Benchmarking Regional Performance in the Information Society: Turning It into Practice

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1 INTRODUCTION

Information and communication technologies (ICTs) have opened up huge possibilities for regions to overcome traditional disadvantages deriving from remoteness and distance. Consequently, some authors have suggested the "death of distance" (Cairncross 1997) as one of the main outcomes of this technological progress. By means of the Internet and other computer networks, it should now be possible for even the most remote company to participate in the global economy, selling goods and, in particular, digital services to clients located hundreds or even thousands of kilometres away, all by the click of a mouse. Geographical closeness seems to have lost any relevance.

But instead of making space more even, ICTs have shown to exacerbate disparities between regions, both inside and across countries. A lot of evidence (see e.g. Gillespie et al. 2001) suggests that regions differ not only according to the speed and intensity with which the local economy and the population adopt ICTs, but also according to whether they can make productive use of the possibilities opened up by the Internet and related technological innovations. Both are seen as major determinants of current prosperity and economic prospects for the future.

As a consequence, regional investments in infrastructure and projects related to the Information Society have increased dramatically over the last years. A recent report (Technopolis et al. 2002) shows that "the Structural Funds can be expected to co-finance a total of just under €16 billion of information society investment in the period 2000-06. This represents an estimated 7.36% of total Structural Funds investment allocated to Information Society investment and suggests that national and regional decision makers are increasingly committed to information society development". This calculation does not include programmes financed outside the Structural Funds: for example, the Emilia-Romagna region itself has recently launched a four year Information Society plan with a budget of €120 million, totally covered by own resources.

Given these developments, it is obvious that not only need investments to be adequately monitored and evaluated, but policy-makers also need to be able to identify areas in which public investments and political support are most likely to be successful. They also need to have good insight into how the region's economy as well as wider society are affected by ICTs and ICT-enabled developments, such as the trend towards globalisation. For this, policy-makers need high quality data on their region's situation with regard to Information Society developments – also and in particular in comparison to other regions, which are by turns seen as competitors, (potential) strategic partners, shining examples

or emulators. Unfortunately, however, availability of such data at the regional level is extremely limited. Arguably, progress towards better regional statistics of this kind is of paramount importance for the ability of regions to devise and run effective Information Society policies.

Collection of Information Society-related data at regional level has suffered until now from the high costs involved, and from non-coordination of regional data collection initiatives. In addition, there is a number of other challenges which need to be tackled as well:

- Which are the best suitable indicators to compare regions, and how can they be identified and selected?
- What is the relationship between ICT indicators with more traditional indicators on regional competitiveness and social progress?
- How can statistics be collected in a way that meets both the demand for short-term information by policy-makers as well as the long-term time series data needed for in-depth research?
- How can data be gathered in order to maximise validity and comparability while making optimal use of available resources?
- Which is the optimal geographical reference unit for comparisons of regions?

The paper deals with these questions based on research undertaken in the context of mainly two projects:

- BISER[1], a recently finished research project supported by the European Commission's IST Programme which developed and piloted indicators for measuring Information Society developments at the regional level; and
- UNDERSTAND[2], an ongoing project started in the beginning of 2004 with the support of the EC Interreg programme and involving 10 European regions. UNDERSTAND builds on the results of previous benchmarking projects to create a good quality, consistent and widely agreed methodology, which could and should be used also by other non partner regions to benchmark on Information society.

The projects are related as follows: BISER, which started in 2001, used a *top-down approach* for indicator development and piloting, i.e. the list of indicators to be selected was derived from a generic model of regional development in the Information Society rather than the specific political objectives of any individual region.

In parallel to BISER, a number of regions which already ran Information Society observatories started co-operation in order to improve the comparability of statistics collected: the Regional IST project involved four European regions. Also, eris@[3] worked towards defining common indicators. It was mainly through eris@ that the Emilia-Romagna region has taken the lead of a group of regions which signed a Memorandum of Cooperation for sharing data and work towards common indicators.

The first concrete act of this cooperation is the UNDERSTAND project, where ten EU regions are currently engaged in designing a common methodology for data collection. During 2004 the methodology will be applied in the participating regions. The UNDERSTAND project starts from the concrete needs of regional government as users of data, and it takes a pragmatic approach by not developing a shared model of regional development (as was the case in BISER), but rather by picking the most relevant domains and indicators out of existing projects in order to meet the concrete needs of policy-makers. It therefore follows a *bottom-up approach*.

In this paper, key findings and experiences from both projects – some of which are complementary, other stand in contrast to each other – will be discussed. The authors point out key challenges which

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1 "Benchmarking the Information Society: E-Europe Indicators for European Regions", see www.biser-eu.com

2 "European regions UNDER way towards STANDard indicators for benchmarking Information Society"

3 European Regions for Information Society Association

everybody who sets out to compare regional performance in the Information Society is likely to face, and present possible solutions based on real-world experience.

2 BACKGROUND

2.1 The BISER project – Piloting survey-derived indicators for measuring Information Society developments at regional level

BISER set out to contribute to the development of better indicators, by designing and piloting a set of quantitative measures to be applied at the sub-national level in Europe. BISER indicators intend to describe the extent to which regions make use of ICT for the purpose of (generic) regional development objectives.

The BISER process consisted of the following steps:

