



**SIBIS**  
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Statistical Indicators Benchmarking the Information Society

## **SIBIS: Preliminary List of Level-1 Indicators and Outline of SIBIS Topic Areas**

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## 0 Introduction to Topic Areas and Lists of Indicators

In the following chapters, each of the nine SIBIS Topic areas are briefly outlined, supplemented by a tabular presentation of level-1 indicators. Level-1 indicators are called those which are most relevant in terms of lack of current data availability and/or value for benchmarking the progress of EU Member States in the Information Society. Data sources for level-1 indicators are either dedicated surveys of the general population or establishments (pilot versions of which are part of the SIBIS project), or other sources, depending on the appropriateness of the methodology for the data requirements involved. It should be mentioned here that, because of budgetary constraints, not all Level-1 indicators can be piloted through SIBIS surveys.

Level-2 indicators are those which are collected additionally in order to gather data on contextual indicators which are needed to support interpretation of level-1 indicators, or in order to validate the new indicators against data from other sources. Level-2 indicators might also be those which are of interest only to a comparatively small group of specialised interests (e.g. ICT manufacturers).

The tables in the following chapters specify level 1 indicators piloted in the SIBIS survey, as well as those which are not included in SIBIS surveys but are suggested either to be taken up by other organisations involved in EU-wide data collection, or to be calculated from readily available data from third sources.

# 1 Telecommunications and access

## 1.1 Domain description

The area of Telecommunication and Access encompasses a large area of research. It is important to highlight the importance of this topic in a global context. Telecommunication networks are the infrastructure by which the entire new economy is enabled. In their raw state they provide the infrastructure over which increasingly large proportions of national economic wealth is generated; they have to some extent taken over from traditional infrastructure – road and rail – as the carriers of national prosperity. In order to give a framework to the research being done through SIBIS, a definition of Telecommunications and Access has been taken as:

- **Telecommunications:** Conveyance of speech, music and other sounds, visual images or signals by electric, magnetic, electro-magnetic, electro-chemical or electro-mechanical means
- **Access:** The ability to retrieve data, graphics, sound, text etc whether on-line or offline

However, within these broad, and yet rather bald, statements there are myriad aspects which we might consider. For example, in terms of telecommunications we can look at (de)regulation, convergence, different technologies, the existence and distribution of telecommunications networks, the status of a nation's competitiveness, the propensity to invest in infrastructure, and market players, shares, dynamics etc. In terms of access we can look at universality, access mechanisms, speed, quality, applications, existence of content, education and skills, socio-economic or demographic influences etc.

Access is a term used to describe the various mechanisms by which citizens, business, and the public sector interact with the networks. They include computers and telephones, and increasingly new devices such as interactive TV, multimedia kiosks and Internet-enabled wireless appliances.

The issue of 'content' (such as e-commerce, e-health, e-government) is covered by the other SIBIS Topic areas, to be outlined in the following chapters of this document.

For reasons of 'data manageability' we have chosen to focus the scope of our investigations on issues which are:

- directly correlated with eEurope priorities OR
- concerned with emerging technologies (on the basis that the detailed information on the distribution of their existence, let alone their use and impact, is still patchy) OR
- concerned with pricing (this topic is still at the forefront of national and European policy attention, especially as a determinant of equality of access) OR
- concerned with regulation (however, although of great interest, this topic is more rigorously treated in the policy documents section. Also, bearing in mind that SIBIS focuses on new statistical indicators for which data can be gathered through representative population and business surveys, measurement of regulatory matters seems to be outside the reach of the project)

## 1.2 Description of major problems and gaps in statistical coverage

The majority of the 'gaps' in available indicators included below derived from the review of the policy documentation included in the first part of the SIBIS research, which showed that the broad categories of missing data are as follows:

- Broadband and high speed network technologies, e.g. penetration rates for different broadband technologies, use and inhibitors to digital wireless broadband, use of cable modems, pricing, choices of access mechanisms (e.g. digital TV), choices of subscriptions rates and packages (such as premium services), socio-economic aspects of access
- Bluetooth and other emerging technologies – barriers to take up and success factors
- Mobile data services and usage
- Internet technologies – use, barriers, location, multiple platforms, Internet telephony (VOIP is especially for business to business adoption)
- Use of alternative technologies (such as Powerline, although we have to acknowledge that this topic receives very little policy attention)
- Convergence Issues and regulatory progress.
- User behaviour – motivations, barriers to use and impacts of new technologies
- Composite indices – such as combining pricing and the use of one or multiple technologies
- Establishing the physical location of secure Internet hosts for e-commerce
- Pricing - local access pricing, interconnection charges, mobile pricing (particularly international roaming, fixed to mobile tariffs, SMS (mobile contents downloads: e.g. ringtones, logos, localised based services, etc...))

Because the area of Telecommunications and Access is so diverse, and so many indicators already exist, it is difficult to highlight only one or two areas to investigate. Because of this it is also tempting to try to create composite indicators to combine two or more items of information, rather than creating new indicators, to deepen knowledge and understanding of the topic. However, as T&A is changing so fast, if we only adopt this 'composite' approach then we risk omitting key data, such as the rate of progress of introduction of new technologies or new access mechanisms. This type of information requires 'old fashioned' methodology (such as counting the instances of something) but applied to new items (of technology, access appliance, pricing comparison, market share etc).

Therefore, we are pursuing two approaches:

- the development of composite indicators (either based on existing data or on existing themes but with new rounds of data collection to ensure consistency of approach), as well as
- the development of new indicators for which data can be collected via surveys of the population and establishments.

In the following, some of the new indicators developed are described.

### **1.3 New indicators overview**

In order to address the highlighted difficulties, the report suggests to use three general areas or domains for defining new indicators:

- Access to new technologies
- Usage of new technologies
- Impact of new technologies

Thematic Domain	Sub-domain	Selected new level 1 indicators	Piloting in SIBIS
<b>Access</b>	Broadband	<ul style="list-style-type: none"> <li>Share of Internet users with broadband access</li> <li>Broadband Migrators - Share of users who previously subscribed to a slower service (e.g. dial up connections)</li> </ul>	SIBIS GPS SIBIS GPS
	Internet	<ul style="list-style-type: none"> <li>Share of Internet users who access the Internet from one, two, or multiple places -- (a) at home (b) at the workplace (c) at an educational institution (d) at free PIAP (e) at commercial PIAP</li> <li>Internet drop-outs - Share of persons who used to have Internet access at home, distinguishing between those who still access the Internet from somewhere else (work, school, or any other place) from those who do not access it anymore.</li> <li>Degree of penetration and typology of narrowband and broadband ISP's subscription packages</li> </ul>	SIBIS GPS SIBIS GPS -
	Mobile	<ul style="list-style-type: none"> <li>Degree of Internet access through mobile phones, broken down by age groups, income bands and other demographic data</li> </ul>	SIBIS GPS
<b>Usage</b>	Broadband	<ul style="list-style-type: none"> <li>Broadband users according to online tenure (share of broadband users according to length of time since first use of the Internet)</li> </ul>	SIBIS GPS
	Internet	E-mail networking intensity <ul style="list-style-type: none"> <li>(a) Degree of networking amongst friends and relatives</li> <li>(b) Usage of e-mail network with friends and relatives</li> </ul>	SIBIS GPS
		Degree of multi-platform online use. <ul style="list-style-type: none"> <li>(a) Digital TV</li> <li>(b) PDA/ palmtop</li> <li>(c) mobile phone</li> <li>(d) others</li> </ul>	SIBIS GPS
Mobile	<ul style="list-style-type: none"> <li>Mobile networking intensity - Degree of mobile ownership networking amongst friends and relatives</li> </ul>	SIBIS GPS	
	<ul style="list-style-type: none"> <li>Degree of SMS mobile data services use (communication, transactions, downloads, news subscriptions)</li> <li>Use of mobile phones abroad</li> </ul>	SIBIS GPS -	
<b>Impact</b>	Broadband	<ul style="list-style-type: none"> <li>Effect of broadband use on time spend online</li> <li>Benefits and barriers to using broadband technologies</li> </ul>	SIBIS GPS -
	Internet	<ul style="list-style-type: none"> <li>Barriers to Internet usage</li> <li>Benefits of Internet usage (Hypothetical effects of not being able to use the Internet)</li> </ul>	SIBIS GPS SIBIS GPS
	Mobile	<ul style="list-style-type: none"> <li>Benefits of mobile phone use (Hypothetical effects of not being able to use a mobile phone)</li> </ul>	SIBIS GPS

