SIXTH FRAMEWORK PROGRAMME

PRIORITY 8.1.B.3.5

Information Society Technologies

TRANSFORM

022780

Benchmarking and Fostering
Transformative Use of ICT in EU Regions

WP2: Indicators on Transformative Use of ICT

– D2.3 Regional Information Society Benchmarking System Report –

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Abstract:

The document presents the elements of a suggested region-level information society benchmarking system. It takes as starting point the indicators which are currently being used within EU policy-making for benchmarking purposes (i2010, Riga), discusses their relevance for capturing transformational uses of ICT (as previously conceptualised in TRANSFORM) and for application at the regional level.

Keyword List:

Information society, knowledge economy, transformative change, statistical indicators, measurement, regional development, regional disparities, innovation, social capital, networks.

***Type: PU-public, RE-restricted, CO-limited to Commission Services,**

****Nature: R-Report, P-Prototype, D-Demonstrator, O-Other**

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1 Objectives and Structure of the Report

1.1 Introduction

As outlined in the TRANSFORM Description of Work, a main goal behind the project is to "contribute to the refinement of our understanding and measurement of the regional aspects of the (regional) digital divide in Europe through:

- devising a benchmarking system, consisting of a set of indicators and tools/methodologies for data collection, to map the transformative uses of new technologies, within the realms of individuals, firms and public institutions;
- pilot testing indicators and tools in a carefully selected sample of EU regions, with a view towards obtaining a benchmarking system that not only fully reflects the state of the art in research on interrelations between the IS/KS and regional development, but that also lays the groundwork for a self-sustaining network of integrated IS/KS observatories at the regional level."

Against this background, TRANSFORM sought to develop a system of indicators which, as well as featuring a core set of established technology indicators, contains adequate measures of the extent to which ICT is used for transformative purposes.

Piloting of selected indicators, together with the assessment of secondary data sources and of the extent to which these can be exploited for the issues at hand, enable us to outline, in the present document, the basic features of a European Regional Benchmarking System on issues related to the information society and knowledge-based economy, with a special emphasis on the transformative use of ICTs. This system consists of:

- A **set of indicators** which are laboratory tested and piloted under real-world conditions, the relevance of which has been validated by domain experts from academia as well as by representatives of the regions themselves. Note that TRANSFORM does not intend to design a set of indicators in the sense that these are comprehensive for a region that needs statistics as a basis for informed decisions; rather, the study seeks to contribute a core set of statistical measures around which regional policy-makers can build there own observatory systems.
- **Methodological guidelines** for collecting indicator data across regions which ensure that resulting statistics are comparable. This refers to indicator operationalisations, sampling frames, sampling procedures, basic questionnaire designs etc. Highest priority is given to issues of cost-efficiency.

Indicator development was based on the conceptual research undertaken in WP1 and WP2. Rather than starting from scratch, however, we aimed to optimise the added value of our work by building, as much as appropriate, on the current state of the art in ICT-related indicators. This refers to statistical measures developed or applied for research purposes, as well as to indicators agreed upon and used for political benchmarking, e.g. within the context of the European Commission's **i2010** and **eInclusion** policy processes.

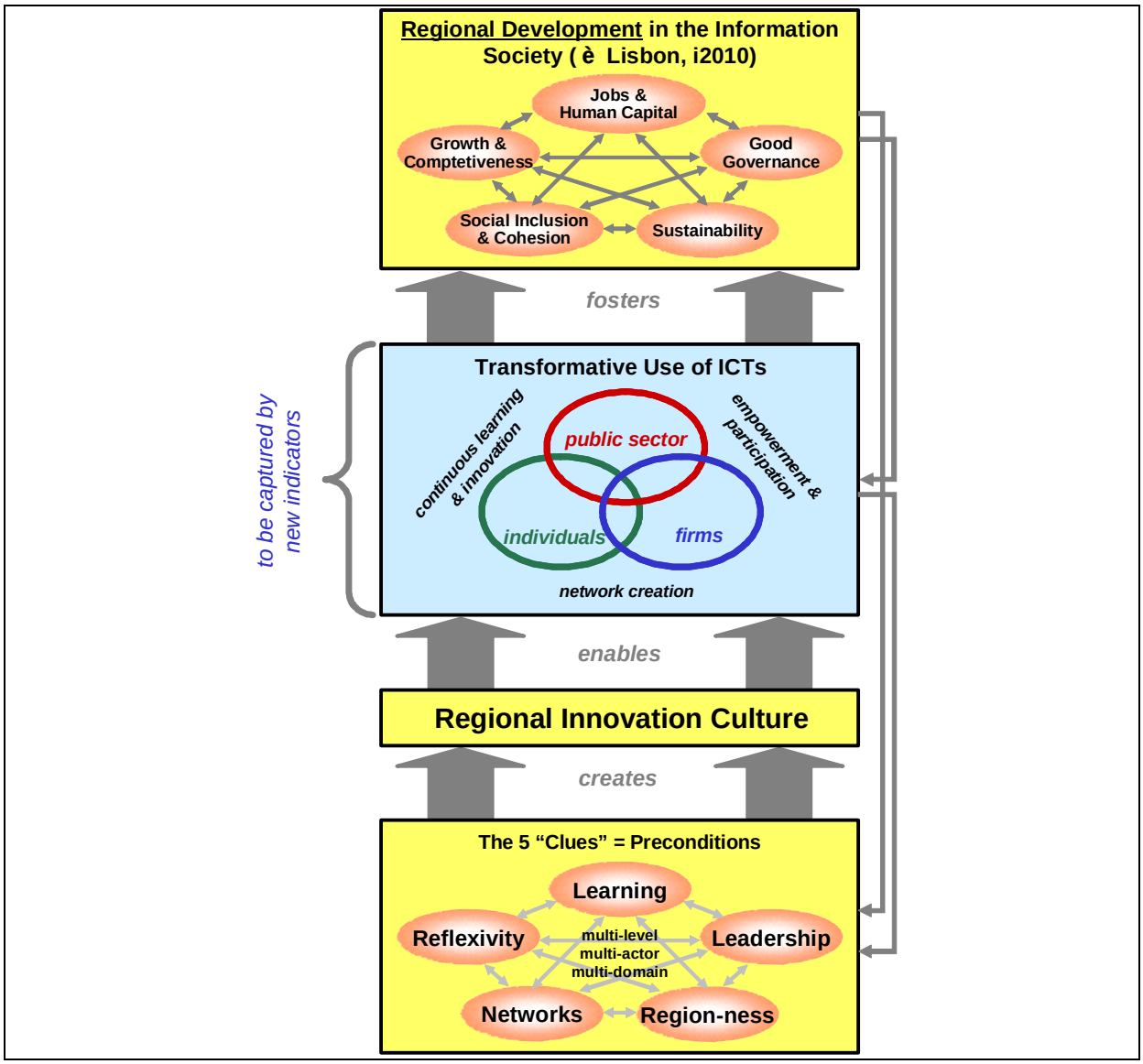
1.2 Relation to Overall Project

The overall conceptual approach chosen for the study is depicted in Figure 1. Transformative use of ICTs is understood as fostering regional development in the knowledge-based economy and society, the goals of which have been set in the major related EU policy processes, namely the revised Lisbon agenda and the i2010 strategic framework.

This means that the main goals of regional development are considered to be: economic growth and competitiveness, employment and human capital formation, social inclusion & cohesion, good governance, and environmental sustainability. With regard to ICT, the i2010 strategic framework defines four core application domains: e-business, e-government, e-learning and e-health. These will be the main focus of TRANSFORM.

Whereas the case study research undertaken as part of WP1 also explores to which extend these policy goals have been taken up within regional policy-making, indicator research is based on the simplifying assumption that these goals apply to all EU regions.

Figure 1: TRANSFORM Schematic Framework



Source: The authors

One of the first work tasks in the project was to explore what the research and practitioner literature has to say about the key factors which explain the different degrees of regions' success in the knowledge-based economy and society. This analysis focussed, in particular, on the role of soft factors such as (regional innovation) culture in enabling individuals, firms and public administrations to bring about transformative change in a region. The review identified five key "clues" which appear to be of major importance for exploring and understanding why some regions, but not others, are able to use ICTs so much more effectively to achieve their goals:

(1) Networks – and in particular, networks that bridge social worlds – play a key role. This relates to the notion of social capital which has been attracted much interest in policy circles in recent years.

(2) Reflection and reflexivity are important, as are shared representations (such as "visions") as the means by which reflexivity can be brought about.

(3) Regional innovation requires learning, not only as a lifelong activity of citizens, but also as collective, social process.

(4) The notion of leadership is another, albeit less openly acknowledged, key factor for differentiating between regional innovation cultures.

(5) The literature offers plentiful of evidence for the importance of regional openness to the outside world. Such openness, though, needs to be rooted in a sense of closure, as reflected in the notion of regional identity.

These five "clues" are seen as determining the kind of regional innovation culture a region is endowed with. One can further hypothesise – based on the state-of-the-art in research about the topic[1] – that the extent to which a region has an effective innovation culture is decisive for the ability of individuals, firms and regional government to make best use of ICT – that is, to make transformative use of ICT.

In a previous deliverable (D2.1 "**Indicator Stocktaking Report**") TRANSFORM had presented:

- A discussion of the purpose of indicators in general, and their role within the context of frameworks for benchmarking countries and regions across the European Union;
- Quality criteria for the development and analysis of indicators, and recommendations for the interpretation of survey-derived indicator data;
- An outline of the process of indicator development for policy guidance;
- A discussion of the function and effect of regional reference units in general, and Eurostat's "Nomenclature of Territorial Units for Statistics" (NUTS) in particular;
- A listing of the NUTS units in all EU27 Member States (plus Turkey and Croatia), including information about which NUTS regional units in which countries are low or no administrative significance for the country in question;
- A conceptualisation of "transformative uses of ICT", and a discussion of ways how the related constructs may be measured (operationalisation);
- A stock-taking of existing indicators which to some extent address transformative uses of ICT.

This formed the background against which the project set out to explore and develop statistical indicators for better capturing transformative uses of ICT.

Deliverable 2.2 ("**TRANSFORM Benchmarking Indicators**") then comprised:

- A discussion of the overall role of statistical indicators within the conceptual framework of the TRANSFORM project;
- A review of the case to be made for regional (as opposed to Member State level) indicators on issues related to the knowledge-based economy and society;
- A discussion of existing frameworks for IS-related indicator collection, in particular the i2010 Benchmarking Indicators, which naturally act as the reference point for any initiative to establish new indicators at EU level in the area;
- A draft set of indicators, the so-called TRANSFORM benchmarking indicators, which were chosen to complement existing data collection systems in order to allow benchmarking of transformative uses of ICT in EU regions.

These indicators were presented to the Indicator Development Expert Group (INDEG) and to practitioners in the case study regions in order to receive comments and suggestions for revisions[2].

Finally, a selection of indicators was then prepared for piloting by means of an Internet user survey conducted in 12 EU regions across seven Member States. For this purpose, a population survey was conducted in late 2007 / early 2008. This was designed as an Internet user survey with the universe set as the total online population aged 18-64 in the twelve EU NUTS 2 regions also covered by the case study research undertaken in TRANSFORM:

- In Poland, (a) Pomorskie and (b) Malopolskie;

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[1] For an overview, see Gertler, M. (2002) 'Technology, Culture and Social Learning: Regional and National Institutions of Governance', in Gertler, M. and Wolfe, D.A. (eds) 'Innovation and Social Learning', Basingstoke: Macmillan/Palgrave: 111-134. and: MacKinnon, D., Cumbers, A. and Chapman, K. (2002) 'Learning, Innovation and Regional Development: A Critical Appraisal of Recent Debates', Progress in Human Geography, 26: 293-311. See also CEC (2007b).

[2] Means applied included a workshop with INDEG experts and an open discussion with regional policy-makers, both staged within the context of the eris@ Annual Conference in Bilbao, June 13-15, 2007.

- In Slovakia, (a) Bratislavsky Kraj [Bratislava] and (b) Vychodne Slovensko [Eastern Slovakia];
- In Germany, (a) Schleswig-Holstein, (b) Thüringen [Thuringia],
- In Sweden, Mellersta Norrlland [Central Norrland],
- In Italy, Emilia-Romagna,
- In Spain, (a) Navarra, (b) Extremadura,
- In the UK, (a) South Yorkshire, (b) East Anglia.

The decision to conduct the survey in the same regions which are also subject of the case study research was taken in order to enable the project to directly compare the findings from both research strands, and therefore to enrich the overall analysis of conditions for transformative use of ICTs in EU regions. Since the survey was targeted at individuals in private households only, no indicators derived from data from businesses or public organisations could be piloted.

The present document is part of a package of documents which together present the results from the TRANSFORM research on indicators:

Deliverable 2.4 describes the methodology employed for the data collection, and reports the main results from the survey in tabular format. The revised version of the document also contains a presentation of the findings from the advanced statistical analysis of the survey data, which sheds light on the relationship between use of the Internet, social capital and networking, and perceived benefits derived from Internet use.

Deliverables 3.3 and 3.4 together make up an Indicator Handbook which will contain in-depth discussion of methodological issues for each indicator, pointing out strengths and weaknesses as well as possible mistakes when interpreting the data. The document will be public and provide a valuable resource for all parties who want to take up TRANSFORM indicators, or want to know to what extent existing data are compatible with TRANSFORM measures.

Recommendations targeted at the European Statistical System and other stakeholders involved in the collection of statistical data on ICT and knowledge society related phenomena will be presented in **Deliverable 4.1** ("Policy Recommendations").

