MUTUAL LEARNING PLATFORM

Regional Innovation Report

BLUEPRINT FOR REGIONAL INNOVATION BENCHMARKING

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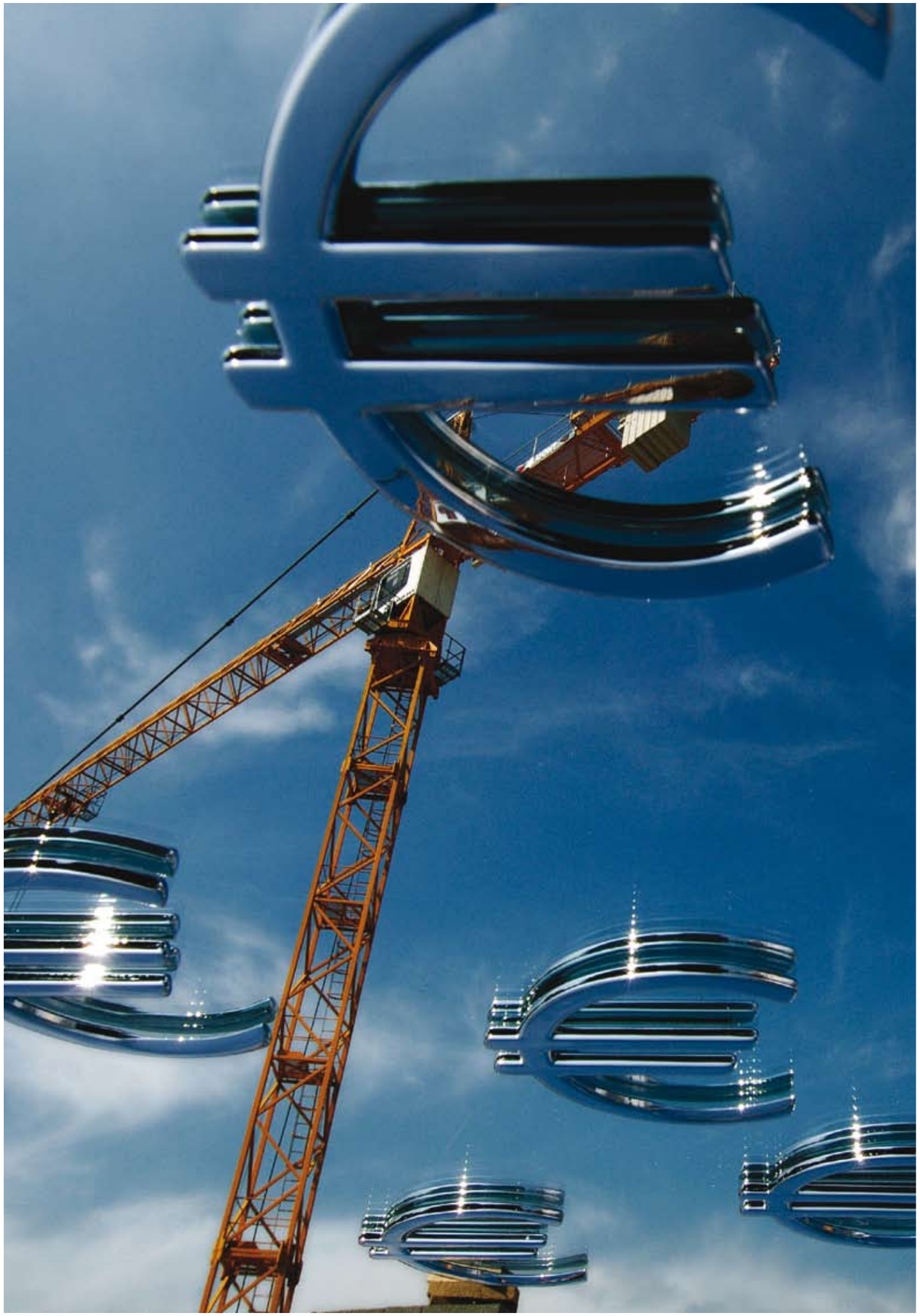
Content



I. Introduction

1.1 WHAT IS REGIONAL BENCHMARKING?

There are numerous attempts to define the concept of "regional benchmarking". However, as definitions are neither correct nor false, but more a case of being adequate or inadequate,- no single definition has been agreed upon by the interested community. This introduction briefly elaborates on how the term is used throughout this document as the blueprint for regional benchmarking. More specifically, the concept of benchmarking will be clarified and the use of the term region in this paper explained.

Benchmarking is understood as an improvement process in which a company, organisation or any other (multi-organisational) system carries out three processes:
1) compares its performance against best-in-class systems[1];
2) determines how these systems have achieved their superior performance; and
3) uses the collected information to improve its own performance. Basically, all processes can be the object of benchmarking.

Benchmarking may be a one-off activity, but is often treated as a continuous process in which systems continuously seek to challenge their practices. Focusing on the process, distinguishes benchmarking from stocktaking. The act of appraising a present situation, condition or degree of progress in a systematic comparison to previous situations, conditions in other systems (e.g. regions) or strategic objectives is described. Furthermore, stock-taking results in rankings and primarily serves as an awareness raising and marketing function. Benchmarking ultimately results in improving processes based upon the insights on what makes processes effective and efficient.

Benchmarking stems from private sector business and has become increasingly popular for political systems over the past years, as nations and regions face increased competition from other competing systems. The first attempts to engage in the benchmarking of political systems and infrastructures were done primarily at national level and less so at regional level. Amongst the early champions, the Australian and the Dutch governments in particular can be seen as pioneers.[2]

Today, it has become not only profitable but necessary for regions to invest in their competitiveness. This insight has stimulated the adoption and adaptation of management techniques (like benchmarking) from the private sector in public policy.

Regional benchmarking means that a specific region conducts a benchmarking process in order to improve its regional development or selected foci of it. There exists a wide variety of exercises in which one party (e.g. a national or multinational) body asks a second party (e.g. a consultancy firm or a University) to perform a "benchmarking" of third parties (e.g. regions). This process is in order to help the third party.

Typically, these "benchmarking processes" comprise the collection, analysis and documentation of good practice cases but not the implementation of improvement. These activities

1. In fact, you can benchmark against average, mediocre or worst-in-class as well. However, this results in a number of difficulties like e.g. unwillingness of systems to honestly and fully share their insights on what they did wrong, lack of positive image transfer from the benchmarked system, and lack of certainty to get things right if they are done somehow differently from the worst case. It has proven highly meaningful to benchmark against systems which have developed from below-average performers to best-in-class performers.
2. See particularly the European Round Table of Industrialists (ERT) report „Benchmarking for Policy-Makers: The Way to Competitiveness, Growth and Job Creation", October 1996. Cf. www.ert.be. The report is based upon a seminar jointly hosted by the European Commission and the ERT in March 1996 aiming at determining whether benchmarking could be an adequate tool to support policy-making

can serve very important functions of e.g. awareness raising but will not be labelled benchmarking in this blueprint[3]. It is considered decisive to ensure the key stakeholders' participation in the process in order to encourage commitment to using the knowledge generated in the policy design.

A region is an extensive, continuous geographically defined part of the Earth's surface. The term is used for vast parts of the Earth like Asia/Pacific as well as for areas which constitute a small part of a country (e.g. a City and its surroundings). In relation to benchmarking none of these understandings is superior to another. Considering the mandate of the Mutual Learning Platform, which is to strengthen Europe's regions, the term region is used throughout this blueprint to describe any geographically defined functional system at sub-national level.

Typically, these sub-national systems have a strong identity and there exist resources dedicated to action at the regional level. In some countries, the concept of strong regions has been present for some time (e.g. in countries with traditionally strong states like Austria and Germany), whereas other countries have begun more recently to systematically strengthen their regions.

The stimuli have come in part from the regions themselves, partly from national level and partly from multinational level (e.g. the European Commission). Regions need not be identical with administrative borders and can in fact comprise of parts of several countries (e.g. the Öresund region comprises of parts of Denmark and Sweden, the entrepreneurial triangle spans from Leuven (Belgium) to Eindhoven (Netherlands) to Aachen (Germany).

The development of such trans-border regions has been greatly fostered by the European Union. Specific support measures such as INTERREG IIIa are defined or particular emphasis is placed on the aspect in the framework of more general initiatives (e.g. when developing blueprints for regional foresight, a specific blueprint was developed for bridging historically and culturally close neighbouring regions separated by national borders - the Transvision blueprint).

Although, small nations are referred to as regions in many discussions, it is important to make a clear distinction between nations and regions. One needs to be aware of the fact that regions are confronted with a substantial set of external framework conditions which have little influence. Nations, meanwhile, have a much larger set of instruments they can deploy in order to achieve their strategic targets. Laws and regulations are used to enhance e.g. competitiveness, Quality of life, sustainable environment and security. A number of policies only make sense on national or supra-national level, like e.g. currency policy, income tax policy, etc.

Obviously, Europe's regions are very heterogeneous. They differ in terms of size (e.g. population, geographic area, natural resources), political independence (some have elected parliaments others have not), economic wealth, among others.

Consequently, there is no overall best region against whom to benchmark. Instead, it is crucial to select adequate and appropriate regions against whom to benchmark. Some key criteria for selecting powerful benchmarks are listed below. In particular, the region(s) against whom to benchmark:

- Should have consciously implemented a relevant process of outstanding effectiveness and efficiency in order that it makes sense to learn from them.
- Should have succeeded under similar circumstances (in respect to the determinants of a superior process design) in order to make the lessons learned relevant for implementation. Depending on the process to be benchmarked, regions can be highly suitable for benchmarking against them in one case and not in another. For instance, a benchmarking of technology transfer processes should be done against systems with similar legal framework conditions in terms of e.g. ownership of intellectual property rights unless the system has the power to change the legal framework.
- Should be motivated to fully share its insights and preferably even support the transfer of know-how in order to: 1) access even sensitive but crucial information (like what was done wrongly); 2) speed up implementation in the own system; and 3) serve as partner for continued mutual learning. In particular, it is very difficult to benchmark against competitors in relation to strategic processes as information provided will not necessarily be trustworthy. In respect to non-key processes, benchmarking with competitors can be very fruitful, though.
- Should be known as a system which has succeeded in order to overcome scepticism in the own region against knowledge from the outside.
- Should be "close" to the own system in terms of geographical distance, language, etc., in order to limit transaction costs.

What an adequate region depends heavily on is the main purpose of the benchmarking exercise and the nature of the region to be benchmarked. For instance, it makes sense to benchmark against other domestic regions if one primarily intends to use the benchmarking for strengthening and communicating one's reputation as number one in the country.

3. It was underlined that also international benchmarking exercises are influencing planning of policy measures. European Innovation Scoreboard (EIS) is linked to the numerous policy measures, e.g. INNOVA, PAXIS, Inno-actions, Inno-nets etc. The results of the EIS are analysed by experts who suggest policy response. Suggested measures target the problem areas revealed by the analysis. During the workshop the problem of how to bring EIS results to the regional level was raised.
Also the OECD regional benchmarking activities are developed with the aim of preparing concrete policy advice for the member countries. The results are taken into account by e.g. national reviews on regional policies, various initiatives working on e.g. cluster policy, technological poles etc.

A region interested in learning how to master a particular challenge (e.g. offer decent health care in scarcely populated areas) should identify regions - preferably with a very similar challenge but to an even higher urgency - that have successfully addressed this particular challenge.

There are numerous approaches on how to conduct benchmarking. There is no overall best approach, but it is necessary to adapt it according to the characteristics of the venture (e.g. object of benchmarking, time horizon, available budget …). However, most benchmarking processes share some characteristics:

Stage 1: Identification of a challenge or opportunity:
This demands a high-quality policy/decision/action for which there currently is no adequate support information. Also necessary is the conviction that benchmarking is an approach that will provide the necessary support information within a reasonable timeframe and budget.

Stage 2: Preparation of the Benchmarking Exercise:
In this stage, it is decided who and what will be required to perform the benchmarking, i.e. what budgets are made available, when who will deliver what deliverables, to whom etc. Furthermore, the regions/systems against whom to benchmark are screened and decided upon and whether these regions will be integrated as partners into the exercise or whether the exercise is to be secret.

Stage 3: Information Gathering:
The first step is defining and collecting indicators from official sources. In later stages, individual empirical research and business/policy intelligence will be employed.

Stage 4: Comparing & Understanding:
The data are stored in a database and analysed. The findings are discussed and validated with the stakeholders.

Stage 5: Analysing the Information:
Conclusions relevant for action are developed.

Stage 6: Implementation:
The final step consists of a critical review of the results and the development of a clear action plan in order to ensure that strategic decisions are implemented on a controlled and systematic basis.