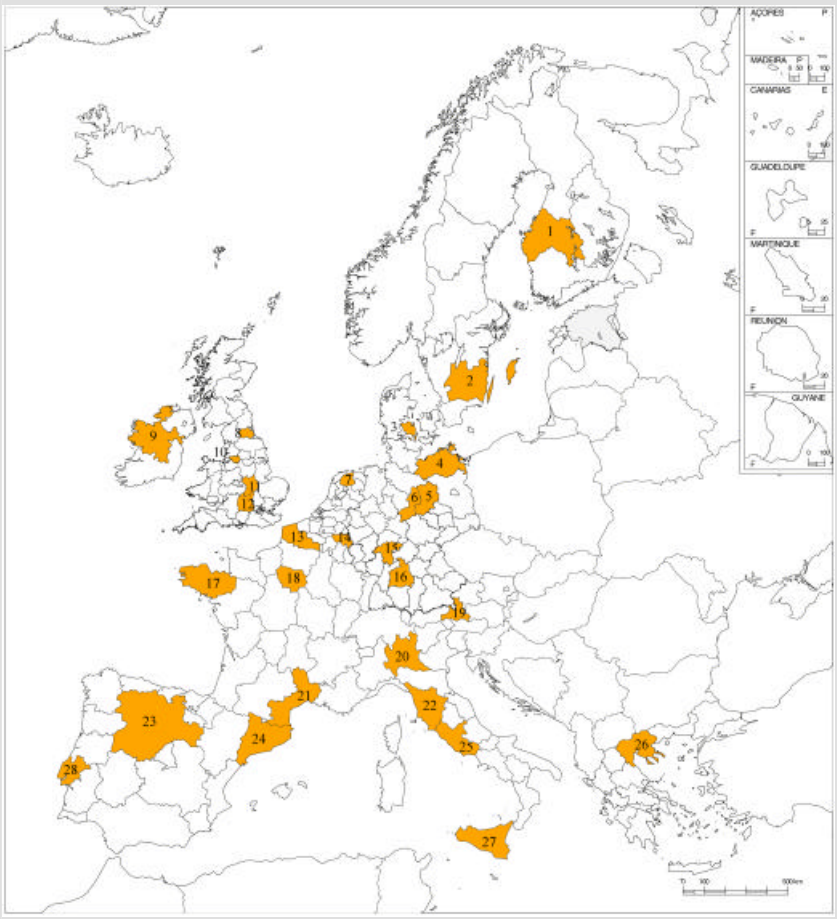
- Existent conceptual approaches relating to the emergence of the Information Society and the Net Economy have been thoroughly assessed in order to build a framework for analysing ICT's impact on regional development, showing the role of all relevant factors at an appropriate level of detail. The results have been synthesized in the BISER 5e Framework, consisting of the dimensions E^1 entity and identity, E^2 economy and efficiency, E^3 equity and cohesion, E^4 environmental sustainability, E^5 e-technology. From these ten domains for which indicators are needed were derived: government and public administration; regional identity; transport and the environment; health and care; business enterprise; innovation and R&D; work and labour market; education, training and skills; social inclusion and cohesion; ICT infrastructure.
- Existing and forthcoming statistical data for these indicators, stemming from supranational and national statistical agencies, commercial research firms and other sources, were then collected in a stocktaking exercise. This allowed the project to identify the main gaps in data availability at regional level.
- For these gaps, BISER in a third step developed a list of regional indicators. The list was then discussed with all interested parties, in particular with organisations representing regions at EU level; National Statistical Institutes and regional policy research Institutes in the EU and the NAS countries; representatives from individual EU regions; the European Commission including Eurostat; and the research community. The feedback received was used to revise the list in order to make a final selection of indicators which was then piloted through interview surveys.
- For piloting, two surveys were conducted in early 2003. The BISER Regional Population Survey used a representative sample of the general population, while the BISER Decision Maker Survey was targeted at a probability sample of establishments (see below).
- Results of the surveys were fed into the BISER eEurope Regions Indicators Database which also contains extensive data from secondary sources. The database has been used for extensive analysis in order to identify patterns of development and interrelations between the main components of the BISER 5e Framework. It is available to interested third parties (on request).
- Results of the survey were also used for testing the value of the indicators for regional benchmarking. With a view towards reducing the number of core indicators as much as possible, factors such as inter-indicator correlation were taken into consideration, too. The result of this process was a list of 20 survey-derived indicators which appear to have a high descriptive power for highlighting key differences between regions with regard to progress on the way towards the Knowledge Society. This list may have to be complemented by supply-side indicators, most of which are to be collected using other methods than interview surveys.
- Findings were summarised in a benchmarking report which contained, in particular, recommendations for other parties who will collect indicators for regional IS benchmarking in the future, based on the experience made in the project.

2.1.1 Data collection: The BISER Surveys

The Regional Population Survey (RPS) covered people's access and use of basic information and communication technology (ICT) equipment and the Internet, uses of ICT in the context of work, education and training, health, travelling, interaction with authorities and government, and usage for explicitly "regional" purposes, as well as demographic and other background variables. Sample size per region: 400 respondents.

The Regional Decision Maker Survey (RDMS) used a probability sample of the the establishment population (with 5 or more employees) and covered access to and use of ICT equipment and the Internet, uses of ICT in the context e-business including selling and purchasing online, ICT in the context of R&D, skills development and skills requirements and the use of e-government interaction with authorities and government business demographics and other background variables. Sample size per region: 300 decision makers.

Figure 2-1: NUTS2 regions covered by BISER



BISER Pilot Regions
(1) Väli-Suomi
(2) Smaaland med Oearna
(3) Fyns Amt
(4) Mecklenburg-Vorpommern
(5) Magdeburg
(6) Braunschweig
(7) Friesland
(8) Tees Valley and Durham
(9) Border, Midland and Western
(10) Greater Manchester
(11) Leicestershire, Rutland and Northamptonshire
(12) Berkshire, Buckinghamshire and Oxfordshire
(13) Nord-Pas-de-Calais
(14) Prov. Liège
(15) Darmstadt
(16) Stuttgart
(17) Bretagne
(18) Île de France
(19) Salzburg
(20) Lombardia
(21) Languedoc-Roussillon
(22) Toscana
(23) Castilla y León
(24) Cataluña
(25) Lazio
(26) Kentriki Makedonia
(27) Sicilia
(28) Lisboa e Vale do Tejo

In both cases interviews were conducted using CATI (computer assisted telephone interviewing) techniques. Source questionnaires were identical for all countries. Both were carried out at the NUTS2 level in 28 selected regions across 14 Member States of the EU (see Figure 2-1). These regions roughly cover the range of patterns of sectoral structure (share of employment in agriculture, manufacturing and services) and wealth (as GDP per head) to be found in the European Union.

2.1.2 The 20 BISER eIndicators

Key indicators were selected using quality criteria for benchmarking, namely political relevance and completeness, and validity which includes the feasibility of statistical concepts and methods to be applied in different cultural contexts. The 20 BISER key indicators are presented in the table below.

Table 2-1: 20 BISER Key Indicators for Benchmarking Regions

20 BISER Key Indicators for Benchmarking Regions
Population-side indicators
Broadband Internet availability and access (population)
Internet users (population)
Private e-government users
Share of employment in ICT-Occupations
ICT-based multi-locational work
E-learning for work-related training
Users of transport related information on the Internet
Online communication with doctor/clinic
Use of the Internet for regional purposes
Ratio of Internet use – lower and higher incomes
Internet affordability insufficiency
Establishment-side indicators
Broadband Internet availability and access (establishments)
Establishments with an internal computer network
Business e-government users
Establishments with a website
Establishments with at least 10% of sales conducted online
Participation in electronically integrated supply chains
IP-supported process and product innovation
Establishments providing ICT training for their staff
More than 25% of staff need Internet skills

In line with the basic focus of the BISER project which was on the demand side, most of BISER key indicators are demand-side measures. However, a comparison with the eEurope 2005 benchmarking indicators (CEC 2002a) points out a number of supply-side measures which appear to be of high value for regions. These are:

- cost of Internet access,
- number of basic public services fully available online,
- number of available basic public on-line services with integrated digital back offices processes,
- public procurement processes that are fully carried out online (electronically integrated) in % (by value) of overall public procurement,
- percentage of public administrations with broadband access,
- number of pupils per computer with Internet connection (broadband/non-broadband).

In general, most other eEurope indicators (as far as they are not identical or similar with BISER indicators) seem to be of limited value for the purpose of regional benchmarking for one of two reasons: firstly, because differences are more likely to occur at the Member State than at the regional level (maybe because national regulation as well as cultural issues play a key role); or secondly, because indicators correlate strongly among each other.

2.2 The UNDERSTAND project

Because of the lack of availability of official statistics on Information Society at the regional level, many regions have launched own initiatives of data collection. These have mostly been somehow related to the benchmarking carried out as part of the eEurope initiative, although the data produced is never fully comparable due to methodological differences and lack of coordination. This non-coordinated flowering of regional initiatives provides some useful data, but it also means a waste of resources since better comparability across regions would considerably increase the value of a given set of data for informing policy-making.

2.2.1 The experience in Emilia-Romagna

The Emilia-Romagna region addressed this issue when developing its own benchmarking project, mainly by ensuring that the methodology applied for data collection in the region was consistent with the main existing benchmarking exercise. In particular, the indicators and methodologies developed were consistent with eEurope (EU national data on e-government, national research networks, schools, public Internet access points), OECD (OECD national data on size of ICT sector, degree in ICT) and BISER (EU regional data on citizens and companies). The results of this benchmarking were about 50 indicators for benchmarking, which addressed many interesting issues and proved useful for "getting an idea" of the situation of the Information Society in Emilia-Romagna.