1.3 Structure of the Document

The following section, **Chapter 2**, provides a summary of the reasoning behind a regional indicator systems on information society related phenomena. It also discusses the definition of transformational use of ICTs as deployed for the study, and the specific requirements which sets of indicators have to meet if they are to be the core of a benchmarking system to be implemented across the entire territory of the EU.

Chapter 3 then develops the key elements of a regional information society benchmarking system which takes full account of transformational uses of ICT. As our intention was not to develop suggestions in isolation from current policy developments, **Chapter 3.1** gives an overview over the most important of established indicator system on ICT-related issues, namely the i2010 benchmarking exercise, the "Riga Dashboard" on eInclusion, as well as activities of the OECD and other stakeholders. **Chapter 3.2** then discusses the key indicators suggested by TRANSFORM on the basis of research undertaken in the project and the discussion with experts and policy-makers. The chapter makes explicit reference to individual i2010 and Riga indicators in order to help readers grasp how TRANSFORM's suggested indicators complement or comment on established statistical measures used for benchmarking within the EU's Open Method of Consultation.

2 Background

2.1 The Case for Better Information Society Indicators

Developing the knowledge-based society (KBS) is seen as a central component in realising the goals of the Lisbon Agenda with regard to competitiveness, growth, and quality job creation as well as cohesion and inclusion. It is increasingly accepted, however, that bringing about a KBS will not be achieved automatically and that, although the market will be the primary driver, policy intervention will be required in a number of areas, if we are to develop an Information Society for All. This position is articulated in a number of documents, notably the **i2010 Strategic Framework**, the 2006 **Riga Declaration**. One of the clearest challenges which Europe faces is to improve the performance of its diverse regions. This is desirable on the grounds of both equity (social cohesion and inclusion) and of improving the overall economic competitiveness of Europe (CEC 2007b).

In order to intervene effectively to enhance social inclusion and to overcome the digital divide, it is necessary to understand the factors which explain the way that certain individuals, organisations and regions engage in or fail to engage in the KBS. To do this systematically, and over a period of time, we need to develop a benchmarking process with a new set of indicators which focus not only on supply and uptake of technology per se, but also on the ends to which technology are adopted by some people, some organisations and some places, and not by others. Going beyond this we need to develop indicators which allow us to explore how technologies are being used in transformative ways. In other words how they are being used to 'add value': to enhance the life chances of individuals, to pro-actively adapt to changing circumstances while avoiding the risks of decreasing quality of life and/or job quality, to extend markets and enhance profitability of firms, and to improve the competitiveness and accelerate the development of individual regions.

The urgency of the issue is becoming clear when considering the recent emphasis which the EU is putting on **innovation** as the engine for self-sustaining growth and prosperity in Europe (CEC 2006a; 2007a; 2007d). The capability of regions to generate innovation is at the heart of the Community strategic guidelines on cohesion, which describe the cohesion policy priorities for the programming period 2007-2013. The CSG state that the Structural Funds should aim at:

> *Encouraging innovation, entrepreneurship and the growth of the knowledge economy by research and innovation capacities, including new information and communications technologies.*

An evaluation of the Operational Programmes, as submitted by the Managing Authorities during the planning phase of the 2007-2013 period, came to the conclusion that "the planned investments in innovation in 2007-2013 through cohesion policy are more than three times higher than in 2000-2006" and that they "will be above EUR 85 billion which corresponds to 25% of the total new envelope for the 27 Member States" (CEC 2007a: 13).

In the same document, the Commission notes as a lesson learned from the subsequent programming period that shortcomings in the field of evaluation need to be addressed: "For 2007-2013 an effort needs to be made to improve the capacity of the regions to reinforce a regional benchmarking culture **namely by the development and use of regional ICT indicators**" (CEC 2007a: 8; emphasis added).

Indeed, as has been discussed in TRANSFORM D2.1 the availability of region level data on ICT-related indicators is considered poor by most observers. Moreover, existing efforts to provide information society-related data at EU regional level have focussed on technology indicators. Stock-taking exercises undertaken by FP5 projects (e.g. BISER, ASPiRE) and by ESPON have been able to identify a considerable number of non-Eurostat data sources (including industrial sources, national survey and benchmarking activities, registers of international service and infrastructure providers) which can be used for analysing regional disparities in the EU. Again, most of these have a strong technology/infrastructure focus. Many are also available only from ad-hoc sources, i.e. no time series data are produced.

This compares against significant improvements when it comes to data availability at national level. Indeed, a number of benchmarking mechanisms have been put in place in order to monitor the progress towards the KBS (see D2.1: Indicator Stocktaking Report). The development of indicators to

benchmark the development of the KBS on a consistent basis across the European territory, however slow-moving the process of coordinating the actors which together make up the European Statistical System might be, marks a significant step in the evolution of European policy.

From the viewpoint represented by the TRANSFORM project, indicators developed to date nevertheless have a number of limitations, such as the following two:

- Existing indicators are overwhelmingly technology focused. They relate principally to the supply of and demand for ICTs and selected electronically-delivered services. Only in some cases are these supplemented by other indicators setting out the purposes for which technologies are used. Even here the indicators are usually not informed by current scientific knowledge of the determinants of (regional) social and economic development.
- They also tend to reflect an assumption that ICTs will automatically lead to economic and social development. This is clear in relation to broadband, which is being promoted under the assumption that it will play a key role in fostering transformative (as opposed to purely consumptive/passive) usage of the Internet. However, we do not know that this is uniformly the case and the indicators developed to date in order to monitor broadband are not sufficiently sophisticated to allow us to test this (cf. Roberts 2008). Statistical monitoring now needs to shift from supply to how broadband is integrated into daily activities of EU households and organisations. Similarly, in respect of the use of ICT by EU businesses, there is a strong need to extend indicators beyond e-commerce to construct indicators which illustrate how organisations are integrating ICT into their business processes as a whole (CEC 2003a), and the benefits they derive from doing so. This applies equally to public and quasi-public sector organisations in areas such as health.

2.2 The Status Quo

The i2010 strategic framework acknowledges that ICTs do not diffuse uniformly across all regions and socio-demographic groups and that “e-inclusion” or the “digital divide” remain a concern across Europe. This view is also reflected in the Fourth Cohesion Report (CEC 2007b), the Riga Declaration on eInclusion, and a number of recent research projects (e.g. ETCPG 2006; EUROREG et al. 2006).

Nevertheless, the **i2010 benchmarking** exercise barely addresses the issue of regional imbalances, even within the context of the narrow technological approach outlined above (see D2.2 “TRANSFORM Benchmarking Indicators”, chapter 3).

The same applies to the complete set of indicators derived from the Eurostat-coordinated **Community ICT surveys**. One exception here is the requested break-down of national indicators into one figure each for the territory falling under Objective 1 and for that not falling under Objective 1. While this will be of obvious value for evaluation of the EU contribution to country’s efforts to foster ICT uptake in their least developed regions, the fact that a Member State’s Objective 1 area does usually not correspond to an individual regional administrative unit means that the indicators will be too distant to practical policy-making to be of much value.

Within the context of the Commission’s policy for fostering **eInclusion**, as agreed upon at the Riga Conference in June 2006, a number of quantitative targets have been defined. Development of the respective indicator values is reported in the so-called “Riga Dashboard”:

> *“The Riga Dashboard is aimed at reporting progress in the achievement of policy targets set by the Ministerial Declaration signed in Riga on 11 June 2006 by 34 European countries. The Declaration defined “e-Inclusion” as "both inclusive Information and Communication Technologies (ICT) and the use of ICT to achieve wider inclusion objective and policies aiming at both reducing gaps in ICT usage and promoting the use of ICT to overcome exclusion". It recognised that ICTs are a powerful driver of growth and employment and that they contribute to improving the quality of everyday life and social participation of Europeans. It maintained that the fight against discrimination to improve ICT access for people with disabilities and the elderly is particularly important.*
>
> *[...] The Riga Dashboard is therefore intended to measure progress towards the Riga commitments. The 2007 Riga Dashboard is the first European Commission's report of this kind and is aimed at providing evidence for the Communication on the European e-*

> *Inclusion Initiative. It mainly draws on available Eurostat indicators and surveys. But it is also complemented by data obtained by specific assessments in other areas such as e-Government, and insights on the areas of ICT for ageing and ICT for cultural diversity.*
>
> *[...] The monitoring of the Riga Dashboard will be performed regularly to continue quantifying and qualifying progress to the fully achievement of the targets by 2010, as part of the i2010 annual progress report.*

For measuring broadband availability in different types of regions across Europe, a study was commissioned (IDATE 2007).

To sum up, creating the KBS is central to realising the key European policy goals as articulated in the renewed Lisbon Agenda. The i2010 strategic framework sets out how an *inclusive* KBS, i.e. an "information society for all", might be delivered and policies are currently being developed to reinforce and build upon the measures articulated in the framework, a particular concern being to address the inter-regional digital divide and to promote growth, competitiveness and employment in the regions and thus social cohesion through the use of ICTs. A benchmarking process has been put in place to monitor progress towards these goals, but this has several deficiencies: Mainly, from the viewpoint of Europe's regions, the data available are insufficient to shed light on KBS-related developments; moreover, available indicators do not take proper account of the 'softer' factors – such as social capital – and thereby may foster ignorance about some of the most relevant factors explaining successful regional development in the Information Society.

The issue is clearly recognised by the European Commission as well, who commented that "for 2007-2013 an effort needs to be made to improve the capacity of the regions to reinforce a regional benchmarking culture namely by the development and use of regional ICT indicators" (CEC 2007a: 8). There is, however, no funding mechanism in place which would support regions in setting up such data collection and benchmarking systems.

What can regions themselves do? Unfortunately, the cost of data-collection remains a big challenge, especially as far as sample-based statistics at the sub-national level are concerned. Information as an input to policy development can come from a process of learning from a region's own past experience and/or from experience in other regions (so-called "best practice"). Regional policy-makers also need to have good understanding of how the region's economy as well as wider society are affected by more general ICT-enabled developments, such as the trend towards ICT-supported outsourcing global collaboration among firms.

For this, neither purely qualitative information nor data on one region alone are enough. The rapid development of ICTs and the applications based on them means that data on the uptake and use of technology needs to be analysed in relation to the region's context, i.e. other regions within the same country, but also regions with structural similarities which are located in other countries. A benchmarking framework can help identify "good performers", not in order to emulate their experience but to provide a framework against which success and failure of different policy or management approaches can be understood. Moreover, comparisons over time are required, for which a scheme for regular collection of data using a consistent methodology needs to be put in place.

Having said that, benchmarking should never be understood as an end in itself. From the viewpoint of policy-makers, statistical data derived from benchmarking exercises only have a value within a system of tools for supporting policy formulation. Not only does the analysis of quantitative data need to be supplemented by qualitative analysis. Benchmarking should also be embedded in a more holistic process of **benchlearning**, which is the translation of the findings of comparative analysis into insight which takes full account of the specific situation in the regions to be compared. Not every policy action which qualifies as "best practice" can be emulated by any region – in fact, this appears to be the exception rather than the rule. But identifying good practice, understanding how it was achieved, and drawing conclusions as to which lessons can be drawn given the specific situation of one's own region, is always possible. Benchlearning implies a highly collaborative process of data interpretation and discussion about what the data mean. We will return to this topic at the end of this report, but first let us take a look at indicators, and how "right" indicators can be identified.

2.3 Operationalising Transformative Use of ICTs

The state(s)-of-the-art(s) analysis carried out in WP1 of TRANSFORM looked into the ways in which

"transformational change" has been discussed in the academic literature (Cornford et al. 2006). It found that:

> *The most extensive literature on change and transformation is found in relation to (mainly large) firms. The, perhaps misleading, notion of Change Management and its more recent (and perhaps more realistic) offspring Change Leadership are increasingly comprehensively covered in the literature. This literature, is closely linked with the world of business consulting: indeed the notion of 'transformational change' substantively emerged from the practice of one consulting company, Gemini, now part of CapGeminiSogati/Ernst and Young, which introduced the term to distinguish it from other firms promoting a more generic Business Process Engineering approach in the 1990s.*

As a consequence, we could argue that the notion of transformational change is comparably well established in the analysis of firms. Indeed, the management literature is full of accounts how to "turn around" companies and how to initiate "revolutionary" change, both of them related in manifold ways with product and process innovation and with what Tidd et al. (2005) call "position innovation" and "paradigm innovation".

In spite of the often elusive nature of some of these concepts, management science has also come up with a large number of methods and approaches for measuring the degree to which companies have achieved positive transformation. It is of help here that there are little doubts about the goals of economic activity within capitalist economic systems – they can be expected to strive mainly for accumulation of capital (profit), competitiveness, market power and longer-term survival.

By contrast, the concept of transformative change appears to be much less clear when applied to the public sector and, in particular, to individuals' use of ICTs.

The possibility of social transformation initiated or enabled by ICTs has been conceptualised by William Dutton (2004; 2005). According to him, choices about the use (or non-use) of ICT "reconfigure the electronic and physical processes through which [people] access vital social and economic resources", by which he means: people, services, information, and technology. Such reconfigurations, he says, give rise to social transformation and also often related to empowerment of ICT users.

It should be mentioned that there are still opposing views about the question whether the Internet and other ICTs are **causing** transformative change, or whether they are simply tools which people embed within familiar social contexts (for an overview, see Webster 2002). It seems that among researchers, Castells' view is most widely accepted: He points out that societies are undergoing longer-term transformational processes, in which innovations associated with technological developments play an important role. In the present stage of transformation, ICTs such as the Internet take over this role (Castells 2001).