To conclude, regional benchmarking puts emphasis on the underlying factors, interrelations and processes in the analysed regional system. Understanding factors underlying regional performance can provide knowledge applicable to strategic planning and policies. An analysis covering only easily measurable quantitative inputs and outputs (e.g. R&D spending or number of patents) will not provide all necessary insights. Benchmarking is therefore an exercise generating applicable in-depth knowledge about the regional economy focusing on its comparative advantages and disadvantages. The regional benchmarking exercise explicitly aims to exploit the knowledge generated by defining and implementing adequate policies.

The benchmarking process should be embedded into a strategic policy process. This means that the project should be implemented in relation to the regional policy-making process and can serve as an ongoing policy impact assessment and evaluation tool. It is not a tool that substitutes regional foresight or regional profiling, but is to be conducted in co-ordination with these approaches. [4]

4. For how regional benchmarking and regional foresight can positively impact each other see e.g. Koellreuther, Chr. (2002): "Regional benchmarking as a tool to improve regional foresight", paper prepared for the STRATA - ETAN Expert Group Action on "Mobilising regional foresight potential for an enlarged EU".

1.2 WHY ENGAGE IN REGIONAL BENCHMARKING?

The ultimate objective for engaging in regional benchmarking is, of course, to improve regional development. Regional benchmarking is a powerful strategic policy tool which contributes to regional development by effectively serving a number of key functions. These include:

Raising awareness:
One of the most important reasons and value added by the regional benchmarking process is raising awareness of regional stakeholders on the region's position as compared to other regions. Presenting the regional situation in comparison to other regions may motivate and commit regional politicians and decision-makers to reconsider strategies and policies. The pressure of a potential hardship as well as a potential for improvement is communicated to key stakeholders.

Generation of knowledge:
By learning how to effectively address major challenges based upon others' policy-learning experiences . As with technical Research and Development, a system cannot perform all learning internally, but has to integrate competence from outside the own system. A main reason for embarking on benchmarking is to learn about how policy has an impact on regional (e.g. innovation) systems.

Trans-regional Co-operation:
Trans-regional benchmarking projects can be an opportunity to collaborate with other regions and build trans-regional partnerships. Regions working together on the common approach to benchmarking methodology get to know each other better and can look for other forms of co-operation. Joint benchmarking creates mutual trust, better understanding of each other and can thus constitute the basis for a strategic co-operation.

Creation of Commitment:
By communicating that there are major threats and opportunities ahead, that others are prepared to master them and that there are lessons learned for the region to implement in order to become/remain competitive.

Regional Marketing:
Benchmarking can be seen as a regional marketing tool. From this perspective a regional benchmarking exercise is seen as a tool for the promotion and positioning of the region on the market as a leader in certain fields.

To summarise, benchmarking is creating and strengthening the stakeholders' motivation, competence and dedication to boost regional competitiveness by implementing more effective and efficient policies. Regional benchmarking generates insights which can be highly instrumental for profiling and positioning a region.

1.3 ORIENTATIONS OF BENCHMARKING (benchmarking of institutions, policies and regions)

In our age of information and knowledge-based development, learning from others is a fundamental way of improving the know-how and competences of organisations, clusters, and regions. This is exactly what Benchmarking is about: to compare the performance of an organisation with other organisations and learn from the best.

Benchmarking has been proven as a powerful tool of intelligence and the techniques of comparative analysis have spread out in many fields of management and policy development. We may now benchmark any type of organisation or institution: companies, R&D labs, education institutions, hospitals, financing institutions, etc. Furthermore, apart from company or institutional benchmarking, we may apply the same methodology to understand better the performance of clusters, industry sectors, regions, states, policies and strategies as well.

Benchmarking of companies is the most common form of benchmarking and is usually done with top-performing companies from other industial sectors. This is feasible because many business processes are essentially the same from sector to sector. The processes that we usually benchmark concern finance, management, R&D, products, production processes, supply chain and quality. Benchmarking focuses on the improvement of business processes by exploiting "best practices" rather than merely measuring the best performance. Best practices are the cause of best performance. Companies studying best practices have a greater opportunity for gaining a strategic, operational and financial advantage.

Cluster benchmarking compares groups of organisations. Here our interest is not on the organisation itself but on the group, the network, the chain that connects and keeps together many organisations. Typical topics of cluster benchmarking are the size, sectoral composition, types of activities performed, geographic scope, breath, growth rates, innovative capacity, and the governance structure, among others[5].

Territorial benchmarking compares and analyses territorial entities, localities, cities, regions and states. It is a rather new form of benchmarking, which looks at the performances of regions and states and the causes of their performance. How other territories get something done? How important performance gaps between regions are? Which are the territories showing outstanding performances? Which practices (best) are sustaining best performance? A well-known form of territorial benchmarking is the European Innovation Scoreboard, which each year compares the performance of the 25 EU member states using a set of 26 indications covering education, R&D, innovation, high-tech employment and intellectual property issues .

Policy benchmarking is also a rather new form of benchmarking for evaluating alternative policies, implementing strategies and improving performance by understanding and adapting successful strategies implemented elsewhere. Main objective of policy benchmarking is to supply policy-makers with examples of best practice, by identifying cases of adequate, well-defined and well-implemented policies.

Comparing one's own performance to that of the best-in-class and adjusting processes to match those established by the leaders, policy benchmarking serves not only to assess the factors that determine observed performance, but it goes beyond policy analysis. It also provides an understanding of the processes, skills and capabilities that create superior performance. Policy benchmarking offers governments and policy-makers an effective tool to foster competitiveness in different fields and it connects with the key medium- and long-term issues of development policies.

Though the specific way that benchmarking is applied in the above fields vary very much, the concept and core methodology remain the same. In all cases, the process starts with the definition of benchmarking topics and continues with the selection of: indicators per topic; data collection; selection of the comparison group; calculation of benchmarks; and interpretation of results. These will be discussed in following sections of this document.

The scope of the methodology also is the same. We attempt to define the range of variation of performance in any field of activity, the minimum, average and maximum scores of performance, the distance from the best, and the practices that sustain performances. Identification of best performance and the underlying best practice are the essential pillars of any form of benchmarking.

5. Enright, M. J. (2000) 'Survey on the Characterisation of Regional Clusters', Working Paper, University of Hong Kong.

6. Arundel, A. and Hollanders, H. (2005), 'Innovation Strengths and Weaknesses', European Trend Chart on Innovation, European Commission DG Enterprise.

II. How to perform benchmarking

2.1 BENCHMARKING: A PROJECT OR AN ONGOING INITIATIVE?

The backbone of a regional benchmarking exercise is that it questions the impact of boundaries on the effectiveness of regional policies. A fundamental question is whether a benchmarking exercise should be a one-off project or an ongoing process. In this section of the report, an attempt has been made to illustrate the pros and cons of both types of exercises. However, the selection of the type of exercise depends entirely upon the scope of the benchmarking exercise.

Literature suggests that benchmarking is most effective when it is ongoing and not a one-off activity. It is most effective when it is continuous and becomes part of regular performance review. Benchmarking is neither a hit or miss process, nor does it bring long-lasting effects when seen as a one-off event or activity that can start or stop on a whim (Sarah Cook, 1995)[7] . Best practice benchmarking needs to be undertaken on a continuous basis, as "best-in-class" is a constantly moving target.

A one-off benchmarking exercise might result in partial or periodic success, which in time may be limited and unsustainable. Even if you have achieved best practice today, regular benchmarking is essential to keep you up to date and ahead of the competition" (Business Gateway 2003)[8].

In order to be effective, benchmarking must become an ongoing, integral part of a progressive improvement process with the goal of keeping abreast of ever-improving best practice (OECD 2004)[9].

One-off exercise
A benchmarking exercise takes the form of a one-off project, when a region is being benchmarked against a group of other regions; standardised static performance indicators are used. The sole outcome of such an exercise is normally to place the region in a ranking scale.

When benchmarking is based on out-of-date performance data it takes the form of a retrospective exercise. Its outcomes are valid to the extent that the data used are still valid. In this case, it shapes a retrospective performance comparison and can be seen as a "one-off" exercise.

7. Sarah Cook 1995, "Practical Benchmarking - A manager's guide to creating a competitive advantage". Kogan - ISBN 0 7494 1551 7
8. Directors Briefing 2003, ST4 (Scotland): "Benchmarking", Business Gateway, 2003 ISSN 1477-5646
9. OECD 2004, "Roundtable on Corporate Responsibility: Encouraging the positive contribution of business to environment through the OECD Guidelines for Multinational Enterprises", Background Report, June 2004

One-off Regional Benchmarking Exercise	
Pros	Cons
• Comparatively lower cost; • Quick results; • Better integration with other innovation strategy data; • More flexible; • Long-term commitment not necessary; • Easy measurable comparisons; • Strengths and weaknesses identified; • No specific knowledge needed.	• Often based on out of date data; • Retrospective exercise; • Uses standardised static performance indicators; • Often concentrates on hard performance measurements and leaves out the soft ones; • Limited understanding of the process which led to such results.

A one-off benchmarking exercise has lower costs than an ongoing exercise. It delivers quick results, is more flexible and can be better integrated with other data of innovation strategy. In addition, there is no need for a long-term commitment on behalf of the regional organisation undertaking the project and the regional stakeholders.

A one -off exercise is often based on out-of-date performance data and it concentrates on hard (quantitative) performance measurement. It leaves out the soft (qualitative) ones that can also yield constructive insights to performance.

When a benchmarking exercise relies solely on quantitative indicators it overlooks the processes which led to a development. Therefore, it is essential for a regional innovation benchmarking methodology to develop meaningful qualitative indicators.

Ongoing process
The identification of a best practice is a key component of a benchmarking exercise. However, a successful example in one organisation or region cannot be transferred to another without a clear understanding of the processes that have resulted in such success.

Ongoing Regional Benchmarking Exercise	
Pros	Cons
• Suited better for a continues exercise; • Robust conclusions; • Understands the processes; • Identifies corrective actions; • Identifies trends; • Establishes long-term partnerships; • Builds trust amongst organisations; • Helps understand ones own process(s) better; • Can be integrated in the innovation policy-making; • Allows trial of improvements and analysis of outcomes; • Leads to sustainable and meaningful improvements; • Helps region to keep up to date with developments, providing inspiration for ongoing innovation; • Ensures transferability; • Can implement lessons learned into practice; • Allows time for modifications to implementation.	• Relatively expensive; • Requires regional consensus; • Long-term commitment for stakeholders; • Requires institutional framework which encourages regional actors co-operation; • Requires supporting mechanisms and institutions of knowledge transfer and learning process.

An ongoing benchmarking exercise is not bound on the comparison of data performance indicators. It is an ongoing, systematic process for measuring and comparing the processes of one region to those of others considered to be of "good practice".

The corrective actions required for continuous improvement can be based on information gained in this way. An ongoing benchmarking process identifies trends in various fields that helps a region to keep up to date with developments and provides inspiration for ongoing innovation. In addition, an ongoing exercise establishes long-term relationships and builds trust among organisations involved in the process.

An ongoing benchmarking process is also relatively expensive,

requires regional consensus and long-term commitment for the stakeholders. It needs an institutional framework which encourages regional actors' co-operation and the existence of supporting mechanisms and institutions of knowledge transfer and learning process.

2.2 CONDITIONS REQUIRED TO INITIATE A BENCHMARKING PROCESS

The identification of a suitable partner/region in a benchmarking project is a pre-condition for a successful regional benchmarking exercise. In order to have meaningful outcomes, a benchmarking exercise should be conducted among regions that share common characteristics. However, a generalised methodology for conducting regional benchmarking does not yet exist. This absence considerably affects the identification of potential partner regions. In order for a region to benefit most from such an exercise, it needs to fulfil a number of tangible and intangible prerequisites.

Tangible assets

Data accessibility and availability
Information related to process inputs has to be available and also obtainable at regional level. Regional statistics have to exist for the specific region and this limits the size of a region which can perform a benchmarking exercise. In addition, the regional statistics and data have to be accessible by the responsible organisation that will undertake the benchmarking exercise and this limits the nature of the organisation which can perform such a task. Data should include innovation-related indicators such as R&D expenditure, employment in IT service, number of patents, human resources for innovation, SMEs innovating in-house, Internet access/use, etc.

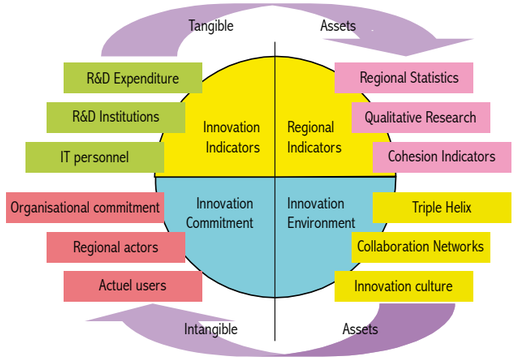


Diagram: Tangible and intangible regional assets: Regional prerequisites for a successful benchmarking exercis

Intangible assets

The existence of specific intangible assets is the basic requirement for the successful implementation of a regional innovation benchmarking exercise.

