. We want to be partners in addressing the Europe-wide structural issues related to R&D, in parallel with bridging the still existing gap, which is rooted in our history over the last 60 years.

European science is part of our culture; the emphasis on raising competitiveness should not be applied on the scientific base in a waythat would demolish this base. The European Research Area vision is the proper framework for that, by overcoming gradually our weakness. We should offer the young talents favourable conditions (such as the EURYI research grants) and exciting tasks based on a well-balanced research infrastructure and a cooperation-based competitive environment (for instance, through the emergence of a European Research Council). This could give an appropriate focus on basic research that has acquired increasing significance. However, exploring appropriate pathways towards applications and market-oriented development are also vital elements of our future activity. The European Research Advisory Board, with both academic and industrial membership, is a good forum to advice the Commission on these and other issues.

I feel honoured to participate in this venture and I am sure that the environment of the new member countries and their scientists in these efforts will bear benefits for all of us.

Finally, let me thank the Commission for its highly efficient way to provide timely information to the scientific community. This journal, "The IPTS REPORT" has proved to be an irreplaceable asset in this context. It is a true Commission success story. We are looking forward to being able to count on this journal as a platform for policy-relevant analysis in an even more direct and hands-on way after accession.

Strategic Vision for Regional Development and European Integration: An Innovation Area in Central and South-East Europe

G. Fayl, I. Bilik, I. Hronszky, T. Kemény, É. Nagy, J. Pakucs, G. Pethes, and J. Veress

Issue: According to available competitiveness indicators, many of the candidate countries will trail behind the rest of the EU when they join the EU on May 1st 2004.

Relevance: The creation of an "innovation area" in central and south-east Europe will help the countries concerned catch up with their stronger partners in the European Union. An "innovation area" of this kind could be the outcome of a pro-active, trans-national education & science & technology & innovation cooperation strategy involving the regions of the new EU Member States. Whenever possible, the broadest European participation should be sought.

Innovation - a driver of regional development and European integration[1]

The conclusions of the Lisbon Summit[2] (March 2000) are currently one of the EU's main policy-drivers. The summit set the objective of Europe becoming "the most competitive and dynamic knowledge-based economy in the world by 2010". This challenging goal the can only be achieved if the enlarged EU is willing and able to take urgent action to significantly increase its innovation potential (see Box 1). The Commission's President, Romano Prodi stated recently: "Member States do not seem to realise that 2010 is around the corner. Four years after Lisbon it is clear that we are going to miss our mid-term targets. [...] Europe deserves better" (EurActiv, 2004).

It is generally recognised that innovation is a precondition for economic growth. Innovation means creative development in terms of both production methods and organisation. It leads to enhanced productivity, and quality, and hence to more competitive products. Hence, innovation is a measure of competitiveness. A key feature of dynamic, sustained innovation is that it often leads to more and better job opportunities. Thus, it has the potential to improve living and working conditions and ensure the economic basis for high-quality public services. All these are significant contributing factors to ensuring a stable and prosperous society.

When looking for complementary measures to improve the innovation potential of the EU, the following should be kept in mind. Firstly, regional

The goals of the Lisbon summit can only be achieved if the enlarged EU is able to take urgent action to significantly increase its innovation potential

The views expressed here are the authors' and do not necessarily reflect those of the European Commission.

economies play an important role in the wider dynamics of innovation and economic growth. Moreover, the current trend towards globalisation necessitates new forms of cooperation, even between previously competing groups, in order to acquire and maintain competitive advantage at the global level. In this context, the enlargement of the EU should be considered as an important opportunity to increase Europe's role in the process of globalisation.

Enlargement of the EU should be considered as an important opportunity to increase Europe's role in the process of globalisation

Direct cooperation between regions, regardless of national borders, offers the EU, and Europe as a whole, a novel and challenging possibility for more active participation in the globalisation process in a way that enhances its competitiveness. Regions with high potential for knowledge creation offer particularly attractive opportunities for such initiatives. These regions need to be home to good quality universities and/or public and private research centres. And these need to possess adequate complementarities in terms of human resources and research infrastructures. Moreover, appropriate micro- and small/medium size enterprises should be present in these regions or adequately close links exist to them.

Integrating Europe's innovation potential within a "European Innovation Area" will open the door to new opportunities. The process needs to be promoted both through individual institutions in the different countries as well as through developing trans-border regional areas cooperating with each other and the rest of the EU and Europe. In this way trans-border regional cooperation activities can achieve synergies of expertise that might otherwise not be realised.

Trans-border regional cooperation activities can achieve synergies of expertise that might otherwise not be realised

Regional innovation systems based on open learning networks are potentially more flexible and dynamic than systems that confine learning and transfer of experience to individual companies or institutions. Regional learning networks can enable information flows, mutual learning and economies of scale (O'Doherty, Arnold, 2003). More and more attention is now being paid to the regions' own policies as a complement to the nation state's own regional policy, so regional authorities need to be brought into the process of economic and social cohesion (Horváth, 2002). However, this is not an automatic process and cannot be done without transferring certain responsibilities to the regions. Decentralisation would minimise unnecessary "red tape", and ideally avoid it altogether.

Optimal conditions should be created for cooperation at regional level to take place on a

Box 1. Policy concerns

The latest analysis of the progress towards the Lisbon strategy shows that full implementation of this process could increase GDP by 0.5-0.75 percentage points over the next 5 to 10 years (European Commission, 2004).

The analysis highlights the need for an energetic implementation of reform in the different spheres through integrated strategies. The Member States are urged to seize the opportunities provided by the economic recovery and the coming enlargement, and to take urgent actions in three key areas:

- *Improving investments in knowledge and networks, by implementing the EU's "Growth Initiative" and giving greater priority to the level and quality of investments in research, education and training.*
- *Strengthening the competitiveness of European enterprises, by applying better regulation - particularly for the industrial sector - and by adopting both the proposal for the "Framework Directive on Services" and the proposal for the "Environmental Technologies Action Plan".*
- *Finally, promoting active ageing by encouraging older workers to remain in the work force and through a modernisation of educational systems for lifelong learning, of work organisation, and of prevention and health care systems.*

Box 2. Initiative to energise innovation potential

Early 2003, a group of experts suggested the establishment of an "innovation area" in central and south-east Europe. The experts came from various parts of civil society and they joined the initiative in a personal capacity. The group met several times in order to formulate their strategy and an action plan for the initiative.

The fundamental paradigm of this initiative is that full use of the innovation potential of the countries involved will help them to become strong partners in the European Union. This innovation potential in central and south-east Europe has existed throughout history, but has been under utilised because national borders have hindered cooperation, sometimes to the extreme.

The basic instrument of the initiative is active, voluntary cross-border regional level networking between universities, research centres and enterprises (above all, micro- and small-sized ones). Networks will be open to all relevant actors that interested both within and beyond national borders. Moreover, attention will be paid to initiatives with similar aims. This includes relevant parts of the "Central European Initiative" that is an integrated, government-level framework of dialogue, coordination and cooperation among its member countries in the political, economic, cultural and parliamentary fields. (CEI, 2004)

The intended outcome of this pro-active trans-national education & science & technology & innovation co-operation strategy is the creation of an "innovation area". This will emphasise trans-border regional co-operation among the new EU Member States (i.e. Czech Republic, Hungary, Poland, Slovenia and the Slovak Republic) and, whenever possible, be extended to regions in the Applicant Countries and other parts of Southeast Europe. Moreover, whenever possible, appropriate partners should be invited from regions in Austria, Bavaria, Greece and Italy. Networking with centres of excellence in Russia, Ukraine and Belarus might be useful.

This is an outline of an independent, non-partisan initiative. On the occasion of the first World Science Forum (Budapest, 10 Nov. 2003), the Hungarian Prime Minister Péter Medgyessy, expressed the need and his support for the initiative and urged for steps to make in this direction.

voluntary basis. To be most efficient, research centres and (in most cases micro- and small size) enterprises, including incubators, should cooperate directly, regardless of national borders (see Box 2). Whenever possible, the participants should take full advantage of the support mechanisms offered through the EU framework for cooperation between regions across national borders. These measures include relevant parts of the RTD Framework Programme, in addition to the Structural Funds (the main instrument to promote social and spatial cohesion within the EU).

With adequate public and private economic support, and sustained political endorsement, enhanced cooperation could evolve between regions in central and south-east Europe that fulfil the "complementarities" criteria alluded to above. For example, illustrative examples along the Hungarian border could include: (i) Miskolc / Kosice / Krakow; (ii) Debrecen / Cluj / Oradea; (iii) Szeged / Arad / Timisoara / Beograd / Novi Sad; (iv) Pécs / Zagreb / Ljubljana / Koper / Maribor; (v) Györ / Sopron / Vienna / Bratislava / Brno / Komarno, just to give a few of the possible examples.

It is significant that these countries have a long tradition in good, sometimes excellent, higher education and basic research. This tradition offers an outstanding opportunity to contribute to the achievement of the Lisbon- and European Research Area objectives. However, to date, the potentials of these resources have been somewhat underutilised. National borders have hindered cooperation, sometimes to the extreme. Another shortcoming is that most of these countries lack experience in efficiently translating promising research results into practical and marketable applications. More experienced countries and regions should offer much needed advice and support in this respect.

Trans-border regional cooperation of the kind suggested above could eventually lead to voluntary resource pooling and the coordination of research activities in fields of common interest. A current example of this development is the "Bonus"

Many countries in central and south-eastern Europe lack experience in efficiently translating promising research results into practical and marketable applications

Box 3. Consortium supporting implementation of the strategic vision

The following actions are required in order to start making an "innovation area" in central and south-east Europe a reality:

- Create a compendium of the existing joint projects in the areas of education, science, technology and innovation that reach beyond individual national borders in central and south-east Europe.
- Identify areas suitable for cooperation in central and south-east Europe and not yet included in the compendium.
- Identify suitable cooperation- and financing partners in central and south-east Europe, and whenever useful, beyond it.
- Organise an international conference to promote the vision and bring together the various players in a fertile environment.
- Throughout the process, full consideration should be given to the support mechanisms offered by relevant EU initiatives.