Often, "transformative" is understood as uses of ICT that open up substantially new ways for individuals, firms and governments to achieve their goals. In many cases, this refers to activities which **would not have been possible** without ICTs. The recent eUSER survey on eLearning, for example, collected information on the adult population's attitudes towards, interest in and practice of lifelong learning, before asking about the use of eLearning for this purpose. In a third step, the survey asked whether the participation in a learning course would have been possible if the eLearning option had not been available. This way, the study found that about every second user of online eLearning courses would have been very unlikely to participate in lifelong learning if it was not for eLearning (eUSER 2006).

In spite of the elusive or suggestive nature of much of the literature on transformative change, we find a number of themes which pervade almost all accounts of ICT-related economic and social transformation. These are the following:

- From early on, experts have considered the transformative potential of ICT such as the Internet and the mobile phone to reside in the way they enable **network creation** at a scale and depth not possible before. The specific properties of networks (such as network externalities), in combination with the particularities of (digital) information goods when compared to tangible goods, imply that network creation is one of the main underlying principles for transformative "impacts" of ICT. In the social domain, network creation and the benefits derived from it have been discussed under the term "**social capital**".
- Transformation is understood here mainly as the outcome of strategic initiative. This does not mean, however, that positive transformation is limited to planned, directed, anticipated change

processes. Given today's volatile economic and technological environment, it is equally important to recognise and react to emergent change through the ability to exploit new opportunities. It becomes obvious, then, that **learning as a continuous, often collective process** embracing the entire population, and the translation of learning into **innovation** (including **social innovation**) are integral components of transformative use of ICT.

- The academic and practitioner literature views transformation not as something which is 'done to' an individual or organisation. Instead, it requires the (more or less) active involvement and co-operation of those concerned. This points towards the importance of **participation** and **empowerment** as key elements of beneficial, transformative change.

When defining these three themes as the focus of indicator research in the project, the latter (participation and empowerment) was meant to include aspects related to "eInclusion" as well. Because of the importance of the issue for current EC policy-making, in the present document indicators dealing with eInclusion will be discussed separately (see section 3.2.5).

While transformation is always a societal process, the notion of transformative 'impact' of ICTs[3] is always contingent on the capability of specific technologies to enable change. As such, the characteristics of the different ICTs and ICT applications themselves are of obvious interest to the analysis of the present research question.

It needs to be clarified that, while we do not subscribe to the opinion that ICT-related transformative change is always something positive, we will use the term here generally to describe changes which are beneficial from the viewpoint of regional development. It will be necessary, however, to also assess some of the negative changes which could be considered as "transformative", such as the increasing use of global computer and mobile networks by organised crime and terrorist groups. Additional complexity is introduced by the fact that some uses of ICT might have positive outcomes for one group of stakeholders, but potentially negative for others. For example, the introduction of ICT-enabled systems of control and supervision of employees, customers and citizens may be of interest for the group which exerts control, but detrimental to those which are being controlled. Current techno-economic developments, such as the imminent wide-spread use of RFID technologies by companies in the production and retail chain, indeed point towards significant risks for privacy (Srivastava et al. 2006). The potential for social conflict arising from such developments needs to be taken into account.

We summarise that there are three concepts which underlie the notion of ICT-enabled, transformative change: **network creation**, **continuous learning and innovation**, and **participation and empowerment**. They will provide the structure for indicator stocktaking and development in TRANSFORM. Indicator needs and existing statistical measures in each of these three domains will be discussed in the remainder of this document.

2.4 Benchmarking Sytems vs. Inventories

While regions may have good reasons to set up full-scale information society observatories covering a large number of indicators and topics, the costs for doing so can quickly become prohibitive for the large majority of regions. Rather than completely renouncing the collection of statistics on ICT-related issues, these regions require a short number of high-value indicators which allow them to compare ("benchmark") themselves against other regions, and thereby identify their main strengths and weaknesses.

In order to demonstrate the difference between observatories and benchmarking systems, it may make sense to briefly look at two EU-financed projects: UNDERSTAND, which is an attempt to harmonise information society observatories, and BISER, which intended to develop a short set of indicators for benchmarking across the whole of Europe.

The UNDERSTAND project, co-financed by the European Commission, grew out of the fact that a number of EU regions had implemented regional observatories already some time ago to provide regularly updated data on Information Society related issues. UNDERSTAND (together with the Regional-IST project and activities by eris@ within the IANIS initiative) set out to harmonise data

[3] Because of its association with deterministic views of societal and economic change, the use of the term 'impact' is criticised by many researchers, see Steinmueller (2003).

collection across as many regions as possible, which for the first time enables these regions to use the data from their observatories for inter-regional benchmarking. UNDERSTAND has developed harmonised methodology toolsets, including questionnaires, for application in regional ICT observatories across Europe. These were published in the form of a methodology handbook in 2006. The number of indicators contained is very large, as the project did not try to implement a common benchmarking system but rather provide the regions with the statistical methodologies needed to collect data for their own individual requirements, while maximising the potential for comparisons across regions.

The BISER project (BISER 2004), meanwhile, developed a short list of key indicators which were proven to be of strongest explanatory power to describe differences in overall ICT uptake and usage, and which were of sufficient overall quality. A major criterion for selecting indicators was that they are non-redundant, i.e. that indicator do not correlate strongly with similar indicators which are also included in the list. The reason for this was that, for example, it might not be necessary to collect data on number of users of computer printers, if we know that the regions with high/low numbers of printer users also have high/low numbers of computer users. BISER suggested that when a number of indicators behave strongly similar with regard to benchmarking of regions across the EU, only one of them should be selected as key indicator. This is because using all of them would not add much value to the benchmarking purposes, but drive up costs.

The other quality criteria developed by BISER are summarised below (cf. TRANSFORM Deliverable 2.1):

Relevance

- Completeness: To what extent does the indicator account for all relevant routes to obtaining the outcome it wants to explain? For example, high usage rates of e-transport applications might depend more on the supply than on the demand for such services; in that case, demand side indicators alone do not give the complete picture.
- Political relevance: How much weight is assigned to the construct which is measured by the indicator in recent EU-level policy-making? This has been assessed via an analysis of EU policy papers. If political relevance is high but the indicator is not directly relevant for Information Society policy, the entry is put in brackets in the tables below.
- Target audience relevance: What is the relevance as assessed by (the rest of) the BISER target audience which comprises representatives of National Statistical Institutes, regional policy research institutes, researchers, and regions themselves?
- Long-term relevance: To what extent will the indicator retain its relevance in the future, assuming that techno-social developments will continue along the same paths as in recent years?
- Relevance of regional level: How much do indicator values differ between regions (as opposed to countries)? Indicators which are strongly discriminating between Member States but not much between regions inside of Member States are of limited relevance for regional benchmarking.

Validity and comparability

- Reliability and freedom from cultural bias: Reliability refers to the necessity that an indicator produces the same results whenever it is implemented to measure a concept. Since data has been collected at only one point in time, reliability is here understood as necessity that an indicator measures the same things in all sub-samples of the survey. Cultural bias plays an important role here, i.e. the question to what extent it can be assured that indicator values are not biased by cultural differences in understanding or replying to survey questions or other methodological devices used for data collection (see Harkness et al. 2003). Factual questions, for example, are likely to be less affected by cultural bias (which includes bias introduced by translation of survey instruments) than attitudinal questions.
- External validity: Are indicator values plausible when compared to other indicators measuring the same (or similar) concept by using other data sources? Another point of reference was the feedback the project received from the group of regional experts for the 28 pilot regions. No entry is given in the tables below if no information was available for assessing external validity.

Costs

- The estimated costs for collecting data for the indicator (e.g. as part of a survey or via administrative data collection). Costs are assumed to be the higher the more (and longer) questions are required to collect data for the indicator. The difficulty in replying is also taken into consideration.

3 Towards a Regional Information Society Benchmarking System

3.1 Established Benchmarking Systems as Starting Point

3.1.1 Introduction

Starting point for the discussion was an existing indicator framework, namely **i2010 benchmarking indicators**, which is an improved set of benchmarking indicators (not all of which available already) targeted, in particular, at measuring progress with respect to achieving the i2010 goals (i2010 HLG 2006). Different data sources, including Eurostat's Community ICT Usage Surveys conducted annually and directed at households and enterprises, as well as one-off Eurobarometer surveys, are being utilised for the purpose. Within the context of i2010, it is not foreseen to collect regional level data, with very few exceptions.

A second important point of reference are the indicators agreed upon at the 2006 **Riga Conference on eInclusion** (see section 2.2).

In addition, up-and-running **Regional Information Society observatories**, which are organised with no or little coordination by Eurostat, should be taken into account – for example those observatories which were involved in the UNDERSTAND project.

When it comes to methodological issues related to the collection and use of statistics on ICT-related phenomena, two documents are of outstanding importance:

- The **OECD Guide to Measuring the Information Society** (revised version 2007), which includes discussion of the OECD's model surveys of ICT use;
- The **Eurostat Methodological Manual for Statistics on the Information Society** (Eurostat 2006), which is a guideline for Member States' National Statistical Institutes for conducting the Internet usage surveys in establishments and private households.

3.1.2 Types of Indicators

For developing indicators on transformative use of ICT, it may be useful to distinguish between four dimensions or layers of ICT use (see :

At the bottom there is the **infrastructure** which acts as the foundation for any application of ICT. Arguably, most efforts at the regional level have until now focussed on improving this layer – for example, by ensuring universal availability of broadband even in disadvantaged regions. Without doubt, there continues to be a need for this type of indicators – especially in the face of successive rounds of new technologies which become standard components of infrastructure within a short period of time, each (re-)opening digital divides (typically) between well connected, urban areas in the most technologically advanced Member States on the one hand, and rural or otherwise structurally disadvantaged regions, especially in the poorer Member States, on the other hand.

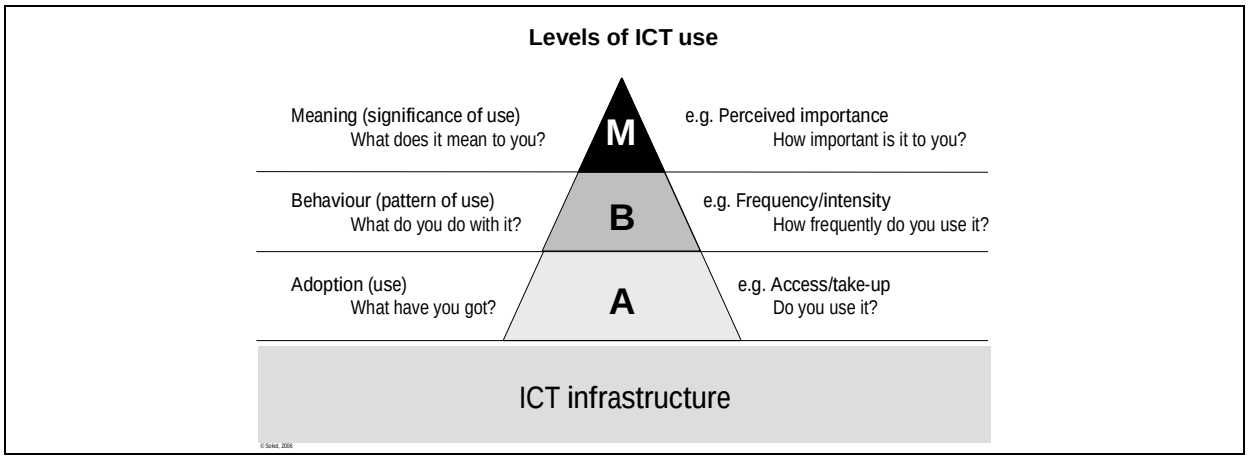
The next layer (**A**) denotes **adoption** of a technology, such as the Internet or mobile telephony. Arguably, take-up alone does not provide utility to households, firms or public administrations (at least not any transformative), but it is the necessary condition for it. Moreover, indicators on uptake may work reasonably well as proxy measures for the value derived from using a certain technology.

Layer **B** denotes **behaviour** which utilises the technology for purposes which can be anything between self-determined on the one hand and imposed by somebody else (e.g. employer, teacher) on the other hand. While benchmarking systems in the area have until now taken a comprehensive approach, i.e. collected detailed data about the purposes for which people use the Internet, it appears necessary to better structure behaviour-related indicators in order to single out those with the highest explanatory strength, and to better relate indicator values to the key domains which are of interest to regional policy-making.

The final layer (**M**), then, denotes uses of ICT becoming important/significant creators of **meaning**. So far, very little attention has been paid to this layer, partly because perceptions and meanings of ICT

use are the least visible and hardest to capture in statistical terms. It is here, however, where we can expect transformational effects of ICT use to manifest themselves.

Figure 2: Typology of Indicators for an Indicator System on Transformative Use of ICTs



Source: TRANSFORM

A way to measure transformational use is to explore whether ICT applications have provided the opportunity to do things which have been impossible before, and which are of relevance to individuals, firms and governments to achieve their goals. The eUSER survey on eLearning, for example, collected information on respondents' attitudes towards, interest in and practice of lifelong learning, before asking about the use of eLearning for this purpose (eUSER 2006). In a third step, the survey asked whether the participation in a learning course would have been possible if the eLearning option had not been available. This way, eUSER found that about every second user of online eLearning courses would have been likely not to participate in lifelong learning if it was not for eLearning.

3.1.3 "Regionalising" i2010 Benchmarking and eInclusion Indicators

A possible approach towards achieving availability of regional-level indicators would be to simply "regionalise" the **i2010 Benchmarking Indicators**, i.e. press for a modification of sampling sizes, sampling frames and (importantly!) the legal basis for data collection by NSIs, with a view to provide all i2010 indicators also at the level of NUTS1 or even NUTS2 level.

