i2010
High Level Group

Benchmarking Digital Europe 2011-2015
a conceptual framework

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1. Introduction

This note sets out the benchmarking framework for developments in the information society for the period 2011-15. It provides a context for measurement and suggests new areas for investigation. As such, it replaces the current benchmarking framework which runs until 2010 and monitors progress in the 3 pillars of the i2010 initiative.[1]

In the 2011-15 period, statistical information will continue to be mainly collected through the following sources:

- Eurostat surveys on ICT use by households/individuals and enterprises, plus other official statistics;
- data on connectivity provided by National Regulatory Authorities;
- ad-hoc studies on different issues for which official statistics are not available[2];
- regular annual surveys on the availability of online public services.

The European Commission has been reporting annually on the list of benchmarking indicators through its i2010 annual report that contains detailed country profiles for the EU, Norway, Iceland[3] and more recently Croatia.

The overall balance for the i2010 benchmarking exercise is positive: most of the indicators listed in the benchmarking framework have been collected in a timely manner and with a good degree of harmonisation, despite the heterogeneity in the levels of ICT take-up across the EU. In particular, Eurostat surveys are conducted in all Member States, Norway, Iceland, Croatia and Serbia[4] according to a common questionnaire and a harmonised methodology with the reference period in January for the enterprise survey and the first quarter for the households and individuals survey. The results are made available by Eurostat at the end of the year. Summary results, including several cross-tabulations, are made available to users. Micro data for enterprises are not disseminated for reasons of confidentiality but they are being used by National Statistical Institutes (NSIs) for analysing the impact of ICT on the economy through pilot projects managed by Eurostat. For households and individuals, micro-data will become available to researchers for statistical analysis. The benchmarking framework has provided the flexibility needed to monitor a fast changing area like the Information Society.

Indicators contained in the benchmarking framework have been giving an exhaustive picture of the take up of ICT in the EU. Different factors may influence levels of take-up across the EU, including the geographical, economic and social context which is exogenous with respect to ICT policies. Nevertheless the main objective of benchmarking is to measure both differences in the level of take-up between Member States and their rate of growth, the latter being closely related to the outcome of ICT policies.

[1] Available at http://ec.europa.eu/information_society/eeurope/i2010/benchmarking/index_en.htm
[2] For example, in recent years surveys have taken place on ICT uptake in schools, on e-health, on broadband (coverage, prices, speeds).
[3] 2009 edition available at : http://ec.europa.eu/information_society/eeurope/i2010/key_documents/index_en.htm#EDCR
[4] Former Yugoslav Republic of Macedonia and Turkey report data only for survey on ICT use by households/individuals.

Despite its overall effectiveness in monitoring progress in the area of ICT production and use in the EU, the i2010 benchmarking framework has showed some difficulties, in particular in terms of international comparisons with non-EU countries. An effort will be made to extend comparability by promoting harmonisation within the OECD and other international organizations, at least for the main important indicators on the development of the Information Society.[5]

As this framework is drafted ahead of the endorsement of the post-i2010 strategy, the list of indicators will be reviewed in 2012.

2. The conceptual model of the 2011-2015 Benchmarking Framework

A new strategy for the European Information Society will shortly follow the current i2010 initiative. Nevertheless, the 2011-2015 Benchmarking Framework needs to be designed well in advance to allow sufficient time for the design of the surveys by the NSIs. It is built on the existing one and will be further developed to give a coherent and exhaustive picture of the information society in the EU.

Overall, the development of ICT and its impact can be described through a supply, use and impact framework:

- efficiency gains in the production of ICTs translate into a growing contribution of the sector to economic growth and into falling prices of ICT goods and services **(supply);**
- decreasing prices stimulate investment prompting the take-up of ICTs by individuals, businesses and the public sector: take-up can further be described through readiness and use of ICT services and content applications **(use)**;
- diffusion of ICT contributes to the sustainable growth of the economy and to jobs, the efficiency of the public sector and the well-being of the population **(impact)**.

In the 2011-2015 benchmarking framework, Eurostat surveys represent the main source of statistical information, with additional data provided by the Communication Committee. The ICT use surveys will keep the current structure, including core indicators (to be maintained for tracking development over time) and special modules focusing on different topics each year. When specific policy needs cannot be covered by official statistics, ad-hoc surveys/studies will be conducted, with particular attention to the issue of quality and reliability. Member States will be involved in the process of validation of these statistics in the framework of a specific group on measurement[6].

3. The supply side

3.1. The ICT Sector

The contribution of the ICT sector to economic growth is important. It depends upon the relative size of the sector in the economy and on the growth rate of value added and productivity. In the EU, the ICT sector prompted a 0.3% productivity growth over the period 2000-2004, driving about one fifth of the whole productivity increase. However, its

[5] Available international comparisons mostly relate to connectivity and to the ICT sector.