The data, taken with due care, were analysed according to several criteria:

- absolute value and comparison with European average;
- strategic relevance of the indicator for regional development; and
- whether the regional government can actually exert any influence on the measured phenomenon (which may not be the case because of limited legislative power or because of the respective scale).

This analysis highlighted several critical data which were pointed out to policy-makers:

- R&S expenditure, and IST projects;
- take-up of e-business in companies (the Internet still seems to be considered a media rather than a tool for improving processes);
- online public service availability, especially with regard to "job search" and health services;
- usage of e-government services by citizens and firms (some evidence that this was better than the EU average, but still rather low).

However, the most critical point was the need to obtain *better data*. Available data suffered from several problems:

- They were chosen not because they were the best indicators, but mainly because data were available at the European level. Some relevant indicators were therefore not included and the available picture is partial.
- Most of them compare the region with other EU or OECD countries.
- Data are not official statistics and their validity is sometimes questionable.
- When regional data are provided, they were from una tantum exercises (such as in the case of BISER), i.e. they will very likely not be repeated in the future.
- Data comparability is limited due to differences in the time of data collection, and also because of the possibility of differences in methodology – which are not necessarily being documented.

Although the European Commission has stressed the importance of the regional dimension in fostering progress towards reaching the Lisbon targets at many occasions, this does not mean that regional data will become available EU-wide from Eurostat and/or the National Statistical Institutes any time soon. The eEurope 2005 plan only vaguely mentions the need for regional data, and no provisions have been

made to implement data gathering mechanisms. The recent EU regulation on Information Statistics (CEC 2004a) indicates that no more than three sub-national units are requested from EU member states for regional breakdowns. This means that no regional data will be requested from any EU country that actually has regional governments.

Because of these limits, the only complete recommendation which came out of the benchmarking exercise was the need to produce comparable regional data, mainly by an effort of harmonisation of data collection by region. Regions will have to collect the data by themselves.

2.2.2 The need for a coordinated project

To start the inter-regional harmonisation work, following the invitation of Emilia-Romagna region, several regions met in Brussels in March 2003 to share available data. It emerged clearly that a large number of regions collect data, but these data were not comparable. Ex-post harmonisation was considered impossible, because methodologies are too different.

It was considered to be necessary therefore to launch a coordination effort among all interested regions to agree a common methodology for data collection. This effort should be large enough to produce network externalities so that many other regions are attracted to use the same methodology. This is a matter of creating consensus, rather than defining the best methodology. A pragmatic approach is a necessity.

2.2.3 The launch of UNDERSTAND

As a first action, 10 Regions signed a memorandum of understanding agreeing to coordinate their data collection activities, in order to share the data and define common indicators. Because of the political significance, the stage of development, and the critical mass of indicators and data collected, partner regions considered the European Commission's "benchmarking eEurope" as a starting point. The aim then was to reproduce it at the regional level, integrating it with regional data and possibly minor modifications to the indicators. Not all eEurope indicators are relevant at the regional level: for example, eEurope basic public services are delivered at the national level in most member states.

Emilia-Romagna launched therefore an evaluation exercise of eEurope indicators, where partner regions gave a priority mark to all eEurope indicators and indicated further suggestions.

The results were quite homogeneous, and indicated that relevant domains for regions were:

- e-business in companies,
- the usage of Internet by individuals,
- the degree of maturity of local e-government,
- the usage of Internet in schools, and
- the availability (supply) of broadband access service and infrastructure.

Internet usage by companies and individuals represent the regional environment for policy-making, and they are the most common domains of interest, addressed for example by OECD in developing model questionnaire and by SIBIS and BISER projects.

E-government is particularly important because it's the field were the public sector is directly involved not only to facilitate and encourage but also to deliver, which means it is strongly related to policy initiatives. The same stands for the schools indicators.

These four domains of indicators are included from eEurope, but the last one is an addition to the eEurope list. It reveals the growing awareness among regional governments that broadband access is fundamental for economic development. It reflects their growing concern that all parts of their territory are in equal conditions to take advantage of ICT, avoiding what is often called the geographical "digital divide" problem. The market failure in provision of broadband translates often in public investment on broadband infrastructure, which is increasingly taking place in many European regions.

The recent revision of Structural Funds guidelines on Information Society investment allows regions to use European funds to build telecommunication infrastructure, provided the investment is justified and that it respects several strict criteria, mostly relating to competition issues. It is quite striking then that eEurope, while including in the action plan the priority on "diffusion of availability and usage of broadband networks across the whole EU by 2005", does not include any indicator relating to this, but only on take-up. The reason for this is probably the market sensitivity of data on broadband availability, and the subsequent difficulty in data collection activities[4].

The domains of indicators selected as priority, reduced to 4 for operational reasons by dropping the "Internet in schools" domain, are the core domains addressed by the UNDERSTAND project, promoted by 10 partner regions and coordinated by Emilia-Romagna with the financial support of the European Programme INTERREG IIIC. Partners come from 7 European Countries: Emilia-Romagna and Piemonte (Italy), Hessen (Germany), Wielkopolska (Poland), Vasternorrland (Sweden), Yorkshire and the Humber and Wales (UK), Aquitaine (France), Baleares and Valencia (Spain). The project aims at filling the gap in regional data availability for the 10 regions, and creating consensus among many more so that other regions take up the methodology and produce comparable data. Furthermore, it wants to build on the data and assess how and why some regions perform better than others.

The project is composed of two similar cycles repeated over two years: the first cycle 2004/2005 includes: revision of existing indicators, definition of a first methodology, data collection, evaluation of results. The second cycle delivers the final methodology following the evaluation of results, and repeats the data collection and evaluation.

The early phase of the project is devoted to indicators selection for the four domains chosen: Internet usage by enterprise, by individuals, by government and the availability of broadband infrastructure.

The project is driven by the concrete needs of the regions, and takes a pragmatic approach by not developing a completely new, uniform methodology but rather adapting existing methodologies. Ideally, benchmarking would start from a theoretical idea of model Information Society, agreed by all partners, and general objectives would then be detailed in concrete indicators (such as in the BISER project). However, building a common theoretical model of Information Society between 10 regions seems to be a very time-consuming exercise of small importance, compared to the pressing need of basic data. Also, the discussion on the concrete indicators can be considered as a "social game" way to elicitate each regional perspective and later build a common theoretical model. For these reasons, the definition of a common theoretical model was not included in the project.

The process for defining the parameters of the indicators and the methodology needs to be highly structured to achieve the goal of a widely agreed methodology. Starting from existing methodologies, the input for the definition come from different actors: partner, experts, policy-makers in partner regions, and regional observatories in non-partner regions.

The definition of the methodology is therefore articulated in a first stage of complete review of existing projects, by extracting the list of indicators developed by each project.

Following that, the long lists of indicators is examined by each partner and discussed by regional policy-makers to reach a regional position on it, so that the indicators reflect not only the "technical" consideration of partner but also the "political" needs. The indicators are then evaluated in a joint open discussion by partners, and ranked by priority. The criteria for evaluating the indicators are:

- completeness,
- relevance (for regional decision makers),
- medium and long-term relevance (accounting for technological evolution),
- feasibility (data availability),
- cost.

[4] However, in 2004 the European Commission provided some interesting data on broadband competition, such as the market coverage of the incumbent for broadband access line.

The most highly ranked indicators are approved and an appropriate methodology is developed for data collection in each region.

In addition to the own partners' opinion and experience, experts from other projects provide insights to the discussion, based on their concrete experience.