In spite of the limited political feasibility of any such attempt (because of the costs involved, see BISER 2004: 160-162), this option is of conceptual significance for indicator development in TRANSFORM. It acts as a point of reference, leading to a number of questions including: Can we identify those i2010 indicators which are of particular importance for transformative change? Are there country-level indicators which need to be modified in order to take account of the specific properties of regions as units of analysis, and of the specific requirements of regional policy-makers? And are there issues of strong relevance for regional policy-making (against the background of the conceptual framework of TRANSFORM which highlights the role of "soft" issues as influencing transformational uses of ICT) which are not at all covered by the i2010 indicators?

The exercise could also be applied to other existing indicator frameworks, namely the Riga eInclusion indicators (some of which already have a regional focus).

Below, the value of i2010, eInclusion and other existing indicators for being applied at the regional level is discussed, and new indicators for addressing gaps in currently available statistics are presented. For the latter, evidence from the TRANSFORM piloting surveys, where available, is presented.

3.2 Suggested Key Indicators

3.2.1 Background Indicators: Infrastructure and Basic Take-up

Network infrastructure

The infrastructure indicators which are currently of most relevance are those related to availability, uptake and prices of broadband. This is reflected in Theme 1 of the i2010 indicators:

> **i2010 Indicators, Theme 1: Development of broadband**
>
> (a) Percentage of population reached by switches equipped for DSL and/or living in houses passed by an upgraded cable. Data source: Survey of operators for electronic communications.
>
> (b) Number of subscribers broken down by platform (DSL, cable, fibre, 3G, wireless connections). Data source: COCOM data on broadband subscriptions broken down by access platform
>
> (c) Percentage of households with broadband access.
>
> (d) Percentage of households having access to the Internet at home.
>
> (e) Percentage of enterprises with broadband access. Data source: Community ICT Surveys.
>
> (f) Subscription numbers broken down by speed with the following thresholds: 256, 512, 1024 (Kbps), 2 and 4 Mbps. Price defined to include installation costs and monthly charges. Prices for metered and unmetered offers will be separated. Data source: Survey of operators for electronic communications.
>
> (g) Percentage of households with access to the Internet broken down by access device: PC, digital TV, mobile device (include all forms of mobile access; handheld computer, mobile phone, 3G). Data source: Community ICT Surveys.

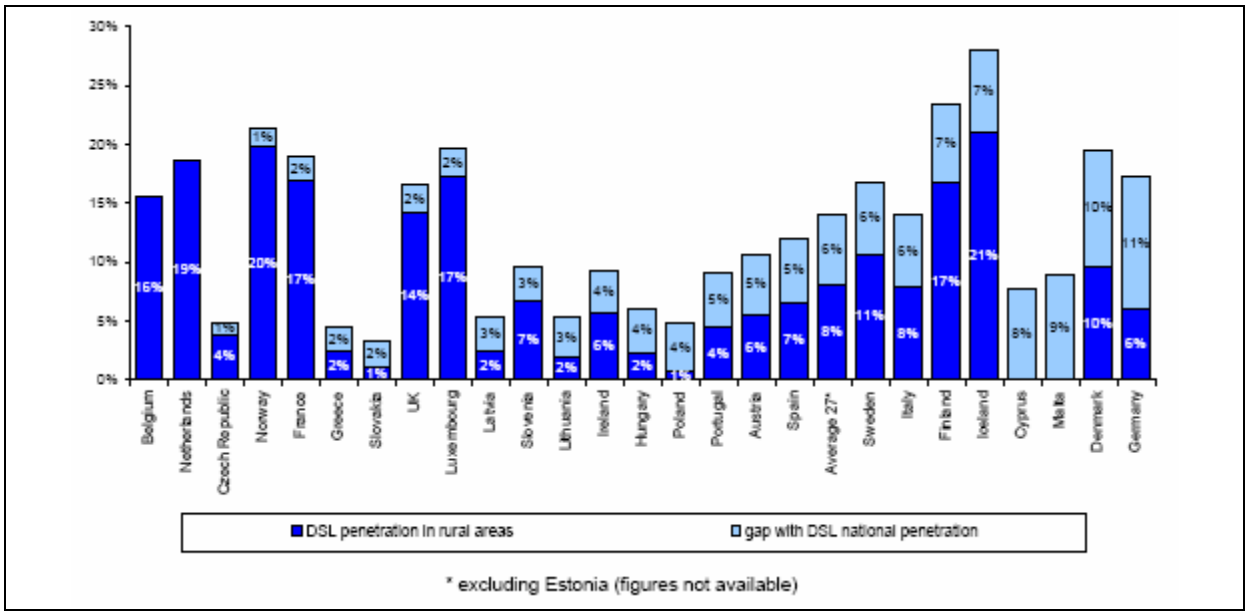
The importance of broadband for regional development can hardly be contested, and is also confirmed by the case study research carried out in TRANSFORM (see Deliverable D1.4). Both availability and prices, the latter often influenced by the existence of competition between different providers, need to be measured. These indicators present relevant background information for any strategy for the knowledge economy and society at regional level. Research has confirmed that users of broadband are more likely to spend more time online, and to use the Internet for more advances activities (for a recent example see Kennedy & Wellman 2007).

In practice, comparisons of prices across countries is made difficult by the fact that the data is typically gathered from providers, who are not always willing to fully co-operate.

In a study commissioned by Commission Services for the specific purpose of producing data for the i2010 broadband indicators, IDATE (2007) explored the gap between broadband penetration rates in rural areas when compared against the national averages. A clear definition of rural areas was provided[4], although data collection itself was not always able to exactly follow this definition for reasons of data availability. The results (Figure 3) indicate that there are considerable differences in the relative size of the rural/urban in DSL penetration. These are not necessarily to be explained by differences in DSL coverage – for example, Denmark has 100% DSL coverage (see Figure 4), but take-up rates are only half as high in rural areas than in the national average.

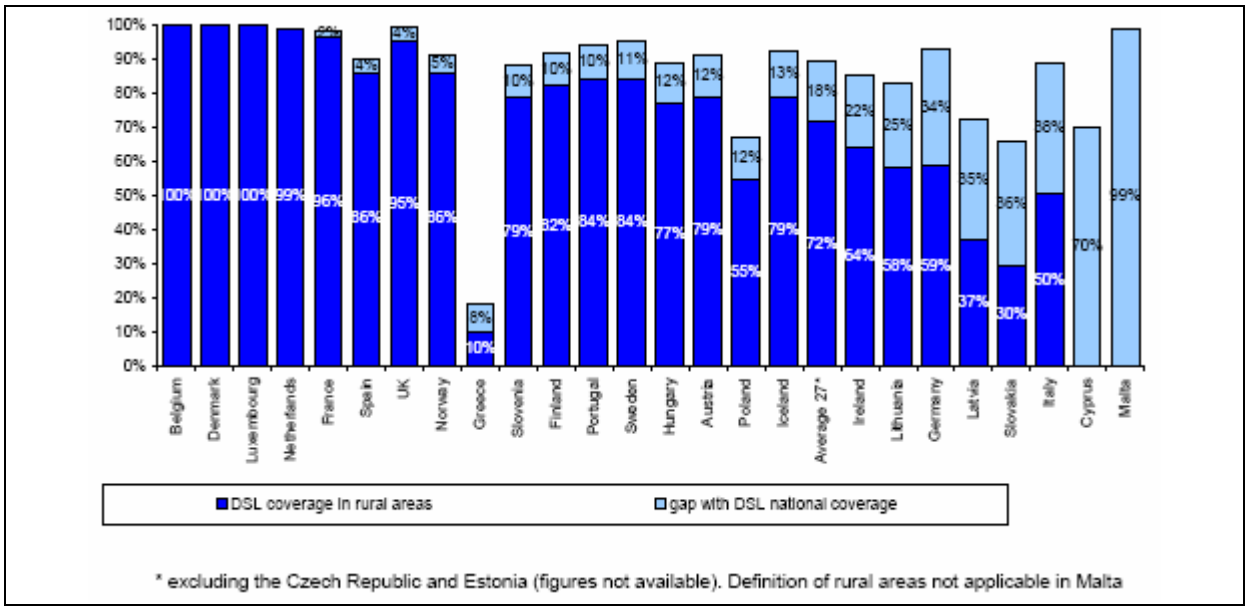
[4] Urban area: a population density superior to 500 inhabitants/Km²; Suburban area: a population density between 100 inhabitants/Km² and 500 inhabitants/Km²; Rural area: a population density inferior to 100 inhabitants/Km².

Figure 3: Gaps between DSL penetration in rural areas and DSL national penetration



Source: IDATE (2007: 8)

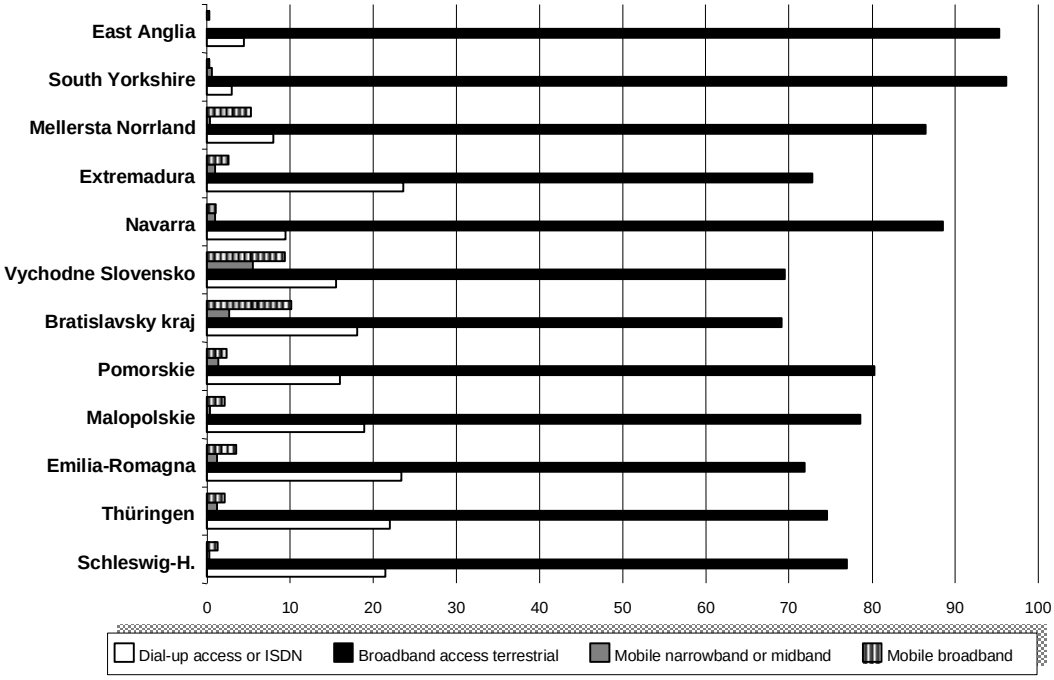
Figure 4: Gaps between DSL coverage in rural areas and DSL national coverage



Source: IDATE (2007: 7)

As discussed in Deliverable D2.1, the full-scale diffusion of mobile broadband may present an important upcoming development, since this would enable a continuous data stream between mobile, always-on devices and the Internet, opening up totally new possibilities for applications of potentially transformative nature (cf. Katz 2006; Cukier 2008). In addition, mobile broadband may be of interest for residents and businesses in regions insufficiently supplied with terrestrial broadband access (CEC 2006b).

Figure 5: Main type of Internet connection used for private purposes



In percentage, single answer only. Base: All Internet users; n=3363

Data source: TRANSFORM 12 Region Internet User Survey

Data from the TRANSFORM survey (see Figure 5) suggest that mobile Internet access is already of significant relevance in some of Europe's regions. 6% of Internet users in the Swedish region of Mellersta Norrland and as many as 13%-15% in the Slovak regions Bratislavsky kraj and Vychodne Slovensko access the Internet mainly through mobile connections. Any benchmarking which exclusively focuses on terrestrial broadband would therefore be inadequate – especially as the example of the Slovak region shows that mobile broadband might be used to leapfrog.

Multiple-location use of the Internet is already very widespread today, even if only accounting for non-mobile access modes, as the data from the TRANSFORM survey confirm.

In the not too distant future, next generation broadband is likely to become the next area where digital divides will open up between users in metropolitan regions and those in rural regions or areas with structural deficiencies. This development should be observed, and adequately reflected in the further development of statistical indicators.

Investments in ICT

Another theme picked up in the i2010 benchmarking framework is investment in ICT research, as measured by:

- (a) R&D expenditure in ICT by the business sector, as % of GDP and as % of total R&D expenditure.
- (b) R&D expenditure in ICT by the public sector as a % of GDP and as a % of total R&D expenditure.

Data on R&D expenditure by the business sector is already being collected at the NUTS 2 level (data source: Eurostat Science and Technology Survey).

R&D expenditure in ICT by the public sector would be of high interest for gauging the effort spent by regions to utilise ICT for improving their service. The same applies to public investment on ICT in general, broken down in hardware, software, services, as well as R&D.

Doubts exist whether the data can be collected in a reliable manner (cf. Roberts 2008a). For the national level, the EC intends to obtain data through an ad-hoc study.

In addition to R&D expenditure, the availability and use of venture capital should to be captured by benchmarking statistics. Capital investment in physical and intangible assets is necessary to transform the technological potential of ICTs into commercial applications both in the ICT sector and in ICT-related investments to improve performance in other sectors. The performance of some highly successful regions in ICT-related sectors, mainly in the USA, has at least partly been explained by the ready availability of venture capital and other forms of risk capital.

