BLUEPRINTS FOR FORESIGHT ACTIONS IN THE REGIONS

TECHTRANS

Transregional integration and harmonisation of technology support mechanism

DISSEMINATION CONFERENCE
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THE TECHTRANS BLUEPRINT

Transregional integration and harmonisation of technology support mechanism

Innovation processes have become more complex and much faster. To be successful in the future requires the best available scientific / technological knowledge from around the world, just in time and with a perfect "fit" to the very concrete solutions needed in practice. This is a challenge for both companies and regional authorities and calls for thorough changes both in innovation strategies and in related support mechanisms. As an essential part of this reorientation new models for trans-regional technology transfer are needed. Awareness raising and change of mind-set are as important as the development of new TTT support mechanisms. Foresight, and especially regional foresight processes can become critical in this respect as they not only generate the necessary strategic knowledge, but are also powerful mobilisation and consensus building tools. The TECHTRANS 'Blueprint' provides a model approach for how to run foresight type exercises addressing these questions. The resulting foresight process will provide a clear guidance for modernizing the practice of technology transfer and the management of innovation processes. Ultimately, this will lead to more competitive and innovative regions.

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The Directorate-General for Research initiates, develops and follows the Commission's political initiatives for the realisation of the European Research Area. It conceives and implements the necessary Community actions, in particular the Framework Programmes in terms of research and technological development. It also contributes to the implementation of the "Lisbon Strategy" regarding employment, competitiveness at international level, the economic reform and the social cohesion within the European Union.

The Directorate "Social sciences and humanities; foresight" (Directorate K) contributes to the realisation of the European Research Area in the fields of the social sciences, economic, science and technology foresight, and the respective analyses. To this end, it monitors and encourages science and technology foresight activities, conducts the economic analyses necessary for the work of the Directorate-General, and co-ordinates policy as regards the relevant political, economic, human and social sciences. It prepares the European reports on science and technology indicators, and it contributes to the development and implementation of the Framework Programmes in these fields. It monitors the progress made in the implementation of the Lisbon strategy. It is responsible for encouraging investment in research and technological innovation. To this end, it develops policies and measures to improve framework conditions for private investment and the effectiveness of public financing instruments.

The unit K 2 "Science and Technology Foresight" contributes to the development of policies and policy concepts through Foresight analyses and activities. Together with other Directorates and General Directorates, and specially the IPTS/JRC, the unit develops the co-operation between Foresight practitioners and users in Europe. In addition, it is responsible for the implementation of the respective activities in the 5th and 6th Research Framework Programme.

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Blueprints for Foresight Actions in the Regions expert group

To develop their potential, and find their new role in the emerging EU25+ knowledge-based economy, regions need to widen their focus and go beyond their own innovation landscape to explore the European and trans-regional dimension to the full. Foresight is a key element in the creation of future oriented and outward looking visions and strategies. Many regions considering implementing foresight exercises need help to overcome initial barriers, such as doubts about the usefulness and usability of foresight, problems linking foresight to existing regional mechanisms, as well as simply lack of knowledge on how to set up and undertake foresight activities. Easy to understand practical blueprints on how to set up a foresight activities to suit specific regional circumstances could be instrumental in supporting regions to implement regional foresight.

The blueprints expert group builds upon the existing Foresight knowledge base developed so far mainly at EU level by involving regional experts and policy makers active in earlier exercises, as well as using already available methodological tools and case studies, e.g., the Country specific Guides to Regional Foresight (http://www.cordis.lu/foresight/cgrf.htm).

> Blueprints are practical guidelines to the setting up and planning of foresight. They are manuals or roadmaps, not foresight exercises in themselves. Blueprints build upon real problems in real regions, with strong stakeholder involvement.

The expert group was built around a core group of experts on foresight processes, who steered five working groups with regional partners, chosen because of their capacity to initiate actions and influence policymaking.

The working groups have been open to outside participation, and the resulting blueprints (one for each working group) are being designed so as to provide useful tools for regions not actively participating in the expert group, but facing the same challenges. The resulting blueprints are:

> FOR-RIS: Experiences and ideas for developing regional foresight in a RIS/RITTS project context;

> UPGRADE: Foresight strategy and actions to assist regions of traditional industry towards a more knowledge based community;
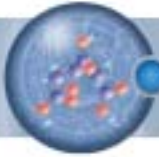
> TECHTRANS: Trans-regional integration and harmonisation of technology support mechanisms;

> TRANSVISION: Bridging historically and culturally close neighbouring regions separated by national borders;

> AGRIBLUE: Sustainable Territorial Development of the Rural Areas of Europe.

The work started in December 2003 and its present stage ends with the dissemination conference on September 23, 2004.
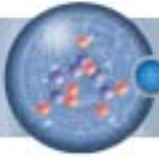
Professor Liam Downey, Chairman
Professor Peter Heydebreck, Secretary

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1. Introduction

Trans-regional Technology Transfer (TTT) is a crucial but up to now only partly developed instrument for a competitive and innovative ERA. The **market for technology and the way technology transfer is done are far from perfect**. Insufficient innovation causes a low growth rate for the European Union. Furthermore, fundamental changes are emerging in the way we manage innovation. There is a real need for a future-oriented development of regional innovation policies that will result in a better functioning of TTT.

Regions must work together in order to stimulate higher growth with more and better qualified jobs. However, efficient co-ordination of regional innovation policies, involvement of stakeholders (including consumers), enhancement of innovation networks and hence improved regional co-operation are needed to build future-oriented and competitive regions.

A **trans-regional foresight process** is needed in order to better understand the upcoming challenges and to develop ideas and concepts on how to manage innovation in the future. The motivation, objectives, framework conditions, design, implementation, monitoring and follow-up of a trans-regional Foresight process are outlined in this blueprint. The purpose of this blueprint is to give a concrete picture of a foresight-process, and to highlight some of the important – generic – questions to be dealt with, when undertaking a foresight process.

The blueprint should be **especially valuable for experts with a background in technology transfer, regional innovation systems and trans-regional co-operation**, including leaders from companies, research institutes and intermediary technology-transfer institutions, and especially for **regional authorities**. It provides a new understanding of the context of TTT, as well as a process for how to design new models of TTT.

2. Mission Statement

Innovation processes have become more complex and much faster. To be successful in the future requires the best available scientific / technological knowledge from around the world, just in time and with a perfect "fit" to the concrete solutions needed in practice.
- One consequence of this is that **companies** need to change their innovation strategies fundamentally.
- Another consequence is that **public administrations** need to adjust their innovation support portfolios, especially for SMEs.
- Otherwise it will be difficult to ensure that companies continue to suc-cessfully maintain their competitiveness under the new framework conditions. As an essential part of this reorientation new models for trans-regional technology transfer are needed. In many cases however, regional policy makers still cling to the belief that regional resources should go to regional knowledge providers and are reluctant to change their respective policies.

Therefore, awareness raising and **change of mind-sets** are as important as the development of **new TTT support mechanisms**.

- **Foresight**, and especially regional foresight processes can – in addi-tion to generating the necessary strategic knowledge – be powerful mobilisation and consensus building tools.

The TECHTRANS **blueprint** sets out a model approach to running Foresight type exercises addressing these questions. Such a Foresight would bring together different types of actors and stakeholders of the innovation systems concerned. It would deliver perspectives of the future with a better understanding of what is to come. **The blueprint describes a trans-regional foresight process which aims at developing a new model of trans-regional technology transfer based on considerations of how innovation processes will take place in the future and the respective roles of companies, research institutions and regional authorities.**

The results of the Foresight-process will provide a clear **guidance** for modernizing the practice of technology transfer. Ultimately, this will lead to more **competitive and innovative regions**.

3. Motivation for a new model of Trans-regional Technology Transfer

Technology Transfer (TT) is not a new concept. It works, in some sense, following market rules. In addition, some public innovation policies are focused on the enhancement of this technology market. Yet, it is commonly accepted that the model of technology transfer practised is far from perfect – especially from the viewpoint of knowledge transfer. This is true despite the fact that a lot of public and private agents act as movers of these knowledge and technology markets.

The basic model of technology transfer is shown in the following figure:
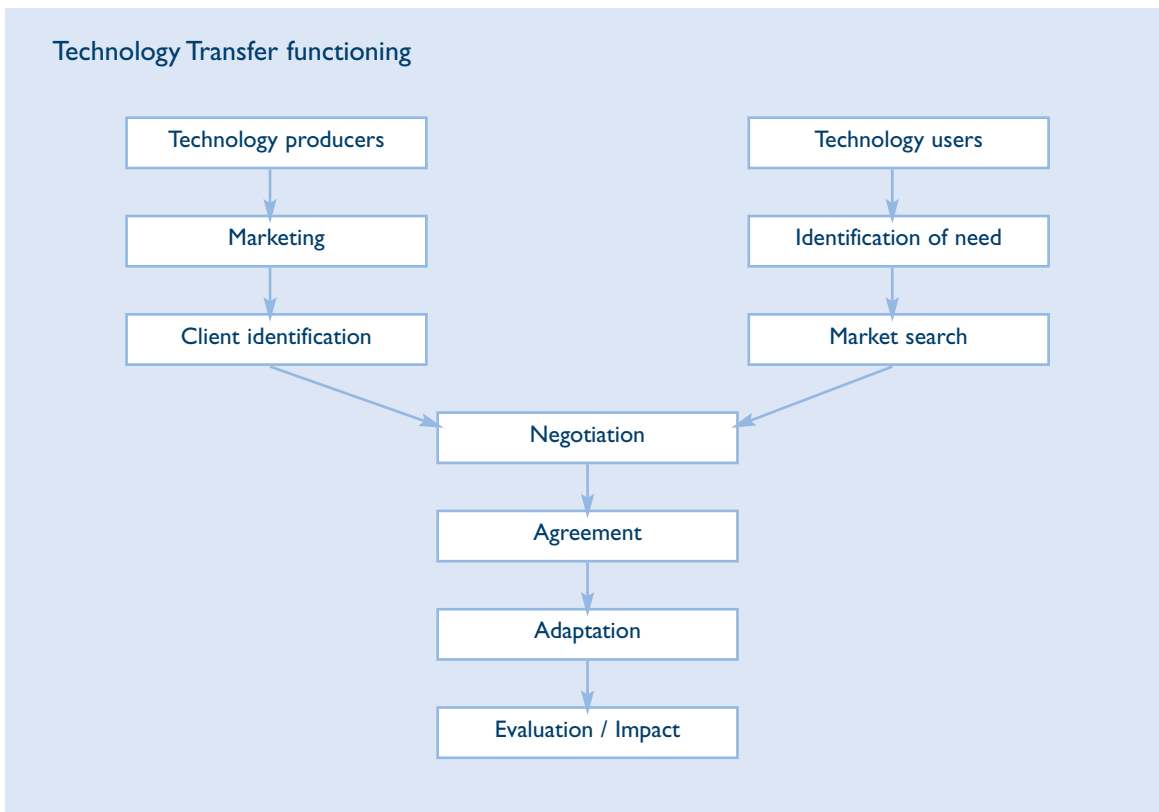
Regional innovation policies have good success-rates, especially in terms of supporting SMEs in order to foster their competitiveness. **But regional policies tend to fail when faced with the urgent need of achieving competitiveness in a global market with multidisciplinary technology-based innovation**. Different countries, and also different regions within a country, have different roles and cultures regarding their respective science-technology innovation systems. Often, this leads to a failure of trans-national policies because they do not fit in the same way to all regional systems. Hence, the success in many cases is far from satisfactory. **In consequence, given the classical model presented in the chart above, it becomes obvious and highly important, to improve several of the steps involved in the process or even to re-design the whole model. To do this, is the aim of the foresight process on TTT**.