[6] In the context of the i2010 initiative these discussions take place in the ad-hoc benchmarking subgroup of the i2010 High Level Group.

contribution in the EU is lower than in the US (0.4%), both because the size of the ICT sector is smaller (5.3% of GDP in the EU as against 6.6% in the US) and because efficiency gains in the EU ICT sector were lower than in the US (5% as against 6.2%).

The following indicators on the size, growth of the sector and its productivity contributions are already envisaged in the current benchmarking framework:

- **Share of the ICT sector in the economy measured as a proportion of GDP and of total employment**
- **Growth of the ICT sector measured as a % change of value added at current and constant prices**
- **Ratio of the productivity level in the ICT sector with respect to the entire economy**
- **Productivity growth in the ICT sector.**

Source: EUROSTAT (Structural Business Survey, National Accounts), EU-KLEMS database

However, these statistics (which come from official sources[7] and the EU KLEMS project) are currently available with a delay of 3-4 years and a limited degree of granularity[8]. An ongoing Eurostat project aimed at improving timeliness in the production of ICT sector statistics could partially improve the picture, although figures could not yet be now-casted with the required accuracy. Clearly, the use of outdated statistics could also negatively impact on the economic and policy analysis of the ICT sector. The box below recalls a new definition for the ICT sector (following ISIC Rev.4) that will be introduced in the 2010-2015 period.

The ICT sector – a new definition following ISIC Rev. 4

The Working Party on Information Society Indicators (WPIIS) of the OECD completed in 2007 a revision of the ICT sector definition which is based on Revision 4 of the International Standard Industrial Classification (ISIC). As the EU version of ISIC Rev. 4, namely NACE Rev. 2, will be implemented in statistics covering the year 2009 onward, also the updated ICT sector definition will be used from that date. That restructuring will make it very difficult to produce new time series consistent with the previous ones (before 2009).

Indeed, ISIC Rev. 4 significantly restructured some of the industries that in ISIC Rev. 3.1 were included in the ICT sector (3312 and 3313 in particular). The main change concerned the criteria for inclusion in the ICT manufacturing sector.

The old principle (dating back to 1998) guiding the inclusion of a given manufacturing industry into the ICT sector was the following: a candidate industry must: 1) be intended to fulfil the function of information processing and communication, including transmission and display 2) or use electronic processing to detect, measure and/or record physical phenomena.

Since ICT is embedded in a large and growing number of products produced by a variety of industries, it would become increasingly difficult to apply criterion 2) above. Therefore the new guiding principle will keep only criterion 1) above, giving rise to a narrower and clearer definition of ICT sector, leading to more useful analysis.

Finally, the revised ICT sector definition is the following (ISIC Rev.4 identifiers in brackets):

ICT Manufacturing Industries: Manufacture of electronic components and boards (2610); Manufacture of computers and peripheral equipment (2620); Manufacture of communication equipment (2630); Manufacture of consumer electronics (2640); Manufacture of magnetic and optical media (2680).

ICT Trade Industries: Wholesale of computers, computer peripheral equipment and software (4651); Wholesale

[7] Based on the OECD definition of the ICT sector

[8] It is not clear at this stage if data from the EU KLEMS projects will be updated.

of electronic and telecommunications equipment (4652).

ICT Services Industries: Software publishing (5820); Telecommunications (61); Computer programming, consultancy and related activities (62); Data processing, hosting and related activities & web portals (631); Repair of computers and communication equipment (951).

One possible solution to the delay in the production of official statistics on the ICT sector can be the use of market data (e.g. Gartner, EITO, IDATE) which tend to be available quicker than official statistics and have a high level of granularity. These are private sources data that are mainly produced by private businesses for commercial purposes. Their main drawbacks are the lack of transparency in the definitions and methodology used and the focus on the value of ICT markets rather than on the ICT producing sector.[9]

Market data can be considered a short-term supplementary source of information and should be used for looking at more recent developments, in particular at the:

- **Size and nominal growth of ICT markets (IT and telecom)**

The efficiency of the ICT sector is linked to its tendency to innovate. R&D is the main driver of innovation and technological change. ICT accounted for 26% of business R&D expenditure (BERD) in the EU in 2005 compared with 34% in the US and Japan. The gap is mainly explained by the size and the composition of the ICT industry. Indeed, firm-level evidence reveals that R&D intensity is similar across the two economic areas.

Investments in **R&D** by the business sector will continue to be monitored through relevant indicators measuring the size and the intensity of the R&D expenditure by the ICT sector. In particular, the following statistics can be envisaged:

- **R&D expenditure by the ICT sector as a % of GDP**
- **R&D expenditure in the ICT sector as a % of total R&D expenditure in the business sector (BERD)**
- **R&D expenditure in the ICT sector as a % of value added (in the ICT sector)**

Source: PREDICT project, EUROSTAT (Science and Technology Survey)

The main limitation of these statistics is the long delay needed for their availability. The PREDICT[10] project has been useful in terms of providing additional information, and results have been extensively used in the i2010 annual progress reports, but it has not solved the problem of timeliness. Firm-level analysis through companies' annual and quarterly financial reports allows a timely identification of R&D trends by ICT segment but will not help in drawing conclusions by country.