The ICT Sector

Regions that have a significant ICT sector should be interested, of course, in benchmarking its development to other regions within and outside of their country. This related to Theme 4 in the i2010 benchmarking indicators.

i2010 Indicators, Theme 4: Impact

(a) Share of the ICT sector in the economy measured as proportion of GDP and of total employment.

(b) Growth of the ICT sector measured as % change of value added at current and constant prices. Data source: EUROSTAT Structural Business Survey (SBS), EUROSTAT National Accounts and the 60 industry database (University of Groningen).

The same would apply, however, to any other industrial sector, and while the ICT sector may play a special role at the Member State and EU level because of a number of assumed trigger effects (e.g. on content markets, standardisation and competitiveness, etc.; see CEC 2007b), this should be of less interest for regions.

Therefore, while the relative importance and growth of the ICT sector may be of key relevance for particular regions, the core focus for regional benchmarking should be on the extent to which the economy in general (across all sectors) exploits the potential of ICTs. Too much emphasis on the ICT sector as a lead sector presumably driving economic development in regions has been identified as a common mistake in earlier attempts to foster the Information Society in European regions (see Cornford 2003).

3.2.2 ICT-enabled Networking and Social Capital Building

Network Building by Firms

Insofar as networking among businesses is concerned, the i2010 list of indicators is quite extensive:

i2010 Indicators, Theme 6: Adoption of ICT by Businesses

(a) Percentage of persons employed using computers connected to the Internet, in normal work routine.

(b) Percentage of enterprises with LAN and using an Intranet or Extranet.

(c) Percentage of enterprises with broadband access.

(d) Percentage of enterprises using open source operating systems.

(e) Percentage of enterprises turnover from e-commerce as % of total turnover.

(f) Percentage of enterprises having received orders via computer mediated networks, where these are ≥1% of the turnover.

(g) Percentage of enterprises having purchased via computer mediated networks, where these are ≥1% of the total purchases .

(h) Integration of internal business processes: percentage of enterprises whose internal business processes are automatically linked.

(i) Integration with suppliers and/or customers: percentage of enterprises whose business

processes are automatically linked to those of their suppliers and/or their customers.

(j) Use of software solutions for improving relations with customers: % of enterprises using software solutions, like CRM (customer relation management), oriented at improving relations with clients.

(k) Percentage of enterprises sending and/or receiving e-invoices.

(l) Percentage of enterprises that make sales on the internet and whose online sales system offers the capability of secure transactions.

(m) Percentage of enterprises using advanced e-signatures in the relations with their suppliers and/or their clients. (Data source: Community ICT Surveys.)

Measuring applications of networked business, these indicators appear of high value for the purpose of benchmarking the extent to which a regions' company base is integrated into the network economy.

In view of the key role which networking outside of contractual relationships seems to play for firm performance, additional measures on inter-firm collaboration, and the role of ICT for enabling it, would be of significant value.

For the purpose of informing policy-making in individual regions, it would be essential to additionally collect information on the geographical spread of inter- and intra-firm linkages. The extensive research of Taylor (2004) has shown that differences in the geographical configuration of business networks are essential for explaining differences in the extent to which agglomerations derive economic benefits from being integrated into the global economy.

Network Building by Individuals

ICT's role in supporting network building and in fostering stocks of social capital is one of the key focus areas in the TRANSFORM project. The Internet user survey was utilised extensively for piloting variables and indicators in this area.

3.2.3 Lifelong and Collective Learning and Innovation

The i2010 benchmarking framework is concerned with human capital related issues in Theme 7 (as well as – less explicitly – under the heading "advanced services"):

> **i2010 Indicators, Theme 7: Impact of adoption of ICT by business**
>
> (a) % of persons employed with ICT user skills.
>
> (b) % of persons employed with ICT specialist skills. Data source: Eurostat Labour Force Survey and Community ICT Surveys.

Since most ICT user skills are acquired by means of learning by doing, typically when using computers at work, it appears sufficient to collect data on "Percentage of persons employed using computers connected to the Internet, in normal work routine" (see Theme 6).

Moreover, ICT skills should not be interpreted as a static set of capabilities but rather as the ability to continuously learn how to use new applications of ICT, since most specific information is bound to become obsolete in a short time (Castells 2001: 91).

ICT specialist skills are today employed across all sectors of the economy, which means that an indicator measuring the share of the labour force with such skills should be of relevance to all European regions. It should be taken into account, however, that disadvantaged regions would be unlikely to benefit from larger numbers of ICT specialists: they are more likely to suffer from low capacity of local employers to absorb expert knowledge rather than from lack of labour supply. This means that the number of ICT specialists should be interpreted as an indicator of absorptive capacity.

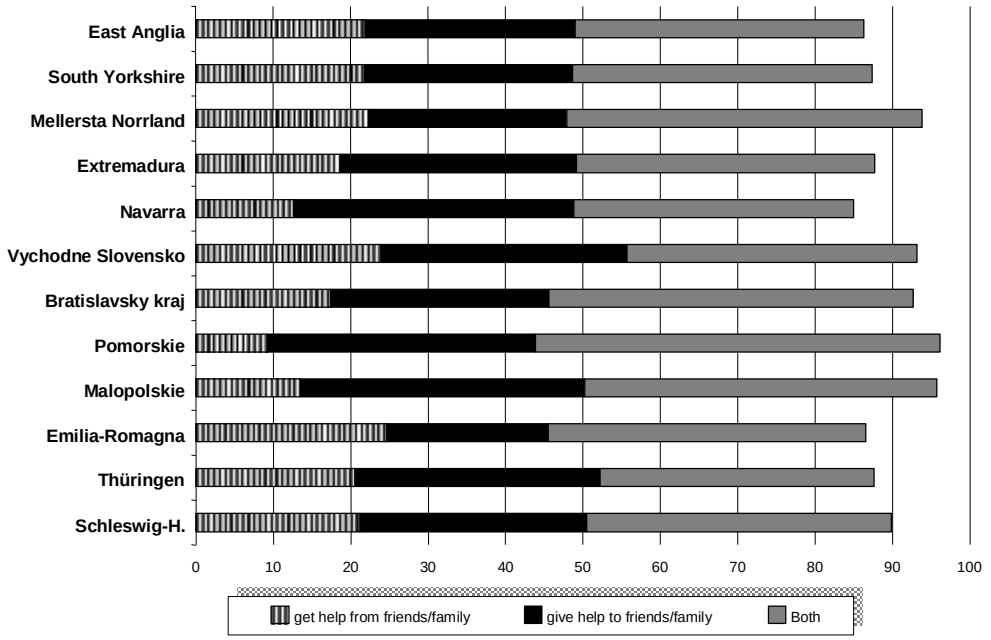
TRANSFORM is interested, in particular, in non-specialist ICT skills and how these are acquired. From a social networking perspective, it appears of special relevance to what extent people are sharing knowledge between each other, since available evidence suggests that formal training has been of importance for a minority only of current Internet users. This is confirmed by the TRANSFORM data, according to which the most important sources for Internet skills are, on average:

- self study and trial & error (ø 3.06 on 10-point scale with 1 = very important, 10 = not important at all);
- help from friends and/or relatives (ø 4.29);
- learning on the job (ø 4.52)

In contrast, neither school, college and university (ø 5.75), nor training courses provided by an employer (ø 6.57) or a public agency (ø 6.97) are considered as having been very important. Of course, these average figure may hide the fact that formal means of acquiring Internet skills may have been very relevant indeed for a minority of current Internet users.

Figure 6 presents the results from a question on whether respondents give help to and/or obtain help from friends and family for using the Internet. A large share of Internet users does both (41%), and less than 10% say they neither give nor obtain help to/from friends and family. This demonstrates the fact that informal knowledge sharing outside of the workplace is a major way in which a region's population acquires the capability to use the Internet and to stay on top of technological developments.

Figure 6: Sharing Internet user knowledge with friends and/or family



In percentage. Base: All Internet users; n=3588

Data source: TRANSFORM 12 Region Internet User Survey

3.2.4 e-Participation and ICT-enabled Empowerment

This area is touched upon in the i2010 benchmarking framework within the Theme "Advanced services":

i2010 Indicators, Theme 2 "Advanced services":

(a) Percentage of individuals regularly using the Internet (broken down by: age, gender, employment, status, education level, bandwidth).

(b) Percentage of individuals doing specific online activities in the previous 3 months broken down by activities, bandwidth, education, and age. Activities: sending/receiving emails, using the Internet for advanced communications, finding information about goods and services, accessing/receiving online media subscriptions, using digital broadcasting services, playing/downloading games and music, using Internet banking, purchasing and buying online, and using the Internet for learning purposes. Data source: Community ICT Surveys.

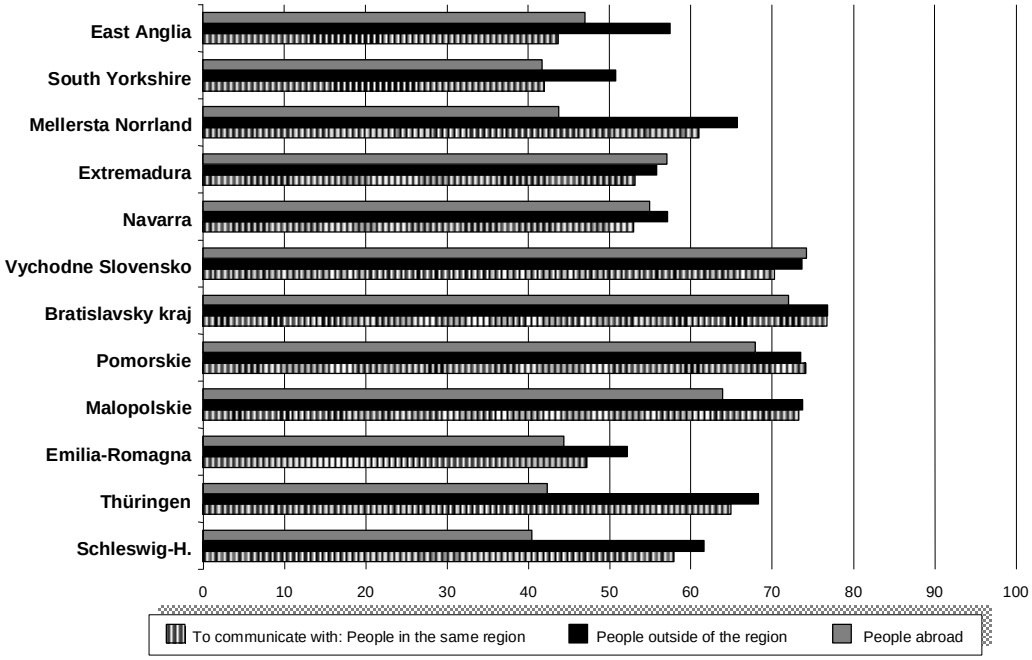
Availability of advanced services: Indicators have not been developed.

The list of activities carried out using the Internet, as included in the current versions of the Community ICT Surveys, appears to be too little guided by theory. A possible starting point would be to classify key activities using the Internet according to their overall purpose, starting from typologies of the major life activities of people, The "spheres of ICT application by individuals" (see Deliverable 2.2) could act as a starting point for revising the list. Such a revised list could also cover issues of "impact". For the purpose of implementing a cost-effective benchmarking framework at the regional level, it may also be required to shorten the module.

TRANSFORM has piloted a module which asked respondents to specify to what extent certain uses of the Internet are important (a) for their private life and (b) for the work life (if in paid work). Figure 7 presents the results on three items which are related to communication with other people according to their location. While the share of respondents who state that communicating with people abroad tends to be somewhat lower compared to communication with people in the same region or country, but the

importance of cross-country exchange is still string for a surprisingly large share of all Internet users.

Figure 7: Perceived importance of selected Internet activities: Communication



In percentage, sum of "very important" replies (values 1-3 on 10-point scale). Base: All Internet users; n=3481–3551

Data source: TRANSFORM 12 Region Internet User Survey

In addition to applications of (typically stationary) Internet access, advanced mobile services should also be covered – not all of these make use of the Internet protocol or are recognised by users as doing so.

e-Participation and ICT-enabled empowerment are important issues within the area of eGovernment and public online services. Three indicators are included in the i2010 benchmarking framework:

i2010 Indicators, Theme 9 "Public services":

(a) Number of basic public services fully available online (definition of basic services to be reviewed). Data source: web-based survey of e-government services

(b) Percentage of individuals using the Internet for interacting with public authorities broken down by purpose (purposes: obtaining information, obtaining forms, returning filled in forms)

(c) Percentage of enterprises using the Internet for interacting with public authorities broken down by purpose (purposes: obtaining information, obtaining forms, returning filled in forms, full electronic case handling, submission of proposal in an electronic tender system). Data source: Community ICT Surveys.