Once the methodology is developed for each of the four domains, the project launches a validation activity aimed at non-partner regions. This includes a questionnaire-based evaluation of the chosen indicators, addressed at non-partner regions and mainly addressing the criterion of "Relevance for regional decision makers". The other criteria are addressed by a feedback process with experts from previous projects. With this validation process, and the results from data collection activities, the first cycle of the project ends and partners are able to develop the final methodologies, to be applied in the second year.

The project includes a data collection activity and a further activity, which aims at building on the data collected to understand how and why some regions perform better than other. This involved in depth face to face discussion involving key player from every region to comment and discuss the data, in order to enable mutual learning from participating regions. At the moment of writing, the project has developed the first version of the methodology.

2.2.4 Progress to date

Around 25 projects were selected on the basis of their maturity, critical mass of data, trans-national character, and degree of institutionality. The review of these projects drove to defining four long-lists of indicators, one for each domain, comprising a total of about 400 indicators. To facilitate the subsequent discussion, indicators were grouped into categories. This is a very important phase because each region has its own logical framework and taxonomy of what Information Society is. The creation of a common taxonomy as well as of a common logical framework was considered outside the scope of the project but partners used operational categories, such as the traditional OECD categories of readiness, usage and impact.

3 INDICATOR DEFINITION AND DATA COLLECTION FOR BENCHMARKING: THE PRACTICAL CHALLENGES

In the following we will discuss some of the main challenges with respect to to regional Information Society benchmarking. Concrete examples for problems faced and possible solutions will be outlined.

3.1 Some general challenges for indicator development

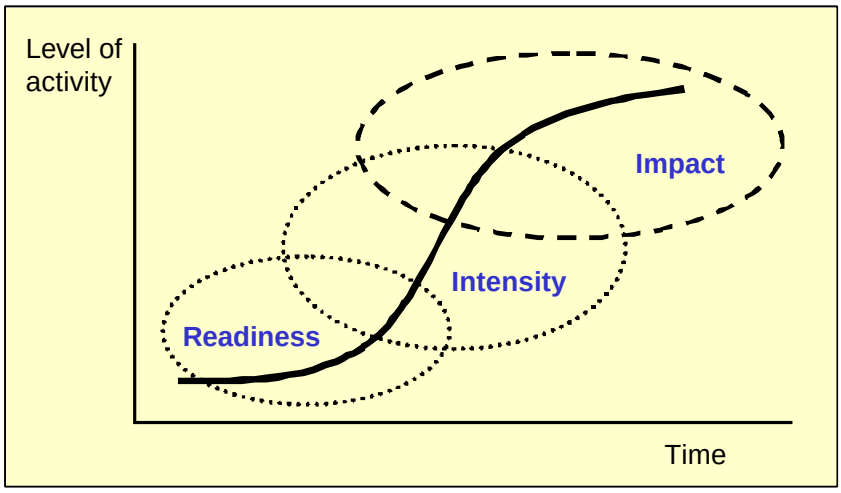
Supply adequate statistics about Information Society related topics poses special challenges to data collectors. The reasons for this are manifold and include the following:

- Because society and the techno-economic system are constantly evolving, there is always a challenge in successfully benchmarking a state of society (such as the Information Society). Indicators once chosen might become irrelevant or misleading, because the relationship between the phenomenon (which is measured by the indicator) and the more general social construct which the indicators is used to describe might change rapidly.
- This danger applies, of course, especially to the current wave of societal change because of the speed of technological progress which seems to have rapidly increased in the last decades. Although there is no established measure, the speed of technological change can be estimated by looking at innovation intensity (e.g. industry-level R&D activities, see Koski & Sierimo 2003), numbers of patent applications (see OECD 2003a) or similar proxies. In eBusiness, in particular, technological change has become a matter of weeks and months rather than years and decades.

This means that together with applications and uses of technology, indicators themselves are becoming outdated faster than ever before.

- While this seems to call for indicators which are generic enough to be applicable across different consecutive technological platforms and paradigms (e.g. focussing on voice communication in general rather than on the use of mobile phones, terrestrial phones, voice-over-Internet etc.), policy-makers demand statistics on the "hot" issues of the day, i.e. which are on the top of their agenda at the current moment; they are much less interested in exploring middle- and long-term social change.[5]
- More fundamentally, the Information Society is not necessarily beneficial by itself (arguably in contrast to other concepts such as the welfare society). Rather, the main visible signs of the Information Society are *tools* such as the computer, software applications, the Internet and so on. The amount of information itself is also something that can be roughly measured, but does not imply a good or bad state of the society in general. This means that there have to be decisions based on normative statements before a benchmarking takes place. Usually, such decisions are taken by policy (e.g. at the European Union level). This is challenging for long-term development of statistics because aims of policy-making are notoriously volatile and subject to abrupt shifts.

Figure 3-1: Market maturity determines research interest and needs: OECD Working Party on Indicators of the Information Society Model for eCommerce indicators



Source: Simpson 1999

With regard to the last point, it has been argued that most statistics available until now mainly focus on the conditions and take-up of ICTs, while a more holistic assessment of the Information Society requires a shift of attention towards the ways (and the ends to which) ICTs are used, and societal outcomes. Figure 3-1 which stems from Simpson (1999) puts these requirements into context. It shows that the focus of statistical analysis should shift according to the stage of diffusion of a certain techno-social innovation. Hence, innovations which are quite new and not wide diffused yet (e.g. e-government applications today) should be analysed by focussing on whether the preconditions for a further diffusion are sufficiently developed (using readiness indicators), whereas innovations that have reached higher rates of penetration (e.g. the Internet) would better be analysed by looking into intensity (how much, in which ways, for what purposes is the innovation applied) and impacts (e.g. economic outcomes such as changes in productivity; or social outcomes such as changes in the accessibility of services to different segments of the population).

[5] An example here are statistics on the supply and demand for ICT skills. When this topic was at the very centre of the public debate (during the so-called "Internet bubble" at the end of the 1990s), EU data was everything but non-existent. Now, as the statistics are slowly becoming available, the economic slowdown has removed the political relevance of the topic, and interest in statistics is much smaller.

Against this background we argue that two different, but interrelated and complimentary layers of Information Society statistics are required:

- firstly a basic layer of long-term statistics on key social indicators as well as key factors determining competitiveness of the economy, both with relation to the shift to the Information Society and Knowledge Economy as they are being discussed today. For these indicators time series data must be available, and concepts used must be based on consensus among all major stakeholder groups involved, as well as in-depth research proving the quality of the indicators (see below) and the underlying data collection systems; and
- a second layer consisting of indicators which cover phenomena of more short-term interest. Time-series data is of less relevance here, but quick on-demand production of statistics for informing policy-making. However, second-layer indicators should – wherever possible – use the same concepts as first layer statistics. This means they act as enrichment of basic indicators rather than as replacements/substitutes.

An Information Society indicator system with these features would provide the biggest value in the medium to long term, prevent the waste of resources caused by duplication of data and production of one-off data which are not being used for time series production, and combine the flexibility much asked for by decision-makers with stability of basic concepts over a longer duration of time.

Needless to say, we are at the current moment still very far away from such a situation. Only a number of very basic concepts and survey components have been developed as yet in a process of supra-national co-operation involving the OECD, the Voorburg Group of Service Statistics, and the European Statistical System made up of Eurostat and the NSIs (Voorburg Group 2002). Until the present day, the data which are available as a result of these activities is patchy (see e.g. Ottens 2003), which means that policy-making has to rely on data from sources which are of a more ad-hoc nature and do not make use of concepts and modules which have been agreed upon by the major stakeholder groups. Of course, the situation concerning data availability is much worse at the regional level than at the national level.