Some hypothetical questions that might become more common:
The R&D unit of an European national company is outsourced to China. How can the knowledge produced benefit the company's European region of origin and the move of R&D abroad be turned into a competitive advantage? Can the newly established links to China be used as an opportunity to develop new products and enter new markets? New models of TTT should help to answer these questions.

A foresight process can make a valuable contribution in terms of future developments and challenges and in developing new concepts which have a **"future-fit"**. The Techtrans working group stresses that a more co-ordinated **multilevel science-technology innovation policy** is needed. To achieve this new framework a process that involves the relevant stakeholders systematically is required. In particular a process that results in a Trans-regional Technology Transfer (TTT) system, generating both critical mass and trans-disciplinarity, and as a consequence, an increase in the competitiveness of the regions.

The trans-regional foresight described in this paper intends to help both policy makers and actors (universities, research and technology organisations, enterprises, intermediary agents, regional authorities etc.) to understand their respective roles with regard to the building of a new framework of knowledge flows and innovation. In addition, foresight will result in a better understanding of the behaviour of innovation systems and serve as a platform for building trust and for enhancing the necessary commitment for a more prosperous future within the enlarged EU.

What is foresight? Definition of foresight by Ben Martin (1995):
Foresight is a "… process involved systematically attempting to look into the longer-term future of science, technology, the economy and society with the aim of identifying the areas of strategic research and the emerging generic technologies likely to yield the greatest economic and social benefits."

Why foresight?
Foresight **enables user**s to achieve:
- Consensus on long term perspectives
- Reduction of uncertainty and ambiguity failures
- Agreement on concrete strategic initiatives
- A commitment to implement those initiatives subsequently

Its **benefits** include:
- Increased research and innovation performance; focused in-vestments; better transformation of knowledge into new products and services
- Improved policy design and implementation in all policy fields (better governance as a source of competitive advantage); design of innovation-friendly regulations
- Improved mutual understanding between science and other parts of society; constructive co-operation between research and industry/social partners for a successful society
- Improved social understanding of innovation; enhance consumer confidence in innovative products and services; stimulate culture of innovation and entrepreneurship
- Development of a strategic intelligence, empowering regional and local actors;
- policy coherence and flexibility which results on a commitment to build the European Research and Innovation Area

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Motivation

For any foresight process it is **crucial, that the partners involved think very hard about the motivation** that drives them to commit themselves to the process. By knowing one's motivation one also knows one's **own interest** and one's own stake in the process. Only with this knowledge is true commitment ensured.

The motivations for the TECHTRANS group are listed below. They provide a better understanding of the reasons why there is a need for a new model of trans-regional technology transfer and also the motivation for a foresight exercise on trans-regional technology transfer focusing on some very practical issues.[1]

- **Faster innovation processes**: Innovation processes are accelerating. A better time-to-market ratio with innovative niche products is an important factor in competitiveness. At the same time, the required technology and the know-how needed is harder to get. Trends such as outsourcing, work in big supplier-networks and globalization have distributed the knowledge needed among various actors in different places. Furthermore, entrepreneurs and scientists have become "two sides of the same medal". Successful innovation relies on sound research and professional entrepreneurship. In addition, technology has to be seen in its social and ecological context: Demand-led innovations are even more crucial than supply-led technological innovations. All innovations must meet a market demand to be successful. Technologies can create their own market but it takes much longer and costs much more. Therefore, knowing about the needs of people is the key to developing an innovation. Information about the demand delivers strategic intelligence, which is essential for innovations and competitiveness in the future.

- **Social capital**: To build up social capital and trust is highly important for functioning co-operations. The future is cooperation and inte-

gration, sharing of information, resources and knowledge. Networks are used also to build the critical mass of resources (mainly professional and financial) needed to pursue the scientific development of some emerging technologies (such as nanotechnologies). A region embarking upon these R&D themes by itself may waste resources due to its inadequacy with respect to the S&T goals and the lack of a critical mass within the region itself.

- **Process to change mind-set**: It is important not to be restricted to instruments and tools. One should also be aware of the importance of a process in itself, making actors think about the future and the implications of future developments. The actual process of using an instrument or tool is often more important than the qualities of the tool itself. One should focus on encouraging potential actors to take part and to try the process (be it Foresight or Technology Transfer (TT)). This is the best way of getting them to realise the importance of Foresight and TT and encourages them to try. It is the doing which creates confidence and commitment. The technology is rarely the problem when it comes to implementation. This seems to be especially important for public bodies. Traditionally, they were in a dominant position of power, but the picture has changed. Today, in order to govern successfully, an administration must be aware of future developments and their consequences for local politics. It is not only globalisation that has undermined the power of national or regional politics.

  - **Change in institutional landscape**: The roles of the regional actors will change, there will be much more trans-regional cooperation. Hence new instruments are needed. This is especially true when seen against the background of the European Research Area (ERA). The role of the regions will alter in respect to the challenges arising from the ERA. Innovation research has shown that innovations occur at the interfaces between

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[1] One might state that these reasons are rather generic. However, it is not the point of this text to describe in many pages the motivation of each region involved individually. The motivations listed are true for all – the specific interpretation has to be given by each partner.

disciplines and sectors. This leads to a significant change in the way we manage innovations: The focus of attention shifts from isolated research in one institution to a network of competencies all crucial for an innovation. In other words, one has to open up the boundaries between institutions and build direct links between the competencies within each of the institutions. These links will make the interfaces productive. In consequence, all institutions involved in innovation processes will face a tremendous change in their organisations' self-understanding and development. A "networkage" has started and it will dissolve the big institutions we know today. Public bodies will often see themselves in the role of a facilitator, initiating and steering innovation processes between partners.

- **The development of the ERA**: Transnational cooperation in the field of S&T must be seen planned and implemented as a tool for translating the concept of ERA into reality.

- **Funding**: The availability of joint funding for collaborative strategic processes such as TTT is important. In addition, more funds for training and new business development should be made available. However, funding must be flexible enough for new demands in technology. What is needed is a simple non-bureaucratic innovation funding system. Where co-operation is seen as important, then there also should be funding for the management of co-operation.

- **Education:** We will have a knowledge-based economy in the future. Therefore we need training and education. It is the key to strengthening collective learning capacity by developing competence in political institutions. Indeed, this is done already in a growing number of universities. However, it is pertinent to provide training in TTT and multidisciplinary work, especially for those responsible for innovation processes (entrepreneurs, senior administrators etc). This of course means that those people with responsibility should have a chance to learn without having negative consequences for their careers when mistakes are made. This could be done for example using software-based "innovation games" that are based on indicators of success of trans-regional innovations. Businesses do not want people with only technical skills that may become obsolete, but trans-functionality.

Cambridge and MIT have a partnership funded by the UK government and are carrying out an experiment in teaching methods. Cambridge graduates have been to MIT for a term and vice versa. MIT is interested in Cambridge's preference for in-depth and often solitary learning and Cambridge is interested in MIT's emphasis on meeting regular deadlines and working on projects involving companies. The benefits of trans-national experiments should be explored intra-regionally in Europe, especially for PhD research projects requiring multidisciplinary teams.

- **Networks**: The future will bring interlinked centres of trans-regional technological, scientific and entrepreneurial excellence. Trans-regional knowledge transfer between enterprises, universities and technology organisations will become usual practice. Clusters will be trans-regional, since small regions cannot survive on their own. Regions will essentially be defined by clusters. Thus is needed is active interfaces and promotion of supra-regional cooperation to foster regional competitiveness and a world class connectivity for local partners. Improved direct communication between disciplines will facilitate interdisciplinary work. The increasing multidisciplinary nature of new technologies may be tackled by combining specialised competences of some regions. Co-operation will be needed in order to have more and competitive patents. However, networks must be efficiently managed.

These demands and challenges will arise in the immediate future. Foresight can provide a well informed picture on these future challenges.

Knowing these challenges one can design a modern model of TTT

Carlos Martínez Riera, Head of Service 'Studies and Evaluation of the Valencian Plan for RTD and Innovation', Valencia, has pointed out that

"We need to engage in a trans-regional foresight process on TTT because,
- *we need to diversify and innovate the industrial fabric of the region (it´s not anymore the price that makes the difference!),*
- *we need to open up the regional industrial and knowledge structure to neighbouring regions,*
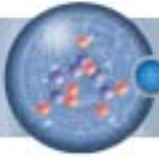- *we face the end of the Structural Funds contribution after 2007."*

See appendix II

Some **crucial questions** arising from the issues and trends outlined include:
- Is there a **win-win solution** for co-operating between regions that also are competitors? This question is especially difficult and pressing in an environment of market-competition. Successful co-operations are win-win solutions. They rely on trust. But, how is trust built trans-regionally? What are instrument which could help?
- Successful innovation needs the best know-how available world-wide. Yet, **knowledge is distributed** more and more broadly among diverse actors. How can a new model of TTT help to bring this knowledge together and make it productive?
- Is there a fundamental **cultural gap** within the TT-community, with one side – research – provides knowledge whereas the other side – business – wanting solutions?
- It is agreed that **regions** are important for the making of innovations. In this blueprint emphasis is given to trans-regional TTT. However, what is a "region" or the entity TTT is working with? It is possible to define a region from very different points of view (politics, economics, cultural, etc.). A region might be understood as a functional rather than geographic entity, which means that it is defined by the way actors in a given space interact. Silicon Valley is understood and known as a region not because of its geography but due to its IT-clusters.

