SIXTH FRAMEWORK PROGRAMME

PRIORITY 8.1.B.3.5

Information Society Technologies

TRANSFORM

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Benchmarking and Fostering
Transformative Use of ICT in EU Regions

WP2: Indicators on Transformative Use of ICT

– D2.1 Indicator Stocktaking Report –

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Abstract:

The document presents the outcome from the stocktaking exercise of existing indicators on transformative use of ICTs. Its objective is to provide the basic reasoning behind the indicator related activities to be carried out as part of the TRANSFORM project. It intends to act – in combination with D1.1 – as the conceptual underpinning for the project's subsequent worksteps, in particular the development and piloting of a set of indicators about transformative use of ICTs in European regions. In order to be able to identify, from the numerous indicator developments and statistical frameworks which tackle issues related to the knowledge society, those measures which are of particular interest to the topic of the study, the document briefly introduces the main areas for which indicators are being sought, based on the TRANSFORM understanding of the main informational requirements of policy-makers in Europe's regions, and in regional policy-making in general. A major part of this document is devoted to the description of existing indicators which are capable of statistically mapping transformative use of ICTs at regional level – or could, at least, be easily adapted for this purpose. An extensive annex contains, in tabular format, a detailed listing of the indicators identified.

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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Executive Summary

Among decision-makers in EU regions, there is still a lot of confusion about how they can best tap the full potential of information and communication technologies (ICTs) and the so-called knowledge economy. Likewise, most region are uncertain about how to react adequately to the challenges arising from recent paradigmatic developments such as globalisation, the network society and the new international division of labour, all of which are directly related to applications of ICT.

Until now, most efforts by regional policy-makers have focussed on laying the infrastructure for ICT deployment, and on fostering the uptake of key ICTs such as the Internet by private households, businesses, the civic sector and government. Across the EU territory, significant progress has been made on both accounts. In spite of this fact, most available evidence suggests that the success in translating ICT investments into real progress in economic and social development varies considerably across the EU regions. It appears that some regions have the capacity to adopt ICTs and use them effectively to create new and successful products and services, organisational and administrative forms, and social innovation. It remains a challenge to explain why this is the case.

Giving an answer to this question also implies the need to advance statistical measurement systems, in order to improve their value in informing and guiding policy-making at the regional level. It appears that additional indicators are needed to better reflect the fact that it is not ICTs in themselves, but the ways in which they are utilised by citizens, businesses and government which really count for social and economic development. In this context, the term “transformative use of ICT” has been entered the public debate. What does it mean?

While much of the literature on transformative change tends to be elusive and normative in nature, we can identify 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.
- 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, collective process embracing the entire population, and **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.

There are, therefore, 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. It implies specific attention to be paid to the role of “soft factors” such as social and networking capital.

As a core part of the project, TRANSFORM will develop and test methods for statistical measurement of transformative uses of ICT in European regions. Indicators will be defined at the level of individuals, firms and the public sector. Development of indicators will proceed in a four-step-process: first, available indicators on constructs related to transformative change will be collected; second, these will be compared to the indicator requirements which follow from the conceptual research undertaken in the project (gap analysis); third, to fill these gaps in indicator availability, new indicators will be developed and piloted in real-world contexts; fourth, the results from indicator stock-taking and piloting of newly developed measures will feed into the drafting of a set of TRANSFORM indicators on transformative change in EU regions. The aim is to produce recommendations to the European

Commission and the European Statistical System about how the current set of ICT related indicators should be supplemented in order to better reflect the impact dimension of ICT use.

The present document presents the outcome from the first of these steps, namely the stocktaking exercise of existing indicators on transformative use of ICTs. Its objective is to provide the basic reasoning behind the indicator related activities to be carried out as part of the TRANSFORM project. It intends to act – in combination with the WP1 report on the "State(s) of the Art(s) in Research on Transformation of Regional Societies Through ICTs" (D1.1) – as the conceptual underpinning for the project's subsequent worksteps, in particular the development and piloting of a set of indicators about transformative use of ICTs in European regions. The document also builds on the findings from a number of earlier studies which sought to identify and develop statistical measures for capturing developments related to the knowledge-based economy and society.

In order to be able to identify, from the numerous indicator developments and statistical frameworks which tackle issues related to the knowledge society, those measures which are of particular interest to the topic of the study, the document briefly introduces the main areas for which indicators are being sought, based on the TRANSFORM understanding of the main informational requirements of policy-makers in Europe's regions, and in regional policy-making in general.

A major part of this document is devoted to the description of existing indicators which are capable of statistically mapping transformative use of ICTs at regional level – or could, at least, be easily adapted for this purpose. An extensive annex contains, in tabular format, a detailed listing of the indicators identified.

The present report will be complemented by a furter deliverable, D2.2 "TRANSFORM Benchmarking Indicators", which will take the discussion one step further by suggesting a list of indicators for capturing transformative use of ICTs at the regional level.

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1 Introduction

1.1 Objectives and Basic Outline of the Report

The TRANSFORM project focuses on “transformative” uses of ICT in European regions, and on exploring how they impact on regions' performance in the knowledge-based economy and society. Specific attention is given to the role of “soft factors” such as social and networking capital, regional institutional capacity and regional “innovation cultures”, and how these are related to the wide variety of observed outcomes among EU regions.

As a core part of the project, TRANSFORM will develop and test methods for **statistical measurement of transformative uses of ICT** in European regions. Indicators will be defined at the level of individuals, firms and the public sector. The aim is to produce recommendations to the European Commission and the European Statistical System about how the current set of ICT related indicators should be supplemented in order to better reflect the impact dimension of ICT use.

We distinguish between three perspectives: The perspective of **individuals** (in private households), the perspective of **firms** and the perspective of regional/local **government** and public administration. The emphasis here is on level of observation (i.e. we are interest in data on individuals, households, firms, government agencies and regional aggregates), since for analysis we must not forget that these three levels are interrelated in multiple ways. Indeed, one of the main assumptions behind the notion of transformative, ICT-enabled change in regions is that interaction between the spheres of individuals, firms and the public sector is being transformed, thereby unleashing the potential for more effective social collaboration and decision-making.

Development of indicators will proceed in a four-step-process: first, available indicators on constructs related to transformative change will be collected; second, these will be compared to the indicator requirements which follow from the conceptual research undertaken in the project (gap analysis); third, to fill these gaps in indicator availability, new indicators will be developed and piloted in real-world contexts; fourth, the results from indicator stock-taking and piloting of newly developed measures will feed into the drafting of a set of TRANSFORM indicators on transformative change in EU regions.

The present document presents the outcome from the first of these steps, namely the stocktaking exercise of existing indicators on transformative use of ICTs. Its objective is to provide the basic reasoning behind the indicator related activities to be carried out as part of the TRANSFORM project. It intends to act – in combination with the WP1 report on the “State(s) of the Art(s) in Research on Transformation of Regional Societies Through ICTs” (D1.1) – as the conceptual underpinning for the project’s subsequent worksteps, in particular the development and piloting of a set of indicators about transformative use of ICTs in European regions.

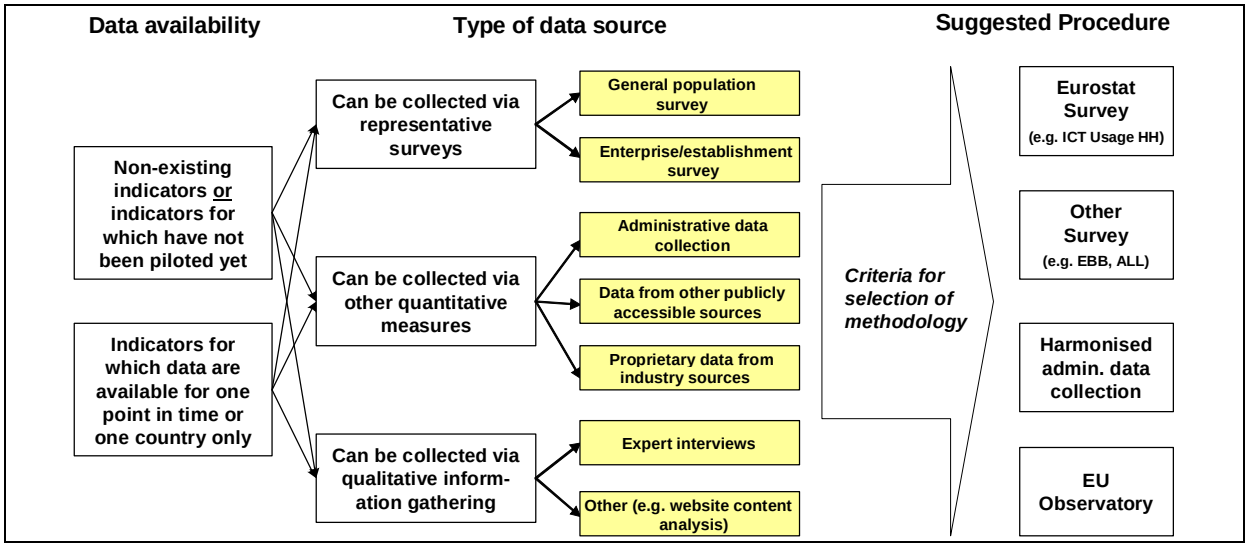
The document also builds on the findings from a number of earlier studies which sought to identify and develop statistical measures for capturing developments related to the knowledge-based economy and society. As a result of such initiatives, there is now an extensive literature on statistical measurement of ICT uptake and application by individuals, firms and the public sector. For this reason, TRANSFORM does not strive for a comprehensive coverage of this area. Indicators will only be listed and discussed insofar as they are of prime importance for the subject of transformative use of ICTs. We will explain what we mean by this in chapter 3.

On the basis of the analysis presented in this document, TRANSFORM will identify the main gaps in the availability of indicators on transformative use of ICTs at regional level. These gaps will then be the main focus of the indicator development and piloting to be carried out subsequently as part of the project.

Gaps in available indicators can take a number of forms (see Figure 1):

- Indicators which have been developed and piloted already, but not yet applied at regional level;
- Existing indicators which have not been applied for cross-country comparative research yet;
- Indicators which have been developed and piloted already, but need modification as to better reflect the objectives of statistical analysis as set by the TRANSFORM project;
- Constructs/phenomena which have not been covered yet by indicators (known to the authors).

Figure 1: Types of Indicator and Data Gaps, and Options for Action



Source: The authors

When assessing and developing indicators, we will avoid to draw a clear distinction between drivers and outcomes/impact. This is because as soon as we analyse regions using a systems approach, it becomes obvious that factors such as, for example, social capital endowment are both impacting on a region's capacity for transformative change, as well as (possibly) being itself affected by transformative use of ICTs. Any indicator framework which assumes a linear causal relationship between readiness for uptake, intensity of usage and social/economic impacts is therefore in danger of misrepresenting reality and, as such, of little value for regional policy-makers who seek insight into possibilities for self-sustaining regional development.

1.2 Relationship to Existing Indicator Frameworks

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.

The first benchmarking frameworks for ICT-related statistics were developed within the original eEurope 2002 initiative, and then further refined during eEurope 2005. Whereas most of the statistics in this early phase were still based on Eurobarometer surveys, one-off research studies or poorly harmonised national sources, lately more and more of the data have been collected by the National Statistical Institutes under the guidance of Eurostat.

The most important instrument for this purpose are the annual Information Society surveys, established in 2002 by the European Commission in view of an increasing demand for official statistics on ICT related issues within the EU (Eurostat 2006d). Indicators derived from the data were used to benchmark ICT-driven developments in enterprises and by individuals. Eurostat developed two model surveys, one on enterprises, one on individuals, in close collaboration with Member States and in coordination with initiatives within the OECD Working Party on the Information Society (OECD 2005b). These model instruments are regularly adapted to the changing needs of users and policy makers. They are composed of model questionnaires and accompanying methodological guidelines for their implementation.

In 2004 the European Parliament and the Council adopted Regulation (EC) No 808/2004 covering the above mentioned surveys. That regulation is a framework regulation: it allows flexibility to adapt the surveys to newly evolving needs by users and decision makers. Annual implementing measures such as Commission Regulation (EC) No 1099/2005 for the survey year 2006 are forming the basis for the Eurostat model surveys and will ensure harmonized data for all EU-25 Member States until 2010.

Within the i2010 policy process, a revised set of benchmarking indicators was agreed upon in 2006 to measure progress towards achieving the i2010 goals (i2010 HLG 2006). They are listed in the box below.

i2010 Benchmarking 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.

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: indicator to be developed.

THEME 3: Security

Indicators to be developed.

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).

THEME 5: Investment in ICT research

(a) R&D expenditure by the business sector, as % of GDP and as % of total R&D expenditure. Data source: EUROSTAT – Science and Technology Survey.

(b) R&D expenditure in ICT by the public sector as a % of GDP and as a % of total R&D expenditure. Data source: ad hoc study.

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 selling on the internet and offering the capability of secure transactions: 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.

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.

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.

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.

Source: i2010 HLG (2006)

For some of these indicators, Eurostat requires NSIs to provide data broken down by location (Objective 1 area vs. non-Objective 1 area). Apart from that, a regional breakdown (i.e. to NUTS1 and NUTS2 levels) of the indicator data for these variables is currently not possible because of the sample sizes and sampling frames being used. An exception are data from the Community Labour Force Survey and, possibly, Eurostat's Structural Business Survey (SBS), the 60 industry database of the University of Groningen, and industry sources. In addition, ad-hoc studies to be commissioned could be required to provide valid data at NUTS2 or, at least, NUTS1 level.

A possible approach towards achieving availability of regional-level indicators would be to simply 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.

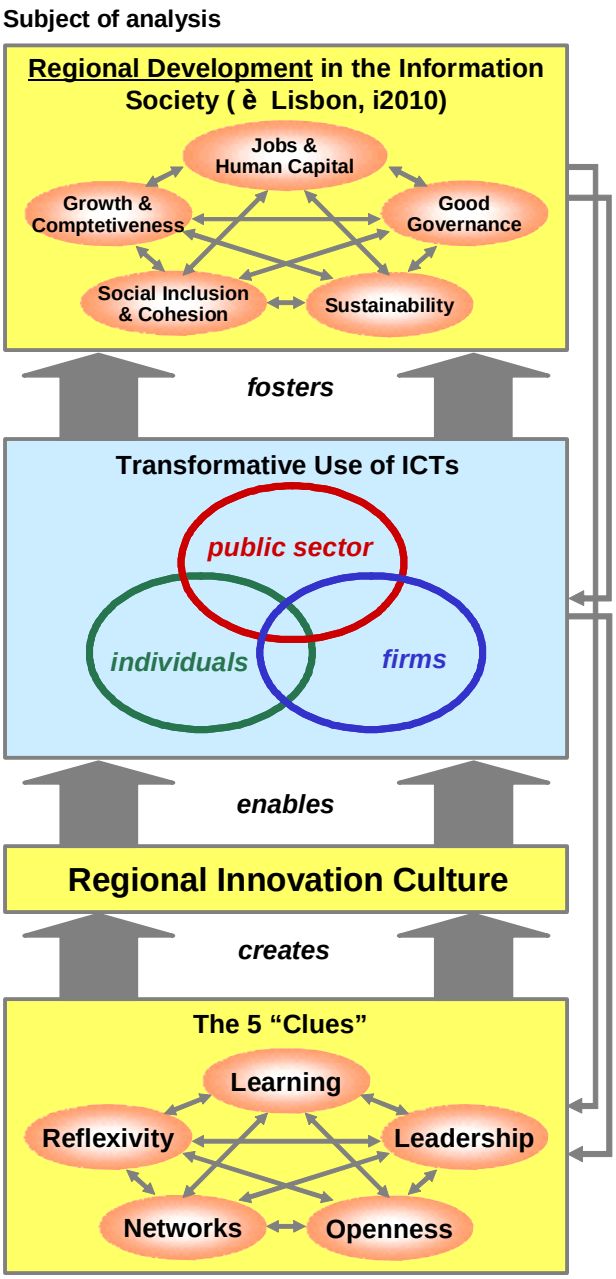
In spite of the limited political feasibility of any such attempt (because of the costs involved, see BISER 2004: 160-162), this option is of concepetual significance for indicator development in TRANSFORM. It acts as a point of reference, leading to a number of questions including: Can we identify those 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, as listed above?

The present report presents the first step towards answering these questions. It will be complemented by a furter deliverable, D2.2 "TRANSFORM Benchmarking Indicators", which will take the discussion one step further by suggesting a list of indicators for capturing transformatice use of ICTs at the regional level.

1.3 Starting Point and Approach

The conceptual approach chosen for the study is depicted in Figure 2. Transformative use of ICTs is here 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**.

Figure 2: Conceptual Approach of TRANSFORM, and Role of Indicator Development



Methodology in TRANSFORM

Indicator development:

Use of well-established outcome indicators as suggested elements in an overall benchmarking system, for example: Growth, Employment, Skills base, Employability, Distribution, Social inclusion, Environment, Individual well-being and happiness; Quality of life; Satisfaction with governance. ***No new indicators to be developed.***

Case studies:

Use of outcome indicators for selection of case study regions, and as contextual information for preparing and analysing the relative rate of overall success in regional development in recent years.

Indicator development:

Public sector: Adoption of ICT for improving efficiency & effectiveness, and quality of service; Satisfaction with online services; ICT-enabled participation; Social capital of policy-makers.

Individuals: ICT-enhanced social capital and access to resources; ICT-enabled empowerment & participation (as employee, as citizen).

Firms: Adoption of ICT (eBusiness) for improving productivity, effectiveness, innovative activity; ICT-enhanced social capital incl. intra-firm networking and access to resources.

New indicators to be developed mainly in the area of social capital and participation. *Otherwise based on established indicator systems such as EUROSTAT, OECD, ESPON, UNDERSTAND.*

Case studies:

Explore the extent to which benchmarking & indicators are used in IS policy-making; Interest in indicators; Validity of suggested indicators in view of anecdotal evidence collected in the field.

Indicator development:

Possibly development of a compound indicator from measures listed below. ***Late project state only.***

Case studies:

Confirmation of the importance of the 5 key factors for overall regional innovation culture

Indicator development:

Indicators for the degree to which each of the 5 key factors are developed in a given region (no relation to ICT, although a reference to ICT may be added in a further step).

Some efforts in this area may be required, but at a later stage in the project only. Any simplistic approach is bound to fail because of the complexity of the issue.

Case studies:

Making sense of the processes, structures, stakeholders/actors, developments which create, maintain and (possibly) change a region's innovation culture, and how they impact upon the region's goals concerning IS/KE-related regional development, and the means with which these are pursued.

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.

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 (Cornford et al. 2006) 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 (e.g. Gertler 2002; MacKinnon 2002) – 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**.

Existing evidence from a variety of scientific disciplines and policy areas suggests that uses of the Internet and other ICT differ significantly by the extent to which they affect change, and the nature of the change processes involved. In this context, the notion of transformation as a particular kind of change has recently come to the fore in the public debate[1]; it often includes a strong reference to ICT as a key enabler of (or at least prerequisite to) transformational change in the present age. But what exactly do we understand when we talk about "transformational use of ICTs"? And how can we distinguish transformative uses of ICT from other, more incremental or supplementary applications of the same technologies? How can the notion of transformative change be conceptualised and operationalised?

1.4 What Is Transformative Use of ICTs?

The state-of-the-art analysis carried out in WP1 of TRANSFORM looked into the ways in which "transformational change" has been discussed in the academic literature. 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 (See O'Shea and Madigan, 1999).*

As a consequence, we could argue that the notion of transformational change is comparably well

[1] For example, a recent UK policy document on eGovernment (2005) was entitled "Transformational Government". The latest book by William H. Dutton, director of the Oxford Internet Institute, is called "Transforming Enterprise".

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.
- 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, collective process embracing the entire population, and **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.

While transformation is always a societal process, the notion of transformative 'impact' of ICTs[2] is

[2] Because of its association with deterministic views of societal and economic change, the use of the term 'impact' is criticised

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. Frissen et al. (forthcoming) present a very useful list of technologies with "transformative potential", which is reproduced here (see annex 5.1).

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 (Rheingold 2002). 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.

1.5 Structure of the Document

Section 2 will give some general information about the process of indicator development, its significance for policy-making, and the quality criteria to be applied for the design of indicators. It will also discuss the peculiarities of indicators to be collected and utilised at the sub-national level. Particular emphasis is put on the NUTS nomenclature which is used extensively for EU policy-making at regional level. For the development, collection and interpretation of regional indicators in Europe, full grasp of the NUTS system and its implications is a must.

Section 3 presents a conceptualisation of the three concepts which underlie the notion of ICT-enabled, transformative change: network creation, continuous learning and innovation, and participation and empowerment (see above). These will provide the structure for indicator stocktaking and development in TRANSFORM.

The main body of the document (section 4 and the separate indicator annex) presents the findings from the stocktaking exercise. It gives an overview of existing indicators which cover the issues described so far. To what extent have quantitative indicators about transformative use of ICTs been developed already, and have they been applied for data gathering in different parts of the world and at different geographical reference levels? The extensive annex contains, in tabular format, a detailed listing of the indicators identified.

by many researchers, see Steinmueller (2003).

2 Indicator Development in TRANSFORM

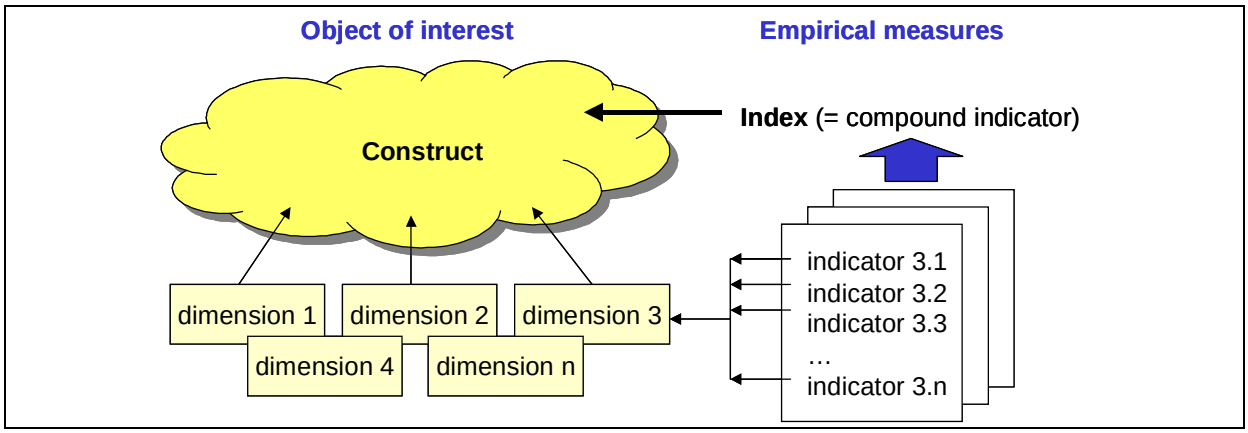
2.1 What Is An Indicator?

An indicator is designed to represent and provide quantitative information about a construct of interest which itself cannot be directly measured. The objective is to be able to compare elements of a set of categories with each other – for instance country with country, region with region, sector with sector, or small with large enterprises, and to be able to follow trends in the construct over time.

Before specifying indicators, it may be necessary to break down a construct – a complex social and/or economic category – into dimensions. These represent a constructs' different elements and features that are measurable using the tools of empirical research. For instance, "value derived from e-government" can be regarded as a construct with different dimensions such as efficiency of service delivery, user-friendliness of customer interfaces, and interrelation with traditional service delivery channels.

Sometimes, a number of indicators are combined into an index (or compound/composite indicator), which then represents – ideally – a quantitative one-dimensional measure for a complex social or economic construct (see Figure 3).

Figure 3: Indicators, dimensions and constructs



Source: empirica 2005

Indicators on transformative use of ICTs can be derived from very different types of data sources, including:

- Representative surveys of the population (GPS) or sub-groups thereof (e.g. Internet users);
- Representative surveys of organisations (for example firms/enterprises, public administration authorities);
- Industry statistics and national accounts;
- Business registers;
- Information supplied by individual organisations but covering observation units different than these organisations (e.g. companies, public authorities, regulation authorities);
- Information gathered through analysis of websites and Internet network traffic data;
- "Baskets" of certain goods or services: Baskets are used, for example, for calculating price indices such as the consumer price index, or telecommunication costs.

The focus in TRANSFORM is on indicators that are based on interview surveys among the general population and decision-makers in firms as well as in local and regional authorities.

2.2 Quality Criteria for Indicators

Indicator development will be based on the literature study undertaken in WP1, and will also be designed to be consistent with the conceptual approach chosen for the case study research.

A central element of indicator development will be operationalisation. This will be done as an iterative process, analogous to "rapid prototyping" of software modules, in which operationalised component variables are subject to pre-testing and consistency tests. In the process of operationalisation, indicators will be broken down into component questions and variables suited to empirical survey techniques and appropriate target populations. Effective data gathering instruments will be designed in order to guarantee high validity, feasibility and cost-efficiency of the benchmarking exercise.

Data on the observation units foreseen (individuals in private households, firms, public agencies) often need to be collected through interview surveys, since other sources of information (such as official registers) do not provide the statistics sought, lack contextual information needed for interpretation, and/or are hard to collect for technical or legal/ethical reasons (data protection/ privacy).

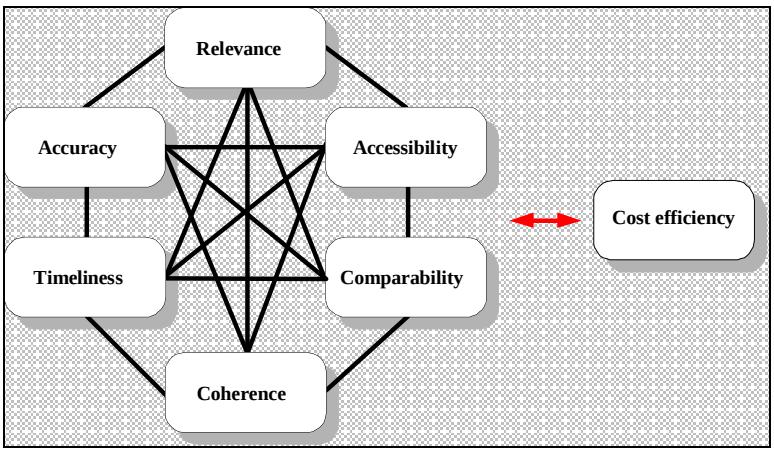
Indicator development will be guided by a set of quality criteria which have been developed in the context of the BISER project and subsequently harmonised with the Eurostat Quality Concept[3] used for assessing the EU's Structural Indicators. The quality framework, which is informed amongst others by the Handbook on Design and Implementation of Business Surveys issued by the European Commission (1998), breaks down quality of statistics, following the concept of Total Quality Management and Total Survey Design, into relevance (outcome focus), validity of estimates, timeliness and punctuality in disseminating results, accessibility and clarity of information, and comparability of statistics and coherence of underlying concepts. Another criterion not of quality, but closely related to it, is cost-efficiency. In fact there is a trade-off relationship between costs and quality criteria.

Some Criteria to Assess Indicator Quality

Basis for quality assessment is the Eurostat Quality Concept (EQC), which has been developed for checking the quality of the European Commission's so-called Structural Indicators. The EQC for structural indicators covers the following quality dimensions:

(a) Feasibility by looking at timeliness and coverage: The indicator has to be available in time for Member States, Candidate Countries and as far as possible the United States and Japan. It should cover more than one reference year. Longer time series are required to allow for a dynamic analysis.

(b) Technical soundness, comprising overall accuracy, comparability (over time and across countries), is assessed as far as possible on the basis of existing quality information in the domain: the indicator should stem from reliable sources meeting high standards and involving statistical expertise as regards the technique and methodology applied; the indicator should be comparable between countries; the indicator has to be comparable from one year to another.



(c) The quality profile discusses the relevance which is considered here to comprise the

[3] See Eurostat (2003)

content and suitability of the indicator to measure appropriately the phenomenon considered, including possible restrictions with regard to describing the characteristics of interest (target population). Moreover, room is provided to describe other characteristics which may lead to restricting the use of this indicator by the Commission, relating e.g. to the complexity of an indicator, a lack of an unambiguous scientific basis or to the coherence with other existing indicators, lack of comprehensive metadata etc.

(d) Where possible, the quality profile also includes a systemic criterion (coherence) aiming at an assessment of how well the indicator may contribute to an integrated analysis of the whole set. This part of the quality profile is to be distinguished from the other criteria in so far as it requires looking at the whole set at one time rather than at a single indicator.

(e) Finally, information on the development perspective for improving the quality of an indicator is provided, including, as far as possible, a qualitative estimation of the related additional costs in terms of implications for the producers of data and burden for the respondents.

Two additional criteria not directly mentioned in the EQC should be mentioned here: First, accessibility is vital since data for some indicators might not be available – for example in cases of proprietary data from industry sources (e.g. consultancies). Second, a criterion not of quality, but which is closely related to it, is cost-efficiency: in general there is a trade-off relationship between costs and quality criteria. Newly developed indicators need to be cost-efficient in order to be feasible for operational implementation.

Particular emphasis will be placed upon ensuring that:

- Indicator design is guided by the requirements of the target audience (outcome focus) and aims to produce a set of indicators which can be applied in the larger context of the European Statistical System;
- Instrument design for interview survey maximises validity of measurement;
- Cross-cultural sources for bias (e.g. translation) are fully accounted for, and controlled;
- Sampling procedures are adequate for the task concerning sampling error and, in particular, avoidance of non-sampling error (bias);
- Not only comprehensive results, but also raw data are made available to the research community after the analysis by the project team is accomplished[4];
- Comparability with existing statistical concepts and data sources is striven for except in cases where there are good reasons to divert from them;
- The ratio between the added value from data gathering on the one hand and costs (including response burden, which is of special relevance in the case of business surveys) on the other hand is maximised.

Those indicators which will be selected for piloting will be translated into survey questions, and subsequently developed into survey instruments. The resulting instruments (questionnaires) will be presented to the EC for commenting. Further test iterations will take place for those indicators/indicator components where issues are raised.

For survey execution, a good option for interviews with firms is Computer Aided Telephone Interviewing (CATI). Telephone interviews offer the advantage of quick and reliable data collection from a central telephone unit. CATI also offers best field control, automated sample administration, simultaneous data entry and permits a complex branching of the interview flow depending on filter questions and thus allows to apply questions tailored e.g. to the respondent firm's equipment status etc.

The final selection of the data collection methodology will need to be taken according to the indicators chosen for piloting, and the context in which data gathering will be implemented.

[4] To be agreed upon with the European Commission.

2.3 The Process of Indicator Development

Indicator piloting will be carried out as a three-step process. The reason for choosing this procedure is as follows: Carrying out a survey in different countries and cultural areas poses some considerable challenges upon research (Harkness et al. 2003). Most prominently, the translation of questionnaires is a very delicate issue to deal with. Questions are commonly regarded as stimuli that need to be set consistently for all participants if analysis should lead to reliable results – and much of questionnaire design literature attempts to meet the challenge that stimuli are understood unequivocally by respondents even if they share a common cultural backgrounds and language. This challenge is even aggravated when doing international survey research. If the objective is to develop a set of indicators

- laboratory pre-testing;
- field pre-testing;
- plausibility tests and constant feedback during collection of "real" data (fieldwork).

Survey research has made significant progress in refining laboratory pre-testing through the application of cognitive testing in recent years. The problems with traditional field pre-testing (i.e. simply testing the completed questionnaire with a number of subjects from the observation population) is mainly that respondents hardly utter comprehension problems, if they recognise them at all. To account for this problem, cognitive techniques are deployed before the actual field phase. They do usually not reproduce realistic field circumstances. Cognitive techniques are always "pro-active" techniques, i.e. involve reassuring with the respondent about his answers/ ways of answering to a question. Laboratory pre-testing will be done by researchers who are deeply involved with the projects hypotheses and the instrument development. Test persons will be informed about the test situation and usually be rewarded. Despite its usually non-standardised situation, we intend to standardise cognitive testing as much as possible, to ensure comparability of results and reliable conclusions.

Field pre-tests will carried out to check the proper functioning of the interview procedure. They will also be used to identify any remaining problems/issues with the instrument and the interview procedure – such as those resulting from inclusion of questions in multi-contractor (omnibus) surveys. Field pre-testing will make use of a number of techniques including interviewer de-briefing, respondent de-briefing, behaviour coding, and analysis of response distributions.