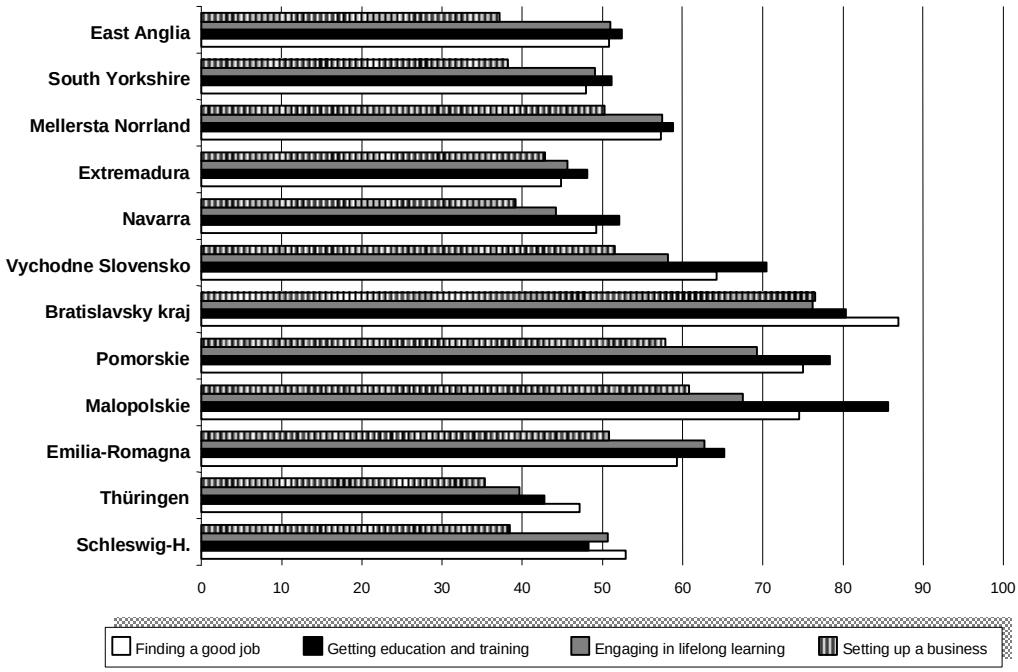
While the focus of benchmarking activities in the area of eGovernment applications has been on front-office public administrative services until now, most experts seem to agree that a shift in direction is asked for. Benchmarking of the online availability of public services should not be replicated at the regional level. Rather, the emphasis should be placed on the ultimate outcome of such eGovernment applications (i.e. effort needed for administrative tasks, and satisfaction with delivery) without viewing online delivery as an end in itself. In many cases, the telephone may prove to be the more user-friendly customer interface. By measuring overall effectiveness of customer service, efforts to reorganise back-offices for increasing efficiency and user-orientation would also be taken into account.

In addition, eGovernment applications which improve the possibility for citizens to engage actively in the policy-making process (eParticipation) should be made subject of indicator development.

In the TRANSFORM Internet user survey, respondents were often unimpressed by the impact the

Internet has had so far when it comes to enabling political participation. When asked what they think the effect of the Internet has on the possibility to "making one's voice heard in regional politics and public life", 49% give a neutral answer (3 on 5-point scale), 39% tend towards a positive effect and 11% see a negative effect. There are large differences between regions, which suggests that the extent to which regions have been successful in implementing Internet-based solutions for improving political participation differs strongly across regions – within as well as between Member States (see Figure 8 and Figure 9).

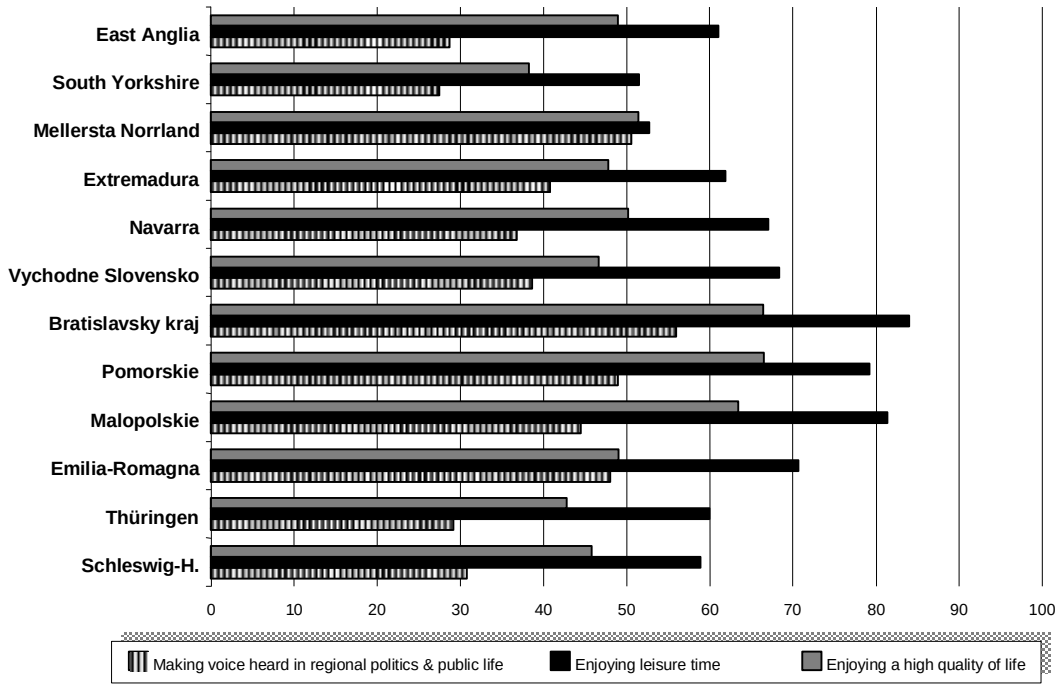
Figure 8: Perceived effect of Internet on general living conditions in the region (a)



In percentage, sum of positive replies (values 1 & 2 on 5-point scale). Base: All Internet users; n=3072–3363

Data source: TRANSFORM 12 Region Internet User Survey

Figure 9: Perceived effect of Internet on general living conditions in the region (b)



In percentage, sum of positive replies (values 1 & 2 on 5-point scale). Base: All Internet users; n=3072–3363

Data source: TRANSFORM 12 Region Internet User Survey

3.2.5 eInclusion

The i2010 benchmarking framework includes two indicators related to social inclusion:

i2010 Indicators, Theme 8 "Inclusion":

(a) Reasons for not having Internet access at home and for not having broadband access at home.

(b) The different places for accessing the Internet in the last three months (at home, at place of work, at place of education, at another person's home, at Public Internet Access points). Data source: Community ICT Surveys.

With regard to the reasons for not using the Internet or broadband access, existing evidence (e.g. van Dijk 2005) would suggest that in-depth analysis of representative national datasets, using advanced statistical methods, is more likely to provide insight into existing barriers and patterns of behaviour than region-by-region data. The same applies to statistics on the place of Internet access. Because of the effect, by now well established, which price differences exert on broadband take-up, background information on prices and the degree of competition on the market for basic ICT services appears to be of more importance.

For addressing the issue of social inclusion in the Information Society, additional indicators are needed which measure the extent to which all sub-segments of the population exploit the potential of ICTs for empowerment (see above). More in-depth analysis of the TRANSFORM survey data along these lines will be reported on in the Final Report.

The Riga declaration specified a number of quantitative targets, for which the following indicators are being used:

Riga eInclusion Indicators:

- The size of the "gap" in Internet usage between current average use by the EU population and use by older people, people with disabilities, women, lower education groups,

unemployed and “less-developed” regions;

- The extent of regional disparities in Internet access (availability of broadband across the entire territory of the EU; population in regions with full broadband coverage);
- Share of public websites that are accessible according to the relevant international standards;
- The extent of the “digital literacy gap” between the EU average and the following sub-groups: the unemployed, immigrants (people with a migration background), people with low education levels, people with disabilities, and elderly, as well as marginalised young people.

While the second of these indicators is, of course, directly related to the regional level, the other ones are of major importance for regional-level indicator systems as much as they are for national-level benchmarking. A practical problem is the need to collect sufficiently large samples to enable valid break-downs of the data-set into sub-groups of the population.

4 TRANSFORM Regional Benchmarking System

Statistics about a region are affected by a so-called network effect: While it may be valuable to have certain ICT-related indicators in a single region, being able to compare these data with those from other regions can make them all the more powerful as input for policy-making. Often, only by comparing statistics between regions and/or countries do they make sense at all, as individual figures do not provide any point of reference. When we refer to benchmarking in this section, we typically mean comparisons across regions within a country but also between different countries.

This raises, however, a number of challenges. We have emphasised above that selection of indicators should be guided by the longer-term as well as current objectives of policy-making within the region. Such policy frameworks differ between regions, which implies that the indicators which are of most use for informing policy-making will not be the same in all regions.

There is, therefore, a need for regions to coordinate their benchmarking activities in order agree on a common approach. The solution to be sought should enable a high degree of comparability across regions, but still enable all participating regions to collect the data which is of most relevance for their specific purposes. This may require a certain degree of redundancy. A common approach needs to consist of a number of elements including:

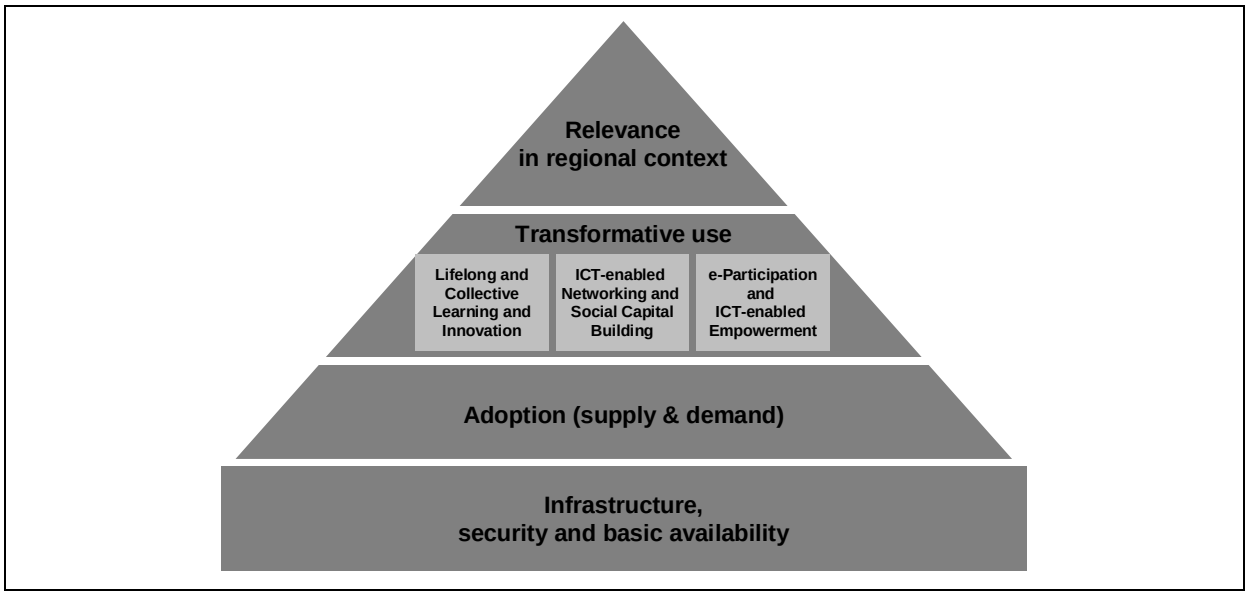
- What to collect data about: Subjects of measurement (e.g. ICT expenditure, online activities, eGovernment take-up);
- When to collect data: Temporal reference and time of data collection;
- About whom to collect data: Observation units (e.g. individuals, households, SMEs, public agencies)
- From whom to collect data: Reporting units (e.g. individuals, “head of household”, HR managers in firms, IT managers in firms or in public agencies, ...)
- How to collect secondary data: Data sources and data properties;
- How to collect fresh data: Methodology for gathering data (e.g. sample design, telephone, postal or face-to-face survey, etc.);
- At what level of aggregation to compare: Geographical reference unit (e.g. NUTS regions, functional regions, cities and their surrounding areas);
- How to process data: Standards for data formats, quality control and validation, data privacy.

In Europe, recent years have witnessed much progress with regard to the coordination of existing regional information society observatories. eris@ has played a key role in this process. Within the context of the UNDERSTAND project, 12 regions have agreed on a comprehensive, common framework for data collection and benchmarking (see below).

4.1 Structure of indicators

As mentioned before, we propose as a way of structuring indicators to dinstinguish between four layers (Figure 3).