To this end, an international consortium has been set up with participation of higher education, public and private research, and industry - see illustration. The consortium should help to create optimal conditions for voluntary co-operation at regional level. It provides an open framework for such co-operation through networking, regardless of national borders (including those of the "Schengen" area). Being a fully open structure, the consortium will help to generate interest for an "innovation area" in central and south-east Europe and to maintain focus on it. The latter could include formulating strategies for lobbying public authorities and civil society bodies.

The international conference mentioned above is scheduled for November 2004 and is currently being prepared.

The consortium is open to any interested, relevant public/private person and organisation that share the objective of this independent, non-political initiative.

Relevant bodies will be encouraged to support the consortium. This includes the "Central- and Eastern European Network", a platform for informal dialogue among the Presidents of national Academies of Science from the countries in Central and Eastern Europe[3].

project, where organisations from eight countries around the Baltic Sea have decided to work together in the area of marine research (CORDIS-1, 2004). The countries involved comprise are four EU Member States (Denmark, Finland, Germany and Sweden) and four Accession Countries (Estonia, Latvia, Lithuania and Poland).

The importance of an "innovation area" in central and south-east Europe

Regional level cooperation between the new Member States and Applicant Countries in central and south-east Europe will be beneficial for all the parties concerned. As these countries face similar structural challenges during the current process of transformation and development towards market economies, they would be able to learn from each other's experience. Moreover, most of them need to gain more hands-on experience in relation to maximising results of knowledge production for wealth creation.

There are also several crucial economic reasons for the development of an "innovation area" in central and south-east Europe.

To perform optimally, the regions' economies need greater market-access. Goods and services from the new Member States will have to compete head-on with existing goods and services already complying with EU standards and regulations. The consumers' measurement criteria will include price, quality, knowledge content and after-sales service.

The main market development potential in Europe for the foreseeable future will be in both central and south-east Europe. EU and overseas companies are already aggressively targeting these markets as can be witnessed by their marketing efforts.

Trans-border, regional cooperation in central and south-east Europe could lead to an "innovation

area" and thereby boost progress towards creating a knowledge-based economy and society in this part of Europe. Obvious proximity considerations resulting from such a regional "innovation area" would further enhance the potential of these countries to produce usable innovations. It would also help to integrate these countries more closely with the "European Innovation Area" as a whole.

It is reasonable to suppose that in the medium to long term it will be high knowledge-content, rather than low labour costs, that will attract further foreign investments to central and south-east Europe.

Furthermore, the establishment of an "innovation area" in central and south-east Europe would promote direct non-political dialogue in the region. We could also hope that growing trans-border cooperation will moderate nationalistic tendencies present in certain segments of society in some of these countries. Together with rising living standards, it could therefore help promote regional stabilisation and full integration with the EU.

However, the full benefit of such an "innovation area" will only be achieved if cooperation is completely open and does not exclude potential partners from beyond these countries' regions. Following on from this, the current initiative (see Box 3) is not an alternative to broader EU-level cooperation.

Policy approaches to promoting regional innovation

Against the background described above, the options available to the public authorities to promote regional innovation could include the following:

- At EU level: promoting the establishment and further development of regional research infrastructures (including electronic networks, comprehensive databases and large installations) and their integration into the mainstream of European research.
- At national level: encouraging the development of innovation potential in targeted fields (biotechnologies, information technologies, energy, drinking water, etc.). This would ensure an efficient combination of the advantages offered by higher education, basic research, and technology development, transfer and application. The latter would require the presence of relevant industries or close links to them.
- Moreover, for less-developed regions: supporting the development of physical infrastructures (highways, railways, telecommunications, etc.). High-quality infrastructures are key contributors to mushrooming business activity, networking and generating new poles of development.

An encouraging development in the context of less-developed regions is the effort the EU is

The establishment of an "innovation area" in central and south-east Europe could also promote direct dialogue in the region

Box 4. Bridging the digital divide in the Balkans

With support of EU funds, the pan-European high-speed research network, GÉANT, has recently been extended to the Balkan countries with the completion of the "South Eastern European Research and Education Networking" (SEEREN) project. This project has provided more than just technical connectivity. Bridging the digital divide that still separates the Balkans from the rest of Europe was one of the key aims of the project. To this end, the project consortium has been active in encouraging EU Member States to work together with researchers from Southeast Europe.

The extension includes Albania, Bosnia and Herzegovina, Bulgaria, Greece, the Former Yugoslav Republic of Macedonia, Romania, and Serbia and Montenegro. It improves online access for researchers, thus enabling full participation and integration of the Balkan research community in the European Research Area.

The network also provides connection to North America and Japan, while further links to the Latin American and Mediterranean regions will be operational shortly. (CORDIS-2, 2004).

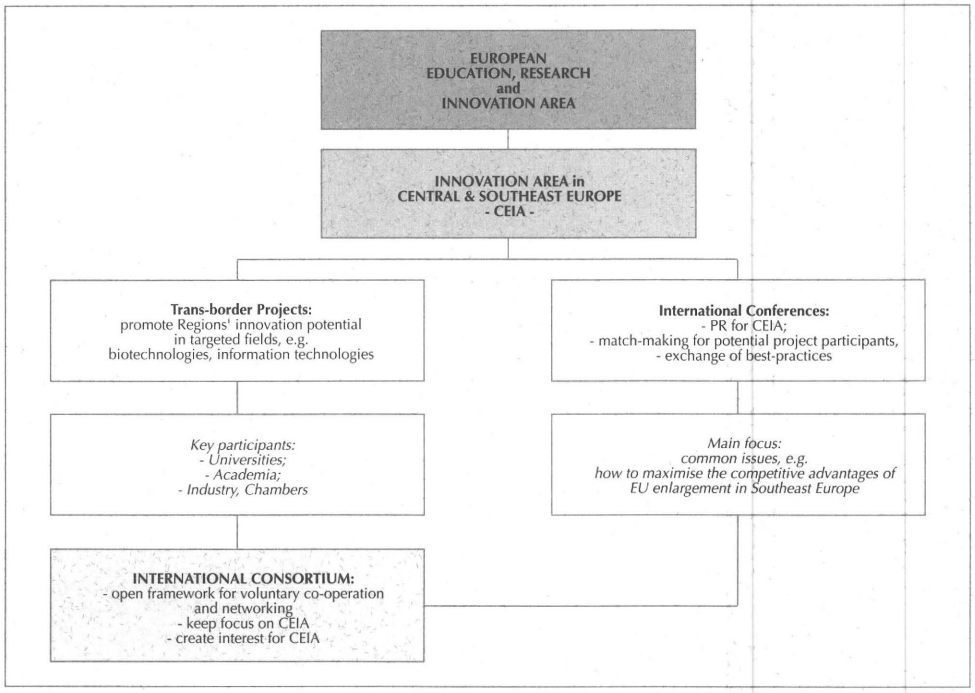
making to bridge the digital divide that separates the Balkans from the rest of Europe (see Box 4).

Conclusion

Initiatives are needed to strengthen cooperation on education, science, technology and innovation between the countries and regions involved, as well as with other countries and regions of the European Research Area. However, such initiatives should not be understood as suggesting a universal recipe for promoting regional innovation capacity. The issue is more complex. Solutions must be found locally. Realising trans-boarder cooperation is a main policy challenge for regions in transition economies (Dory, 2002). Initiatives such as that described here can become an element in reinforcing the strategies of the regions in the central and south-east European countries.

The backbone of the "innovation area" in central and south-east Europe is a pro-active trans-national cooperation strategy on education, science, technology and innovation. Its active promotion will eventually result in more and better jobs - an admirable and necessary objective. The challenges are clear, but so are the opportunities.

Figure 1. The CEIA International Consortium



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Keywords

European integration, innovation, knowledge creation, regional development, trans-border regional cooperation

Notes

1. This article represents the views of its authors and not necessarily those of their respective organisations.

2. **http://europa.eu.int/comm/lisbon_strategy/index_en.html**

3. The Central- and Eastern European Network (CEN) is a platform for informal dialogue among the Presidents of national Academies of Science from the countries in Central- and Eastern Europe. The Presidents participate in their personal capacity and do not represent their Academies as such. The initiative for the CEN was taken in 2003 by the European Academy of Sciences and Arts, and supported by the City of Vienna, in connection with the forthcoming enlargement of the EU.

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Lessons from Targeted Socio-economic Research for the Formulation and Evaluation of European Science and Technology Policy Options

Nikos Kastrinos, *European Commission* and Ken Guy, *Wise Guys, Ltd.*

Issue: In the last few years a substantial body of socio-economic research has been accumulated at EU level in the area of evaluation of science and technology policy options through programmes such as the European Commission's Targeted Socio-Economic Research (TSER) programme.

Relevance: Policy can exploit the opportunity to draw lessons from targeted socio-economic research to better understand innovation systems, and develop and assess relevant policy options. This is a key element of the utility of socio-economic research programmes such as, notably, the European Commission's TSER programme.

Introduction

The core contribution of the TSER programme was to thoroughly investigate, refine, adapt and apply the concept of innovation systems to European problems, with the concept subsequently playing a major role in defining EU policy agendas on research, industry and enterprise

The Targeted Socio-Economic Research (TSER) programme of the European Community invested about €50 million in research in the area of the Evaluation of Science and Technology Options in Europe. Research projects, thematic networks and accompanying measures spanned the period 1995-2002 and brought together more than 400 research teams from all over Europe to address issues pertinent to the design and implementation of European RTD policy.

This article[1] does not aim to evaluate the TSER programme and cannot pretend to do justice to the breadth and depth of research carried out within it. Rather, it aims to reflect some of the main insights and findings of the research and to point out the main lessons for the assessment of EU RTD policy options. It has benefited from the period that elapsed since the research was performed, and from the policy debates and developments that have taken place in the meantime.

The core contribution of the research was to elaborate the concept of innovation systems. This was thoroughly investigated, refined, adapted and applied to European problems, with the concept subsequently playing a major role in defining policy agendas in EU research, industry and enterprise policy, culminating in the strategy set out by the European Council in Lisbon in

The views expressed here are the authors' and do not necessarily reflect those of the European Commission.