The competitiveness of the ICT sector in the EU can also be investigated through **indicators on ICT export, imports and the relative trade balance[11]**, which are available within Balance of Payments and Trade statistics and are based on international agreed definitions on ICT goods and services[12]:

[9] Unlike what described for findings of ad-hoc studies, data from market sources cannot undertake a validation process, because they are not produced specifically for meeting policy needs and their production methodology cannot be influenced.

[10] IPTS- European Commission

[11] Which are not listed in the I2010 benchmarking framework.

[12] OECD (2008a), "Information Economy Product Definitions based on the Central Product Classification (Version 2)", Working Party on Indicators for the Information Society, DSTI/ICCP/IIS(2008)1/REV1, Paris

- **Imports and exports of ICT goods and services as a % of total imports and exports**

Source: EUROSTAT (ComExt)

3.2. Supply of broadband

Additional indicators referring to the supply side are those on the **availability of broadband connectivity, the related speeds and prices**[13]**.** These subjects are listed also in the current benchmarking framework and they have been made available by the Commission through ad-hoc studies[14]. All these indicators showed substantial improvements: broadband coverage in EU27 by ADSL technology grew from 88% in 2005 to 93% in 2008 and rural coverage from 66% to 77%. At the end of 2008 three quarters of EU broadband subscriptions are estimated to be associated to nominal speeds above 2 MB/s, a three fold increase relative to 2005. Price for a broadband standalone service with download speeds between 2 and 4 MB/s has decreased from an average of around €/PPP 52 per month in April 2007 to about €/PPP 37 in April 2008.

These indicators will continue to be provided in the benchmarking framework 2010-2015. In particular, benchmarking in the 2011-2015 period will have to fine tune the following issues:

(i) All broadband statistics, including coverage, speeds and prices, will have to take into account wireless and mobile broadband. The extension of the broadband statistics to wireless and mobile access entails methodological issues in relation to both the data collection and the comparability of the results with fixed broadband data. A subgroup to the Communication Committee (the Market Data subgroup) will meet to address some of these issues.

(ii) As far as speed is concerned, current measures tend to lead to an overestimation of speeds by focussing on advertised rather than on actual speeds and this problem is also reflected in price indicators. In the light of this, an ad hoc study has been launched by the Commission with the purpose of measuring effective performance. First results will be available in 2011.

(iii) A revision of the current definition for broadband connectivity (144 kbps) will have to be applied to reflect ongoing progress and facilitate international comparisons within the OECD.

(iv) Broadband price measures, currently based on available offers, will need to be refined through the definition of consumer profiles. Discussions are ongoing in the Communication Committee Market Data subgroup.

The following indicators can be envisaged:

- **Broadband coverage: % of population reached by wired (e.g. DSL, cable, fiber), wireless (e.g. Wifi, Wimax, Satellite) and mobile (e.g. EDGE, UMTS, HSPA) broadband access (by region)**

- **Subscription numbers broken down by nominal speed (256, 512, 1024 (Kbps), 2, 4, 8, 16 (Mbps))**

- **Broadband prices**

  Source: ad hoc studies and CoCom

[13] Prices are not strictly related to the supply side only, but they are dealt with in this section.
[14] http://ec.europa.eu/information_society/eeurope/i2010/benchmarking/index_en.htm

In the period 2011-2015 account will be taken of the comments above and the indicators may evolve accordingly, for example including an indicator of nominal vs. effective speeds.

4. The use of ICT

So far data collection to measure progress in the information society has been structured around the issues of take up of available **connectivity** opportunities, **the use of ICT and possible obstacles, eInclusion and eSkills**, the diffusion of eCommerce[15] and **eServices**. It covers households, businesses and the public sector.

Current indicators will need to be adapted to reflect the emergence of new technologies and their usage. However, the issue of burden for respondents and National Statistical Institutes should be taken into consideration. **Statistics will be collected with different frequency (annual, biannual or once in five years), depending on policy priorities.**

4.1. Connectivity

The main indicator on connectivity comes from the Communication Committee, with 2 yearly releases:

- **Number of broadband subscriptions per 100 inhabitants (broken down by platform)**

The scope of the measurement will be widened, as to include mobile connections.[16]

On the households and individuals side, most connectivity data come from the Eurostat Community survey on ICT usage. The survey measures households access to the internet at home. In addition, the type of internet connectivity and the place of access are monitored. The indicators are as follows:

- **% of households with internet access at home**
- **% of households with internet access via broadband**
- **Places for accessing the internet in the last three months** /biannual/
- **% of individuals accessing the internet through mobile connections**
- **Reasons for not having internet[17] access at home.**

On the enterprise side, data come from the specific Eurostat survey on ICT use, which keeps track of computer, network devices and internet use. Available indicators can be complemented by indicators on mobile access to the internet:

- **% of persons employed using computers connected to the internet in their normal work routine**
- **% of enterprises with broadband access (fixed or mobile)**

[15] Taking into account the ongoing revision by OECD of the definition of e-Commerce.
[16] Discussions are ongoing in the CoCom Market Data Subgroup
[17] Previous benchmarking indicators made a distinction between reasons for not having the internet and reasons for not having broadband at home. The proposed indicator merges the two concepts.