2.4 The Region as Level for Indicator Development

Since the focus in TRANSFORM is on indicators which can be used for policy-making at the regional level, the question arises in which ways regional indicators are different from nation-level indicators, which are much better established.

The most obvious answer is that indicators are needed which represent the geographical reference unit for which regional (as opposed to national or local) policy-making is of relevance. Only then can indicators fulfil the function of giving input to the policy-making process at the regional level. Indicators on transformative use of ICTs can play an important role for identifying regional policy challenges, assessing the current situation, and evaluating whether policy objectives are being met (see Figure 4).

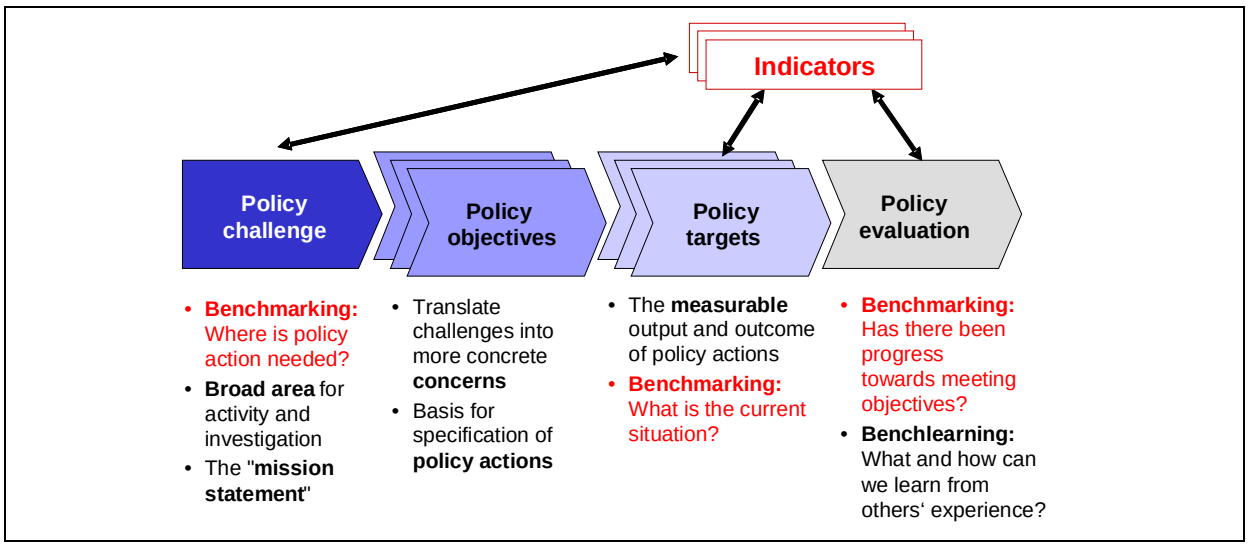
National and regional indicators can have a number of different relationships:

- Some indicators can be **applied in the same way** at the national and the regional or local level. This is the case for most indicators for which the unit of observation is the individual household or firm. For example, the share of individuals or firms using ICTs (such as the Internet or mobile devices) are measures the value of which for analysis does not differ between geographical reference units.
- Some indicators are applicable **mainly at the national level**, but much less at the regional or local level. This applies to constructs for which the country is the main unit of analysis, for example because of the system of governance in place. An example would be a measure on the existence of regulatory frameworks which are set at the national level, with regional or local governments having little or no say. Indicators describing the components of a national innovation system would be another example.
- Some indicators are more valuable if collected **at regional level**, as aggregation at national level would be likely to hide significant differences between sub-national units. An example would be

prices for advanced telecommunications services, which often differ considerably within Member States between the dominant agglomerations and the periphery.

- Another type of indicators are those which should be collected at regional or local level, but which are **mainly of relevance for policy-making at national level**. This concerns indicators describing the geographical effects of policies which are set at the national level (depending on the country, this typically includes spending on defence, higher education, publicly funded R&D, etc.). It may also include indirect effects of nation-level policy-making, such as the spatial impact of industry policy.
- By contrast, indicators which are of **particular importance for policy-making at the regional level** are those measuring phenomena which can be directly influenced by regional policy-makers. This includes investments in ICT infrastructure and applications, e-government related developments at the regional/local level, supply and demand for ICT applications which are directly related to the region, etc.

Figure 4: The Role of Benchmarking as a Policy Tool



Source: adapted from Empirica 2006

From this discussion, we can extract two main criteria for assessing the extent to which an indicator is of particular relevance for the regional (as opposed to the national) policy-making: Does the indicator measure a construct or development:

- which is of direct relevance for regional economic and/or social development, and
- which can be (directly or indirectly) influenced by regional policy-makers.

In TRANSFORM, every indicator suggested for regional benchmarking systems needs to be assessed along the lines outlined above. To take an example: With regard to communities, social-interaction and business networks, we need to ask how the transformative changes associated with increasing use of ICTs (if there are any) are related to spatial levels of analysis: For example, does strong involvement in virtual communities have an equivalent in the offline world, and if so, how does this relate to the region in which the people/organisations which are participating in the virtual community reside?

Deciding whether indicators are of interest for regional benchmarking or not needs to take account of the specific structures of government and public administration in a country, and of the objectives for which the benchmarking exercise is being deployed.

2.5 Regional Reference Units[5]

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

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

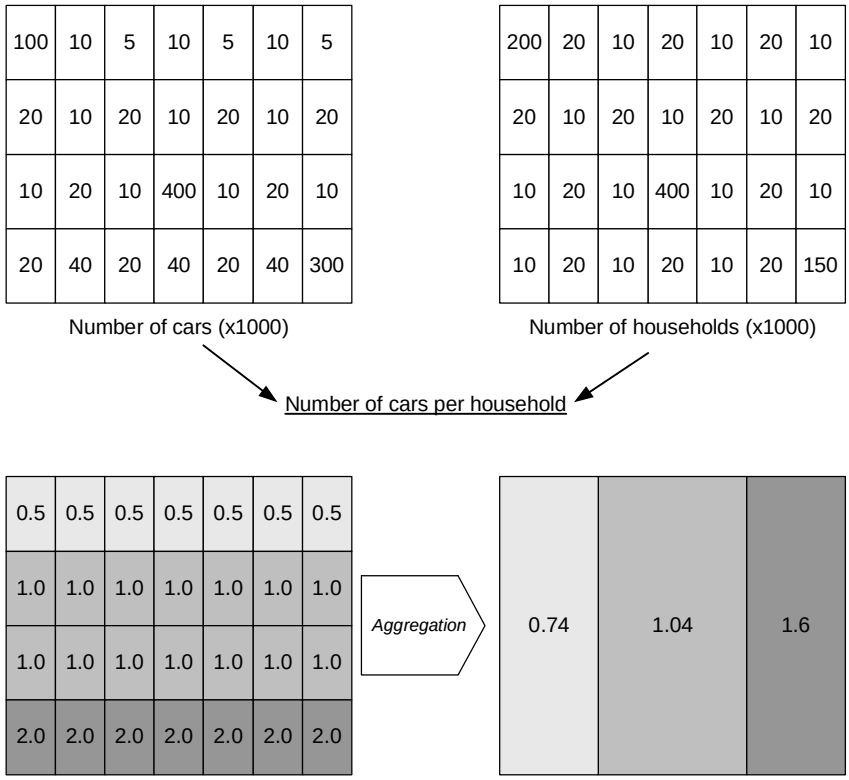
Why NUTS3 Rather than NUTS2? The effect of aggregation on the representation of territorial structures in statistics

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

The graph below demonstrates how aggregation can produce a picture of reality which is in sharp contrast to what is found at the disaggregated level. In this (fictional) example which has been adapted from Monmonier (1991) as quoted in Quick (1994: 21), the number of cars and the number of households in each of the cells are combined to an indicator "cars per household". At the more detailed level, we can observe a south-north divide, with households in the southern regions owning on average 2 cars each, while at the northern margin the value is only 0.5. Were these units aggregated into only three units as shown in the right-hand picture, we can observe what seems like a contrasting result – an east-west divide.

[5] This section is an updated version of chapters 4.1 and 4.2 of the author's BISER eEurope Regions Benchmarking Report (see www.biser-eu.com).

[6] €213 billion in the period 2000-2006



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

Comparability problems result from the fact that NUTS is mainly built on existing administrative units in the Member States, as opposed to a functional regional classification (see below) which would more adequately reflect the internal structure of the territory, as well as size and population of a region. This is unfortunate for scientific regional analysis in general.[7]

Nevertheless, NUTS also makes use of regional units which are of low or no administrative importance for the country in question, in order to construct a complete hierarchical system of territorial units (see below). Although this is of benefit for comparability, it means that NUTS data is not always of much use for the Member States[8]. National and regional policy-makers need data which reflect the regional territorial structure of their country as it is reflected in their administrative structure, but also in culture and in the public mindset – that is, data for a regional classification that "makes sense".

NUTS is used for the purpose of reporting on regions, e.g. the European Commission's Reports on Economic and Social Cohesion, Reports on the Social and Economic Situation and Development of Regions in the European Union. Most data contained in DG Regio's REGIO database are broken down to the NUTS 2 level (and by implication also NUTS 1, as NUTS 1 data can be aggregated from NUTS 2 data). NUTS was devised in collaboration between Eurostat, the other Commission departments and the Member States as a "uniform and consistent territorial demarcation system for compiling Community regional data". The system was founded and expanded on the following principles:

Ÿ To favour the existing institutional boundaries in the Member States, mainly for practical reasons of data availability and regional policy implementation;

[7] Quick (1994: 23) points out that differences between regions inside of one Member States are biggest in countries in which regions have been defined using socio-cultural criteria (e.g. Spain) or in which they have historical roots and a much political power (e.g. Germany). Countries with a strong centralist tradition, meanwhile, tend to have more uniform regions (e.g. France).

[8] For example, when the Eurostat Working Group on Information Society Statistics discussed about the EU-harmonised ICT user household and enterprise surveys, representatives from most National Statistical Institutes showed no interest in the option of ensuring that national data can be broken down to NUTS levels (e.g. NUTS 1 and NUTS2).

Ÿ To favour general regional units over territorial units specific to particular fields of activity (agricultural areas, employment areas, transport areas etc).

This means that NUTS uses normative criteria for the delineation of regions (as opposed to analytical criteria). Normative regions are the expression of a political will; their limits are fixed according to the tasks allocated to the territorial communities, according to the sizes of population necessary to carry out these tasks efficiently and economically, and according to historical, cultural and other factors. The delineation of normative regions does usually not take account of (and hence does not correspond with) spatial relationships which underlay regional development, e.g. between the living and working locations of the labour force (commuting regions). For this, a system of analytical (or functional) regions would be needed which would have to be defined according to analytical requirements. Analytical regions group together zones using socio-economic criteria (e.g., homogeneity, complementarity or polarity of regional economies) or geographical criteria (e.g., altitude or type of soil).

NUTS is a 3-level hierarchical classification (Eurostat has defined two additional levels for local administrative regions (LAU 1 and LAU2), but these are not being used much yet). Since administrative structures in the Member States are generally found at only two regional levels (Länder and Kreise in Germany, Comunidades autonomas and provincias in Spain, régions and départements in France, and so forth), an additional level was specified with the aim of identifying, at each level, territories which are comparable in terms of economic size. This extra level thus represents an administrative structure which is less clear-cut or does not exist at all in the country ("non-administrative level"). It may be found at any of the first three NUTS levels, depending on the Member State: at level 1 for France, Italy, Greece and Spain, at level 2 for Germany, at level 3 for Belgium, etc.

With regulation No 1059 from 26 May 2003, the EU has provided a legal framework for NUTS for the first time. It also sets out to "institute clear rules for future amendments". In reality this means that NUTS regions of every level (1 to 3) are to become more similar in population: The table below shows the population thresholds within which the average size class of this class of administrative units in Member States should lie.

Level	Minimum	Maximum
NUTS 1	3 Million	7 Million
NUTS 2	800 000	3 Million
NUTS 3	150 000	800 000

While this is certainly a step in the right direction, there must be doubts whether a partial homogenisation of the population numbers per NUTS unit will contribute much to making regions better comparable, because Member States might still feel tempted to define their territorial units in a way which ensures that transfers from the regional funds are not endangered. The limits the regulation sets for such changes[9] will presumably not be very effective. As is demonstrated in the box below, the selection of size and population as the single criteria for comparability of regional units is not very useful, because comparability depends just as well on the internal structure of a region, i.e. the extent to which regions comprise functional systems (cf. OECD 2002a).

To summarise, there is a trade-off between comparability of data at the EU level on the one hand, and the value of regional data from the viewpoint of the regions themselves and the Member States they belong to on the other hand. Moreover, political factors are also to be taken into account. In so far as a regional statistical system on the Information Society will depend on co-operation and financial contributions of the regions, a system based purely on a certain level of NUTS seems not very feasible. The other extreme, a totally different classification based on functional regions that are detached from national administrative structures is very unlikely to become available any time soon, and would hardly be feasible for political reasons.

In the case that Member States (or regions thereof) should provide the data or bear a large part of the costs for data gathering, it must be assumed that the decision for which NUTS level to apply must depend on whether NUTS3 is a administrative structure of sufficient importance in the country in

[9] Article 5, paragraph 3 states: "Amendments to the NUTS for the non-administrative units in a Member State, as referred to in Article 3(5), may be made if, at the NUTS level in question, the amendment reduces the standard deviation of the size in terms of population of all EU territorial units."

question. In cases where this is not the case (e.g. Belgium, Austria, the Netherlands, Portugal) interest in regional data can be expected to be very limited.

Differences between NUTS regions and functional regions – an example:

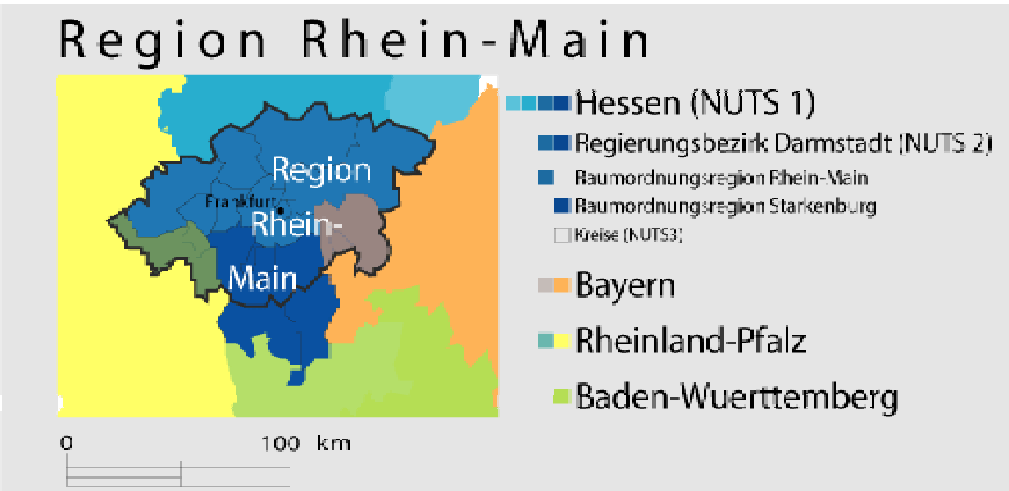
The Rhine-Main agglomeration in Germany

The Rhein-Main-Gebiet (Rhine-Main agglomeration) is a poli-centrical agglomeration which covers large parts of south Hessen (the *Bundesland*), but also stretches into Rhineland-Palatia (Mainz conurbation) und Bavaria (Untermain region including the city Aschaffenburg; see map below), both of which do not belong to the same NUTS2 or NUTS1 unit. The region contains the financial centre of Frankfurt and the city's International Airport as well as a number of manufacturing giants such as Opel/General Motors, Aventis (formerly Hoechst AG), Degussa, Lurgi and Merck. Around 4.8 Mio. inhabitants live in the region, 2 Mio. of which are gainfully employed. Commuting patterns in the area are highly complex and do not fit very well with administrative (i.e. NUTS) regions.

Regional units in comparison: The Rhein-Main agglomeration						
	area in km²	population density	inhabitants (thousands)	Employment (thousands)	Unemploy-ment rate	GDP/head in PPS (% of EU average)
NUTS 1: Hessen	21,114.4	286.9	6,058.3	2,729.8	5.9	129.4
NUTS 2: Reg.bez. Darmstadt	7,444.7	500.7	3,727.7	1,730.3	5.1	148.8
NUTS 3: Stadt Frankfurt	248.4	2,598.3	645.4	541.6	6.0	296.5
Planning region "Rhein-Main"	4,867.4	553.2	2,692.5	1,315.0	5.3	161.3

Data source: Eurostat REGIO database 2003

NUTS1 corresponds with the *Bundesland* Hessen (see figure below). The Rhein-Main-Gebiet includes the whole southern part of the *Bundesland* which is very different from northern Hessen which is much less densely populated, more rural, and by consequence also poorer. NUTS1 data is therefore not suited for providing an adequate picture of the Rhine-Main agglomeration.



NUTS2 corresponds with the *Regierungsbezirk* Darmstadt, which takes up the southern part of Hessen. While being much closer to the extension of the Rhein-Main-Gebiet than the Bundesland, this NUTS2 region does not include the adjacent parts of Bavaria and Rhineland-Palatia which functionally are clearly belonging to the same agglomeration. On the other hand, the Regierungsbezirk Darmstadt does include parts of the mountainous Odenwald area, which functionally belongs to the agglomeration of Mannheim, Heidelberg and Ludwigshafen.

Nevertheless, the Rhein-Main-Gebiet is fairly well represented by this NUTS2 region in statistical terms.

NUTS3 corresponds with the municipality of Frankfurt (*kreisfreie Stadt*). However, large parts of the working population of Frankfurt live outside of the city limits on the outskirts of the conurbation: while there are 600,000 inhabitants living in Frankfurt, the city's daytime population is more than 900,000. The households located in the centre of the city have actually lower average incomes than households in some of the surrounding areas. This is not reflected in GDP figures, because GDP is measured at the location of employment, which for many is the financial business district at the very core of the city of Frankfurt. On the other hand, recent suburbanisation of office employment has increased the share of jobs which are located just beyond the city limits, which includes the airport (the region's biggest employer) and newly developed office centres in Eschborn, Bad Homburg and Offenbach. The Frankfurt region is therefore hardly represented well by NUTS3 statistics.

In this, Frankfurt differs from most of the other second-order cities of Germany: for them, NUTS3 is the more adequate statistical reference unit than NUTS2. This complexity increases the difficulty of working with NUTS data in Germany, just as in many other Member States.

Since the collection of data at the NUTS3 level is extremely cost intensive, the alternative of setting up a database that use a mixture of NUTS2 and NUTS3 regions, depending on which of both is the more important administrative structure in each country, should be explored.

Table 1 below shows the regional levels which correspond to administrative structures of major importance, for each Member State (underlined region names). Differences between countries abound. Eurostat and the European Commission decided to use NUTS2 for most reporting and also for appraisal of eligibility for aid from the Structural Funds under Objective 1 because "NUTS 2 (Basic regions) was the framework generally used by Member States for the application of their regional policies and was therefore the appropriate level for analysing regional-national problems" (CEC 2003a: 13). However, as the table shows this holds true for only eight out of 15 Member States.

In some countries (Ireland, Wales, Scotland, North Ireland) none of the sub-national NUTS levels correlate with administrative units of much relevance.

Table 1: The NUTS system in the OMS and correspondence with major administrative levels[10]

	NUTS 1		NUTS 2		NUTS 3		LAU 1		LAU 2	
BE	Gewesten/ Régions	3	Provincies/ Provinces	11	Arrondisse-menten/-ments	43	-		Gemeenten/ Communes	589
DK	(Denmark)	(1)	(Denmark)	(1)	Amter	15	-		Kommuner	271
DE	Länder	16	Regierungs-bezirke	41	Kreise	439	Verwaltungs-gemeinschaften	539	Gemeinden	13176
GR	Groups of development regions	4	Periferies	13	Nomoi	51	Demoi/ Koinotites	1034	Demotiko diamerisma/ Koinotiko diamerisma	6130
ES	Agrupación de comunidades autónomas	7	Comunidades y ciudades autónomas	19	Provincias+ Ceuta y Melilla	50+ 2	-		Municipios	8108
FR	Z.E.A.T+ DOM	8+1	Régions + DOM	22 + 4	Départements + DOM	96+4	-		Communes	36678
IE	(Ireland)	(1)	Regions	2	Regional Authority Regions	8	Counties/ County Boroughs	34	DEDs/Wards	3440
IT	Gruppi di regioni	5	Regioni	21	Provincie	103	-		Comuni	8100
LU	Luxemburg	(1)	(Luxemburg)	(1)	(Luxemburg)	(1)	Cantons	13	Communes	118
NL	Landsdelen	4	Provincies	12	COROP regio's	40	-		Gemeenten	489
AT	Gruppen von Bundesländern	3	Bundesländer	9	Gruppen von Politischen Bezirken	35	-		Gemeinden	2381
PT	Continente	3	Comissões de	5 +	Grupos de	30	Concelhos -	308	Freguesias	4257

[10] Source: Eurostat (2006) 'Regions: Statistical Yearbook 2006', Luxembourg: Office for Official Publications of the Eureopan Commissions.

	NUTS 1		NUTS 2		NUTS 3		LAU 1		LAU 2	
			coordenação regional + Regiões autónomas	2	Concelhos		Municípios			
FI	Manner-Suomi, Ahvenanmaa/ Fasta Finland, Åland	2	Suuralueet / Storområden	5	Maakunnat / Landskap	20	Seutukunnat / Ekonomiska regioner	82	Kunnat / Kommuner	446
SE	(Sweden)	(1)	Riksområden	8	Län	21	-		Kommuner	290
UK:		*12*		*37*		*133*		*443*		*11095*
England	Government Office Regions	9	Counties (some grouped); Inner and Outer London	30	Upper tier authorities or groups of lower tier authorities (unitary authorities or districts)	93	Lower tier authorities (districts) or individual unitary authorities	354	Wards	7223
Wales	(Wales)	(1)	Groups of unitary authorities	2	Groups of unitary authorities	12	Individual unitary authorities	22	Wards	863
Scotland	(Scotland)	(1)	Groups of unitary authorities or LECs	4	Groups of unitary authorities or LECs (or parts thereof)	23	Individual unitary authorities or LECs (or parts thereof)	41	Wards (or parts thereof)	1202
N.Ireland	(North Ireland)	(1)	(North Ireland)	(1)	Groups of districts	5	Districts	26	Wards	569
EU-15 total		84		250		1224		2896		105,425

New Member States

In a formal manner, there is not a thing like NUTS regions for countries not belonging to the EU. However, since the enlargement of the European Union is impending, the submission of a territorial classification of the accession countries is essential as a basis for accession negotiations. Therefore, the new Member States had, in coordination with the European Commission and Eurostat, to provide a definition of regions according to the NUTS classification. Like in the EU Member States, statistical regions within the candidate countries are defined at three different levels. For the EFTA countries, codes have been assigned also on levels 4 and 5. In the candidate countries codes for local units are assigned instead of levels 4 and 5. On accession to the EU, the bilaterally agreed breakdown into "Statistical Regions" that is in force in a given country automatically becomes part of the NUTS and subject to the provisions of the NUTS Regulation (CEC 2003a).

Given that most of the New Acceding Countries have gained or regained their economic and/or political independence in recent years only, administrative structures often had to be adapted in order to optimise public administration during economic restructuring. The result was a number of changes to the regional breakdowns originally agreed between Eurostat and the countries concerned (CEC 2005b).

Table 2: The NUTS system in the NMS10 and correspondence with major administrative levels [11]

	NUTS 1		NUTS 2		NUTS 3		LAU 1		LAU 2	
CY	(Cyprus)	(1)	(Cyprus)	(1)	(Cyprus)	(1)	Eparchia	6	Demoi + Koinottia	614
CZ	Území	1	Oblasti	8	Kraje	14	Okresy	77	Obce	6249
EE	(Estonia)	(1)	(Estonia)	(1)	Groups of Maakond	5	Maakond	15	Vald, Inn	241
HU	Statisztikai nagyrégiók	3	Tervezési-statisztikai	7	Megyék + Budapest	20	Statisztikai kistérségek	168	Települések	3145

[11] Data source: http://ec.europa.eu/comm/eurostat/ramon/nuts/introannex_regions_en.html and http://ec.europa.eu/comm/eurostat/ramon/nuts/statistical_regions_en.html [retrieved 2007-01-28, 16:00]. Note that data for LAU 1 and LAU 2 in Cyprus reflects a recent notification to Eurostat of new administrative boundaries not restricted to the "Government controlled area".

			régiók							
LT	(Lithuania)	(1)	(Lithuania)	(1)	Apskritys	10	Savivaldybes	60	Seniunijos	515
LV	(Latvia)	(1)	(Latvia)	(1)	Regioni	6	Rajoni, republikas pilse-tas	33	Pilse-tas, novadi, pagasti	536
MT	(Malta)	(1)	(Malta)	(1)	Gzejjer	2	Distretti	6	Kunsilli	68
PL	Regiony	6	Województwa	16	Podregiony	45	Powiaty i miasta na prawach powiatu	379	Gminy	2478
SI	(Slovenia)	(1)	(Slovenia)	(1)	Statisticne Regije	12	Upravne Enote	58	Obcine	193
SK	(Slovakia)	(1)	Oblasti	4	Kraje	8	Okresy	79	Obce	2928
NAC10		10		41		123		881		16,967

Romania, for example, retained its regional structure at the third level but redrew the Level 2 breakdown. Poland, on the other hand, "reshaped its regional structure completely, moving from 49 Level 3 voivodships to 16 Level 2 voivodships and than negotiating with Eurostat a Level 3 structure which grouped together numbers of smaller (Level 4) regions. The Czech Republic, Bulgaria and Slovakia also radically reshaped their regional breakdown and, as recently as late 2001, Estonia modified three of its five Level 3 regions in order to better reflect the population distribution and economic structure of the country. From January 2003, Poland has one more region at Level 3. Statistical Regions have now been defined for all candidate countries, including Malta, Cyprus and Turkey" (CEC 2005b).

Table 2 shows Eurostat's nomenclature of Statistical regions for the 13 candidate countries. Again, NUTS regions which correspond with administrative structures of major importance are underlined, while non-administrative regions are not underlined.

For the subsequent empirical research in TRANSFORM this means that, while we strive for NUTS2 regions as this is the most widely used regional level used in EU statistics, we will need to take full account of the regional dimension of national administrative systems. This means that in cases where NUTS2 regions are without much practical meaning for policy-making, the analysis has to shift its focus to the related NUTS1 or (selected) NUTS3 regions.

While NUTS has been defined only for the Member States of the European Union, for the candidate countries awaiting accession to the EU, for the other European Economic Area (EEA) countries and for Switzerland a coding of statistical regions has been agreed between Eurostat and the countries concerned, see Table 3.

Table 3: The NUTS system in the latest NMS and Candidate Countries[12]

	LEVEL 1		**LEVEL 2**		**LEVEL 3**		**LEVEL 4**		**LEVEL 5**	
BG	Rajon	2	Rajon za planirane planning region	6	Oblasti	28	Obshtini	262	Naseleni mesta	5340
HR	Hrvatska		Regija	4	Županija	21				
RO			Regions	8	Judet + Bucuresti	42			Communes + Municipiu + Orajse	2951
TR	Bölgeler	12	Alt Bölgeler	26	Iller	81	Ilceler	923	Köy	37,675

[12] http://ec.europa.eu/comm/eurostat/ramon/nuts/statistical_regions_en.html [retrieved 2007-01-28, 16:00]

3 Conceptualising Transformative Use of ICTs

Above we identified three key domains for which indicators are to be developed:

- The degree to which individuals, firms and the public sector are endowed with **social capital** and engaged in maintaining and creating it through ICT-based or ICT-enhanced **networks and networking activities**;
- The extent to which regional actors are engaged in ICT-based or ICT-enhanced **lifelong learning and collective learning**, and the translation of these into **innovation**;
- The level of ICT-enabled or ICT-enhanced **participation in decision- and policy-making** in the regional society, including issues of **empowerment** of citizens, workers, and SMEs.

In this section, we will take a closer look at each of these. The challenge will be to identify existing indicators which are (or could be) applied to measure the extent and success with which regions apply ICTs for making progress in each of these three domains.

There has been a large number of initiatives towards defining indicators on ICT usage which go beyond simple measures of readiness and uptake[13]. Most of these, however, have been concerned with indicators to be applied at the national level. As outlined in section 2.4, regional policy-makers have specific requirements when it comes to indicators which can inform political action. The following discussion of individual indicators will therefore try to assess how relevant existing indicators might be for regional benchmarking.

Before reporting on existing indicators, we will in chapter 3.1 to 3.3 discuss the main issues which are of interest from the viewpoint of transformative use of ICTs for regional development, based on the main findings from theoretical and empirical research in each of the three indicator domains.

3.1 ICT-enabled Networking and Social Capital Building

The Network Economy

Not only since Manuel Castells' seminal work on the "Rise of the Network Society", the network as structure of social organisation has attracted increasing interest among those with an interest in the relevance of ICT for economic and social development (Castells 2000a; 2000b; 2004). Castells established the term "network enterprise", a key characteristic of which is that "while the firm continues to be the unit of accumulation of capital, property rights (usually), and strategic management, business practice is performed by *ad hoc* networks" (emphasis in original). This means that a key element underlying transformative change in businesses relates to structural changes in business processes, enabled by ICT and impacting, in particular, upon the depth and effectiveness of inter-firm networking and collaboration (e.g. supply chain integration, joint R&D, "coopetition", etc.).

In economic thinking, **flexible networks** are seen as a highly competitive alternative to hierarchical, vertically integrated organisations (considered as prototypical of the industrial era) on the one hand, and transactions on the free market (which suffer from lack of trust) on the other hand (Picot et al. 2003). Indeed, there is much evidence that **collaboration tends to boost innovative activity and performance**, in spite of the fact that co-operative endeavours are usually far from trouble-free. A paper from Frenz et al. (2004) looked at the evidence from the third European Community Innovation Survey (CIS) to test between co-operation and innovation. It found a statistically significant positive association between co-operation on the one hand and innovative activity on the other. This result was established both for co-operation between firms and for co-operation between firms and universities. Still, the paper found that surprisingly little co-operative activity actually takes place. One reason for this may be that the pay-back from innovative activity may vary, depending on a range of factors including the degree of absorptive capacity within the firm in question. Such capacity might require skilled personnel, investment in equipment, and a degree of internal R&D. The paper therefore tested for such factors, and found a statistically significant correlation between these and the propensity to innovate. The results thus call for policy action to encourage firms to co-operate, including

[13] For an overview, see OECD (2005b) and Empirica (2005).

collaboration with universities. The authors also suggest that it will be vital to enhance the absorptive capacity of SMEs in Europe (cp. Arundel & Hollanders 2006).

There is also an extensive literature about the **effects of ICT on firm performance**, which in more recent years has benefited from a large number of empirical research studies using firm-level data (for an overview, see OECD 2003a; 2004a). Apart from the direct effect stemming from the ICT-producing sector, positive effects on productivity result from capital deepening through ICT investments and from ICT use, both taking place in all parts of the economy.