- TTT is to a considerable degree dependent on the co-operation between public and private bodies, due to the fact that innovations are very often developed by alliances of very different partners. Thus, is TTT always a **public-private partnership** (PPP) or should it be that way?
- How is it possible to **bring together all relevant partners of a TTT** – across national and cultural borders? How can this be done efficiently and be a basis for an high output in TTT? Could one develop platforms which continuously gather strategically relevant issues for a cross-boarder TTT?
- How is it possible to motivate companies to do engage in TT and to get them to **use new technologies**? Many companies do not see the need, or do not have the capacity, to innovate. Can the technological absorbative capacity of SMEs by enhanced by training?
- Is TTT for all SMEs or only for those who want to engage in TTT and who are qualified for TTT?
- What is the future picture of a **support scheme of TTT**? Especially concerning EU structural funds.

The aim of foresight on TTT is to develop answers to these key questions.

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Casper David Friedrich (1818):"Wanderer über dem Nebelmeer" / "Wanderer above the Sea of Fog")

This famous painting can be used to illustrate some essential aspects of foresight: In order to get a clear picture of the day-to-day paths of business – which are in the foggy valleys – one has to climb on top of a mountain. There you can see way-ahead: What are important peaks, developments coming up? Where can I orientate myself? What is the weather, the circumstances of business going to be like? Obviously, the walker does not know what the exact path is going to look like. Yet, he is better informed and well prepared on his way!

4. Objectives of the regional foresight process

Foresight, co-operation and the culture of innovation

One of the interesting and challenging results of innovation research has been the **detection of opportunities and developments contingent on trans-regional cooperation**. As much as global, international and national policies and conditions shape and penetrate regional activities, so do regional responses to these challenges determine the fate and speed of regional development. Regions that limit their responses to play along with the global crowd become undistinguishable players in the global concert, and will not be rewarded in the global market place. Global and international competitiveness depends on an active search for and development of the regional strengths and features that need to be marketed regionally and globally. **Regional innovation systems combined with regionally specific innovative networks seem to govern the opportunities for becoming a dynamic and forceful player in the local and global environment**. In addition, a regional focus helps all actors to become aware of their potential capabilities and to improve their performance, allowing the region to develop a stronger feeling of identity and a strategic vision of its present and future path to prosperity. Regional foresight and assessment institutions can thus play a catalytic role for establishing regional innovation initiatives, monitoring their performance and suggesting improvements and changes in the course of implementation.

Regional foresight fills a demand for ways to **address strategic questions** in a local context and in a socially and geographically comprehensive manner. On a regional level one can involve a wide constituency of societal stakeholders and make use of innovation networks that **operate beyond traditional boundaries**.[2] It can be argued that the role of regional foresight is to ensure the development of the specific region where industry, academia, government and social actors interact, and to set up hybrid networks that overcome established boundaries, be they social, institutional or disciplinary. Furthermore, foresight is a very valid vehicle **to promote societal learning and to stimulate a culture of innovation.**

A new direction to regional foresight is the possibility of **regional cooperation across countries.** Regions with similar economic profiles or complementary structures can join forces and act upon a common strategic plan for developing their industrial and economic strength and to define fields of cooperation so as to reach the critical momentum necessary to becoming a global player. Communication networks, transportation of goods and services all transgress national boundaries and these boundaries no longer limit the competition in a regional market and cooperation between distinct regions can flourish and produce significant added value.

Inter-regional innovation systems

Knowledge is becoming much more important for a successful economy. However, knowledge today cannot be covered by one institution. **Knowledge is "distributed" among various actors** within a region (between departments of a university, R&D units in companies, administrations etc.). This implies a much higher level of professional and target-oriented networking (or "swarming"). This brings to the notion of "innovation system". Regions that have successfully working innovation systems are able to assemble and use "**strategic intelligence**". This is the ultimate aim of modern innovation systems, of dynamic economies, and thus of foresight.

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[2] It is somehow a policy instrument translation of the 'mode 2' and 'actor-network' theories (see Latour and Gibbons and others)

Globalization provides new approaches to the traditional methods of doing business. Traditionally, business comprised cooperation partners on one side and competitors on the other side. Due to the fast pace of process change and the need for an increasing velocity of product-innovations new kinds of co-operations are developing between competitive companies. Partners that used to be competitors benefit from such cooperation, especially in those business-fields which promise advantages for the positioning of the company in future markets. Areas such as futures planning and research collaborating may well be the core of such "**co-opetitions**" of (multinational) companies connected through new-type clusters. This could be a new dimension for regional foresight and may widen the horizon for regional co-operation across countries.

Success stories from Innovation Relay Centres (IRCs)
Technology transfer across national borders from Germany, to Switzerland, to Greece, to the Netherlands ...

See appendix III: Two examples of IRC D/CH TTT

The European Commission is taking steps to strengthen Transnational-Technology-Transfer (TTT). For example more than 230 Innovation Relay Centres (IRCs) located in many European areas are assisting mainly small and medium sized enterprises to acquire technologies from other countries or to offer their own technologies in foreign markets. "Co-opetition" strategies are important in order to build more competitive new markets and use resources more efficiently by not duplicating work.

Using this knowledge and taking into consideration the resulting benefits concerning the cooperation between companies in different European countries the question arises whether it would it be an **advantageous for the TTT process to be planned on an trans-regional level** where the co-opetition-partners are European regions? It is clear to the members of the Techtrans-working group that the **framework conditions will change tremendously in the future. Hence**

• There may no longer be a need for organisations dealing with and enforcing TTT because it will be a core business for the universities whose legal conditions and public funding may change in response to the need for more engagement in company-funded projects.

• There may be a need for more academic knowledge on how to work together in a globalised world (Bench-Learning ➔ see PAXIS-Exercise).

The question arises whether TTT organisations of today (like Steinbeis-Foundation in Baden-Wuerttemberg or the European-Business-Networks like IRCs, EICs, BICs) should change to become the "TTT universities" of tomorrow? The basic problems to be solved are very similar in all European regions. It may be easier to first find the basic solutions in a trans-regional strategic process and then build an individual answer for each region?

Why are clear objectives important for a foresight process?
Objectives ought to be set, because
- You will want to know the scope of your project– what you want to achieve.
- You will want to be able to set up a monitoring – without very concrete and detailed objectives this is not possible.
- You will want to ensure that your partners are really committed – the more specific the aims are, the more substantial the commitment.
- You will want to get useful outputs – without clear objectives you will end up running a talk-shop.

The specific objectives for a foresight on TTT

Taking the above mentioned considerations into account, the **objectives for foresight on trans-regional technology transfer** are:

- The development of a **shared vision and understanding** of effective **trans-regional innovation support mechanisms** (tool-boxes), especially in relation to Trans-Regional Technology Transfer (TTT).

- The creation of a **strategic network** that would establish a common trans-regional inno-vation strategy (e.g. detection of future markets, shaping of institutional landscape) and run joint research and product development activities. The network would serve as an **innovation backbone** of regional innovation policies in Europe, and improve the efficiency of regional innovation systems and actions (e.g. better time-to-market; demand-led R&D).

Catalonia:

In the future, the dilemma of focusing resources in some sectors with high potential levels of growth and the need to continue the support to the rest of sectors makes it necessary to create/reinforce mechanisms to collaborate with other regions.

See appendix VII

- Development of **education and training** of the skills needed for innovation and coopera-tion. TTT is a heavy-duty-activity. Therefore, the TTT players (such as entrepreneurs or scientists) have to be trained in order to win this challenge. "Simulation games" could be developed by the trans-regional network to help train the entrepreneurs in less time than the normal business cycles. Additionally these computer-aided simulation programs could help to test different TTT strategies using different sets of indicators and help find important indicators for the evaluation of the trans-regional strategy. Benchmark-processes between several European regions in order to learn how to build business structures for the technology transfer activities of the future could also be used.

The outcomes are expected to contribute to the overall goal

- of stimulating and supporting the co-evolution of the different **regional innovation** systems in a way that ensures the **long-term competitiveness** of each of these regions, as it effects the important key players for innova-tion development (RTD) and implementation (SME, industry).
  - Orientate the TT & innovation process to adapt to the changing market structures and be less dependent of geographical closeness;
  - Develop the different regional innovation support portfolios in a way that companies can always get the optimum knowledge mix of intra- and/or trans-regional TT.

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Example of concrete objectives from the perspective of a TTT facilitator: New high value services for the future

Assessing some of the recent discussions concerning the services and future perspectives of IRCs the results are objectives for a future concept of TTT.

See appendix X

TTT is a generic process and not related to a specific discipline. It can be used as an instrument for all technologies. The specific issues have only a minor influence on the way TTT is done.

Appendix XI contains a preliminary list of issues put forward by the members of the TECHTRANS working group.

A Trans-regional Foresight exercise could be represented as follows:

Trans-regional Foresight Process at a glance

2004		2015

Present "Where we are now "		Future Vision "Where we want to be"

Road Mapping

Regional positions   **Scenarios**

Trans-regional Position

- Region 1
- Region 2
- Region 3
- Region n

- Mutual understanding
- Intra/inter-regional networks
- Multidisciplinary networks
- R&D improvement
- Improved policy design
- Knowledge based economy
- Successful co-operation

5. Framework conditions of the regions involved in the foresight

This chapter sets out an analytical framework to describe the specific situation and the context of a region that is about to embark on TTT or on a foresight on TTT. It is of paramount importance to assess the framework conditions in the light of the objectives prior to designing the foresight process.

The local framework conditions have to be addressed, mapped and evaluated prior to the commencement of a trans-regional foresight exercise on TTT. This facilitates the identification of conflicting regulations, contradicting business ethics (which should be smoothed out), best practices, worthwhile tools and common approaches to be encouraged further. This information is crucial. Where it is not known, the risk is high that the whole process will fail because the crucial framework conditions have been disregarded. This is very common where issues which are difficult, problematic and possibly connected with conflicts (e.g. business ethics, culture of co-operation) are not properly addressed.

Where such analyses are done, it is much easier to compare regions with each other. This is then the basis for a sound co-operation between different regions. In other words, a **due diligence between the regions regarding the "framework-fit"** must be done in order to determine whether two regions do fit to each other or not.

It is absolutely necessary to think about the framework conditions before embarking on and designing a foresight process. **There is no "one-fits-all method" for a Foresight. There is always the need for a case-specific analysis of the situation** when designing of a foresight process.

Classification of the framework conditions

1. The political (public) framework focus area refers to the overall environment that incorporates the following elements:

- Regulatory environment: Administrative, legal, fiscal compatibility of the local environment in comparison to the environment of the regions between which TTT future is being examined. Different administrative procedures have to be addressed and recommendations for bridging these differences should be made (e.g. company establishment procedures). Legislation concerning foreign investment and capital mobility has to be thoroughly studied. Accounting systems (international accounting model vs. national accounting models) have to be compared and discrepancies must be ironed out.
- Different kinds of institutions, as well as different players in separate fields, have to work together without raising obstacles. Research organisations, academic institutions, banking and finance players, industrial firms, etc. are not only controlled by different establishment laws, but are also governed by different mentalities and philosophies.
- Governmental institutions have to be open and take account of the future. Governmental organisations and people can affect the TTT process by legislation not only based on technical criteria but also on political and ideological lines.
- Integration of policies at national, regional and pan-European level is a long term and ongoing process. It is carried out in Europe by taking into account capital and people mobility. Integration of policies under the perspective of TTT should be studied in a foresight exercise for TTT .