2000[2]. Needless to say, the concept of innovation systems predates the TSER programme[3]. However, through the TSER programme the community of researchers associated with innovation systems has been enlarged and its knowledge base has become deeper and more substantial.

We argue that, as this knowledge base evolves, research findings gain in credibility and new sets of 'stylised facts' are created, along with increasingly accepted implications for policy. A review of these stylised facts and their policy implications is thus particularly apt at a time when attempts are being made to reconfigure the European Research Area. These consolidated research findings and conclusions aid our understanding of the role of European research policy and its interactions with other policies and actors, thus helping to define policies in line with the objectives of the Lisbon declaration.

The rest of the article is organised in thematic sections which summarise, in an epigrammatic fashion, the main 'stylised facts' that emerge from projects spanning:

- Innovation system concepts, performance and policy
- Regional innovation systems
- Public research systems
- Innovation systems and enlargement
- Innovation systems, globalisation and ICTs
- European welfare versus market-based models: the peculiarities of the EU's knowledge society

The final section draws implications for the assessment of European science and technology policy options.

Innovation System Concepts, Performance and Policy

The key feature of the innovation systems approach is its emphasis on the interaction between the 'actors' and 'institutions' within a system. **Interactions between different policies:** Institutional frameworks set up to promote one set of goals (e.g. rules and regulations designed to promote or ensure perfect competition) can be antithetical to innovation (which relies on interaction and, to a certain extent, collaboration). Public procurement regulations designed to maximise competition, itself a very important goal, for example, can be inimical to the formation of the close user-supplier relationships needed for innovation to be successful.

The innovation deficit of EU economies: The EU economy is weaker than the economies of Japan and the USA in those industrial sectors in which growth, employment creation, R&D, product innovation and dynamism tend to be the greatest. EU industry has become locked into technological trajectories that prioritise process innovation over product innovation, with the consequence that innovation tends to be labour saving rather than job creating and growth as a whole has a lower employment intensity than in Japan and the USA.

Innovation at the firm level: Attempts to lower costs, enhance quality and improve skills are the key drivers of innovation (technological and organisational) within firms. The most important barriers to innovation relate to scarcity of funding, the cost of researchers, lack of management time and low workforce skills and know-how. All these barriers are more pronounced in less favoured regions.

Access to capital: Restricted access to capital is an important constraint on new high-tech firm formation in the EU. Even when capital is available in the EU, the predominant form in which it is available (credit-based financing) often favours incremental process innovation, whereas equity-based financing, which is often used to finance

The TSER programme has enlarged the community of researchers associated with innovation systems and its knowledge base has become deeper and more substantial

EU industry has become locked into technological trajectories that prioritise process innovation over product innovation, with the consequence that innovation tends to be labour saving rather than job creating

Europe continues to be characterised by fragmentation of policy between the different levels of government and the continuing diversity of systems of innovation, with national governments still playing a prime role in policy-making

new ventures and new product development, is more common in the USA than it is in the EU.

Coordination between European and national policies: Europe has been characterised by a continuing fragmentation of policy between the different levels of government and the continuing diversity of systems of innovation, with national governments still playing a prime role in policy-making, and European policy being marginal in most science and technology-related areas. The European Commission has already done much to stimulate R&D and encourage collaboration and networking, and has had a catalytic role in effecting policy changes at a national level via 'soft coordination' approaches rather than via more coercive tactics. The most important need has been for more coordination and 'joined-up' strategic approaches to policy-making at national and regional levels rather than at a Community level.

Regional Innovation Systems

The role of regional governance: Strong regional governance is a necessary but insufficient condition for the existence of a regional innovation system, while strong central governance is correlated with the existence of weak regional innovation systems. Firms referring decisions to head offices outside of a region are not found to hinder initiatives promoting innovation at a regional level.

The role of universities in regional innovation systems: There is a much deeper engagement of universities in their regions than is evident in the conventional literature on innovation activities, though this involvement is heterogeneous across regions. This embeddedness stems not only from the research activities of universities and their links with industry, but also from their role in the provision of education, their contribution to the local cultural environment and their involvement in regional governance structures.

Regional learning capacity: The development of a regional collective learning capability involves spin-offs from large firms and universities (the most important process); formal and informal inter-firm collaboration and networking; and the mobility of key research, scientific, professional and management staff within regional labour markets.

The importance of RTD networks: Regional and European-wide RTD linkages and networks are important in the evolution and competitiveness of regional clusters of innovative high-technology SMEs in the EU. Large firms and universities play an increasingly important role within regional clusters, often as a source of spin-offs and qualified personnel for high-tech SMEs.

Innovation partnerships in Less Favoured Regions: Firms within a region rarely consider local universities to be an important source of information about innovation, though they are sought out as partners when problems have to be solved. Typically, large firm links with universities and other actors within the public innovation infrastructure (research institutes, technology transfer organisations, training establishments etc.) are much more pronounced than SME links. However, academic links with industry tend to take the form of contract research and consultancy rather than involvement in licensing and spin-offs.

Public Research Systems

There are a number of challenges associated with policy developments in this sphere across many European countries:

- the preoccupation with industrial relevance has the potential to divert resources away from more basic research;
- the same preoccupation may also divert

resources away from research which has a broader social relevance, e.g. research oriented towards the resolution of health and social welfare issues;
- the blurring of missions resulting from multiple types of institution competing for the same scarce resources has the potential to lead to 'square pegs filling round holes', with some universities, for example, particularly ill-suited to servicing the needs of local SMEs;
- changes in the working conditions of staff, an increased focus on shorter-term applied research and less autonomy in the choice of research tracks can also deter potential new recruits from following a career in science.

The appropriate response is:
- to create mechanisms capable of counterbalancing these adverse effects;
- to raise additional finance, e.g. through the constitution of a variety of new public-private partnerships, which would allow universities to undertake a healthy mix of curiosity-oriented basic research, industrially-relevant work and other socially-desirable research.

Innovation Systems and Enlargement

Industrial systems in transition: the economic and industrial restructuring has taken place since the end of the Cold War has involved the opening up of domestic markets, new inflows of foreign investment, and the abandonment of vertically integrated production in many sectors. Economic growth in the early restructuring phase was then linked to different forms of firm-based learning in novel economic environments and wholesale changes in the structure of resource allocation.

Disintegration and re-integration of innovation systems:
- the links between the science base and industry, where these had existed, were neglected during the first stages of the transition process;
- the high R&D potential of many countries was undermined by low investment in this early phase and the S&T infrastructure was downgraded;
- the reintegration of science and technology systems into the industrial and economic mainstream has been progressing at different rates in different groups of countries (relatively faster in Poland, Czech Republic, Hungary, Estonia and Slovenia than in the remaining Central and Eastern European countries).

Policy needs common to all countries include:
- reshaping the role and position of industrial R&D institutes within individual economic environments;
- involving public-private partnerships in the creation of domestic science and technology infrastructures (with the 'customers' of scientific and technological services shaping their focus and delivery by contributing to the costs of these services);
- the stimulation of both supply and demand for vocational training;
- the strengthening of regional approaches to the development of sound innovation systems.

European welfare versus market based models: the peculiarities of the EU's knowledge society

The socio-economic contexts of Continental European 'welfare systems' are clearly different from a group of 'market based systems' (UK, Australia, Canada, Japan and the US) along a number of dimensions. In particular, Continental European countries possess similar labour market and social protection characteristics; egalitarian income distributions; roles for government services in GDP; shares of industry in economic activity; high proportions of national R&D in 'classical' industrial sectors such as automobiles, chemistry

Regional and European-wide RTD linkages and networks are important in the evolution and competitiveness of regional clusters of innovative high-technology SMEs in the EU

and equipment goods; and scientific specialisation in physics and chemistry.

Over time and since the mid-eighties the division grew more emphatic, with a greater divergence between the two groupings along dimensions such as the equality (or inequality) of income distributions. In parallel, there was increasing convergence within the EU grouping in terms of egalitarian income distributions and the robustness of employment and welfare protection.

There were no overt differences between the two groupings over this period, however, in terms of productivity and employment performance, and both groupings were characterised by higher education enrolment, increased public and private R&D and S&T activity, and a larger share of business services, biotechnology and ICTs in economic activity.

European integration facilitated the harmonisation of social protection and labour legislation and thus aided the process of convergence and improvement within the EU. Integration also allowed the EU to keep abreast in terms of the social and regulatory changes needed to stay on the path to knowledge-based societies. Socially protective labour conditions can attract highly skilled workers and researchers, and income equality can give rise to a large demand for high quality goods and services. Both thus form an opportunity to develop a European knowledge-based society.

Implications for policy assessment

A perspective for assessing the past

The first and foremost implication of the foregoing for the assessment of programmes such as the European Commission's research Framework Programme (FP), is that assessment should be carried out in terms of the role of such programmes within the various innovation systems that exist at different sectoral, regional, national and international levels within Europe. As just one component of such systems, the FP in particular can influence their overall dynamics, but it cannot be considered as either the only, or the even the main, determinant of overall system change. Assessments that primarily focus on attempts to establish the scale of causally related impacts are thus misguided. Rather, priority has to be given to evaluations which concentrate firstly on the appropriateness of the programme in different innovation contexts; secondly on the efficiency and effectiveness of the bureaucratic procedures used to implement the programme; and only thirdly on the downstream impacts of individual projects.

In the first instance, assessments need to consider whether the right strategic choices were made in the design and formulation of the programme. Since RTD is but one among many factors affecting the functioning of innovation systems, it is important to assess the extent to which the themes and instruments chosen were sufficient to mobilise appropriate parts of the targeted innovation systems.

Secondly, assessments need to consider whether the tactical choices and administrative arrangements for implementing the programme (the calls, the rules of participation, the eligibility and evaluation criteria) were appropriate, and whether they facilitated or prevented good interfacing between programme participants and with other important actors in the relevant innovation systems.