- **% of enterprises providing devices for a mobile connection to the internet to their employees**

- **% of persons employed provided by the enterprises with devices for a mobile connection to the internet**

4.2. ICT usage by Households and Individuals

Regular **internet use**, defined as at least once a week, has grown substantially in the EU, from 43% in 2005 to 56% in 2008. This use has also become more frequent, with 43% of the population (i.e. 77% of regular users) now using the internet almost every day, compared to 29% in 2005. In addition internet use is more inclusive, with the most disadvantaged groups having progressed the most. Nevertheless, large gaps still remain, across countries and socio-economic groups, and a second digital divide, based on quality of use, is emerging. Empirical evidence shows that digital inclusion is largely driven by age and education levels.

Regular usage by **individuals** should continue to be monitored through the following indicators:

- **% of individuals using the internet at least once a week**

- **% of individuals using the internet every day or almost every day**

In addition, benchmarking should look at the use of the internet to enhance the analysis of its impact on citizens' life, according to age and to other socioeconomic variables. The following list of indicators, including statistics already collected and additional proposals, covers ICT activities and services grouped under different purposes and they are all defined as % of individuals having used the internet for that purpose in the last 3 months[18]. The indicators listed are not necessarily monitored every year[19].

- Personal communication:

  - **Sending/receiving e-mails** /biannual/

  - **Telephoning, videocalls over the internet** /biannual/

  - **Other communication uses (chat sites, messenger, etc.)** /biannual/

  - **Participating in social networks (facebook, twitter, etc.)** /biannual/

- Use of entertainment (web TV and radio, online games, music and videos):

  - **Listening to web radios or watching web TV** /biannual/

  - **Uploading games, images, films or music files to be shared** /biannual/

  - **Downloading games, images, films or music** /biannual/

  - **Playing networked games** /biannual/

[18] Apart purchaising through eCommerce, for which the reference period will be last 12 months
[19] This would not be easily feasible for technical reasons.

- Access to information:
  - **Reading / downloading online newspapers / news magazines** /biannual/
  - **Subscribing to news services or products to receive them regularly (including RSS, …)** /biannual/
  - **Seeking health information (on injuries, diseases, nutrition)** /biannual/
  - **Looking for information about education, training, courses** /biannual/
  - **Looking for information about goods or services** /biannual/
  - **Downloading software (Other than games)** /biannual/
- Civic and political participation:
  - **Accessing or posting opinions on websites (e.g. blogs, social networks, etc) for discussing civic and political issues** /biannual/
  - **Taking part in consultations, voting and opinion polls on-line on political issues** /biannual/
- Creativity (user generated content: photos, music, blogs, wikipedia):
  - **Creating websites or blogs** /biannual/
  - **Uploading self created content (including software) to any website to be shared** /biannual/
- Learning:
  - **Doing an online course** /biannual/
  - **Using wikis** /biannual/
- e-Health:
  - **Making an appointment with a practitioner** /biannual/
  - **Consulting a practitioner online** /biannual/
- Managing of personal finance/personal administration:
  - **e-banking** /biannual/
- e-Commerce:
  - **Selling of goods or services**

- **Purchasing goods or services, including cross border purchases**[20]
- **Purchasing services related to travel and accommodation** /biannual/

o Professional life:

- **Looking for a job or sending a job application** /biannual/
- **Using professional networking sites** /biannual/

o **eInclusion**

Current analysis is mainly conducted through indicators on **ICT use broken down by gender, age, employment condition, education level, income, area of residence.** In the future the **condition of migrant should also be identified**, hence citizenship will be considered through the breakdown variables of the Households/Individuals survey**.** Moreover, in the i2010 context specific indicators were developed as part of **the Riga Dashboard**, to measure the overall level of disparity in internet usage and skills. The Riga Dashboard addresses 2010 objectives and will be up for review after 2010.

Because of the importance of socio-economic and demographic characteristics for the analysis of ICT usage, the Eurostat survey on Household/Individuals is proposed to consider the following **breakdowns**:

- age, gender, educational level, employment situation, country of birth, country of citizenship, region, household composition, household income

o **eSkills**

eSkills will remain among the top priorities of the information society. **Digital literacy is mainly measured through a list of tasks performed with a computer and when using the internet**, from which the following indicators are derived:

- **% of individuals with computer skills (none, low, medium, high**[21]**)** /biannual/
- **% of individuals with internet skills (none, low, medium, high**[22]**)** /biannual/

The indicator should be kept but updated and extended to cover new usages, mobile access to the internet, web 2.0 technologies etc. and should be linked to education. A special module on eSkills is foreseen for the 2011 Eurostat survey on Households/Idividuals.