Regional framework of collaboration
In order to benefit most from the outcomes/results of a benchmarking exercise, the existence of specific intangible assets is necessary for a region . Such assets are:
- Establishing regional and interregional partnerships;
- Supporting mechanisms and institutions of knowledge transfer and learning process;
- Reinforcing network collaboration inside the region;
- Institutional framework encouraging regional actors' co-operation.

Commitment
A benchmarking exercise, especially when it takes the form of an ongoing process, requires long-term commitment from various actors:
- Regional stakeholders' commitment
- Organisational commitment (the organisation that undertakes the exercise)
- Users' commitment (the team of members directly involved in the exercise)

Regional consensus
A regional consensus must, by definition, be agreed prior to the launch of the exercise because the collection of regional data requires the active participation and collaboration of different regional agents from the regional authorities, academia, and both the private and public sectors.

2.3 OVERVIEW OF REGIONAL INNOVATION BENCHMARKING METHODOLOGY

The scope of the benchmarking methodology is to measure the performance of an entity (region, organisation, company, etc.) based on specific numeric indicators and to compare the performance of the variable with those of another entity. Two benchmarking methods could be followed:
- One-to-one benchmarking: comparing an entity with another one showing best practice, thus illustrating the deviation of the entity in focus from the organisation showing best practice.
- ne-to-many benchmarking: comparing an entity with the statistics of many other variables, greater or smaller, thus positioning the entity in focus into the range between the best and the worst performance.

Regional benchmarking follows the second method. We usually compare a geographical entity (region, city, locality) with a

number of other regions. For instance, we may compare an objective 1 region with all objective 1 regions in the EU. The Index of the Massachusetts Innovation Economy compares the pace of innovation in Massachusetts with eight technology leading states in the USA [10].

The steps for the implementation of the regional innovation benchmarking methodology include:

- ***Selection of indicators***, which should be able to bring to the surface the performance of a region in the field of innovation;
- ***Creation of the benchmarking database***, which relates to the gathering and storage of information on regional performance and the calculation of selected indicators from different regions;
- ***Production of the benchmarking data***, which highlights the main statistics and graphs for the statistically significant indicators (e.g..minimum, maximum, mean, mode, quartiles) and positions the region in focus within the statistical range of these statistics;
- ***Analysis and interpretation of statistics***, which shows cause and effect in terms of the observed performance and the practices that are responsible for this performance;
- ***Suggestions for improvement***, based on all known best practice, the benchmarking process concludes by offering measures which should be taken to improve the innovation performance of a region.

It may now be seen that there are a number of issues critical to the successful implementation of benchmarking:

- Indicators are of major importance for the measurement of the innovation performance and the drawing of comparison tables and diagrams. In order to obtain reliable results, indicators have to be fully defined, in terms of concept, variables involved, calculation process, year of measurement, etc., and calculated with a uniform process;
- Data should be based on official sources which guarantee the validity and uniformity of the information collected;
- The selection of the comparison group depends on the scope of the benchmarking exercise. A region may be compared towards all entries of the database or towards a group of regions characterised by a specific criteria set (i.e., geographical area, GDP, population, innovative products, etc.). Best practice is usually linked to the top performance identified among the regions of the database;
- Interpretation of results defining the causes of a specific regional innovation performance depends greatly on the expertise of consultants involved in the benchmarking exercise.

10.http://www.masstech.org/institute/the_index.htm

2.4 HOW TO IDENTIFY REGION-SPECIFIC NEEDS FOR INNOVATION BENCHMARKING

As noted above, regional benchmarking is generally carried out as one-to-many exercises. The choice of what to benchmark usually depends on a number of factors including:

- The stage in the policy or programming cycle (ex-ante, mid-term, ex-post, etc.);
- The type of analysis or policy development being supported by the benchmarking work (e.g. a foresight analysis will normally consider different indicators from benchmarking done as part of a policy evaluation.);
- The nature of the sponsoring organisation or organisations composing a partnership (e.g. an employers federation or trade union will normally have different preoccupations, as would a regional ministry for research and education versus a regional ministry for industry).

For instance, at the early stages in the programme cycle, the focus will normally be on strategy development, hence positioning the region against competitors or regions with a similar economic structure. This may provide crucial information for the partnership or authorities responsible for proposing a programme for a longer period (e.g. the Structural Fund programming cycle, 2000-2006 or 2007-13).

As benchmarking exercises are costly, it is important that the regional partnership or authority develops clear and precise terms of reference (if tendering out) or work-programme (if the analysis is being done by the partnership). The context of the benchmarking exercise must be set out precisely in order to clearly explain the region-specific needs, which obviously vary from case to case.

Three main types of regional benchmarking can be identified:

- Benchmarking the performance of the region;
- Benchmarking the performance of institutions in the regional system of innovation;
- Benchmarking the effectiveness or impact of innovation policies.

The first type is probably the best known and is exemplified by the European Innovation Scoreboard at national level (published annually) and the related European Regional Innovation Scoreboard (published periodically depending on data availability).

The second type of benchmarking has been done to some extent in the framework of RIS-RITTS[11] projects as part of the "supply analysis" (However, the analysis was often viewed as superficial in terms of comparing performance intra-regionally.). It is carried out on an ad- hoc basis, often in the framework of evaluations of regional research or innovation centres, universities, etc.

11 RIS (Regional Innovation Strategy)/ RITTS (Regional Innovation and Technology Transfer Strategies and Infrastructure)

The third type is possibly the most complex. Benchmarking the effectiveness or impact of policy interventions 'scientifically' requires a great deal of careful analysis and identification of lines of causality, contextual, historical and external factors (complex related and non-related variables). These factors may have led directly or indirectly to two similar schemes in two different regions producing widely varying results.

The performance of the region

When considering specific needs as regards the benchmarking of the innovative performance of a region, it is important to keep in mind the following: there is likely to be a significant difference between the needs or wishes of the regional partners commissioning a benchmarking analysis and the available or collectable data and information.

What "innovative regions" would like to benchmark:

- Longer term trends against a group of key competitors (markets, technologies, regions etc.);
- Outputs of innovation activity and their impact on growth and employment;
- The interactions in (and outside) with the regional innovation system on knowledge creation, diffusion and application.

"Innovative regions" usually manage to benchmark:

- Short-term changes against regions with similar statistical datasets. (From the same country or at least within the EU);
- Intensity of investment in R&D and survey data on innovation activity;
- Stocks and flows of quantitative data offering some insights into interactions (e.g. foreign direct investment, SMEs co-operating with universities, etc.).

The European regional innovation scoreboard is a good example of where in order to benchmark performance across as wide a number of regions, a deliberate choice was made to limit the number of indicators used. This was due largely to data availability. Most benchmarking studies look at standard sets of indicators including:

- Research intensity (by sector);
- Propensity to innovate (by sector);
- Degree of technology diffusion (via proxies such as ICT expenditure, training costs, etc.);
- Research inputs and outputs (public expenditure in region, patents, etc.)

A good example of this is the 2003 Regional Innovation Performance working paper of European Innovation Scoreboard (http://trendchart.cordis.lu/scoreboard2003/html/scoreboard_papers.html).

To have an in-depth understanding of performance need, measure system type indicators a benchmarking anaysis requires access to data on other indicators including:

- Number, type of collaborative projects (university-industry, etc.);
- Propensity to co-operation (e.g. from Community Innovation Survey);
- Part of turnover of public/academic R&D labs generated by private contracts;
- Number and types of networks notably when cross-sectoral or multi-actor;
- Attractiveness of the region (human capital flows, foreign investment).

However, these are rarer, more costly and require additional specific survey or in-depth analysis of data.

The performance of institutions composing the regional system of innovation

At a first level, benchmarking the performance of institutions comprising the regional system of innovation can be considered as a relatively simple organisation benchmarking exercise akin to that practised by collecting key performance indicators of enterprises. However, as for more complex enterprise benchmarking exercises, comparing data, on say the percentage of the annual budget of organisations generated from sales to enterprises versus public subsidy (self-financing capacity), only tells half the story.

The benchmarking analysis needs to take into account both specific contextual issues relating notably to the mission of the organisation and its place or function within the specific regional innovation system.

To simplify, organisational benchmarking in the regional context can be carried out at two levels:

- The organisation level: looking at individual performances in relation to mission, capabilities and instruments, etc. against similar organisations in the same region or in other regions (e.g. all business and innovation centres or all innovation relay centres can be benchmarked since they fulfil similar roles in the system, at least theoretically);
- A systems level benchmarking: Role and task division in the system (functional analysis), flows and relations on the systemic level (e.g. demand and supply of innovation related services), influence on regional innovation performance.

Different types of regional innovation organisations can be analysed but the key factor to keep in mind is that organisational performance is a reflection of their specific mission or strategy. Hence, comparing the performance of a university laboratory with a contract research organisation is likely to lead to false conclusions if their specific missions are not considered.

Various types of regional innovation organisations can be identified depending on their missions:

- Academic / not for profit /public research performing organisations: the primary mission being to carry out non-commercial research but usually are also involved in co-operation or contract research projects with regional enterprises;
- Contract research organisations: organisations with a primary mission or objective to provide R&D, industrial design, prototyping services on a revenue generating basis

to enterprises (or public authorities);
• Specialised Science and Technology (S&T) intermediaries - organisation with specific mission to diffuse and transfer research results and promote research offer among companies;
• University interface and commercialisation units - specific units at Universities and other higher education institutions with a mission to manage intellectual property, diffuse and promote their research results, and offer among companies;
• Research Centres' interface units - specific units at research centres with a task to diffuse and promote their research results and offer their specific service to companies;
• Technology transfer organisations - organisations with a specific mission to transfer technology to companies (e.g. Innovation Relay Centres, IRC);
• Non-technological intermediaries - organisations with a mission to support companies, but focusing on non-technological assistance e.g. supporting access to funding or managerial training (e.g. Business Industry Centres, BIC);
• Chambers of commerce and associations - organisations and institutions supporting e.g. networking, partner search and awareness raising activities.

Often organisations fulfil a number of functions which are not always evident from their mission statements. Thus, it is important to understand what functions or services are actually provided by organisations in order to benchmark them effectively. Typically, the following constitute a range of services present in a regional innovation support system:

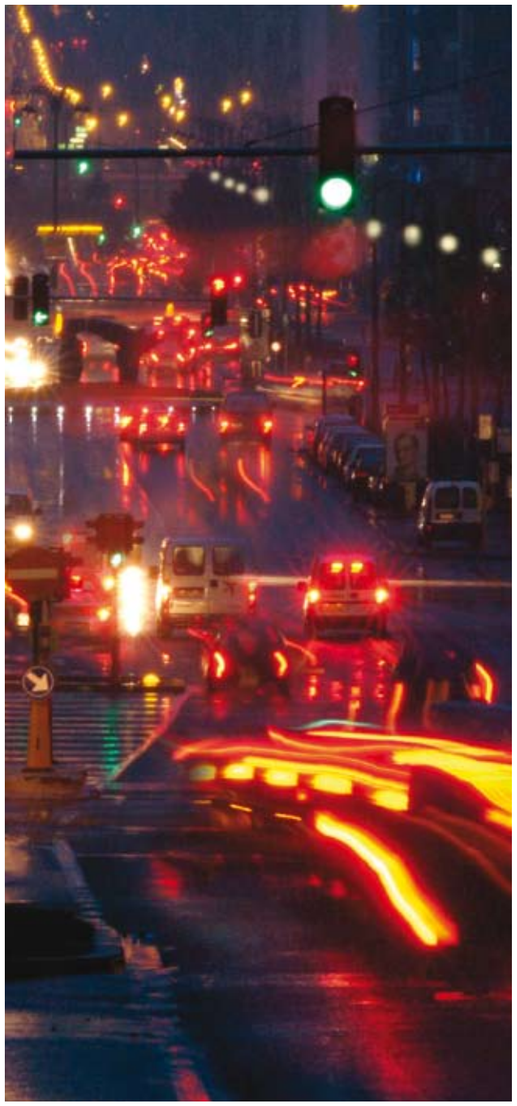
• Raising awareness and information sharing (collective actions);
• Supporting technological and scientific cooperation;
• Supporting new product and service development;
• Protecting IPR;
• Licensing;
• Supporting innovative start-ups and spin-offs;
• Assisting in human capital mobility;
• Networking and clustering;
• Supporting and creating clusters, and promoting SMEs and research base participation;
• Assisting in accessing public funding for RDTI activities;
• Searching for public funding and monitoring of public tenders;
• Assisting in accessing funds from EU Framework Programme;
• Assisting in accessing funds from EU Structural Funds.