A list of composite indicators including both SIBIS data and other external sources will become available from the project soon. Four indices are to be developed and piloted:

- Broadband e-readiness
- Broadband Snapshot
- 3G readiness index
- Internet e-readiness

## 2 Internet for R&D

### 2.1 Domain description

The diffusion of new information and communication technologies has affected society in general. The relationship between the research and development (R&D) system and the Internet must be considered as particularly important: R&D is an important source of inventions, technical knowledge and skills and is therefore a major motor of economic growth; and there can be no doubt that multiple feedbacks between the Internet and R&D are at work: the Internet has facilitated the access to information that would otherwise be difficult to obtain; E-mail has made asynchronous communication less formal and more frequent; R&D collaboration over large distances has been enhanced, as it has become easier to communicate and transmit information even if it is "large" and "bulky".

There are essentially three different perspectives to look on the relationship between the Net and R&D:

- **Internet-related ICT infrastructure for R&D:** This approach investigates the extent to which elements of the research infrastructure (research networks, on-line information sources, tools for computer-mediated communication, grid technologies, personnel input) are used and what impact they have on R&D.
- **Integration of new network technologies into research activities:** This view on the Internet could be labelled process-oriented, as it assesses how the Net has changed and more often than not enriched R&D processes (e.g. data collection or the dissemination of results).
- **Computer networks and R&D collaborations:** By reducing communication costs significantly, the Internet has created a strong incentive to substitute communication for other inputs into R&D. Hence, the growth of collaborative research has been supported and new ICT-based forms of collaboration have appeared (collaboratories, virtual teams).

### 2.2 Description of major problems and gaps in statistical coverage

Though the trends described above are well known and their importance is not disputed, there have not been any initiatives to benchmark national research systems on their way to the Information Society.<sup>1</sup> The SIBIS analysis on the Internet for R&D closes that gap and develops indicators which are appropriate for measuring the extent to which the Internet has been integrated into R&D and the effects of this. For this purpose, a review of scientific literature, statistical documents and policy documents was carried out in 2001. The main outcome of this is an indicator system which is appropriate for benchmarking national R&D systems and which will be implemented (and improved) in pilot data collections.

This indicator system is even more necessary as the European science and technology (S&T) policy increasingly develops an orientation towards ICT. The common thread of many goals and measures described in the Commission's documents on the European Research Area (ERA) is the creation of multi-layered networks within the R&D system as well as across its boundaries, including other socio-economic areas and political institutions. These networks

<sup>1</sup> The conclusion of a 1999 European Science Foundation conference still applies: "There is a pressing need to increase efforts and resources to undertake in-depth empirical studies on the innovative uses of Internet in science and to carry out European-wide surveys on this issue. Such studies are the only way to generate a sufficient amount of data and information necessary to evaluate the impact of new, high capacity electronic communication facilities upon the organization, distribution and conduct of collaboration on fundamental research problems." Foray, D. (1999): Building the Virtual 'House of Salomon': Digital collaboration technologies, the organisation of scientific work and the economics of knowledge access. Report of the ESF-IIASA-NSF Workshop - 3 to 5 December 1999 - at the International Institute for Applied System Analysis, Laxenburg, Austria, p. 9. (<http://www.esf.org/policy/pdf/iiasa.pdf>)



have to be paralleled by modern and high-capacity communication networks. The European Commission acknowledges this fact and consequently promotes within its eEurope initiative the enhancement of Research and Education Networks for data transmission and the development of novel collaboration-oriented computer systems ("Grids"). The ERA communications cover the usage side of ICT and encourage the development and implementation of further computer-based tools for science, the training of researchers on the possibilities of ICT and the use of computer networks to connect the best researchers in Europe to form "virtual centres of excellence". Many European countries have developed new concepts of research policy over the last three years and some, *expressis verbis* Finland and the U.K.<sup>2</sup>, expect ICT to contribute to the development of science.

### 2.3 New indicators overview

Whereas only few existing indicators could be found in the literature, a number of concepts and approaches were identified which are helpful to guide and direct the pilot work of constructing an indicator system on the Internet usage within R&D. Such an indicator system could be infinitely large and in order to make it feasible the useful indicators have to be differentiated from the less useful and useless. Besides measurement-related criteria as validity, reliability, direction, sensitivity to differences and accessibility, the range of applicability was an important criteria to chose an indicator. As the aim of the SIBIS project is to produce indicators which are suitable for reflecting the situation in the entire national research systems across the European Union and Switzerland we abstracted as much as possible from the specifics of an individual academic discipline. However, this does not imply that the indicator system ignores differences among the academic disciplines. But it will try to make them visible by assessing comparable indicators.

After discussing the different possibilities for measuring the amount of Internet use and the impact on R&D and selecting indicators which would not meet the required criteria the following list of indicators was assembled (see table). The largest number of indicators relates to the Internet-related ICT infrastructure for research activities, the other two sub-topics are covered to a smaller extent. However, most indicators produce more than one item of information; e.g. an indicator on the effects of information retrieval from and via the Internet includes as response categories: time budgets, contacts, productivity and quality of work results. Hence, the number of indicators is not really representative for the amount of information gained.

Except from two indicators on specialised computer staff, the indicators are not suitable to be tested in the SIBIS surveys: the GPS would need a heavy overrepresentation of researchers, the DMS would have to be targeted specifically to the management responsible for R&D, such as the heads of R&D units. This was not possible considering the budgetary constraints of the project. As an alternative the majority of indicators will be tested by means of a domain-specific survey among researchers which will be carried out as part of SIBIS at the end of 2002. Specific indicators for research networks can be taken from the Trans-European Research and Education Networking Association (TERENA) second survey of their member networks, which was carried out in January/February 2002.

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<sup>2</sup> The Finnish Government elaborated "A National Strategy for 2000-2004. Education, training and research in the Information Society" which deals with ICT and the information society as research objects and also covers the multiple opportunities of employing ICT for scientific research. The British Government communicated its science and innovation policy in a White Paper on "Excellence and Opportunity: a science and innovation policy for the 21st century" together with an implementation plan.