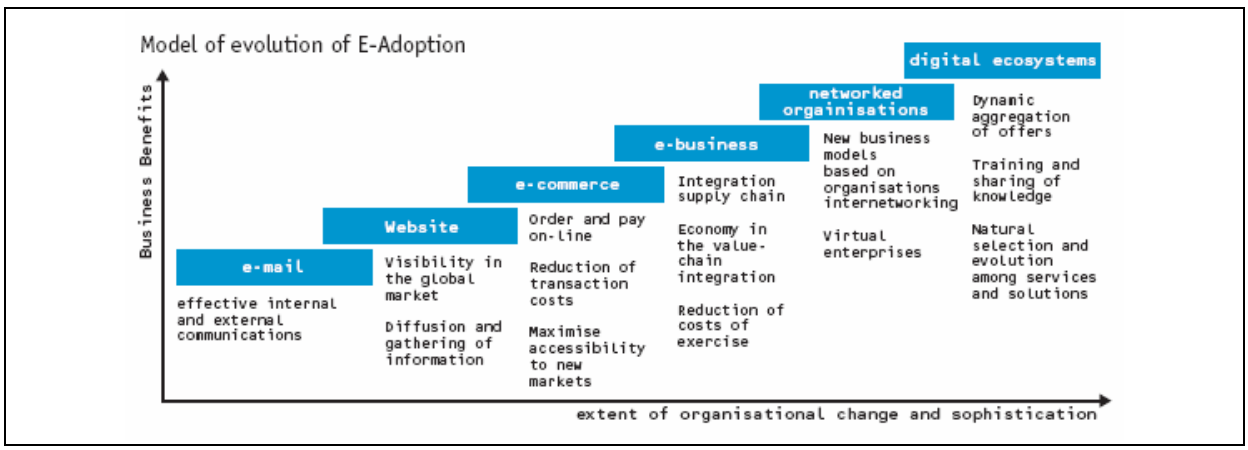
How can we best make sense of the ICT- and collaboration-related transformations which have affected firms in recent years? Many researchers and management consultants have approached this question. Many of them have come up with more or less convincing models of change. The fact that much of the discussion is being heavily influenced by authors with a business management background means, however, that it is not always easy to distinguish scientifically robust insight from the hypes of the day.

We must not fall into the trap of assigning technology (in this case, computer networks such as the Internet) the power to bring about transformative change in the business world. Rather, as Castells clarifies, "the Internet diffused rapidly in the business world during the 1990s because it was the appropriate tool for the business model that had emerged in the practice of the most productive, competitive firms since, at least, the 1980s" – long before the Internet became the topic of business interest. One of the requirements which was met by computer networks and the Internet was the "need for chosen-time, high-capacity, high-speed, interactive communication, via data transmission" (Castells 2001: 68). Castells considers as the specific contribution of the Internet (as opposed to earlier established technologies of computer networking) the following: scalability, interactivity, management of flexibility, branding, and customization in a networked business world.

Recent years have brought some clarification about the exact pathways in which business applications of ICT impact on performance. As a result, substantial progress has also been achieved in developing frameworks, constructs and indicators for measuring firms' use of ICTs and impacts derived from this (Clayton 2002; Clayton & Criscuolo 2005; OECD 2005b). The extent to which implementation of ICT is embedded within structural changes in business processes aiming at increasing depth and effectiveness of inter-firm networking and collaborative modes of production plays a key role.

Among the numerous models which try to conceptualise different degrees of transformation using ICT, the **e-Adoption Ladder** developed by the UK "Information Age Partnership" led by CISCO (see Figure 5) appears to be the most widely acknowledged (CEC & IBM 2003).

Figure 5: The "e-Adoption Ladder"



Source: CEC and IBM (2003)

The model shows that the adoption process can be characterised in terms of progression through a number of key steps. Organisations would typically start by introducing e-mail to achieve more efficient communications both internally and externally, then progress through a simple web presence, towards taking and placing orders online (e-commerce). Eventually, firms implement ICT throughout their internal business processes and external supply-chain (e-business). In the most advanced cases ICT is used to completely re-invent the business model by scrutinising the roles of value chain partners and remodelling roles & processes in order to maximise network productivity.

The problem is that small and medium-sized enterprises (SMEs), which make up the vast majority of the EU economy, find it persistently difficult to collaborate and network with external organisations – especially if these are not located in their vicinity (Frenz et al. 2004). Their is a recognised need for regional policy-making to help increase the **capacity of local SMEs for collaborative networking**.

Rusten & Cornford (2003) stress, however, that no automatism should be postulated which would imply that all businesses need to take all steps of this ladder (in consecutive order). In fact, increasing transaction costs might undo any benefit from a network-type organisation in cases where trust relationships are of vital importance.

Many researchers have stressed that ICTs are (particularly) social technologies and that "their full power is only unlocked in a broader social context" (Cornford et al 2006). The most successful applications of e-business tend to be those which are undertaken not by individual businesses alone, but through co-ordinated adoption of technologies and standards by a number of interrelated actors (firms and their forward and backward linkages, intermediaries, government agencies). From this point of view, the object of technology "adoption" is not so much the firm but rather a wider "social" entity – perhaps the supply chain, the cluster, or the sectoral business community. This insight has recently pointed attention at what has become known as the **digital business ecosystem** (Nachira 2002; O'Callaghan 2005). Of course, not all of these multi-organisational entities are tightly regionally bounded, but they do all have strong spatial characteristics.

Social and Network Capital

In recent years, the notion of **social capital** has attracted much interest in the public debate, in particular with regard to strategies for fostering economic and social development in the Information Society and Knowledge Economy (OECD 2001b; CEC 2003b) The European Council passed a "Resolution on Social and Human Capital" in 2003.

Schuller et al. (2000) observed that the key benefit of the notion of social capital lies in the way in which it shifts the focus of analysis from the behaviour of individual agents (individuals, firms, public agencies) to the **pattern of relations between agents, social units and institutions**.

Social capital is usually understood as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit. Social capital thus comprises both the network and the assets that may be mobilized through that network" (Nahapiet & Goshal 1998: 243). In general there is the assumption that social capital has positive effects not only on those who "own" it, but also for the community (region) at large. This is due to the externalities generated by social behaviour, which often have the form of network externalities (Iyer et al. 2005). High stocks of social capital in a region are associated with relative ease of the sharing of knowledge and expertise, with community building and social cohesion.

In their influential paper from 1998, Nahapiet and Ghoshal pointed out three distinct dimensions of social capital[14]:

- a **structural dimension** (network ties, network configurations and organisation);
- a **cognitive dimension** (shared codes and language, shared narratives);
- a **relational dimension** (trust, norms, obligations, identification).

Clearly, **trust** is a key component of any definition of social capital. Unfortunately, as Nandhakumar (1999: 47) points out, "the notion of trust is often seen by researchers as the most difficult concept to handle in empirical research because of the diverse definitions of trust used in each discipline and the multitude of functions it performs in the society". The same may be said about shared codes, language and narratives, which make up the cognitive dimension of social capital.

For development of statistical indicators, therefore, it appears that the structural dimension is of most importance because of the more elusive nature of the cognitive and relational dimensions. Moreover, network ties and their utilisation can be interpreted as outcomes of the cognitive and the relational dimensions (i.e. a shared understanding and a feeling of trust are conditions for network building and maintenance), which means the extent and structure of networks may well be good indicators for

[14] Adler & Kwon (2002) suggest a three-dimensional structure which bears resemblance to the above and distinguishes between opportunity, ability and motivation.

these dimensions.

The focus in TRANSFORM, therefore, is on networks as agents of social and economic transformations, and as expressions of stocks and investment in social capital.

The challenge here is that networks appear to be, in general, under-researched – at least as far as statistical measures are concerned. Indeed, empirical evidence on inter-linkages, networks and flows between regions/cities (and actors within them) is relatively scarce. As Peter J Taylor, the initiator of the World City Network Project, has shown, the underlying cause for this can be traced back to the rise of the nation-state in the 19th century. Modern statistics has been developed by states for state-related purposes (Taylor 2002):

> *States are the great producers of publicly-accessible evidence on all social activities which is why the results are called stat-istics (albeit without the hyphen!). Our social world is described by states for state purposes. Whether UN statistics at the international scale or local statistics at the sub-national (regional or urban) scale, state agendas are intrinsic to the information gathered.*

Using Castells' (1996) influential distinction between the "space of places" and the "space of flows", Taylor concludes that "we are provided with masses of information to describe and analyse spaces of places, but relatively little for serious consideration of spaces of flows" (Taylor 2002: 6-7). In a similar manner, Sheller & Urry (2005) bemoan the dearth of research on "mobilities" (including interaction in virtual networks), which they see as symptomatic for a general situation of "social science as static".

Such claims appear to be supported by recent research into availability of indicators on "networkedness", collaboration and co-operation which crosses the boundaries of firms, regions, countries or even continents (e.g. Huws & Flecker 2004; OECD 2005a; Gareis 2006a; 2006b).

Whereas the notion of social capital has generally being considered in the policy process as something positive for those who are endowed with it (see for example Parissaki & Humphreys 2005), closer analysis reveals that there is a need to distinguish between different types of social capital if the purpose is to identify structures and developments which are conducive to economic development.

Indeed, newer research has stressed that social capital can have negative as well as positive effects with regard to, in particular, the ability to innovate (Florida 2002) and to respond to complex, changing environmental conditions (Prusak & Cohen 2001). A number of researchers have emphasised the possibility for "dysfunctional behaviour within tight-knit social networks" (Huysman & Wulf 2004: 6; see Uzzi 1997) and the superiority of weak ties over close ties for regional innovation (Florida 2002: 267-282, see also Portes 1998). Huysman & Wulf (2004: 7) list the following potential problems in relation to networks which are characterised by strong bonding capital: "restrictions imposed on actors who do not belong to the network; a lack of perception concerning environmental changes outside the network; negative social dynamics within the network and a downward levelling of norms; a dependency on central actors and their loyalty toward the network; restrictions on autonomy and individuality resulting from demands for conformity; irrational economic behaviour due to a feeling of solidarity toward partners in the network; irrational economic behaviour due to personal aversion". We conclude that any attempt to compare or benchmark regional systems according to the strength of social capital accumulation should be careful to take account of the possibility of both positive and negative impacts of networks characterised by "close ties" (Bresnen et al. 2004).

The distinction between strong ties and weak ties was originally suggested by Granovetter (1973) who famously proclaimed "the strength of weak ties" and pointed towards the increasing importance of weak ties for success in social and economic domains. The term "weak ties" might be misleading, though, as O'Brien et al. (2005: 1046) point out: "The essential characteristic of bridging social capital is not its weakness or strength but rather its extensiveness and inclusiveness". In order to avoid such confusion, Woolcock (2001) proposes three types of social capital:

- **bonding social capital**, i.e. strong ties between like people (or organisations) in similar situations;
- **bridging social capital**, i.e. more distant or "weak ties" of like persons (or organisations);
- **linking social capital**, i.e. weak ties which reach out to unlike people/organisations, such as those which are entirely outside of the community or in a different sector.

This refers to another distinction being made, between horizontal ties (linking together like people or organisations) and vertical ties (linking together unlike people or organisations), see Figure 6.

Figure 6: Types of Network Ties

	horizontal	vertical
intra region	bonding or bridging social capital	linking social capital
inter region	bonding or bridging social capital	linking social capital

Source: Based on Cornford et al. 2006

Note that strong (bonding) ties do not rely on physical proximity (although they tend to be fostered by it). A typical example of bonding ties which stretch across distance are family ties. But bonding ties can also be developed to people as yet unknown, as in the case of faith-based strong ties which are extended to strangers on the basis of a joint religious faith. Al James (2005) observed such strong ties in his case study on Mormonism.

It appears that the relative importance of weak ties has, indeed, increased at the same time that economic success is being based more and more on the success of inter-firm collaboration and international network-building. This also relates to the increasing importance of tacit knowledge and its transfer (Polanyi 1966) in the knowledge-based economy and society, and to the notion of industrial clusters (for an overview see Asheim et al. 2006).

Bresnen et al. (2002) point out the contingencies that are likely to make social capital enable or inhibit learning and innovation in organisational settings. Small, newly established firms in industries which are characterised by high importance of tacit knowledge (e.g. high technology) are likely to rely heavily on social capital for the development of innovative products and processes (Powell 1998) and their distribution. The situation appears to be different in larger, well established organisations in mature industries for which the inward-looking aspect of social capital can result in a potentially dangerous insulating effect and over-dependence on established inter-organisational connections (Bresnen & Marshall 2002). It follows that regions which want to participate in the dynamic development of knowledge-intensive industries need to be supplied with sufficient amounts of social capital.

There is some evidence which suggests that bridging social capital, in particular, may be undersupplied in many EU regions. For example, Iyer et al. (2006: 1017) point out: “In many countries, both developed and developing, such [bridging] social capital is considerably under-provided and it has been argued that without such social capital, the opportunities for social exchange are lowered and the potential for destructive conflict is raised”. For this reason, policy-makers try – more or less explicitly – to foster the creation and maintenance of social capital, and also voice concern when evidence occurs which suggests that (some) social capital is in danger of being eroded (compare the public debate about the conclusions from Putnam’s work in the later 1990s/early 2000s; see Field 2003).

In this context, the possibility to use ICTs as a means to foster social and human capital building, as well as the risk that ICT-mediated human interaction may deplete stocks of social capital, have been discussed extensively (Kraut et al. 1998; Putnam 2000; Katz & Rice 2002; van Bavel et al. 2004; Anderson et al. 2006).

The “impact” of ICTs on social capital has been heavily discussed for many years already. The original proposition, mainly influenced by the publications of Kraut et al. (1998) and Putnam (2000), was that communication through the Internet “inhibits interpersonal collaboration and trust” and, as such, would be detrimental for social capital building and maintenance.

As Kraut and his team of researchers later admitted, most empirical evidence collected in the aftermath of their study (including their own, see Kraut et al. 2002) found that the Internet tends to strengthen existing social capital. Katz & Rice (2002: 328-9) summarise the findings from their own as well as other’s research as follows:

- The Internet makes it easier and more effective to participate in all the traditional forms of social capital;
- It also contributes to overall levels of social capital. This is done often by people acting in self-interest, which as a result of network effects creates both individual-level and collective level social capital – intentionally or not. “The Internet provides more opportunities to activate resources and create new knowledge for oneself and others” (ibid: 334). Internet users were found to be

significantly more likely to have a sense of belonging to a social group than non-users (after controlling for demographics).

- More surprisingly, the Internet also builds new forms of social capital, at least in so far as "computer-mediated communication is not included in definitons of the social-capital processes of community, interaction, or participation" (ibid: 335). For example, the researchers found that "those who tend to be introverted find their social contacts expanded via the information relative to their nonsurfing counterparts.[...] This means that the "being an Internet user is itself a source of online sociability" (ibid: 264).
- Moreover, the Internet offers immense potential for identifying and interacting with people who have common interests, as suggested for example by the proponents of the "virtual communities" idea (see also Rheingold 2000). The current debate about what has been termed "Web 2.0" (Benkler 2006), which is being taken up enthusiastically by users (see OFCOM 2006a; 2006b), as well as likely future developments in mobile applications (Rheingold 2002; Mitchell 2004); point towards an increasing range of possibilities for Internet-based social innovations to transform patterns of sociability.

These results were upheld after controlling for the degree of offline sociability and for a number of personal characteristics which can be expected to affect the dependent variable.

In line with these findings, an increasing number of commentators and researchers point out that the Internet can play a decisive role in transforming access to social capital. Indeed, ICTs appear to be of special value for maintaining strong and weak ties which are inhibited by physical distance: "The Internet is effective in maintaining weak ties, which otherwise would be lost in the trade-off between the effort to engage in physical interaction (including telephone interaction) and the value of the communication" (Castells 2001: 129). Katz and Rice (2002: 353) follow from there own extensive empirical research that "the Internet does not reduce social capital but rather contributes to social capital [and] innovative uses of the Internet build what is commonly thought of as social capital". These findings are confirmed by the extensive research carried out by Barry Wellman (see Wellman 2001; Quan-Haase et al. 2002; Wellman and Quan-Haase 2004). In a recent study by Pew Internet (Boase et al. 2006), the focus was on whether Internet users derive a personal benefit from the social contact-enabling characteristics of ICTs. The main results suggest that this is indeed the case, see Table 4.

Table 4: The Strength of Internet Ties: Summary of Findings from Pew Internet Study

The Internet plays socially beneficial roles in a world moving towards "networked individualism."
E-mail allows people to get help from their social networks and the web lets them gather information and find support and information as they face important decisions.
The Internet supports social networks.
E-mail is more capable than in-person or phone communication of facilitating regular contact with large networks.
E-mail is a tool of "glocalization". It connects distant friends and relatives, yet it also connects those who live nearby.
E-mail does not seduce people away from in-person and phone contact.
People use the Internet to put their social networks into motion when they need help with important issues in their lives.
The Internet's role is important in explaining the greater likelihood of online users getting help as compared to non-users.
Americans' use of a range of information technologies smooths their paths to getting help.
Those with many significant ties and access to people with a variety of different occupations are more likely to get help from their networks.
Internet users have somewhat larger social networks than non-users. The median size of an American's network of core and significant ties is 35. For Internet users, the median network size is 37; for non-users it is 30.
About 60 million Americans say the Internet has played an important or crucial role in helping them deal with at least one major life decision in the past two years.
The number of Americans relying on the Internet for major life decisions has increased by

one-third since 2002.
At major moments, some people say the Internet helps them connect with other people and experts who help them make choices. Others say that the web helps them get information and compare options as they face decisions.

Source: Boase et al. 2006.

While the general pessimism expressed by Putnam (2000) and others, therefore, appears to be unfounded, another observation by Putnam is still much debated: In his words, "anyone who thinks the Internet could restore social capital lost through other means is a wild-eyed optimist". In fact, quite some empirical research, including the study by Millard & Christensen (2004), suggests that ICTs are unlikely to create social capital and a sense of regional identity where these are undersupplied in the first place. Analysis of a major local ICT initiative, the Blacksburg Electronic Village, made Kavanaugh & Patterson (2002) conclude that "social capital may turn out to be a pre-requisite for, rather than a consequence of, computer mediated communication". If this was found to be true, it would be hard to sustain the claim that ICTs can have a transformative 'impact' on regions with regard to social capital building.

As pointed out already, the evidence collected by Katz & Rice (2002) suggests otherwise. They claim that the Internet also **builds new forms** of social capital "that are in many ways different and more powerful than the local, physical means of earlier areas" (ibid.: 332). This mainly refers to the new types of sociability enabled by the Internet (Benkler 2006) as well as by mobile ICTs (Castells et al. 2004). Among these new forms, there is also what some scholars call **sociotechnical capital**: "productive resources that inhere in patterns of [impersonal] social relations that are maintained with the support of ICTs" (Resnick 2005: 400). This comprises automatic taste matching, recommender and reputation systems which are being applied not only for commercial purposes (cf. eBay, Amazon), but also for helping users identify relevant news and form their opinion.

The original perception of the Internet being detrimental to social capital may have been the result of a lack of contextualisation. As Katz & Rice (2002: 117) state, "any analysis of the relationship between new media or technologies such as the Internet and changes in the nature of and involvement in communities is naturally confounded with the changing conceptualization and reality of community itself". Indeed, Castells reminds us that the Internet, and the community-building which takes place in cyberspace, need to be interpreted as exacerbating a well-established trend in western industrialised countries, i.e. "a historical process of separation between locality and sociability in the formation of communities: new, selective patterns of social relations substitute for territorily bound forms of human interaction" (Castells 2001: 116). The change in the types of social capital which are sought, certainly enabled by the Internet and other ICTs, has its root in a growing diversity of sociability patterns which are themselves not caused (primarily) by any technologies.

Against this background, Barry Wellman (2001: 1) suggests a working definition for communities which is detached from earlier notions of community as being spatially bounded: "networks of interpersonal ties that provide sociability, support, information, a sense of belonging, and social identity".

We can conclude with Castells (2001: 127-128) that, since individualism is the currently "dominant trend in the evolution of social relationships", the evolving patterns of sociability could be best described as "networked individualism" with the nuclear family in the household at its core, "from where networks of selective ties were built according to the interests and values of each member of the household".

Networking of Regional Government and Public Administration

For description of options for implementation of the Internet in the public sector, the concept of an **adoption ladder** (see above) has also been applied to **e-government** (Mansell & Nikolychuk 2002; UNO 2005). It indicates the depth with which governments have reorganised their service delivery through ICT, distinguishing between five stages:

- establish a basic official website – "emerging presence",
- extend the non-interactive website presence – "enhanced presence",
- provide limited interactivity – "inter-active presence",
- provide transaction capability – "transactional presence", and

- provide 'one stop' interactive services – "networked presence".

Intra-regional ICT networks certainly play a huge role in the **reorganisation of government back-offices**. A recent review of good practice in the area (Millard et al. 2004: 24-25) identified eight promising reorganisation strategies:

- "Digitisation of largely unchanged back-offices – typically where existing back-office arrangements function well, so are easy to digitise without significant changes enabling high quality on-line services to be implemented for users.
- Deep reorganisation of back-offices – this strategy is required where existing back-office arrangements are complex, not integrated and maybe in crisis, so that significant reorganisation is required in order to implement high quality services for users.
- Centralisation of back-office and de-centralisation of front-office functions – represents a rationalisation of back-offices and their functions (e.g. data-storing and management) in order to increase efficiency and make savings, whilst recognising that users require local contact or adaptation.
- Back-office clearing house – a useful strategy where existing back-office arrangements are relatively complex and often not integrated but are difficult to change, so a separate data exchange mechanism is established for use both between agencies and with users thus ensuring high quality on-line services.
- Generic types of interaction between user and agency – can provide important economies of both scale and scope by modularising common back-office or service components over a broad area, whilst retaining flexibility to adapt to specific requirements.
- Portals – a user-centred approach which presents bundles of existing services in a manner and context suitable for particular user activities or profiles, rather than reflecting existing back-office arrangements.
- Pro-active services – as back offices become more and more integrated and able to share data and resources amongst themselves, it is possible to offer services which require little or no initiative from, or action by, the user, thus saving the user time, expense and effort. Giving user greater control over back-office data and service components.
- Greater user responsibility and control – greater back-office integration and interoperability enables users to take more responsibility and initiative, so the user can determine, largely on an individual basis, precisely where, when and how the service is to be used."

All of these require increased levels of inter-agency networking, which often turns out to be an organisational rather than a technical challenge.

Social networking between representatives of regional governments has a long tradition in Europe. Main goals of such activities are exchange of experience and good practice, comparative analysis and benchmarking, and joint learning processes in more general. At the EU level, examples include **Regional Innovation Strategies** (RIS) and **Regional Innovation and Technology Transfer Strategies** (RITTS), two instruments implemented in the second half of the 1990s. The objective behind RIS/RITTS was to pilot a bottom-up methodology for strengthening regional knowledge transfer capacities. The process was to be based on open dialogue – informed by careful analysis of the economic situation – between regional and national authorities, research centres, universities, chambers of commerce and other actors.

Another important networking platform is **INTERREG**, a Community initiative which aims to stimulate interregional cooperation in the European Union, financed under the European Regional Development Fund (ERDF). In a large number of INTERREG projects, regional governments have co-operated and exchanged knowledge, often based on social capital newly created through meetings, attendance at conferences and intensive communication through the phone and e-mail, supplemented by face-to-face interaction.

Inter-regional networking also takes place through a number of open networks for knowledge exchange. These include networks which focus on the development of local and regional Information Society strategies, such as **TeleCities** and **ERIS@**, the latter being consortium partner in TRANSFORM.

3.2 Lifelong and Collective Learning and Innovation

Lifelong Learning for the Knowledge-based Economy & Society

It has become more and more obvious in recent years that the role of learning and training needs to change if the basic objectives of regional policy making are to be met. Knowledge has become the most important factor of production for the majority of economic activities, deciding about the economic fortune of companies, regions, countries and continents (Sianesi & van Reenen 2002). Knowledge also determines more than ever before the probability of an individual achieving personal well-being and economic wealth (London Economics 2005).

But not only has knowledge become more valuable – it has also become less durable. The increasing speed with which market environments change with regard to technology, the structure and dynamic of capitalist economy and the regulatory framework have affected the type of skills which are required at any given point in time. It is now clear that the skill input must be constantly adapted to account for changes in requirements. Traditionally, basic skills and qualifications that are necessary to compete in the labour market were acquired in the initial stages of continuous, full-time education in school, vocational training, universities, gradual schools, etc. These set the ground for the following stage(s) of gainful work. In the information society, training and working must to some extent take place in parallel, interacting with each other. This becomes clear in the face of estimates which put the average half-life for technical knowledge at 3-5 years and estimate that complete obsolescence sets in after 6-10 years (Finke 2000: 5).

Such shortening of skill life cycles is the result, in particular, from the shortening of product life cycles that is being enabled by technology and enforced by economic restructuring and globalisation. The intensity of research and development associated with creating new products has steadily increased in recent decades. Competitive forces are bound to lead to a further acceleration of the process of translating innovation into marketable products and processes. As new products and processes are associated with new skill requirements, skill life cycles, too, have shortened and will decrease further in the future. This process has resulted in skill requirements not being in sync anymore with the traditional working life cycles of individuals. Workers can to a much smaller extent rely on being able to market the skills they have acquired in the early stages of their life throughout their lifetime; rather, they have to constantly adapt their skills to the demands of the labour market. This means that distinctions between education and work are becoming increasingly blurred. This belief is behind the concepts of lifelong learning and continuous training (OECD 1996). Lifelong learning is defined, sensibly, by the European Commission as “all purposeful learning activity, undertaken on an ongoing basis with the aim of improving knowledge, skills and competence” (CEC 2000a: 3).

Skills and knowledge are, of course, not only needed for participation in the labour market but also for non-economic activities, as the Commission’s Memorandum on Lifelong Learning observes: There are “two equally important aims for lifelong learning: promoting active citizenship and promoting employability” (CEC 2000a: 5). This means that skills and knowledge also fulfil an important role for quality of life in general (by allowing individuals to realise their full potential), and for the development of society (by fostering democracy, reducing the disparities and inequities among individuals and groups, and promoting cultural diversity). While the skills required in this respect might be less dependent on technology in comparison to economic activities, it is safe to say that the speed of change has increased in all aspects of daily life, which is at least partly a result, again, of the wide-spread implementation of ICTs.

We can conclude with Castells (2001: 258) that “if there is a consensus about the societal consequences of increased access to information it is that education and life-long learning become essential resources for work achievement and personal development”.

Incidental (experiential) learning

Traditionally, analysis of education systems and rates of participation in education and training were concerned only with the formal education system and the systems for what is called non-formal education and informal learning (cp. ISCED definitions). All of these are limited to structured and purposeful learning processes.

In recent years, a number of authors have suggested that rather than these, it is actually incidental (experiential) learning which is the most important way in which people acquire skills, thereby implying

that such learning is capable in theory to fulfil a similar function as more formal learning activities e.g. in courses (Dohmen 2001; Tuomi 2006). The main obstacle to recognition of incidental learning is seen as the lack of accreditation (Björnavold 2000), which means that skills are usually only acknowledged and rewarded on the labour market if they have been acquired through formal education activities.

This brings up an essential question for the debate around lifelong learning: If it is correct that incidental learning is more important than learning in more formal settings, does this imply that efforts which aim to increase adults' participation in training courses and other structured and intentional learning activities should be abandoned, and that policy should rather concentrate on boosting chances of people to acquire knowledge through experience (such as "learning by doing" on the job)?

Some evidence indeed suggests that incidental learning has a significant role to play in skill acquisition:

- A US study of about 1,000 workers in seven companies found that roughly 70 percent of the job training received by employees is informal, and concludes that "informal learning was widespread and served to fulfil most learning needs. In general, we noted that informal learning was highly relevant to employee needs and involved knowledge and skills that were attainable and immediately applicable. [...] Workers constantly learn and develop while executing their day-to-day job responsibilities, acquiring a broad range of knowledge and skills" (Center for Workforce Development 1998: 1).
- In Germany, the "Berichtssystem Weiterbildung" reports that three out of four persons in employment state to learn informally for their job (BMBF 2003: 56). Knöchel (2000: 109) estimated for Germany that 80% of the complete learning undertaken by adults takes place informally.
- Data from an the eBusiness Watch survey (2002) shows that enterprises regard "learning on the job" clearly as the most important way to develop IT skills in the company. About 60% of enterprises say that "learning on the job" is "very important", much more than in the case of formal training schemes. This confirms results from the BISER survey targeted at workers (Salzburg 2004).
- Livingstone (2000, 2001) who conducted the first Canadian national survey on adults' informal learning practices found that adult Canadians spend on average 15 hours per week on informal learning (most of which related to paid or unpaid work), in addition to 4 hours per week spent on average on participation in training courses. 95% of adult Canadians were involved in some form of adult learning which they can identify as such.

In spite of these findings, we must be doubtful about the ability of experiential learning to prepare people for change (as opposed to coping with change) – something which has become vitally important in times when we all need to adapt much quicker to the ever-changing socio-economic environment (OECD 2002b). There is a wide-spread perception of lack of skills among workers as well as among employers – which seems to imply that even if the large majority carries out incidental learning, it appears not to be able to meet all skill needs. Anecdotal evidence would also suggest that more formal, purposeful learning, especially if it yields a form of certification, provides benefits in the form of higher self-esteem and motivation.

Therefore, we must conclude from the research into incidental learning that working (and living) in an environment which is rich in experience (for example having a computer workplace with access to the Internet) has a major influence on the amount of skills a person is likely to acquire, regardless of the extent of taught learning they are involved in. The potential of ICTs for transforming the acquisition of knowledge and skills is, therefore, by no means limited to intentional and structured processes of education and training.

eLearning

Against the background of a growing need to engage more people in lifelong learning, and to increase the efficiency and effectiveness of learning activities, attention has focused on the potential contribution of ICTs. There is the hope that ICTs can improve the process of learning and training, by giving easier access to more adequate learning content and more efficient learning techniques. It has long be understood that eLearning can help meeting the challenge posed by the need for lifelong learning. "Lifelong learners will require personalized curriculums, individual guidance, and sophisticated and flexible delivery concepts for a new type of competence-focused learning

experience which allows them to learn anything and anywhere" (Finke 2000: 28). Only by exploiting the potentials of ICT will it become possible to offer such services to large parts of the population. In particular, ICTs are expected to make self-learning more attractive to larger numbers of citizens. For these reasons it can hardly surprise that already in 1999, proponents of eLearning exclaimed that "the Internet could probably be classified as one of the most powerful and important self-directed learning tools in existence" (Gray 1999: 122).

The following is a list of advantages which are usually ascribed to web-based forms of learning against traditional types of learning (see Finke 2000; Attwell et al. 2003; L-CHANGE 2003). eLearning is said to:

- Make learning resources and tools accessible anytime, anywhere. It is therefore optimally suited for a world of flexible e-work, distributed organisations, and the "24-hour-society";
- Eliminate travel expenses;
- Give just-in-time access to timely information;
- Allow content to be updated quickly and centrally – a key advantage over off-line electronic training material such as CD-ROMs;
- "Empower the learner" (OECD 2001c: 22-23) by means of personalised learning (learner-controlled, self-paced) – enabled by modularity of presentation; higher retention of content is the likely result;
- Provide true interactivity and simulations of real-world events which can increase learner's motivation;
- Improve collaboration and interactivity among students;
- Be less intimidating than instructor-led training – students can try new things and make mistakes without exposing themselves;
- Allow providers to directly measure the effectiveness of training programmes in a way that was never possible before;
- Give advanced possibilities for management and control of the learning process.

These advantages explain why eLearning can contribute considerably to the provision of learning and training to individuals who are in risk of being left behind by the development towards the information society, as the ESDIS group stresses in their report on e-inclusion (CEC 2001: 30):

> *e-Learning can make a major impact for social inclusion. It provides access to education and training opportunities for all, in particular for those who have access problems for social, economic, geographic or other reasons. ICT offers possibilities of transforming the learning paradigm and bringing knowledge to those who have not earlier been able to participate in education. eLearning can also play a significant role in implementing the concept of flexible and individualised learning, answering individual education needs, and avoiding the limitations of current systems, based mainly on pre-defined options.*

The main objective of policies which try to foster eLearning is less, therefore, to substitute for less efficient or more costly types of learning, but rather to increase the overall amount of participation in learning (see Dohmen 2001).

Such positive effects of eLearning will not come about automatically. Rather, it will require determined policy action to exploit the potential of ICTs for social inclusion: "The strategic challenge for e-Inclusion policies is twofold: to fully exploit the ICT potential to overcome traditional forms of social exclusion, while ensuring that all citizens [...] benefit from the Information Society" (CEC 2001: 4). The size of this challenge has transpired more and more in recent years which have seen some sort of backlash against the hyped-up expectations regarding the size of the eLearning market (OECD 2001c: 30) and the prospect of an immediate shift to universal lifelong learning (OECD 2003b: 7).

For a definition of eLearning, a distinction is to be made between:

- **Internet-enhanced training and education**, where the learner has opportunities to meet face-to-face with the instructor. Often, online delivery of training is supplementary here (and generally subordinate to) traditional face-to-face classes. It may replace materials previously delivered to students through the mail or handed out in person. Internet-based segments of the training are typically asynchronous, implemented through either a web editor or an asynchronous course management system.