In well-functioning systems, individual organisations will have set for themselves or have had set for them by public funders, a set of key performance indicators. These can be used to compare performance against targets over time for the organisation per se. Theoretically they can also be used to benchmark with other organisations but this implies gaining access to information for these benchmark organisations that is often not published or considered as confidential.

Example of key performance indicators for a large non-profit research centre.

KPI 1 Total research income (M€)
KPI 2 Number of publications
KPI 3 Number of invited papers
KPI 4 Number of PhDs
KPI 5 Number shared publications with regional universities
KPI 6 Number of contracts with regional universities, research centres, etc.
KPI 7 Total turnover from regional companies (10% error margin)
KPI 8 Number of contracts with Flemish SMEs
KPI 9 Number of new regional SME partners
KPI 10 Turnover from contracts with regional SMEs (M€)
KPI 11 Number of contact hours training to regional com panies
KPI 12 Number of new spin-offs

Source: Technopolis



In more complex types of analysis, the issue of how well the regional system is functioning arises. This is highly complex to do for a single region and requires considerable resources in order to benchmark one regional system with another. Such exercises usually involve mapping techniques where the role, results or linkages between organisations are compared from one system to another. The chart below illustrates this in a simplified manner.

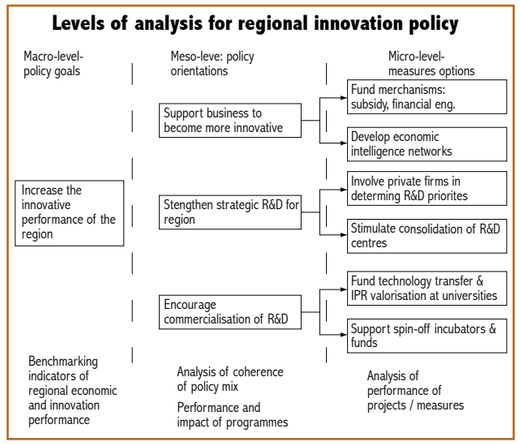
Positioning of different types of organisations vis-à-vis functions provided and stages of a product development cycle for a specific region

	ideal development	technical assessment	technical feasibility	business model	product development	testing	commercialisation	IPR
support in obtaining public R&D funds			public research center			public laboratories		
information on R&D activities								
awareness raising on technological innovation	University							
networking	Industrial association, buisiness networks							
S&T partner search								
industrial partner search					industrial association	industrial association	industrial association	
technological watch	technology center							
legal support on IPR		University						
designing and management R&D projects								
technological audit								
search for R&D personnel		public research institute	public research institute		public research institute	public research institute		

Benchmarking organisational performance is usually done as part of an evaluation or wider study (e.g. the 2002 study on business incubators in Europe, see: *http://ec.europa.eu/enterprise/entrepreneurship/support_measures/incubators/index.htm).*

The impact of innovation policies

Benchmarking regional innovation policy has to fit into the wider context of understanding and improving the regional innovation system. Benchmarking policy can be done at three levels of analysis, as illustrated in the following diagram:



Source: Technopolis

In most cases, benchmarking is done as part of the evaluation of specific measures (e.g. funding for a spin-off programme) or at the level of a regional programme. The third level of analysis is close to the benchmarking of performance, but with an emphasis on trying to explain how specific trends may have been influenced by specific policy choices; this requires a long time lag and considerable econometric type analysis.

Policy benchmarking also needs to consider that different forms of policy intervention exist and that it is not only funding measures that can influence regional innovation performance. Three basic types of measures can be identified in terms of the resources mobilised or types of activities:
• Financial measures support projects in enterprises, etc;
• Knowledge or information-based measures (vision, strategy, foresight, etc.);
• Legal and regulatory measures designed to explicitly affect the innovation process.

Finally, as for the benchmarking of organisations, it is important to consider the context of regional policies and the objectives pursued, which may vary widely between different types of regions. Comparing the impact of policies pursued in a less developed "cohesion region" with those of a more autonomous highly-developed region (e.g. from federal countries such as Belgium or Germany) will lead to erroneous conclusions about performance. As illustrated in the following exhibit, it is also important to understand the types of broad objectives pursued since this will influence the priority given to different types of instruments and hence the policy mix. Comparing your region with another region pursuing a different set of

policy objectives may lead to conclusions being drawn which do not necessarily contribute to policy making, even if transnational policy learning takes place.

Type of policy	Main objectives	Types of instruments	Strengths & drawbacks
"High-tech growth»	Strengthen knowledge creation Increase R&D spending Diversify economy	Classic single actor R&D and investment subsidies Linear approach to research commercialisation	Limited scope Focus on input additionality, some output additionality
"Networks and clusters"	Strengthen knowledge flows Increase innovation activity (still focus on high-tech)	Multi-actor measures Focus of funding on 'human capital' measures Funding for network 'organisers'	Takes account of sectoral/ technology structure Shift to learning effects Picking 'winners' - problem of exclusion!
"Learning economies "	Innovation as a cultural objective Promoting innovation Activity across all types of sectors	Diffusion of knowledge/strategic intelligence Support for 'value innovation' (design, marketing, etc. Social innovation' (e.g. in public services)	Broad scope Emphasis on changing behaviour (learning additionality) Lower emphasis on knowledge creation

Source: Technopolis

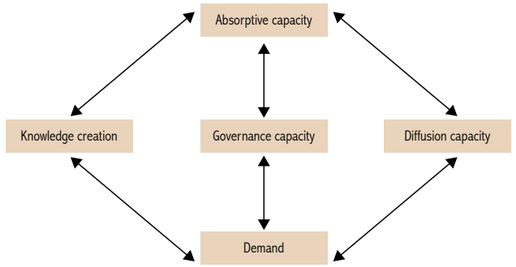
In short, there is a need to take into account the types of policies pursued and the policy mix in terms of measures when undertaking benchmarking of innovation policies.

2.5 HOW TO DEFINE THE MAIN BENCHMARKING THEMES

Innovation is multi-dimensional and multi-level activity. Usually, understanding of innovation is reduced to one of its components, namely knowledge generation and in particular, R&D. R&D is a major, but not the only, part of the knowledge generation process. Moreover,, knowledge generation is only a part of the overall process of innovation that leads to a new or improved product being placed on the market.

The approach adopted by regional benchmarking exercises needs to take into account different components of innovation capacity at regional level. From a system of innovation perspective, growth and competitiveness are driven by the innovation capacity of an economy, which depends not only on the supply of R&D but also on the capability to absorb and diffuse technology and on the demand for its generation and utilisation.

One possible multi-dimensional approach to benchmarking regional innovation capacity is illustrated in the following diagram :



This approach was used in a 2005 study on "Enlarging the European Research Area" (Identifying priorities for regional policy focusing on research and technological development in the New Member States and Candidate Countries [13]). It is used here as a working example to illustrate the need for an underlying conceptual model for regional benchmarking exercises, as well as in terms of the types of indicators that can be used.

Once a conceptual model is agreed upon, the next step is to decide on the selection of comparator regions. This can in two ways: either on the basis of an explicit choice, objectively based on an agreed methodology (e.g. regions with a similar industrial structure, etc.) or more subjectively (e.g. the "hotspots" or "motors" of European innovation) against a group of high-performing regions to which the region in question aspires to join.

13 Fraunhoger ISI, MERIT and Technopolis for DG RTD.

2.6 HOW TO SELECT WHAT INDICATORS SHOULD BE CONSIDERED FOR EACH KIND OF BENCHMARKING

The choice of indicators is obviously a function of the conceptual model underlying the benchmarking exercises. However, in general, the team carrying out the benchmarking will often run into a range of difficulties when starting from an "ideal" list of indicators they would like to use.

The difficulties include:

- Non-correspondence of administrative boundaries used for data collection with the realities of regional innovation dynamics (e.g. "corridors" of high-tech enterprises that cross regional administrative boundaries);
- Lack of data at the lower levels of the NUTS categorisation - so the role of main urban centres versus the hinterland of less innovative rural areas in many regions is hard to capture;
- Incomplete data sets for many regions, making the application of a common set of indicators a search for the "lowest common denominator";

The 2005 study on enlarging the ERA mentioned above set out to analyse the five key factors using at first a wide range of indicators. In the end, the more qualitative but often most important factors, such as the governance capacity, were reduced to very small sets of indicators based on very incomplete information.

	Variables
1.	**Knowledge Creation**
1.1	R&D expenditures (% of GDP)
1.2	R&D employees (full-time equivalent per 1 000 employees)
1.3	Concentration of patent inventors
1.4	Concentration of publications in Life Sciences
1.5	Concentration of publications in Nanosciences
2.	**Absorptive Capacity**
2.1	R&D expenditures by firms BERD (% of GDP)
2.2	R&D expenditures for higher education HERD (% of GDP)
2.3	Population with tertiary education (% of 25-64 age class)
2.4	Population with secondary education (% of 25-64 age class)
2.5	Population with secondary or tertiary education (sum; % of 25-64 age class)
2.6	Population with lifelong learning (% of 25-64 age class)
2.7	IS_population (% of households using www)
3.	**Diffusion Capacity**
3.1	Technology diffusion infrastructure
3.2	Employment in high-tech services (%)
3.3	Employment in manufacturing industries (%)
3.4	Employment in agriculture (%)
3.5	IS_enterprises (% of firms using e-banking)

4.	**Demand**
4.1	GDP in Euro per capita
4.2	Cumulated growth of GDP
4.3	Unemployment rate (%)
4.4	Population density (persons/km2)
4.5	Change in population density
5.	**Governance capacity**
5.1	Participation to EU initiatives
5.2	E-Government (% of firms using e-administration)
5.3	Web-presence of regions (availability of website)

In conclusion, the comparative presentation of specific quantitative or qualitative indicators can only provide so much insight. It usually needs to be placed in an analytical framework and complemented with an analysis which merges together the three types of benchmark targets: performance, organisation/ regional systems and policies.

An example of this type of analysis is a recent study on 'regional hotspots in Europe' carried out by Technopolis for the Dutch Ministry of Economic Affairs (see the presentation to the MLP working group on regional profiles: *www.innovating-regions.org/templates/ris_doc_counter.cfm?doc_id=2838&doc_type=doc)*

2.7 HOW TO CREATE COMPOSITE INDICATORS FOR EACH BENCHMARKING THEME

Once the themes to be benchmarked are identified (the performance of the regions, the performance of institutions composing the regional systems of innovation, the impact of innovation policies) one must pay attention to the advantages and disadvantages on composite indicators (CI). Can we construct a common system (methodologies and/or parameters) for estimating indicators?

What is a composite indicator?
Composite indicators add a layer of information to the underlying list of indicators. They can be used to summarise complex or multi-dimensional issues in order to support decision-makers. They provide the big picture and facilitate the task of ranking regions on complex issues.

However composite indicators may send misleading messages and may invite politicians to draw simplistic policy conclusions. From the methodology level, one aspect to be considered is the fact that the construction of composite indicators involves stages where a judgement has to be made.

An index needs a framework for converting indicators into a unitary value. Most indices also group related indicators into categories that can be useful for analysing regions/countries' relative strengths and weaknesses. The indicators are then described with goalposts and weighting.

Choosing your composite indicator
The quality of a composite indicator is in its fitness or function to purpose. Although we cannot tackle here the vast issue of the quality of statistical information, there is one aspect of the quality of composite indicators which we find essential for their use. It is the existence of a community of peers (be these individuals, regions, countries, facilities of various nature) willing to accept the composite indicators as their common yardstick based on their understanding of the issue. However, no matter how good the scientific basis is for a given composite indicator, its acceptance relies on negotiation.

As a first step towards the construction of a composite indicator, one should look at the indicators as an entity, with a view to investigate its structure. Multivariate statistics is a powerful tool in helping achieve this objective. This type of analysis is, thereafter, of exploratory nature and is helpful in assessing the suitability of the dataset. It also provides an understanding of the implications of the methodological choices (e.g. weighting, aggregation) during the construction phase of the composite indicator.

Weights
Central to the construction of a composite index is the need to combine in a meaningful way the different dimensions. This implies a decision on the weighting model and the aggregation procedure. Different weights may be assigned to indicators to reflect their economic significance, statistical adequacy, cyclical conformity, speed of available data, etc.

Several weighting techniques are available, such as weighting schemes based on statistical models (e.g. factor analysis, data envelopment analysis, unobserved components models), or on participatory methods (e.g. budget allocation, analytic hierarchy processes). For example, weights would be determined based on correlation coefficients or principal components analysis to overcome the "statistical" double counting problem when two or more indicators partially measure the same behaviour. Weights may also reflect the statistical quality of the data; a higher weight could be assigned to statistically reliable. Weights usually have an important impact on the results of the composite indicator, especially whenever higher weight is assigned to indicators on which some countries excel or fail.