Thematic Domain	Sub-domain	Selected new level 1 indicators	Piloting in SIBIS
<b>Infrastructure</b>	Expenditure on ICT infrastructure	R&D expenditure on ICT (total)	—
		R&D expenditure on different types of ICT	—
	Research Networks (RN)	Core usable backbone capacity on a national RN	Data from TERENA
		Congestion on the RN	Data from TERENA
		Budget size of a national RN	Data from TERENA
	Electronic library services	Number of titles in digital collections	—
		Staff providing electronic library services	—
	Researchers' web presentations	Information displayed on a researcher's web page	SIBIS survey of researchers
		Effects of researchers' web page(s) (on time budget, communication, contacts and recognition)	SIBIS survey of researchers
	E-mail	E-mail communication for R&D purposes	SIBIS survey of researchers
		Effects of e-mail use for R&D purposes (on information, contacts, collaborations, productivity, quality of work)	SIBIS survey of researchers
	Computer skills of R&D personnel	Computer skills of R&D personnel	SIBIS survey of researchers
		Effects of computer skills on R&D	SIBIS survey of researchers
	Specialised computer staff	Computer staff providing services to R&D	SIBIS DMS
		Unfilled vacancies in private businesses for computer staff providing services to R&D	SIBIS DMS
<b>Research processes</b>	Digital library and peer site usage	Frequency of information retrieval from electronic sources	SIBIS survey of researchers
		Documents/items from electronic sources	SIBIS survey of researchers
	Software usage	Frequency of software usage	SIBIS survey of researchers
	Information retrieval	Effects of information retrieval from and via the Internet (on time budgets, productivity, quality of work, contacts)	SIBIS survey of researchers
	E-publishing	Amount of work published in electronic media	SIBIS survey of researchers
		Impact of publications in electronic media (on size of readership, time to publication)	SIBIS survey of researchers
Quality control	Review activities for e-journals	SIBIS survey of researchers	
<b>R&amp;D collaboration</b>		Participation in long-distance R&D collaborations	SIBIS survey of researchers
		Impact of computer networks on R&D collaborations	SIBIS survey of researchers

Source: FHSO compilation

## 3 Security and trust

### 3.1 Domain Description

Concerns about security of electronic networks and information security have been growing along with the rapid increase in the number of network users and the value of their transactions. The perception of insufficient protection by citizens and businesses is a potential impediment to the development of the information society. In fact, one of the enabling elements to create an information society in Europe is a fast and secure Internet. However, "secure" should not only be seen in terms of secure technology, but wider than that: both technical security measures and security as perceived by consumers and organisations ("trust") are important. Current policy literature and statistical indicators provide the basis for identifying the gaps and the kind of information needed to fill them. The process of identifying gaps together with exploring existing indicators allows the development of a vision on what new indicators could complement current policy needs for information.

In order to do this, it is important to look at both, the supranational and the national level. In fact, while, collaboration on the issue of trust and security at a supranational level is a rather recent phenomenon (with some experience on the law enforcement side such as information exchange and collaboration between police forces), the national level has a longer history and deeper insights on these topics.

An adequate set of reliable indicators is necessary in order to know where eEurope stands today and what direction it needs to take for the future. An analysis of the policy literature and of indicators being used today highlights the main relevant issues at stake concerning security and trust, such as:

- Rising number of individuals on-line
- Borderless nature of the Internet
- Economic impact and number of organisations suffering attacks
- Characteristics of cyber crime victims and perpetrators
- Variety of crime types due to the ever-changing aspect of the Internet
- Law enforcement and new legal initiatives to deal with new forms of criminal offences linked to the Internet
- Technical capability of the Internet to cope with authentication and protection
- Awareness of trust and security issues
- Ability to deal with trust and security issues (training and education)

Based on these issues the major problems in statistical coverage as well as viable solution can be identified. A set of new indicators is proposed to help redress the current lack in cross-country statistics in this area.

### 3.2 Description of major problems and gaps in statistical coverage

SIBIS defines **security** as *the combination of technical and managerial processes that aim to foster confidentiality, privacy, integrity & availability of data and information systems, as well as to provide authentication and non-repudiation functionalities*. As concerns "trust", a fundamental problem is that trust is not a single *representative, useful and agreed* objective to be used for benchmarking. The review of the various possible definitions of "trust" offered by literature on the topic confirms the need to reject the use of a single indicator measuring trust and concentrate, instead, on the measurement of three distinct indicators for security. At the same time the analysis suggests the identification of *units of analysis* (governments,

businesses and individuals) which should guide data collection based on surveys and existing indicators.

Although it is possible to argue that the above units of analysis as a whole appreciate security, each one has a specific individual perspective on this matter based on their particular operational objectives. This differentiation leads to qualitative and quantitative difficulties in structuring the data collection process through general public (GPS) and decision-making (DMS) surveys. For example, government officials involved in electronic government programmes will have different perspectives on security depending upon the criticality and nature of their services. Likewise, some industries will view security as a burden imposed, for instance, by regulatory mandates. At the same time, there are companies that have a commercial interest in promoting security since this will provide them with business opportunities.

Current indicators do not provide a clear specification of the particular unit of the analysis. The CSI *Computer Crime and Security Survey*, for instance, collects information directly from computer security specialists of US corporations, medical institutions and universities. The results, consequently, should provide a general overview of the status of information security and “cyber-crime” in the United States. Nevertheless, the results do not address information concerning each of the industry actors. More importantly, the results do not allow for comparisons between sectors and of course, being a national study, between countries.

### **3.3 New indicators overview**

In order to address the highlighted difficulties, three thematic domains are suggested for benchmarking online security:

- On-line malicious activities
- Prevention of malicious activities and downtime
- On-line interaction facilitators

Specific indicators, referring to the three Security benchmark indicators may be split between level-1 and level-2 indicators. While all indicators selected for inclusion in the SIBIS survey are “level 1”, nonetheless, some relevant indicators could not be included because of budgetary constraints. The following tables list the “level 1” indicators, specifying whether or not they are included in the survey.

Thematic Domain	Selected new level 1 indicators	Piloting in SIBIS
<b>On-line malicious activities</b>	• Security breaches occurred in the organisation	SIBIS DMS
	• Type and relevance of breaches suffered	SIBIS DMS
	• Supposed origin of breaches	SIBIS DMS
<b>Prevention of on-line malicious activities and downtime</b>	• Concern regarding on-line security	SIBIS GPS
	• Source of information on occurred breaches	SIBIS DMS
	• Presence of security policies	SIBIS DMS
	• Sort of information security policy	SIBIS DMS
	• Information security priorities	SIBIS DMS
	• Barriers to information security	SIBIS DMS
	• Tools of information security	SIBIS DMS
	• Importance attributed to information security	—
	• Comprehension of Private Sector's Security Requirements by the Public Sector	—
	• Co-operation of private sector in fostering information security	—
<b>On-line interaction facilitators</b>	• Perceived security features of websites	SIBIS GPS
	• Effects of Security concerns on on-line shopping behaviour	SIBIS GPS
	• Propensity to report incidents of on-line violations without assurance of anonymity	SIBIS GPS
	• Propensity to report incidents of on-line violations under assurance of anonymity	SIBIS GPS
	• Effects of perceived security features of websites on consumers' propensity to shop on-line	SIBIS GPS
	• Quality assurance and commitment of on-line merchants to security	—
	• Companies' information about on-line security	—

Particular attention is given to identifying possible approaches for combining traditional and innovative indicators in order to derive a single aggregate measure. However, since they represent different domains, the three thematic domains should be kept separate. In fact they cannot be homogenised or compared unless they are quantified using a common base. The multidimensional nature of "trust" prevents us from devising a single benchmarking indicator, and makes us concentrate on the three main thematic domains above. Nonetheless, their overall usefulness is not impinged by this separation. As long as they are interpreted and examined in parallel, the statistical indicators for the three proposed thematic domains can provide policy makers with a useful tool to devise appropriate policies aimed at fostering security for the information society.

## 4 Education

### 4.1 Domain description

The concept of “education” is changing. From the formal and predefined curriculum of the industrial society, education today is redefined as lifelong learning in the information society. Lifelong learning certainly reflects a new comprehension of the need for education in society. The “redefinition” seems to be the conceptual answer to the increasingly complex needs and possibilities for development and learning in the information society. The concept lifelong learning also corresponds to the broad political efforts and initiatives on developing education related to ICT in individual countries, the European Commission, and other supranational organisations.