Measuring eSkills in the **workforce** is also needed, in particular for specific groups such as teachers, doctors or civil servants. Current indicators on ICT specialist and users, which are based on the Eurostat Labour Force Survey, are not sufficient for this purpose[23], since the assumptions on which they are based appear to be largely arbitrary. An ad-hoc survey may be envisaged for this purpose.

[20] Because of the burden, the data collection on cross-border purchases may take place on a biannual basis.
[21] Each skill category is associated with a certain number of activities performed.
[22] Each skill category is associated with a certain number of activities performed.
[23] Indicators on ICT specialist and user skills are collected on the basis of the OECD definition of ICT related occupations: http://www.oecd.org/dataoecd/26/35/34769393.pdf.

4.3. ICT usage by Enterprises

The take-up of ICT by businesses is crucial to the raising of Europe's productivity potential and future growth prospects. The main difference between the US and the EU productivity differential in the decade 1995-2005 rests in the adoption of ICT by the economy at large. The enterprise survey analyses the take up of technologies and applications which stimulate companies' efficiency by facilitating the reorganisation of business processes. It also collects information on eCommerce values through geographical breakdowns to assess the impact of the internet on the internal market.

ICT take-up by European businesses over the period between 2005 and 2008 shows a mixed picture. Significant progress has been made in connectivity, eBanking and the uptake of online public services, reflecting efforts made by the public sector with regard to electronic public services. Less progress has been made in the area of electronic transactions. Evidence on the take-up of advanced solutions aimed at supporting enterprises' business processes shows that use of ICT for the automation of internal business processes through the automatic exchange of information and for the management of human resources is quite common, especially among large enterprises. But eBusiness applications enabling the automatic link with business partners, including those automating the supply chain and the transmission of invoices, are still used by a minority of EU enterprises.

Some issues have emerged in relation to the eBusiness benchmarking results in recent collections. To solve these issues, the Commission services intend to support quality enhancement measures already starting in 2010.

Take-up by enterprises is monitored by looking at how ICT impacts on processes and functions. The themes shown below, for which data have in most cases already been collected in one or more editions of the dedicated Eurostat survey, cover a wide range of topics related to different business processes.

- Internal processes
  - **Integration of internal business processes: % of enterprises whose internal business processes are automatically linked**
  - **% of enterprises using dedicated application for employees to access human resources services** /biannual/
- Integration with customers/suppliers and SCM
  - **% of enterprises electronically exchanging business documents with suppliers and/or customers broken down by type of document**
  - **% of enterprises sharing electronically information on supply chain management broken down by business function** /biannual/
  - **% of enterprises sending and/or receiving e-invoices** /biannual/
- Key technologies for the internet of things (e.g. RFID)
  - **% of enterprises using key technologies for the internet of things, by purpose** /biannual/

- e-Commerce, Customer Relation management (CRM) and secure transactions

  - **% of enterprises having a website with e-commerce functions** /biannual/
  - **% of enterprises using software *applications for managing information about clients*, like CRM** / could be biannual/
  - **enterprises' turnover from e-commerce as % of total turnover**
  - **% of enterprises selling by e-Commerce**
  - **% of enterprises purchasing by e-Commerce**
  - **% of enterprises doing e-commerce transactions broken down by destination (National, EU, World)** /biannual/

The Eurostat survey is proposed to consider the following relevant **breakdowns**:

- economic activity and employment size class

The testing of a new indicator to assess the percentage of enterprises using **open source applications** (including operating systems) is envisaged. It will be used if reliable data can be collected, and in this case it will be added to the list of core indicators during the 2012 review.

An effort is needed to gather more information on the use of ICT in R&D at firm level, for product design and innovation or for knowledge management. The feasibility of new indicators based on other sources, as the innovation survey, will be explored.

The **e-Business Watch**[24] is an additional data-source for observing ICT use in the economy with a focus by economic sector, even if the limited geographic coverage makes it difficult to use it for benchmarking at EU level.

4.4. e-Public Services

There is a range of relevant policy issues so far only partially managed by Eurostat surveys. As for the past, indicators from official statistics will eventually have to be integrated with other complementing sources.

- **Healthcare:** The monitoring of the use of ICT for online health services is increasingly important. The Eurostat survey on ICT use can provide some evidence on the use of the internet for health related purposes, but for a more exhaustive picture, the analysis has to cover also the **use of ICT by the health sector** on the basis of ad-hoc surveys[25]. A Commission study on e-Health benchmarking provided additional inputs in terms of measurement framework and on possible related indicators[26]. The Commission is currently launching a study on use of ICT and e-Health solutions by medical staff in hospitals, both for administrative and clinical processes, in order to develop a better understanding of the current level of digitalisation and of its effectiveness [27]. Results will be available at the beginning of 2011.

[24] http://www.ebusiness-watch.org/
[25] http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/gp_survey_final_report.pdf
[26] http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/ehealth_ii_bench_final_report.pdf
[27] http://ec.europa.eu/information_society/eeurope/i2010/studies/

- **Education:** ICT use in the education sector was monitored through an ad hoc survey targeting schools[28]. A study is foreseen in 2011 to assess ICT take-up in schools as well as its impact on the education system.