This is why weighting models need to be made explicit and transparent. One should have in mind that, no matter which method is used, weights are essentially value judgments and have the property to define the objectives underlying the construction of a composite (Rowena et al., 2004).

The issue of aggregation of the information conveyed by the different dimensions into a composite index comes together with the weighting. Different aggregation rules are possible. Sub-indicators could be summed up (e.g. linear aggregation), multiplied (geometric aggregation) or aggregated using non linear techniques (e.g. multi-criteria analysis).

Uncertainty & sensitivity analysis
Doubts are often raised about the robustness of the results of the composite indicators and about the significance of the associated policy message. Uncertainty analysis and sensitivity analysis are powerful combinations of techniques to gain useful insights during the process of composite indicators building, including a contribution to the indicators' quality definition and an assessment of the reliability of countries' ranking.

A combination of uncertainty and sensitivity analysis can help to gauge the robustness of the composite indicator, to increase its transparency and to help framing a debate around it.

Uncertainty analysis (UA) focuses on how uncertainty in the input factors propagates through the structure of the composite indicator and affects the composite indicator values.

Sensitivity analysis (SA) studies how much each individual source of uncertainty contributes to the output variance. In the field of building composite indicators, UA is more often adopted than SA and the two types of analysis are almost always treated separately. A synergistic use of UA and SA is proven to be more powerful.

The types of questions for which an answer is sought via the application of UA&SA are:
- Does the use of one construction strategy versus another in building the composite indicator actually provide a partial picture of the countries' performance? In other words, how do the results of the composite indicator compare to a deterministic approach in building the composite indicator?
- How much do the uncertainties affect the results of a composite indicator with respect to a deterministic approach used in building the composite indicator?
- Which constituents (e.g. regions) have large uncertainty bounds in their rank (volatile regions) and therefore, if excluded, the stability of the system would increase?
- Which are the factors that affect the ranks of the volatile regions?

The composite indicator is no longer a magic number corresponding to crisp data treatment, weighting set or aggregation method; rather it reflects uncertainty and ambiguity in a more transparent and defensible fashion.

The iterative use of uncertainty and sensitivity analysis during the development of a composite indicator can: 1) contribute to its well-structuring; 2) provide information on whether the countries' ranking measures anything meaningful; and 3) could reduce the possibility that the composite indicator may send misleading or non-robust policy messages.

The way of presenting composite indicators is not a trivial issue. Composite indicators must be able to communicate the picture to decision-makers and users quickly and accurately. Visual models of these composite indicators must be able to provide signals, in particular, warning signals that flag for decision-makers those areas requiring policy intervention.

Transparency
One final suggestion concerns the 'transparency' of the indicator. It would be very useful for developers, users and practitioners in general, if composite indicators could be made available via the Web, along with the data, the weights and the documentation of the methodology.

Given that composite indicators can be decomposed or disaggregated so as to introduce alternative data, weighting, normalisation approaches etc., the components of composites should be available electronically. This would allow users to change variables, weights, etc., and to replicate sensitivity tests.

2.8 HOW TO SELECT DATA COLLECTION METHOD AND COLLECT RELEVANT DATA

This section analyses the choice of indicators, pointing out their utility as well as their limitations with possible repercussions for index results.

Defining the data collection criteria
The main criteria that will be taken into account for the selection of data will be that of quality:
- **Relevance**: it is important to understand "who has to decide what" and to provide suitable cognitive support;
- **Accessibility and clarity**: availability of the statistical data in the form users desire it;
- **Coherence**: between annual and infra-annual statistics, between provisional and final statistics;
- **Comparability**: over time, between geographical areas, between domains;
- **Coherence and comparability:** better no comparison than a "wrong" one;
- **Accuracy:** closeness between the estimated value and the true (unknown) population value with the sampling and non sampling errors (e.g. non- response errors);
- **Timeliness and punctuality** of the statistics produced;
- **Timeliness 1**: indicators reflect an "out-of-date" vision of the economy always ex-post and often available after a long delay;
- **Timeliness 2**: acceleration of economic processes requires a switch from reactive to proactive approach;
- **Transferability:** differences between contexts in which policies implemented can have a great impact on their effectiveness.

Defining the data collection methods
There are a number of techniques used to collect data. Issues that evaluators must face are the variety of names given to methods and the way some are tied to the methodological ideologies behind them. What we are trying to here is to give a list of data collection methods.

Interviewing: is a method where, on a one-to-one basis,

the researcher attempts to collect data from the interviewee using open questions, semi-structured questions or structured questions (or a combination of all three). The views, knowledge or whatever of the interviewee is the primary data for the research.

Group-based: the key to the group-based method is that you intend to collect data from more than one person, at the same time.

Observation: a method used when the researcher wishes to collect data about what is happening in real time. The researcher is interested in knowing what is happening during an activity, process or task. The observations can be made on an individual or group.

Existing documentation: the general form of this method is to look at what type of data is available that might reflect upon the objectives of your evaluation process.

Surveys: method covers the broad approach where data is being collected by some paper and pencil method. This now includes online data collection. however. According to the amount of structure in the questions done, we may have surveys:

- Structured;,
- Semi-structured;
- Unstructured.

Cognitive analysis: method to analyse the behavioural impact in the economical process: the cognitive approach increases the explanatory power of economics by providing it with a more realistic interpretation based on the psychological setting of the organisations. It allows to compare similar decisions taken in different managerial contexts and to evaluate the background (milieu) impact on the rational decisions.

2.9 PRIMARY AND SECONDARY DATA: WHAT ARE THE DIFFERENCES?

This section explores the advantages and disadvantages of using primary or secondary data.

Primary data
Data which are collected for a specific investigation are known as primary data. They are collected by the researcher himself. There are different data collection techniques such as case study research or in-depth interviews, focus groups, etc.

Secondary data
Secondary data - are those collected by others and "re-used" by the researcher.

Differences

When one is using primary data, one has a clear understanding of how those data should appear (in a frequency table, for example). It can't be so if one is using someone else's data; you won't necessarily know all of the subtleties that were involved in making coding decisions and in inputting the data.

The benefits of using secondary data are that you have neither the time nor the financial investment in their accumulation. The trade-off, though, is that you do not have the control over how the instrument is designed, how the data are collected or how carefully they are manipulated and documented.

2.10 HOW TO SELECT THOSE AGAINST WHOM TO BENCHMARK

The problem of deciding against whom to benchmark is closely related to the availability of international databases that allow easy handling of data for a large number of countries/regions.

Setting up comparable data sets
Two other problems that have to be taken into consideration are the setting up of internationally / trans-regional comparable data sets and the harmonisation of data.

Considered the general steps of the benchmarking process, these steps may be applied in different ways. Our proposal is the following:

- Select the superior performer (benchmarking partner);
- Study the own process;
- Study the chosen (superior) process;
- Determine the differences in performance;
- Set performance goals for improvement;
- Implement plans;
- Monitor results and develop further.

The first step in a benchmarking project is to decide what will be benchmarked. Once that is completed the benchmarking partner and data collecting method have to be identified. Data analysis involves determining the current performance gap.

The goal of this analysis is to determine if the benchmarking partner is indeed better, why it is better and how its practices can be incorporated or adapted for use in the individual region. Determining how the best practices can be used in the region leads to the next step in benchmarking: integration of the results. This step includes communicating the findings of the benchmarking study, gaining acceptance for these findings and establishing functional goals for the findings' implementation. The last major steps in the process are the implementation and monitoring of the results.

Classifications of benchmarking
Classifications of benchmarking found in the literature are based mainly on the type of partner, and are as follows:

- **Internal benchmarking** means comparison of performance of units or departments within one organisation. Comparison can also be made of similar products or services of similar business units;
- In **competitive benchmarking** the comparison of performance is made with a direct product competitor. In this case, comparison can be made of products or services and business processes;
- Specific function comparison with best business practises in two or more organisations in the same industry is called functional benchmarking;
- **Generic benchmarking** is the search for the best practice irrespective of the industry. It is similar to functional benchmarking, but the aim is to compare with the best in class without regard to industry.

2.11 FIRST-LEVEL ANALYSIS: HOW TO CALCULATE BENCHMARKING STATISTICS

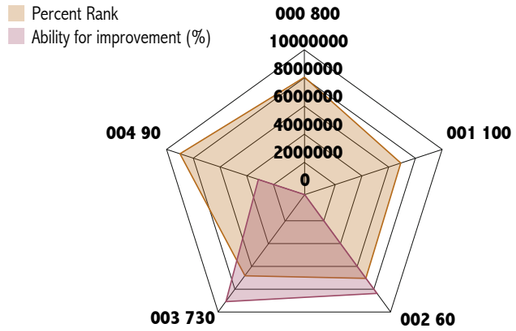
First-level benchmarking analysis is about the calculation of benchmarks and the positioning of the region distinctly within these benchmarks. Benchmarks are calculated from a sample of regional profiles that were collected and stored into the database.

Usual benchmarks are: 1) the minimum value of the index into the sample; 2) the maximum value of the index into the sample; 3) the mean value of the index; 4) the quartile values; and 5) the standard deviation that measures the dispersion of values from the mean.

Against these benchmarks, the positioning of a regional index is made by calculating:

- The real index value, which shows the performance of the region in a specific field of activity, i.e., patents, R&D expenditure, tertiary education, etc.;
- The percent rank value, which ranks a value in a data set as a percentage of entities included in the data set. This function can be used to evaluate the relative standing of the entity having a value within a data set of entities;
- The improvement index value, which shows the distance of the current index from the maximum value.

The positioning of a sum of indexes may appear as a table or a graph. A spider, for instance, is a usual graphical presentation of benchmarking indices. Each vertex represents data for one index. Two areas are drawn on the graph. The blue area is the percent rank of each index into the sample and shows the position of the region in respect to the other regions. The red area shows the ability of improvement with respect to the maximum value in the sample for each index.



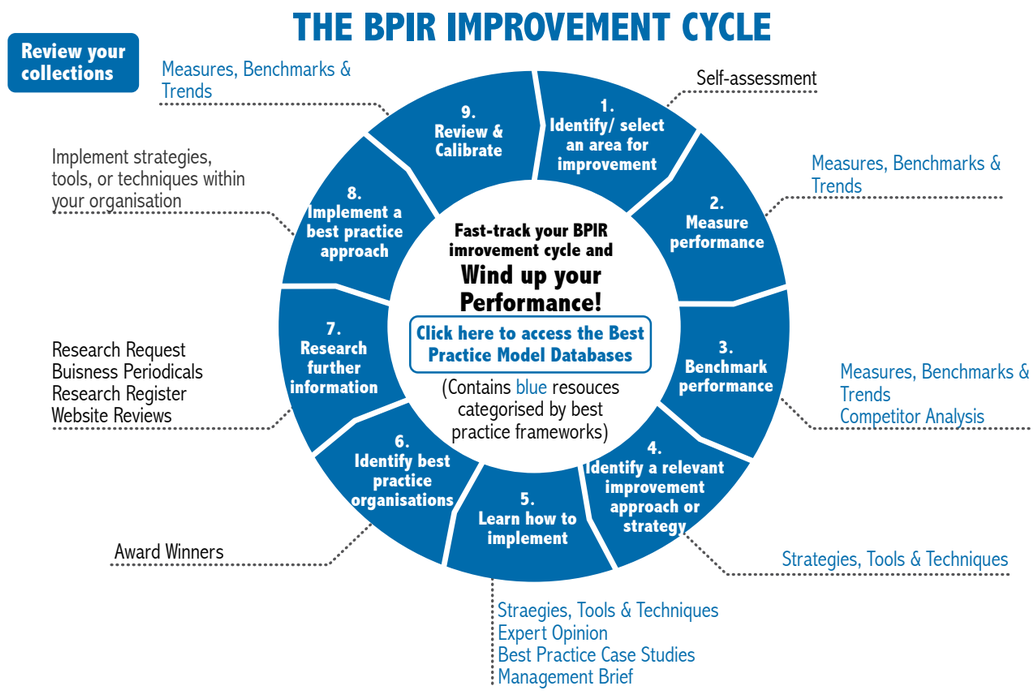
By drawing both those areas on the spider the benchmarking consultant can have a clear holistic view of the data. This is true in both the sense of the current status as well as the potential capabilities of the region.

Data collection and data entry into the database should be followed by a validation process. All data should have the same format and extreme data have to be excluded. The proposed way is to normalise the sample by applying standard deviation rules and exclude extreme values outside +/- 3 STDEV limits.