As lifelong learning appears to be an important key concept for education in national action plans, it is also evident that a change of focus in education policy has taken place, i.e. emphasis is shifting away from the system to the learner.

In this context, education is understood as a formal institutionalised process of knowledge transfer and knowledge development, focusing on institutional structures and activities of education, preparing individuals before they enter the labour market for the first time. This contrasts with informal learning arrangements that take place through various communities of practice arrangements, i.e. on-the-job-training and peer learning. These informal learning arrangements are discussed in the next chapter which deals with the SIBIS Topic “Work, skills and employment”.

SIBIS divides the Topic “education” into three general and seven specific issues. These issues are interdependent and interwoven, but separated for analytical reasons. The three general issues are lifelong learning, e-learning, and evaluation and research. The seven specific issues are all related to the eEurope action plan and are found to be issues for statistical indication of development of the information society in education:

- ICT infrastructure of the educational system
- Support services and educational resources - software (pre-conditions for e-learning)
- Integration of ICT in curricula
- Training of teachers – teachers’ qualifications
- Digital literacy
- Flexible educational institutions and virtual mobility
- Networking between educational institutions and public/private collaboration

The analysis of existing indicators and outlining of gaps in statistical coverage is related to these seven specific issues only. Statistical indicators already available as well as indicators under development have been collected from various sources. The sources have been at supranational level, especially the EU and OECD as well as at a national level, especially Denmark, Sweden, Finland, Canada and the UK.

### 4.2 Description of major problems and gaps in statistical coverage

The review of indicators and surveys covering the topic showed that within most of the seven issues a huge number of indicators and survey based data already exists. The very wide variety in institutional structures within in the formal educational system across the European countries has, however, important consequences for the coverage of data. Some supranational indicators and surveys exist, but most indicators and data are closely related to specific national educational structures. Some of the “existing” indicators on the educational

topic are therefore limited to being accepted and used in one or a few European countries, as the survey data is delimited to these countries.

In two of the issues (Flexible institutions and virtual mobility, and Networking between educational institutions and public/private cooperation) very few indicators existed. A few indicators, mainly at the level of "strategy and infrastructure", were proposed to be surveyed by qualitative and very targeted methods.

Furthermore, the shift of focus in education from system to learner opens up a gap between existing and needed indicators on education and ICT. So far, the focus has mainly been on indicators as infrastructure, counting computers, net access, etc. In the near future, the central focus is going to be on use and competencies. The technological developments as well as the increasing distribution of hardware tends to decrease the importance of the hardware/infrastructure relative to the use/competence indicators. Therefore, there is a need for generic, statistical information on citizen and employee behaviour when working and learning in the information society as well as indicators outlining the availability of competencies in the information society.

### **4.3 New indicators overview**

The analysis has shown that a number of education themes need to be better covered by statistics in order to provide a complete picture of the main relevant issues in present-day education. Development of new indicators was partly determined by the data gathering methods which are available to the SIBIS project, i.e. telephone based surveys. The definition of indicators which suit this approach will supposedly also facilitate an implementation of the new indicators into existing surveys conducted by supranational statistical institutions such as EUROSTAT, or the National Statistical Institutions.

Furthermore, indicators were selected on the basis of policy relevance, which means, in particular, that they should reflect the shift of focus from infrastructure towards use and competencies.

Two main sets of indicators are suggested:

- In relation to indicators for measuring support services and educational resources, integration of ICT in curricula and training of teachers, five questions are proposed to be implemented in future teacher/head teacher surveys similar to the Eurobarometer flash survey conducted in late 2001. A module on e-learning is being piloted in the SIBIS General Population Survey (GPS);
- In relation to digital literacy, a number of questions are piloted in the SIBIS GPS to test their quality for assessing digital skills among students as well as adults at different ages (as indicators of educational level).

Future work in SIBIS on the Topic "education" will include suggestions for two composite indices, one attempting to show a country's readiness for using ICT in education and a second one aiming at mapping the outcomes of a country's educational system with regard to digital literacy, e.g. the digital skills among pupils and students at the time they leave school or university. These indices will be suggested for benchmarking the standing of a country's educational system in the Information Society.

Thematic Domain	Sub-domain	Selected new level 1 indicators	Piloting in SIBIS
<b>Support services and educational resources (Content)</b>	Barriers to e-learning: networks/platforms	Lack of satisfactory e-learning /networking platforms as reason for teachers not using internet in education (to be broken down by educational level: first, secondary, tertiary)	proposed for Eurobarometer flash survey
	Barriers to e-learning: content	Lack of satisfactory content in educational ICT resources as reason for teachers not using Internet in education (to be broken down by educational level: first, secondary, tertiary)	proposed for Eurobarometer flash survey
<b>Integration of ICT in Curricula</b>	Change in pedagogical practices	Development in pedagogical methods resulting from new possibilities offered by ICT (teachers assessment) (to be broken down by educational level: first, secondary, tertiary)	proposed for Eurobarometer flash survey
	ICT as a tool in other subjects	Use of e-learning by students	SIBIS GPS
<b>Training of teachers – teachers qualifications</b>	Training of practising teachers	Teachers ICT training. (to be broken down by educational level: first, secondary, tertiary)	proposed for Eurobarometer flash survey
	Training of practising teachers	The content of teachers ICT training (Technical or pedagogical skills) (to be broken down by educational level: first, secondary, tertiary)	proposed for Eurobarometer flash survey
<b>Digital literacy</b>	Capability to communicate	Confidence in getting in touch with others through the Internet (average & distribution) Confidence in creating a personal web page (average & distribution)	SIBIS GPS SIBIS GPS
	Capability to find and install software programs	Confidence in downloading and installing software (average & distribution)	SIBIS GPS SIBIS GPS
	Capability to search and use information	Confidence in use of search engines(average & distribution)	SIBIS GPS
	Capability to use digital services	Confidence in locating information on the Internet (average & distribution) Confidence in questioning the reliability of digital information on the internet (average & distribution)	SIBIS GPS —
	Overall digital literacy	Composite measure of the above, broken down by (a) age bands (b) occupational status (c) other independent variables (see also section)	SIBIS GPS



## 5 Work, employment and skills

### 5.1 Domain description

The spread of what is called new ways of working, often being made possible by advances in information and communication technology (ICT), has been described as a paradigm shift. In general, the transition from the previous to the recent paradigm is characterised by developments toward greater flexibility of labour deployment. A changing economic environment together with transformations in social attitudes are believed to have resulted in greater spatial, contractual and temporal flexibility, shifts towards less uniform social security provision, the need for updated skills and multi-tasking, and significantly more dynamic skill requirements. In this, ICTs act as enablers of change, although they do in no way predetermine outcomes.

SIBIS divides indicator research on “work, employment and skills” into three domains: (a) skills, (b) work organisation, and (c) structure and outcomes of employment. **Skills** are the necessary basis for the productive deployment of individuals in the production process (**work organisation**) which in turn creates the foundation for **employment** and the value derived from it (**outcomes** such as productivity, remuneration, work satisfaction, but also work-related health impairments etc.). Available indicators as well as indicators which are in development, i.e. have been piloted in one-off studies or in one or a small number of EU Member States, have been collected. Data sources range from administrative data collections by supranational statistical bodies such as Eurostat, ILO and the OECD, and by national statistical offices, to regular surveys conducted by research organisations.