Thirdly, the assessment still needs to deal with the direct and indirect impacts of projects, but with a focus on identifying the various ways in which impacts occur and the factors influencing them (e.g. endogenous factors such as the technical and

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managerial competence of the partners and exogenous factors such as variations in the technological and commercial environments in which participants exist). The more we understand about these factors, the easier it will be to construct selection criteria likely to enhance the impact of individual projects.

Forward-looking considerations

The most important implication of the TSER programme, in particular, for future policy stems from the perspective that well-functioning innovation systems require component sub-systems both to function well themselves and to interact smoothly with other sub-systems. In simple terms, this suggests that the science base has to be strong and adequately linked to industrial research and technological capacity; that innovation in industry has to be finely attuned to the absorptive capacity and needs of markets; that consumers have to be educated to the point where they are able to appreciate and benefit from innovative goods and services; and that education systems also have to train sufficient skilled people to work within the science base, industry and the delivery systems for these goods and services.

The need for policies tailored to individual innovation system contexts and the European reality of contiguous yet interdependent national and regional innovation systems also highlight the desirability of adequate linkages between the policies and policy-making bodies of these various spheres and raise the curtain on a discussion of appropriate roles for EU-level initiatives. What, for example, should be the role of a European public research system within the context of existing national systems, and how should the policies of the various actors involved be synchronised? Even more pertinently, what systems of governance are needed in future if Europe is to evolve a genuine 'European Innovation System' capable of satisfying the different needs of very diverse stakeholders? How will national and international programmes and funding mechanisms be coordinated with each other and with European level policies? What structures will ensure the most fruitful implementation of the Lisbon strategy? How can coordination between Directorates-General at the level of EU institutions be strengthened in order to improve the coordination of policies for Research, Technology, Education, Innovation, Enterprise, Regional Development, Competition, Health, Environment, Employment and Social Affairs that currently shape the character and performance of innovation systems? Whilst past research does not provide answers to all these potential problems, it certainly highlights the need to solve them and provides insights into the criteria needed to evaluate different policy options.

By way of conclusion

It is now clear that our understanding of Europe's innovation systems would have been poorer without the TSER programme, whose results continue to provide food for thought to innovation policy-makers and analysts. But how important is the contribution of targeted socio-economic research to policy in comparison with non-targeted social science research or even consultancy?

Following Rip[4], we believe that controlled storytelling is the core way in which social science research influences (and can influence) policy. This storytelling blends evidence about the past with an understanding of the context in which the evidence is generated to produce educated guesses about future events.

Looking back at the TSER from this perspective, we suggest that the scale and quality of the research conducted within the programme left an indelible mark on the world social science scene as well as

Well-functioning innovation systems require component sub-systems both to function well themselves and to interact smoothly with other sub-systems

New systems of governance need to be developed if Europe is to evolve a genuine 'European Innovation System' capable of satisfying the different needs of very diverse stakeholders

on numerous policy discourses within Europe. Non-targeted social science research would not have provided the critical mass of stories, while consultancy – because of its typically very narrow focus and short time horizons – would have lacked both the breadth and depth needed to establish credibility. Thus we are convinced that targeted research programmes in the social sciences make sense as a way of organising and implementing policy relevant research agendas.

Keywords

Socioeconomic research, policy assessment, innovation

Notes

1. This article draws on a project aimed at synthesising TSER findings relevant to the evaluation of S&T policy options in Europe (see: K. Guy (2003), Insights from Policy Research for the Formulation and Evaluation of Policy: A Review of Projects Funded under the TSER Programme and the Implications for European Science, Technology and Innovation Policy and the Five-Year Assessment of the Framework Programmes; Final Report to DG RTD, November 2003). The review, which was conducted a few years after the end of most projects, took a helicopter view of the relevance of 63 final project reports to contemporary policy debates. Information on these projects (and the reports reviewed) can be found at **http://www.cordis.lu/improving/socio-economic/area1.htm**

2. In March 2000, the European Council in Lisbon set out a ten-year strategy specifically designed to make the European Union the world's most dynamic and competitive knowledge-based economy (see: **http://europa.eu.int/comm/lisbon_strategy/index_en.html**). For a detailed discussion of the issues, see: Rodrigues, M-J; B-A Lundvall; G. Esping-Andersen; L. Soete; M. Castells; M. Telò; M. Tomlinson; R. Boyer; R M Lindley (2002), The new knowledge economy in Europe: A strategy for international competitiveness and social cohesion; Cheltenham: Edward Elgar.

3. See, for example: Lundvall B, A (1988), Innovation as an interactive process: from user-producer interaction to the national system of innovation, in G. Dosi *et al* (eds), Technical change and economic theory; London: Pinter Publishers; Charbit, C, J-L Gaffard, C Longhi, J C Perrin, M Quere and J L Ravix (1991), Local systems of innovation in Europe; FAST FOP 235 (EN) Brussels, CEC; Lundvall B A (ed), (1992) National Systems of Innovation: Towards a theory of innovation and interactive learning, London & New York: Pinter Publishers; Nelson, R. R. (ed.)(1993), National Innovation Systems; New York and Oxford: Oxford University Press.

4. See A. Rip (2001), In praise of speculation, in OECD (2001), Social Sciences for Knowledge and Decision-Making; Paris: OECD Proceedings.

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Learning Networks as a Policy Instrument: an example from a Network of Regions of Excellence

Tomás Botella and Jean Noel Durvy, *Innovation Policy Unit, DG Enterprise*

Issue: The creation of innovative firms depends to a large extent on local or regional environments favouring innovation, which should be based on multidisciplinary and highly empirical (tacit) knowledge on the part of the policy-makers concerned.

Relevance: The acquisition and/or transfer of such tacit knowledge, which is necessary to support the definition of regional policies designed to foster innovative firms, requires appropriate instruments combining activities based on methodological considerations with others which have a more practical orientation.

Background

Fostering innovative business start-ups is one of the main elements in the creation and sustainability of high-quality employment. The deficit of innovative business creation that is the counterpart of Europe's current scientific research performance, together with a lack of entrepreneurship and the appropriate framework conditions, have been identified as the major weaknesses of the European innovation system (EC, 1996).

Setting up innovative businesses, however, is a complicated matter requiring a high level of 'tacit knowledge': a mixture of technological and organisational know-how and other practical skills, strongly influenced by cultural or situational specificity. This knowledge is often inseparably linked to processes and people, representing a central element in the competencies and skills of the members of a team. It is highly specialised and not easily expressed in words, and therefore difficult to transfer to other 'holders' in order for them to fully benefit from it.

Many European regions have proven conditions and operate public schemes which can facilitate the setting-up and growth of innovative start-up businesses. The identification, dissemination and exchange of good practice and successful schemes already implemented in such regions could drive a mutual learning process among the European regions. Such an exercise could lead to a substantial improvement in the 'tacit knowledge' of many regions and hence in the conditions for creating innovative new firms at European level.

Fostering innovative business start-ups is crucial to strengthening the European innovation system

The identification, dissemination and exchange of good practice and successful schemes could help create the conditions in which innovative new firms can emerge

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Networking has clear advantages as a policy instrument, mainly because of its operational flexibility. It is also an optional instrument for implementing cross-border exchanges of experience

At European level, its added value would, in particular, lie in the exchange of information, experience, competence and good practices, and in the highlighting of 'success stories'. It would constitute a 'European show case' on innovation, which could have a large impact and knock-on effect for all the regions of the Union (EC, 1998)

Networking as a Policy Instrument

One of the main characteristics of new business patterns is the increasing need for connectivity among the various actors involved in economic processes. Cooperation has become an effective way of broadening knowledge among partners and enhancing the effectiveness of its use.

Throughout history, businesses have clustered different economic elements, always with very pronounced geographical and interactive components.

Since the mid-1980s, we have witnessed the parallel emergence of the sociological and communications concept of networks, linked with economics and management. Initially, it was oriented towards fostering alliances and cooperation among small manufacturing firms. The scope of networking has been enlarged and now extends to numerous network patterns which can differ widely, mainly as a function of the typology of the members (firms, business providers, local and regional organisations, etc.) or objectives (support services, learning, technology transfer, etc.)

This phenomenon has given rise to a paradox: local and regional networks need to be reinforced in order for them to compete internationally in a global economy.

Networking has clear advantages as a policy instrument, mainly because of its operational flexibility, which extends to the soft-law process (relationships among members range from informal contact to formal contract). On the other hand, it is an optimal instrument for implementing a large variety of cross-border activities centred on the exchange of experiences (pools of tacit knowledge). The main drawback is that, given the need to foster trust among the members, it is a relatively long-term process.

The PAXIS Network

Framework conditions and objectives

In 1997, in line with the first Action Plan for Innovation (EC, 1997), the Commission launched a wide consultation process, the outcomes of which were presented at the First European Forum for Innovative Companies, held in Vienna on 12-13 November 1998. One of the main issues dealt with by the Forum was the proposal to launch a pilot initiative focusing on:

- *actions to create and develop innovative enterprises by regions demonstrating particular skills and creativity in this area. This initiative would be designed to link the principal actors in the innovation system at local level.*

The proposal of the Vienna Forum was structured in the form of a pilot action called *Mechanisms to facilitate the setting-up and development of innovative firms,*[1] known also by the acronym "PAXIS" (Pilot Action of Excellence on Innovative Start-ups, see Box 1). It is based on an even balance between short-term results (research projects) and a long-term vision of the strategic advantages of thematic networks (Network of Regions of Excellence[2]).

Two years after the launch of PAXIS, the Network of Regions of Excellence has been consolidated and has become a genuine knowledge-sharing platform. The outcomes of the pilot phase (EC, 2003) can be reviewed in the light of the various dimensions of the network.

Firstly, the network has a practical dimension, since it constitutes an 'in vivo' laboratory for testing, validating and supporting pilot initiatives at European level, thus ensuring they can be scaled up safely.

Some pilot initiatives have emerged within PAXIS, such as the European Day of the

Box 1. PAXIS

The specific objective of PAXIS was to contribute, via a practical approach, to the identification, analysis, validation and dissemination of local conditions of excellence for the creation of innovative firms. This process upgrades existing 'tacit knowledge' and contributes to its dissemination throughout the European regions, providing strong indirect support to the creation of innovative business, and therefore to economic growth.