- **eGovernment:** The eGovernment benchmarking has been based on the measurement of **20 "basic public services"** in terms of **availability** and **sophistication** through 14,000 public service provider websites across Europe. Europe advanced from 50% in 2006 to 58% of basic services being completely available online in 2007, the largest percentage increase for a single year since 2001, but the gap between the leader and the worst performer is significant at 85 percentage points. There is a strong correlation between the sophistication and availability of eGovernment services. According to the Community surveys on ICT use in businesses and households, 2007 saw a significant improvement in the take-up of eGovernment services, both by individuals and businesses. For individuals, 30% of internet users have interacted online with public authorities in one way or another. This represents a 6 percentage point increase relative to 2006, but still lags behind the figure for businesses (66%).

  Eurostat surveys cover the usage side, while annual ad-hoc studies provide information on the supply side. Time series exist for:

  - **Online availability and interactivity of the 20 basic public services for citizens and enterprises**

    Source: Capgemini

  - **% of individuals using the internet for interacting with public authorities by level of sophistication**

  - **% of enterprises using the internet for interacting with public authorities broken down by level of sophistication**

    Source: EUROSTAT (Survey on ICT usage in households and by individuals, Survey on ICT usage and E-commerce in enterprises)

  The 2011 Enterprise Survey will devote a special module to the use of eGovernment, to spread light on which services are mostly used by enterprises, at what degree of sophistication, and in relation to the main barriers to usage.

  Measurement of eGovernment is under continuous review, trying to build time series to measure progress over time and explore new issues. Current reflections and tests on measurement are pointing to:

    - Measuring specific services or features: like eProcurement which has been piloted – it could be extended to electronic ID cards or others.

    - Measuring the impact in terms of efficiency with a direct link to the framework on the measurement of the administrative burden at the EU Level.

    - Measuring the benefits for users through a specific User Satisfaction Monitoring exercise (ongoing).

    - Measuring the 20 basic services at a (City-) Regional level.

[28] http://ec.europa.eu/information_society/eeurope/i2010/docs/studies/final_report_3.pdf

- Measuring the Compliance with the EU Service Directive.
- Revising or extending the 20 basic services; this might be a way of moving from eGovernment to public services at large.
- Building on bench-learning to capture the impact of back office re-organisation as experienced in the Member States.

5. New technological trends and policy issues – Proposals for future special annual modules

The 2011 special modules will concern **eSkills** in the Households/Individuals survey (with the double objectives of measuring progress since the 2007 survey and the consideration of skills for new digital activities) and **eGovernment** in the Enterprise survey (to identify the services mostly used by enterprises and progress in eProcurement).

There is a clear need of keeping track of the developments in the use of ICT technologies that have recently attracted increasing policy interest. The following themes are the main areas of application for special modules until 2015:

- **ICT and sustainable development:** The issue of ICT impact on the environment is getting strong political support. The question arises as to what kind of instrument should be used for measurement purposes. There are three degrees of ICT's environmental impacts during business cycles: the impact of ICT itself, the impact of ICT on business operations and the supply chain, and the impact of IT on the consumption of products and services. While an exhaustive and objective measurement of these three aspects cannot be foreseen through the Eurostat ICT survey, it would be still possible to enquire about enterprise strategies and plans in respect of green ICT. Other questions could target actions with the purpose of reducing travelling and commuting of employees. Finally, the attitudes and behaviour of households and individuals could also be investigated, with questions ranging from the level of awareness about energy consumption related to ICT equipment used for private purposes, to actions taken for reducing it with a focus on the use of ICT driven systems for energy efficiency.

- **Mobile use of the internet - Ubiquitous Connectivity**: Mobile devices give the possibility to stay always connected from all possible locations and this is expected to have a huge impact on the way the internet is used for business and private purposes. This phenomenon has to be investigated with specific indicators to be collected by the two Eurostat surveys, in a special module, in addition to core indicators on connectivity[29]. For individuals, statistics should target both the frequency and the kind of activity performed with a mobile connectivity away from home and work. For enterprises, the focus should probably be on the take-up of solutions which allow the remote use of IT resources. Emphasis should be put on the use of location-based services.

- **Cloud computing, software as a service:** This technology will shift the way purchasers of IT products and services contract with vendors, with an expected strong economic impact. IT functionalities and resources will be more and more available on the internet and users will pay in relation to their effective fruition. This is expected to positively impact on the tendency of SMEs to take up e-business, thanks to the lower capital expenditure required and the increase in the level of flexibility of the offers.

[29] See section 4.1

- **Trust and security:** Security is the focus of the 2010 ad-hoc module of the Eurostat surveys which foresees the collection of indicators on the level of concern in relation to possible problems, incidents experienced and precautions taken (for both individuals and enterprises). Previous attempts to collect data on this issue gave quite poor results, because of lack of awareness and technical skills among the large part of internet users and confidentiality problems for companies. Future measurement will also take into account how growing ICT technologies, and in particular mobile internet, RFID and cloud computing will impact on e-security and privacy. An ad-hoc survey may be envisaged for this purpose.