### 5.2 Description of major problems and gaps in statistical coverage

The stock-taking analysis came up with plenty of indicators that cover the topic of work, employment and skills, but our research has shown that the developments that mark the shift from industrial to Information Society are insufficiently represented by available data. A common problem with the large majority of indicators identified concerns the timeliness of the information, and the regularity of data gathering exercises. Many of the surveys which produce the most interesting data are conducted only once in several years, or they are one-off exercises without any prospect of producing time-series data. Another important issue is that indicators should allow for breakdown of data by gender and other demographic as well as socio-economic variables. This is necessary to support EU policy-making in the area of e-Inclusion, equal opportunities and the prevention of a digital divide.

Fields in which additional indicators, together with data gathering structures that provide for continuous and timely data, are most urgently needed are: lifelong learning, in particular ICT-related and informal learning; supply of ICT-related skills inside of the labour market and among the unemployed and the labour reserve; ICT-related skill requirements; changes in work content and working conditions; telework in the widest sense of the word, especially tele-cooperation, mobile teleworking and other less “visible” kinds of telework; changes to the formal as well as “informal” contract between workers and employers; quality of jobs with flexible work arrangements; and non-monetary benefits of employment as well as detriments from work.

### 5.3 New indicators overview

Indicator development in SIBIS focuses on indicators for which data can be collected through telephone-based interview surveys, as SIBIS conducts a series of such surveys as part of the

project. The table below shows the main domain and sub-domain areas for which indicators have been developed, together with a selection of indicators which are piloted in SIBIS.

<b>Thematic Domain</b>	<b>Sub-domain</b>	<b>Selected new level 1 indicators</b>	<b>Piloting in SIBIS</b>
<b>Skills</b>	Skill acquisition	<ul style="list-style-type: none"> <li>• Use of e-learning by workers (offline/online)</li> <li>• Spread of self-directed learning</li> <li>• Share of companies that offer staff access to ICTs</li> <li>• Use of PIAPs by the population, by teleworkers</li> </ul>	SIBIS GPS SIBIS GPS SIBIS DMS SIBIS GPS
	Skill provision	<ul style="list-style-type: none"> <li>• ICT skills in the labour force (self-assessed)</li> <li>• ICT skills in the labour reserve (self-assessed)</li> </ul>	SIBIS GPS SIBIS GPS
<b>Work Organisation</b>	Content/ applied skills	<ul style="list-style-type: none"> <li>• Spread of cross-organisational co-operation</li> <li>• Participation in decision-making in jobs with flexible working arrangement</li> </ul>	SIBIS GPS SIBIS GPS
	Time	<ul style="list-style-type: none"> <li>• Worker-centred adaptability of working times</li> </ul>	SIBIS GPS
	Place	<ul style="list-style-type: none"> <li>• Share of teleworkers according to telework intensity (home-based, mobile, SOHO)</li> <li>• Share of jobs which are perceived feasible for telework</li> <li>• Interest in telework (demand side)</li> <li>• Teleworker churn</li> <li>• Teleworkers by motives for starting telework</li> <li>• Telework-enabled labour force participation</li> </ul>	SIBIS GPS SIBIS GPS SIBIS GPS SIBIS GPS SIBIS GPS
	Contract	<ul style="list-style-type: none"> <li>• Spread of eLancing among self-employed</li> </ul>	SIBIS GPS
<b>Employment Structure and Outcomes</b>	Benefits from employment	<ul style="list-style-type: none"> <li>• Relative job satisfaction in flexible work arrangements</li> <li>• Job quality of jobs with flexible work arrangements</li> <li>• Perceived job security of workers with flexible work arrangements</li> <li>• Outcomes of flexible work arrangements on work-family balance</li> </ul>	SIBIS GPS SIBIS GPS SIBIS GPS SIBIS GPS
	Employment structure	—	—
	Output of employment	—	—

For analysis and dissemination of indicator development results, the topic report includes suggestions for compound indicators (indices). One of these is intended to represent worker-centred flexibility of work arrangements, the other to represent company-centred flexibility of work arrangements. When contrasted against a traditional measure of labour productivity, these two indices will allow for interesting insights into the interrelation between different types of labour market flexibility and productivity.

## 6 Social Inclusion

### 6.1 Domain Description

The advent of the Information Society and new Information and Communication Technologies (ICTs) that are associated with it has often been heralded as an extremely positive development that should in principle benefit all members of society. It is now well accepted that the spread and usage patterns of ICT tools has been uneven, with many European citizens still lacking an easy access to them, and crucially and result ing out of this, are having a differential proximity to, and level of engagement with this information society. In other words, it can be claimed that, just like with any other major social change, the arrival of the information society, apart from bringing undisputed and numerous benefits, at the same time brings threats to many and highlights their vulnerability to handle, let alone benefit from this change. This comparability with other social changes is largely behind the reasons for approaching the topic of digital inclusion from the broad-spectrum point of social inclusion and has led to it being considered and analysed from a similar vantage point and perspectives. However, it has to be emphasised that although broadly the same individuals and groups that are at risk from social exclusion in general are just as likely to be excluded from the information society, there are some unique characteristics of this new divide that merit a separate and an in-depth research enquiry.

Although the initial enthusiasm regarding the advent of the information society has receded somewhat, its potential to decrease marginalisation and, at the same time, to empower people to participate more in a wider society is still an appealing and indeed a laudable concept. However, before the policy makers and indeed wider society can fully endorse this concept and approach, it is important to fully appreciate how widely and indeed effectively the ICT tools have been used.

### 6.2 Description of major problems and gaps in statistical coverage

The rationale for providing this enquiry outlined above with an additional set of indicators cannot be overstated and is reinforced by the fact that this new socio-economic cleavage, referred to as a *digital divide*, is not well quantified nor are its implications, dare one suggest, fully understood and appreciated. Therefore, the aims of the project in this area are twofold - seeking to compile and formulate these indicators, as well as to contribute towards a better theoretical conceptualisation of the whole area of digital inclusion, mainly by providing a coherent framework for the subsequent development of the indicators aimed at capturing this topic.

SIBIS believes that the best way to achieve this is by fragmenting the topic into several sub-topics and then highlighting the issues related to these sub-topics. It is contended that this approach should facilitate a better comprehension of the indicators designed and used to encapsulate this topic and provide a basis for benchmarking. SIBIS research into this topic report presents, on the one hand, the results of a thorough examination of relevant policy documents which seeks to decipher contemporary perspectives on the topic. On the other, it represents a stocktaking exercise of existing indicators that are (or can be) used for capturing and quantifying this topic, in a way that is consistent with identification of pathways for innovative indicator generation. It therefore relates in many ways to the demand of the European policy makers for better, primarily quantitative indicators conducive for policy evaluation, valuable for supporting the policy making and, crucially, suitable for benchmarking. The stocktaking effort and subsequent analysis thereof has indicated that there is a dearth of both focused research on the topic, and of suitable indicators, and this was particularly the case for Europe. Furthermore, many pieces of researches were conducted only once in several years, or they were one-off exercises without much prospect

of being replicated in a way that would generate longitudinal data<sup>3</sup>. At the same time, the data was not gathered simultaneously, with due regard to comparability and needs for benchmarking that can be clearly set in a certain point in time. These types of data are increasingly becoming indispensable policy tools, at least in terms of policy evaluation and progression.

SIBIS divides the topic into three subtopics that are deemed conducive for indicator generation and typology. The most obvious way to examine whether the new digital divide coincides with or cuts across the existing lines of social exclusion appears to be to examine the proximity to the information society of the individuals and groups that have traditionally been most vulnerable [i.e. susceptible to general social exclusion]. This reasoning was behind the first subtopic - identifying individuals and groups 'at risk' or relatively more likely to be e-excluded (it is this area that highlighted many common themes between so-called "classical" social inclusion and e-inclusion). The second subtopic focused on the whole area of access issues, with access defined in a broad sense to include not just a physical access but also issues such as awareness of (and benefits of) access, accessibility and user friendliness of the Internet, skill possession and affordability of access to ICTs, mainly conceptualised as the Internet. Finally, it was also endeavoured to examine the issues behind the rationale for participation (in the information society) such as sustainability of participation, with references to both individual and community level participation.