The profile of the organisations representing the regions is that of local/regional developers playing a central coordinating role among innovation stakeholders and participating in policy-definition processes.

The measure of the *degree of regional excellence* as regards innovation issues in applicant regions was based on a set of indicators, and the procedure for selecting the members of the Network of Regions of Excellence was based on a set of 29 parameters originally defined in 1999[3].

After the first call for proposals[4], the initial network was launched in mid-2000 with 15 members and a relatively brief pilot phase lasting until the first half of 2002 (i.e. 18 to 24 months). Following a second call for proposals[5], a new 'stable network' phase has been running since January 2003, with 22 members clustered into five operational networks:

HIGHEST: *Alpes Maritimes, Berlin, Helsinki region, South Sweden and Turin area.*
KREO: *Emilia-Romagna, Karlsruhe-Pforzheim, Lyon-Grenoble and Oxfordshire.*
PANEL: *Munich, Barcelona, Dublin and Milan.*
SPRING: *Stockholm, Cambridge, Madrid and Stuttgart.*
START: *Vienna region, Copenhagen, Edinburgh, Hamburg and Veneto region.*

Together with its policy learning aspects, the PAXIS network has a more politically oriented component deriving from its being a European showcase for regional innovation with strong participation by regional and local politicians at the highest level.

Lastly, considerable importance is attached to the network's dimension as a platform supporting the implementation and validation of new initiatives, such as the European Day of the Entrepreneur and the Euro Offices, which were referred to above. In addition to the short-term objectives of such initiatives regarding the process of creating innovative firms (awareness-raising and supporting internationalisation), they have a clear long-term contribution to make in structuring a European research and innovation space.

To sum up, the PAXIS Network of Regions of Excellence is a multi-dimensional policy instrument with considerable potential to support regional and local policy-makers and politicians for innovation purposes at Community level.

Entrepreneur (Box 2), the Euro Offices (Box 3), the "visiting scheme" or the Award of Excellence which helps "brand" regions and is now a prestigious award in recognition of achievement in the field of regional innovation (**www.cordis.lu/paxis**).

There is also an important analytical and methodological dimension due to the fact of being a permanent co-ordination system with the participation of regional and local stakeholders and policy-makers to implement joint working practices on innovation (exchange of best practice, comparison, benchmarking, etc.)

In this respect, it is worth noting the following outcomes:

- Mapping, using common methodologies, of the innovation and start-up support models and systems existing in each of the networked economic areas. This constitutes a first step in identifying good practices, making comparisons and initiating a reciprocal process of learning from successful schemes applied in other parts of the network.
- Identification of a common range of subjects which have been jointly addressed in the framework of the network, such as:
  - The design of a tool for rating the Intellectual Capital (IC) in the Regions of Excellence by adapting the business Intellectual Capital approach and scaling it up to the regional dimension.
  - The validation of two seed-fund models for early-stage financing, in order to address and bridge the equity gap between (public) research funding and (private) risk capital affecting academic spin-offs.

Box 2. European Day of the Entrepreneur

The pilot initiative on the "European Day of the Entrepreneur" (EDE) undertaken in co-operation with Eurocities (an association of major European cities), is a learning opportunity for cities to exchange ideas and agree on a common effort to promote entrepreneurship, as proposed in the Green Paper (EC, 2003).

From January to October 2003, by following a bottom-up approach with the participation of about 40 major European cities, a methodology was developed and validated, defining the framework, basic requisites and common conditions for local events to be labelled as EDE.

The outcome was an EDE Manual that provides guidance to cities interested in organising "European Day of the Entrepreneur" events. Other communication instruments implemented during this pilot phase were an EDE website (**www.entrepreneurday.org**), a newsletter and a set of promotional material.

Finally, there is a communication dimension, since the network is a genuine European showcase for regional innovation. In this region the 'European Forum for Innovative Enterprises', which has been held every two years since the Vienna Forum (in Lyon in November 2000 and Stockholm in April 2002, with the next one due to be held in Stuttgart in December 2004), has succeeded in mobilising numerous European stakeholders and regional and local political authorities at the highest level (**www.thirdforum.org**).

Networks such as the one in the exercise described here can decentralise 'soft' structure in such a way that members are clustered into independent 'operational networks' which act as 'learning cells'

Policy considerations

Certain features of the Network of Regions of Excellence have clear policy relevance:

a) Sampling as a means of assessing the phenomenon of innovation

A very useful approach from the exercise described here has been adopted is sampling based on selection of members of local innovation hot spots and champions (Regions of Excellence). This can provide a unique sample of regions for a reliable study of the mechanisms for creating innovative firms.

In such a sample, the fundamental processes and mechanisms which facilitate business start-up are highlighted more clearly than in other clusters of regions which include more laggardly areas where such mechanisms may be masked or affected by environments which are less favourable to innovation because they are deficient in fields such as research, support services, or funding. The upshot is that the learning and dissemination processes among regions (such as those used in PAXIS) could be considerably speeded up.

A clear example of the potential of such networks is that they can be used as a tool for defining and implementing European standards of excellence. Although its diversity constitutes a great opportunity for Europe to learn in most areas, prior definition of some common standards of excellence appears necessary.

b) *Ad hoc* knowledge inception approach.

Networks such as the one in the exercise described here can decentralise 'soft' structure in such a way that members are clustered into independent 'operational networks' which act as 'learning cells', each comprising four to five members (regions), for greater efficiency in

Box 3. The Euro Offices

The objective of the Euro Offices is to support the internationalisation of start-up companies in the member regions by offering them the use of offices and services in incubators or science parks located in other member regions. An embryonic Euro-Office initiative has been running since early 2003, with the participation of seven PAXIS Regions of Excellence: Alpes Maritimes, Helsinki Region, South Sweden, Berlin, the Turin area, Stockholm and Munich.

interpersonal dynamics. The working approach is based on an overall methodology and common qualitative and quantitative indicators, where appropriate, for comparing and assessing individual regional and local performances.

In this context the creation of new knowledge is based on the joint activities of analysis and benchmarking performed by operational networks to transform 'information' into new 'knowledge'.

Policy lessons at European and regional level are extracted mainly from the assessment of the results of operational networks. The results are assessed with the help of an external panel of experts. The cross-regional participation of partners in exploiting complementarity and creating a framework for policy practitioners to share tacit knowledge and learning at a European level.

c) High level of involvement of people (human factor)

The adoption of good practices identified in certain European regions requires instruments which offer schemes providing opportunities for learning rather than merely schemes for transferring "packaged" measures. Since the transfer of knowledge requires people, attention needs to be focused on the role of mentoring by outstanding regions as a means of transferring good practice in business support methodologies from one region to another. A bottom-up approach, based on comparison and benchmarking of specific priority subjects defined and performed by regional representatives in a pro-active manner, has greater added value than other, less personal, exercises based solely on comparisons of the available data or statistics.

Conclusions

Sound innovation policy-making processes depend on the availability of appropriate instruments for assessing information and transforming it into new knowledge, which is useful for drawing policy lessons. Support for such processes typically stems from the sharing of codified knowledge and information (statistics, scoreboards, targeted studies, panels of experts, etc).

In such processes, however, learning is not achieved by mere imitation, since learners are already policy-makers who are actively seeking to formulate or decide on programmes. As has been pointed out, the setting-up of new, innovative firms is mostly based on *tacit knowledge* and as such requires the availability of practical learning instruments, such as the PAXIS Network of Regions of Excellence, which enable policy-making teams and practitioners to acquire and transfer appropriate tacit knowledge from outstanding European regions and conurbation areas, in a complementary manner to the above-mentioned processes based on codified knowledge.

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Keywords

innovation, learning networks, European regions

Notes

1. EC: Official Journal of the European Communities L 64, 12.3.1999, p. 91.
2. Although the term 'regions of excellence' is used, network members are mainly European conurbation areas structured around big cities, which are at the core of the knowledge-based economy.
3. Call for proposals of 15.06.1999. Guide for proposers – Part 2. Appendix 1C: Proposals submission forms for Thematic Networks, pages 24 to 27.
(**ftp://ftp.cordis.lu/pub/innovation-smes/docs/f_pg2_en_199902.pdf**)
4. EC: Official Journal of the European Communities C 167, 15.6.1999.
5. EC: Official Journal of the European Communities C 141, 15.5.2001, p. 18.

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Biodiversity Information and Policy-making in the light of Costa Rica's Experience

Erick Mata and Rodrigo Gámez, *InBio*

Issue: The future of biodiversity will depend entirely on the conscious perception held by the various sectors of society of the material, intellectual and spiritual values of this diversity.

Relevance: Biodiversity information can be crucial in building awareness among policy-makers and the public. Providing this information in a policy-relevant way can play a key role.

Introduction

The first step towards protection a country's biodiversity is to find out how much biodiversity there is and where it is located. In Costa Rica, the need for a specific institution for this task of cataloguing and understanding biodiversity was acknowledged in 1989 with the creation of the National Biodiversity Institute, INBio (see Box 2). Historically, this task had been carried out by a variety of national and foreign scientific and academic institutions.

The approach taken to preserving biodiversity in Costa Rica is based on the "save", "know" and "use" strategy. A key part of implementing this approach is to gather, process and share information and knowledge. This is a four-step process, known as the "core process", which can be viewed as an information loop, where the shared information is fed back into the system once its impact and relevance for target audiences has been assessed.

The first step of the "core process" consists of collecting data and samples in the field. This is carried out by so-called "parataxonomists", who are people from rural areas with a solid training in this process and a grounding in taxonomy. The information they provide is validated and fed into the system by technicians who are also trained specifically for their task.

The second step in the process is information generation. Knowledge from the network of collaborating taxonomists spread around the globe enriches the data gathered in the field and, in particular, enables the samples collected to be fully identified.

The third step is to package the information for specific audiences. This may mean writing a scientific paper, producing a CD-ROM for children,

The approach taken to preserving biodiversity in Costa Rica is based on the "save", "know", and "use" strategy

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a web site for the general public, etc. This is carried out by interdisciplinary teams in which educators and communicators play a key part.