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2. The technical process (private) focus area - incorporating the elements of :

• Production chains and how they work on a national and international level must be addressed and examined. The multinational business model should be reconsidered under trans-regional perspective.

• Information and accessibility management. How businesses identify, assess and present their technology needs has to be defined as well as how technology providers (firms and research & technology centres) develop, certify and promote their know-how. The system of knowledge management and the identification of market opportunities in trans-regional technology transfer should also be examined.

• Access to finance and knowledge of technology evaluation processes are of paramount importance. Investors, venture capital, business angels, banks, state funding schemes together with technology evaluation processes create a complex system of technological and economic knowledge that must be managed.

3. The TTT market focus area refers to the availability and awareness of a market for TTT (demand/supply). This is the **fundamental precondition for TTT** providing its critical mass. Key questions that arise in this regard are: Is there a supply locally and regionally? Is there a demand? What is the size of this market? Which are the sectors (thematic and horizontal)? What is the history and the lessons that can be drawn from previous experiences?

4. The existing initiatives/networks to facilitate the TTT process (IRCs, etc.). Technology Transfer brokers and their networks are the "movers and shakers" of innovation. How well established they are? What is their reputation in the market? Is there an established professional image? Is there a new profession arising from this

activity? What are the skills and qualifications of such a professional expert? What are the advantages of having a strong network of technology brokerage? Which are the complementary structures available providing mediation services? How can they be coordinated to maximise the efficiency of TTT projects?
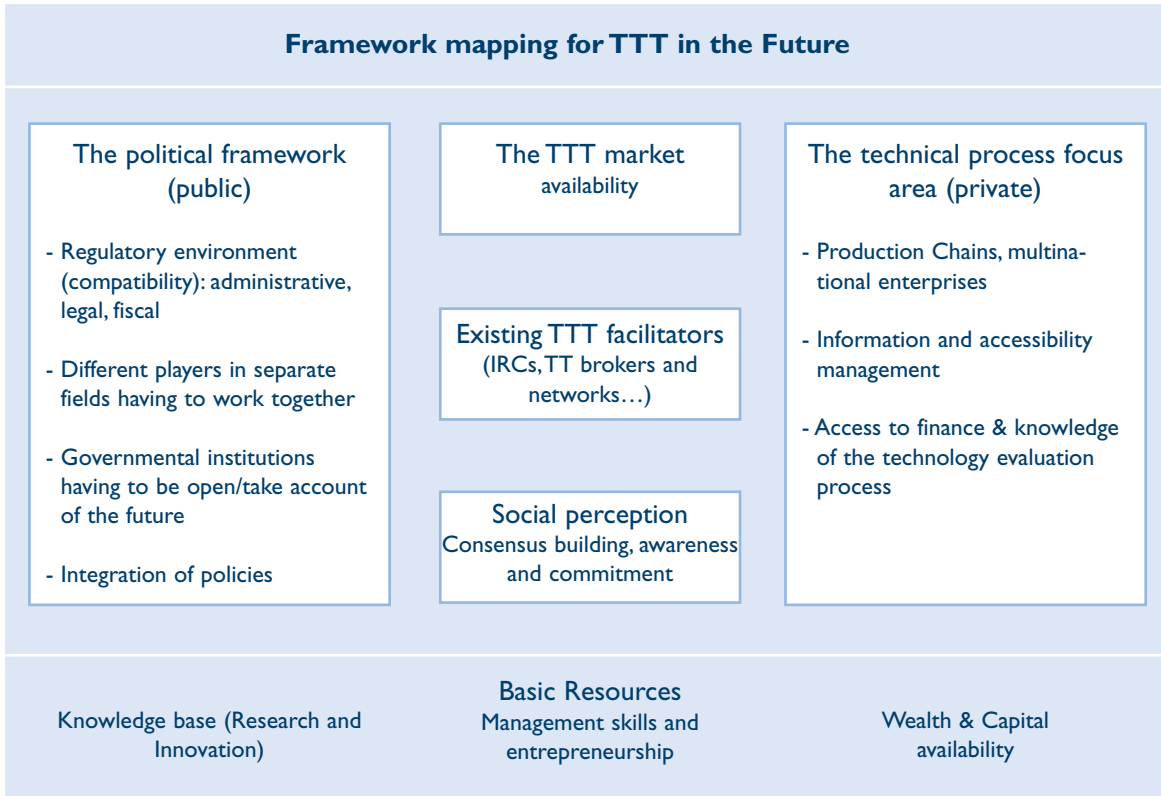
5. The social perception focus area, refers to:
• Consensus building (at all levels) in terms of its availability and development
• Awareness of and commitment to the process Considerations need to be given to the public attitude to foreign investment, products and services; the public confidence in local expertise operating at international level; how businesses, the state and the general public view further internationalisation of their economic activities; the terms and conditions (social character) the general public would like to see in the internationalisation of technology and business; how socially negative terms such as "globalisation" can be countered; etc.

6. The basic resources focus area on which all the above concepts are relying is composed of:

• Knowledge base (Education and Research), with extended mapping of the research and technology community in the regions under examination, taking into consideration linkages and current co-operations.
• Management skills, with education and local tradition in international business.
• Entrepreneurship, including tradition, skills development and initiatives to promote it in local and regional level.
• Availability of public /private funds (wealth and capital). Apart from the existence of institutions and systems, what are the actual wealth resources available for investments in TTT? What is economic environment in the last few years and what are the forecasts?

The framework mapping can be represented schematically in the following chart:

Framework mapping for TTT in the Future

The political framework (public)

- Regulatory environment (compatibility): administrative, legal, fiscal

- Different players in separate fields having to work together

- Governmental institutions having to be open/take account of the future

- Integration of policies

The TTT market
availability

Existing TTT facilitators
(IRCs, TT brokers and networks…)

Social perception
Consensus building, awareness and commitment

The technical process focus area (private)

- Production Chains, multinational enterprises

- Information and accessibility management

- Access to finance & knowledge of the technology evaluation process

Basic Resources

Knowledge base (Research and Innovation)

Management skills and entrepreneurship

Wealth & Capital availability

Valencia:
The Innovation, Development and Technology Transfer Programme (IDTTP) are indicative of supportive policies for innovation and technology transfer.
See appendix VI

6. Design of the trans-regional foresight process

This chapter re-emphasises that it is absolutely necessary to think about the framework conditions before starting to embark on the design of a foresight process. **There is no "one-fits-all method" for foresight; there is always the need for a case-specific analysis of the situation.**

It is important to note, that the design outlined in the following text is not the only possible way to run a foresight process on TTT; it is just one possibility among others. The process proposed is designed to give a concrete picture of a practical process design and some insights in the way foresight is done: It should provoke questions and critical reflections and motivation to engage in foresight.

The methodology describes a **foresight process aiming to develop an innovative and future-oriented concept of TTT: What is our idea and picture of TTT in the year 2015? What does a new model look like, including the question of a strategic network for TTT and the necessary training schemes?** The results of this process are concrete and practical concepts and plans of an innovative model of TTT, based on bringing different regions and experts together, and encouraging them to think into the future.

The question might be raised **why it is necessary to involve many regions and different experts in order to develop a new model of TTT?**
1. Looking at the history of TT and even TTT it would challenge common sense to say it was a clear success, hence there should be additional people thinking about TT.
2 With regard to the complexity of the issue in terms of cultural and regional differences, the fundamental changes in the ways innovation "happens" allied by the fact that this exercise is about the future, it would be impossible to nominate a small group of experts in order to draw up a new model of TTT.
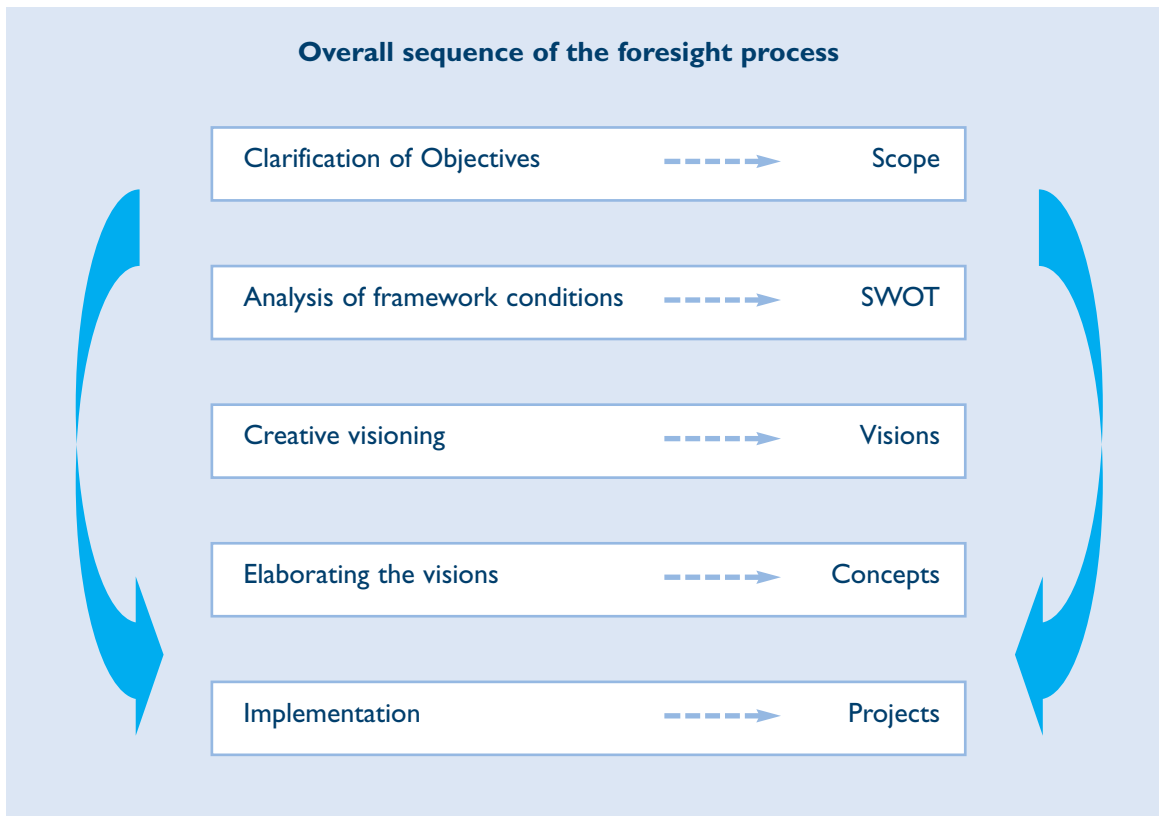
3. To get the new model implemented the participation of those who work on the ground and do TTT is essential. Stakeholder participation is a "conditio sine qua non" for a Foresight on TTT.