From the relevant conceptual point of view, the emphasis is on identifying and capturing the (relative) gap in individuals' and groups' proximity to the information society.

### 6.3 New indicators overview

While the need for new indicators in this area is enormous, direct indicator development in SIBIS has been to a large extent been led by methodological requirements (and budgetary constraints) focusing thus on those indicators for which data can be collected at a single point in time via telephone-based interview surveys, being the main data generating vehicle of the project. Furthermore, the indicators that can be gathered via 'omnibus' type of a survey, being the main research instrument available to the project, have been prioritised. In this vein, and following further the project's methodological approach, a distinction is made regarding the indicators (operationalised as variables and / or survey questions) that will relate to a general population survey (GPS) and those to be piloted in a survey targeted at the decision makers in companies/establishments (DMS). In summary, two issues above were crucial for indicator generation and selection process (in addition, of course to the topic and its associated perspectives) and subtopic relevance:

- *policy relevance*: whether indicators that are / will be relevant for [EC] policy making purposes, in particular for eEurope action lines, and for better understanding of the Information Society in the EU in general, and
- *Efficiency and feasibility*: apart from the cost-benefit assessment (i.e. benefits of including certain variables in surveys and usefulness of indicators that can be generated from them). Another issue had to be recognised, mainly that not all indicators and not all topics lend themselves to (telephone) survey research. However, it has to be added that there remains a considerable potential for creating some innovative composite indicators by combining the SIBIS indicators with indicators from other sources, where appropriate.

This brings us to the issue of the potential of SIBIS to both benefit from (and at the same time to contribute to) the indicators developed and to be developed in this area (of social inclusion and the information society). This is another part of the process of indicator generation and this potential can be realised by building the compound or composite indicators out of individual items that can be meaningfully amalgamated together. In addition, there are some

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<sup>3</sup> With the exception of the US based research on the topic (Falling Through the Net series), which further reinforces the need for comparable research in the EU context

indicators that can be at this stage only suggested for uptake by other researchers. This two pronged approach to the indicator generation process is necessary given the nature of the topic itself, which has traditionally being the most difficult to capture methodologically.

The table below lists the main topic and subtopic areas for which indicators have been developed, together with a selection of indicators which are being piloted in SIBIS (inclusive of indicators being suggested for uptake), forming so called *level one* indicators.

Thematic Domain	Sub-domain	Selected new level 1 indicators	Piloting in SIBIS
<b>Social Inclusion and the Information Society</b>	Identifying vulnerable/'at risk' groups and individuals <sup>4</sup>	<ul style="list-style-type: none"> <li>Use of ICTs by 'traditionally' disadvantaged groups in society (using various socio-demographic variables)</li> <li>Regional disparities in use of ICTs (e.g. ICTs in localities of different size bands)</li> <li>Usage of ICTs by ethnic minority groups</li> </ul>	SIBIS GPS  SIBIS GPS  —
	Access -- nominal / physical access	<ul style="list-style-type: none"> <li>Differential levels of access in terms of speed (broadband/narrowband)</li> <li>Individual perceptions regarding the access possibilities for using the Internet</li> </ul>	SIBIS GPS  SIBIS GPS
	Access – skills required	<ul style="list-style-type: none"> <li>Individual perceptions regarding the level of skills required for using the Internet</li> <li>Ability to source information on the Internet</li> <li>Ability to utilise Internet-based/ associated modes of communication</li> </ul>	SIBIS GPS  SIBIS GPS  SIBIS GPS
	Access – accessibility ( of the Internet), as prioritised in relevant eEurope action lines	<ul style="list-style-type: none"> <li>Corporate website accessibility for people with disabilities /special needs</li> <li>Corporate website adaptability to special needs/user requirements</li> <li>Corporate website being developed with regard to Web Accessibility Initiative</li> </ul>	SIBIS DMS  SIBIS DMS  SIBIS DMS
	Access – awareness / skills	<ul style="list-style-type: none"> <li>Perceptions regarding the ease of access to the Internet</li> <li>Usage of PIAPs/free Internet access points</li> </ul>	SIBIS GPS  SIBIS GPS
	Access - affordability	<ul style="list-style-type: none"> <li>Perceptions regarding affordability of Internet access at home</li> </ul>	SIBIS GPS
	Rationale for participation in IS	<ul style="list-style-type: none"> <li>The spread of virtual communities/civic networks</li> </ul>	—
	Perceived benefits of participation	<ul style="list-style-type: none"> <li>Perceptions regarding usefulness of the Internet for an individual</li> </ul>	SIBIS GPS
	Sustainability of participation in IS	<ul style="list-style-type: none"> <li>Share of Internet drop-outs (persons who used to have Internet access at home)</li> <li>Assessment of detrimental impact of not having access to the Internet on individual's perception regarding social enfranchisement</li> <li>Ability to provide information about self over the Internet via creating personal webpage</li> <li>Degree of Internet-based networking amongst friends and relatives</li> <li>Diffusion of the Internet in voluntary/NGO sector</li> </ul>	SIBIS GPS  SIBIS GPS  SIBIS GPS  SIBIS GPS  —

<sup>4</sup> Although broadly similar to classic indicators aimed at identifying the individuals and groups at risk of traditional exclusion, these indicators are nevertheless necessary to fully examine the digital dividing lines.

## 7 e-Commerce

### 7.1 Domain description

The growth of business to consumer and, in particular, of business to business commercial transactions over the Internet is bringing about important changes, which are represented by the emergence of new products and services, new delivery methods, innovative business processes and new business organisations. Due to the pervasive nature of such changes, the electronic revolution in commerce is strongly affecting the performance of the economies as a whole and, at the same time, is having important effects on the socio-political context of different countries. As a consequence there has been a growing interest among academic researchers, statistical agencies and policy makers in recent years towards the way in which electronic commerce can be measured, which has in turn raised relevant issues concerning the notion of electronic commerce itself.

The existing theoretical approaches that aim at assessing electronic commerce from a quantitative perspective vary substantially across different studies and these differences are mainly attributable to the lack of a common definition. SIBIS adopts the OECD approach, which is quite flexible, in that it involves two definitions of electronic transactions. These definitions are based respectively on a narrow and on a broad notion of the *communications infrastructure*. According to the narrow definition, an Internet transaction is the sale or purchase of goods or services, whether between businesses, households, individuals, governments and other public or private organisations, conducted over the Internet. According to the broad definition: an electronic transaction is 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.

Along this line, the focus of the analysis should be on the most developed and largest markets for electronic transactions: business-to-business, business-to-consumer, and business-to-administration (government). The attention in SIBIS is on the first two of these categories. Businesses can act either as sellers or as users of products/services, in which case we talk about electronic procurement. This definition implies that the simple process of gathering information does not constitute alone electronic commerce: in order for electronic transactions to take place, it is necessary that at least the purchasing/ordering step is carried out. However, in the design of a comprehensive measurement framework, it is important to consider also the processes of delivery, payment and customer support, as long as it is possible to develop useful and appropriate indicators for these functions.