Apart from these general considerations, identifying adequate indicators also requires much elaboration and debate to ensure that the statistical measure selected actually reflects the objectives of policy-making and/or analysis. Unfortunately, all too often indicators are used which do not fulfil this essential requirement – especially in fast-moving areas such ICT-related developments, as is briefly outlined in the next section.

3.2 Identifying the right indicators

While practical circumstances often mean that analysts simply use the statistics that happen to be available, every thorough benchmarking exercise needs to spend considerable effort on identifying the best possible indicators for the purpose on hand. This can be demonstrated using two examples.

With respect to e-government, the methodology which is politically most influential was developed by Cap Gemini Ernst & Young on behalf of the European Commission (e.g. CGEY 2003). It measures the online availability of 20 basic public services using a scale from 0 (no information at all) to 4 (full transaction and payment). The advantages of this method are that, because it relies on website screening, it is objective while not causing any effort for the measured entity, since the latter does not have to respond to a questionnaire or similar. As a consequence, the method is also quite cheap.

However, the methodology has a major drawback if it is chosen as the sole measure of progress in e-government supply: the indicator only measures a very small part of e-government, and arguably not the most important for modernising public administration. It excludes fundamental issues such as back-office re-engineering, take-up of public services by the target audience, and multi-channel delivery of services (SMS, telephone, e-mail and other). In fact, an exploration carried out by Emilia-Romagna showed that at the local level there is *only a weak correlation* between online availability of services and back-office integration. There are many municipalities who simply launch a tax payment service, totally implemented by an external supplier, and claim to be implementing e-government, without any further improvement of the process of tax claim processing. This means that the CGEY

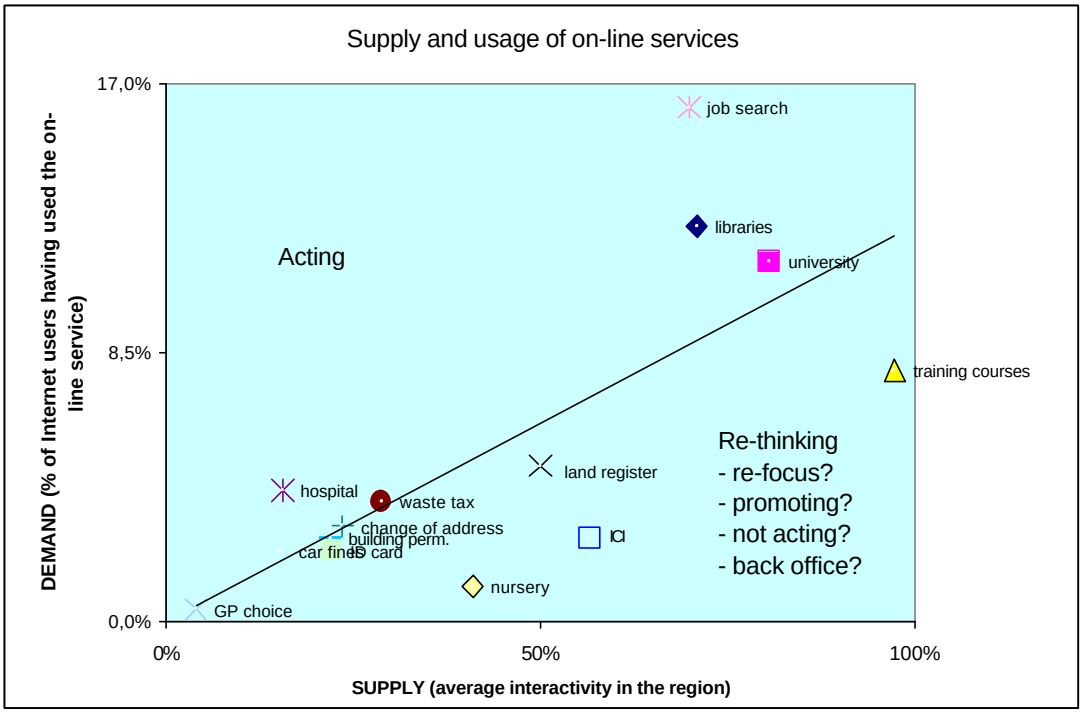
methodology tends to over-value superficial and lightweight innovations, while neglecting more innovative usage of ICT for process re-engineering.

With respect to e-business, some recent evidence suggests that indicators are of limited value for benchmarking if statistics used are averages across all economic sectors and size classes. Analysis of existing datasets has shown that the sectoral composition of the economy and the size structure of companies deeply affect average figures. This can lead to the point where the statistics only reflect underlying structural factors rather than giving any insight into differences in ICT take-up and usage. For example, regions dominated by employment and/or output in manufacturing must be expected to have very different ICT-related performance than regions relying mainly on tourism. For the purpose of benchmarking, the appropriate indicator is therefore the ICT adoption of firms from the same sector.

While BISER concentrated on demand-side indicators, UNDERSTAND found that from the point of view of policy-makers in the regions supply-side indicators are of special relevance, too, because of the continuous need for information that can inform investment decisions. Also, supply-side indicators are more directly related to public investment. If we consider benchmarking a decision support tool, which also aims at evaluating policies' impact, indicators such as broadband infrastructure endowment, number of PIAPs, number of interactive public services, PCs per student are strongly relevant to policy-makers because their decisions can directly influence such indicators.

Ideally, demand and supply indicators should both be monitored in time, and jointly analysed and compared in order to assess which ICT solutions are meeting the needs and preferences of users. For example, Emilia-Romagna has compared actual supply and usage of e-government services (see Figure 3-2).

Figure 3-2: Supply and usage of eGovernment services in Emilia-Romagna



The chart highlights which of the on-line services provided are meeting the demand of larger numbers of citizens. Based on these data it can be argued that services on the upper left part should be receiving higher investment to be put on-line, where services on the bottom right part should rather pursue other paths.

3.3 Collecting valid and comparable data with optimal use of available resources

As benchmarking causes substantial costs to data collectors as well as respondents, we have to bok for sustainable ways of benchmarking. That means using available data as far as possible without collecting the data on purpose. Against this background it must seem ironic that we have problems finding the funds to collect data on ICT related developments, while applications of ICTs themselves are continuously producing huge amounts of data. For example, every on-line service and every website produces data on its usage. This means that public administrations seeking for data on e-adoption should first look at what data they already produce, and how this can be harnessed. For example, data on the usage of the national service of tax form submission, broken down by region, could be a very good indicator of e-government usage. Another example of usage of public data is the CORDIS database on European research projects. The database has been recently mapped and it is possible to obtain data about regional participation in the European research projects on ICTs. Because the research programme of the EC provides large investment in ICT research, this is a good indicator of the innovation in the regions. Moreover, data on websites usage could be very valuable if they were harmonised – which they are not at the moment.

Ideally, only if data cannot be collected at the point of transaction should surveys be carried out. Surveys not only cause considerable (opportunity) costs for the respondents (especially in the case of business surveys); results are also potentially distorted by the opinions of the respondents, and by shortcomings in instrument design.