The fourth step in the process is to share the information and knowledge acquired. This can be achieved through training courses, workshops, active participation in national and international forums, and educational activities under the umbrella of the bioliteracy programme.

Despite all the political and subjective arguments that often emerge when conservation issues are discussed, the final decisions should always be based on scientifically sound information

Lessons learned

A number of lessons have been learned in the process of gathering information and knowledge on biodiversity in Costa Rica. First of all, it has shown that there are a number of prerequisites for information to have a genuine impact on biodiversity. Biodiversity information should, therefore, be:

- scientifically sound
- up-to-date
- representative
- available on various scales
- sufficiently basic to be used as building blocks for other applications,
- readily accessible.

Clearly, information that is scientifically sound is an indispensable support to critical decision-making processes. Amidst the political and subjective arguments that often emerge when conservation issues are discussed, scientifically sound information should form the bedrock on which any final decision is based. All samples collected therefore need to be subjected to a rigorous process involving formal protocols for their collection, preservation and storage. At the end of the inventory process each sample needs to be fully geo-referenced, bar-coded and have its details entered on a database. A wide range of biodiversity information is available in both digital and traditional formats. However, given the inherently dynamic nature of biodiversity resources, constant monitoring and maintenance is required to prevent the information from becoming obsolescent (e.g. updating the database on a daily basis). Posting the data online can also help in this process, as it means it is constantly subjected to review and improvement.

It is not possible to produce a full inventory of biodiversity. Statistically consistent sampling methods need to be used in order to provide accurate estimates of what biodiversity exists and where it is located

It is impossible to maintain a full national inventory of biodiversity as one would with the stock held by a shop. However, statistically consistent sampling methods need to be used in order to provide accurate estimates of what biodiversity exists and where it is located. In practice, this goal can be met by sampling representative sites in many ecosystems located across the country.

Biodiversity information should be available on various scales, in terms of both geography and taxonomies. The requirements of decision-makers at national and local level vary, and taxonomists clearly need a greater degree of detail than do school children. The use of geographic information systems (GIS) makes it possible to manage and present geospatial information at many levels. The flexibility of allowing users to move from one level to another is another important feature of any biodiversity information system.

A biodiversity informatics strategy needs to be defined in a way that is based on the concept of information buildings blocks. Given the enormous complexity of the systems studied (which encompass the whole spectrum from the genetic to the ecosystem level), the large amounts of information involved (for example, there are millions of species in the Americas alone), and the millions of relationships that can be established between a given species and its environment, it is impossible to design an information system that delivers interpreted information (knowledge) in such a way as to meet all users' needs. Rather, the

strategy takes the building-block metaphor as its inspiration (i.e. it aims to supply information at specimen, species and ecosystem level) and uses report-generating mechanisms as the cement to hold them together. A flexible query system that facilitates both the generation of relevant reports and the integration of these reports into a unified information product under user control is an essential tool for decision-markers. Finally, an obvious but frequently neglected requirement of biodiversity information is that it should be widely available, not only in electronic form, but in traditional formats as well.

Another lesson learned from the gathering of biodiversity information is that three specific actions need to be promoted to enhance the impact of the information over the medium to long term:

- Forming values, particularly among the young. In the medium to long term a country benefits from an educational system that promotes values such as respect for life and an ethical interaction with nature.
- Supporting decision-making, especially in policy-making. These actions should cover the whole spectrum, from raising awareness of conservation issues among politicians to providing information and knowledge to legislators, municipalities and government offices.
- Supporting people, organisations and communities that are currently taking concrete action to save and use biodiversity sustainably. Direct involvement of empowered communities is indispensable to turning policies and values into concrete actions. This principle, of course, has important implications concerning capacity building and outreach.

It needs to be highlighted here that these three actions cannot be conducted by a single institution alone, but must involve the right set of partners and stakeholders to ensure both efficiency and effectiveness.

The quest for the knowledge required to preserve a country's biodiversity and use it sustainably is fraught with challenges. It requires the scientific methodologies to generate sound information, appropriate technologies to ensure cost-effectiveness, and a continuous assessment of the needs of current and potential users of the knowledge acquired.

Given the enormous complexity of the systems studied, any biodiversity informatics strategy needs to be defined in a way that is based on the concept of information buildings blocks

Box 1. Biodiversity in Costa Rica

Tropical countries such as Costa Rica face the complex challenge of protecting their biological wealth while simultaneously promoting the social and economic development they need to support and enhance the welfare of their population.

The magnitude of Costa Rica's biotic wealth is significant, as with a territory of 51,100km² the country is home to an estimated half a million species of plants, animals and micro organisms, representing nearly 5% of the world's diversity of species.

In its quest for a sustainable human development model, the country is devoting nearly a third of its territory to the conservation into perpetuity of its natural heritage. This represents a major investment for any country, but particularly for a small developing tropical one, and is the outcome of a conscious decision to renounce the short-term gains of non-sustainable use of this portion of its territory. This implicitly brings with it the obligation to demonstrate that the long-term gains will exceed the short-term benefits forgone.

The sectors of society concerned will only perceive this trade-off as beneficial if biodiversity information is made available to society as a whole through education and awareness. Additionally, scientific and technological knowledge is needed in order to be able to make intelligent and sustainable use of the country's biodiversity.

The Costa Rican Ministry of the Environment is managing the various categories of protected areas under state ownership and controls, supports and facilitates the management of other categories of privately owned protected areas through its National System of Conservation of Areas (SINAC).

Box 2. The Costa Rican National Biodiversity Institute, INBio

INBio is a private, public-interest, scientific institution specialising in gathering, processing, producing and sharing biodiversity information. This information is used in the "save" and "use" steps of the biodiversity conservation strategy. This core process within the institution is actually an information loop in which the shared information is fed back into the system once its relevance and impact for target audiences is assessed. Around 200 people are involved in INBio's core process, working in coordination with SINAC and with strong support from the more than 250 high-level scientific collaborators from around the world.

Strategically the core process has been conceived as one that should use rigorous scientific methodologies and knowledge mixed with innovative uses of information technologies, such as bar codes, geographic information systems, relational databases, multimedia and the Internet. As a part of this effort INBio designed an implemented an information system called ATTA, which supports most of the information-processing activities involved (MAT, 2001). This system has been in operation since August 2000 and has achieved international recognition as a good example of the latest generation of biodiversity informatics tools.

More information at: **www.inbio.ac.cr**

Keywords

biodiversity informatics, biodiversity conservation, biodiversity inventories

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Meeting the Lisbon Objectives for the Information Society: How ICT Foresight can contribute

Ramón Compañó, Corina Pascu, Paul Desruelle and Jean-Claude Burgelman, *IPTS*

Issue: In the year 2000, the Member States agreed in the Lisbon Summit upon an ambitious plan to turn the European Union into the most competitive knowledge-based economy in the world. What this means for ICT is still to be defined.

Relevance: Policy-makers today are confronted by the lack of a solid understanding of the drivers and challenges influencing the pathways toward the Lisbon 2010 objectives with respect to Information and Communication Technologies (ICT). Foresight tools can help mitigate these difficulties.

Introduction[1]

In the year 2000, the Lisbon Summit set the ambitious goal for the EU to become the most competitive and dynamic knowledge-based economy in the world by the end of the decade. Within this overall context, the role and contribution of information and communication technologies (ICT) is particularly important as it contributes in three ways. [2]

Firstly, ICTs are an indisputable element to enhance the productivity and quality of services from all economic sectors.

Secondly, it is a highly important industry *per se* and its success will be crucial to achieving the Lisbon Objectives. Thirdly, ICT are a systemic technology affecting or enabling the necessary social and institutional changes needed to meet the Lisbon goals.

In the past four years, the gap between the EU and its key competitors has not diminished in most information and communication technologies. The European Commission wants to mobilise all means to reverse the trend. The question arises how much the tools and methods used by the foresight community can help to detect and to speed-up those actions that will enable Europe to become one of the leading players in a number of crucial ICT areas. This article discusses the methodology employed in the Fistera[3] project to make best use of classical foresight tools, e.g. fully fledged foresight exercises; technology road-mapping, scenario development[4], towards the Lisbon Objective for ICT. Taken in isolation each of the tools offers useful, but partial information.

Despite the goals of the Lisbon Summit, since 2000 the gap between the EU and its key competitors in ICT has tended to increase rather than decrease

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Simply putting all elements together is not sufficient either for such a difficult task. Therefore FISTERA proposes an integrated aggregation of the individual components of foresight. The following table (Table 1) presents the SWOT structure which will be used for integrating the findings in a systematic fashion. Fistera tries to understand Europe's strengths and weaknesses with respect to IST as compared to the main global competitors, the opportunities, threats and challenges for improving Europe's position.

Adapting the "classical" foresight toolbox

Technology road-mapping (TR) considers technological developments at the generic and/or global level. TR promises to yield useful information on where EU industry should focus its efforts. Within the ICTs area, TR has demonstrated some potential to define the path of technological drivers in a number of cases. The most prominent among them is the process of miniaturisation in the semiconductor industry[5]. At the same time, TR has limitations whenever it has to respond to an economic target or offer solutions that are largely influenced by social behaviour and patterns. One specific ICT difficulty arises from the fact that –generally speaking- technological progress in ICT takes place at a high speed and the rates of change may vary significantly within the different clusters of information and communication technologies. For some ICTs, such as software, significant changes can occur in less than three years, for other ICTs the pace is slower. In the Fistera approach, three time frames were chosen: 2004, 2010 and 2020. The 2010 time horizon coincides with the Lisbon objective. 2020 is set as horizon at which we can consider having room for "shaping the future".