- **Internet-delivered training and education**, where the learner is never (or very rarely) in physical proximity to the instructor. This is in some ways a successor to "distance education[15]", "correspondence courses" or "distance learning". Instructor-led traditional classroom sessions are either eliminated, adjusted for some different form of asynchronous interaction, or replaced with real-time "virtual classrooms".

Skills and Digital Literacy

The increasing power and versatility of ICTs have exerted a decisive influence on the speed and direction of economic restructuring in recent decades. In the advanced capitalist countries, the main 'impact' has been to substitute capital (in the form of ICT-driven machines) for labour. But contrary to earlier fears that this development would lead to mass unemployment, it appears that people are still needed for tasks for which computers are ill-suited. According to Levy & Murnane (2004: 13-30), the main characteristic of such jobs is that they require **complex pattern recognition**. Such complex pattern recognition is at the core of **expert thinking** and **complex communication**, two of the key meta-skills which Levy & Murlane identify as being of increasing importance in the knowledge-based economy and society:

- "Expert thinking: solving problems for which there are no rule-based solutions. [...] By definition, these are not tasks computers can be programmed to do. While computers cannot substitute for humans in these tasks, they can complement humans in performing them by making information more readily available";
- "Complex communication: interacting with humans to acquire information, to explain it, or to persuade others of its implications for action."

On the other hand, skills in doing things which computers are better at than humans – basically, those based on clear rules[16] – are becoming less valuable.

Castells (2001: 91) states that the most important objectives of the learning process have become "first, learning how to learn, since most specific information is likely to become obsolete in a few years [....]; secondly, having the ability to transform the information obtained from the learning process into specific [operationally valuable] knowledge". In this context, and with regard to the labour process, he speaks of the need for "self-programmable labour".

In so far as directly ICT-related skills are concerned, a distinction is being made between e-skills and digital literacy skills. E-skills themselves can be broken down into:

- **ICT practitioner skills**: The capabilities required for researching, developing and designing, managing, the producing, consulting, marketing and selling, the integrating, installing and administrating, the maintaining, supporting and service of ICT systems;
- **e-Business skills**: the capabilities needed to exploit opportunities provided by ICT, notably the Internet, to ensure more efficient and effective performance of different types of organisations, to explore possibilities for new ways of conducting business and organisational processes, and to establish new businesses.
- **ICT user skills**: the capabilities required for effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work (which is, in most cases, not ICT) or private life.

ICT Practitioner Skills: The current situation in Europe

In the aftermath of the burst of the so-called dot-com bubble, many observers claimed that previous projections of shortages concerning ICT practitioners were hugely overblown. Indeed, a number of studies (see e.g. Frinking et al. 2005) came to the conclusion that there were "no widespread significant shortages of ICT Practitioners within the EU at the aggregate level".

The same study, however, also pointed out that mismatches within the group of ICT

[15] Distance education is defined by Verduin & Clark (1991: 8) as "any formal approach to learning in which a majority of the instruction occurs while educator and learner are at a distance from one another".

[16] "Computers' comparative advantage over people lies in tasks that can be described using rules-based logic: Step-by-step procedures with an action described for every contingency" (Levy & Murnane 2004: 16).

Practitioners remain a challenge. Moreover, current trends with regard to students enrolled in ICT-related higher education courses point towards stagnation in many EU countries, which might risk the longer-term ability of EU employers to fill their skills needs.

In a research report published in September 2005 commissioned by Cisco Systems (Kolding & Kroa 2005), IDC explored the current situation and projected future development regarding networking skills, defined as "people needed to plan, design, manage, and support the networking technologies in the organization". Shortages are most significant in the area of "advanced network technology skills" (a subgroup of total networking skills) which deal with new network developments such as IP telephony, security, and wireless networking. For the whole of the EU, the study estimates:

[...] that the actual number of skilled people needed to fill the advanced skills gap will be around 160,000 in 2005, growing to some 500,000 by 2008. These figures represent skills gaps as a proportion of total demand of 8.1% in 2005 and 15.8% in 2008.

[Regarding total networking skills] IDC estimates a shortage of people with networking skills of around 230,000 in 2005, increasing to 615,000 by 2008. In percentage terms, the gap, as a proportion of demand, is expected to increase from 6% in 2005 to 11.8% by 2008.

Because of the significance of networking skills in a knowledge economy which is more and more driven by value generation in networks, the study authors stress that estimated skill shortages would be not so much a problem in themselves, but rather that they would keep down efficiencies and "hold back Europe's competitiveness in the global market".

In addition to these directly ICT-related skills, there are skills of a more generic nature which are required to fully participate in a society which is increasingly dominated by knowledge- and information-rich environments and technologically mediated communication. These are often subsumed under the term "digital literacy skills".

The notion of digital literacy takes on real meaning when it is understood as the extent to which individuals are endowed with digital competence, as defined in the "European Reference Framework on Key Competences for Lifelong Learning" (CEC 2005a): "Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication [and] is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet". Defined as such, the term refers back to more traditional notions of literacy which stress that people need not only basis skills such as reading and writing, but also the ability to understand information, to communicate ideas, express opinions and solve problems in order to function effectively in modern society. What counts today is not (only) the ability to handle ICT equipment and applications, but to use them appropriately and effectively to achieve one's goals in one of the four spheres of life: personal life, family life, work life, and community life.

The Commission Proposal on Key Competences for Lifelong Learning clarifies the term in more detail as follows:

> *Digital competence requires a sound understanding and knowledge of the nature, role and opportunities of IST in everyday contexts: in personal and social life as well as at work. This includes main computer applications such as word processing, spreadsheets, databases, information storage and management, and an understanding of the opportunities of Internet and communication via electronic media (e-mail, network tools) for leisure, information sharing and collaborative networking, learning and research. Individuals should also understand how IST can support creativity and innovation, and be aware of issues around the validity and reliability of information available and the ethical principles of in the interactive use of IST.*
>
> *Skills needed include: the ability to search, collect and process information and use it in a critical and systematic way, assessing relevance and distinguishing real from virtual while recognising the links. Individuals should have skills to use tools to produce, present and understand complex information and the ability to access, search and use internet-based services; they should also be able use IST to support critical thinking, creativity, and innovation. Use of IST requires a critical and reflective attitude towards available information and a responsible use of the interactive media; an interest in engaging in communities and networks for cultural, social and/or professional purposes also supports competence.*

For the conceptualisation of the different kind of skills which make up digital competence, the categorisation suggested by Steyaert and further developed by van Dijk (2005) is of particular value. They differentiate between operational (instrumental) skills, informational (structural) skills and strategic skills:

- Operational skills are needed to operate ICTs (computers, software, Internet connections, mobile devices);
- Information skills are required to search, select and process information from computer and network files, which implies the ability to structure information according to specific requirements and preferences;
- Strategic skills denote the ability to take own initiative in searching, selecting, integrating, valuing, and applying information from various sources as a strategic means to improve one's position in society. It often implies the continuous scanning of the environment for information which might be relevant to the four spheres of life: personal life, family life, work life, and community life.

It is important to take into account that digital literacy is by no means limited to the utilisation of the Internet. Any definition and operationalisation of digital literacy needs to include the full spectrum of (current and future) ICTs, which include mobile applications and services which are expected to become much more dominant in the coming years. More generally, any definition of digital literacy must be open to new technological and market developments which will become relevant in the future. Against this background, it may make sense to define as the focus of digital literacy any *ICT-enabled means with which to access, manage, integrate, or evaluate information, construct new knowledge, or communicate with others*.

The digital literacy skills outlined above refer in many ways to types of generic skills which are in demand on today's labour markets. Felstead et al. (2002), through In-depth analysis of the UK Work Skills Surveys, identified ten categories of generic skills and how these can be operationalised. In Table 5 the relevance of each of these ten skill categories for computer-mediated communication and interaction is discussed in brief.

Table 5: Skills categories of particular relevance for the Knowledge-based Economy and Society

Skills category	Description	Relevance for Employment in the Knowledge-Based Economy
Literacy Skills	Both reading and writing forms, notices, memos, signs, letters, short and long documents etc.	Essential because of the increasing dependence on text-based information.
Physical Skills	The use of physical strength and/or stamina	Low relevance.
Number Skills	Adding, subtracting, divisions, decimal point or fraction, calculations etc., and/or more advanced maths or statistical procedures	Increasing importance for interpreting and processing computer-generated information (Levy & Murnane 2004: 103-105)
Technical 'Know-How'	Knowing how to use tools or equipment or machinery, knowing about products and services, specialist knowledge and/or skill in using one's hands.	Technical knowledge of computers remains important. The degree to which specialist know-how is needed is, however, dependent on whether and how the supply-side will make progress in usability.
High-level Communication	Top-down communication skills, including persuading or influencing others, instructing, training or teaching people, making speeches or presentations and writing long reports. This skill is also linked to the importance of analysing complex problems in depth.	Relevant as increasing shares of workers are asked to carry out management tasks.
Client Communication	Selling a product or service, counselling or caring for customers or clients.	Relevant as increasing shares of workers have to communicate with customers.
Horizontal Communication	Working with a team of people, listening carefully to colleagues.	High relevance and interrelation with "technical know-how"
Planning	Planning activities, organising one's own time and thinking ahead.	Very high relevance (cp. Castell's notion of "self-programmable

Skills category	Description	Relevance for Employment in the Knowledge-Based Economy
		labour")
Problem-Solving	Detecting, diagnosing, analysing and resolving problems	High relevance as responsibility is distributed more evenly across workers of all ranks.
Checking Skills	Noticing and checking for errors.	High relevance as responsibility is distributed more evenly across workers of all ranks.

Source: First two columns from Felstead et al. (2002: 34)

Collective Learning and Innovation

The performance of regions in the knowledge-based economy is, of course, not only determined by the availability of a appropriate human capital base, but also by the ability of the regional system to generate innovation. Innovations are inventions which are being translated into marketable new products or new processes applied in operational contexts (Sundbo 1998: 1-2).

In this context, the concept of the **Regional Innovation System (RIS)** has found wide acceptance in the academic and policy debate. It is derived from the more well-established notion of the National Innovation System, defined by its main proponents Freeman (1987) as "the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies" and Lundvall (1992) as "the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge [...] and are either located within or rooted inside the borders of a nation state".

An RIS, then, can be understood as a system made up of a concentration of firms, which are interacting with each other, and associated non-market institutions (e.g. universities, research institutes, training institutions, standard-setting bodies, local trade associations, regulatory agencies, technology transfer agencies, business associations, relevant government agencies and departments) within the boundaries of a region. Together, these actors combine to create new product or process innovations.

Newer accounts often add further types of innovation, e.g. Tidd et al. (2005: 10) who distinguish between:

- Product innovation – changes in the goods and services offered on the market;
- Process innovation – changes in the ways in which goods and services are created and delivered (i.e. the production system);
- Position innovation – changes in the context in which these goods and services are introduced;
- Paradigm innovation – changes in the "underlying mental models" which frame what an organisation does.

The capability of the European economy to generate innovation has been at the centre of political debate for many years now. The Lisbon agenda, in its original as well as its revised form, bears evidence of a widely held concern, namely that Europe's performance in the translation of knowledge and research into innovation is insufficient. The fact that Europe has, since the mid 1990s, not achieved the same productivity increases than the USA is usually brought forward as proof of this claim (see for example the 'Aho Report': Aho et al. 2006). While most of the policy actions proposed by the Aho Report and similar documents concern national regulatory frameworks, the huge disparities between regions regarding their innovative performance (OECD 2005c; Hollanders 2006) imply that policy-making at the regional level can play a key role as well.

An element of particular importance for the promotion of innovation in Europe is **entrepreneurship**. The European Commission's 2003 Green Paper on "Entrepreneurship in Europe" focused on two questions in particular: why do so few Europeans set up their own business and why are so few European businesses growing? The (not always explicit) benchmark for both observations is the situation in the US, which seems to have benefited from high rates of business set-ups, in combination with highly flexible labour markets. In 2004, the European Commission published an Action Plan which sets out a European agenda based on five strategic policy areas: fuelling entrepreneurial mindsets; encouraging more people to become entrepreneurs; gearing entrepreneurs for growth and

competitiveness; improving the flow of finance; and creating a more SME-friendly regulatory and administrative framework (CEC 2004, 2006a).

Firm-level research has used basically three different approaches to conceptualise entrepreneurship: the personality traits-related approach, the social psychology approach and the behavioural approach (Mostafa et al. 2005). Each of these emphasises the importance of social and cultural context on the propensity for entrepreneurial activity.

For the analysis at the regional level, studies which have looked at the competitive advantage derived from regional environments that foster entrepreneurship and innovation appear of particular relevance. Most of these studies have included a reference to Silicon Valley (Saxenian 1994; Benner 2002). A study that has provoked a high level of public debate is Richard Florida's "The Rise of the Creative Class" (2002). By arguing that innovation needs a local/regional climate which is open to outsiders and which puts a high value on tolerance, he dismisses earlier accounts – such as that from Putnam (2000) – which are more concerned about internal cohesion and bonding social capital. Florida's book has had a strong influence also on regional policy-makers to the extent that today, more and more European cities and regions strive to increase their attractiveness for members of the "creative class". Evidence about geographical labour mobility in Europe (CEC 2006b) certainly suggests that, against an overall picture of limited mobility, those workers who tend to be the most important for innovation and entrepreneurship – basically the younger, highly-skilled, often single – are much more willing than the average to move places for work-related purposes.

Audretsch and Keilbach (2004) found, using NUTS3-level data for Germany, that "entrepreneurship is a key factor in explaining variations in output across German regions [and that] the impact of entrepreneurship capital is stronger than that of knowledge capital", expressed as number of employees engaged in R&D (2004: 956).

3.3 e-Participation and ICT-enabled Empowerment

Introduction: Empowerment

For a meaningful analysis of transformation in the form of individual empowerment, a recourse to theories of human and social development is required. This, of course, implies the danger of culturally bounded value judgements. Nevertheless, there appears to be a common understanding of some of the basic goals of social development, as reflected in the declaration of the World Summit of the Information Society (signed by 175 countries) which observed a:

> *"… common desire and commitment to build a people-centred, inclusive and development-oriented Information Society, where everyone can create, access, utilize, and share information and knowledge,* ***enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life****" (WSIS 2003: 1; emphasis added).*

But how can we make sense of the notion of "achieving one's full potential"? For the purpose of identifying ICT applications which "make a real difference" for people, a number of researchers have referred back to well-established theories of the basic needs of people. The most well-known of these is **Abraham Maslow**'s "Hierarchy of Human Needs". According to Maslow (1954), the needs of human beings are arranged in a hierarchy in terms of their potency. Although all needs are innate (instinctive), some are more powerful than others. The hierarchy of needs is often depicted as a pyramid consisting of five levels: the four lower levels are grouped together as deficiency needs associated with physiological needs, while the top level is termed growth needs associated with psychological needs. The lower the need is in the pyramid, the more powerful it is. The higher the need is in the pyramid, the weaker and more "distinctly human" it is.

Mansell (2002) points out the emphasis on the self (rather than the self in relation to the other) in Maslow's theory is problematic, and has often been criticised by researchers with a different cultural background (see Hofstede & Hofstede 2005). This does not, however, diminish the value of Maslow's work with regard to the basic structure and working of the hierarchy of human needs. Of particular interest for the analysis of present-age society appears to be Maslow's notion of self-actualisation, which he defined as the "instinctual need of humans to make the most of their unique abilities and to strive to be the best they can be".

Against the little contested potential of the Internet (as well as mobile phones and other ICTs) to act as an enabler and tool for individuals and organisations to "make the most of their abilities", the main question must be how we can explore the actual extent to which ICTs are being applied to this end. This brings us to the body of work of Nobel price winning economist Amartya Sen. He suggests that policy-making, as far as it is concerned with social and economic development, should focus on the "**capabilities**" which people have, their relation to the "**functionings**" which they "have reason to value", and how both are affected by policy choices (Sen 1999). His concept of "capabilities" can be understood as **entitlements** based on legal rules but also socially-enforced moral rules which enable or constrain the ability to do or be certain things. Functionings "reflect the various things a person may value doing or being" (Sen 1999: 75).

Garnham (2000) and Mansell (2002) stress that Sen's work is of high relevance for policy choices surrounding implementation of ICTs:

> *Sen's thinking [...] can substantially enrich the debate on IST for growth and cohesion. In a nutshell, he shows that mere aggregate numbers about availability of resources, such as Internet connections, do not say much about effective empowerment of the individual and thus the productive use of the technology at societal level. Sen's normative framework therefore prompts us to switch from a technology-centred to a people-centred take on inclusion.*
>
> *[...] Sen's central conclusion [is] that it is not abstract rights or basic material endowments that are relevant benchmarks for what constitutes a dignified life or makes a cohesive society, but rather* ***the range and depth of effective capabilities*** *that individuals can develop and use on the basis of these endowments in a concrete social, economic and political setting. Building on this fundamental proposition, Sen himself and many other political philosophers and policy practitioners after him have identified and systematically elaborated a set of key conditions and effective capabilities that are essential for promoting human freedom, dignity and development. Although specific elaborations vary somewhat in detail, the central conditions identified usually include* ***freedom from hunger, disease, premature death and entitlements to personal development and equitable participation in public life****. These categories are reaffirmed and articulated in a wide number of international policy frameworks, most recently the UN Millennium Declaration of 2002. They have also given rise to leading policy benchmarking heuristics such as the UNDP Human Development Index. (Bianchi et al. 2006: 21)*

Alampay (2006: 9) points out that applying Sen's concept for the analysis of ICT-related policies "raises the questions on the capabilities and functionings that ICT allow. In other words, it forces policy stakeholders to revisit the whole premise of why universal access [e.g. to the Internet] is deemed essential".

In addition, Sen's view that policy should strive for equitable distribution of capabilities rather than of actual goods (functionings) is of major importance in view of the complex choice processes which people are faced by regarding media use: "[...] in a fluid digital media environment, where many choices over access options have to be exercised, it may be the capability of choosing, rather than the achievement of access to, a particular communicative resource that matters" (Couldry 2007: 397). Couldry (2007) suggests the term "communicative entitlements" for capabilities related to the use of the Internet for communication and interaction purposes.

The relevance of this discussion for the issue of empowerment becomes clear when looking at the European Commission's definition of empowerment, which is "the process of granting people the power to take responsible initiatives to shape their own life and that of their community or society in economic, social and political terms" (CEC 2005).

Spheres for Empowerment

The term transformational use of ICT by citizens is usually understood as implying the purposeful and beneficial use of ICT within everyday lives, for example in the domains of working, lifelong learning, health and well-being, to the extent that ICT such as the Internet "make a real difference" with regard to people's capacity to reach the goals of these activities. How, then, can we identify and conceptualise everyday activities which are potentially transformed by ICTs, and how can we make sense of the 'empowering impact' such changes have on individual users?

A useful starting point is the work of Nurmela et al. (2004a), who have developed a very useful framework for the analysis of individuals' use of ICT, based on extensive empirical research with focus groups. The authors distinguish seven spheres of application of ICTs by private households / individuals: communication, personal production/self-expression, search for information, automatic information and processes systems, personal business, mass media and media culture (see also Viherä & Viukari 2004). In a similar vein, Shih and Venkatesh (2004) identified 17 different uses of computers, grouped into seven major categories (work related; family communication; family recreation; home management; home shopping; education/learning; information centre).

For the purpose of analysing the objective functions (utility) which individuals derive from these activities, application of the media-system dependency goals identified by Ball-Rokeach (1985, 1998) appears to be of special interest. Jung et al. (2001) based their "Internet Connectedness Index" on this approach. They came up with six main goals with regard to the use of Internet and other ICTs:

- Two understanding goals:
  - to stay on top of events and groups that you care about (social understanding),
  - to express yourself or your opinions (self-understanding);
- Two orientation goals:
  - to accomplish business, financial, or work tasks (action orientation),
  - to get advice on how to deal with other people, such as doctors and other health professionals (interaction-orientation);
- Two play goals:
  - to play or amuse yourself (solitary play),
  - for social reasons like making new friends (social play).

For the purpose of TRANSFORM, we define these six goals as "objective functions". Based on these and other similar categorisations, we identified eight activity areas for "everyday life activities". Table 6 lists these, together with information about the main utility derived by users from each of these activities.

Table 6: Spheres of ICT Application by Individuals, and Demand-Side Conditions for Uptake

Activity	***Applications of ICT (Examples)***	***Users' Objective Function***
Communicate (social interaction)	e-Mail, mobile phone, SMS, messaging services, IRC chat, upcoming value added services	Social play; Social understanding; Self-understanding Interaction-orientation Action orientation
Perceive information (one-to-many)	PC and mobile device, Digital /interactive TV and radio, Internet information portals, streaming radio, podcasting, blogging	Social understanding; Interaction-orientation
Find information	PC and/or mobile device, Internet, search engine, discussion boards on communities of practice eLearning services	Social understanding; Interaction-orientation; Action orientation; Self-understanding
Take care of personal business, transactions and requests for assistance	PC and/or mobile device, Internet, mobile phone, SMS, 3G-phone, online banking software, spreadsheet programme, security software, Patient-sided eHealth services;	Action orientation
Entertainment	Latest generation PC or mobile device, gaming software, multimedia software, broadband Internet, peripherals	Solitary play; Social play
Generate and distribute own content	PC, digital camera, Internet, multimedia software, publishing software, podcasts, blogging	Self-understanding; Solitary play; Social play
Participate in policy-making and public life	PC and mobile device, Internet, discussion boards on communities of practice, IRC chat, advanced Internet applications	Self-understanding; Ssocial understanding
Employment-related activities	Office applications, specialist software, Internet, Intranet, peripherals, CSCW tools, PDA, mobile telephony etc.	Action orientation

Source: The authors

Each of these spheres of activities will be briefly discussed below.

Communication and Social Interaction

Techno-social innovations which give rise to fundamentally new communication channels and tools can be expected to play a potentially transformative role, simply because of the essential role which communication plays for human society. Without any doubt, the Internet belongs into this category, as does mobile telephony (which tends be less often acknowledged, see Sheller & Urry 2006). Both of these technologies are in the process of becoming ubiquituous, which as Castells et al (2004: 236) argue means nothing less than a homogenisation of space: "being ubiquitous means transcending space". Obviously, this has far-reaching consequences for social interaction.

Katz & Rice (2002: 5) define social interaction as "focused on individual relations and goals", in contrast to civic and community involvement ("participation in a jointly produced social, civic, or community activity"). Social interaction "entails interaction with specific others whom one either knows initially or eventually comes to know. This interaction is likely to involve dyadic, familial, friendship, romantic, and group relations. It speaks less directly to the interests and goals of collectives".

One of the Internet's killer applications has been, without doubt, e-mail: It drives people online just to be able to participate in electronic communication. The reasons are, of course, well established. First of all, e-mails are fast and easy to send compared to the more laborious regular mail or fax. Transmission times are (mostly) extremely short, which enables almost synchronous communication. Costs for sending e-mails are very low. Equally important, due to full digitisation e-mail allows unprecedented levels of reusability, documentation and integration with other communication channels (e.g. copy-pasting text to other applications; multiple recipients; message forwarding; free text search in e-mail archives). By the use of file-attachments, not only messages but also every other kind of digitised information (data files) can be transmitted through the same channel. Last but not least, as an Internet application, e-mail accounts can in principle be accessed from any location where there is an Internet connection.

In a similar way, the diffusion of mobile telephony has exceeded all expectations as users have quickly grasped the possibilities which it offers them to do things they value highly, but could not do before (Feldmann 2005; MobileLife 2006). Most importantly, users of mobile phones are independent from stationary connections, i.e. they can make phone calls and send text messages from practically anywhere. The implication is that people enjoy considerably enhanced control over the communication process. But this is far from the only major transformative effect which is ascribed to wireless communication systems (see box below).

The Transformative Potential of Mobile Communication

Based on Castells et al. (2004: 239-249), we can identify a number of essential aspects to the social 'impact' of the mobile phone:

Autonomy and "mobile intimacy": This means the extension of personal links through a "technology closely associated with the body" (Sørensen 2006: 45) rather than with the physical location of the household or the workplace. Users of mobile telephony significantly enhance their autonomy – "vis-à-vis spatial location, time constraints, and to a large extent, social and cultural norms".

Networks of choice: Shifts in the ways people organise their life through the mobile phone and also in the types of networks which are being created and maintained: "Mobile communication has greatly enhanced the chances, opportunities, and reach of interpersonal sociability and shared practice".

Instant communities of practice: "The emergence of unplanned, largely spontaneous communities of practice in instant time, by transforming an initiative to do something together in a message that is responded from multiple sources by convergent wills to share the practice". This practice, dubbed "smart mobs" by Rheingold (2002), has been observed in a number of cases from all around the world in which – within a very short time – a critical mass of political protesters was called to action by means of text messaging (cp. Benkler 2006).

Blurring of established boundaries: Mobile communication takes place in a spatial context and a new time which is chosen by the communicating subject (in interaction, of course, with the communication partner). Castells et al. interpret this as "an extraordinary strengthening of

the culture of individualism (meaning, the primacy of individual projects and interests over the norms of society or reference groups) in material terms".

Users as producers of content and services: The ready availability of camera-phones which allow users to take photos and record short videos, together with the ability to instantly share self-generated content with others over mobile networks, means that consumers are being empowered to become producers and distributors of content themselves. The possible social consequences of this are, however, far from uniquely beneficial, as Sørensen (2006: 45) points out when he warns that the general public may turn "into a mass of 'little sisters' reporting any activity deemed inappropriate".

Safety and surveillance: As survey data have repeatedly shown (e.g. MobiLife 2006), the mobile phone makes people feel safer at the same time then it makes them enjoy greater autonomy. There are also threats, though: Because mobile networks register the geographical location of devices, this is a technology which makes near-ubiquitous surveillance possible, as a number of scholars including Rheingold (2002) have powerfully argued.

Fashion, culture and language: Mobile phones are powerful purveyors of meaning. They are being adopted as part of the process of individual expression, of "the construction of identity by appropriating a new technological environment and still feeling oneself". As such, the technology may also have transformed the use of language, for example in the form of texting-oriented vocabularies which are optimally tailored to the 160 character limit of SMS messages.

The arrival of the third generation of mobile telephony, especially of fast UMTS-connections and the increasing functionality of mobile phones (integrating features of personal information managers, cameras, digital music players etc.) will also open up new possibilities and further heighten the transformative potential of this kind of applications.

We need to be careful, however, lest we take for granted that "unfettered communication (a utopian attribute of the Internet) necessarily fosters healthy and socially beneficial communities" (Katz & Rice 2002: 110). Just enabling people from different backgrounds (e.g. different nations, cultures) to communicate freely with each other will not necessarily yield positive outcomes.

As has been discussed above (see chapter 3.1), the interrelation between use of the Internet and social interaction has been researched comprehensively in recent years (see Robinson & Alvarez 2005 for an overview). Castells (2001: 128) describes the evolving patterns of sociability, enabled by the Internet, mobile telephony and other ICTs, as "networked individualism". In spite of the fact that the community as a social construct – based primarily on face-to-face interaction and as such bound to a limited geographical territory, such as a neighbourhood – has lost much of its relevance long before the advent of ICTs and the Internet (Wellman 2001), it still remains to be assessed what influence to increasing practice of networked individualism has on the ability of regions to achieve self-determined development.

Perception of Information (one-to-many)

The perception of information from the mass media remains one of the basic purposes of media consumption, including use of the Internet. Having said that, the progressive convergence between previously separated media spheres, strongly influenced by the further development of the Internet, has made traditional distinctions, such as mass media vs individual/personal media, more and more meaningless. Today, most experts observe a gradual shift towards what is called "meso-media" (Feldman & Zerdick 2005), with mass media becoming more personalised (e.g. though increasing number of specialist channels, digital television with heightened interactivity) and personal media being opened up to larger numbers of the public (e.g. through online chats, discussion forums, blogging).

At regional level, the possibilities for production and distribution of mass media content tailored to the interests of a regional audience have improved. There is, however, hardly any evidence available which would suggest that significant change in this direction is taking place. From the viewpoint od regional development, therefore, this domain of ICT use by individuals appears to be of low importance.

Perception of information which has been produced for a larger audience is also, of course, an integral component of e-learning services. The learning domain is being discussed in section 3.2 of this report.

Retrieval of Information

The Internet has made a huge difference to the accessibility of information. People who are equipped with the adequate skills in identifying, selecting and processing information enjoy the benefits of almost instant access to an incredible wealth of data on the Internet. As opposed to the pre-Internet era when most mediated information was transmitted through the mass media, the Internet enables high degrees of personalisation of information retrieval. The huge leaps in performance which search engine technology have made in recent years have provided users with adequate tools to exploit this richness of information.

Nevertheless, the question remains valid whether this development constitutes a transformation of previous practice, or simply an acceleration.

It is certainly true that just enabling people from different backgrounds (e.g. different nations, cultures) to exchange information freely between each other will not necessarily yield meaningful outcomes. Many Internet users might be much less interested in learning new things, but in finding confirmation for opinions they already hold and in contacting people which they feel are "like them" (Katz & Rice 2002: 110). It has been noticed that the possibility for personalising the information which one is exposed to may lead to "narrowmindedness and social fragmentation" (Shapiro & Leone 1999). Indeed, a study by Neuman (2001) provided evidence that levels of selective exposure to news are significantly higher for Internet users than for newspaper readers and viewers of TV news. As a consequence, Hill and Hughes (1998: 183) claim that "people go on-line to find out more information about a subject, not to be transformed".

There are, however, also many signs of truly transformative practice. Online communities of practice are of particular importance in this regard. The experience of recent years certainly gives credibility to the claim of Castells et al. (2004: 241) who state that virtual communities of practice are an expression of the latent existence of common interests and/or values between people who do not know each other, but who could derive personal utility from interaction.

For the purpose of the analysis in TRANSFORM, we need to ask how the transformative changes associated with increasing use of ICTs (such as the emergence of virtual communities of practice) are related to spatial levels of analysis: For example, does strong involvement in virtual communities have an equivalent in the offline world, and if so, how does this relate to the region in which the people/organisations which are participating in the virtual community reside?

The retrieval of information from computer networks has also become a key element of many individual or collective learning projects. The learning domain is being discussed in section 3.2 of this report.

Personal Business, Transactions and Requests for Assistance

Instrumental uses of ICTs in the private domain include transactions such as online banking, online ordering and reservations, as well as many e-government applications. One of the more fascinating effects of the Internet has been the evolution of online trading and selling between private households through the Internet, mainly by means of online auctions.

The Internet, together with other ICTs, has made a big impact on the ease and flexibility with which such tasks can be carried out. The basic underlying reason can be found in transaction cost theory. Transaction cost theory was originally developed to explain the existence and boundaries of business enterprises. It suggests that there are marked differences in the costs of executing transactions inside of organisation as opposed to on the market. This leads to the theoretical finding that profit-maximising companies execute those transactions internally that would cost more to conduct through market contracts. As was noted by the early transaction cost theorists already, transaction costs can be altered by technological progress. ICTs in general, and the Internet, in particular, have been shown to reduce the costs of many types of transactions (Picot et al. 2003). An important component of the transaction costs that are incurred by activities for acquiring information are search costs. These arise when market participants have to invest in activities to find the information they need to decide how to behave on the market, e.g. to take part in the labour market or stay out. Search costs are determined by the nature, number and intensity of search activities, but also by the technique and technology used for investigating information. For this reason, ICTs have a major influence on search costs, not only on their overall level, but also on their composition and the relative costs of different search

techniques.