Business surveys at the regional level are patricularly affected by shortcomings with respect to the availability of list sources (address lists) which are needed as sampling frames. This concerns, in particular, small and micro enterprises with less than 10 employees, where available address lists are of notoriously bad quality (mostly because they contain only selected branches and do not properly reflect the structure of the universe). Also, there is also hardly any robust data about the size and structure of the universe in different countries, and especially regions. This is partly due to differences in legislation with regard to the self-employed without staff which in some Member States have the status of companies (e.g. Sweden), while in others they are not included in business registers. More dedicated research on sampling frames is urgently needed in this area, because there is increasing awareness of the fact that micro enterprises are of key importance for many "young" industry sectors and can be a key determinant of the level of innovative activity and entrepreneurism to be found in a region (CEC 2002b).

A special challenge is the size of sampling frames. Because of the large number of micro-firms as a share of all establishments (usually between 70% and 90% of all establishments in a Member State have less than 10 employees), most studies use weighting by employment, which means that the probability of an establishment to be drawn for the sample is equivalent to its share of total employment in the region. This means that the sample is disproportional to the effect that larger establishments have a higher probability to be included than small ones. It requires sampling frames that include a big enough number of large establishments.

This poses a problem because during a survey it is normal that only a minor share of addresses which have been drawn from the sampling frame actually end up in the final dataset. Reasons include incorrect entries in the list source, extinguished addresses, refusals and incomplete relies, etc. Survey organisations usually calculate that they need five to ten times as many addresses compared to the target sample size. From the knowledge of list sources which were used for the BISER establishment survey, it must be assumed that for many NUTS3 regions, list sources of the required size are not available. This means that it will not be possible to interview as many larger establishments as intended.

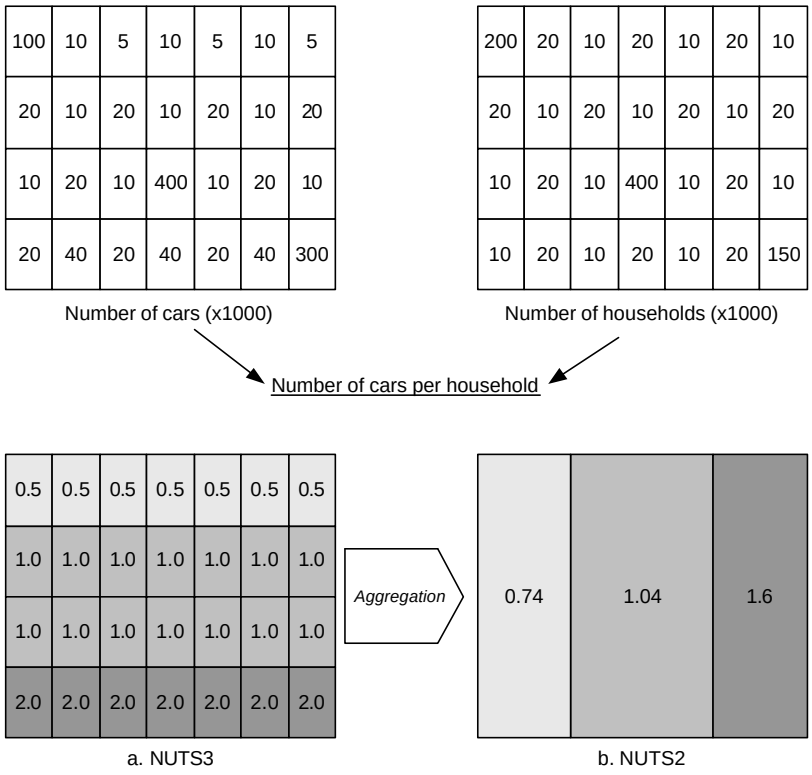
Additionally, one general shortcoming of many sampling frames is that they tend to cover mainly (headquarters of) enterprises rather than establishments. However, for region-level indicators in particular only a survey of establishments can suffice if an adequate representation of the business structure is required, since branch plants and local offices etc. can make up a major part of a regional economy.

3.4 Choosing the appropriate geographical reference unit

For the purpose of collecting data at the regional level, a question of vital importance concerns the regional breakdown being used, that means which regions will be the reporting units. Eurostat collects data using the "Nomenclature of Territorial Units for Statistics" (NUTS) which has been used since 1988 in Community legislation, especially for the framing of Community regional policies (CEC 2003a, 2003b). Because about one third[6] of the Community budget is spent on regional policy (in the form of transfers by the Structural Funds and the Cohesion Fund), the NUTS classification is a highly political issue: any amendments to NUTS (which because it is based on national administrative structures, takes place automatically as soon as a Member State changes borders of its administrative regions) can lead directly to changes in the amount of funds being transferred by the European Union. Under these circumstances, the statistical comparability of data collected using this nomenclature has taken a back seat.

Why NUTS3 Rather than NUTS2? The effect of aggregation on the representation of territorial structures in statistics

Most indicators of the type discussed in this report are not directly related to a territory but to individual units (e.g. establishments, general population), each of which have a certain definite location in space (business and residential address, respectively). This means that for comparative studies that look into larger territorial units, data which is ultimately measured at points in space must be aggregated. Since territory is never totally homogenous, different ways of aggregating points into territorial units lead to different average values for indicators (cp. Quick 1994). *Aggregation always leads to a levelling out of differences*. This effect is the stronger a) the more heterogenous the territorial unit is and b) the higher the degree of aggregation is.



The figure above demonstrates how aggregation can produce a picture of reality which is in sharp contrast to what is found at the disaggregated level. In this (fictional) example which has been adapted from Monmonier (1991) as quoted in Quick (1994: 21), the number of cars and the number of households in each of 28 NUTS3 regions are combined to an indicator "cars per household". At the NUTS3 level, we can observe a south-north divide, with households in the

6 €213 billion in the period 2000-2006

southern regions owning on average 2 cars each, while at the northern margin the value is only 0.5. Were these units aggregated into NUTS2 units as shown in the figure, we can observe what seems like a contrasting result – an east-west divide.

Problems of this kind are most likely to occur when there are differences in the way urban and rural areas are aggregated into larger territorial units.

As Quick (1994) points out, while the use of diverging concepts (e.g. of unemployment) for national comparisons is usually acknowledged and treated as a problem, this is not the case for the use of different territorial units (see e.g. the Cohesion Reports published by the European Commission). However, as can easily be shown, aggregation of data into territorial units can considerably distort findings (see box above).

Comparability problems result from the fact that NUTS is composed of a mixture of existing administrative units in the Member States and so-called non-administrative regions (i.e. regions which only exist for statistical or similar purposes). This means that NUTS data is not always of much use for the regions. Regional policy-makers need data at the regional level at which decisions are taken. In the concrete example of Information Society statistics, data should be available at the level where investment decisions on ICTs are taken. This means to start not from NUTS definition, but rather from administrative entity. Overall, in Europe, regional governments are investing hugely on ICT, so from their viewpoint, a system based purely on NUTS is not useful.