Classical technology road-mapping is country neutral and can act as a complement to national foresight exercises

TR offers considerable insights on how technology options might develop over time, but this alone is not sufficient for designing an encompassing IST research policy as it would lead to a pure technology push approach only. Take the evolution of the processing capacity as an example. Assuming that the prediction made by Moore's law continues to hold, it gives a very detailed view of future options for the semiconductor industry, but it says little or nothing about potential applications and services, the demand for them, their acceptance by society or, more generally, their social impact. The implication of more processing power and the potential changes it may have to people's lives is not discussed. A more integral approach would be to place the technological evolution in a broader socio-economic context and look for their interdependencies. The Fistera

	Strengths & weaknesses	Opportunities, threats & challenges
Technological-related factors	Bibliometric analysis of patents, publications and secondary sources (such as R&D funding)	Analysis of technology trajectories and disruptions
Economic & political factors	Information from national foresights and literature	Online Delphi and targeted workshops
Socio-related factors	Information gathering from literature search & online-delphi	Scenario-building exercises and workshops and online –delphi
S&T-based competitiveness	Information gathering through desk research and check by interviews; online-Delphi	Scenario-building exercises and workshops

Table 1. Within the Fistera project, a combination of foresight tools is employed to elaborate upon Europe's strengths and weaknesses as they appear today. The threats and challenges are to be understood from the 2010 Lisbon objective IST vision (right column)

methodology tries to link current and emerging technologies to their potential applications. These projections, which are called "technology trajectories", are constructed upon an intensive discussion with many experts in the field. Each opinion is subjective, but the ensemble of inputs may yield insights as to the direction in which "the future can be constructed" (see Fig 1).

One source of inspiration for the selection of technologies was the *National Foresight studies* of eight European Countries to which a considerable number of high level ICT experts have contributed. Generally speaking, national foresight exercises are meant to identify visions, offer particular strengths, and weakness that may result in good recommendations for the particular country. Extracting best practices for Europe from national experiences is not obvious. On the one hand, looking for commonalities of national foresight exercise leads to a limited number of intuitive concepts ("lowest common denominator effect"). On the other hand, important national specificities which would allow a national competitive ICT advantage cannot be simply extrapolated or aggregated at European level.

From the eight national foresight studies Fistera analysed, some noteworthy points emerge with respect to the technologies and their trajectories.

"Technology trajectories" can be constructed by aggregating experts' opinions about the future direction technologies will take

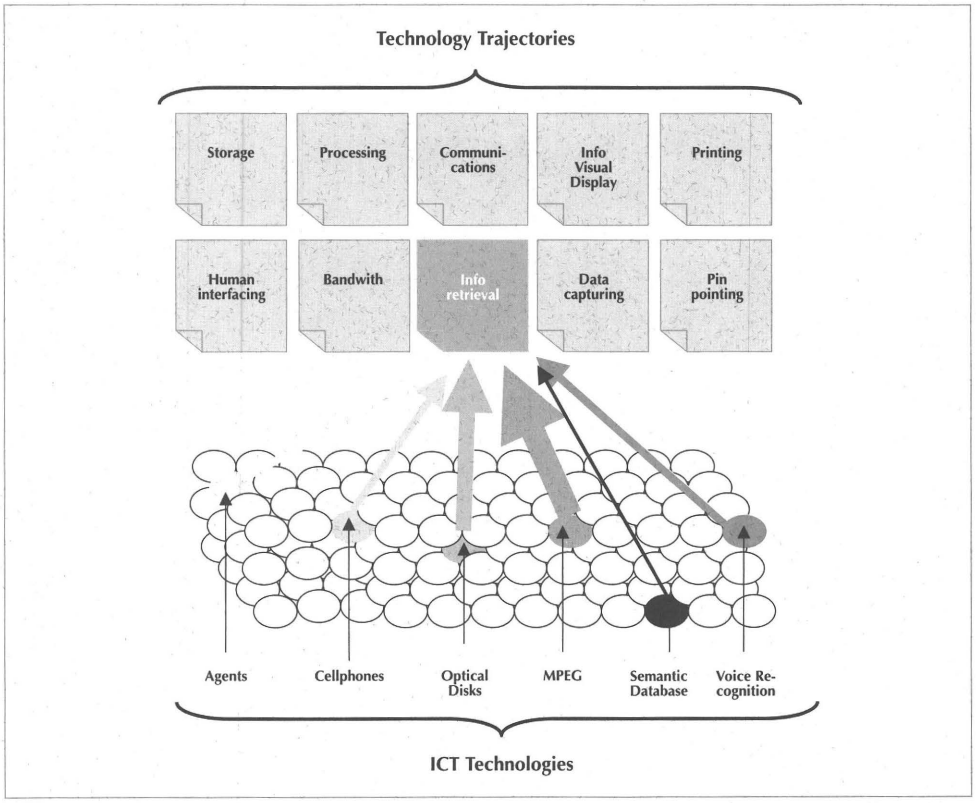


Fig 1. A given IST- relevant functionality may be based on a set of technologies. The Fistera team member TILAB identified ten "technology trajectories" on the basis of their capability to guarantee a specific functionality. These technology trajectories are evaluated at three points in time: 2004, 2010 and 2020. The figure shows the example for "information retrieval" in the year 2010. In this case mainly six (out of the eighty) technologies are expected to contribute to this trajectory / functionality. The thickness of the arrows indicates the relative weight of the six technologies.
Source: Tilab's online tool (available via Fistera website at ***http://fistera.jrc.es****)*

Combining the strengths of the individual tools, a "foresight tool-box" can be put together to make it possible to assess future scenarios against the key emerging technologies and trajectories

First of all, national foresight reports contain comparatively little on emerging key technologies or technology trajectories. Second, most studies limit themselves to identify subjects worth of support at the national level only. Third; the scenarios resulting from the process are often not particularly technology-specific but do provide scope for the support of projects contributing to progress in key areas of technology, such as artificial intelligence.

To sum up, national foresight exercises do generally not cover the whole chain from technology assessment to its impact on society and offer limited value for a EU approach.

As regards technology foresight, Figure 2 indicates which of the ten technology trajectories (as defined in Fig 1) have been contemplated in the eight considered national foresight studies. Although, the depth and the purpose of these national foresight studies vary significantly, some common patterns seem to emerge. While technologies related to improved communications, increased bandwidth or providing improved or novel human-machine interfaces stand out in most national foresight exercises; this is not the case for other trajectories such as 'data capture' or 'information retrieval'.

Technology road-mapping is a powerful tool when progress can be traced back and offers sufficient evidence to be extrapolated into the future. However, technology disruptions – qualitative changes in the development of technologies like the jump from mainframe to PC - are impossible to predict this way. Here, *scenario building* may help to "think outside of the box" and help the analyst make different type of projections into the future. A number of *ICT scenarios* have been developed in recent years. Perhaps the most prominent case set of ICT

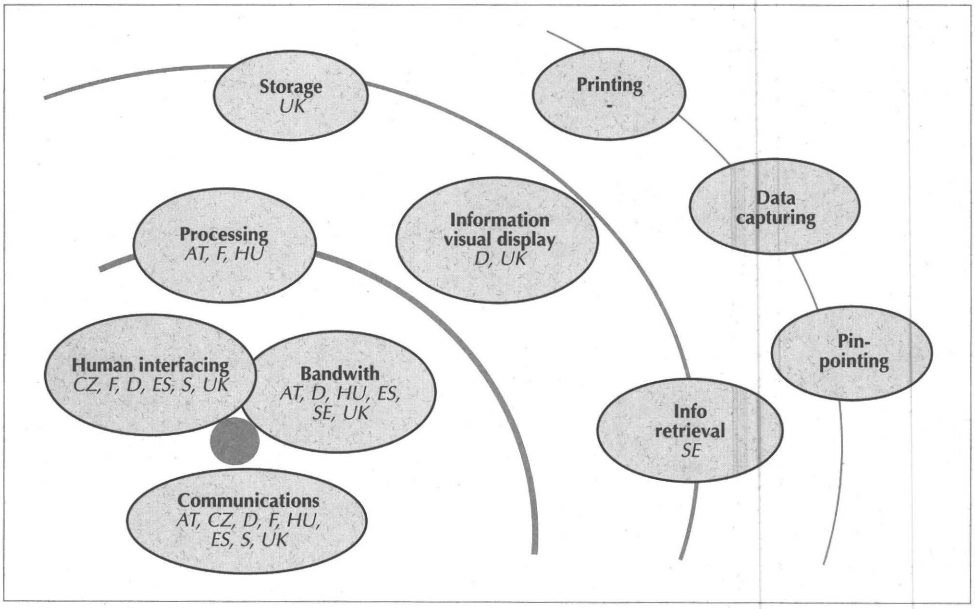


Fig. 2. Mapping the national foresight exercises to the ten key technology trajectories Fistera specified (see Fig 1). This figure indicates which of the eight national foresight reports mentions ICT technologies contributing to the ten trajectories. In principle, a high number of citations can be seen as indicator for consensus on promising ICT domains, but this may be biased by the "Zeitgeist" problem (i.e. the extrapolation that what is "hot" today will remain so in the future).

scenarios it the one that converged into the "Ambient Intelligence" vision, which has become the leitmotiv for the European Commission's current 6th IST research programme[6]. A potential risk of scenario building here is that it may offer only simplistic results for defining research directions when not taking into account adequately the ongoing technology environment. In Fistera, we try to overcome this problem by tightly linking technology road-mapping to scenario building. In particular, scenario building is employed for the discussion of the societal acceptance and potential impact, resulting from discussion of promising technology development.

Here, the basic idea is to assess future technology based scenarios against the information arising from emerging technologies trajectories. This results in a series of issues, such as performance trends, challenges ahead, cost trends, application areas, main actors, key technologies and features. For this then a number of storylines are developed to presents different ICT perspectives, with the purpose to trigger the discussion on what is technically viable and on what its impact on society might be[7].

Understanding the influencing factors

Foresight in any technology domain has often to struggle with the so-called "Zeitgeist" dilemma, i.e. being a prisoner of the spirit of the times and "believing that the big issues or technologies of today will also be big tomorrow". ICTs do not escape from this issue, but there are a number of differences with respect to other technologies.