6. ICT Impact

Take up of ICT is expected to **impact on the economy and more in general on society**.

As far as businesses are concerned, an "objective" measurement of ICT impact can be done by looking at productivity, output growth, innovation and employment.

Up to now, empirical analysis for the EU Member States has been conducted in the framework of the **EU KLEMS project**, where the role of ICT investments on output and productivity in the EU has been addressed through the growth accounting model applied at sector level.

However, there are still a set of pending issues: the EU KLEMS has not clarified the role of ICTs in boosting productivity growth through enhancements in the level of efficiency in the use of production inputs (Multi Factor Productivity). In particular the role of ICTs in helping process innovation and in the management of intangibles has not been exhaustively addressed and it would require an analysis at enterprises level. Several studies at national level have provided interesting insights but a harmonized analysis at EU level is still needed. The e-Business Watch[30] has also explored the issue with an approach based on perceptions, rather than on objective measurement and this poses some concerns on the reliability of results[31].

An Eurostat pilot project, for the moment limited to some EU Member States and based on micro level empirical observations, is aimed at better disentangling the effects of ICT investments and use on productivity and it could later be applied to the whole EU. This analysis could also benefit from an ongoing Eurostat exercise aimed at measuring ICT investments and expenditure in the business sector.

In addition, the role of ICT as driver of process, product and business model innovation is still largely unexplored at empirical level. The same applies to the role of ICT in changing patterns of consumption. An additional open issue is the role of public policies in promoting the implementation of ICT in enterprise processes, including those more closely related to ICT (in particular, standardisation) and those affecting the openness and flexibility of the general economic environment (competition and labour policies). **An ongoing Commission study on the economic impact of ICT** is aimed at improving knowledge in all these areas[32]. The role of ICT in fostering innovation is also the focus of an ongoing OECD project. To measure the impact of ICT, these works need to link data from different surveys. **Linking surveys to measure ICT impacts is one of the main statistical challenges ahead**.

[30] http://www.ebusiness-watch.org
[31] IT managers tend to overemphasize the contribution of ICT to the enterprise performance.
[32] http://ec.europa.eu/information_society/eeurope/i2010/studies/studies_ongoing/index_en.htm

The impact of ICT on the public sector is an issue that is still unsolved due to problems of measurement together with the lack of a clear theoretical framework. In particular, the measurement of output and productivity for non market activities is already quite challenging.

The social impact of ICT is also still a basically unexplored area at the European level. Clearly, it is not easy to gauge whether or not ICT is beneficial for well-being and to the construction of social capital[33] because these questions tend to be multi-faceted and to contain subjective elements. The way to go is probably to look at different aspects affecting life of citizens, instead of addressing directly the impact on well-being. An attempt to build a coherent measurement framework has been done by the OECD Working Group on Information Society Statistics[34]. Additional proposals should come from the ongoing Commission study on the Social Impact of ICT[35], whose final results will be delivered at the end of 2009, both in terms of measurement framework and source of information. In particular, the study will look at the impact of ICT on life of citizens, seen as learners, workers, consumer, patients, communicators and creators, in addition to the role of ICT in promoting social capital.

The availability of official statistics on time use and the role played by ICT technologies and applications should also be investigated in this context. In fact, several problems relating to the measurement of the social impact of ICT is due to the limited measurement of ICT use. The Commission is working with the OECD on the development of internet-based statistics. In particular, it will launch a study on statistical challenges like sampling and will work on overcoming the privacy and cost issues involved in the exercise.

7. Conclusions

The European Commission will be reporting on the list of benchmarking indicators through its annual digital competitiveness reports, which will also include detailed country profiles for the EU, Norway, Iceland and accessing countries. A summary list of the indicators proposed throughout this document can be found in the Annex.

As the present framework has been drafted ahead of the endorsement of the post-i2010 strategy, its content and list of indicators will be subject to review in 2012.

[33] According to the OECD definition, Social capital is defined as the norms and social relations embedded in the social structures of societies that enable people to co-ordinate action to achieve desired goals.
[34] October 2007 http://www.oecd.org/dataoecd/43/25/39869939.pdf
[35] http://ec.europa.eu/information_society/eeurope/i2010/studies/studies_ongoing/index_en.htm

8. Annex – Summary list of the proposed indicators

A. The ICT Sector

A1	• Share of the ICT sector in the economy measured as a proportion of GDP and of total employment
A2	• Growth of the ICT sector measured as a % change of value added at current and constant prices.
A3	• Ratio of the productivity level in the ICT sector with respect to the entire economy
A4	• Productivity growth in the ICT sector.
A5	• Size and nominal growth of ICT markets (IT and telecom)
A6	• R&D expenditure by the ICT sector as a % of GDP
A7	• R&D expenditure in the ICT sector as a % of total R&D expenditure in the business sector (BERD)
A8	• R&D expenditure in the ICT sector as a % of value added (in the ICT sector)
A9	• Imports and exports of ICT goods and services as a % of total imports and exports