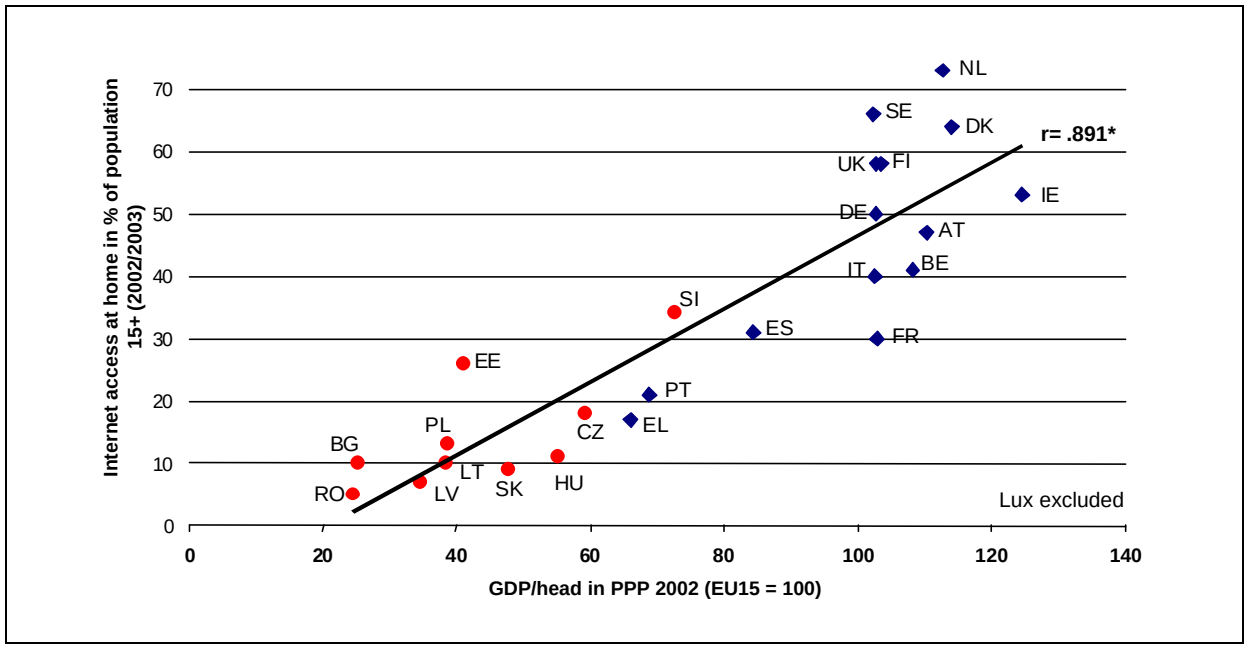
A possible solution would be to choose an administrative, politically relevant level low enough in the hierarchy to allow also for the aggregation of NUTS data at a higher level – for example NUTS2. A detailed suggestion for this has been developed by the BISER project (see BISER 2004).

3.5 Contextualising ICT indicators with traditional indicators on regional competitiveness and social progress

Comparing regions is not an end in itself. It is meant to support policy-making by highlighting how similar settings and challenges have been dealt with in different ways by different regions, thereby leading to differences in performance on the basis of which conclusions about successful policy measures can be made. It is well-known that regional "scores" for Internet take-up, for example, are deeply affected by contextual factors such as age structure, level and distribution of wealth, educational attainment and the degree of urbanisation. Similarly, regional indicator values for e-business take-up is determined to a large extent by the sectoral and size class structure of the economy. Comparing regions which are structurally very different by means of uni-dimensional indicators therefore is of very little value for supporting policy-making. Not only that, it can also lead to an effect observed by Clayton (2002): "overall ranking of countries [or regions] was not a helpful presentation format for best practice exchange, because it tends to induce defensive reactions" rather than initiating a learning process.

For these reasons, for benchmarking to provide added value it is necessary to contextualise indicator data with data on traditional variables of regional development. This can be done by using bi-variate presentation formats such as shown in Figure 3-3. Another possibility is to compare not overall regions but focus on specific segments of the population: for example small companies, the hotel sector, the unemployed, managers, etc.

Figure 3-3: Internet access according to national income (GDP/head) in Europe

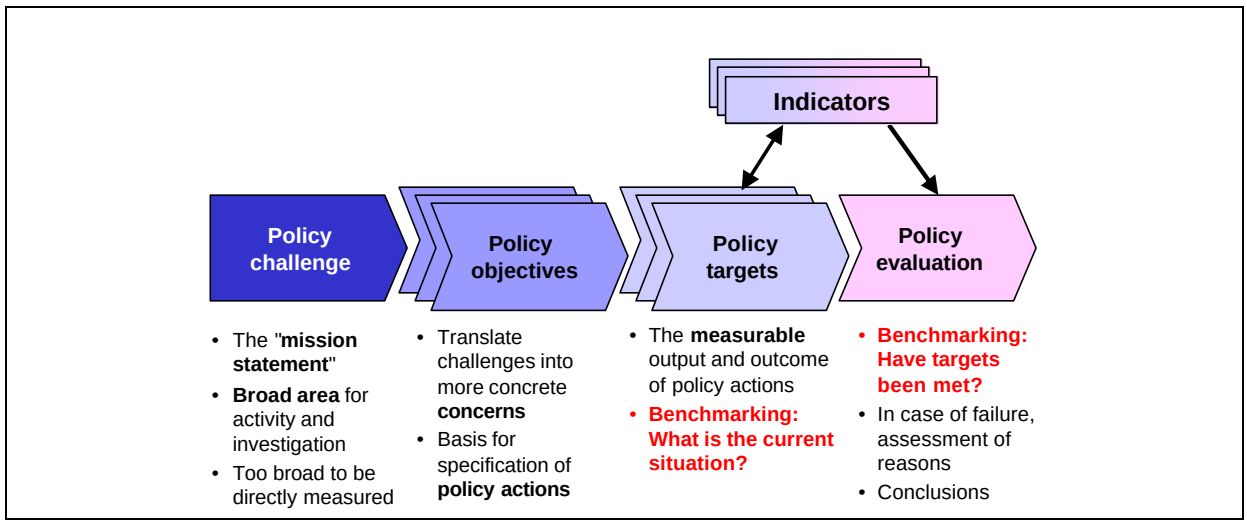


Data source: SIBIS 2002/2003

3.6 Making an impact: How to use benchmarking for informing regional policy making

Benchmarking has recently achieved a major importance as a tool for policy-making, in particular at the EU level and in the context of the Lisbon process. Still, some additional considerations seem to be necessary concerning the link between benchmarking and policy-making. Benchmarking can have a very different meaning according to the institutional and political set-up where it is applied.

Figure 3-4: Benchmarking as a policy tool: The top-down approach



Source: BISER 2004

When used in relation to target-related policies, such as the Lisbon strategy or national action plans (e.g. the UK's target to become the leading eBusiness country in the world), benchmarking can be used to measure the success of the policies. Where there are no quantitative targets defined by the policy-maker, the role of benchmarking is much more fluid.

Furthermore, it makes a huge difference if benchmarking is coordinated from the top or from the bottom. The eEurope action plan is coordinated by the European level to measure and stimulate the development of supportive policies in the Member States. So here, benchmarking acts *within* the political scope of eEurope and to measure (and stimulate) eEurope policy objectives. However, benchmarking eEurope does not say anything about the relevance of the objectives of the eEurope action plan, but rather accepts them as given. At the end, such benchmarking is not a tool to evaluate the policy design but to check whether objectives have been achieved. In this framework, the model of Selhofer (2003) later developed by BISER (2004; see Figure 3-4) applies. Benchmarking acts after policy vision and challenges have been agreed on, and it defines indicators relevant to these policies.

It is different if you consider regional benchmarking as a bottom-up approach, where regions get together to agree on common indicators between themselves. UNDERSTAND partner regions have no common policy framework, so benchmarking domains are not the operationalisation of specific policy objectives. The choice of indicators are a result of a compromise among different regions without any superior coordination. Also, EU regions have different powers in different domains: some regions can act on the education or health system while others cannot (because policy is formulated at a higher hierarchical level, typically the national government level). That means, for example, that measuring the availability of PCs in schools or the usage of e-health services by citizens can be very meaningful for informing policy-making in one region while it is less so in another. Moreover, the same indicator can measure very different things in different regions: policy output, result, impact or being a simple framework indicator. The length of fibre optics network is an output policy indicator for Emilia-Romagna, which has a projects to put down new fibre, but a context indicator for another region.