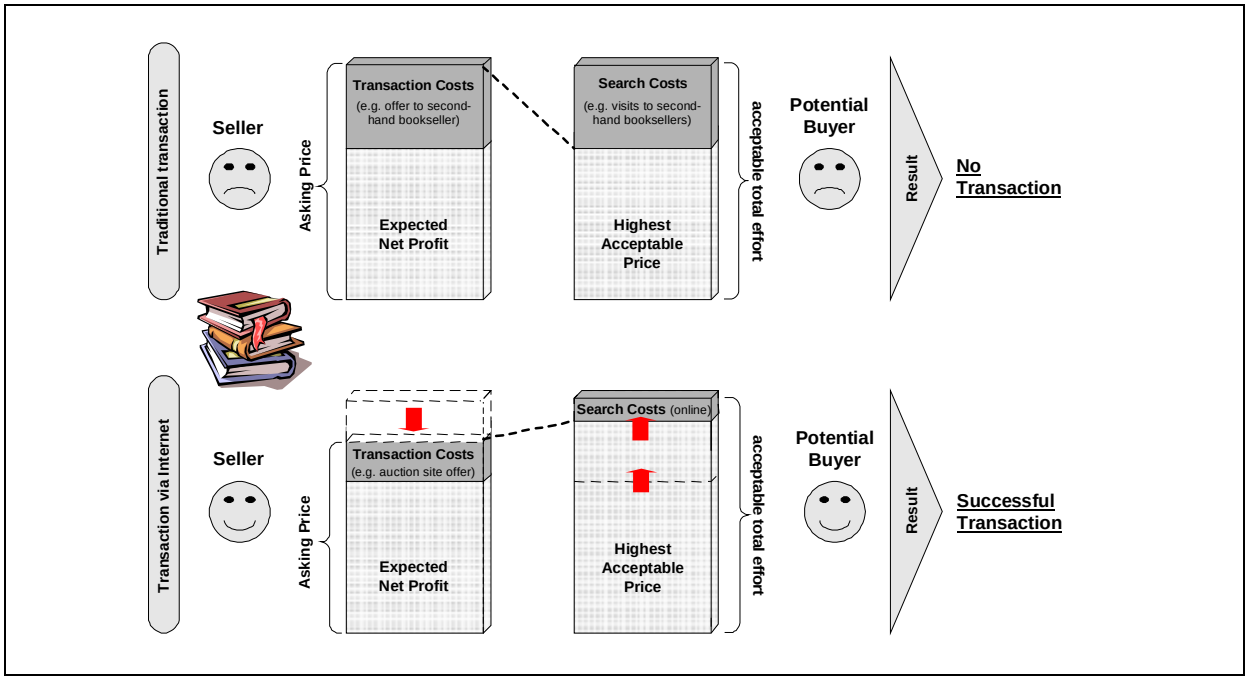
ICTs enable the transfer of all types of data across distance, which together with the trend towards informatisation of economic activity and digitisation of products and services means that it becomes increasingly possible to substitute the flow of data in networks for physical transport. Because physical transport is expensive and burdensome, distance has always exerted a strong influence on the types and levels of activities people carry out at a given place. Electronic transfer of data has the special characteristic that marginal costs for the transport of a unit of information, once the basic infrastructure is in place, are very small. This means that many activities that used to require physical transport, but can now be carried out with the help of electronic data flows, have become cheaper. In practice the distance-shrinking character of ICTs mean that more and more of everyday activities can now be carried out electronically from anywhere at the klick of a mouse. This has opened up a whole range of new possibilities for people whose ability to take care of personal business and transactions used to be constrained – for example because of lack of time, because of individual functional restrictions, or because of geographical location in a peripheral or otherwise disadvantaged region of Europe.

By applying these theoretical approaches to markets into which ICT-mediated communication and interaction are introduced, a number of researcher have identified the changes which are likely to arise and the benefits which are to be expected for each of the groups involved (consumers, suppliers, intermediaries). The advantages of electronic commerce from consumer viewpoint are typically described as follows:

- Convenience (fewer time and place constraints, no opening hours);
- Access to larger supply (number of providers);
- Anonymity (of relevance for some product categories);
- Instant access to broader information about market situation (prices, suppliers), often in real time;
- Easier access to independent advice through communities of interest (e.g. product ratings by other consumers);
- Time savings (instant delivery in case of many digitised information products);
- Enhanced interactivity through e-mail, embedded voice mail etc.; and
- Personalisation (providing consumers with information and offers which are tailored to their individual preferences and/or needs).

The Internet has also enabled the emergence of new markets which have not been sustainable before, because transaction costs were prohibitive (see Figure 7) – a typical example of market failure which the Internet and other ICTs were able to abolish. By decreasing transactions costs (here: the costs for identifying a person interested in buying a used book on the one side, and the cost for finding a copy of a sought after book on the second hand market on the other side), Internet platforms such as eBay have created markets which ultimately lead to everybody being better off – with the possible exception of intermediaries who cashed in on the lack of market transparency in the situation before.

Figure 7: Emergence of new markets enabled by Internet related decreases is transaction costs



Source: Translated from Gareis et al. 2000: 14

In cases where citizens require immediate assistance, for example in health emergencies, a decrease in transaction costs has similarly positive effects on the efficiency and effectiveness of service provision. Examples include the addition of new channels for contacting emergency services based on mobile networks. Table 7 lists some of the applications which are currently being piloted in this domain (see also Roe 2007).

Table 7: Examples of ICT Applications in the Care and Independent Living Domains

Sub-domain	Selected examples of ICT applications
Standalone AT	Communication aids/software
	Devices for locating lost things for people with cognitive restrictions (e.g. keys)
	Devices for remembering things (e.g. taking pills) and carrying out tasks
	Personal mobile robotic assistants
Smart homes	Integrating standalone AT applications described above
	Passive alarm systems
	"Intelligent" household appliances (dish washer, washing machine, freezer etc.)
	Sensors to open/close doors and windows, turn on/off lights
	Monitoring systems to prevent wandering
Remote social and medical care	Remote consultation with formal/informal care staff (e.g. reassurance services)
	Remote medical services (e.g. tele-rehabilitation, diagnosis, SMS service for diabetes management)
	Active alarm services (e.g. through mobile phone, wrist alarm)
	Care planning applications (videoconfercing, "virtual team" bringing together home-care etc.)
	Monitoring of patient's health status from a remote site (e.g. wearable health monitoring systems for people with cardiac problems or diabetes)
Wider ambient intelligence	Navigation and orientation support (e.g. a mobile device with GPS function, including possibility to call a call centre)
	Use of sensors in public buildings to assist people with handicaps
	Public transport information systems taking into account the needs of older and frail people

Source: Empirica & WRC (2005: 137)

Entertainment

"Users have a tendency to twist new technology to fulfill their interests or desires", as Castells (2001: 54) writes. The Internet, mobile telephony and the other new ICTs are certainly no exceptions in this

regard.

Because of TRANSFORM's focus on applications of ICT which are of relevance for regional development, we will not deal with the area of entertainment. Note, however, that boundaries between ICT-based entertainment activities and other domains, such as learning, social interaction and communication, distribution of own content, and even employment, are becoming increasingly blurred (Castranova 2005).

Generation and Distribution of User-Created Content

As Nurmela et al. (2004b) emphasises, the Internet and (increasingly) also mobile networks offer unprecedented possibilities for the distribution of user-created content. This appears – in contrast to other uses of the Internet such as information retrieval and one-to-many entertainment – to represent a fundamentally new way of people to interact with public media. In 2004, the authors noted that "the need now is for various kinds of forums where citizens could build up the courage they need to put up their own production on display" (Nurmela et al. 2004b: 14). Since then, the runaway success of Internet services such as MySpace and YouTube has confirmed that there is a big interest from users in publishing self-created content on the Internet (Benkler 2006). This also shows in the empirical data collected on behalf of UK's national regulator OFCOM in a survey covering the UK, France, Germany, Italy, USA, Japan and China (OFCOM 2006a).

Castells (2001: 200) stated already in 2001 that "the most important latent demand [is] for interactive free expression and autonomous creation – nowadays largely stymied by the sclerotic vision of the traditional media industry." Examples include "open source, free posting, decentralised broadcasting, serendipitous interaction, purpose-oriented communication, and shared creation". In this context, Katz and Rice (2002: 5) apply the term "Internet enabled expression" which "refers to the material that is created by individuals or groups to reflect their views, interests, or talents. These materials are produced for the observation, interest, or response of their creators and, usually, others". This definition clearly points towards the overlap between self-generated content and civic and political participation (see below).

Participation in Policy-Making and Public Life

Katz and Rice (2002: 24) observed that, especially in the years up to the bursting of the so-called Internet bubble, "the fundamental conceptualization of the audience as citizens who actively participate in the public sphere has been largely replaced by the audience as consumers in the new media environment". In the process, they argue, "consumer interests have become the fundamental criterion for evaluating the performance of social systems. [...] Political sovereignty has become confused with consumer sovereignty" (ibid).

This came as a surprise in the face of the earlier prevalence of claims that the Internet would play a considerable role in fostering democracy through enhanced participation of citizens in the policy-making process – especially at the local and regional levels of government. As a number of leading scholars (e.g. Tuomi 2002) have shown, the development of the Internet itself ows much to a fundamentally open, democratic process of social production. It is hardly surprising, then, that futurist authors have seen in the Internet a potentially giant step forward towards a truly democratic society.

After the business hopes of everlasting Internet-fuelled growth had fizzled out in 2000/2001, the potential contribution of the Internet to policy-making came back into focus. In this context, the term **e-participation** emerged on the public agenda, itself drawing on three developments:

- The development and implementation of **CSCW** (Computer Supported Cooperative Work) and groupware, which make use of latest-generation ICTs to enable and support collaborative human interaction, originally mostly in work-related settings;
- Increasing interest in what is termed **e-democracy** (earlier: tele-democracy) since the late 1990s, when the focus shifted rapidly from eVoting to several forms of ICT-supported and ICT-enabled interaction between governments and citizens, including direct interaction such as consultations, lobbying, petitioning and polling, as well as indirect ones pursued outside of government itself, including electioneering, campaigning, and community informatics;
- The evolution of **e-government** developments towards increasingly complex service delivery. Complex services require considerable interaction including searching, selecting options based on

multiple criteria, calculating outcomes, notifications, inquiries, complaints, and many other activities. There are several ICT tools for such tasks, ranging from FAQs to call centres, but to be effective there is a need for all of these to be coordinated into user-friendly but powerful toolsets for client-organisation encounters.

While the issue of e-voting has all but disappeared from the political agenda in most EU countries[17], the pace of techno-economic change, as indicated by the rapid diffusion of broadband access to the Internet, and the spread of online social networking mean that the possibilities for citizen participation in policy-making have, arguably, never been as good as today. This is against evidence that until now, the Internet has not lead to much progress in terms of political engagement, as Katz and Rice (2002: 332) conclude from their research: "no immediate and revolutionary transformation is occurring in political expression or representation" (cp. UNO 2003: 85-102).

There is some evidence that, whether top-down implementation of e-participation makes progress or not, social movements are making extensive use of ICTs, and as such will put pressure on government at all levels of administration. Castells (2001: 137) is convinced that the Internet "becomes the indispensable component of the kind of social movements emerging in the network society", by which he means "loose coalitions, semi-spontaneous mobilizations, and *ad hoc* movements of the neo-anarchist brand" which substitute for the vertically integrated, permanent, structured, formal organisations inherited from the industrial era.

At the same time, Castells thinks that dystopion views on the implications of the Internet for political participation are not without credibility. Against the background of the political culture in the USA, he sees the danger that "the Internet [might] deepen the crisis of political legitimacy by providing a broader launching platform for the politics of scandal" as it is being used increasingly "by maverick journalists, political activists, and people of all kinds as a channel to diffuse political information and rumours" (Castells 2001: 158; see also Rheingold 2002).

This discussion shows that, in order to be able to make sense of the relationship between Internet usage and the democratic process, one needs to clarify the meaning of the term "democracy" and the processes through which the Internet may affect it. In this context, Dahlberg's distinction between liberal individualism, communitarism and deliberate democracy is very useful (Dahlberg 2001). **Liberal individualism** presumes that individuals are "rational, autonomous subjects who know and can express their own best interests. **Communitarism**, by contrast, is built on the belief that only "a well developed sense of community enables individual freedom, expression, and democracy, by providing a shared identity and purpose (Katz & Rice 2002: 113). **Deliberative democracy** "presumes that rational discourse [among stakeholders] in the public sphere is required to legitimate democracy" (ibd.). Depending on the observer's view about these, they will perceive the role of the Internet on the democratic process quite differently.

Worker Empowerment and Organisational Change

We can sketch the development of the public debate about transformative impact of ICTs in organisations as follows: Starting from an early phase in which the focus was on technology per se, via a backlash phase in the aftermath of the dot.com crash, in which the positive effect of ICT on performance was put in doubt in general (see the discussion about the so-called Solow paradox in OECD 2003a; see also Nicolas Carr's controversial article from 2003 titled "IT Doesn't Matter"), the scientific and public debate has now reached a consensus that ICT does indeed matter, but that its introduction needs to be embedded in a wider strategy of organisational change. Confirmation comes from a rich body of research which has appeared since the mid 1990s (Brynjolffson & Hitt 2000; OECD 2001b: 32-34; Smith & Fingar 2003; OECD 2003a; 2004)[18].

This means that, while the e-Adoption ladder (discussed in section 3.1) focuses mainly on how ICT "drives" organisational change, complementary organisational change is required to 'unlock' the powers of ICT. Such a strategy needs, more than anything else, take full account of the central role which the workforce plays in making successful change happen.

For analysing such processes of organisational change (and the degree to which they amount to

[17] For example, in Germany, the federal election supervisor ("Bundeswahlleiter") recently ruled out any chance that online voting will be possible for federal elections in the foreseeable future.

[18] See Gareis (2006b: 40-42) for a compilation of empirical research.

"transformational change"), it appears useful to refer to the research about what has been called "new forms of work organisation", "new organisation of work" or "modernisation of work organisation". Interest in the topic increased markedly in the second half of the 1990s against the background of a perceived growing need for flexibility in labour deployment, combined with a focus on quality of work. The recession at the start of this decade added further impetus to the debate. Technological progress at the workplace started to be seen in the overall context of increasing the efficiency and effectiveness of work organisation (CEC 2003b, OECD 2003a, 2004a) and business processes (Smith & Fingar 2003). The earlier OECD paper on "Knowledge, Work Organisation and Economic Growth" was decisive in moving the agenda forward.

Following this line of argument, the European Commission (2003b), the European Foundation for the Improvement of Living and Working Conditions (2005) as well as the OECD (2004) stress that investments in ICT need to be more often supported by investments in company reorganisation and in staff retraining – something which happens too seldom, as empirical evidence for example from the EWCS and Eurobarometer indicate.

How can modern ways of organising work be distinguished from more traditional patterns? A widely used definition of New Work Organisation was adopted by the European Work Organisation Network (EWON)(see Savage 2001): "New Work Organisation is the application of principles and practices within enterprises which aim to capitalise on, and develop the creativity and commitment of employees at all levels in achieving competitive advantage and in meeting the business and service challenges posed by the social, economic and technological environment in which the enterprise exists".

In a similar vein, Business Decisions Limited (1999: 15) – in a study for the European Commission – states that "new forms of ('high performance') work organisation are based on a 'high trust' and 'high skill' organisational model that encompasses extensive employee involvement in operational decision-making", while also putting stress on the fact that "there is, however, no single model of desirable organisational change. Each company must adopt organisational structures and forms of work organisation that fit with its strategy and its source of competitive advantage". The antidote to new ways of work organisation are seen in the "scientific management" principles usually associated with the names of Frederick Winslow Taylor and Henry Ford (Amin 1997).

These definitions implicitly refer to the earlier classification of Atkinson (1984) who distinguished between functional flexibility, numerical flexibility and wage flexibility. New work organisation is primarily concerned with functional flexibility, which is "the ability of enterprises to reorganise jobs so that the jobholder can deploy his or her skills across a broader range of tasks and be well prepared for new tasks" and which is "based on decentralised responsibility and a multi-skilled workforce" (Nordflex 1999: 54; see also OECD 2001b). Opposed to this is numerical flexibility, i.e. the ability of a company to adapt (quantitatively) the work input to variations in workload, for example through over-time, short-time, part-time or temporary work contracts. Wage flexibility is "the ability of a work place to adjust wage costs to market fluctuations, and to differentiate wages depending on performance of employees" (Nordflex 1999: 72).

Other terms which have been much in use to describe basically the same phenomenon (albeit putting the emphasis on different features) are "High Performance Work Organisation" (Sung & Ashton 2005) and "High-Involvement management" (Bessant 2003). Antila and Ylöstalo (2002, 2005), in their research on Finland, talk about "proactive workplaces", key characteristics of which are "that personnel have increased possibilities to exert influence, and at the same time increased responsibility. [...] In the proactive way of working (in an ideal case), the management controls the goals and how they are reached. the worker controls the working methods and the results of his/her work, by which the goals of the organisation are reached" (Antila & Ylöstalo 2005: 9-10).

Based on the available empirical research it is possible to identify a number of features which are at the core of these concepts (cp. BDL 2002: 18):

- The way work is organised within operational activities
  - Work being organised in semi-autonomous work teams;
  - Multi-skilling as opposed to workers being assigned to single tasks;
  - Job rotation.
- The way work is coordinated across the organisation
  - Non-hierarchical decision making structures;
  - Open information policy ensuring that performance information is made available to individual

employees;

- o Frequent team/management interaction (employee participation in decision-making at business manager level);
- o Performance measurement using a range of financial and non-financial measures.

Ÿ Supporting human resource management policies

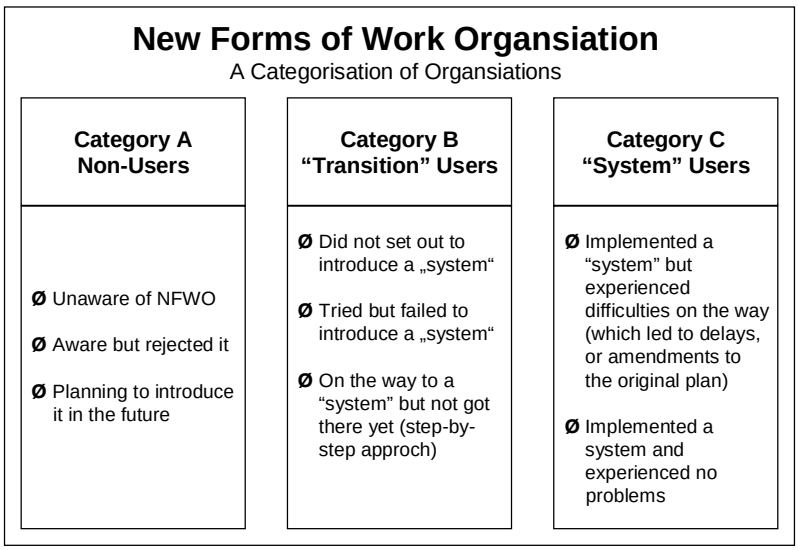
- o Regular off-the job training of all employees, covering both job specific and generic skills;
- o Reward systems, i.e. an important element of the pay depends on individual or team performance.

Nordflex (1999) and BDL (1999, 2002) stress the importance of new forms of work organisations being implemented as a system rather than in piecemeal fashion. One reason for this is that the success of each of the above elements of a modern work organisations depends to a certain extent on complementary measures being put in place as well. For example, a higher degree of decentralisation in an organisation is bound to imply stronger demand for self-management skills:

> *[...] Decentralisation of responsibility requires a wide range of knowledge on the part of employees, and therefore a professional attitude towards skills development and the training of staff. If the staff acquire greater skills and knowledge, there are greater possibilities for everyone to participate in the decision-making process and to perform several different tasks. Decentralised responsibility for decision-making and working tasks often implies a more frequent use of teams and job rotation [...] (Nordflex 1999: 78)*

For this reason, many studies including the above mentioned defined the most advanced users of new forms of work organisation as those that use a combination of various of the above mentioned elements. Based on this premises, BDL (2002: 21) drafted a categorisation of users according to their propensity to use new forms of work organisation, see Figure 8. The same approach was also used by Antila & Ylöstalo (2005) in their study on "proactive workplaces" in Finland.

Figure 8: Categorisation of New Forms of Work Organisation



Source: Business Decisions Limited (2002)

Most available statistics suggest that the diffusion of new forms of work organisation is lower than one would expect when observing the public debate around the topic. For example, the EPOC study found that "there is a very considerable gap between rhetoric and reality as far as the new forms of work organisation are concerned. The rhetoric suggests that new forms of work organisation are widespread and inevitable. The reality is that some of even the most basic practices associated with these forms are absent in the majority of EU workplaces. Something resembling an integrated approach affects only a handful of organisations" (Sisson 2000: 29-30). Only 4% of establishments covered by the sample used more advanced forms of team work. A similar number (3%) was found in a extensive survey conducted in Germany (Wengel et al. 2002).

The Nordflex (1999) study carried out in the second half of the 1990s in Finland, Sweden, and

Denmark used a common definition of “flexible organisations” that focuses on employee development and task delegation. It found that between 15% and 25% of Nordic workplaces can be defined as “flexible”.

A review of available statistics by BDL (1999: 25) concludes that while “many companies use at least one high-performance work practice somewhere in their company [...] few use them extensively throughout the company.”

A similar review carried out by the OECD (2001b: 9-13) comes to the conclusion that the rate of adoption is large only for “practices which can be accommodated with relatively little change in the overall work organisation structure, e.g. suggestion schemes and weakly autonomous teamwork.” Still, the OECD reports that “there is some evidence that the proportion of firms adopting new work practices is on the rise. In the four countries where comparisons through time can be made (Australia, France, the United Kingdom and the United States), the rate of adoption of each practice (except quality circles) is on the rise”.

Based on the results of its own company survey conducted in 2002, BDL (2002) estimates that 60% of organisations with more than 50 employees are users of some new forms of work organisation, but only 10% are what the study calls “system users” (cp. Figure 2). The survey was later also conducted in Finland (Antila & Ylöstalo 2005), where 83% of organisations with 50 or more employees were found to be “transition users”, but only 4% were found to be system users.

Lorenz & Valeyre (2003), in their analysis of data from the 2000 European Survey on Working Conditions, emphasise the existence of national differences in the diffusion of models of work organisation. Through cluster analysis the authors identified four different models of work organisation: learning organisation (comprising 39% of the EU workforce), lean production (28%), Taylorism (14%) and traditional organisation (19%). The type which appears closest to new forms of work organisation as defined in this paper, “learning organisation”, is most wide-spread in the Netherlands the Nordic countries.

Because of the central role of team work for new forms of work organisation, it is necessary to remind oneself that “team-oriented ways of working can mean some very different things” (Antila & Ylöstalo 2005: 5). Antila and Ylöstalo define the concept of a well-functioning team as follows (ibid.):

- “the team members have good possibilities for influence and, at the same time, a lot of responsibility both for their own work tasks and for achieving the team’s goals quantitatively and qualitatively;
- the team members have versatile know-how and they are able if necessary to cope with the work of other team members;
- the teams interact directly both with other team members of the workplace and with outside instances; and
- the team members are rewarded for good results.”

4 Existing Indicators on Transformative Use of ICTs

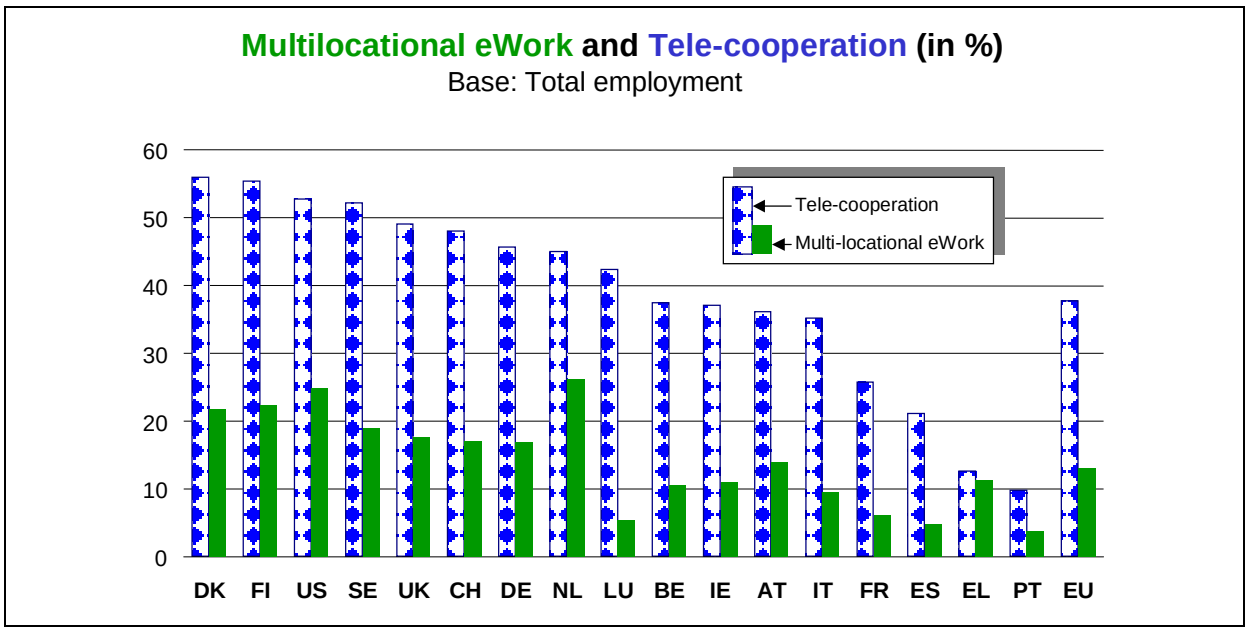
4.1 ICT-enabled Networking and Social Capital Building

4.1.1 Firms

There are very little statistical measures available for mapping the extent to which companies are engaged in ICT-based networks and networking activities, as the overview compiled by Gareis (2006a) shows. This is surprising against growing evidence which suggests that collaboration, even if defined in a very crude way, is associated with higher productivity and higher rates of innovative activity.

Indicators on collaboration and co-operation can be collected at the workplace level, at the establishment or at the company level. The SIBIS project developed an indicator on **tele-cooperation** to be collected from the employed population. The indicator was operationalised for survey research as "employees communicating with external business contacts via e-mail, video-conferencing or electronic data transfer" (Gareis & Hüsing 2002). Results from the piloting, which took place in 2002 and 2003 in all EU Member States, showed that while majority of white-collar workers today appear to be co-located in central office buildings (rather than teleworking from remote locations), they are often working closely together with value chain and project partners who are themselves located remotely (see Figure 9).

Figure 9: Telework and Tele-cooperation in EU15 Countries in 2002 (in % of total employment)

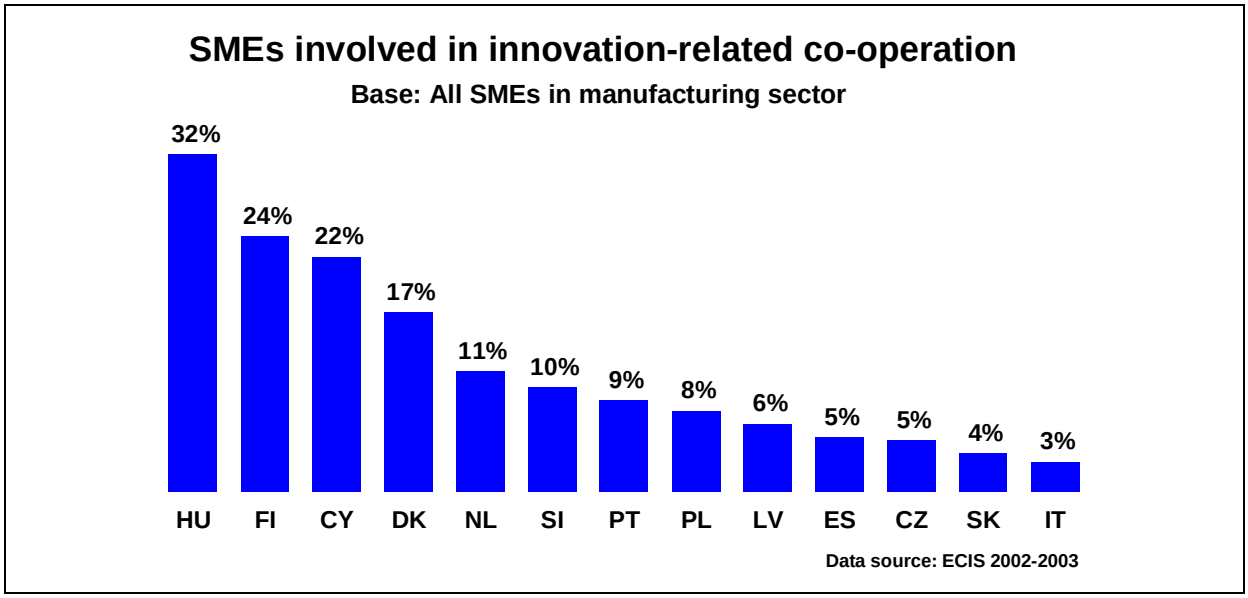


Source: Own calculation based on data from SIBIS 2002/2003, see Empirica (2002)

In the future further steps will become necessary to gather data on the nature of tele-mediated cooperation. This is likely to require special surveys which analyse working processes in much detail. Existing surveys such as Germany's "Qualification and Employment Situation Survey" (BIBB/IAB) can act as bases for this. Other similar national surveys have been compiled by the STILE project (see Ramioul et al. 2005).

An important indicator on **inter-firm collaboration** in general is provided by the European Community Innovation Survey (ECIS): The "percentage of all innovative firms that co-operate with other firms or organisations" (see Figure 10).

Figure 10: SMEs involved in innovation related co-operation



Source: Data from Eurostat (2006)

The definition used for innovation covers "co-operation which is active participation with other enterprises or non-commercial institutions on innovation activities. Both partners do not need to commercially benefit. Respondents should exclude pure contracting out of work with no active co-operation". This indicator does not take account of the role which ICT play for collaboration, but this could easily be modified.

Distinctions are made between the type of cooperating partner:

- Other enterprises within your enterprise group;
- Suppliers of equipment, materials, components, or software;
- Clients or customers;
- Competitors or other enterprises in your sector;
- Consultants, commercial labs, or private R&D institutes;
- Universities or other higher education institutions;
- Government or public research institutes.

For each category, respondents are required to state its location (same country; other Europe, United States, all other countries). The survey also asks for the type of co-operation partner which the respondent firm found most valuable for its innovation activities. The data on these indicators is collected only from "innovative firms", which themselves are defined as those that "have introduced technologically new or improved products or services on the market, or technologically new or improved processes. The product should be new to the enterprise, but does not necessarily have to be new to the enterprise's market".

A drawback of the ECIS indicators for the purpose of measuring networking links is their focus on collaboration for innovation purposes only, and the lack of data on the extent to which ICTs are used for collaboration purposes.

The extent, structure and shape of Information Society related collaborative networks in Europe has been researched by Malerba et al. (2007) using network topology analysis. The methodology comprised the following steps:

- Identification of locations (at NUTS2 level) of participants in IST research projects, operationalised as European networks formed by organisations participating in FP6 IST – TA1 projects;
- Identification of locations (at NUTS2 level) of participants in IST deployment projects defined as European networks formed by organisations participating in eTen and eContent projects;
- Calculation of "intensity of participation" indicators on both research and deployment for all NUTS2 regions in EU15;

- Collection of data on participation of NUTS2 regions in selected Community deployment initiatives such as LEADER+, INTERREG, EQUAL and URBAN as supplementary information.

The value of these indicators as proxies for the overall networking intensity of local firms and public-sector organisations in ICT-related R&D and deployment is dependent on the extent to which participation in EU research is representative of overall participation in these activities. Nevertheless, network analysis derived indicators appear to be of high potential value for the statistical analysis of inter-firm networking for collaboration on ICT research and deployment.

The harmonised UNDERSTAND survey looked specifically at the communication channels used for inter-firm collaboration. It asks firms whether they have jointly developed new or improved products with cooperation partners, before enquiring whether this was done "via the Internet". UNDERSTAND also developed and applied indicators about the geographical origin of the majority of core business cooperation partners (in the same NUTS 1 region, in the rest of the country, in the rest of the world).

Much more detailed indicators on ICT-enabled cooperation were piloted in the context of the EMERGENCE project (Huws & O'Regan 2001), which focussed on formalised collaboration along the value chain (see box below).

EMERGENCE eWork Indicators

The project defined seven generic business functions which were deemed to be "delocalisable" (i.e. feasible for ICT-enabled delocalisation). These were:

- Sales (telemarketing and mobile sales)
- Customer service (e.g. providing information, counselling & advice to customers)
- Data processing (e.g. typing and other forms of data input)
- Creative or content-generating work (e.g. R&D, design, editorial work, multimedia production)
- Software development, maintenance and support
- Accounting, debt collection and other financial services
- General management, human resources management, and training.