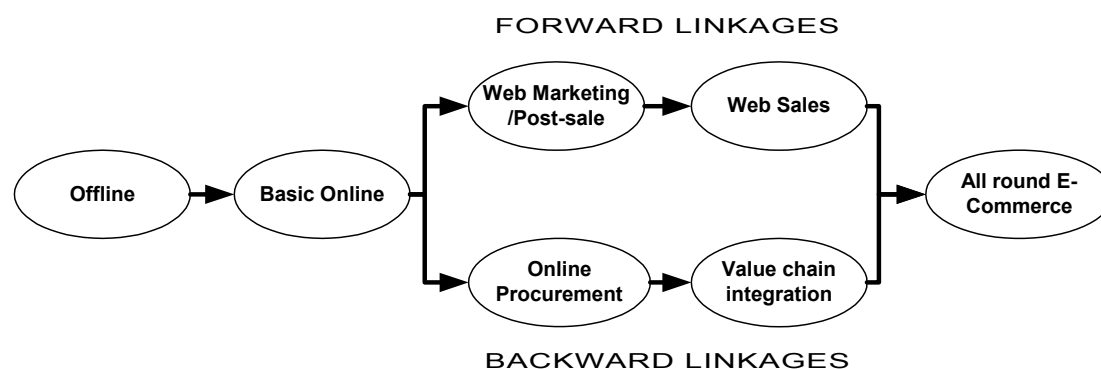
### 7.2 Description of major problems and gaps in statistical coverage

The existing literature on e-commerce tends to integrate two major objectives. On the one hand, it focuses on a quantitative dimension, i.e. the measurement of electronic commerce (for which different working definitions are being used). On the other hand, it concentrates on a qualitative dimension, i.e. the analysis of the impact of this phenomenon on the social and economic systems.

In consideration of the development of innovative indicators for the assessment of electronic commerce, it is worth remembering some features of electronic commerce that help identify an appropriate set of measures for its evaluation. First, electronic commerce is not an insulated phenomenon, but it constitutes an important manifestation of the wider process of digitalisation of the economy as a whole. This means that it is advisable to consider the measurement of electronic commerce as a crucial step in the path of measuring the digital economy and that therefore the design of the evaluation framework should be modular and

expandable, in terms of the underlying conceptual model and indicators. Second, electronic commerce is not simply a technological system that must be implemented, but it involves the interplay between technology and business. Electronic commerce concerns the development of electronic or on-line services and the consequent changes needed to make this possible in business processes and organisation networks. Within this context, ICT play an important role as enablers of electronic transactions. Third, electronic commerce drives a process of value chain deconstruction and reconstruction, since most components of the business functions can be organised to a varying extent by electronic means. The implementation of electronic commerce applications can be seen as a process of dismantling and reforming (in different and innovative ways) the existing value chains, so that some links will remain the same, some intermediaries will disappear, while new agents will emerge. As a consequence, electronic commerce leads to the development of new business models, which will all differ in terms of the business processes that can be conducted electronically and in terms of innovation. This phenomenon often requires substantial organisational adaptations and learning.

According to the OECD methodology, we identify three areas of electronic commerce measurement - readiness, intensity and impact - which refer respectively to the enabling conditions (infrastructure and human resources) for the implementation of electronic commerce, to the magnitude and characteristics of electronic transactions and to the social and economic impact of this phenomenon. Readiness indicators are largely available across different studies and the geographical coverage is quite extensive. The suggestions for the development of innovative indicators in this area will be directed at generating composite indices of readiness. Intensity indicators have just recently emerged and have usually been proposed by country-specific statistical documents. Some gaps exist in this area, particularly with reference to the need of gathering information on qualitative issues such as the purchasing behaviour of consumers and the characteristics of on-line businesses, as well as on the differences between electronic and traditional economic transactions. There is also a lack of data which can show how e-commerce-related business activities diffuse inside of companies. Such data is of high importance for policy-makers as they need to know for which stage of diffusion companies (especially SMEs) are in most need of political support. The figure below shows the SIBIS e-business development model -- every company can be assigned to one of the e-business types in the model<sup>5</sup>. Data for this typology will be collected by SIBIS on a pilot basis.



Many gaps in available statistics refer to the impacts of electronic commerce and this is due partly to the early stage of development of electronic commerce across European countries and partly due to the intrinsic complexity of measuring the effects of this phenomenon on consumers and businesses, and on the economic/social context in which these agents operate. SIBIS proposes first steps towards gathering data on impact indicators using the tools for data collection which are available to the project, i.e. surveys of decision makers in establishments as well as consumers.

The structure of indicators as indicated in the table below follows the distinction between the two types of stakeholders that are relevant for the survey - the general population (consumers

<sup>5</sup> The figure shows the "ideal" diffusion path of e-business inside of companies, without proclaiming that such a sequence is the only possible one.

in B2C e-commerce) and establishments (supply in B2C e-commerce and supply as well as demand in B2B e-commerce).

### 7.3 New indicators overview

The theoretical background for the development of innovative indicators for electronic commerce, from which the basic framework of analysis in terms of object and methodology was derived, is based on the literature analysis which covered scientific sources as well as key policy documents and statistical publications. This work enabled the project to identify the most important gaps in data coverage, which form the starting point for indicator development in SIBIS. The following list contains a selection of the level-1 indicators, many of which are being piloted through the SIBIS general population and establishment surveys. A central

Thematic Domain	Sub-domain	Selected new level 1 indicators	Piloting in SIBIS
<b>Technology readiness and ICT penetration</b>	establishments	<ul style="list-style-type: none"> <li>• Use of ICTs</li> <li>• Existence of a website</li> <li>• Purposes of website presence</li> <li>• Breadth of access - share of office workers with access for e-mail/ Internet/ Intranet</li> </ul>	SIBIS DMS SIBIS DMS SIBIS DMS SIBIS DMS
	consumers	<ul style="list-style-type: none"> <li>• Use of ICTs</li> <li>• Intensity of use of e-mail and Internet</li> </ul>	SIBIS GPS SIBIS GPS
<b>Barriers to e-commerce</b>	establishments	<ul style="list-style-type: none"> <li>• Perceived barriers to e-commerce</li> <li>• Perceived barriers to e-procurement</li> </ul>	SIBIS DMS SIBIS DMS
	consumers	<ul style="list-style-type: none"> <li>• Perceived barriers to e-commerce</li> </ul>	—
<b>E-commerce intensity</b>	establishments	<ul style="list-style-type: none"> <li>• Share of establishments according to e-commerce typology (offline; basic online; web marketing/post-sales; ...; all around e-commerce users)</li> <li>• Scope of the website</li> <li>• Participation in e-marketplaces as buyer/seller</li> <li>• Geographical markets for online sales</li> <li>• Share online sales of total sales to (a) consumers (b) businesses (c) public sector</li> <li>• Dual-channel e-commerce: Share establishments using call center of all that sell online</li> </ul>	SIBIS DMS  SIBIS DMS SIBIS DMS SIBIS DMS SIBIS DMS
	consumers	<ul style="list-style-type: none"> <li>• Scope of accessing the Internet</li> <li>• Use of mobile commerce (online commercial transactions via mobile phone)</li> </ul>	SIBIS GPS SIBIS GPS



Thematic Domain	Sub-domain	Selected new level 1 indicators	Piloting in SIBIS
<b>E-commerce Impacts</b>	establishments	Perceived impact of online selling on: <ul style="list-style-type: none"> <li>• (a) sales</li> <li>• (b) costs</li> <li>• (c) sales area</li> <li>• (d) quality of customer service</li> <li>• (e) efficiency of internal business processes</li> </ul>	SIBIS DMS
		Indirect impacts of online selling on: <ul style="list-style-type: none"> <li>• (a) inter firms alliances and agreements</li> <li>• (b) development of new products and services</li> <li>• (c) emergence of new groups of consumers</li> </ul>	—
		Perceived impact of online procurement on: <ul style="list-style-type: none"> <li>• (a) costs</li> <li>• (b) stock-keeping</li> <li>• (c) number of suppliers</li> <li>• (d) relations to suppliers</li> <li>• (e) efficiency of internal business processes</li> </ul>	SIBIS DMS
		Indirect impacts of online procurement on: <ul style="list-style-type: none"> <li>• inter firms alliances and agreements</li> </ul>	—
	consumers	<ul style="list-style-type: none"> <li>• Benefits of use of Internet (Hypothetical effects of not having access to the Internet)</li> <li>• Consumer satisfaction with online purchasing</li> <li>• Substitution (types of products and services that could be purchased exclusively online)</li> </ul>	SIBIS GPS
			—
			—

The next step will include the development of composite indices, making use of data derived from our own surveys as well as from third sources, as appropriate.