Crucial issues that must be considered

*   **Scope:** In order to run a successful foresight process it is necessary to define the scope of the work in terms of what are you trying to achieve and what the issues to work on are. It is essential to be clear about the objectives and to be open about the interests involved.
*   **Legitimacy:** To start a new project and get people to agree on a preferred future, legitimacy is a prerequisite. In considering the issues it is helpful to reflect on the framework conditions of every region.
*   **Engagement:** The co-operation between researchers, companies (SMEs) and policy-makers is essential to legitimise the project.
*   **Quality:** The nomination of partners depends on the expected output. What are common tools to be used in the process? How to reach and secure good quality outcomes? Apart from the specific methodological questions of foresight, professional experiences in process and network management are required.
*   **Information:** In order to reach the desired quality, the sources of good strategic information must be identified. What sources of information are valid and accessible? Here one has to look for an optimal cost-benefit-sharing among the partners.

Very few of the questions raised above can be worked upon given the existing **deficits in the infrastructure** (e.g. qualifications, services, manpower) in the regions. The prerequisite for a successful foresight on TTT is the analysis of the framework conditions. If done soundly at the start, it will have provided the regional promoters with the necessary information to upgrade infrastructure and run a successful foresight process.

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Overall sequence of the foresight process

Clarification of Objectives	- - - - →	Scope
Analysis of framework conditions	- - - - →	SWOT
Creative visioning	- - - - →	Visions
Elaborating the visions	- - - - →	Concepts
Implementation	- - - - →	Projects

Determining the scope of the foresight for TTT exercise

The more objectives to be achieved, the less likely a successful outcome. Thus, the whole foresight exercise should aim to provide concrete outputs for clients of TT in each country. Accordingly it is essential to define the **mutual benefits** for the trans-national partners, so that clear aims and objectives can be agreed at the outset of the process. In designing the methodology, partners would need to understand and define:

- **What types of concrete outputs are being referred to?**
- **What do clients want/need?**
- **What are the interests and incentives of the partners?**

"Jumping" into the future

Recall: What is the status quo of the region?
The given status in a region usually is determined using a SWOT analyses and a framework for which is outlined in the previous chapter. The results from this exercise provides a basis for the concrete design of the process for a specific region and an understanding of the major tasks to be fulfilled in order to optimize the capabilities of the region.

How is a picture of the future drawn? Visioning the future of TTT
To build a shared vision among the partners, the foresight process should start with a number of creative workshops aimed at formulating "**pictures of the future**" (e.g. What is TTT in 2020?) and reflecting on topics and fields of work seen as important in the future. The workshops provide information on emerging trends and shaping (or critical) factors that influence TTT in the future.

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Possible future questions and elements might be:
- What will a system of innovation look like in 2020 and what will be the roles of the partners in the new system?
- How will actors from various regions interact and with what technologies and methods?
- What is the "tool box" for TTT institutions in order to be informed about the strategic issues of their regions?
- How will people be trained for TTT?
- How will the TTT be financed?

When creating visions, it is of paramount importance to think about needs and demands of society in the future. These workshops should take place in each of the regions participating in the foresight process. The workshops should comprise an analytical part defining the shaping factors and a creative part developing the visions. Participants of the workshops are regional **stakeholders** who are important for the future model of TTT. It is important to also involve those responsible for the implementation and who need to be integrated in the foresight process at an early stage.

Balancing bottom-up and top-down: How to ensure participation and manage a result-oriented process?
All the stakeholders of the regions form the "**sounding board**" of the process, which will reflect and comment on all the crucial steps during the project. The board is a virtual community and an important element of the bottom-up part of the process. It should also involve those stakeholders that are relevant to the process, even those that do not have the resources to participate in the workshops. This participatory approach to the vision-building process ensures that the interests of the stakeholders is properly articulated. The trans-regional foresight process needs to be fully explained to all actors (economic agents, stakeholders and supporters).

A **core group** –formed by the project managers of the various regions – should synthesis the visions from the regions into one **unified vision** and send t back to the sounding board for feed-

back. The core group ensures that the process has a clear management and a focussed orientation on the results that are defined in the overall objectives. The same sharing of responsibilities will be used throughout the process.

This step in the process can also be used for the official start of the process. There could be a major **European conference** bringing together all stakeholders of the process and high level representatives from the EU and the countries involved. The conference will give feedback on the unified vision and formulate more specific **working objectives** by allowing the stakeholders to clarify their interests and commitment to the project. Given the visions and objectives it is possible to define the main **fields of work** more specifically. The conference could be organized as a 2-day open space conference. This setting gives the opportunity for a quick communication between regions and core group and fosters the commitment of the stakeholders. The agenda:
- Feedback by promoters from politics and economy;
- Discussion of overall visions and concrete objectives;
- Detailed discussion on specific objectives and interests, i.e. of specific parts of the vision.

The benefits of good **PR work** that makes the process known to a broader audience and gives it more awareness and importance should not be underestimated. In the first phase of the process, the vision is finalised by the core group (the duration of the first phase is approximately 6 months).

Elaborating the visions and building up quality

Focus groups: How to develop the specific contents of TTT? What needs to be done to reach the visions?

The task of the **focus groups** is to elaborate on the various objectives and fields of work. The members should be determined by the stakeholders from the regions. It is extremely important that the members of the groups represent a wide range of experts from academia, business and civil society. The quality of the focus groups is determined by their members, which should adopt **multiple (interdisciplinary) perspective**s on the themes discussed. Several focus groups can work in parallel.

The focus groups will need to meet several times in the subsequent six-month period to work out **how to reach the visions.** The task is to develop concrete concepts that show how a modern TTT might work[3], including different future instruments for TTT, models for collaborative platforms for permanent scanning of strategic issues for TTT, new professions for TTT or training schemes for universities. They should work intensively on the elements of the classical model of TT. **The results of the work of the focus groups are specific concepts and working plans.** With these the foresight process has reached an important milestone.

Quality control: How to keep things on track and not loose sight of the objectives?

The results should be constantly monitored by the core group, which intervenes when necessary. A successful foresight process is a learning process involving the constant re-designing of the project in order to provide optimal solutions. To monitor a process it is necessary to have a transparent project plan including milestones, deliverables and criteria for quality.

The first draft final concepts should be sent to the sounding board and specifically to those groups who will be involved in the implementation of the outcomes. Some of these may be part of the focus groups, but others – such as SMEs, who frequently will not be engaged in the group work have to be given the opportunity to comment on the draft findings).

This part of the process will have taken another 6 months.

Why should a foresight process give emphasis to implementation?

Given the visions and the results from the focus groups the foresight process in a narrow sense is finished. However, in order to ensure implementation, the outlined design suggest further action. Or to put it another way: **Foresight should always be planned with an implementation phase.** From the beginning of the process it is necessary
- to ensure the availability of funding for subsequent pilot or action plans and
- at an early stage in the process involve those actors that later on will have responsibility for the outcomes of the process.

Implementation of the results of the foresight process

Issue conference: Kick-off of the implementation

Having developed the instruments and tools for TTT, the stakeholders will define the **concrete issues to start with**, such as biotechnology or Agro-Industry. This can be done in a big conference with all participants, presenting – and celebrating – the first concrete outcomes of the process and can kick-off the implementation phase of the project.

Task forces should then transform the conceptual results of the foresight phase into more comprehensible and concrete tasks. For example a task force could start focus on new training schemes for TTT managers or they could start to build a strategy platform for the scanning of future-TT issues.

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[3] This reminds of a road-mapping exercise although a classical road-map has many details and a very work-intensive complexity which is not needed here.
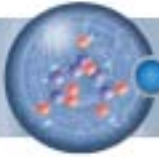
An instrument from a foresight on innovations in nanotechnology co-operations

	Technologies			
	Technology 1	Technology 2	...	Technology n
Application 1		●		
Application 2		●		
...				
Application n				●

(row label: Applications)

The identification of nanotechnologies "attractive" for the regions involved in the exercise can be based on building a "relevance" matrix, which provides for each technology the expected impacts of the main industries of each region. For any technology/industry grouping showing high impacts in a given region, an assessment should be then made of the related scientific and industrial capabilities. Grounds of possible cooperation among regions could come out and provide the basis for a trans-regional research and technology transfer action.

7. Implementation of the trans-regional foresight process and mobilisation of stakeholders

There is no foresight and no TTT without the people actually doing it. Foresight often lacks a successful implementation of its results. Foresight cannot be driven by people who will not be involved in the implementation; it relies on ownership both of implementation and the earlier stages of the process, and stakeholders must include initiators, champions and supporters.

The stakeholders of TTT: Initiators, Champions and Supporters of the process

Who are the stakeholders?

Key Players:
- Policy makers at regional level and regional authorities have an important role in initiating reforms in the case of TTT. Support to a competitive environment may stimulate companies' interest in using TTT, and change processes can be initiated through funding schemes.
- Research and Technology Organisations (including Universities and Technology Centres): Academics (new skills will be needed)
- TTT players (IRC!)
- Foresight experts and expert consultants
- Global actors (multinational companies)

Supporters (financial support and testimonial support):
- Policy makers at national and European Union level
- Industrial federations, large companies
- Banking foundations
- Unions
- Chambers of commerce
- Financial institutions

What can the key players provide?

The main actors to be involved in the design and implementation of a foresight exercise on TTT should provide:
- financial resources,
- scientific and technical capabilities,
- consensus.

Financial resources
Financial support must come from the regional government that is the main of initiator of the foresight exercise, in cooperation with other local institutions (e.g. Province, Chamber of Commerce). Other bodies that can provide financial resources include banks, foundations, etc.

Scientific and technical capabilities
Two categories of actors can provide scientific and technical know-how, namely:
- large firms (specially multinationals);
- universities and public research centres.

They can contribute to identifying the technologies that are likely to be transferred to industry, by assessing both their attractiveness for the medium-long term competitiveness of the industry of the region, and the feasibility of developing these technologies within the regional research and innovation system. In addition, expertise in foresight is necessary to properly design and carry out the exercise.

Consensus
Regional trade associations contribute to raising awareness and consensus about the goals of the foresight exercise and follow-up actions in technology transfer. Their involvement is important in order to properly assess the expected utilization of the innovative technologies in the industry of the region and to spread the foresight results specially among SMEs.