However, as this probability testing depends on the data source, each indicator must be examined differently. For field survey data, if it is required, the person who provided the data will have to be contacted again for any clarification or modifications. After these controls, the person responsible for validation may characterise the data as valid and proceed to

2.12 SECOND-LEVEL ANALYSIS: HOW TO INTERPRET THE STATISTICS, ASSESS THE CURRENT PERFORMANCE GAP AND DEFINE BEST PRACTICE

Numerical calculation of benchmarks and positioning of regional performance within the benchmarks is the initial part of regional benchmarking. To get the most value from the benchmarking, we should discover what underlines best performance and introduce the necessary changes to achieve it. The figure below shows a number of important steps beyond the calculation of benchmarks: identification of improvement strategy, learn how to implement and identify best practice. The full circle of benchmarking is completed with these steps focusing on the conditions of best performance.



Source: http://www.bpcknowledge.com/site/bpc.asp?pageid=101

Regional benchmarking, however, is considerably different from company benchmarking, in which the "best performance - best practice" model applies more easily. In regional benchmarking, the political, economic, and social factors related to the performance observed are beyond the reach and control of a single authority. Social division of labour and market relations are much more complex and less controllable than the technical division within the company. At regional level the best practice - best performance model is less dependable than at company level.

It should be noted that a regional innovation strategy that is successfully followed within a particular region won't necessarily bring significant results if copied to another region. There are several other factors that can affect the regional innovation performance.

There is no simple practical guide on how to deal with these complexities. Regional benchmarking should be combined with SWOT analysis, model building, foresight, future studies, and other regional planning techniques. Before beginning to write a regional benchmarking report, one should, at least, take into account:

- the main strengths and weaknesses of regional performance over past periods;
- the regional priorities that were set in previous planning periods and the expected outcome of regional policies, notably the performance indicators which should be positively affected;
- the level of improvement (or non-improvement) in performance indicators with respect to the policies exercised.

In simple terms, regional performance benchmarking should be combined with regional policy impact analysis and the identifi-

2.13 INFORMATION TECHNOLOGY APPLICATIONS FACILITATING THE BENCHMARKING PROCESS

Most benchmarking applications use information technologies to facilitate the process. Web-based applications may support the users during all the benchmarking process steps: from gathering information and data entry to the database, to the data analysis and generation of benchmarking reports.

Let us take a look at some examples:

- UK Benchmark Index (http://www.benchmarkindex.com) centres on the online completion and analysis of an in-depth questionnaire aimed at gathering data on the company's performance across a wide range of business issues. This data is then fed into a secure database where it is used to provide the company with performance comparisons against other similar companies. By analysing these comparisons it is possible to highlight strengths and weaknesses and identify areas in need of improvement;
- URENIO benchmarking application (http://www.e-benchmarking.org/) uses a similar approach, producing online benchmarking reports that compare an organisation with a selected target group of other organisations, using several quantitative performance indicators. Thus, strengths and weaknesses are detected;
- Best Practice Club (http://www.bpclub.com) allows the user first to measure performance, then assess, and understand it by comparing his performance against that of other successful organisations. Contains a growing database of generic individual, industry average, and world-class benchmarks (over 500 at present) on all areas of performance with links to the full case studies or articles from which they have been taken;
- Industrymetrics.com (http://www.industrymetrics.com/) includes a Self Assessor & Diagnostic tool offering a way to measure a company's performance to determine where the company fits amongst others in similar and dissimilar industries. The results are immediately displayed on the screen alongside the running industry standard.

The added value of using ICT benchmarking tools occurs at four levels:

Automation of data management and benchmarking reports creation: all available data are stored into a database that is constantly growing. The use of database enables the selection of the comparison sample in real time. Benchmarking may use alternative comparison groups. Real time benchmarking reporting may be produced in various output formats. There is also improved connectivity and ability to export / import data available in third party software and databases.

Simplification of use: there is no need of special knowledge from the user perspective as the application guides the user during all the benchmarking process steps. The intelligence is built into the application, not the user. The service can be offered remotely, online. The user using a Web browser fills a questionnaire, chooses the comparison sample, and obtains the benchmarking results easy, simple and quickly at any moment of time.

Dissemination and awareness raising: the Internet has become the mainstream dissemination channel for benchmarking techniques. Huge amounts of data relating to all benchmarking areas are available through the web (methodologies, techniques, best practices, questionnaires, process models, sample reports, etc). By using common searching techniques the users can, easily and quickly, find critical information about benchmarking and how should use it in order to improve the performance.

Facilitate cooperation through the creation of virtual communities, discussion groups, and networks. Users can collaborate to identify and implement best practices in various fields of activity. Virtual consultants' networks may provide mentoring during the benchmarking process and data evaluation.

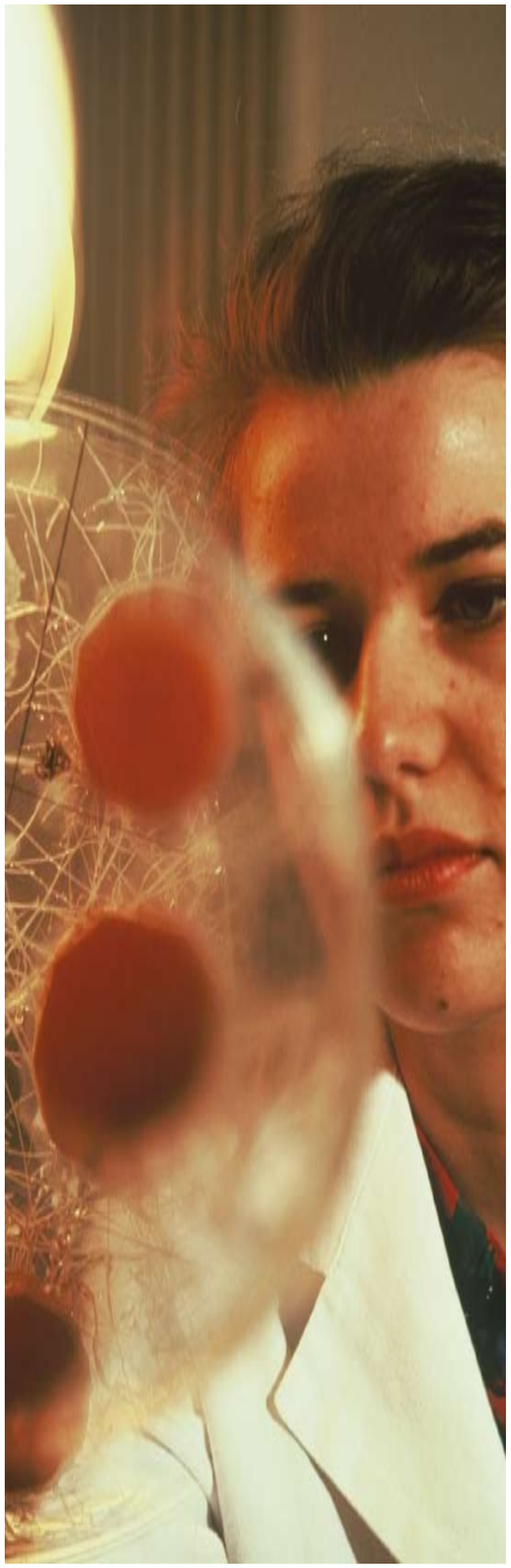
2.14 PARTIES INVOLVED IN THE BENCHMARKING PROCESS

Regional Stakeholders
The relevant regional stakeholders representing different institutions should be actively involved from the beginning of the exercise. Clear selection criteria should be established to select the relevant regional actors.

The composition of the partnership should depend on the planned character of the exercise. It should be noted, however, that stakeholders themselves may have interest in influencing the outcomes of the exercise (e.g. overrepresentation of particular interest or institution etc). Therefore, assuring involvement of all the relevant stakeholders should be priority as it minimises the risk of the exercise being dominated by limited number of interests. Some systematic way of dealing with and taking into account the stakeholders expectations should be established.

Politicians
There was a wide consensus amongst the workshop participants on the key importance of assuring political backing for the exercise from the design to the implementation phase. Benchmarking exercise - if it is to lead to concrete decisions and actions - has to have a political commitment behind.

Experts
The participants underlined that the right balance between role of experts and stakeholders should be found. It was emphasised that in case of lack of necessary analytical skills and knowledge in the region the external knowledge supplier (e.g. external experts) should be involved.



2.15 HOW TO TURN BENCHMARKING INSIGHTS INTO BENCHMARKING-BASED ACTION?

Benchmarking is to be an action-oriented exercise and lessons from the process should lead to better-targeted polices and knowledge based strategies. The results should be taken into account in both the policy design and implementation. Ensuring participation of the relevant stakeholders in the process should create commitment to using the knowledge generated in the policy design.

Benchmarking results should be accessible and easily understandable by all stakeholders. The analysis of the outcomes of a benchmarking exercise has to be illustrated in a simplified and understandable way.

A benchmarking exercise can help a region to realise its limits opportunities, and be more efficient, competitive and sustainable. It can also raise awareness about performance and identifies relative regional strengths and weaknesses.

Awareness raising exercise
One of the most important reasons and value added of the regional benchmarking process is raising awareness of regional stakeholders on the position of the region as compared to other regions in Europe and world. Presenting the regional situation in comparison to other regions may motivate and commit regional politicians and decision-makers to reconsider so far strategies and policies.

The examination of competitive regions' policies will provide benchmarked regions with a broader range of policy options.

What a regional benchmarking exercise may offer to the innovation strategy
- Providing better SWOT analysis, defining the areas of weaknesses and the indicators that show these weaknesses;
- Finding similar regions and good practice related to the development level of the region;
- Quantifying the objectives taking into account the margin of improvement of various indicators;
- Defining the underlying practices in order to improve performance indicators;
- Improving innovation support tools by identification and adaptation of good practices among regions e.g. How does a regional cluster compares to the others in its industry but in another region in terms of competitive performance and strength;
- Assisting regional development agencies to identify policy instruments and designing programmes that promote innovation e.g. by identifying best practice of cluster formation that work in other regions;
- Identifying key members or elements of the regional innovation system and important sources of innovative ideas inside and outside the region;
- Providing research institutes and organisation with better insights into their role in regional innovation systems and how they can function more effectively;
- Reinforcing partnerships and knowledge transferring mechanisms;
- Creating new co-operation methods and networking among organisation and agencies working in the same strategic area;
- Bringing together various regional stakeholders and Promotes "learning from each other" within regions;
- Raising awareness of regional stakeholders on the position of the region as compared to other regions Presenting the regional situation in comparison to other regions may motivate and commit regional politicians and decision-makers to reconsider so far strategies and policies.

Dissemination Techniques
The potential benefits of a Benchmarking exercise should be widely disseminated among stakeholders. In this way, benchmarking processes will be embed into the regional culture and it will be an integral part of any regional strategy planning

There are various ways of disseminating and embedding the recommendations of a benchmarking exercise into practices:
- Final Report: Production of a final report which should contain recommendations, barriers, applications and potential benefits;
- Good Practice Guide: A benchmarking guide is the normal output of a benchmarking exercise;
- Publication of the Results: The outcomes of the benchmarking exercise are normally reported in the regional press and included in statistical regional publications and studies;
- Internet-based information: There are many ways of making sufficient use of the Internet. The outcomes of the exercise are generally published in a static Web form or they can "feed" an on-line benchmarking tool.

2.16 INTEGRATING BENCHMARKING WITH OTHER INNOVATION POLICY INTELLIGENCE METHODS (FORESIGHT, INNOVATION PROFILING ETC.)

Benchmarking is a process of information analysis and performance improvement by continuously identifying, understanding, and adapting outstanding practices and processes found inside and outside an organisation (company, public organisation, university, cluster, etc.). Benchmarking follows the typical stages of intelligence methods, gathering, analysis, and dissemination of information, and it may be easily complemented and enhanced with other methods of intelligence gathering and dissemination, such as market and technology watch, foresight, and R&D monitoring.

Complementary to benchmarking, market watch is the collection and dissemination of information about commodities and prices. In more advanced forms includes product offer and demand, auctions, announcement of new products, new machinery and technology, production reports, and future estimations about prices and production volume. Because of the complexity and extent of information, market watch is better organised on an industry or cluster basis. One of the most sophisticated applications is to be found at <www.yarnsandfibers.com> which covers market intelligence on the textile and fiber industry.