Figure 10: Typology of Indicators for an Indicator System on Transformative Use of ICTs

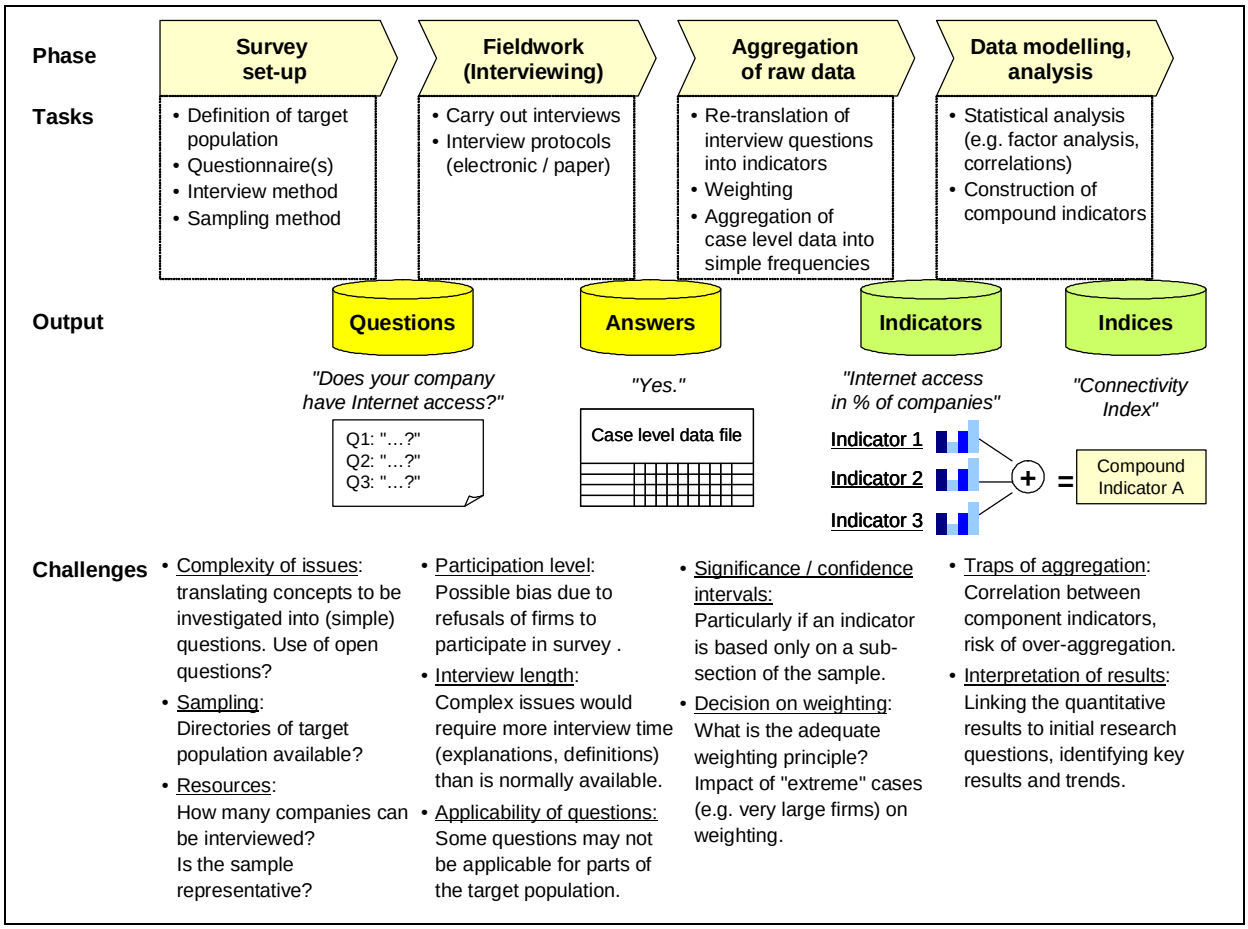


Source: TRANSFORM

4.2 Methodological Issues

While best use should be made of data sources already available, fresh data collection is likely to be needed in cases where existing data sources do not provide the statistics sought or lack contextual information needed for interpretation. The process of data collection and processing is outlined in Figure 11.

Figure 11: Data Collection and Processing for Production of Indicators



Source: Based on empirica 2006

Key steps for collection of fresh data via surveys are: (a) definition of the target population (whom to collect data about), (b) a decision about the interview method to be used (e.g. telephone survey or postal survey), (c) design of the data gathering instruments (e.g. questionnaire), (d) design of the so-called sampling frame (in cases where it is impossible or not necessary to address the whole population), (e) decisions about the weighting scheme to be used (relevant, in particular, for enterprise surveys).

Target population: Depending of course on the specific topics which are covered in the survey, the target populations needs to be defined. For issues surrounding business, the target population is usually either enterprises (firms) or establishments and, within these, the core decision-makers who have the knowledge and are entitled to answer the questionnaire. Private households or individuals living in private households are to be chosen - for example - for questions of end-user demand, civic activities, and the supply-side of the labour market. Insofar as public sector related issues are concerned, the target population follows from the structure of public administration in the country/region and the distribution of authority, which means differences between countries tend to be considerable.

Interview method: The choice of the most adequate interview method depends on the person the survey interviews are to be addressed at, on the type and complexity of subjects covered, on the length of the interview, and a number of other factors. More and more, computer-aided telephone interviews (CATI) have become the norm, as modern society has become more mobile and people are less available at home or their workplace for a face-to-face interview. Respondents also often prefer phone interviews as they take less of their time and are perceived as more anonymous. Postal surveys can appear comparatively easy to administer, but they suffer from the disadvantage of typically low response rates and lack of control. Contrary to wide-spread expectation, postal surveys are usually not cheaper (cost per successful interview) than telephone surveys.

Care should be taken when collecting data through surveys that **data protection guidelines** are

followed. Apart from national legislation, the major survey organisations across Europe have developed a number of detailed guidelines on how telephone, face-to-face and postal surveys should be conducted to avoid violating the interests of respondents.

Questionnaire design: The survey questionnaire is the main instrument which is used to collect indicators through representative surveys. This is a critical step in the implementation of the data collection process, and the related challenges involved are commonly underestimated by laymen. The task of questionnaire drafting may appear fairly easy at first sight, but in fact requires a lot of experience and care if it is to provide useful, valid data. The challenges involved concern adequate translation of "research questions" into "survey questions"; and the need to reduce complex concepts and theses into simple, **instantly comprehensible** survey questions. Any ambiguities need to be avoided under all circumstances.

While simple concepts such as "having access to the Internet" can easily be translated into a survey question, this can be difficult for more complex concepts, such as for example the issue of linking business processes electronically (a core notion within research on eBusiness and its impacts on firms). Such issues may need explanation or may have to be broken down into sub-sets each of which is then dealt with separately.

Survey costs are basically a function of the length of the questionnaire (i.e. interview duration), the size of the sample, and the difficulty to get target persons to agree to being interviewed. There are also big differences in survey costs between EU countries. The choice of the interview method (e.g. face-to-face, postal or by phone) tends to play a smaller role.

It follows that interviews (especially phone and postal interviews) should be as short as possible, as otherwise refusal and break-off rates become too high and costs skyrocket. This means that there is no time for lengthy explanations or discussions of complex concepts. Questions must be straightforward and immediately understandable. Against this background, it is evident why thorough testing ("piloting") of a questionnaire before launching the survey is so important.

Sampling frame: Questions of how to produce a sample (i.e. a representative subsection of the total population to be analysed, such as “all firms” or “all private households”) loom large in the academic literature. Interested readers are referred to the Further Reading section of this report. Suffice to say here that sampling under real-world conditions always has to work with compromises; for example, because address lists are incomplete – an especially serious problem for enterprise surveys which may have to sample from the (notoriously unreliable) Yellow Pages if no official business registers exist. It is of key importance, however, that researchers as well as the users of the statistics to be produced are fully aware of the implications which the choice of sampling frame has on the validity of the results based on the data.

Weighting: In order to be able to translate the figures obtained from the sample (e.g. 60% of respondents in the sample are Internet users) into estimates for the whole region (e.g. 60% of adults or firms in region x), some form of weighting is required. This is to adequately reflect the structure and distribution of establishments or types of households in the total population of the region under analysis.

In household surveys, different weighting issues have to be considered; for example, the transformation from a household sample to a person sample. If only one person per household is interviewed, the described sample procedure provides a household sample, i.e. each household of the base population has the same likelihood of being in the sample, but not each person. With the weighting stage of the transformation, the equal likelihood of households is replaced mathematically by the equal likelihood of the individuals. In addition, an adjustment of the unweighted sample structure to the official statistics in terms of population distribution (for example age, gender or income) needs to be considered.

For all benchmarking activities at regional level, whether survey-based or not, a vital question concerns the **geographical reference unit** being used, which refers to which regional units will actually be compared with each other. As many experts have pointed out, the use of diverging concepts (such as for unemployment) for national comparisons is usually acknowledged and treated as a problem, whereas the use of vastly different territorial units is usually not identified as a problem in this respect. However, a benchmarking exercise will only be a valuable input to policy-making if the regional units compared actually lend themselves to such comparisons.

Ideally, comparisons should be made between “functional regions” (OECD 2002) which have been defined using common criteria such as commuting patterns. In practice, useful criteria are similar size

(measured by population), similarity with regard to the position in the national administrative hierarchy, historical and cultural integrity, and a minimum degree of functional integration (this can mean, for example, that regions which include agglomerations should also comprise their hinterland in so far as this is functionally highly dependent on the core (as measured by commuting patterns).

4.3 Tabular Overview

The table below lists and describes the indicators which are deemed to be of most potential value for covering the issue of transformative use of ICTs for regional development, including those which have been piloted within the context of TRANSFORM. The table includes information on the observation and reporting units to be used and on relations to existing indicators. With regard to the latter, we distinguish between five different types of indicators:

Œ indicators which are already established in the European Statistical System, but have not yet been collected at regional level across Europe;

• indicators which have already been piloted in cross-country, European surveys (for example in one-off academic or industry studies), but are not yet established in the European Statistical System, and may need refining for analysing developments at the regional level;

Ž indicators which are already in use in national contexts but not yet for cross-country studies, and which may need to be refined for analysing developments at the regional level;

• indicators which are not existing yet (i.e. for which no data exists yet) but which are deemed necessary for coverage of transformative use of ICTs for regional development;

œ indicates indicators which were piloted in TRANSFORM.

The last column, finally, contains information about the economic feasibility of data collection for the indicators in question, i.e. cost efficiency.

Post-Piloting[5] List of TRANSFORM Benchmarking Indicators

TRANSFORM Indicators	Definition	Unit of observation / Reporting unit	Relation to existing indicators	Comments + Economic feasibility
INFRASTRUCTURE, SECURITY AND BASIC TAKE-UP				
Broadband access by firms	Share of organisations having broadband access to the Internet Add.: Broken down by access connection (terrestrial / mobile) Add.: Share of staff having broadband access to the Internet at their workplace Add.: Prices for broadband access basket	Enterprises/ IT managers (or other)	Œ Existing indicator – i2010 (based on Community ICT Survey)	Broadband definition needs to be adapted in time Contained in Community ICT Survey, but mostly not available at NUTS1 or NUTS2 levels
Broadband access by households	Share of households having broadband access to the Internet Add.: Prices for broadband access basket Add.: Percentage of population reached by switches equipped for DSL and/or living in houses passed by an upgraded cable, or who live in areas which are covered by 3G networks or WiFis	All private households/ Private households Availability: Regional operators or national regulation body	Œ Existing indicator – Community ICT Enterprise Survey	Broadband definition needs to be adapted in time Already contained in ICT Usage Household Survey
Mobile broadband access (firms)	Share of organisations having mobile broadband access to the Internet Add.: Share of staff having mobile broadband access to the Internet for work purposes Add.: Prices for mobile services basket	Enterprises/ IT managers (or other)	Ž Indicator may exist in some national surveys, but not included in the ICT Usage Enterprise Survey yet	Broadband definition needs to be adapted in time Could easily be included in a regionalised ICT Enterprise Survey
Mobile broadband access (by individuals)	Share of individuals in private households having mobile broadband access to the Internet Add.: Share of total population who live in areas which are covered by 3G networks or WiFis Add.: Prices for mobile broadband access basket	Total adult population/ total population	œ Piloted in TRANSFORM Indicator may exist in some national surveys, but not included in the Community ICT Surveys yet	Broadband definition needs to be adapted in time Could easily be included in a regionalised ICT Usage Household Survey

[5] Piloting was only carried out when indicated in the table.

TRANSFORM Indicators	Definition	Unit of observation / Reporting unit	Relation to existing indicators	Comments + Economic feasibility
Public sector investment in ICT	Total public investment in ICTs per head Add.: Broken down in hardware, software, services, R&D	Administrative unit (region)/ Regional government	Ž Indicator may exist in some countries, but not included in the REGIO database	Feasibility to collect data at the regional level needs to be explored. See Roberts (2008)
Venture capital invested in ICT-related areas	Total venture capital investment in sectors related to ICT (including content markets), per head	Administrative unit (region)		Cooperation with industry sources of data may be required
ADOPTION (SUPPLY & DEMAND)				
ICT-enabled Networking and Social Capital Building				
Inter-firm collaboration	Share of firms involved in collaboration in innovation related activities Add.: Share of firms involved in collaboration in other activities (not related to innovation) Operationalisation of "collaboration": "Collaboration means active participation in joint R&D and other innovation projects with other organisations (with other enterprises or non-commercial institutions). It does not necessarily imply that both partners derive immediate commercial benefit from the venture. Pure contracting out of work, where there is no active working together towards the same goal, is not regarded as collaboration."	Enterprises/ Senior managers responsible for R&D	Œ/ • Collaboration for innovation related activities is covered by the ECIS. Similar variable included in EB "Innobarometer". Operationalisation of collaboration similar to ECIS.	Rather than only collect data on ICT-induced or ICT-enabled collaboration, it appears that it would be advisable to address collaboration in general to increase the validity of measurement. An extension of the European Community Innovation Survey to the regional level is not foreseen as yet.
ICT-based Inter-firm collaboration	Share of firms involved in (online) collaboration in innovation related activities with partners from (a) inside the region (b) from other regions (c) from abroad. Add.: Share of firms involved in online collaboration in other activities (not related to innovation)	Enterprises/ Senior managers responsible for R&D	• Not existing yet, but related to indicator in ECIS	An extension of the European Community Innovation Survey to the regional level is not foreseen as yet.
Supply chain integration – Integration with suppliers and/or customers	Share of enterprises whose business processes are automatically linked to those of their suppliers and/or their customers. Add.: Supply-chain integration involving partners from (a) inside the region (b) from other regions (c) from abroad.	Enterprises/ Senior managers responsible for R&D	Œ Existing indicator – ICT Usage Enterprise Survey (add. indicator not yet collected)	An extension of the European Community Innovation Survey to the regional level is not foreseen as yet.