In the last few decades, we have witnessed of an impressive number of unexpected technological ICT breakthroughs that have led to unexpected or unforeseen applications and services influencing our economy and daily lives in a profound way . The evolution of the Internet and mobile telephony are two of the most obvious examples. Of the key problems foresight has been struggling with is that these alternative developments or wild cards (like the recent terrorists attacks in the US and Europe) are very hard to predict.

At best, as Fistera's aims to set up, an "early detection system" it could offer at least some foresight value. One part of this system consists in monitoring possible technology disruptions, highlighting technology areas to keep an eye on them as they may change drastically the evolution of the trajectories. The second one is to understand better the nature of critical factors that will influence the future deployment of ICT.

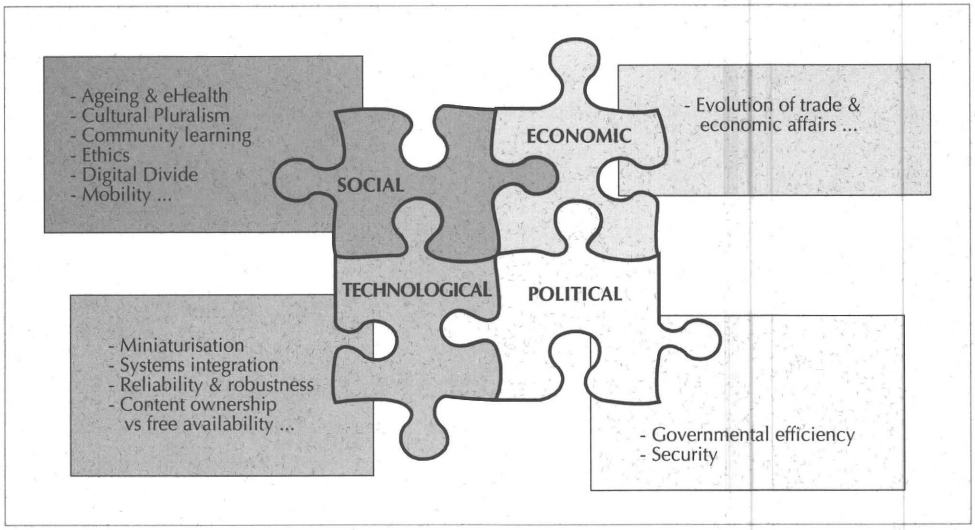
The influencing factors may be of social, economic, political or technological origin (Fig 3). By its nature these factors are interrelated, and may change over the course of time. A first step is to review some European IST scenarios and to try to identify a number of trends and drivers that are likely to influence future societal changes. By identifying drivers and understanding their impact we hope to provide insights for decision makers. A trend needs to be considered seriously because it is going to affect whatever you are foreseeing and planning to do. For instance, this is the case for the ageing population. For technology trends we use the technology trajectories projections, which should deliver more information than classical technology roadmaps. Challenges are hurdles one needs to overcome in order to move in a certain direction, bringing together major issues constraining the integration of ISTs in the European society. A proper understanding of all these would help us undertake vision building activities for anticipating the future of ICTs.

The relationship and dependency between different factors is complex. The factors are of different nature: technological (e,g miniaturisation),

The factors that influence the analysis are interrelated trends, drivers and challenges. These factors may change over the course of time

Various economic, social and political factors need to coincide in order to for a technology to conquer the market

Figure 3. Influencing factors



social (e.g. the increasing demand for mobility) or economical (e.g. reduction of the cost per unit of functionality) and often difficult to link. Often these factors are juxtaposed. For example, the factor 'more personalization' or 'more security' is at the expense of the factor 'cost' or 'privacy'. Although a complete picture cannot be established, it is for certain that in order for an ICT to conquer the market, a number of factors need to coincide: it must be respond to a demand and be in line with the political structure. For instance, the deployment of e-commerce, requires a political willingness to underwrite policies enabling privacy and security, a technology that delivers people's needs and the trust of society in this policy and technology.

Conclusions

The key drivers, challenges and trends considered important for IST/ICT are closely interrelated since various aspects of the social system impinge upon each other in numerous direct and indirect ways. For the sake of simplicity, these influences have been grouped into four major areas: technological-related factors, economic and political factors, socio-related factors and S&T (science & technology) – based competitiveness (including human factors). Scenarios often follow a top-down approach: the scenario is developed assuming a "wish list" of technologies and services that would be indispensable. On the contrary, technology roadmaps are bottom-up in nature in as much they tend to extrapolate current technology trends, and a potential risk is to spend effort in technologies for which the need is unclear ("solution looking for a problem" syndrome). The challenge is to understand under which circumstances scenarios and technology roadmaps meet as, in this case, the probability of success increases. This balance between top-down und bottom-up approach should be more suited to understand how to spend best limited resources.

Fistera offers this integrated approach and by doing so hopes to better contribute to priority setting in ICT research. Fistera is also convinced that a very important technique to do that is discussion amongst the stakeholders. If our work contributes to a more informed European discussion we probably will have met our objective. In the end the future is (luckily enough...) indeed made by people.

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Ramón Compañó holds a physics degree and a PhD from the Technical University of Aachen (Germany). He worked at the University of Modena (Italy) before joining the European Commission in 1993, where he took care of the follow up of research projects in the area of advanced materials, physical analysis, surface science and metrology. In 1996 he set up the Nanotechnology Information Devices Initiative, taking care of the nanoelectronics strategy for the European Commission's IST progrmme. Currently he is in charge of the of the FISTERA project at the ICT unit of the IPTS.

Keywords
ICT, foresight, Lisbon Objectives

Notes

1. For more info visit **http://fistera.jrc.es**
2. For more info, visit the High-Level Socio-Economic Group website at **http://www.cordis.lu/ist/about/socio-eco.htm**
3. The Telecom Italia Lab maintains the FISTERA database on technologies and their trajectories. This database is available online via the FISTERA website at **http://fistera.jrc.es** by going to the Key European Technology Trajectories at TILAB Activity site. This database in regularly updated with the technical information received online. Interested parties are strongly invited to interrogate this database and/or contribute to its maintenance by sending suggestions to **fistera@tilab.com**
4. Scenario building activities are channeled through the PREST web site. Available online via the FISTERA website at **http://fistera.jrc.es** by going to the IST forum for consensus building on future visions for IS at PREST Activity site. Readers interested in participating in an Online-Delphi are encouraged to contact Prest at **Rafael.Popper@les.man.ac.uk**
5. Examples are the "international technology roadmap for semiconductors" edited by the Semiconductor Industry Association (available at **http://public.itrs.net/**) or the "Technology Roadmap for Nanoelectronics" of the European Commission (available at **http://www.cordis.lu/ist/fet/nidqf.htm**).
6. For more info please visits EC's ISAG website at **http://www.cordis.lu/ist/istag.htm** and EC's 6th FWP website at **http://fp6.cordis.lu/fp6/home.cfm** or at **http://europa.eu.int/comm/research/fp6/index_en.html**
7. A number of storylines, the so-called vignettes, are available on PREST's Fistera web page as part of the Scenario building activities.

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Acknowledgements

The authors would like to thank the FISTERA team members, in particular:
Michael Rader, Knud Boehle, Carsten Orwat, Institut für Technikfolgenabschätzung und Systemanalyse (ITAS), Karlsruhe
Roberto Saracco, AnnaFlavia Bianchi and Graziella Spinelli, TelecomItaliaLab, Turin
Rafael Popper, Ian Miles, Lawrence Green and Kieron Flanagan, PREST Univ. Manchester
Bernard Dachs and Matthias Weber, Arc-sys Seiberdorf
Mark Boden, IPTS, *and Ken Ducatel,* DG Information Society.
Financial support for Fistera from the European Commission's FP5 IST Programme is gratefully acknowledged (contract IST-2001-37627).
The authors would also like to thank *Pierre Marro* from DG Information Society, Fistera's scientific officer.

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- The Institute for the Protection and the Security of the Citizen (IPSC)
- The Institute for Environment and Sustainability (IES)
- The Institute for Health and Consumer Protection (IHCP)
- The Institute for Prospective Technological Studies (IPTS)

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ABOUT THE IPTS

The Institute for Prospective Technological Studies (IPTS) is one of the seven institutes making up the Joint Research Centre (JRC) of the European Commission. It was established in Seville, Spain, in September 1994.

The mission of the Institute is to provide techno-economic analysis support to European decision-makers, by monitoring and analysing Science & Technology related developments, their cross-sectoral impact, their inter-relationship in the socio-economic context and future policy implications and to present this information in a timely and integrated way.

The IPTS is a unique public advisory body, independent from special national or commercial interests, closely associated with the EU policy-making process. In fact, most of the work undertaken by the IPTS is in response to direct requests from (or takes the form of long-term policy support on behalf of) the European Commission Directorate Generals, or European Parliament Committees. The IPTS also does work for Member States' governmental, academic or industrial organizations, though this represents a minor share of its total activities.

Although particular emphasis is placed on key Science and Technology fields, especially those that have a driving role and even the potential to reshape our society, important efforts are devoted to improving the understanding of the complex interactions between technology, economy and society. Indeed, the impact of technology on society and, conversely, the way technological development is driven by societal changes, are highly relevant themes within the European decision-making context.

The inter-disciplinary prospective approach adopted by the Institute is intended to provide European decision-makers with a deeper understanding of the emerging S/T issues, and it complements the activities undertaken by other Joint Research Centres institutes.

The IPTS collects information about technological developments and their application in Europe and the world, analyses this information and transmits it in an accessible form to European decision-makers. This is implemented in three sectors of activity:

- Technologies for Sustainable Development
- Life Sciences / Information and Communication Technologies
- Technology, Employment, Competitiveness and Society

In order to implement its mission, the Institute develops appropriate contacts, awareness and skills for anticipating and following the agenda of the policy decision-makers. In addition to its own resources, the IPTS makes use of external Advisory Groups and operates a Network of European Institutes working in similar areas. These networking activities enable the IPTS to draw on a large pool of available expertise, while allowing a continuous process of external peer-review of the in-house activities.

The IPTS Report is published in the first week of every month, except for the months of January and August.
It is edited in English and is additionally available in French, German and Spanish.

S.P.S.04.04

LF-AA-04-084-EN-C

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