For each of these business functions, the survey asked whether it was carried out (a) remotely, i.e. it took place at a geographical distance[19] from the establishment which was surveyed; and (b) by means of telemediation, i.e. that a telecommunications link was used to deliver the work. In the latter case, a distinction was made between:

- fully home-based working by employees (telework)
- multi-locational or nomadic working by employees
- freelance work carried out away from the premises
- remote work carried out in internally owned back offices excluding/including call centres
- remote work carried out in third-party premises excluding/including call centres
- work outsourced to business service suppliers excluding/including call centres.

When combined with the seven categories of generic services, these nine possible forms result in 63 different possible forms of eWork which may be used (at least in theory) by any given organisation.

Source: Huws 2002: 4-6

The disadvantage of the EMERGENCE indicators is their high degree of complexity, which makes them extremely difficult to integrate in existing data collection frameworks.

The European Commission's European eBusiness Watch[20] has developed and piloted a number of indicators which can be applied to capture elements of the e-adoption ladder depicted in Figure 5 on page 28. Definition of key terms related to e-business adopted by the eBusiness W@tch project are as follows:

- **e-Transactions**: Commercial exchanges between a company and its suppliers or customers which are conducted electronically. Participants can be other companies ("B2B" – business-to-business), consumers ("B2C"), or governments ("B2G"). This includes processes during the pre-

[19] Defined for some (but not all) indicators as in a different NUTS1-region

[20] www.ebusiness-watch.org

sale or pre-purchase phase, the sale or purchase phase, and the after-sale / purchase phase;

- **e-Commerce**: Electronic Commerce. The sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over computer-mediated networks (definition originally from OECD);
- **e-Business**: Electronic Business. Automated business processes (both intra- and inter-firm) over computer mediated networks (definition originally from OECD);
- **e-Interactions**: Electronic Interactions include the full range of e-Transactions, and in addition collaborative business processes (e.g. collaborative design) which are not directly transaction focused.

Of most interest to the present study are inter-firm e-business applications (as well as those which bind together firms with organisations from the public sector, such as educational organisations). Unfortunately, a well-established conceptual model for e-business and its measurement is not yet available[21]. However, the OECD Model Questionnaire of ICT Use by Businesses (OECD 2005b: 104-129) has questions on linkages associated with e-commerce, whether "systems used to receive/place orders over computer networks are linked with internal systems, customers' systems and/or suppliers' systems. There is an emphasis on e-commerce linkages because of the significant interest still in e-commerce and the potential productivity gains from automatically linking electronic transactions with downstream processes such as inventory ordering, delivery, accounting functions etc. In addition, questions such as these are fairly well-defined in a statistical sense and have been used (though not necessarily in the exact form as on the model questionnaire) reasonably successfully by at least two member countries (the United Kingdom and Australia)" (OECD 2005b: 45). The OECD also discussed whether it is possible to collect valid data on "integrated e-business processes", such as supply-chain management (SCM) and CRM (customer relationship management), see box below.

Options for Measurement of Integrated e-Business Processes

There are several possible approaches which could be considered in measuring the use of integrated e-business processes. They include:

(a) Directly ask the business whether it uses applications such as SCM (supply chain management), ERP (enterprise resource planning) or CRM (customer relationship management). Following the arguments presented above, the best statistical approach is probably to describe those processes rather than to use the precise terms and expect that respondents will understand them in the same way. Denmark used a descriptive approach in its 2005 survey to ask about use of ERP and CRM applications. However, it is considering changing that approach to ask about processes rather than systems. This is because it is thought that respondents might not uniformly understand terms which describe specific systems (as ICT systems could integrate several processes).

(b) Follow the Statistics Canada approach to asking about integrated business processes. The questions tested by Canada42 were: whether a browser-based system is used to manage functions associated with online sales, online purchases, customer relations and logistics. Supplementary questions asked about automatic linkages with backend systems, customers' systems and suppliers' systems.

(c) Ask about sales and purchases transactions generally and whether those transactions generate an automatic update in other systems such as backend systems, customers' systems and suppliers' systems. This approach has the advantage that it covers all sales and purchase transactions not just those which constitute e-commerce. It also focuses on functions which are common to most businesses (that is, purchasing and selling goods or services).

(d) Consider Denmark's approach (used in its 2005 survey) for obtaining information on external integration. Denmark asked about the electronic exchange of data between the business' systems and other entities' systems. It specified that these exchanges use structured messages and agreed message standards. More information is provided in the form of a classification of the types of documents and transactions for which data are exchanged (they include salary transactions, electronic invoicing, product descriptions, transport documents, data for public authorities and financial transactions).

[21] The OECD set itself the goal to agree on such a model at the December 2003 meeting of the Working Party on Indicators for the Information Society, but without success (see OECD 2005b: 44).

> All these approaches present a problem which also occurs in other areas of ICT use measurement and that is 'how can the significance of the activity be ascertained'? It would almost certainly be problematic to ask businesses about the number of 'linked transactions', their value or other measures of intensity. Therefore the data obtained from approaches such as those described above are generally a series of 'yes/no' responses. This means that if a business is using particular e-business processes for a minor part of its business or in respect of a small number of transactions, its reply has the same significance as a business which has used ICT to completely transform the way it does all its business.
>
> *Source: OECD 2005b: 45-46.*

In spite of these challenges, some indicators on the use of inter-firm collaboration tools and structures are available from the eBusinessW@tch as well as from other sources. The UNDERSTAND dataset, for example, includes indicators on business use of a) customer relationship management systems, b) supply chain management systems, c) collaboration with business partners to forecast product demand, to manage capacity or inventories, d) telephone conferencing, e) video conferencing, f) online discussion fora, g) Internet relay chat. Eurostat's ICT Usage Enterprise Survey asks whether the respondent firms have IT systems for managing orders which automatically link with any of the following IT systems: a) Internal system for re-ordering replacement supplies, b) Invoicing and payment systems, c) Your system for managing production, logistics or service operations, d) Your suppliers' business systems (for suppliers outside your enterprise group), e)Your customers' business systems (for customers outside your enterprise group).

An aspect of ICT-based collaboration which has come into the focus of statistical measurement recently is ICT outsourcing. The UNDERSTAND firm survey asks companies whether they have outsourced ICT services to an external service provider in any of a number of application areas (maintenance of hardware and/r network; web hosting or data storage services; software development; software application hosting to application service provider; call centre services; other ICT services). This topic is also being covered in the e-skills module that has been included in the 2007 edition of the Eurostat ICT Usage Enterprise Survey[22]. It asks:

- Whether any ICT functions (i.e. those requiring ICT practitioners) are performed by external suppliers, either in the same country, abroad but within the EU, or in non-EU countries;
- Whether any ICT functions are performed by foreign affiliates which were established by the enterprise (internal suppliers from abroad), and if so, which functions these are (ICT management; ICT development and implementation; ICT operations; other);
- Whether any business functions that require ICT user skills or e-business skills are performed by external suppliers, either in the same country or abroad;
- Whether any business functions that require ICT user skills or e-business skills are performed by foreign affiliates which were established by the enterprise (internal suppliers from abroad), and if so, which functions these are (sales and marketing, customer services; research and development, product design and engineering; other).

There are also a number of national business surveys as well as surveys on work environments which have applied innovative indicators about inter-firm collaboration using ICT[23].

As far as fully networked organisational forms such as **virtual enterprises** and **digital ecosystems** are concerned, no statistical indicators have been identified by TRANSFORM. Because of the elusiveness of these concepts, this can hardly surprise. It would be possible, however, to find indicators on elements of the notion of virtual collaboration. Gareis (2006a: 6-7) lists the following elements which together make up the concept of "new, collaborative work environments (NWEs)":

- **Collaboration**: Collaboration occurs when two or more people interact and exchange knowledge in pursuit of a shared, collective, bounded goal. Bounded goals imply a beginning and an end. Two people interacting in order to get smarter is not collaboration. However, two people interacting in order to prepare for a calculus exam is. For empirical research, this definition needs to be operationalised. We suggest that one should speak of collaboration only when an explicit

[22] The module is reproduced in annex 6.2.

[23] see STILE Questionnaire Database at www.stile.be/surveydb/

(e.g. written, but not necessarily legally binding) agreement about common aims has been made. It is important to distinguish collaborative work contexts from other forms of coordination (see Laso Ballesteros & Salmelin 2005). In this context it appears useful to refer to the established typology of coordination modes in the context of workflow processes (van de Ven et al. 1976): These are, ranked according to increasing interdependency: pooled/additive, sequential, reciprocal and intensive interdependence arrangements. These types also relate to the extent to which co-workers carry out tasks in parallel, sequentially, or together. Depending to the extent to which tasks are designed as business processes, the two last types (reciprocal and intensive) are most likely to fit our understanding of "collaboration". However, sequential coordination can also amount to collaboration if co-workers interact and exchange knowledge in pursuit of a shared, collective, bounded goal.

- **Boundary spanning**: An important aspect in which virtual collaboration differs from traditional forms is the extent to which it crosses boundaries of space, time, function, culture, and organisation. This stems from the initial rationale behind virtual collaboration which is to combine the skills and capabilities of a number of agents for the pursuit of a certain goal regardless of the traditional constraints of distance. Mobility – in any sense of the term – plays a key role in this regard. With regard to the geographical boundaries, NWEs typically involve the transfer of work inputs and/or outputs via data telecommunications links across distance. Distance refers here to physical remoteness between collaborators. Remote work most often is being (implicitly) defined as meaning different sites/locations/addresses.
- **Team and project organisation**: We define collaboration in virtual teams as a group of individuals who (or: some of whom) are located remotely from each other and who collaborate, and in which interaction takes place exclusively or almost exclusively via telemediation. Virtual collaboration is understood to take place in teams, i.e. in groups of persons who work together for a longer stretch of time. A project is a temporary endeavour being undertaken to create a unique product or service. Projects are temporary. In recent years, cases of (virtual) collaboration between companies and their customers have attracted increasing interest (Voß & Rieder 2005).
- **Ubiquitous access to resources**: New work environments do not only provide advanced possibilities for interacting with remote collaborators, they also offer anytime, anywhere access to resources such as access to codified information in databases, and digital applications (often containing ambient intelligence) which effectively support the adaptation of the working environment (tools, etc.) to the requirements of the specific task on hand. Ubiquitous access to information resources turned from science fiction into a realistic perspective with the advent of the Internet. IP-based applications are likely to dominate NWE tools in the near future.
- **People focus**: Depending on the complexity and nature of the tasks involved (see further below), NWEs need to provide optimal working conditions for the worker if they are to support high levels of productivity – as research into high performance work organisation and related concepts has shown. Worker focus usually implies some or all of the following characteristics: a non-hierarchical organisational structure; flexibility in working methods; corporate cultures focussing on people orientation; continuous investments in learning & training; and innovative performance measurement and reward schemes. In addition, people focus goes beyond catering for workers as it also implies that the focus of business processes should is on optimally serving the customer.
- **Technology**: The type of collaboration outlined above is possible only with the support of advanced tools for, for example, computer supported collaborative work (CSCW); for mobile communication and for ambient intelligence. In essence, these tools enable easy access to knowledge resources and required communication channels at any place and any time, and are fully integrated in the working environment in order to support creative work as good as possible.

The **social capital** concept has only rarely been applied explicitly to firms. An exception is the ESCR / Cardiff University UK Small Firm Performance Survey piloted a number of indicators on collaborative relationships, community memberships and other "soft factors" which may be of importance for decision-makers in firms (Cooke et al. 2005). This included:

- Perceived importance of "hard" locational factors as well as "soft" factors (social contacts, membership of clubs, forums or societies) to the overall performance of your company;
- Geographical reach of social contacts and membership of clubs, forums or societies (local, regional, UK-wide, international);
- Perceived importance of informal information exchange with customers and suppliers;
- Number and type of collaboration partnerships, and their respective importance for business

performance;

- Trust towards collaborators and its importance in "compensating for certain asset short-falls within your company";
- Perceived importance of different types of collaborative relationships (informal business & social relationships; contractual; arms-length; indirect (via a third party) relationships);
- Perceived importance of different modes of interaction (face-to-face; telephone/fax/video-based; IT based contact);
- Extent to which new social or business/social relationships are developed strategically.

On the basis of the data they collected, Cooke et al. (2005: 1073) suggest that there are "so many factors (both endogenous and exogenous) impacting simultaneously, any given individual variable is typically only associated with very small variances in another [including performance indicators]". For this reason, they recommend data reduction analysis to create composite variables, as these are likely to be more effective in showing associations.

Westlund and Nilsson (2005) piloted a number of indicators for the measurement of investments in social capital by enterprises. They included monetary investments in internal social capital (formal education, internal entertainment) and in external social capital (R&D, marketing, local sponsorship, external entertainment) as well as investments in time in internal social capital (formal education, internal entertainment) and in external social capital (social contacts with decision-makers, external entertainment). The authors concluded from their research that "only direct investment in social links can give a correct picture of social capital" (ibid.: 1092), as social links do not logically and consistently emerge as a by-product of investments in economic links. Westlund and Nilsson follow that "measuring the investments made by enterprises in social capital requires the use of questionnaires, with all the problems associated with this method" (ibid.).

4.1.2 Individuals

Most social capital research, of which there has been an explosion in the last years, focuses on the individual and her/his relationship to other agents, social units and institutions. Still, measurement of individual-level social capital continues to pose serious conceptual and methodological challenges (Field 2003).

As far as the effect of ICTs is concerned, a number of commentators have pointed out that the claim from Putnam (2000) that levels of social capital are decreasing might be caused by inappropriate choice of indicators, or more exactly: the failure to update indicators in order to reflect major trends in societal behaviour. For example, Katz and Rice (2002: 331) find that "computer-mediated communication is not included in definitions of the social-capital processes of community, interaction, or participation". Indeed, "if social capital is measured by dinner parties, as it often is, the Internet may appear to be a negative" (ibid: 332).

A key instrument used for research on the topic is the **Wold Value Survey**[24] and the initiatives which have sprung from it, such as the **European Social Survey**[25] and the **European Values Study** (Halman 2001). Key variables from these are listed in the accompanying indicator description annex. A problem with these established surveys is that they do not very well distinguish between types of social capital, and they also do not include data on ICT usage. Because of ICT's potential to support the formation of social capital in the form of strong ties and, in particular, weak (bridging) ties, this is extremely unfortunate.

A recent survey by the European Commission's **Eurobarometer** (EB59.2) included questions on social uses of the Internet, i.e. whether the Internet is being used for (a) contacting family and friends, (b) get in contact with new people, chatrooms, forums, (c) to connect to communities/organisations online (EEIG 2004). Unfortunately, the Eurostat's annual ICT Usage Household Survey has not taken up this question, but only asks for instrumental/transactional uses.

An important contribution has been made recently by the **Pew Internet & American Life Project**, which conducted a survey on the relevance of the Internet for social networking and the ability to

[24] www.worldvaluessurvey.org/

[25] www.europeansocialsurvey.org/

access help in cases of need (Boase et al. 2006). The researchers first established the size of the network of weak and strong ties for each respondent, using the following definitions given to respondents:

- "I'm going to ask you questions about two different types of people in your life – those you feel VERY CLOSE to who do not live with you, such as close family and friends, and those you feel SOMEWHAT CLOSE to who do not live with you. We'd like to know how many people in your life fit into each one of these categories. Let's start with the people you feel VERY close to, which might include those you discuss important matters with, regularly keep in touch with, or are there for you when you need help. Thinking about ALL the people who fit this description and who do NOT live with you, how many are…
  - Members of your immediate family – parents, siblings, adult children, or in-laws;
  - Other relatives;
  - People you know from work;
  - Neighbours;
  - Other people who are not co-workers or neighbours.
- Now think about the other type -- the people you feel SOMEWHAT CLOSE to who do not live with you. They're more than just casual acquaintances, but they're not as close as the friends and relatives we just talked about. Thinking about ALL the people who fit this description, how many are…
  - Members of your immediate family – parents, siblings, adult children, or in-laws;
  - Other relatives;
  - People you know from work;
  - Neighbours;
  - Other people who are not co-workers or neighbours."

They then ask how many of these are women, of a different ethnicity, located more than one hour's travel away, before asking if any of these have ever helped with each of the following activities: to find a new place to live; to change jobs; to buy a personal computer; to make a major investment or financial decision; to look for information about a major illness or serious medical condition; to care for someone with a major illness or serious medical condition; to put up drywall in your house; to decide who to vote for in an election. In a further step, the communication modes used for interacting with close and weak ties are established. Also covered was the heterogeneity of personal networks, i.e. whether any of the people very or somewhat close to the respondent are in one of the occupations: lawyer, truck driver, sales or marketing manager, pharmacist, janitor or caretaker, engineer, cashier, waiter or waitress, computer programmer, carpenter.

By correlating these variables with information about ICT usage patterns, the study was able to find evidence for positive association between Internet use and social network capital at individual level. This conclusion was upheld after controlling for the influence of third factors which can be expected to exert an influence on social capital (demographics, socio-economic status, etc.).

It appears that the approach chosen by Pew Internet for this survey is extremely useful for the given subject, and that it could be very feasible for inclusion in established social survey instruments.

In some countries, social capital modules have been piloted for the purpose of including them in ongoing social surveys by the National Statistical Institutes. For example, the module developed in the UK (Green & Fletcher 2003) includes questions on how respondents text or email friends and relatives, and how often they use chatrooms on the internet to talk with friends and relatives.

An important further step would be the inclusion of social capital and ICT-related questions in panel surveys of the kind of the now discontinued European Community Household Panel. The **SOCQUIT** project (Anderson 2006) has used panel data from the earlier **eLiving** project to construct indicators about:

- Bonding social capital:
  - Number of friends you can count on if you need to talk;
  - Leisure activities (Frequency of: Playing sport, keep fit or go walking; Go to cinema, concert, theatre or watch live sport; Have a meal in a restaurant, cafe or go for a drink to a bar or club; Meet with friends);

- Bridging social capital:
  - Number of the following groups a member of: social groups (sport, gym etc), voluntary groups (church and volunteering), political groups(such as unions and other political campaign groups), other;
  - Frequency of attending: Activity groups such as evening classes.

In addition, the dataset contains indicators about ICT usage, in particular about changes in technology uptake and in usage patterns. If such panel data was collected over a longer period of time, important contributions to the debate about ICT and social capital could be made.

A number of studies have applied indicators on stocks of social capital among **workers**, and its use for employment- and work-related purposes (Stone et al. 2003). No studies have been identified, however, which look into the role of ICTs in this context.

A particular question concerns the role ICTs play in supporting a sense of regional identity. It was dealt with in the BISER project, which developed and piloted indicators on the topic (Millard & Christensen 2004), see Table 8.

Some of these variables have been taken up by the UNDERSTAND project which developed harmonised questionnaires for application in regional ICT observatories across Europe (see UNDERSTAND 2006).

Table 8: Regional Identity Module Piloted in the BISER Project

Area	Sub areas	Indicators and definitions	Base
1.) Unravelling regional identity (BISER intermediate indicators)	1.1 Sense of regional identity	Percentage of respondents who state the following sense of identity with the region they live in: 1. strong 2. moderate 3. weak 4. none	All respondents, excluding 'do not know'
	1.2 Use of traditional regional media	Percentage of respondents who have in the last four weeks: 1. read a regional or local newspaper 2. listened to a regional or local radio station 3. watched a regional or local TV station's programme	All respondents
	1.3 Residential preference	Percentage of respondents who: 1. would prefer to stay in the region 2. would prefer to move out of the region but stay in country 3. would prefer to move abroad 4. do not care where they live.	All respondents
2.) Regional identity and ICT (BISER 'e' indicators)	2.1 Use of the Internet for regional purposes	Percentage of Internet users who have: 1. got news about region from the Internet 2. checked for opening times, addresses or other practical information about the region 3. visited the website of a regional organisation dealing with hobbies, sports, or recreation 4. visited the website of a regional neighbourhood, charity, welfare or voluntary organisation 5. visited the website of a regional political party, trade union, residents group or other civic or political organisation 6. visited the website of the governing mayor or head of local government within the region	Respondents who have used the Internet within the last 12 months
	2.2 Effect of Internet and email on regional identity	Percentage of recent internet users who state effect of internet and e-mail is: 1. a greater sense of identity with the region 2. less sense of identity with the region 3. a different sense of identity with the region 4. no effect on sense of identity with the region	Respondents who have used the Internet within the last 4 weeks
	2.3 Location of email partners	Average percentage of e-mail partners located: 1. in region 2. in country but outside region 3. outside country	Respondents who used e-mail last week

Source: Millard & Christensen 2004: 13

Indicators on participation in cultural activities were also covered by two Eurobarometer surveys conducted in 2001/2003 in the then candidate countries (EEIG 2002).

One of the fisrt edictions of the EU Adult Education Survey, which is currently being prepared, is likely to include a section on social participation, including some questions concerning participation in organisations and voluntary work. It is hoped that "these variables on social (and civic) participation would measure the difficult area of social capital or even social participation and give information on the relationship between social activity and learning activity" (Eurostat 2005a).

4.1.3 Regional Government

The United Nations' Division for Public Administration and Development Management eGovernment has developed an e-adoption ladder for the purpose of international comparative measurement and benchmarking (see box below). The actual data collection is conducted through a website measure survey, the purpose of which is "to assess all UN member states' online presence through their national site, as well as five predetermined ministries along with associated and integrated portals" (UN 2005: 248).

United Nations Model for Stages of e-Government Evolution

Emerging Presence is Stage I representing information, which is limited and basic. The e-government online presence comprises a web page and /or an official website; links to ministries/departments of education, health, social welfare, labour and finance may/may not exist; links to regional/local government may/may not exist; some archived information such as the head of states' message or a document such as the constitution may be available on line, most information remains static with the fewest options for citizens.

Enhanced presence is Stage II in which the government provides greater public policy and governance sources of current and archived information, such as policies, laws and regulation, reports, newsletters, and downloadable databases. The user can search for a document and there is a help feature and a site map provided. A larger selection of public policy documents such as an e-government strategy, policy briefs on specific education or health issues. Though more sophisticated, the interaction is still primarily unidirectional with information flowing essentially from government to the citizen

Interactive presence is Stage III in which the online services of the government enter the interactive mode with services to enhance convenience of the consumer such as downloadable forms for tax payment, application for license renewal. Audio and video capability is provided for relevant public information. The government officials can be contacted via email, fax, telephone and post. The site is updated with greater regularity to keep the information current and up to date for the public.

Transactional presence is Stage IV that allows two-way interaction between the citizen and his/her government. It includes options for paying taxes; applying for ID cards, birth certificates/passports, license renewals and other similar C2G interactions by allowing him/her to submit these online 24/7. The citizens are able to pay for relevant public services, such as motor vehicle violation, taxes, fees for postal services through their credit, bank or debit card. Providers of goods and services are able to bid online for public contacts via secure links.

Networked presence is Stage V which represents the most sophisticated level in the online e-government initiatives. It can be characterized by an integration of G2G, G2C and C2G (and reverse) interactions. The government encourages participatory deliberative decision-making and is willing and able to involve the society in a two-way open dialogue. Through interactive features such as the web comment form, and innovative online consultation mechanisms, the government actively solicits citizens' views on public policy, law making, and democratic participatory decision making.

Implicit in this stage of the model is the integration of the public sector agencies with full cooperation and understanding of the concept of collective decision-making, participatory democracy and citizen empowerment as a democratic right.

Some doubts can be raised about the validity of measurement since it supposes fairly common

structures of public administration and its online interface to the public. The e-government supply indicators developed as part of the eEurope benchmarking framework are more specific since they refer to 20 specific (more or less well defined) public administration services and the extent to which these are offered online (Capgemini 2006). For each service, between 4 and 5 stages are defined, based on the following generic framework:

- Stage 0 – Total absence of any publicly accessible website managed by the service provider; or the public service provider has a publicly accessible website, but this one does not offer any relevant information, interaction, two-way interaction or transaction possibilities at all concerning the analysed service.
- Stage 1 – Information: The information necessary to start the procedure to obtain this public service is available on-line.
- Stage 2 – One-way Interaction: The publicly accessible website offers the possibility to obtain in a non-electronic way (by downloading forms) the paper form to start the procedure to obtain this service. An electronic form to order a non-electronic form is also considered as stage 2.
- Stage 3 – Two-way Interaction: The publicly accessible website offers the possibility of an electronic intake with an official electronic form to start the procedure to obtain this service. This implies that there must be a form of authentication of the person (physical or juridical) requesting the services in order to reach stage 3.
- Stage 4 – Full electronic case handling: The publicly accessible website offers the possibility to completely treat the public service via the website, including decision and delivery. No other formal procedure is necessary for the applicant via "paperwork".

Table 9: eEurope Common List of 20 Basic Public Services

Public Services for Citizens	**Public Services for Businesses**
Income taxes: declaration, notification of assessment Job search services by labour offices Social security contributions Personal documents (passport and driver's licence) Car registration (new, used and imported cars) Application for building permission Declaration to the police (e.g. in case of theft) Public libraries (availability of catalogues, search tools) Certificates (birth, marriage): request and delivery Enrolment in higher education / university Announcement of moving (change of address) Health related services (e.g. interactive advice on the availability of services in different hospitals; appointments for hospitals.)	Social contribution for employees Corporation tax: declaration, notification VAT: declaration, notification Registration of a new company Submission of data to statistical offices Customs declarations Environment-related permits (incl. reporting) Public procurement

Source: Capgemini 2006

As far as more specific indicators about inter- and intra-regional online networking are concerned, the indicators suggested by the UNDERSTAND (2006) project appear to be of much value. These are collected from local/municipal authorities and include:

- Share of local authorities/municipalities that have an Intranet;
- Share of municipalities that do not have an Intranet but have one planned for the future;
- Average (in %) of employees that have access to the Intranet in the municipalities that have one (of employees with administrative functions);
- Share of municipalities/local authorities that implement joined up service delivery by sharing of:
  - Service delivery information with other public agencies;
  - Front desk facilities with other public agencies;
  - Call centre facilities with other public agencies;

- Private networks or Extranets with other public agencies;
- Access to databases with other public agencies.

Because of the heterogeneity of administrative systems and regulation frameworks, the use of such indicators for valid cross-country comparisons is bound to be difficult. For this reason, most existing comparative studies make use of qualitative as well as quantitative data.

Table 10: INTERact Programme Measurement Framework

ELEMENTS OF SOCIAL CAPITAL TO BE MEASURED		INDIVIDUAL SOCIAL CAPITAL Interpersonal Networks	COLLECTIVE SOCIAL CAPITAL Intra-organisatorial Networks	COLLECTIVE SOCIAL CAPITAL Inter-organisatorial Networks	QUANTITY
Structural Properties of Institutional Networks	SIZE	Number of persons within whom one maintains different types of relationships: intime friends and family, less close friends and family, simple acquaintances, neighbours, work colleagues, etc.	Number of members in an organisation	Number of partners in a network	Nr
	DENSITY	Level of interconnections between network members	Level of interconnections between members of an organisation	Level of interconnections between partners in a network	H/M/L
	DIVERSITY	Heterogeneity of the socio-economic status of network members	Heterogeneity of the socio-economic status of members of an organisation	Heterogeneity of the organisational partners in a network	H/M/L
	FREQUENCY OF CONTACT	Number and lenght of contacts between network members	Number and lenght of contacts between members of an organisation	Frequency of communications between the organisations and number of network activities	Nr
	INTENSITY OF CONTACT	Strenght and nature of a relationship in terms of emotional investment (weak – strong)	Strenght and nature of working relationships within the organisation	Strenght and nature of the relationships between organisatorial partners	H/M/L
	SPATIAL PROXIMITY OF PARTNERSHIP MEMBERS	Network members who meet face to face on a regular basis	Organisational members who meet face to face on a regular basis	Network partners who work in the same geographical area	Nr
Social Networks Dynamics	MOBILISATION OF PARTNERSHIP: GAP BETWEEN PERCEIVED AND MOBILIZED RESOURCES	Expectations about available support/resources and questions on the support/resources actually received	Expectations about available support/resources and questions on the support/resources actually received	Expectations about available support/resources and questions on the support/resources actually received	H/M/L
	RELATIONAL COMPETENCY AND CONDITIONS OF SOCIAL INTEGRATION	Relation skills and effects of life-course events	Stability of intra-organisational relations through various events that mark the organisation's evolution	Stability of inter-organisational relations through various events that mark the collective action's evolution	H/M/L
	NORMS AND RULES INTERNAL TO THE NETWORK	Norms: cultural and ethical dimensions of relationships (e.g. trust, belonging, tolerance, inclusion, etc) Rules: reciprocity, symmetry, equality, transitivity	Quality and democratic aspect of interactions, openness and respect of actors, common perception of issues, confidence in the contribution of each member of the organisation	Quality and democratic aspect of interactions, openness and respect of actors, common perception of issues, confidence in the contribution of each of the partner organisation	H/M/L
External Context in which Social Capital operates	STRUCTURES AND INSTITUTIONAL ARRANGEMENTS	Number of formal/informal arrangements which help/hinder the development of relationships and social integration	Number of formal/informal arrangements which help/hinder interactions between members of the organisation	Number of formal/informal arrangements which help/hinder the creation and functioning of interorganisatorial partnerships	Nr

Source: Fiorini et al. 2006

The INTERact programme recently published the results from a study on indicators for monitoring the transnational and interregional cooperation programmes under European territorial cooperation in the last and the new round of Structural Funds (Fiorini et al. 2006). The indicators developed focus on individual programmes as their observation unit. The study is of special interest to TRANSFORM because it is particularly concerned with the social capital approach to the added value produced by such cooperation. Fiorini et al. set out by identifying the main reasons for cooperation in the context of regional development policies:

- to build up partnerships between different actors both from a horizontal (geographical coverage) and vertical (public/private sectors at different levels) perspective;
- to support the evolution of the project partnership into a stable institutional network (thematic or sectoral), able to raise the awareness of being a part of a European process and to consider this as the added value in the implementation of joint activities. At the same time project/programme

activities may generate new or strengthen pre-existing sectoral/ thematic networks among target group members;

- to promote economic growth and to combat social exclusion and unemployment supporting the cohesion of the European Union through the general development of social networks (ibid.: 59).

A distinction is being made between individual social capital (interpersonal networks) and collective social capital (intra- and inter-organisational networks), see Table 10.

The indicators suggested distinguish between quantitative measurement (number of networks established, activated or supported) and qualitative measurement. The latter focuses on:

- Structural properties of each network
  - size and density
  - characteristics of the members (diversity)
  - relational properties (frequency, intensity, spatial proximity)
- Network dynamics
  - extent to which partnership resources are mobilised (mobility)
  - relational skills and conditions for social integration
  - norms and rules internal to the network
- The external context in which social capital operates.
  - structures and institutional arrangements.

In a similar vein, but with stronger focus on quantitative measurement, the study by Malerba et al. (2007) developed an indicator for inter-regional cooperation in the context of selected Community deployment initiatives such as LEADER+, INTERREG, EQUAL and URBAN. The indicator was calculated for every NUTS2 region in the EU15.

4.2 Lifelong and Collective Learning and Innovation

4.2.1 Firms

Innovation and learning related indicators can be distinguished into measures on investment (e.g. learning activities, research & development), stocks (e.g. human capital, skill levels, qualifications) and outputs (e.g. innovative behaviour, new products or processes, patents).

Investments in Training and eLearning

Insights about needs, interests and preferences of employers with regard to the delivery of training to staff can be obtained by:

- observing companies' actual behaviour with regard to training, i.e. the extent to which they provide training to their staff, purchase training services on the market, and so forth;
- asking employers about their perceived training needs as well as about related attitudes;
- measuring actual skills shortages[26] in companies (which would indicate a need for training); and
- asking employers on perceived skills shortages in their company (Gareis & Mentrup 2004: 67).