TRANSFORM Indicators	Definition	Unit of observation / Reporting unit	Relation to existing indicators	Comments + Economic feasibility
Membership in (work-related) virtual communities	Share of persons in paid work who are active members in virtual communities which are (at least partly) related to their work. Add.: Membership in (leisure-related) virtual communities	Total population in paid work / total population in paid work	• Not existing yet	Effort required needs to be explored.
ICT-based personal networks	Share of Internet users who actively participate on social networking platforms (incl. chat sites, newsgroups, online discussion forums, own weblog, creating a profile on a social networking site) Add.: Share of Internet users who upload self-created content to the Internet (incl. own weblog; uploading text, images, photos, videos, music, etc.; designing or maintaining a website) Add.: Heterogeneity of ICT-based personal networks – an Index that measures the degree to which the ICT-based personal networks of individual members of the population comprise different types of people (geographical location, ethnicity, occupation as proxy for socio-economic status)	Total adult population total adult population	œ Piloted in TRANSFORM For heterogenity index: Similar indicator used by Pew Internet & American Life Project (Boase et al. 2006)	Indicator definition needs to be regularly checked and, if necessary, updated in order to keep track with technological and market developments
Networking intensity of public sector institutions	Network-analysis derived indicator measuring the extent to which a region's public sector institutions (including universities) are participating in (a) intra-region (b) cross-region (c) international collaborative research and/or deployment activities	Administrative unit (region)/ E.g. databases on participation in R&D programmes	• Piloted by Malerba et al. (2007) based on data on participation in EU-funded research and deployment projects	Arguably, because of the central importance of ICT for maintaining collaborative networks, no explicit reference to ICT is needed.
Lifelong and Collective Learning and Innovation				
ICT-enabled lifelong learning	Percentage of persons engaged in an online eLearning course who state that they would not have engaged in a training course if it had not been possible online.	Total adult population total adult population	• Piloted in the eUSER study, see Gareis(2006)	Carrier survey to be identified.

TRANSFORM Indicators	Definition	Unit of observation / Reporting unit	Relation to existing indicators	Comments + Economic feasibility
Digital skills	Self-reported confidence in: o using a search engine to find information on the Internet o using e-mail to communicate with others o downloading and installing software onto a computer o identifying the cause for computer problems o understanding text written in English	Total adult population / total adult population	Ž Adapted from eUSER; similar variables are contained, for example, in the SIBIS (empirica 2003) and BISER (2004) surveys	Data should be broken down by sector to produce a synthesized indicator on the situation of public sector employees only. The indicator could be included in a regionalised European Union Adult Education Survey.
Updating of digital skills	Share of the population who have a favourable perception of their personal opportunities to learn about new ICT applications and uses through: o formalised educational institution (school, college, university, etc.) o training courses and adult education centres, on own initiative o training courses and adult education centres, on demand of employer o through self-study using books, Internet, CD-Roms, mobile services, etc. o through learning by doing o informal assistance from colleagues, relatives in friends and some other ways	Total adult population / total adult population	• Not existing yet	The indicator could be included in a regionalised European Union Adult Education Survey, or ICT household survey.

TRANSFORM Indicators	Definition	Unit of observation / Reporting unit	Relation to existing indicators	Comments + Economic feasibility
Collaboration & communication skills	Self-reported confidence in o working with a team of people; o listening carefully to colleagues; o selling a product or service; o counselling or caring for customers or clients; o persuading or influencing others; o instructing, training or teaching people; o making speeches or presentations; o writing long reports.	All in paid work / all in paid work	Ž Similar question contained in the UK 2001 Skills Survey	The indicator could be included in a regionalised European Union Adult Education Survey.
Self-management skills	Self-reported confidence in o planning activities; o organising one's own time; o thinking ahead; o detecting, diagnosing, analysing and resolving problems; o noticing and checking for errors.	All in paid work / all in paid work	Ž Similar question contained in the UK 2001 Skills Survey	The indicator could be included in a regionalised European Union Adult Education Survey.
Workplaces enabling experiential learning	Share of persons in paid work who have a workplace in a knowledge-intensive environment. [to be operationalised as follows: "Not all learning takes place intentionally or via learning-by-doing. One can also learn new things by observing what people around oneself are doing and talking about. Would you say that at your workplace it is easy to learn from observing what people around you are doing and talking about?]	All in paid work / all in paid work	• Not existing yet. Related to ESWC items: o I can get assistance from colleagues if I ask for it o I can get assistance from superiors if I ask for it o I can get external assistance if I ask for it o At work, I have opportunities to learn and grow	Data should be broken down by sector to produce a synthesized indicator on the situation of public sector employees only. Carrier survey to be identified.

TRANSFORM Indicators	Definition	Unit of observation / Reporting unit	Relation to existing indicators	Comments + Economic feasibility
Collaboration's effects on capacity to change	Share of enterprises using virtual collaboration (see above) which report a positive impact on the capacity to change in the reference period. Time to action to be operationalised as follows: The effect on your organisation's ability to adapt quickly o to fluctuations in demand, o to unexpected changes in the market environment (if applicable), o to lack of available skills on the labour market (if applicable), o to new market opportunities.	Enterprises using virtual collaboration / senior managers	• Not existing yet.	Carrier survey to be identified.
Individual effects of innovation-related collaboration on firm performance	Perceived importance of a number of hypothetical effects of collaboration for innovation, relating to a period of three years prior to the survey. Items include the following: o Increased range of goods and services o Entered new markets or increased market share o Improved quality in goods or services o Improved flexibility of production or service provision o Increased capacity of production or service provision o Reduced labour costs per unit output o Reduced materials and energy per unit output o Reduced environmental impacts or improved health and safety o Met regulation requirements	Enterprises/ Senior managers responsible for R&D	Œ Existing indicator – Community Innovation Survey	An extension of the European Community Innovation Survey to the regional level is not foreseen as yet.

TRANSFORM Indicators	Definition	Unit of observation / Reporting unit	Relation to existing indicators	Comments + Economic feasibility
Barriers that have negatively affected firms' innovation-related collaboration	Perceived barriers which have been negatively affecting innovation-related collaboration in the reference period (three years prior to the survey). Items include the following: o Lack of funds within your enterprise/group; o Lack of finance from external sources; o Innovation costs too high; o Lack of qualified personnel; o Lack of information on technology; o Lack of information on markets; o Difficulty in finding cooperation partners; o Markets dominated by established enterprises; o Uncertain demand for innovative products; o No need to innovate.	Enterprises/ Senior managers responsible for R&D	Œ Existing indicator – Community Innovation Survey	An extension of the European Community Innovation Survey to the regional level is not foreseen as yet.
e-Participation and ICT-enabled Empowerment				
Job autonomy index	Share of the employed labour force who have control over the way they work. Based on three items: o order of tasks o methods of work o speed or rate of work. Add.: Share of the employed labour force who can participate in key decisions about the organisation of their work.	All in paid work / all in paid work	Œ Existing indicator – ESWC	Carrier survey to be identified. Regionalisation expensive.
ICT use for collaborative work in teams or projects	Share of people in work who state that the Internet is important to them for working together in teams or projects with people based in (a) same region (b) outside of the region, but same country (c) a foreign country	All in paid work	œ Piloted in TRANSFORM	Carrier survey to be identified.

TRANSFORM Indicators	Definition	Unit of observation / Reporting unit	Relation to existing indicators	Comments + Economic feasibility
ICT-enabled access to resources (individuals)	Percentage of individuals who have experienced ICT-enabled improved access to vital resources Vital resources to be operationalised in reference to the list of "major moments in life" used in the Pew research, see Horrigan & Rainie (2006).	Total adult population/ Total adult population	œ Piloted in TRANSFORM based on Pew Internet & American Life Project study	Carrier survey to be identified.
ICT applications perceived as of major importance for the life of citizens	Percentage of individuals who perceive specific applications of ICT in their region as of major importance for their private life and their work life. Items cover the following 7 spheres of ICT applications: o Communicate (social interaction); o Perceive information (one-to-many); o Find information; o Take care of personal business, transactions and requests for assistance; o Entertainment; o Generate and distribute own content; o Participate in policy-making and public life; o Employment-related activities	Total adult population/ Total adult population	œ Piloted in TRANSFORM	Could be included in a regionalised ICT Usage Household Survey
Availability of tools for eParticipation	Index calculated from the extent to which online engagement is enabled, differentiated by the five stages in the policy-making cycle: o Agenda-setting o Analysis o Formulation o Implementation o Monitoring	Unit of analysis is dependent on the administrative structure of the region in question / Regional/local government officials	• Not existing yet.	Appropriate methodology for data capturing needs to be explored. Compare the experience from the online availability of public services (Capgemini 2006)
Perceived effect of Internet on general living conditions in the region	Share of persons who perceive a significantly positive effect of the Internet on the conditions within the region with regard to: Finding a good job; Getting education and training; Engaging in lifelong learning; Setting up a business; Making voice heard in regional politics & public life; Enjoying leisure time; Enjoying a high quality of life	Total adult population / total adult population	œ Piloted in TRANSFORM	Could be included in a regionalised ICT Household Survey

5 Conclusions

With respect to the limited availability of indicators at regional level, it appears that any policy which attempts to foster transformative use of ICTs is currently penalised by the lack of an appropriate statistical base. This applies, in particular, to measures which go beyond simply "counting computers". Unfortunately (though predictably) we do not have indicators of the transformative uses of ICTs (nor has any, to our knowledge, been devised). This problem is not specific to transformational uses of ICT or, indeed, to any uses of ICT. In fact, it tends to be a more general problem for regional policy makers.

Benchmarking is a central component of the Open Method of Coordination and, as such, has been an important policy tool for EU policy-making on information society related issues. Within the i2010 policy process, a revised set of benchmarking indicators was agreed upon in 2006 to measure progress towards achieving the i2010 goals . However, with the exception of distinguishing between Objective 1 (from 2007: "Convergence") and 2 ("Regional Competitiveness & Employment") regions – a regional breakdown which is of limited or no use for informing region's policy-making, as it does not allow comparisons between NUTS regions within a country) – these i2010 indicators do not address the regional level at all.

The obvious first step must be to make progress towards availability of basic indicators of ICT uptake and use for all NUTS2 regions. In addition, there is a need to supplement the Lisbon/i2010 focus on technology with a focus on "soft factors" such as social and networking capital and regional institutional capacity. In particular, we need to develop new indicators for benchmarking the capacity (of individuals, firms and regions) to 'unlock' the transformative potentials of ICTs.

A possible approach towards achieving regional-level indicators would be to simply press for all i2010 indicators also to be available at the level of NUTS1 or even NUTS2 level. However, we recognise that the cost makes this impractical. A more selective approach is required that focuses on a limited number of key indicators of transformative uses of ICT which can be operationalised. In particular, effort should be concentrated on assessment of:

- Which i2010 indicators are of particular importance for transformative change?
- Are there country-level indicators which need to be modified in order to take account of the specific properties of regions, and of the specific requirements of regional policy-makers?
- Are there issues of strong relevance for regional policy-making – which highlight the role of "soft" issues as influencing transformational uses of ICT – which are not at all covered by the i2010 indicators?

There are two main criteria for assessing the extent to which an indicator is of particular relevance for regional (as opposed to national) policy-making: Does the indicator measure a construct or development: (a) which is of direct relevance for regional economic and/or social development, and (b) which can be (directly or indirectly) influenced by regional policy-makers. When applied to, for example, the indicators fed by the Eurostat harmonised questionnaires on ICT usage, it appears that quite a few of the commonly used measures may be of limited value for regional policy-making. A small set of core indicators with direct relevance to regional development should be defined.

From a practical perspective, regions require a small number of high-value indicators which allow them to measure their progress over time and to compare ("benchmark") themselves against other regions, thereby identifying their main strengths and weaknesses – rather than being faced with either the expense of setting up observatories or doing nothing at all. We suggest that indicators should be non-redundant, i.e. they should not correlate strongly with similar indicators in the list – since using all of them would not add much value to the benchmarking purposes, but drive up costs. Of course, regions are free to set up more comprehensive statistical data sets at their own cost if they feel the need for them.

For developing (or selecting) indicators on transformative use of ICT, it may be useful to distinguish between four dimensions, or layers, of ICT use: infrastructure, adoption, behaviour and meaning. While generic indicators can be developed and agreed upon for the infrastructure, adoption and behaviour layers, measurement of aspects in the top layer ("meaning") need to take full account of the specific policy objectives and – often culturally influenced – deployment context of the country or

region for which indicators are calculated. It may therefore be of limited use to try to benchmark across regions using statistical indicators of “meaning”.

Promising candidates for such leading indicators can be grouped using three concepts which underlie the notion of a regional innovation culture and the capacity for ICT-enabled, transformative change: these are: network creation; continuous learning and innovation; and participation and empowerment. In general, a possible way to measure transformational use is to explore whether ICT applications have provided the opportunity to do things which have been impossible before, and which are of relevance to individuals, firms and governments to achieve their goals.

There needs to be further work on the creation and refinement of indicators for transformation of the society. Do we choose to define a threshold under which rather we just talk about a search for efficiency gains, a search for rationalisation and modernisation, and beyond which we really recognize a transformative effect? Moreover, building richer indicators would allow comparison of different regional approaches, different information society models, and the evolution of each along with distinct sets of parameters.

But even a “perfect” benchmarking system, if it existed, should not be understood as an end in itself. From the viewpoint of policy-makers, statistical data derived from benchmarking exercises only have a value within a system of tools for supporting policy formulation. Not only does the analysis of quantitative data need to be supplemented by qualitative analysis. Benchmarking should also be embedded in a more holistic process of **benchlearning**, which is the translation of the findings of comparative analysis into insight which takes full account of the specific situation in the regions to be compared. Not every policy action which qualifies as “best practice” can be emulated by any region – in fact, this appears to be the exception rather than the rule. But identifying good practice, understanding how it was achieved, and drawing conclusions as to which lessons can be drawn given the specific situation of one’s own region, is always possible. Benchlearning implies a highly collaborative process of data interpretation and discussion about what the data mean. We will return to this topic at the end of this report, but first let us take a look at indicators, and how “right” indicators can be identified.

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