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To give the process strong visibility and a strong image, "leaders" of the region (politics, finance, business, academia, media, public administration, etc.) should be attracted to participate to the foresight exercise.

Organisations representing societal groups (citizens, NGOs, trade unions, consumers, etc.) are important in the dissemination of the inter-mediate and final results, and it is beneficial to involve them early in the process. A wide range of means of communication (press, workshops, newsletters, etc.) can also play a critical role.

The foresight process has to provide for the participation of:

- Policy makers
- Banks
- Foundations
- Large firms (including multinational companies)
- University and research centres
- Regional leaders
- Trade associations
- Trade unions
- NGOs
- Foresight experts.

Key players and their mobilization: an Italian case (Lombardia)

Three main types of players can be identified:

■ Financial supporters
  • Regione Lombardia
  • Cariplo Foundation

■ Scientific and Technical supporters
  • Large firms
    - Pirelli
    - ST Microelectronics
    - ENI
  • Research centres & Universities
    - Politecnico of Milan
    - University of Milan
    - CNR (national Reserch Council)

■ Consensus providers
  • Assolombarda (Association of industrial firms of Milan)
  • Federlombarda (association of industrial firms of Lombardia)
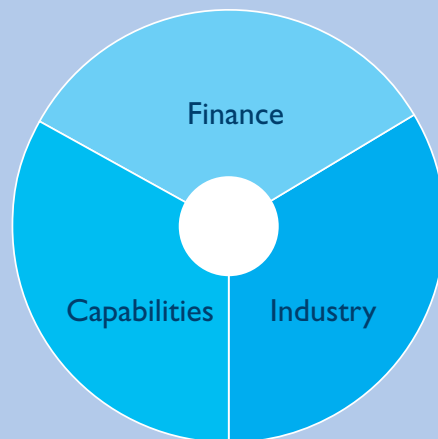
How to motivate stakeholders to support: why should the key players provide support?

Financial supporters

In order to gain the support of the regional government and institutions, it's important to demonstrate to them that foresight can improve policy formation and increase their effectiveness by developing a wide basis of consensus from the relevant actors of the regional economic and social systems. Banks can be motivated to be involved by recognising that support to a more strategic approach to business by the firms of the regions would lead to an improvement of the economic performance of the regional economy.

Scientific and technical actors

Scientific and technical experts are the main sources of knowledge for the foresight exercise and the following technology transfer process. They can be motivated to participate in the foresight exercise by the expected role they will have in the implementation of the research and technology transfer actions that would follow.

Consensus

Consensus providers can be involved by a raising role and a improvement of services provided to their associated firms, as these will use advanced tools for the improving of their technological competitiveness.

The stakeholders of TTT: Some Examples of Baden-Wuerttemberg:

- Attempto (Tübingen): Transfer-Technology-Organistion of the University of Tuebingen
- BIOPRO (Stuttgart): Agency for 3 biotechnology-cluster in Baden-Wuerttemberg
- Cyber-Forum (Karlsruhe): A private initiative to help start-ups coming to market
- FHG Fraunhofer-Gesellschaft: Solving R+D-Problems of companies with Applied Research Projects
- IBH (Stuttgart-Hohenheim): Transfer-Technology-Organisation of the University of Hohenheim (mostly being engaged in food-production and life-sciences)
- Icon (Stuttgart): private organiziation being envolved in TTT
- InnoAG (Karlsruhe): private organiziation being envolved in TTT
- MFG Agency for Media (Stuttgart): Managing the Baden-Wuerttemberg Media-cluster
- Steinbeis-Foundation: More than 350 transfer-centres are bringing technologies from universities (mostly universities of applied sciences/Fachhochschulen) to large and small and medium sized enterprises
- SEZ Steinbeis-Europa-Zentrum (Stuttgart/Karlsruhe): Hosting the IRC Stuttgart-Erfurt-Zürich
- Spitzmueller: private organiziation being envolved in TTT

Communication of the process should focus not only on core actors (stakeholders) but should also include the general society in relation to the rationale, motivation and benefits of the foresight on TTT.

Monitoring and evaluation of the foresight process

Why monitoring?

Monitoring should primarily be used to lead and improve the project. It is an essential part of the continuous learning process.

An example
An initial set of indicators for monitoring the process could be:

Indicators of activity:.
- Number of regions involved in the foresight process
- Number of stakeholders from each individual region involved in the foresight process
- Number of intra-regional meetings devoted to define the intra-regional network
- Number of trans-regional meetings devoted to achieving agreement on running the foresight process
- Number of trans-regional meetings devoted to define the Trans-regional network
- Number of subgroups established to run the exercise
- Number of meetings of the trans/intra-regional groups/subgroups dedicated run the foresight process

Indicators of impact:
- Number of areas of trans-regional co-operation in the foresight process
- Number of trans-regional networks of interest in the foresight process
- Number of trans-regional innovation policies defined by the foresight process
- Number of recommendations related to changes in the respective regional innovation policies (in order to enhance TTT)
- Number of recommendations related to changes in the EU innovation policies (in order to enhance TTT)
- Number of pilot plans/action plans for TTT enhancement
- Number of monitoring indicators defined for the pilot plans/action plans for TTT enhancement defined

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- The monitoring and evaluation should focus on the foresight process itself.
- The trans-regional character of the process is also an important issue.
- The scoreboard of indicators may be influenced by the results of the trans-regional foresight exercise. However, its is important to clarify that indicators of the process are different from those that would be used for monitoring the actions plans that will result from the foresight process to be run in the application cluster of regions.

Outlook and Conclusions

Fundamental changes in the immediate years ahead require new strategies for innovation in regions and the re-design of the classical model of TT.

While we do not know what the future will bring. However, we can **shape the future. Foresight is a powerful tool to highlight the trends and opportunities which should be considered for a better future.**

A Foresight on Trans-Regional Technology Transfer (TTT) could lead to a more effective **innovation policies** and the achievement of many of the objectives of the enlarged European Union.

A trans-regional foresight exercise would provide a **common understanding** of the European science-technology and innovation systems, especially with regard to technology transfer. To undertake such an exercise we need to collect the information that is dispersed between many different stakeholders.

In addition to the absolute necessity to involve all the regional stakeholders concerned with technology transfer attention must also be given to raising the **capabilities of the partners** to successfully work in TTT or in a foresight on TTT. **Pilot actions and training require commitment and resources.**

A modern concept of TTT developed in a foresight process could greatly improve the communication between stakeholders, especially:
- Those that have the knowledge and those that should implement it on the market.
- Those that have solutions and those that have problems in relation to TTT.
- Those engaged in R&D and those in the business sectors.
- Those that know how to innovate and those that need innovation to progress.

Improved communication would **enable amore effective circulation of knowledge** which in turn would provide a strong basis for innovations in production, organisation and marketing. Hence, the Foresight on TTT would make a highly valuable contribution to the **shaping of the upcoming knowledge society**. This process could be an essential element to structure networks of excellence in Europe and strengthen the European Research Area (ERA).

The process of change will not take place early enough if the **supporting mechanisms** which initiate these processes are not in place. Regional actors often need an **external stimulation** in order to embark upon a process of change and explore new approaches.

To develop new ways of doing business and research in cross-border networks, involving new kinds of innovation processes, new institutional settings and a new culture of learning and innovating throughout Europe, a foresight on trans-regional technology transfer is urgently needed.

Appendix I

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Appendix II

Key challenges for the Valencian Region

Need to diversify and innovate the industrial fabric of the region. There is clear evidence that the traditional competitive scheme based on lower costs and prices is no longer a valid approach in the new European and global context. There is consensus among all regional actors that new policies must be based on the introduction of technological innovation in traditional sectors and the creation of new sectors based on knowledge and technological innovation.

Need to open up the regional industrial and knowledge structures to neighbouring regions. We are convinced that regional competitiveness can be better achieved joining efforts and complementing skills with other regions with converging interests. Each region can preserve its own parcel of distinctive competitive edge whilst, at the same time, all regions benefit from sharing, inter alia: information on research assets (research lines, research groups, R&D centres and infrastructures), R&D and innovation strategic plans.

Advanced training, think-tank activities and implementation of innovation action plans.
Furthermore, some sectors may require R&D results from connected areas not present in the region and possibly not worthwhile being developed from scratch, but developed in a neighbour region. For example, the aeronautic sector, well developed in a region, may require new technologies on fuel cells for ancillary on-board systems, which are being developed in another region. Both regions would so complement each other, yet preserving their own focus on their strategic choices.

The end result is expected to be either i) purely regional increase of competitiveness in sectors which resources have been shared with other regions or ii) creation of truly trans-regional innovation poles.
The Valencia region has already embarked in a number of trans-regional collaborations (foresight, S&T indicators, opening up of SMEs collaborative schemes) aiming at establishing permanent trans-regional structures.

Facing the end of the Structural Funds contribution after 2007. The region must prepare already for the 2007 horizon, which will require both a change in mentality and a structural adaptation to the new framework conditions after that date. Other regions face similar challenges and we all have to learn together how to keep the innovative momentum without the thrust of the Structural Funds.

We are currently closely following up and supporting the TECHTRANS activity, through the collaboration of the Innova Foundation of the Polytechnic University of Valencia with the Foresight and Technology Transfer Office (OPTI) in Madrid.
Finally, we are collaborating with other regions in south-east Europe in preparing joint foresight actions through the Interreg IIB project REPARTIR.
We are also considering joining the CORNET project for opening up SMEs collaborative schemes, which will require foresight studies to orientate the new collaborative programmes.

Appendix III

Two examples of IRC D/CH TTT – success stories

Success story 1 - Optimum Visibility along the Supply Chain

A Supply Chain Management tool developed in Baden-Württemberg was introduced in the Greek market. IRC D/CH and IRC Help Forward identified the right partners and implemented transnational technology transfer between LogControl GmbH, Baden-Württemberg and Elogistics S.A. Athens.

IT solutions in the sector of supply chain management can improve and shorten the processes between production and distribution of products. LogControl a small enterprise with 15 employees located near Pforzheim, Baden-Württemberg, developed an innovative IT solution for article based tracking and tracing information within the EU-funded project „Rolling Stock". The Rolling Stock Monitor that was developed is a web-based information platform which is supplied with data by XML data communication from different systems of the partners in the supply network using the system.

Advantage of the innovative technology

The Rolling Stock Monitor helps organisations to find out about possible ways to improve networked delivery chains by using Supply Chain Management thus enhancing visibility and integrating information from different sources:
The technology concerns a web-based information platform (Rolling Stock Monitor), which enables the receiving company to control the incoming transport flows across the different logistics service providers. The article-based tracking and tracing information is supplied by XML data communication that consolidates the dynamic information from different actors in the supply network allowing the localisation of specified articles inside the transport units. Through this system, the company has the possibility of following products in transit, anticipating in parallel their use in production. In consequence, the overall logistical costs can be cut based on a higher vehicle load factor, lower stock values, better ramp management for unloading processes and better

harmonisation of material input flows and production processes. On the general transport and traffic level, the control of freight transport flows can be optimised and the efficiency in vehicle fleet usage is increased, reducing the negative impact on the environment.