Business investment in training and education is covered by the Continuing Vocational Training Survey (CVTS). The third wave of the CVTS was conducted in 2006, with 2005 as the reference year. The scope of the CVTS has increased gradually, and it now includes initial as well as continuing vocational training (participant numbers and total costs). A revised section on qualitative questions aims at developing an indicator on "enterprise professionalism in the pursuit and management of their

[26] Following the definition by the UK Learning and Skills Council (DfES 2001), we define the different deficiencies as follows: A skill shortage is a quantitative lack of skilled people in the labour market; a skill gap is a competence shortfall between the current and needed competence levels of the staff within companies or other organisations; a skill mismatch is a mismatch between the competence of the trainee or graduating student/learner and the expected competence needs of the employers assumed to arise from course curricula misalignment.

vocational training activities". Although microfirms (those with less than 10 employees) are excluded, some participating countries conducted pilot projects on this category (see Eurofound 2005b). Apart from the continuing vocational training courses, other forms of CVTS are also covered. These include "self-learning through open and distance learning (methods used in this type of learning; can include using video/audio tapes, correspondence courses, computer based methods (including Internet) or the use of a Learning Resources Center)", but e-learning is not singled out in a separate question/variable.

For the latter, the Eurostat ICT Usage Enterprise Survey supplies an indicator about "use of the Internet for training and education" (Eurostat 2006c). Because of the lack of any definition of what activities and of what kind of uses of the Internet qualify as such, this question cannot be expected to produce valid data. The new e-skills module of the same questionnaire is of more value, but its focus is on ICT as subject of training measures:

- Did your enterprise provide training to develop or upgrade ICT related skills of your personnel?
- IF YES: Was this (a) training for ICT/IT specialists or (b) training for users of ICT?

The eBusiness W@tch[27] asks companies whether they:

- regularly send employees to ICT training programmes (yes/no);
- use e-learning applications, such as learning material for employees available on an Intranet or on the Internet.

The UNDERSTAND questionnaire covers the issue in the following way:

- Does your company have a written learning strategy for employees?
- Has your company used e-learning (computer supported learning) to provide training (not only ICT related but on any subject e.g. foreign languages, project management, laws)?

For classification of learning activities into formal education, non-formal education, and informal learning, and for delimitation against non-learning activities, Eurostat has defined guidelines in a dedicated manual (Eurostat 2006b).

With regard to training-related attitudes, Eurostat's CVTS explored what reasons organisations give for not providing training to their staff (CEC 2002: 44-45). The by far largest share of non-training organisations claimed they had no need for training (72% in the EU15). Other reasons which are often mentioned in the literature such as lack of time (23%), expenses (15%) and the difficulty to assess training needs (12%) are cited only by a minority of all companies (see Table 11).

Table 11: Reason given[28] for not providing training to staff in reference year, % of all companies

	EU15	BG	CZ	EE	HU	LT	LV	PL	RO	SI
No need	72	82	96	69	83	54	79	82	77	60
No time	23	13	6	17	12	5	9	14	11	16
Too expensive	15	37	14	41	22	45	16	37	29	22
People recruited with the skills needed	27	71	48	54	70	50	42	27	63	59
Initial training sufficient	21	14	12	30	39	1	13	36	40	27
Investment recently made; no need this year	4	1	3	2	3	3	5	3	1	2
Difficult to assess enterprise's needs	12	9	5	7	5	9	11	0	3	11

Source: CEC 2002: 44-45

Skills

ICT-related skills of relevance for employers are basically of two kinds: those skills which are required

[27] www.ebusiness-watch.org/

[28] It was possible to tick a maximum of three reasons.

to develop, produce, maintain and program ICT systems; and those which are needed to apply such systems for not directly ICT-related business activities. Both of these are subsumed under the term "e-skills". In addition, there are those skills which people need to participate more generally in a society that is increasingly being affected by applications of ICT in all spheres of life. These skills are called "digital literacy skills". They are of relevance for firms not only because they form the basis of or supplement to employees work-related e-skills, but also because digital literacy is required for exerting demand for ICT products and services.

The following definition of e-skills, now well established in the European debate about the issue, stems from the European e-Skills Forum's 2004 synthesis report:

Categories of e-Skills

The term e-skills covers mainly three categories:

ICT practitioner skills: The capabilities required for researching, developing and designing, managing, the producing, consulting, marketing and selling, the integrating, installing and administrating, the maintaining, supporting and service of ICT systems;

ICT user skills: the capabilities required for effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work, which is, in most cases, not ICT. User skills cover the utilisation of common generic software tools and the use of specialised tools supporting business functions within industries other than the ICT industry;

e-Business skills: the capabilities needed to exploit opportunities provided by ICT, notably the Internet, to ensure more efficient and effective performance of different types of organisations, to explore possibilities for new ways of conducting business and organisational processes, and to establish new businesses.

Other definitions circulate. A recent study by IDC, commissioned by CISCO Systems, used the notion of "**networking skills**", defined as follows: "people needed to plan, design, manage, and support the networking technologies in the organization. The definition of skills needs to be broad due to the proliferation of networking technologies in organizations of all sizes" (Kolding & Kroa 2005: 15).

Statistics for Europe have been produced for all types of e-skills – there are indicators on how many individuals with these skills are currently in the European workforce, and how supply and demand will develop in the coming years (IDC 2001). The latest IDC study found that shortages are most significant in the area of "advanced network technology skills" (a subgroup of total networking skills) which deal with new network developments such as IP telephony, security, and wireless networking (Kolding & Kroa 2005: 15). For the whole of the EU, the study estimates:

> *[...] that the actual number of skilled people needed to fill the advanced skills gap will be around 160,000 in 2005, growing to some 500,000 by 2008. These figures represent skills gaps as a proportion of total demand of 8.1% in 2005 and 15.8% in 2008.*
>
> *[Regarding total networking skills] IDC estimates a shortage of people with networking skills of around 230,000 in 2005, increasing to 615,000 by 2008. In percentage terms, the gap, as a proportion of demand, is expected to increase from 6% in 2005 to 11.8% by 2008.*

Since these statistics were produced by IDC using proprietary methodologies, however, they cannot be reproduced by others, and are as such of little value for indicator development purposes.

Eurostat's latest version of the questionnaire for the ICT Usage Enterprise Survey includes an extensive module on e-skills (see annex 5.2). It covers the topic in some detail, collecting data on:

- Employment of ICT practitioners (number);
- Attempted and/or successful recruitment of ICT practitioners (yes/no);
- Hard-to-fill vacancies for ICT practitioners (yes/no);
- Perceived main reasons for hard-to-fill vacancies (lack or too low number of applicants with ICT specialist skills; lack of ICT related qualifications from education and/or training; lack of work experience in the field of ICT; salary requests too high; other);

- Attempted and/or successful recruitment of personnel for jobs requiring ICT user skills[29] (yes/no);
- Hard-to-fill vacancies due to applicants' lack of skills in the use of ICTs (yes/no);
- Training in e-skills (see above);
- Outsourcing of ICT functions and functions requiring use of ICTs (see above).

Development of the module was based on national experience in a number of Member States. For example, the NSIs of the UK and Germany have featured similar questions in business surveys for some time already (DfES 2001; Kölling 2002).

Innovation

Most approaches towards measuring innovative activity, such as those based on Eurostat and the OECD's "Oslo Manual", distinguish between inputs to innovation (mainly R&D) and innovation outputs.[30]

The indicator most often used for innovation outputs are related to patent applications. As has been discussed extensively elsewhere (e.g. Richiardi 2000; Wolters 2005), of course, there are many reasons why we need to be careful to put too much emphasis on patents, as there are other ways for companies to effectively protect the economic value of their inventions, and not all inventions lend themselves easily to be patented – they are most adequate for protecting product innovations of a technical nature. Additional indicators need to be sought and explored.

The Community Innovation Survey (CIS) uses self-reported innovative activity for the construction of indicators. Among others, the data collected covers the following **innovation output** variables:

- New products, developed mainly by (a) the enterprise/enterprise group; (b) together with other enterprises/ institutions; (c) mainly by other enterprises/ institutions;
- New processes, developed mainly by (a) the enterprise/enterprise group; (b) together with other enterprises/ institutions; (c) mainly by other enterprises/ institutions;
- Introduction, turnover and turnover share of (a) unchanged/marginally modified products; (b) products new only to the firm; (c) products new to the market;
- Patent and IPR related activity (patent applications; registration of trademark or industrial design; copyright claims).

Innovation inputs (investments in R&D) are covered as follows:

- Engagement in and expenditure on intramural R&D and extramural R&D[31]
- Engagement in and expenditure on acquisition of machinery, equipment and software
- Engagement in and expenditure on acquisition of other external knowledge
- Engagement in training
- Continuous engagement in intramural and extramural R&D
- Intramural, extramural R&D and total innovation expenditure as a share of total turnover
- Public funding of innovation (from local or regional authorities, central government, the EU, the 5th or 6th Framework Programmes)

Related to innovation inputs, the CIS asks about main **sources for information** for innovation related activities. The main categories for information sources are:

- Sources within the enterprise or enterprise group;
- Suppliers of equipment, materials, components or software;
- Clients or customers;
- Competitors or other enterprises of the same sector;

[29] Defined as: "Jobs requiring ICT user skills: ICT is an important tool for the job and is used to produce work output and/or used intensively at work (in day-to-day activities)"

[30] For a discussion of conceptual issues surrounding the difficulty to identify appropriate indicators for innovation, see Richiardi (2000).

[31] Expenditure on R&D may be made within the statistical unit (intramural) or outside it (extramural).

- Consultants, commercial labs or private R&D institutes;
- Universities or other higher education institutes;
- Government or public research institutes;
- Conferences, trade fairs, exhibitions;
- Scientific journals and trade/technical publications;
- Professional and industry associations.

The latest versions of the CIS now also includes questions on the perceived importance of individual **effects of innovation**, relating to a period of three years prior to the survey. Items include the following:

- Increased range of goods and services
- Entered new markets or increased market share
- Improved quality in goods or services
- Improved flexibility of production or service provision
- Increased capacity of production or service provision
- Reduced labour costs per unit output
- Reduced materials and energy per unit output
- Reduced environmental impacts or improved health and safety
- Met regulation requirements

Finally, the CIS includes questions about innovation activities which have been abandoned or seriously delayed, and about **barriers** which have been negatively affecting innovative activity in the reference period:

- Lack of funds within your enterprise or enterprise group;
- Lack of finance from sources outside your enterprise;
- Innovation costs too high;
- Lack of qualified personnel;
- Lack of information on technology;
- Lack of information on markets;
- Difficulty in finding cooperation partners for innovation;
- Markets dominated by established enterprises;
- Uncertain demand for innovative goods or services;
- No need to innovate due to prior innovations;
- No need to innovate because no demand for innovations.

Some of the indicator data from the edition of the CIS-2 (1997) were broken down to the NUTS2 level for the 2003 Regional Innovation Scoreboard (see Hollanders 2003). The exercise was not repeated because of the limited suitability of the sample for sub-national analysis (concerning, in particular, sample sizes per country and region).

Eurostat's REGIO database contains patent related indicators derived from the patent registers of the European Patent Office (EPO):

- Patent applications to the EPO by priority year (total number, per million inhabitants and per million labour force) and by by IPC sections, classes and subclasses[32];
- High Tech patent applications to the EPO by priority year; total number, per million inhabitants and per million labour force;
- ICT patent applications to the EPO by priority year; total number, per million inhabitants and per

[32] Definition of patents: A patent is a legal title of industrial property granting its owner the exclusive right to exploit an invention commercially for a limited area and time. Patent data provide a measure of R&D output. Regional and Urban Statistics – Reference Guide 2006 118 REGIO contains data on patent applications to the European Patent Office (EPO) from the regions of the Member States of the European Union at the NUTS Levels 1 and 2. There are two parts to the regional patent table, namely patent applications to the EPO by IPC section and patent applications to the EPO in the high technology fields.

million labour force;

- Biotechnology patent applications to the EPO by priority year at the regional level; total number, per million inhabitants and per million labour force.

The European Commission also collects similar data through the annual Innobarometer (EOS Gallup 2004c), a telephone survey within the Eurobarometer framework. In addition to questions on innovation outputs and inputs, the Innobarometer goes in some detail regarding public support for innovation activities, and their effects on firms' ability to innovate. Moreover, the Innobarometer 2004 asked whether firms "participate in an innovation network including other firms, universities, or research institutes".

The direct relevance of ICT for the innovation process is not covered by any of these indicators. The eBusiness W@tch features an abridged version of the same module, supplemented by questions on the relevance of ICTs for the innovation process:

- During the past 12 months, has your company launched any new or substantially improved products or services?
- Have any of these product or service innovations been directly related to or enabled by information or communication technology?
- During the past 12 months, has your company introduced any new or significantly improved internal processes, for example for producing or supplying goods and services?
- Have any of these process innovations been directly related to or enabled by information or communication technology?

4.2.2 Individuals

Lifelong Learning and eLearning

While indicators on formal education are well developed in the EU and allow for detailed cross-country comparisons (and for this reason, will not be discussed in this document), this is not true for non-formal, adult education and informal learning. Since ICT-related learning activities often take place outside of the formal education and qualification system and encompass self-learning as well as company-provided training, this poses a particular problem for statistical analysis of learning and skills related aspects of the Information Society.

Most indicators in use are based on the traditional assumption of a succession of phases which are either exclusively dedicated to learning or exclusively dedicated to working. This applies to the usual educational attainment indicators. But as there is now a consensus that both, learning and working, must take place in parallel, new indicators for measuring learning which is only a secondary activity need to be developed. These also have to include training that is neither provided by the state nor by companies but by individuals themselves or by other institutions, such as: self-learning activities (differentiated according to types of skills acquired); participation in training as a secondary activity, in parallel with employment; and participation in training that is provided by non-state, public institutions such as unions, church organisations, self-help groups etc. This refers to the debate around lifelong learning.

According to the definition by Eurostat (2006b: 8) lifelong learning includes "all learning activities that are:

- purposeful, that is activities which are undertaken with the purpose of improvement in behaviour, information, knowledge, understanding, attitude, values or skills; that are undertaken on an ongoing basis, which means that they are not incidental or random but have "the elements of duration and continuity", as indication of organisation, in principle without any lower duration limits;
- independent of whether they are formal or not; includes different types of learning like apprenticeships, second-chance schools, on-the job or off-the job education and training, self-learning, etc.;
- independent of source of funding, that is funded either by the private sector, the public sector or the individual;
- independent of mode of provision (using traditional or modern means, such as information and communication technologies) encompassing the entire population independent of age and

independent of labour market status".

In addition the source states that LLL is to comprise "in principle all kinds of activities ranging from early childhood education to leisure education for retired persons [and it] should not be limited to work related outcomes". The authors point out that, while the "definition of LLL remains consistent with ISCED since learning in ISCED is understood to be 'any improvement in behaviour, information, knowledge, understanding, attitude, value or skills', [...] the focus of the [Eurostat] LLL definition is the process of learning while the ISCED definition describes learning by the intended outcome".

The current structural indicator of the same name, however, uses a operational definition which is decidedly different. It covers participation in lifelong learning per 100 population aged 25-64, with Lifelong learning being defined as "participation in any type of education or training course during the four weeks prior to the survey. Education includes both courses of relevance to the respondent's employment and general interest courses, such as in languages or arts. It includes initial education, further education, continuing or further training, training within the company, apprenticeship, on-the-job training, seminars, distance learning, and evening classes".

The data for the indicator stems from the national labour force surveys. As previous analysis has shown (Empirica 2003), the differences in questionnaire wording between Member States are considerable, which suggests that country differences on this indicator may not adequately reflect the real comparative situation. Suggestions for a harmonised questionnaire module on lifelong learning have been brought forward by the SIBIS, BISER and eUSER projects (Empirica 2003; 2004; Gareis 2006c).

The focus in TRANSFORM is on adult education, i.e. "adults who have left initial education and training" as defined by the OECD (2003b). For indicators covering the use of ICTs within the formal education system (schools, universities, etc.), see Eurydice (2004; 2005) and empirica & TNS Emor (2007).

Adult education has been the subject of extensive indicator development activities in recent years. At the European level, a taskforce set up by Eurostat (2005) explored the possibilities for an EU Adult Education Survey, partly based on the findings of an earlier taskforce that looked into measurement of lifelong learning (Eurostat 2001). A main outcome of the survey is to enable the categorisation of the entire adult population into one of four types: (1) Non-learners, (2) Learners only in formal or/and non-formal education, (3) Learners combining participation in formal or/and non formal education with informal learning activities, (4) Learners only in informal learning activities (for definitions and sub-sections of education, see box below).

Eurostat Classification of Learning Activities

1. Formal education
2. Non-formal education
2.1. Non formal programmes
2.2. Courses:
2.2.1. Courses conducted via classroom instruction (including lectures)
2.2.2. Combined theoretical-practical courses (including workshops)
2.2.3 Courses conducted through open and distance education
2.2.4. Private tuition (private lessons)
2.3. Guided on-the-job-training
2.4. Other non-specifi ed elsewhere
3. Informal learning
3.1. Taught Learning
3.1.1. Coaching / Informal tuition
3.1.2. Guided visits
3.2. Non-taught learning
3.2.1. Self-learning
3.2.2. Learning-group

3.2.3. Practice

3.2.4. Non-guided visits

Source: Eurostat 2006b: 22

Regarding the coverage of ICT-related issues by existing statistics, it is necessary to distinguish between **ICTs as subject of learning** and **ICTs as tools for learning**. The former can, of course, take place via formal education (e.g. university degrees in IT), non-formal education (e.g. training courses in companies) and informal learning (e.g. self-learning at the home PC or using a mobile device). It is discussed below. ICTs as tools for learning refer to **modes of delivery** for skill acquisition. An input document prepared for the European Adult Education Survey Taskforce distinguished between (Eurostat 2005a: A6-1)

- Taught learning:
  - attending teaching lessons (courses);
  - attending lectures (with teacher student relationship).
- At the borderline between taught and non-taught (still to be classified):
  - visiting conferences, presentations, talks (without teacher student relationship);
  - distance learning, correspondence courses;
  - face-to-face instruction (e.g. at the work place, in the family, etc).
- Non-taught learning:
  - informal learning groups (e.g. among friends, colleagues, students; quality circles);
  - visiting specific institutions (e.g. libraries, learning centres, exhibitions, scientific museums);
  - reading books, magazines;
  - using the computer (online vs. offline);
  - using educational broadcasting (online: TV, radio; offline: Video/audio tapes etc);
  - "learning by doing", "learning by watching and trying out".

Skill acquisition via a computer is part of the concept of **e-learning**. As discussed above, e-learning enables persons to take part in learning activities who would otherwise have to overcome severe obstacles resulting e.g. from lack of free time and remoteness to locations of training courses. E-learning applications can be classified as follows (Empirica 2004):

- Offline electronic learning material (including CD-ROMs):
  - used at home;
  - used at work;
  - used at a mobile location;
  - accessed at educational institution or somewhere else.
- Online learning material provided on the internal computer system of the company or educational institution:
  - real-time (e.g. live tutorials);
  - archived.
- Online learning material accessed through the Internet:
  - real-time (e.g. live tutorials):
    - accessed at home;
    - accessed at work;
    - accessed at educational institution or somewhere else.
  - archived:
    - accessed at home;
    - accessed at work;
    - accessed at educational institution or somewhere else.

Eurostat's ICT Usage Household Survey includes some questions on e-learning. The master

questionnaire first asks whether the Internet was used (in the reference period) for training and education, namely:

- Looking for information about education, training or course offers;
- Doing an online course (of any subject);
- Consulting the Internet with the purpose of learning.

Subsequently, the questionnaire asks whether the respondent has taken any kind of training course, and (in case of a positive reply) whether she/he has:

- done research as part of a training course or your education;
- exchanged messages relating to the course content with other learners;
- download learning content which was provided online ;
- looked for the availability of a book or article for your course in a library.

Skills

Using the data from the Eurostat ICT Usage Household Survey, a recent publication presented statistics on the share of Member States' population with none, low level, medium level and high level of basic computer skills (Eurostat 2006e). This is based on user experience in carrying out six computer-related activities:

- Using a mouse to launch programs such as an Internet browser or word processor,
- Copying or moving a file or folder,
- Using copy and paste tools to duplicate or move information on screen,
- Using basic arithmetic tools to duplicate or move information on screen,
- Compressing files, and
- Writing a computer program using a specialised programming language.

These six computer-related items were used to recode respondents into levels of skills: persons who replied yes to only one or two of items were coded as 'low level of basic computer skills', persons who have carried out three or four items were coded as 'medium level' while those who had carried out five or all activities were labelled as 'high level of basic computer skills'. People with no basic computer skills are those who have never used a computer and those who have not carried out any of the six items.

A different approach towards the measurement of basic e-skills is to use a self-assessment approach. In this case, respondents are asked to indicate their level of know-how in carrying out specific tasks related to computer use. There is some empirical evidence suggesting that people's perception of their computer skills is usually a good proxy measure for their actual abilities (see Hargittai 2005).

The population survey conducted in the context of the eUSER study (Gareis & Mentrup 2006) featured a module on the confidence users feel in carrying out each of four tasks:

- using a search engine to find information on the Internet;
- using e-mail to communicate with others;
- downloading and installing software onto a computer; and
- identifying the causes of computer problems.

In this study, the decision to ask for perceptions of confidence in own skills was taken against evidence which suggests that rather than actual endowment with skills, it is the perceived sufficiency of one's skills (what is called self-efficacy) which acts as a barrier to take up (Empirica 2004).

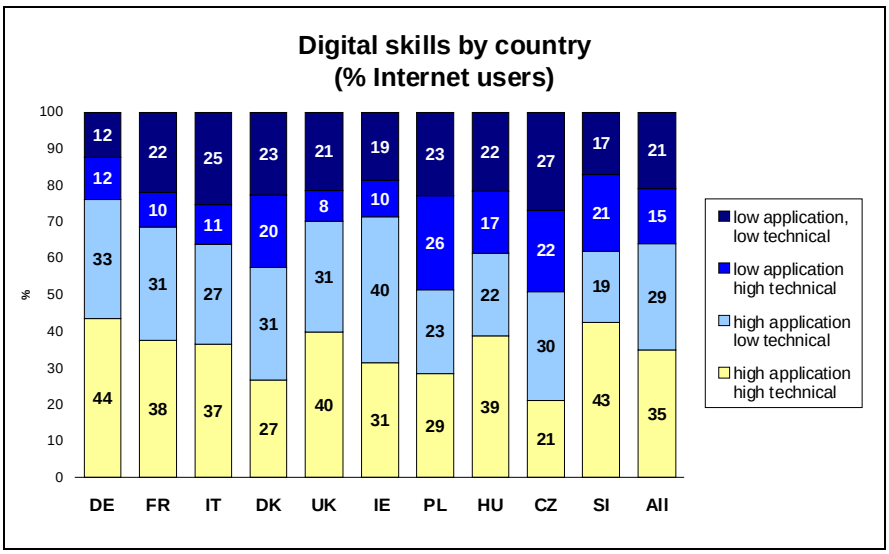
eUSER then constructed a skills typology based on a principle components analysis of the results from this question. This led to two factors that can be labelled "application usage" skills and "technical" skills, respectively. Internet users can be divided into four groups in relation to these (Table 12 and Figure 11). As can be seen, there is a tendency towards higher levels of application skills rather than technical skills amongst the overall population of Internet users.

Table 12: Digital Skills Typology

	Low technical skills	High technical skills
Low application skills	21%	15%
High application skills	29%	35%

Data source: eUSER GPS 2005; Base: Internet users

Figure 11: Digital Skills by Country



Data source: eUSER GPS 2005; Base: Internet users

Detailed measurement frameworks for (self-)assessment of – mainly operational – digital skills are available from organisations who have developed training courses, such as the ECDL[33]. An earlier example which has reached wide use, especially in the USA, is the Digital Literacy Checklist developed by the University of Washington in Seattle[34]. It distinguishes between basic computer operations competencies, desktop competencies (Windows, writing and word-processing, time, task and contact management, presentation, data management) and Internet competencies (communication, general web process, information literacy, information search, data retrieval and manipulation, information organization, bibliographic citation, copyright knowledge). For larger scale survey research, these skill frameworks are not well suited because of their degree of detail. There main application area is for direct measurement in the context of training activities.

Using van Dijk's distinction between **operational**, **information** and **strategic skills**, the skills mentioned above fall mainly in the category of operational skills (van Dijk 2005). For statistical coverage of information and, in particular, strategic digital skills, more refined measurement systems are required. In general, measuring literacy – with regard to traditional media as well as digital media – requires methodologies including direct measurement. This is extremely cost-intensive. Major investments are required not only for data collection itself, but also for the design of the conceptual framework and measurement instruments, which have to aim for high comparability across countries with diverse cultural backgrounds.

For this reason, there is only one survey of this kind available, the Adult Literacy and Life Skills Survey (ALL), a large-scale co-operative effort undertaken by governments, national statistics agencies, research institutions and multi-lateral agencies across the world. The ALL presents an update of the International Adult Literacy Survey (IALS), the world's first internationally comparative survey of adult skills undertaken between 1994 and 1998.

The foundation skills measured in the ALL survey include prose literacy, document literacy, numeracy, and problem solving (see box).

[33] http://www.ecdl.org

[34] See http://courses.washington.edu/hs590a/modules/69/diglit/diglit.htm

The Skill Assessment Domains in the Adult Literacy and Life Skills Survey (ALL)

Prose literacy – the knowledge and skills needed to understand and use information from texts including editorials, news stories, brochures and instruction manuals.

Document literacy – the knowledge and skills required to locate and use information contained in various formats, including job applications, payroll forms, transportation schedules, maps, tables and charts.

Numeracy – the knowledge and skills required to effectively manage the mathematical demands of diverse situations.

Problem Solving – Problem solving involves goal-directed thinking and action in situations for which no routine solution procedure is available. The problem solver has a more or less well defined goal, but does not immediately know how to reach it. The incongruence of goals and admissible operators constitutes a problem. The understanding of the problem situation and its step-by-step transformation based on planning and reasoning, constitute the process of problem solving.

Additional skills assessed *only indirectly* include familiarity with and use of ICT. This means that there are possibilities to infer, through multi-variate analysis, whether Internet use is associated with different types and degrees of adult literacy, but ICT-related skills themselves are not covered by the survey.

The possibility for direct measurement of ICT-related skills was assessed recently by means of a feasibility study conducted on behalf of the PISA ICT Expert Panel (Lennon et al. 2003). The study explored the possibility of developing and delivering a direct assessment of (ICT) literacy in the context of the Programme for International Student Assessment (PISA). It resulted in a set of performance-based ICT assessment tasks that were tested on a sample of students in Australia, Japan, and the United States. The definition of ICT literacy applied in the study is as follows: ICT literacy is the interest, attitude, and ability of individuals to appropriately use digital technology and communication tools to (1) access, (2) manage, (3) integrate, and (4) evaluate information, (5) construct new knowledge, and (6) communicate with others in order to participate effectively in society". This list reflects the underlying belief that "ICT is not about specific technical skills, but rather it is about information gathering, knowledge construction and communication. As such, these processes reflect the integration of technical knowledge and skills with more traditional cognitive skills such as literacy and numeracy". The study came to the conclusion (albeit preliminary) that direct measurement of ICT skills defined as such is feasible given that the resources required are being made available.

As input for policy development, indicators which capture the **source of e-skills** are of special interest. Eurostat's ICT Usage Household Survey includes indicators on the way in which citizens have obtained computer and Internet skills:

- Formal educational institution (school, college, university);
- Training courses in adult education center (but not on the initiative of your employer);
- Vocational training courses (on the demand of the employer);
- Self-study using books, cd-roms, online courses, etc.;
- Self-study in the sense of learning-by-doing;
- Informal assistance from colleagues, relatives, friends;
- Some other way

Based on this module, the Adult Education Survey will contain a module on self-reported skills, including ICT skills (CEC 2005a).

Innovation

In general, innovation in the economic sphere is being measured at the level of the firm. Firm-level and individual-level indicators merge, however, when it comes to the issue of **entrepreneurship**.

Indicators on entrepreneurship can be collected from individuals (e.g. behavioural and attitudinal variables) as well as from firms (start-ups) and administrative sources (new firm creation). An example for the latter are the indicators collected by Eurostat from Member States' business registers (see Eurostat 2005b) about enterprise births and deaths, survival rates, employment in start-ups, etc.

Behavioural and attitudinal variables are harder to come by. Audretsch and Keilbach (2004: 953-4) have introduced the term "entrepreneurship capital". In their opinion, "creating a metric for entrepreneurship capital presents a challenge" since it was "an unobservable (i.e. latent) variable", which lets them choose new-firm start-up rates as an indicator of manifested entrepreneurship capital.

There have been attempts, however, to measure entrepreneurship capital in other ways as well. The European Commission, for example, piloted a module on people's attitudes towards entrepreneurship through a series of Eurobarometer surveys (EOS Gallup 2000; 2011; 2004a; 2004b).

The Global Entrepreneurship Monitor (GEM, see Minniti et al. 2006) conducts annual surveys of the working population. Based on the data, a number of indicators are constructed:

- **Nascent entrepreneurs**: Those individuals, between the ages of 18 and 64 years, who have taken some action toward creating a new business in the past year. To qualify for this category, these individuals must also expect to own a share of the business they are starting and the business must not have paid any wages or salaries for more than three months.
- **New business owners**: Owner-managers of firms are classified as new business owners if the entrepreneurs report that they are active as owner-managers of new firms that have paid wages or salaries for more than three months, but less than 42 months.
- **Early-stage entrepreneurs**: Sum of nascent entrepreneurs and new business owners.
- **Transition ratio**: Established business owners / early-stage entrepreneurs.
- **Opportunity entrepreneurs**: Those early-stage entrepreneurs whose motivation it is/was to exploit a perceived business opportunity.
- **Necessity entrepreneurs**: Those early-stage entrepreneurs whose motivation it is/was that all other options for work are either absent or unsatisfactory.
- **Growth expectations**: Compound indicator of the growth potential of early-stage entrepreneurs and established business owners, aggregating individual responses regarding (a) novelty of products, (b) expected level of competition, and (c) newness of the technology.
- **Factors influencing perceptions about the entrepreneurial environment**: Items included "Do you know someone personally who started a business in the past two years?", "In the next six months will there be good opportunities for starting a business in the area where you live?", "Do you have the knowledge, skills, and experience required to start a new business?" and "Would fear of failure prevent you from starting a new business?".

Entrepreneurship is, of course, not the only way in which people can engage in innovation outside of employment relationships with companies. As Castells (2001: 41-52) has noted, transformation in the way innovation is created takes place partly as a result of what some researchers have called the "hacker culture" (cp. Himanen 2001). Castells identifies "a transition from an academically and institutionally constructed milieu of innovation to the emergence of self-organizing networks transcending organisational control" (Castells 2001: 42). Clearly, ways how to conceptualise let alone measure innovative activity outside of established "milieu of innovation" are still in demand. Some initial attempts to statistically capture active participation in social networking are reported on in section 4.3 below.

4.2.3 Regional Government

Only very few indicators have been developed for capturing public sector investments in the provision of **lifelong learning** and **e-learning**.

An exception is the UNDERSTAND master questionnaire, which includes questions on:

- the extent to which municipalities/local authorities offer ICT training to their staff;
- the share of civil servants who have received ICT training in the last year (average for all municipality/local authorities that offered ICT training);
- use of e-learning by municipalities /regional authorities for training their staff.

Statistical measures on e-skills in the public sector can be derived by means of sectoral break-downs of related data collected from the working population or organisations (see sections 4.2.1 and 4.2.2).

No indicators have been identified which would deal with **innovative activity** in the public sector.

4.3 e-Participation and ICT-enabled Empowerment

4.3.1 Firms

As outlined in section 3.3 above, the main way in which firms can contribute to ICT-enabled participation and empowerment is through organisational changes which give workers more say in their work – in exchange mainly for more commitment and responsibility. The concept of "new forms of work organisation" is not necessarily related to ICTs, but as has been stressed by many experts, the success of implementation of ICT systems in firms is usually dependent on the degree to which work organisation is modernised as well (OECD 2001b). Moreover, new forms of work organisation are in many ways enabled or supported by ICTs, such as in the case of telework, hot-desking systems, virtual teamwork, etc.

Only three studies have been identified which have been designed for the purpose of cross-country comparison with regard to new forms of work organisation, namely the EPOC study (which focussed on direct employee participation across 10 EU Member States, see Sisson 2000), the Nordflex study in the four Nordic countries (Nordflex 1999) and a study carried out by BDL on behalf of the European Commission in 2002 (BDL 2002), which was later extended to Finland (Antila & Ylöstalo 2005). In addition, the European Community Innovation Survey now contains a module on organisational innovation (data not available yet).