It is therefore necessary to accurately analyse every indicator. The OECD model (readiness/usage/impact, see Figure 3-1) tells us something about the relation between the individual/organisation and ICT. This model is somewhat similar to the evaluation model of the European Structural Funds, which is based on indicators categorized as output-result-impact. These categories address the relation between the public money spent and the effects they have. Largely quoting from "The Guide for evaluation of European Structural Funds", we can say that output indicators represent the product of the programme activity […], everything that is obtained in exchange of public expenditure. […] Example of output indicators include kilometres of road built, number of trainees, […]. Result indicator represent the immediate advantages of the programme for the beneficiaries (e.g. time saved by users of the road, qualifications earned by trainees). Impact indicators represent the consequences of the programme beyond its direct and immediate interaction with beneficiaries (e.g. traffic on the road one year after it is opened, the placement rate of trainees after twelve months). An additional type of indicator is "context", that is an indicator which is not directly related to the policy but provides a background view of the state of the region.

Table 3-1: The different meaning of indicators in different policy context

		>>> Less direct relation of observed phenomena with policy >>>			
	Indicator / Policy	Output indicator	Result indicator	Impact indicator	Context indicator
Less direct relation of policy with broadband supply	The region finances the cabling of the territory	**Growth of fibre street coverage in km**	% of territory reached by DSL	Take-up of broadband among private companies	Enhanced competitiveness of enterprises
	The region pursue an active marketing policy to encourage investment by telecom providers	Number of telecom companies reached	**Growth of fibre street coverage in km**	% of territory reached by DSL	Take-up of broadband among private companies
	The region encourages broadband take-up by subsidising demand	Number of subsidies conceded	Take-up of broadband among private companies	**Growth of fibre street coverage in km**	% of territory reached by DSL
	The region has no specific policy on broadband	//	//	//	**Growth of fibre street coverage in km**

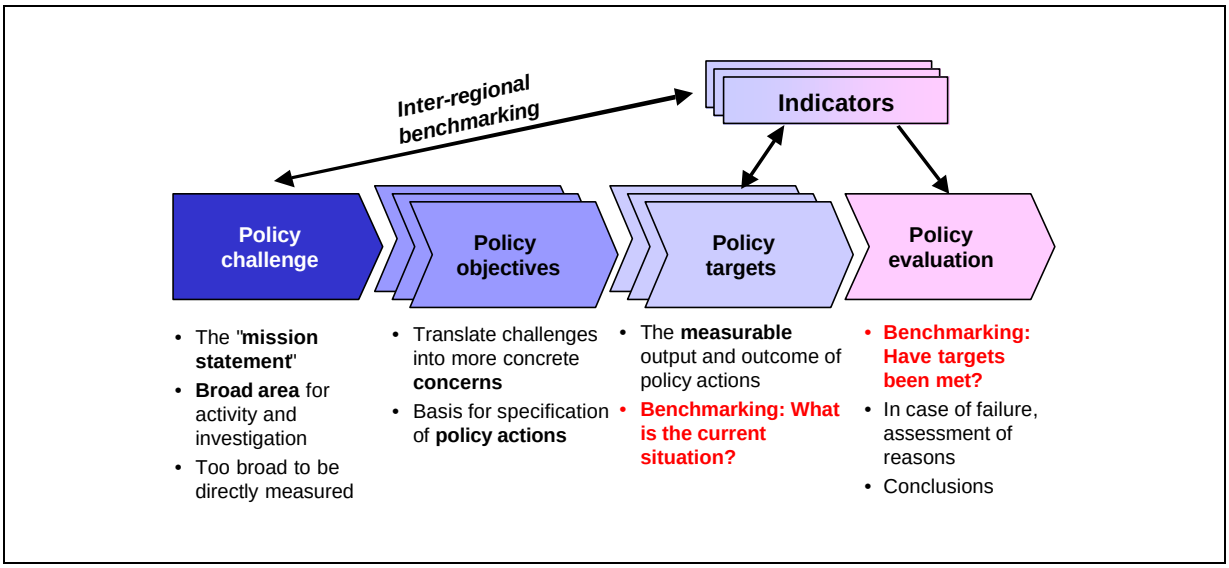
The same ICT indicator can therefore mean very different things in different regions. If we consider the indicator "fibre optic kilometres", it can have different meaning depending on the policy context

where it is located. Table 3-1 outlines the different meaning indicators can have in different policy contexts.

For every single region, indicators should be analysed according to these criteria. Clearly, a low score on an output indicator shows a failure of the specific policy. Conversely, a low score on a context indicator would mean that the region has to address a new issue that it has not considered as crucial before. So the very meaning of the same indicator is different for every region, and should be analysed *only* in relation in the framework of the regional policies in place. If not carefully treated, there is a strong risk that indicators, instead of supporting policy-making, take the front stage to drive policy-making.

This brings us back to consider the role of indicators in the policy-making process. While in Figure 3-4 indicators enter the stage only after policy targets have been set, in the UNDERSTAND case (as in any inter-regional cooperation which follows the bottom-up approach) it can act in the earlier stages of the process already. In particular, it can and should influence the identification of policy challenges (see Figure 3-5).

Figure 3-5: Benchmarking as a policy tool: The bottom-up approach



This means that the role of benchmarking at the regional level is not simply to measure the extent to which policy objectives have been achieved (policy evaluation), but it can also have a direct impact on the policy design (prescription). Ultimately and paradoxically, it could lead partner regions to have not only common indicators, but similar policies (although adapted to local contexts)! For example, if a region with no policy priority on broadband finds out that it has much less fibre optics coverage than other EU regions, it may want to introduce a new political priority.

The very same visibility that statistics have makes them disturbing and easy to attack. Politicians do not appreciate when a visible tool such as benchmarking tells them what political priorities they should concentrate on – unless, of course, they are the same they have already decided to act upon. If we do not elaborate on the role of benchmarking in the policy-making cycle, there is the risk that benchmarking will be used only as a fig leaf by politicians who seek to justify their decisions.

4 CONCLUSIONS

The central role which regions have to play in making the benefits of the Information Society come true for all Europeans has been acknowledged by policy-makers across the field. However, we have argued in this paper that this is not reflected in the availability of statistical data on Information

Society related developments at the regional level. Such data is of key importance to informing policy-making. It can, in particular, support a process of benchmarking and "benchlearning" by which regions learn from the experience of other regions and apply the lessons to their own specific situation and context. It cannot be expected that high-quality statistical data on ICT related issues will become available from central sources such as Eurostat, at least not in a format which is useful for the regions themselves. This means that the regions themselves may have to become active.

While this causes considerable challenges to regions, for example with regard to funding, it also means that regions have the possibility to direct the benchmarking process in a direction which suits their specific needs – largely independent from central policy-making frameworks such as the eEurope initiative.

This paper has discussed a number of issues which have to be taken into consideration when attempting benchmarking at the regional level. These stretch from the fundamental question of the role of benchmarking in the policy process, over how to identify the most adequate indicators, to practical problems in collecting the data and sustaining benchmarking activities over a longer period of time. A number of regions have begun to address these issues in a coordinated effort. Much progress still needs to be done before regional Information Society data will become available across the whole territory of the enlarged European Union. The pure size of the EU budget alone which is spent on ICT related investments in the regions should make it clear that every effort needs to undertaken to speed up this process.

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