Conquering distances and connecting technologies

Before starting the European project, LogControl contacted Steinbeis-Europa-Zentrum, Innovation Relay Centre of Southern Germany and German speaking part of Switzerland (IRC D/CH). They asked for support in the dissemination of the technology.
"One way of disseminating the activities and technical innovations was to promote the out-comes of the project directly in different European countries by carrying out road shows, seminars and presentations" (Heike Fischer, IT project manager of Steinbeis-Europa-Zentrum and responsible for the project).
To reach a widespread dissemination for this innovative development in the supply chain sector, SEZ contacted the network of Innovation Relay Centres, especially some relevant IRC in the IT and logistic sector.
IRC HELP-FORWARD answered quickly with an expression of interest. The two IRC entered into a discussion and decided a joint action. IRC HELP-FORWARD, on behalf of the IRC D/CH client LogControl GmbH, organised a seminar in Athens, where LogControl GmbH presented their RTD results in front of Greek end-users (companies and RTD in transport sector). "To guarantee a successful matching between potential partners and to analyse the needs of Greek companies, we were in close contact with IRC HELP-FORWARD for the preparation of the seminar," emphasised Heike Fischer. According to the agenda suggested by Heike a brochure was created by SEZ. IRC HELP-FORWARD used it to do an effective and informative promotion of the seminar.

A pre-selection of companies was carried out. IRC HELP-FORWARD pre-screened the logistic market in Greece and SEZ discussed the results with the project partners LogControl GmbH and the Institute of Applied Research (both responsible for carrying out the research within the Rolling Stock project).

Finally a number of Greek companies were identified and invited to the seminar. After the seminar some of those organisations requested a meeting with the representatives of the two German organisations to discuss the technology and possible ways of collaborating further.

Deepening the paths of similar interests

After the initial contact in the presence of IRC staff (IRC Help-Forward undertaking the role of assisting both parties, in agreement with their colleagues at IRC D/CH), an open line of communication was established between the two companies.

"During the meeting with the Greek company Elogistics S.A., it became apparent that the two companies had more in common than Elogistics S.A. first thought! " mentioned Panagiotis Ignatiadis from Help Forward. "Starting from the technology presented, which initially attracted the Greek company to the German one, they realised that if they brought their expertise together they could further develop and integrate similar products or modules that were ready to be introduced in the Greek market." The technology transfer between the two companies was in the form of a licensing agreement, but the two companies have also agreed to continue their technical co-operation in the future, and are even considering submitting a joint R&D EU project.

Both Elogistics S.A. and LogConrol GmbH were established clients of the two IRC and hence well aware of the services offered by the IRC network having even utilised some of them before (Technology Offers, Partner searches, BBS searches etc.). Having seen the concrete results of utilising the IRC network, they have already expressed their will to go on utilising the network for other projects.

LogControl GmbH had been quite impressed by the efficiency of the network. "Without the IRC we wouldn't have had the opportunity to meet clients in this south-east part of Europe", mentioned Frank Werner, Project Manager of LogControl. The effective follow-up and the close connection of both IRC with their clients lead to the technology transfer agreements signed.

Success story 2 – Cashing in on innovative cash registers

The problem

CAS Computer Abrechnungs Systeme GmbH, a small company located in the German Federal State of Thuringia, the "Green Heart of Germany" has been involved in a wide range of soft-ware developments for ECR systems, hotel management and communication since 1993. In this business field CAS Computer Abrechnungs Systeme GmbH has to deal with a very strong competition. Since the beginning of the new century it has become particularly challenging for CAS Computer Abrechnungs Systeme GmbH to meet the demands of this fast growing and changing market. The right decision on the direction and the future business strategy had to be made.

The competent consultancy service

In order to take a look across the borderlines the manager decided to involve an external expert for technology and innovation at European level: the regional IRC service hosted by THATI GmbH - IRC. On very short notice a company visit with the IT consultant of THATI GmbH – IRC was arranged and a customised consultancy service agreed upon.

A strategy for future business activities in the short and the long run needed to be established.

In a first step the state-of-the-art and the degree of innovation have been identified and evaluated in several meetings resulting in a technology audit and the assessment of the existing know-how. The audit was followed by a SWOT analysis in conjunction with a study of the EU market. In the result a new innovation strategy aimed at the development of software for the management of

Electronic Cash Registers (ECR) was recommended to be implemented by CAS Computer Abrechnungs Systeme GmbH.

But how to finance such a project considering that the company has only five employees and needs a quick solution to maintain it's competitiveness? Equity capital was very low, that meant to look for public financing sources.

The new strategy and the result

Together with the IT consultant of THATI GmbH-IRC a comprehensive innovation concept has been developed and a practicable financing scheme worked out, taking also regional and national funding opportunities into account. In result a heterogeneous management system for the control of cash register and scale systems in the retail, hotel and gastronomy sector has been developed. It is applicable to retail and chain stores with 100 and more branches. The system includes the administration of all data and reporting, warehouse management, inventory, mobile data capture, import and export of data within merchandise management systems as well as label printing.

Exploitation of the results

Accompanying the innovation project the IRC consultant has been also involved in the preparation phase of the marketing concept. New markets need new providers. A lot of new contacts were initiated, but most of them didn't meet the expectations of CAS Computer Abrechnungs Systeme GmbH.

On the occasion of the international computer fair CEBIT in Hanover in March 2003 the contact to a known cooperation partner, the Dutch company "De Ridder BV" was revived. "De Ridder BV" is a well established supplier of cash register and scale systems for the retail and gastronomy sector. Based on the superior performance and the innovative characteristics of the heterogeneous ECR management system of CAS Computer Abrechnungs Systeme GmbH the contact resulted in a common technical cooperation agreement.

Both sides agreed to develop a located version of the ECR Management system adapted to the Dutch market. "De Ridder BV" has close relationships and trade channels to the Dutch market. The IRC consultant supported both parties during the negotiation phase.

The long-term impact

Meanwhile a lot of joint activities have been carried out in order to produce an ECR management system tailormade for the Dutch market. Finally 200 ECR management systems were sold to a large supermarket chain in the Netherlands. Today the ECR management systems of CAS Computer Abrechnungs Systeme GmbH are distributed to wholesalers, retailers, ECR distributors as well as system vendors in many countries e.g. Germany, Denmark, Finland, Croatia, Luxembourg, Netherlands, Austria, Sweden and Switzerland.

Appendix IV

Contacts of the regional foresight practitioners/experts of the TECHTRANS group

Regional contacts:
- Lombardia: IreR, Fondazione Rosselli, Politecnico di Milano – Centro per la Valorizzazione della Ricerca
- Catalonia: CIDEM
- Wales: Welsh Development Agency
- Greece: FORTH
- Valencia region: Innova Foundation
- Baden-Württemberg: SEZ Steinbeis-Foundation (Steinbeis-Europa-Zentrum), MFG Agency for Media, BIOPRO Baden-Württemberg GmbH.

Appendix V

Earlier experience of forward-looking strategic planning a foresight can build on

For a foresight activity it makes a big difference if you can build on the experiences from other foresight-exercises. The TECHTRANS group has listed some of these activities:

Lombardy

More than the RISE project, a trans-regional technology foresight exercise has already been carried out: it's the Four Motors Foresight (FoMoFo) project that has been promoted and financed by European Commission-DG Research through the STRATA program. It involved the regions "Motors of Europe" (Baden-Wurttemberg, Catalonia, Lombardy and Rhône-Alpes) and aimed of experimenting different approaches to regional foresight, so providing evidence for a better design of a foresight exercise at regional scale. Regarding Lombardy, this project was implemented by Fondazione Rosselli and was focussed on the silk district of Como and the metal-mechanical district of Lecco.

For the RISE project the methodology was derived by the one used by Fondazione Rosselli in its foresight exercise "Critical technologies for Italian industry". The core of the process was the evaluation of each emerging technology selected in some areas, according to both its (potential) impacts on the industrial sectors of Lombardy (Attractiveness) and the scientific and industrial resources available in Lombardy and their capability to develop that emerging technology (Feasibility). These notions (Attractiveness and Feasibility) were translated into a rather large number of indicators, which were evaluated and scored by a panel of experts, from industry and academia. Their values were then synthesised into a smaller number of indicators, which allowed correlating Attractiveness with Feasibility. The main problems to be faced with this methodology are due to the likely differences of the scales used by the experts when scoring the indicators. Discussion among the experts within the panel helped to achieve a more homogeneous background. To this aim the ability of the coordinator of the panel was critic.

- RISE 1 has identified the Attractiveness and Feasibility of some technology areas (Advanced materials, ICT, Biotechnologies, Energy technologies, Nanotechnologies) and an Action Plan was designed for the Advanced materials area, by setting scientific and industrial objectives, identifying (R&D and industrial) actors and sources of financial resources.
- RISE 2 elaborated Action Plans that implement the innovation strategies for ICT, Biotechnologies and Energy technologies areas.

Catalonia
- Catalonian Innovation Plan 2000-2004

Baden-Württemberg
- „Leitbild Baden-Württemberg", Innovationsbeirat, 1998
- "Innovationssystem Baden-Württemberg", Wirtschaftsministerium, Januar 2000
- „Zukunftsinvestitionen in Baden-Württemberg", Landesstiftung (Roland Berger), 2001
- „Landes-Entwicklungsplan Baden-Württemberg", Landesregierung, Juli 2002
- Steinbeis-Foundation (Steinbeis-Europa-Zentrum)
- MFG Agency for Media
- BIOPRO Baden-Württemberg GmbH.

Greece
- Participation of several regional players in the National Foresight programme
- FORTH involvement (via STEP-C) in a regional foresight with the IN-TRACT project (in collaboration with Madeira, Canary Islands and Sicily, in the context of ERA " Regions of Knowledge 2003 call"
- FORTH's involvement (via IRC HF) in Regional Foresight with Bulgaria and Romania (STRATA)

Navarra
- 2nd Technology Plan of Navarra 2004-2007

Wales
- Regional Technology Plan 1996 -8
- Regional Foresight 2001 – 2003
- Welsh Assembly Government - Innovation Action Plan 2003

Appendix VI

Innovation, Development and Technology Transfer Programme (IDTTP) in Valencia

Definition

One of the basic objectives of the **Innovation, Development and Technology Transfer Programme (IDTTP)** is to encourage the participation of the private sector in the Valencian RDI System so that it reaches a similar proportion to that observed in the National and European environment by 2006. The business culture of the economic sectors of Valencia, together with the need to attend to the profit and loss account in the short term, makes it necessary for the procedure for introducing RDI investment into the strategic considerations of firms to pass through innovation. Thus, technological innovation almost necessarily becomes firms' first (and only) mode of access to R&D. For this reason, the IDTTP constitutes the key programme for achieving greater integration of the private sector in the Valencian RDI System.