All of these studies came to the conclusion that, whereas individual elements of new work organisation have diffused widely among EU organisations, more advanced applications using an integrated or even systematic approach have been adopted by only a very few organisations. It is therefore necessary to carefully distinguish between different elements and degrees of work modernisation.

Focussing on forms of direct participation only, the European EPOC study (see Sisson 2000: 3) for their business survey distinguished between the following:

- Individual consultation:
  - 'Face-to-face': arrangements involving discussions between individual employee and immediate manager, such as regular performance reviews, regular training and development reviews and '360 degree' appraisal.
  - 'Arms-length': arrangements which allow individual employees to express their views through a 'third party', such as a 'speak-up' scheme with a 'counsellor' or 'ombudsman', or through attitude surveys and suggestion schemes.
- Group consultation:
  - 'Temporary' groups: groups of employees who come together for a specific purpose and for a limited period of time, e.g. 'project groups' or 'task forces'.
  - 'Permanent' groups: groups of employees who discuss various work-related topics on an ongoing basis, such as quality circles.
- Individual delegation:
  - Individual employees are granted extended rights and responsibilities to carry out their work without constant reference back to managers – sometimes known as 'job enrichment'.
- Group delegation:
  - Rights and responsibilities are granted to groups of employees to carry out their common tasks without constant reference back to managers – most commonly known as 'group work'.

From the large number of studies which have looked into new forms of work organisation, and how they relate to ICTs, we can summarise the main features of modern, flexible, pro-active work organisations as follows (cp. BDL 1999: 16; OECD 2001b: 8-9; Antila & Ylöstalo 2002; 2005).

- Decentral organisational structures:
  - flat hierarchies and decentral decision-making (reduction of the number of management layers

and number of different functions, i.e. job enlargement; improved flow of information between shop floor and management);
- semi-autonomous work teams;
- market and process focus.

Ÿ Flexible ways of working:
- flexibility in working times and locations;
- flexible working methods (multi-skilling, job enrichment)

Ÿ Flexible business practices:
- focussing on quality management and continuous improvement;
- high responsiveness to market changes.

Ÿ Corporate cultures which focus on people:
- worker focus: strong people orientation, human capital development, greater personal autonomy and accountability;
- customer focus: continuous assessment of business processes according to value created for customers

Ÿ Continuous investment in lifelong learning:
- more systematic approach to skill acquisition (lifelong learning) with a focus on widening skills rather than simply adapting skills to changing functional requirements;
- greater focus on soft skills such as communication skills, team-working, conflict management etc.;
- wider participation in training, also involving less qualified members of staff.

Ÿ Innovative performance measurement & reward schemes:
- management by objectives (for teams and individuals);
- financial and non-financial performance measures;
- performance-related pay: use of profit sharing, bonus and share schemes etc.

For all of these aspects, indicators are available if not from the international studies mentioned above, then from the many national surveys which are conducted on the subject. The STILE project (Ramioul et al. 2005) has provided a very useful overview over national business surveys[35]. The database is currently maintained and further developed within the context of the WORKS project[36].

The module on organisational innovation now included in the European Community Innovation Survey provides the following indicators:

Ÿ Share of enterprises which introduced organisational innovations in the reference period. An organisational innovation is defined as the implementation of:
- New or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within your enterprise;
- A major change to the organisation of work within your enterprise, such as changes in the management structure or integrating different departments or activities;
- New or significant changes in your relations with other firms or public institutions, such as through alliances, partnerships, outsourcing or sub-contracting.

Ÿ Organisational change in enterprises – Share of enterprises that have changed their organisational structure in the reference period in any of the following ways:
- New or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within your enterprise;
- A major change to the organisation of work within your enterprise, such as changes in the management structure or integrating different departments or activities;
- New or significant changes in your relations with other firms or public institutions, such as through alliances, partnerships, outsourcing or sub-contracting.

[35] The STILE Questionnaire Database is at www.stile.be/surveydb/

[36] www.worksproject.be/

- Outcomes of organisational change in enterprises: Degree of observed effect: high, medium, low, not relevant.
  - Reduced time to respond to customer or supplier needs;
  - Improved quality of your goods or services;
  - Reduced costs per unit output;
  - Improved employee satisfaction and/or reduced rates of employee turnover.

4.3.2 Individuals

Above (section 3.3) we distinguished between eight spheres of ICT applications of major interest for individuals/citizens: communicating (social interaction); perceiving information (one-to-many); finding information; taking care of personal business, transactions and requests for assistance; entertainment; generating and distributing own content; participating in policy-making and public life; and employment-related activities. In all of these domains the Internet and other ICTs are believed to foster empowerment of citizens.

Statistical indicators for the uptake of the Internet, mobile networks, and other ICTs, and about the activities carried out with their help (e.g. e-commerce, e-government, e-health). All of these have been subject to intensive indicator development and piloting in recent years. As a consequence, statistical measures are readily are available from a large number of sources, including Eurostat's ICT Usage Household Survey, several Eurobarometer studies, surveys of the European Foundation for the Improvement of Living and Working Conditions, one-off research projects such as SIBIS, BISER, eUSER and eLiving, and national data-gathering exercises. There have also been many attempts to design compound indicators (indices) in order to capture ICT-related developments by means of easily comprehensible aggregate statistics. For a discussion, see Empirica (2006: 45-56)[37].

An issue which has attracted a lot of interest in recent months is **user-generated content**. Indicators which adequately cover citizens' activities in this area have been piloted, for example, by Statistics Finland (Nurmela et al. 2004b) and OFCOM (2006a). From a regional development point of view, such activities would be of particular value if they remain (in some way) tied to specific regional contexts/activities rather than being limited to the virtual domain. Existing measures do not allow such differentiation.

The remaining discussion in this section will focus on two issues only: on the use of ICTs for dealing with major decisions in life, and for participation in public life including political decision-making.

In a much discussed survey, the Pew Internet project assessed the perceived **importance of the Internet for taking important decisions in life** (Horrigan & Rainie 2006). The research question was operationalised as follows:

- Now I'd like to ask you about some important decisions or changes that may have occurred in your life. In the last two years have you…?
  - Bought a car
  - Made a major investment or financial decision
  - Gotten additional education or training for your career
  - Chosen a school or college for yourself or your child
  - Helped another person deal with a major illness or health condition
  - Experienced the death of a family member or close friend
  - Found a new place to live
  - Changed jobs
  - Received a major promotion and/or raise at work
  - Started a major new romantic relationship
  - Ended a major romantic relationship
  - Gotten married

[37] A compound indicator which appears to be of much interest for the subject of the present study is the "Internet Connectedness Index" developed by Jung, Qiu & Kim (2001),. See also Katz & Rice (2002: 28).

- Gotten divorced
- Dealt yourself with a major illness or other health condition
- Become involved in a lawsuit, criminal case or other legal action
- Started a new hobby or become more involved with a hobby

Ÿ [IF YES] Thinking about the process you went through as you made this decision or dealt with this event, would you say the Internet played a crucial role in this, an important role, a minor role, or no role at all?

Ÿ [IF INTERNET PLAYED 'CRUCIAL' OR 'IMPORTANT' ROLE] We'd like to know the specific role the internet played in that decision or event. Did the internet mostly…

- Help you find advice or support from other people
- Help you find information or compare options
- Help you find professional or expert services
- Something else.

The results clearly indicated that a large share of the population in the USA perceive the Internet as playing an important role in dealing with major decisions in life (Horrigan & Rainie 2006).

Civic participation has been a key focus of indicator-based social research since Almond and Verba's classical study on "The Civic Culture", first published in 1963 (Almond & Verba 1989). The level of social or civic participation is also one of the main indicators suggested by Putnam (1980) in his influential research about the development of social capital in Italy and the USA. Partly based on established measurement frameworks such as the World Value Survey, he used as indicators active membership in socio-cultural, sports, recreation and religious organisations, interest groups and other formal/informal groups. While each of these measures is hard to contest, substantial debate has arisen about the question whether taken together, such activities amount to a valid index on social/civic participation (see e.g. Misztal 2000).

Thus, while it is easy to see how traditional measures of civic participation could be taken up in order to construct indicators on ICT-based modes of social participation, this would not solve the basic question of how to adequately cover all relevant ways in which citizens can participate in regional decision-making processes. Some researchers claim that Internet-based sociability and engagement in virtual communities (which are not covered by traditional indicators on civic participation) are better suited to the dominant trend in the evolution of social relationship in our societies, which is the rise of individualism. In this context, Manuel Castells (2001) talks about "networked individualism".

With regard to **political participation**, population surveys are a traditional tool for gathering insight into attitudes and behavioural patterns among citizens. Only very few of these have started to cover also ICT-based forms of political participation more than just superficially. One such example is the U.K. Home Office Citizenship Survey from 2005.

Dedicated studies on so-called e-participation are also rare, and mostly appear to concentrate on supply-side analysis (e.g. OECD 2003c). An exception are indicators on the use of e-mail and the Internet for contacting local policy-makers or political candidates, which have been applied e.g. in Finland, the UK and the USA.

4.3.3 Regional Government

Government can contribute to citizen empowerment by giving users better access to its services, which is one of the underlying principles of e-government. Indicators on the levels of supply and sophistication of e-government are, of course, well established, and are discussed elsewhere in this document (see section 4.1.3).

Advanced indicators on user-friendliness of government websites have been applied in the Netherlands annually since 2001[38]. For this purpose, a citizen's panel has been established to gather information about citizens' experiences and opinions about Dutch e-government programmes. Currently this panel consists of 2300 citizens, selected to represent the Dutch population according to age, education and region. The panel is consulted several times a year using online questionnaires.

[38] See www.advies.overheid.nl/jaaronderzoek/

When it comes to empowering citizens, however, the main interest is in ICT-supported political participation. The United Nations' regular survey on e-participation, the results of which are summarised in the e-participation index, is based on a website analysis which assesses the sites of the national governments, plus the sites of a number of pre-defined ministries (UN 2003; 2005). In total, the latest measurement evaluated 21 online services and facilities across 179 countries. The services were grouped according to their sophistication into three categories: e-information; e-consultation; and e-decision-making (see box below), and the country performance subsequently scored. The compound indicator is then constructed by standardizing these scores.

UN e-Participation Framework

E-Information: The government websites offer information on policies and programs, budgets, laws and regulations; and other briefs on key public interest. Tools for dissemination of information exist for timely access and use of public information, including web forums, email lists, newsgroups, and chat rooms.

E-Consultation: The government website explains e-consultation mechanisms and tools. It offers choice of public policy topics online for discussion with real time and archived access to audio and video of public meetings. The government encourages citizens to participate in discussions.

E-Decision-making: The government indicates it will take citizen input into decision-making. Government provides actual feedback on the outcome of specific issues.

Source: UN 2005

The approach applied for the UN index is by necessity rather basic, because the evaluation comprises developed western democracies as well as countries from the developing world. For a more in-depth analysis, reference to different types of ICT-enabled participation in policy-making is required.

Table 13: Tools for Online Engagement at Each Stage of Policy-Making

Stage in policy-making cycle	Information	Consultation	Participation
Agenda-setting	Site-specific search engines E-mail alerts for new policy issues Translation support for several languages Style checkers to remove jargon	Online surveys and opinion polls Discussion forums Monitoring emails Bulletin boards Frequently asked questions (FAQs)	E-communities E-petitions E-referenda
Analysis	Translation support for ethnic languages Style checkers to remove jargon	Evidence-managed facilities Expert profiling	Electronic citizen juries E-communities
Formulation	Advanced style checking to help interpret technical and legal terms	Discussion forums Online citizen juries E-community tools	E-petitions E-referenda amending legislation
Implementation	Natural language style checkers E-mail newsletters	Discussion forums Online citizen juries E-community tools	E-mail distribution lists for target groups
Monitoring	Online feedback Online publication of annual reports	Online surveys and opinion polls Discussion forums Monitoring emails Bulletin boards Frequently asked questions (FAQs)	E-petitions E-referenda

Source: Macintosh 2003: 13

There is a broad range of available eParticipation techniques, ranging from blogging and community portals to eConsultation, ePanels, eForums and ePetitions. In order to delimit the scope of the term eParticipation, reference to the framework developed on behalf of the OECD by Macintosh (Table 13) appears very useful. The framework distinguishes between the five main stages in the policy-making cycle: agenda-setting, analysis, formulation, implementation, and monitoring. For each of these, it lists common eParticipation applications, distinguished into three categories according to the depth of interaction (little = information, medium = consultation, strong = participation).

The structure of Table 13 also suggests an operational definition of eParticipation to be used for indicator development.

Indicators for measurement of aspects of this framework have been piloted, in particular, in the context of national benchmarking studies, often with the purpose of ranking municipalities/regions according to their "citizen friendliness". These studies usually define a measurement schema, consisting of a number of criteria for assessing individual sites. Data collection itself tends to be carried out by researchers using content analysis methodologies, which limits the value of these studies for purposes of statistical indicator development. One example of this type is the study by Bräuer & Biewendt (2005) who compared 82 official municipal websites in Germany.

A different approach was chosen for a study in the UK (MORI 2005). Here, the researchers questioned policy-makers using an extensive questionnaire. The list of variables included the following:

- Methods of engagement (offline) with local residents (Comments/compliments/complaints; Open public meetings; Scrutiny/select committees; Citizens'/residents' panel; Councillor surgeries; Focus groups; Sample surveys; Local area/neighbourhood forums; Forum for particular groups; Open forum at council meetings; Petitions; Planning for real/visioning exercises; Involving residents in mystery shopping; Citizens jury; Other);
- Responsibility for engaging local citizens;
- Perceived effectiveness of councils' communication, consultation and engagement strategies (offline and online);
- Methods of engagement (online) with local residents (Online comments/compliments/complaints scheme; Online survey of local residents; Involving residents in website testing; Online citizens/residents panel; Webcast council meetings; Online petitions; Online scrutiny/select committees; Online planning for real/visioning exercises; Online focus groups; Online councillors surgeries; Online local area/neighbourhood forums; Web logs; Online citizens jury; Other);
- Activities conducted to encourage e-Democracy engagement (Frontline staff promoting e-enabled services to the public; Council paper based literature; Themed weeks (eg Local Democracy Week); E-mail enquiries; Website promotions; Local media; Promotions in libraries; Co-operation with other stakeholders in e-Democracy; Poster campaigns; Community workshops/ICT centres; Radio/television interviews; Mail shots; Training for the public; Specific campaign for e-Democracy promotion; SMS text message; Other; No current marketing activity)
- Use of technology to communicate with residents (Online press release; Online minutes/agendas of council meetings; Online council newspapers/magazine; e-Bulletins; Web casting/video streaming; Text alerts; Web logs; Other; None)
- Existence of a written e-democracy strategy and a dedicated budget for e-democracy;
- Research or consultation conducted regarding e-democracy;
- Attitudes of local council officers and members towards e-democracy (Another initiative to be implemented; general enthusiasm; Active promotion by senior council officers; No willingness to back up support of e-democracy with investment and resources; Concerns about increased level of public awareness)
- Perceived impacts, of e-democracy;
- Perceivced importance and effectiveness of the Internet / of e-mail / mobile phone and texting / street kiosks / digital television / webcasting and video streaming in engaging the public;
- Priority groups for engagement via e-Democracy (Young people; People who are disabled; Older people; Low income households; BME (Black and minority ethnic); Council employees; Students; Council tenants; Parents/carers; Professional households; Women; Gay and lesbian; No specific groups targeted);
- Perceived effectiveness of use of online surveys, comments and website testing;

- Success factors and barriers perceived.

A survey-based approach was also chosen by the UNDERSTAND project. Three main indicators have been defined by the authors:

- % of municipalities/local authorities that provide an individual electronic way for citizens to contact elected members;
- % of municipalities/local authorities that held consultations with citizens via the web;
- % of municipalities/local authorities monitoring citizen services by channel.

5 Annexes

5.1 List of Potentially Transformative Technologies

Technology	Summary of argumentation
PDA	Existing technology that is limited applied by governments (mainly in the policing and healthcare sectors). The technology enhances the communication, organisation abilities and information position of individuals and groups of individuals and could therefore stimulate new (forms of) organisation and change the information power balance. The technology is mature and has the potential to be deployed on a larger scale by governments.
Wearable computers	Existing technology that is limited applied by governments (mainly in the defence sector). Enhances the communication, organisation abilities and information position of individuals and groups of individuals and could therefore stimulate new (forms of) organisation and change the information power balance. However still relatively immature, the technology has the potential to be further developed the coming 15 years and to be deployed on a larger scale by governments.
MP3-Players	Existing technology that is limited applied by governments (mainly Podcasting by politicians). Enhances the information position of individuals and could therefore stimulate new information power balances. The technology is mature and has the potential to be deployed on a larger scale by governments.
Mobile phones	Existing technology of which some functionalities are fully applied (communication among governmental practitioners) but of which some functionalities are not fully applied (communication between government and citizens). Enhances the communication, organisation abilities and information position of individuals and groups of individuals and could therefore stimulate new (forms of) organisation and change the information power balance. The technology is mature and has the potential to be deployed on a larger scale by governments.
Robotics	Existing technology that predominantly is applied in the entertainment and automobile industry (and by some governments for rescue purposes). Could stimulate a shift in tasks, roles and processes. Robots may take over tasks that up to now have been carried out by people, but may also support individuals to carry out tasks that hitherto have been carried out by professionals. The technology is maturing, however has the potential to be deployed on a larger scale by governments (for example in the healthcare sector).
Intelligent agents	Existing technology that predominantly is applied in the defence industry. Could stimulate a shift in tasks, roles and processes. Robots may take over tasks that up to now have been carried out by people, but may also support individuals to carry out tasks that hitherto have been carried out by professionals. The technology is maturing, however has the potential to be deployed on a larger scale by governments (for example in the policing, social security and healthcare sector).
Sensor technology	Existing technology that is increasingly applied by governments for surveillance purposes. Could stimulate a shift in tasks, roles and processes. Sensors may take over tasks that up to now have been carried out by people, but may also support individuals to carry out tasks that hitherto have been carried out by professionals. The technology is relatively mature and has the potential to be deployed on a larger scale by governments.
Language processing	Existing technology that is maturing and that is predominantly used in the telecom industry Enhances new communication between individuals and computers and therefore new products, services and processes. The technology is maturing, however has the potential to be deployed on a larger scale by governments (for example in the policing, social security and healthcare sector).
Serious games	Existing technology that is mainly used for entertainment purposes. Enables new approaches and shifts in existing paradigms (for example learning paradigms). The technology is mature and has the potential to be deployed on a larger scale by governments.
RFID	Existing technology that is mainly deployed by the retail industry. Enhances transparency (tracking and tracing of people, animals and objects) and therefore could result in changing power balances. The technology is mature and has the potential to be deployed on a larger scale by governments (for example for tracking and tracing purposes).
Biometrics	Existing technology that is increasingly deployed by governments for identification purposes. Enhances transparency (tracking and tracing of people, animals and objects) and therefore could result in changing power balances. The technology is mature/maturing and has the potential to be deployed on a larger scale by governments.
WiFi	Existing technology that is highly deployed by some EU governments. Strengthens mobility, the access to information and services and therefore could result in new products, new market players and new processes. The technology is mature and has the potential to be deployed on a larger scale by EU countries that are lagging behind in the deployment of WiFi.
WiMax	Existing technology that mainly is deployed in trials. Strengthens mobility, the access to information and services and therefore could result in new products, new market players and new processes. The technology is maturing and has the potential to be deployed on a larger scale.

Technology	Summary of argumentation
Broadband	Existing technology that is highly deployed by some EU governments. Strengthens mobility, the access to information and services and therefore could result in new products, new market players and new processes. The technology is mature and has the potential to be deployed on a larger scale by EU governments that are lagging behind in the deployment of Broadband.
Web technology	Existing technology of which some functionalities are highly deployed by governments (information), but of which some functionalities (communication and transaction) are not fully deployed yet. Enforces the communication and creation ability of individuals and groups of individuals and therefore could cause new forms or organisations, new processes and changes in power balances. The technology is mature and has the potential to be deployed in a broader way (more functionalities).
Social software	Existing technology that is mainly deployed in the private sphere (mySpace, Bebo, etc.) Enforces the communication and creation ability of individuals and groups of individuals and therefore could cause new forms or organisations, new processes and changes in power balances. The technology is mature and has the potential to be deployed on a larger scale by governments
GRID	Existing technology that is predominantly used in the research sector. Enables new forms of usage of computer resources and therefore could lead to new forms of organisation, processes and new products. The technology is mature/maturing and has the potential to be deployed on a larger scale by governments.
Semantic technologies	Existing technology that is mainly deployed in the private sector. Enhances the information position of individuals and organisations and therefore could lead to new processes, new organisations and new power balances. The technology is maturing and has the potential to be deployed on a larger scale by governments.

Source: Frissen et al. (forthcoming): 15-16.

5.2 e-Skills Module of Eurostat ICT Usage Enterprise Survey 2007

Module E*: e-Skills – ICT competence in the enterprise unit and the demand for ICT skills
(asking enterprises with ICT)

E1. **Did your enterprise employ ICT/IT specialists, in January 2007?**
(Filter question)
Yes | | No ☐ → Go to E3

Definition ICT/IT specialists *: ICT specialists or IT specialists have the capability to specify, design, develop, install, operate, support, maintain, manage, evaluate and research ICT and ICT systems. ICT is the main job.*

E2. **How many ICT/IT specialists were employed by your enterprise, during January 2007?**
(Number)

If you can't provide this value,
Please indicate an estimate of the percentage of the number of ICT/IT specialists in relation to the total number of persons employed, during January 2007.
| | | %

E3. **Did your enterprise recruit or try to recruit personnel for jobs requiring ICT specialist skills, during 2006?**
(Filter question)
Yes | | No | | → Go to E4

E4. **Did your enterprise have hard-to-fill vacancies for jobs requiring ICT specialist skills, during 2006?**
(Filter question)
Yes ☐ No ☐ → Go to E5

E5. **What do you believe were the main reasons of having hard-to-fill vacancies for jobs requiring ICT specialist skills?**

	Yes	No
a) Lack or too low number of applicants with ICT specialist skills		
b) Lack of ICT related qualifications from education and/or training		
c) Lack of work experience in the field of ICT		
d) Salary requests too high		
e) Other - Optional		

E6. **Did your enterprise recruit or try to recruit personnel for jobs requiring skills in the use of ICT, during 2006?**
(Filter question)
Yes | | No ☐ → Go to E8

Definition ICT user skills: *Capabilities enabling the effective use of common, generic software tools (basic user skills) or advanced, often sector-specific, software tools (advanced user skills). Jobs requiring ICT user skills: ICT is an important task for the job and is used to produce work output and/or used intensively at work (in day-to-day activities).*

E7. **Did your enterprise have hard-to-fill vacancies due to applicants' lack of skills in the use of ICT, during 2006?**
Yes | | No | |

E8. **Did your enterprise provide training to develop or upgrade ICT related skills of your personnel, during 2006?**

	Yes	No
a) Training for ICT/IT specialists		
b) Training for users of ICT	☐	☐

E9. **Were any ICT functions requiring ICT/IT specialists performed by external suppliers (fully or partly), during 2006?**
Yes | | No | |

Definition External Suppliers: *Other enterprises, includes also foreign enterprises/legal entities, associated or not associated to a group of enterprises.*

E10. **Were any ICT functions requiring ICT/IT specialists performed by suppliers <u>in a foreign country</u> (fully or partly), during 2006?**
(Filter question)

Definition Suppliers in a foreign country: *Suppliers in a foreign country or foreign suppliers can be 1) foreign affiliates, usually legal entities, established by the enterprise (internal suppliers from abroad) and/or 2) other foreign enterprises (external suppliers from abroad).*

Yes by foreign affiliates established by the enterprise	Yes by other foreign enterprises	No
		→ Go to F13/X

E11. **Which ICT functions were performed by suppliers' ICT/IT specialists in a foreign country?** - Optional

	Yes	No
a) ICT management (includes e-business and ICT systems management)	☐	☐
b) ICT development and implementation (includes business software development programming, web development, database development, communication network development, systems integration and installation)	☐	☐
c) ICT operations (includes technical support, user help and support, network administration, web administration, database administration)	☐	☐
d) Other ICT functions	☐	☐

E12. **From which of the following geographical regions did your enterprise engage suppliers' ICT/IT specialists?**

	Yes	No
a) other EU Member States	☐	☐
b) Non-EU Countries	☐	☐

E13. **Were any business functions requiring users of ICT performed by external suppliers (fully or partly), during 2006?** - Optional

Yes ☐ No ☐

E14. **Were any business functions requiring users of ICT performed by suppliers in a foreign country (fully or partly), during 2006?** - Optional
(Filter question)

Yes by foreign affiliates established by the enterprise	Yes by other foreign enterprises	No
☐	☐	☐ → Go to X

E15. **Which business functions (non-ICT) were performed by suppliers' ICT users in a foreign country?** - Optional

	Yes	No
a) Sales and marketing, customer services	☐	☐
b) Research and development, product design and engineering	☐	☐
c) Other (non-ICT) business functions	☐	☐

E16. **Please indicate the geographical regions from where you engaged business services requiring ICT users.** - Optional

	Yes	No
a) other EU Member States	☐	☐
b) Non-EU Countries	☐	☐

5.3 Existing Sources for Cross-Country Data on Transformational Use of ICTs

Name of data source	Description (incl. target, survey unit)	Responsible	Country coverage	Frequency
ALL – International Adult Literacy and Life Skills Survey	GPS (people aged between 16 and 65); pilot in 2001, first survey in 2003, survey in a second group of countries 2005	Statistics Canada, OECD	CD, USA, CH, N, NL, BE, IT, China, others	2003, 2005
BISER – Benchmarking the Information Society: eEurope Indicators for European Regions	General Population Survey: Target: total population aged 15+; total sample size: 11,369. Business survey: Target: all establishments 5+ employees; total sample size: 8,579. Representative samples in 28 NUTS II regions across the EU	BISER consortium led by empirica.	28 NUTS II regions across EU (excl. LUX)	2003 (one-off)
CLFS –Community Labour Force Survey	Households	Eurostat with NSIs	EU25	annual (quart. since 1999)
CVTS – Continuing Vocational Training Survey	Target: DMS (enterprises > 9 workforce); Sample: e.g. 3,200 companies in Germany	Eurostat with NSIs	EU	1994, 2000, 2006
DTI International Benchmarking Study	Companies (DMS) (500 in the UK, 300 in other countries)	DTI, Romtec (prev.: Spectrum)	UK, FR,. DE, IT, SE, US, CA, JP	annual since 1997; latest published: 2004
e-Business W@tch	Target: firms of all sizes from 10 /15 sectors, 2002: 9000 firms; 2003: 10000 firms; 2005: 5200 firms; 2006: 14000 firms	e-Business W@tch/ IPSOS	2002: EU 15 2003: EU 25, NO 2005: CZ, DE, ES, FR, IT, PL, UK 2006: EU 2, EEA, Candidate Countries	2002, 2003, 2005, 2006
EB – Eurobarometer Flash "Entrepreneurship 1-5" (160, 146, 134, 107, 83)	GPS (8063 in all EU Member States, 507 in USA)	CEC/ Gallup Europe	EU25, USA	2000-2004 (annually)
EB – Eurobarometer Flash 120 "Working Conditions (Flexible Employment)"	GPS	CEC/ Gallup Europe	EU15	2-3/2002 (one-off)
EB – Eurobarometer Flash 88, 97, 103112, 125, 135 "Internet and the Public at Large"	GPS (~30 000 in EU15 + Norway, Iceland)	CEC/ Gallup Europe	EU15	10/2000 - 11/2002 (discontinued)

Name of data source	Description (incl. target, survey unit)	Responsible	Country coverage	Frequency
EB – Eurobarometer Flash 187, 164, 129, 100 "Innobarometer" , Special Eurobarometer 236	Target: Companies	CEC/ Gallup Europe	EU25	Annual survey, latest: 2006
ECHP – European Community Household Panel	60,000 European households	Eurostat with NSIs	EU	The total duration of the ECHP was 8 years, running from 1994 to 2001
ECIS – European Community Innovation Survey & Community Innovation Survey Light[39]	Target: Companies with 10-49 employees (small), 50-249 employees (medium-sized) and 250 + employees (large).	Eurostat, CEC	EU	1992, 1996, 2001, 2004 (light), 2005
eLiving	Target:1750 individuals in each country Wave 2: 66-83% of of the 1750 individuals per country where re-interviewed	e-Living Consortium	NO, DE, IS, IT, BG, UK	Wave 1: 2001 Wave 2: 2002
EMERGENCE Employer Survey	Target: organisations with 50+ employees, all sectors Sample: 8000, representative Topics: eWork, electronic outsourcing of selected services	IES/ NOP	EU + HU, PL, CZ + additional countries in following years	2000 (one-off)
ENSR – Enterprise Survey	Target: SME (less than 250 employees) Sample: 8,000	KPMG Special services and EIM/ENSR	EU + LIE, N, CH, IS	annual since 1992
EPOC – Employee Direct Participation in Organisational Change Survey	Target: organisations with more than 25/50 employees Sample: 5,786	European Foundation for the Improvement of Living and Working Conditions	DE, DK, E, FR, IT, IE, NL, PO, UK.	1996
EQLS – European Quality of Life Survey	Target: Individuals in private households Sample: 26,000 (face-to-face interviews)	European Foundation for the Improvement of Living and Working Conditions	EU25 + IS,NO,CH	2003, 2007
ESW – European Survey on Working Time and Work-Life Balance	Target: Both personnel managers and – where available – employee representatives in enterprises with 10+ employees; Sample: 20,000, all sectors	European Foundation for the Improvement of Living and Working Conditions	Europe (EU-21 : EU15 + CY,CZ,HU, LV, PL,SI)	2004-2005

[39] Source: http://europa.eu.int/estatref/info/sdds/en/innovat/innovat_cis_base.htm

Name of data source	Description (incl. target, survey unit)	Responsible	Country coverage	Frequency
ESWC – European Survey on Working Conditions (prev.: ESWE)	GPS (aged 16 to 64), N = ~21,000 (in 2000, excluding NMS)	European Foundation for the Improvement of Living and Working Conditions	EU25+	1990, 1995, 2000/2002, 2005
ETUS – Harmonised European Time Use Survey (TUS)	GPS	Eurostat, NSIs	EU	2001 (1st)
EUSI – European System of Social Indicators	Collects and presents harmonised data from various sources	ZUMA, EuReporting Project Consortium	EU15, CH, CZ, HU, NO, PL, US, JP	various
Eurostat ICT Usage Enterprise Survey	DMS (enterprises >9 employees); reporting unit: IT manager of unit; 200.000 enterprises	Eurostat, NSIs	EU	annually since 2001
Eurostat ICT Usage Household Survey	GPS , 185.000 individuals	Eurostat, NSIs	EU	annually since 2002
Eurostat Urban Audit database	Data on 284 cities and surrounding regions. Data for three points in time: 1991 and 1996 (some variables), 2001 (all variables)	NSIs, RSIs, cities	EU 27	1992, 1997, 2002
IALS – International Adult Literacy Survey	GPS (2000 to 8000 adults aged 16-65 per country)	OECD, Statistics Canada, others	1994: CD, DE, IE, NL, PL, SE, CH (part), US. 1996: AU, BE, IE, UK, Z. 1998: CR, DK, FI, HU, IT, NO, SI, CH (rest).	1994, 1996, 1998
ISSP – International Social Survey Programme	Target: approximately 1000 individuals per country	various national social research institutes	Module on "work orientation": AT, UK, IE, IT, NL, NO, DE, HU, US plus (only 1997): FR, DK, PL, ES, SE, CH, CZ, PL, JP.	1989, 1997, 2005
OFCOM: The International Communications Market 2006	Target: 400 adults aged 18-65 (China and Japan 18-85) per country	Synovate/Ofcom	UK, FR, DE, IT, US, JP, CN	2006
STILE Pilot Survey on Telework	Target: Multi-locational eWorkers Sample: non-random, n=718 Topics: Testing of pilot module on eWork for inclusion in CLFS	STILE consortium	BE,HU,IT,UK	2002 (one-off)

Name of data source	Description (incl. target, survey unit)	Responsible	Country coverage	Frequency
VET – Vocational Education and Training Survey	Administrative data collection; data collection on *initial* vocational education and training	Eurostat, DG XXII, CEDEFOP	EU	Five-yearly: next 2006

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