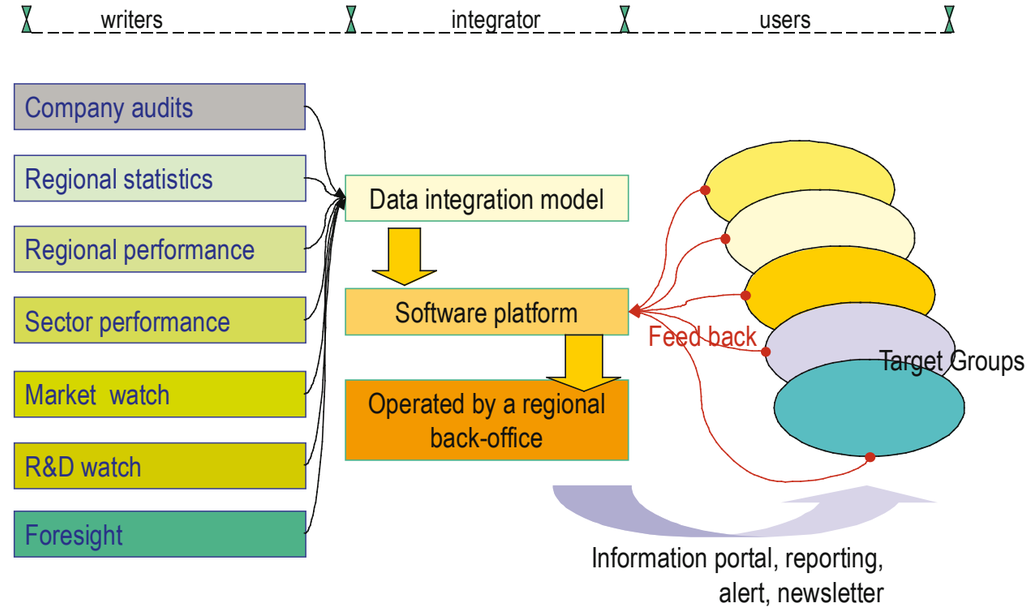
On the other hand, foresight can be defined as a systematic, participatory process, involving gathering intelligence and building visions for the medium-to-long-term future, and aimed at informing present-day decisions and mobilizing joint actions. Foresight involves thinking about emerging opportunities, challenges, trends and discontinuities; however, the aim is not to produce insights about the future, but to bring together key actors and sources of knowledge and develop strategic visions and anticipatory intelligence.

The purpose of combining intelligence from benchmarking, market watch, foresight and other sources is to gather information from multiple sources, integrate multi-dimensional information, and widen the horizon of survey and watch. Information from competitors (benchmarking) may be combined with information from the sector (market watch), related technologies (R&D monitoring), future trends and forecasts (foresight), leading to more robust and global intelligence .

A concrete attempt to integrate regional intelligence was made under the Meta-foresight project. Meta-foresight belongs to the first generation of Regions of Knowledge Pilot Action introduced by the European Parliament in 2003. The acronym denotes both the use and further advancement of knowledge generated during regional foresight exercises. The strategic objective was to create an integrated regional information system of market and technology watch, based on the cooperation among university and research institutions, private companies, sectoral associations, and public authorities . Main concern and core concept of Meta-foresight was to integrate information from five fields of intelligence:

- Regional foresight, which allows the systematic, participatory, future intelligence gathering and medium-to-long-term vision-building process aimed at present-day decisions and mobilising joint actions;
- Benchmarking, which foster the development by learning from others through comparing practices and performances;
- Market watch, which provides information on product offer and demand, new products, prices, emerging markets, and channels of distribution;
- R&D watch, which focus on technology capabilities emerging from regional and global R&D players, and identifies patents and other IPR enabling the acquisition of promising technologies;
- Regional technological competences and skills, which allow identifying human capital and expertise to support innovation and technological solutions;

Intelligence integration, as core concept of Meta-foresight, has two complementary sides. On one hand it denotes complementarity in the supply side, referring to combination of information and knowledge from organisations active in the above five fields of intelligence (foresight operators, benchmarking agencies, market and R&D watch systems). On the other hand, it denotes participation of the users in the assessment and flow of information; it is a feed back from users, thus integration of information between providers and users (see Figure below).



Source:Meta-foresight, http://www.urenio.org/metaforesight/guide.html

Meta-Foresight is an example of systemic intelligence, using information from regional, sectoral, and company sources and perspectives. Information from different sources (company, region, market, R&D, etc.) is combined to give a holistic view to a subject (strategy, innovation, quality, demand, etc.) for the shake of better understanding and anticipating the future.

III. Good Practice

3.1 EUROPEAN INNOVATION SCOREBOARD

The European Innovation Scoreboard (EIS) is an annual assessment of innovation performance in the individual Member States of the European Union. It was developed at the request of the Lisbon European Council in 2000. It focuses on high-tech innovation and provides indicators for tracking the EU's progress towards the Lisbon goal of becoming the most competitive and dynamic knowledge-based economy in the world within the next decade. The EIS includes innovation indicators and trend analyses for all 25 EU Member States, as well as for Bulgaria, Romania, Turkey, Iceland, Norway, Switzerland, the US and Japan.
To measure innovation performance a set of 26 "indicators" are used, such as the number of science graduates or the number of patents filed. As the indicators are measured in the same way across all Member States, the scoreboard is a "benchmarking" tool - namely it can be used to compare one country against another.
Particular emphasis has also been given to 5 key dimensions of innovation, which are further explored in the EIS (Innovation Drivers, Knowledge Creation, Innovation and Entrepreneurship, Applications, IPR).

Its purpose is to enable Member States to see for themselves their strengths and weaknesses, thus helping them in formulating policies and programmes. High-scoring Member States may increasingly become sources of best practice as Scoreboard users look to adopt what has worked elsewhere. Hence, it is a starting point for discussion and action; a factual foundation to future measures. The richness of detail enables policy-makers and opinion formers to use it as a tool in order to identify priorities, to articulate strategies and to measure the success of those strategies.

The Scoreboard is a part of the wider Innovation Trend Chart initiative. The Trend Chart provides a comprehensive and detailed overview of innovation-related initiatives at Member State level. This is in order to put a resource at the disposal of those who are interested in what is happening in innovation around Europe - and more importantly, what is working.

The 2005 EIS has been fully revised in collaboration with the Joint Research Centre (JRC). The number of categories of indicators has been revised and increased from four to five and the set of innovation indicators has been modified and increased to 26. The innovation indicators are assigned to five categories and grouped in two main themes: inputs and outputs.

Innovation Inputs:
Innovation drivers (5 indicators), which measure the structural conditions required for innovation potential;
Knowledge creation (5 indicators), which measure the investments in R&D activities, considered as the key elements for a successful knowledge-based economy;
Innovation & entrepreneurship (6 indicators), which measure the efforts towards innovation at the level of firms.

Innovation Outputs:
Application (5 indicators), which measure the performance, expressed in terms of labour and business activities, and their value added in innovative sectors;
Intellectual property (5 indicators), which measure the achie-

ved results in terms of successful know-how.

See Table 1 below for the list of indicators.

Table 1. EIS 2005 Indicators

	INPUT - Innovation drivers	Data source
1.1	S&E graduates per 1 000 population aged 20-29	EUROSTAT
1.2	Population with tertiary education per 100 population aged 25-64	EUROSTAT, OECD
1.3	Broadband penetration rate (number of broadband lines per 100 population)	EUROSTAT
1.4	Participation in life-long learning per 100 population aged 25-64	EUROSTAT
1.5	Youth education attainment level (% of population aged 20-24 having completed at least upper secondary education)	EUROSTAT
	INPUT - Knowledge creation	
2.1	Public R&D expenditures (% of GDP)	EUROSTAT, OECD
2.2	Business R&D expenditures (% of GDP)	EUROSTAT, OECD
2.3	Share of medium-high-tech and high-tech R&D (% of manufacturing R&D expenditures)	EUROSTAT, OECD
2.4	Share of enterprises receiving public funding for innovation	EUROSTAT (CIS[1])
2.5	Share of university R&D expenditures financed by business sector	EUROSTAT, OECD
	INPUT - Innovation & entrepreneurship	
3.1	SMEs innovating in-house (% of all SMEs)	EUROSTAT (CIS[1])
3.2	Innovative SMEs co-operating with others (% of all SMEs)	EUROSTAT (CIS[1])
3.3	Innovation expenditures (% of total turnover)	EUROSTAT (CIS[1])
3.4	Early-stage venture capital (% of GDP)	EUROSTAT
3.5	ICT expenditures (% of GDP)	EUROSTAT
3.6	SMEs using non-technological change (% of all SMEs)	EUROSTAT (CIS[1])
	OUTPUT - Applicatiom	
4.1	Employment in high-tech services (% of total workforce)	EUROSTAT
4.2	Exports of high-technology products as a share of total exports	EUROSTAT
4.3	Sales of new-to-market products (% of total turnover)	EUROSTAT (CIS[1])
4.4	Sales of new-to-firm not new-to-market products (% of total turnover)	EUROSTAT (CIS[1])
4.5	Employment in medium-high and high-tech manufacturing (% of total workforce)	EUROSTAT
	OUTPUT - Intellectual property	
5.1	EPO patents per million population	EUROSTAT
5.2	USPTO patents per million population	EUROSTAT
5.3	Triadic patent families per million population	EUROSTAT, OECD
5.4	New community trademarks per million population	OHIM[2]
5.5	New community designs per million population	OHIM[2]

1: Community Innovation Survey

2: Office for Harmonisation in the Internal Market: http://oami.eu.int/

Innovation Benchmarking features a tool which compares innovation performances and helps to assess the transferability of "best practices". It delivers summarised and concise information and statistics on innovation policies, performances and trends in the European Union. It is also a European forum for benchmarking and the exchange of best practices in the area of innovation policy.

References:

European Trend Chart on Innovation Methodology Report on European Innovation Scoreboard, a discussion paper from the Innovation/SMEs Programme, EC Enterprise Directorate-General May 2005, *http://trendchart.cordis.lu/scoreboards/scoreboard2005/scoreboard_papers.cfm*

TrendChart Innovation Policy in Europe, European Commission, Enterprise & Industry Directorate General, Innovation Policy Development unit, *http://trendchart.cordis.lu*

3.2 Massachusetts Innovation Economy Index

General

The annual Index of the Massachusetts Innovation Economy is a collection of leading performance indicators of the innovative sectors in the commonwealth. Published by the Massachusetts Technology Collaborative (MTC), the Index measures and monitors innovation processes which utilise local resources and convert them into competitive economic results. It provides a framework for identifying elements contributing to innovation and understanding how these elements interrelate.

There are three primary components of the Index. The first, Results, is a barometer of the labor force—"outcomes for people and business." The second, Innovation Processes, measures those interactions that convert resources into results, including "idea generation, commercialisation, entrepreneurship, and business innovation." The third, Resources, includes public and private inputs - human, technological, and financial - which contribute to the Innovation economy. It's a comprehensive and well-presented portrait of innovation in a state known as a leader in innovative practices and industries.

The purpose of the Index of the Massachusetts Innovation Economy is:

- To establish a reliable source of information about the Massachusetts Innovation Economy that can be updated annually;
- To inform opinion leaders about the performance of the Innovation Economy and the resources and processes that support its development;
- To stimulate discussion about how best to foster the development of the Innovation Economy.

Publication started in 1997 with 33 indicators measuring the performance of nice clusters over time compared with the measure of six competitive Leading Technology States (LTS). This Index neither provides a composite/weighted benchmarking of performance nor does it impart recommendations for policy implementation.

Benchmark Comparisons: Leading Technology States

Tracking the Massachusetts Innovation Economy over time is crucial for regularly assessing its strength and resilience. At the same time, benchmark comparisons can provide an important context for understanding how Massachusetts is doing in a relative sense. Thus, several indicators in the Index are compared with the national average or with the measure of eight competing Leading Technology States (LTS). Because the Index focuses on the Massachusetts Innovation Economy, states with similar economies were selected for comparison. In addition to Massachusetts, the LTS includes California, Connecticut, Illinois, Minnesota, New Jersey, New York, North Carolina and Pennsylvania.

The LTS are selected based on the comparison of the total number of key industry clusters (Computer & Communication Hardware, Defence Manufacturing & Instrument, Diversified Industrial Support, Financial Services, Healthcare Technology, Innovation Services, Postsecondary Education, Software & Communication Services, Textile & Apparel) having an employment concentration above the national average. In this way, the selected LTS are comparable to Massachusetts in having a similar range of innovative clusters.

Indicators Selection

Indicators are quantitative measures of factors at work in the Massachusetts Innovation Economy. A rigorous set of criteria was applied to each potential indicator. All of the selected indicators:

- Are derived from objective and reliable data sources;
- Are statistically measurable on an ongoing basis;
- Are bellwethers that reflect the fundamentals of economic vitality;
- Can be readily understood by a wide variety of readers;
- Measure conditions in which there is an active public interest.