The Innovation, Development and Technology Transfer Programme (IDTTP) aims to encourage innovation as the motor of technological development, the transfer of new technologies and the orientation of basic research.

For similar reasons, National and European R&D policies and strategies have evolved in recent years in several directions:

- *There has been insistence on the need for knowledge and research results, as far as possible, to be applicable.*
- It has been attempted to give SMEs the capacity to access the possibilities offered by technology.
- The creation and setting in motion of mechanisms and infrastructures of transfer and diffusion of technologies have been encouraged.

In this sense, the Central Administration and the European Union have incorporated plans and programmes of action that aim to consolidate and give concrete form to these strategies, notably the following:

- Central Administration:
    - National Programme of Investigation, Development and Innovation (2004-2004)

- European Union:
    - Framework programme 6

The Innovation, Development and Technology Transfer Programme, has to be especially sensitive to these tendencies for three fundamental reasons:

1. The need for coordination between the RDI policies of the different public administrations in order to improve their effectiveness, their complementariness and their concordance, which would lead to a higher return on the funding available.

2. The greater opportunities of a policy of innovation for the economic structure of the Valencian Community, which consists, to an even greater extent than Europe or the rest of Spain, of SMEs present in traditional sectors – users rather than producers of new technologies – with predominantly low levels of internal production of scientific and technical development.

3. The longer initial delay with which the private sector undertakes a determined policy of support for technological innovation which is a symbol of an incipient maturity of the degree of development of firms.

The IDTTP, like European and National programmes, must focus on the concept of technological innovation, and so acknowledge that Valencian firms are of small or medium size, and that they demand, rather than offer, new technologies. Focusing on the concept of technological innovation means to allow the scope of the programme to flow between the technology and research centres, on the one hand, and the economic activity of firms on the other.

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Technological innovation is a multidisciplinary process in which scientific, technological, organisational, financial and commercial activities intervene. It includes not only R&D actions, but also industrial design and engineering, the integration of outside technologies (patents, licences), the incorporation of innovative capital goods, the commercialisation of the new products, and new marketing tools that generate value, among others. Note the inclusion of technological improvements and processes of innovation developed in the area of services linked to productive activity; this is justified by the great importance they have acquired in modern economies. All these aspects offer an important way of projecting an improvement of the economic fabric of Valencia which it is necessary to exploit and enhance.

The **IDTTP** thus incorporates the concept of technological innovation into the programme, giving it a broader perspective than that of R&D and the transfer of technology. It is a programme of a clearly horizontal character which brings together and coordinates the actions undertaken in the Valencian Community in matters of R&D, innovation and technology transfer of utility and application in all sectors of production.

Objectives

Taking into consideration all the above, the fundamental objectives of the IDTTP are indicated below. They centre around making the Valencian Science-Technology-Business-Society System more dynamic, by means of a broad set of actions, among them:

Scientific and technical environment:

1) To favour the growth of applied research and the transfer of technology.
2) To favour the training of research personnel, motivating them especially for research into subjects of interest for productive activities.
3) To encourage the interchange of qualified research personnel between industries and research centres.
4) To foment the development of technologies for application in the Valencia productive sector.

Business environment:
5) To encourage technological culture, innovative management strategies and technological capacities in firms.
6) To stimulate the generation and diffusion of technology by enhancing demand for it by the industrial sector.
7) To motivate the creation of new firms, especially in high added value technologies.
8) To enhance telecommunications infrastructures and access to information with special emphasis on small industries.

Articulation of the Innovation Valencian System:
9) To foment the collaboration and the research and technological capacity of public and private RDI centres and of firms.
10) To encourage interactivity and cooperation between the scientific and technical environment and the productive environment in technological innovation.
11) To favour the transfer of technologies and the diffusion of innovations to productive sectors, reinforcing the articulation structures of the scientific, technological and productive environments.

Lines of action

The lines of action considered most effective for energising and consolidating the system, which will subsequently be grouped in sub-programmes, are summarised below:

1) To enhance the research and technological capacity of public and private centres of R&D applicable to industry.
2) To encourage applied RDI in sectors with endogenous technological potential, and promotion of new firms that may arise in these sectors.
3) Promotion of technological cooperation initiatives in business and in particular those between University, Technology Centre and Firm.
4) To enhance the structures of articulation of the scientific and technological and productive environments to make the transfer of technologies and the diffusion of technological innovations to productive sectors more effective.
5) To encourage technological culture, management strategies of innovation and technological capacities in firms.

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Appendix VII

Objectives - Example from Catalonia for the increase of international collaborations

In the future it is going to be very difficult for any region to maintain high levels of excellence in any technological field without cooperating/collaborating with others.

In the case of Catalonia this fact is even more important because of its diversified industrial economy. In Catalonia there are industries in textiles, food, pharmaceuticals, chemicals, automotive, machinery, electronics… sectors. Because of this fact, the past industrial policies have been horizontal, so the government created instruments that could be used by any sector.

In the future, the dilemma of focusing resources in some sectors with high potential levels of growth and the need to keep the support to the rest of sectors makes more evident the need of creating/reinforcing mechanisms to collaborate with other regions.

Some ideas to increase such international collaborations could be:
• Establishing agreements with other leading regions with the aim to share resources specific projects.
• Developing collaboration agreements between Catalan SMEs (through the Government) and foreign technological centres/universities in order to facilitate the access to their knowledge.
• To share resources in technology watch.
• To establish common training programs in the field of trans-national technology transfer addressed mainly to SMEs.
• To integrated clustering activities with those regions for which complementarities are clearer. In such clustering activities there could be a share of technological advisory services, IP experts…
• Creation of a common centre/structure for the commercialisation of technology (licensing of patents, creation of spin-offs, capital risk…)

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Appendix VIII

Framework conditions: The case of Catalonia

Over the last 4 years the Government of Catalonia has executed its Research and Innovation Policies through two regional plans "The Research Plan" and "The Innovation Plan". The Research Plan has been executed by DURSI, the Department of Research and Universities and the Innovation Plan has been executed by CIDEM, the Department of Industry.

At the present, the Government decided to integrate and better coordinate both policies by creating the future "Research and Innovation Plan of Catalonia, PRIC". The new plan will start its activities begining 2005.

Three key issues will be the basis of the future Research and Innovation Plan:
1) Coordination of regional actors
2) Coordination with the National, European Commission and other regional policies.
3) Making SMEs aware of the importance of managing innovation technology processes, as they manage other business activities. Need to increase technology pull (demand).

In relation to the coordination of regional actors in Catalonia we can draw a wide map of technology transfer providers. The most relevant are: 11 universities (with their correspondent technology transfer offices), 14 intermediate associations delivering advisory services to SMEs in the field of technology, 12 technological centers, more than 15 excellent research groups… Despite these facts, Catalan SMEs do not know the best way to proceed when starting TT activities. Another important issue is the low efficiency rate for each organisation when assessing their technology transfer results.

There are about 10.000 industrial SMEs in Catalonia (90 % with less than 50 employees) that need to recognise innovation technology as a key issue for their future competitiveness. The situation in Catalonia is that only about 1.000 enterprises are considering innovation technology (IT)

as a key issue. One of the main tasks in the future will be to increase the number of companies aware of IT and help them to initiate relevant activities. Thus, there is a big challenge for the government to convince those SMEs to start with IT and TTT processes.

Catalonia has a good position regarding TT at a regional level, several TT networks (IT Network, Technological Trampolines Network, Intellectual Property Promoters Network, Technology Adisors Network…) have been created and developed with success. When talking about TTT, it is clear that the future PRIC will need to focus on the creation/maximisation (IRC) of concrete instruments to support transnational activities or connecting Catalan TT networks with others.

Catalonia has a high potential as a knowledge economy and there is a good basis of skilled people on management but not on managing technology/knowledge. The future PRIC will reinforce its collaboration with business schools in Catalonia in order assure the training of future/actual managers in such a topics.

In the field of assuring financial support for innovation projects, CIDEM supported the creation of serveral initiatives (network of private investors, capital concept funds…) acting at a regional level. The main barrier for supporting new initiatives has been the lack of market orientation of some projects and the lack of technolgy specialisation of the private inverstors. This fact often made it difficult to assure solid finance even for good projects. By increasing the number of TTT mechanisms we could increase the connection of the Catalan technology market with others.

Appendix IX

**Draft list of TTT issues named by the members
of the TECHTRANS-working group**

TTT is a horizontal process. Therefore, the following list of issues should only be mentioned as "potentially interesting issues". However, the specific issues have only a minor influence on the way TTT is done.

Issues TTT could focus on (draft list of interests named by the members of the TECHTRANS-working group):

- Agro-Food (Green Biotech), Agro-Industry
- BioTech, BioSciences, Biotechnology (sustainability), Health
- Materials (Nanotech-) / Nanotechnology
- Telecommunication: Safe broadband, 4G mobile network, medical applications
- Machine tools engineering / Mechanic, electric and electronic equipment manufacturers / industrial equipment / Industrial automation / Microelectronics.

Appendix X

**Example of concrete objectives from the perspective of a TTT facilitator:
New high value services for the future**

- Sustain and further enrich the services to SMEs to help them innovate and internationalise in addition to the already successful trans-national technology transfer services
- Provide technological intelligence services (transform technology watch into development opportunities and create opportunities with high economic impact)
- Promote new types of technological co-operation to the SMEs (such as value added subcontracting)
- Change Management support: adopting best practices from other companies to stay competitive and enable companies to better react on market and environmental changes
- Animate sectorial clusters of SMEs at European scale (technology watch, business intelligence, benchmarking)
- Education and Training in Innovation for SMEs
- Innovation Assistant: educate and train staff in innovation matters
- Post graduate innovation management education
- Entrepreneurship support to Universities and Research and Technological Organisations
- Play the role of GateWay to Europe for Industry-Liaison and Technology Transfer Offices of Universities and RTOs
- Support the creation of spin-off companies from Universities and RTOs by providing specialised services and access to international financing
- Enable Universities and RTOs to build strategic trans-national partnerships to develop their entrepreneurship capabilities and prospects
- Proactive exploitation management support to SMEs and labs who participate in European Framework Programmes from the birth of the project
- solving the enterprise - successor - problem (finding potential successors in other European regions)