B. Broadband and Connectivity

B1	• Broadband coverage: % of population reached by wired (e.g. DSL, cable, fiber), wireless (e.g. Wifi, Wimax, Satellite) and mobile (e.g. EDGE, UMTS, HSPA) broadband access (by region)
B2	• Subscription numbers broken down by nominal speed (256, 512, 1024 (Kbps), 2, 4, 8, 16 (Mbps))
B3	• Broadband price
B4	• Number of broadband subscriptions per 100 inhabitants (broken down by platform)
B5	• % of households with internet access at home
B6	• % of households with internet access via broadband
B7	• Places for accessing the internet in the last three months
B8	• % of individuals accessing the internet through mobile connections
B9	• Reasons for not having internet access at home.
B10	• % of persons employed using computers connected to the internet in their normal work routine
B11	• % of enterprises with broadband access (fixed or mobile)

B12	• % of enterprises giving devices for a mobile connection to the internet to their employees
B13	• % of persons employed provided by the enterprises with devices for a mobile connections to the internet

C. ICT usage by Households and Individuals[36]

C1	• % of individuals using the internet at least once a week
C2	• % of individuals using the internet every day or almost every day
	Personal communication:
C3	• Sending/receiving e-mails
C4	• Telephoning, videocalls over the internet
C5	• Other communication uses (chat sites, messenger, etc.)
C6	• Participating in social networking (facebook, twitter, etc.)
	Use of entertainment (web TV and radio, online games, music and videos):
C7	• Listening to web radios or watching web TV
C8	• Uploading games, images, films or music files to be shared
C9	• Downloading games, images, films or music
C10	• Playing networked games
	Access to information:
C11	• Reading / downloading online newspapers / news magazines
C12	• Subscribing to news services or products to receive them regularly (including RSS, …) /biannual/
C13	• Seeking health information (on injuries, diseases, nutrition)
C14	• Looking for information about education, training, courses
C15	• Looking for information about goods or services
C16	• Downloading software (Other than games)
	Civic and political participation:
C17	• Accessing or posting opinions on websites (e.g. blogs, social networks, etc) for discussing civic and political issues
C18	• Taking part in consultations, voting and opinion polls on-line on political issues

[36] Indicators from C3 to C31 except C27 and C28 are defined as % of individuals having used internet for that purpose in the last 3 months. Indicators C27 and C28 are defined as % of individuals having used internet for purchasing goods or services in the last 12 months.

	Creativity (user generated content: photos, music, blogs, wikipedia):
C19	• Creating websites or blogs
C20	• Uploading self created content (including software) to any website to be shared
	Learning:
C21	• Doing an online course
C22	• Using wikis
	e-Health:
C23	• Making an appointment with a practitioner
C24	• Consulting a practitioner online
	Managing of personal finance/personal administration:
C25	• e-banking
	e-Commerce:
C26	• Selling of goods or services
C27	• Purchasing goods or services
C28	• Cross-border purchases
C29	• Purchasing services related to travel and accommodation
	Professional life:
C30	• Looking for a job or sending a job application
C31	• Using professional networking sites
	e-Skills
C32	• % of individuals with computer skills (none, low, medium, high)
C33	• % of individuals with internet skills (none, low, medium, high)
	e-Inclusion
	Analysis will be based on indicators of the level of disparity in internet usage and skills, based on break down by gender, age, employment situation, education level, household income, area of residence, migrant status
Break down varia-bles	The indicators of ICT usage in Households and by Individuals will be broken down by age, gender, educational level, employment situation, country of birth, country of citizenship, region, household composition, household income

D. ICT usage by Enterprises

	Internal processes
D1	• Integration of internal business processes: % of enterprises whose internal business processes are automatically linked
D2	• % of enterprises using dedicated application for employees to access human resources services
	Integration with customers/suppliers and SCM
D3	• % of enterprises electronically exchanging business documents with suppliers and/or customers broken down by type of document
D4	• % of enterprises sharing electronically information on supply chain management broken down by business function
D5	• % of enterprises sending and/or receiving e-invoices
	Key technologies for the internet of things
D6	• % of enterprises using key technologies for the internet of things, by purpose
	e-Commerce, Customer Relation management (CRM) and secure transactions
D7	• % of enterprises having a website with e-commerce functions
D8	• % of enterprises using software *applications for managing information about clients*, like CRM
D9	• enterprises' turnover from e-commerce as % of total turnover
D10	• % of enterprises selling by e-Commerce
D11	• % of enterprises purchasing by e-Commerce
D12	• % of enterprises doing e-commerce transactions broken down by destination (National, EU, World)
Break down varia-bles	The indicators of ICT usage by Enterprises will be broken down by economic activity and employment size class

E. e-Public Services

E1	• Online availability and interactivity of the 20 basic public services for citizens and enterprises
E2	• % of individuals using the internet for interacting with public authorities by level of sophistication
E3	• % of enterprises using the internet for interacting with public authorities broken down by level of sophistication