Indicators used in the *Index:*

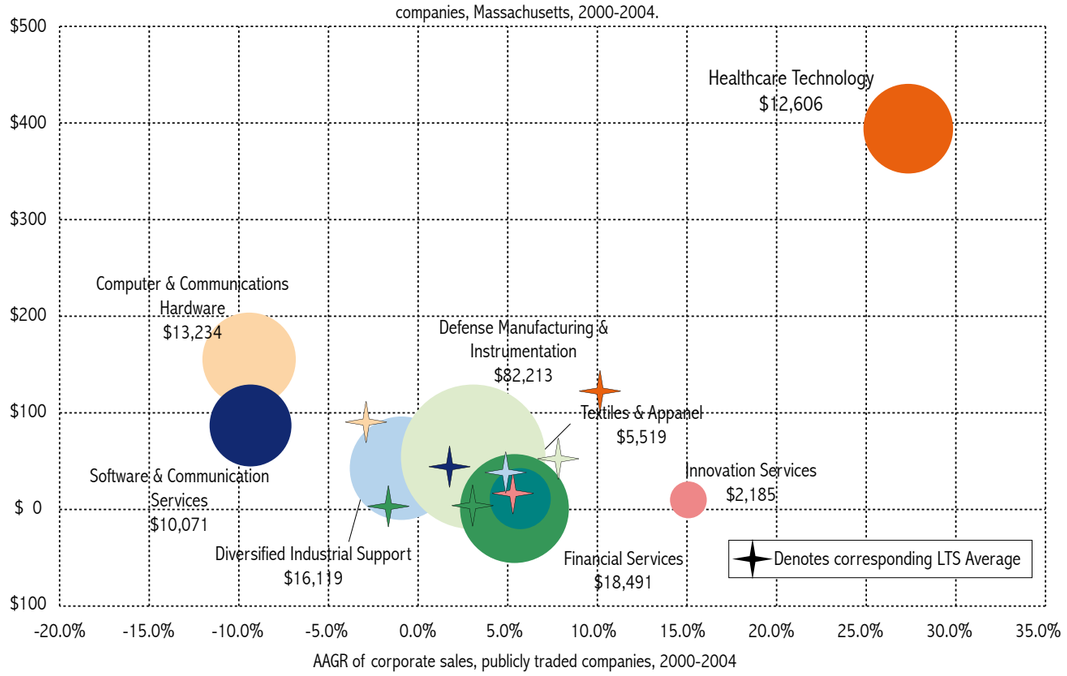
- Industry Cluster Employment and Wages;
- Corporate Sales, Publicly-Traded Companies;
- Occupation and Wages;
- Median Household Income;
- Manufacturing Exports;
- New Business Incorporations and Business Incubators;
- Initial Public Offerings (IPOs) and Merges & Acquisitions (M&As);
- Corporate Headquarters, Technology Fast 500 Firms, and Inc 500 Firms;
- Small Business Innovation research (SBIR) Awards;
- FDA Approval of Medical Devices and Biotech Drugs;
- Corporate Research & Development Expenditure, Public-Traded Companies;
- Patents, Invention Disclosures, and Patent Applications;
- Technology Licences and Royalties;
- Investment Capital;
- Federal Research & Development Expenditure and Health Research & Development Expenditure;
- Intended College Major or High School Seniors and High School Dropout Rates;
- University Enrollment and Public Higher Education Expenditure;
- Educational Attainment and Engineering Degrees Awarded;
- Population Growth Rate and Migration;
- Median Price of Single-Family Homes, Home Ownership rates, and Housing Starts.

Indicators are presented in graphical format or are analysed in various multivariable configurations to provide state decision-makers with very compelling information.

Example:

Corporate R&D vs. Sales Growth

Figure 1.4, Portfolio of average corporate R&D expense per $1,000 of sales and adeverage annual growth rate (AAGR) of corporate sales, publicly traded companies, Massachusetts, 2000-2004.



Data source: Standard and Poor's

Data Availability

For the 2005 Index, indicators were developed from existing credible national secondary sources. Indicators from these sources usually required the reconfiguration of existing data-sets. These groupings of data were derived from a wide range of sources; consequently, there are variations in the timeframes used and in the specific variables that define the indicators being measured. MTC intends to continue updating and refining the Index report in future years so that it can serve as an effective monitoring system.

References:

2005 Index of the Massachusetts Innovation Economy, Massachusetts Technology Collaborative, John Adams Innovation Institute (Innovation Institute) http://www.masstech.org/institute/the_index/2005index.pdf

Zvi Rozen 2006, "The Massachusetts Innovation Index, Case Study", presentation at the Mutual Learning Platform Workshop on Regional Innovation Benchmarking, organised by the IRE Network, 20 June 2006, Brussels

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3.3 Region Lazio Innovation Scoreboard (RLIS)

Lazio was the first region in Italy to produce an annual statistical report on innovation. RLIS, now in its fourth edition, has become a tool whose usefulness has been widely acknowledged across Europe.

Region Lazio Innovation Scoreboard was produced under one of the Pilot Actions of Lazio Regional Programme of Innovative Actions "InnGovernance" (2002-2005). The main objectives were the definition and application of a governance model for innovation policies management at regional level. Today, it is an important means for improving and reinforcing the regional dimension of policies in the sectors of innovation, research and entrepreneurship.

The report measures the degree of innovation at regional area (NUTS2) within the national dimension (NUTS1). The 2006 report has been drawn on the basis of 23 indicators (table 1), classified into eight categories:

- Education (3 indicators);
- Employment (3 indicators);
- Research and development (2 indicators);
- Patents (1 indicator);
- Innovation of enterprises (4 indicators);
- Spread of new technologies (4 indicators);
- Performance, dynamism and quality of enterprises (3 indicators);
- Competitiveness (3 indicators).

With respect to the previous edition, the RLIS2006 benefits from the presence of a new section detailing the territorial dynamics within the Italian geographical macro-partitions. It makes it possible to compare Italian regions -- both with each other and with the average Italian values. There has been a significant increase in the index for the Lazio region, which has reduced the distance by which it trails Lombardy. There has also been a notable reduction in the index for the Liguria, Emilia Romagna and Umbria regions. All of the southern Italian regions have improved their performance in terms of innovation - the most significant examples being Campania, Puglia, Basilicata and Calabria.

	Indicator	Definition	Data source
Education	1.1	S&E graduates (% of 20-29 years age class)	Filas Observatory adapted from ISTAT and MIUR
	1.2	Population with tertiary education (% of 25-64 years age class)	EUROSTAT
	1.3	Employed persons participating in training and education activities (% employed adults)	ISTAT
Employment	2.1	Employment in medium-high and high-tech manufacturing (% of total labour force)	EUROSTAT
	2.2	Employment in medium-high and high-tech services (% of total labour force)	EUROSTAT
	2.3	Labour productivity in SMEs	ISTAT
R&D	3.1	Public R&D expenditure (% of GDP)	ISTAT
	3.2	Business expenditure on R&D (% of GDP)	ISTAT
Patents	4.1	EPO high-tech patent applications (per million population)	EUROSTAT
SME innovation	5.1	Enterprises innovating in-house, 1998-2000 (% of total)	ISTAT (CIS3)
	5.2	Innovation expenditures per employed person, 2000	ISTAT (CIS3)
	5.3	Enterprises that introduced new products or processes, 1998-2000 (% of all enterprises innovating in-house)	ISTAT (CIS3)
	5.4	Venture capital in high-tech enterprises (% of GDP)	Filas Observatory adapted from ISTAT and AIFI
Spread of new technologies	6.1	Internet access by households (% of households)	ISTAT
	6.2	Number of enterprises with a website (% of total enterprises)	IIT-CNR Pisa
	6.3	Population of Municipalities with computerised services	Filas Observatory adapted from Ancitel and ISTAT
	6.4	ADSL coverage (% of population)	Broadband Observatory
Performance, dynamism and quality of enterprises	7.1	Volatility rate of enterprises	Filas Observatory adapted from InfoCamere
	7.2	High-tech export as % of total export	ENEA Observatory adapted from ISTAT
	7.3	IT expenditure per employed person	Assinform and ISTAT adapted from Ministry for Innovation and Technologies
Competitiveness	8.1	Capital accumulation rate	ISTAT
	8.2	Foreign investment attraction	ISTAT, UIC, OECD
	8.3	Development rate of "services for enterprises"	ISTAT

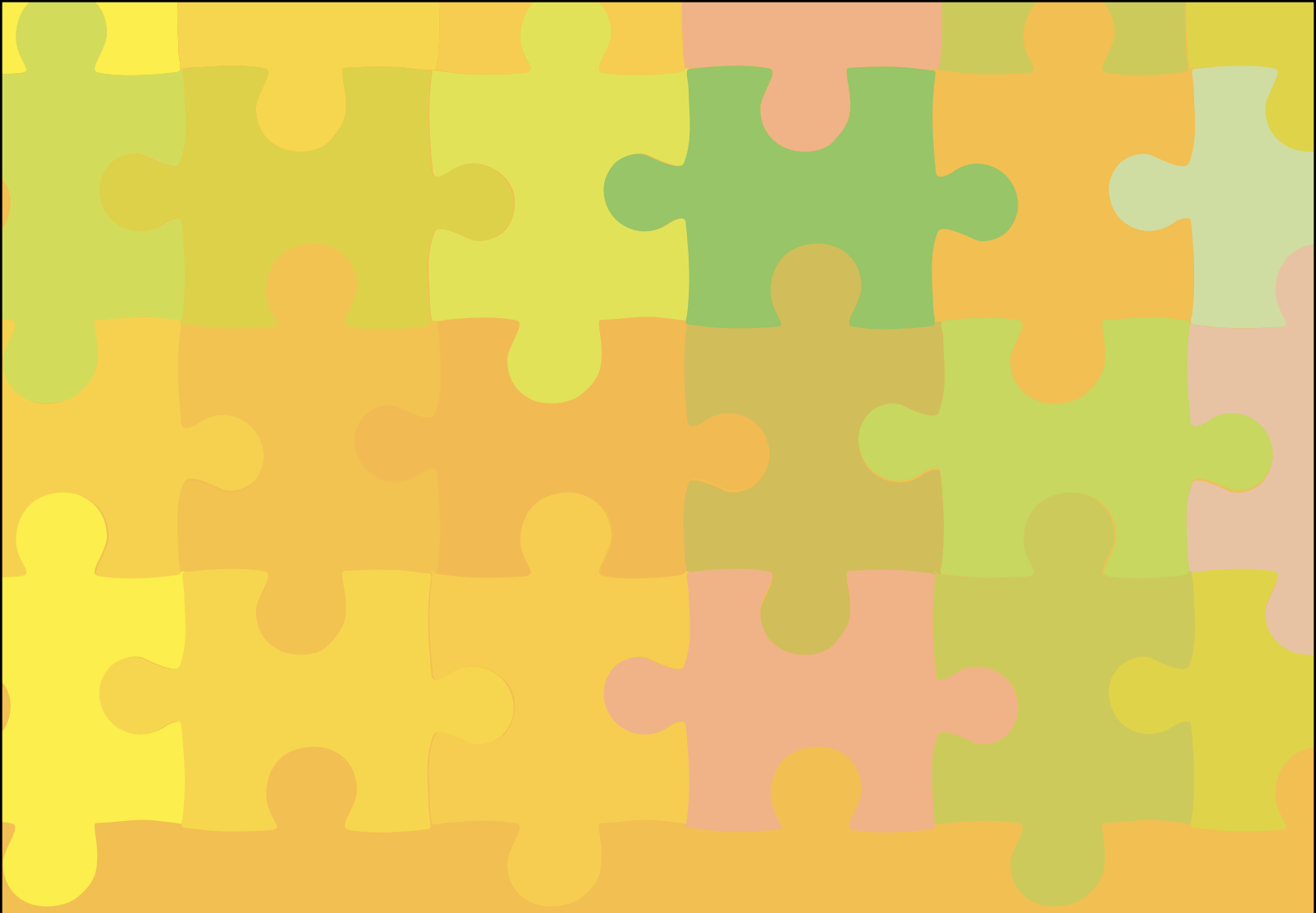
Source: Osservatorio Filas (Region Lazio innovation Scoreboard, 2006)

References:

Region Lazio Innovation Scoreboard (RLIS2002), Filas, June 2003, *http://www.osservatoriofilas.it/download/Scoreboard_Lazio_Engl.PDF*

Region Lazio Innovation Scoreboard (RLIS2004), Filas, June 2004, *http://www.osservatoriofilas.it/download/RLIS_Eng_2004.pdf*

Region Lazio Innovation Scoreboard (RLIS2004), Filas, July 2005, *http://www.osservatoriofilas.it/download/RLIS_2005_english.pdf*



More information on Mutual Learning Platform, including:

- Workshop reports,
- Presentations
- Reports for Investing in Research and Innovation in European Regions

- "Blueprint on Regional Innovation Benchmarking"
- "Regional Foresight - Boosting Regional Potential"
- "A Toolkit on how to Make Regional Growth Poles Work"

can be found on MLP website: http://www.innovating-regions.org/mlp

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