## 8 e-Government

### 8.1 Domain Description

E-government plays an important function in mediating government actions. Its role will continue to grow as communications technologies become more widespread. Already, communications technologies change the way that government operates by facilitating information dissemination, communications, and transactions. E-government comprises a number of functions currently filled by traditional modes of communications. Transactions that today require face to face contact, letter writing, or telephone communication may soon be replaced by electronic interaction.

Member States have made a commitment to the development of e-government. To this end, governments have chosen to turn e-government into a reality by making government services more accessible and more efficient. However, because of the evolving nature of information technologies and telecommunications, the requirements of building e-government are still not fully understood. Thus, it is not clear how expensive e-government will be or how long it will take to implement. Even so, momentum continues to carry this process forward.

SIBIS research into e-government examines how the implementation of e-government is coming about. Three different aspects of e-government are to be separated for analysis: government-to-citizen, government-to-business and government-to-government. Some government agencies have taken steps to create interactive sites for citizens and businesses to transact, while others restrict their presence to online information. National policy documents show how the governments of Member States are choosing to orient their efforts on e-government. Many documents sketch out a view of what e-government could be. One aspect of e-government that is treated is the expectation that it will be used by all, or at least by many. In addition, these documents consider the opportunity to redesign government processes while implementing e-government. Based on the Action Plan of the European Commission and the individual Member State Action Plans, three central tasks can be distinguished<sup>6</sup>:

- Electronic delivery of services ("Open Government"): increasing the quality of electronic government information.
- Citizen and business access to public information ("Customer orientated Government"): developing electronic services and "customer orientated" interactive service provision (authentication service, signature certifications, electronic forms, help desks and call centres, public e-mail and contact directories, job banks) and back office operations (transaction monitoring, information exchange, client feedback, etc.). Many administrative areas are concerned: land registry, taxes, passports, welfare and social service, revenue, etc.
- Improvement of internal working procedures within the central government but also between government agencies (regional representatives of ministries) and decentralised public authorities (regional and local authorities).

### 8.2 Description of major problems and gaps in statistical coverage

Existing statistics mainly focus on the availability and accessibility of electronic government services online. They consider specific government services and the level of sophistication that these services have attained. This provides a view of how the e-government infrastructure is progressing. A necessary complement to these statistics that has not developed to the same extent is a set of measures of e-government adoption and usage as

<sup>6</sup> Public strategies for the Information Society in the Member States of the European Union; OECD Science, Technology and Industry Scoreboard, 2001

well as of user satisfaction. Most indicators to measure the usage of the electronic services are still in the development phase.

Indicators that examine the adoption, usage and user satisfaction of e-government are important because the success of e-government ultimately depends on its use and for this reason it is important to understand whether the expected consumers of e-government services are taking advantage of what is being offered to them. If not, it would be useful to understand what barriers stand in the way of realising the e-government vision that has been formulated by the European Commission in its Action Plan.

### 8.3 New indicators overview

To map the progress of e-government across different countries, a hierarchical structure of all relevant indicators was developed. This framework clearly identifies the parties involved in the elaboration of e-government. For each party, the potential of e-government is a dimension of interest. Complementary to this vision is a measure of usage that identifies barriers to usage, convenience of usage, level of usage and type of usage. The hierarchy is further analysed to define new indicators and suggest how they might be measured. This approach is followed for each of the parties: citizens, business and government. Existing indicators are mapped onto this hierarchy and gaps are identified. The gaps are the basis for proposed indicators. The table below shows two types of indicators:

- indicators for which data will be gathered on a pilot basis in SIBIS;
- additional indicators that were identified as useful measures of the status of adoption of e-government but that cannot be piloted in the SIBIS surveys for a variety of reasons, mostly because no survey of governmental organisations is being conducted in the scope of the project.

Where the thematic domain shows government, the area of interest is intra-government communication, which could be within a government agency or reach across agencies.

Thematic Domain	Sub-domain	Selected new level 1 indicators	Piloting in SIBIS
<b>Business Usage</b>	Level of usage of e-government	Current usage of Internet or EDI to access government services: <ul style="list-style-type: none"> <li>• Payment of social contribution for employees</li> <li>• Corporation tax declaration</li> <li>• VAT declaration</li> <li>• Submission of data to statistical offices</li> <li>• Obtaining environment-related permits</li> <li>• Participation in public invitation to tender</li> </ul>	SIBIS DMS
	Demand for e-government	<ul style="list-style-type: none"> <li>• Preference for using electronic means for above services compared to conventional means of data transfer</li> </ul>	SIBIS DMS
	Barriers to the use of e-government	<ul style="list-style-type: none"> <li>• Perceived barriers and advantages of online government services</li> </ul>	SIBIS DMS
	Cost of e-government	<ul style="list-style-type: none"> <li>• Cost comparison of e-government and conventional channels of communication</li> </ul>	—

Thematic Domain	Sub-domain	Selected new level 1 indicators	Piloting in SIBIS
<b>Citizens Usage</b>	Demand for e-government	Preference for using online or conventional (face-to-face, telephone or mail) method to carry out specific government transactions: <ul style="list-style-type: none"> <li>• Tax declaration / filing income tax return</li> <li>• Use of job search services of public employment service</li> <li>• Request for passport, driver's licence, birth certificates or other personal documents</li> <li>• Car registration</li> <li>• Declaration to the police, e.g. in case of reporting theft</li> <li>• Searches for books in public libraries</li> <li>• Announcement of change of address</li> </ul>	SIBIS GPS
	Access to e-government	<ul style="list-style-type: none"> <li>• Access to above government services by Internet</li> <li>• Access to above government services by other means (face-to-face, call-center, ...)</li> </ul>	SIBIS GPS —
	Experience with the use of e-government	<ul style="list-style-type: none"> <li>• Experience using above government services via the Internet</li> <li>• Availability of necessary technologies to use e-government</li> </ul>	SIBIS GPS —
	Barriers and advantages	<ul style="list-style-type: none"> <li>• Faced barriers and advantages of online government services</li> </ul>	SIBIS GPS
	Willingness to use e-government	<ul style="list-style-type: none"> <li>• Willingness to use online government services</li> </ul>	SIBIS GPS
<b>Government</b>	Training needed to access e-government	<ul style="list-style-type: none"> <li>• Training barriers preventing the use of e-government services within government</li> </ul>	—
	Equipment needed to access e-government	<ul style="list-style-type: none"> <li>• Existence of inadequate equipment to enable the implementation of e-government</li> </ul>	—
	Demand	<ul style="list-style-type: none"> <li>• Preferred ways of interacting within government</li> </ul>	—
	Shortcomings and advantages	<ul style="list-style-type: none"> <li>• Perceived shortcomings and advantages of e-government services</li> </ul>	—

Individual indicators provide insights into the development of e-government. In certain instances, these indicators may be combined to give composite indicators that provide better insight into the situation of interest. Existing composite indicators integrate measures of e-government achievement across individual government services. These are combined to show how well government responds to citizen and to business needs. Till now, these composite indicators are only calculated for the Netherlands, but the project will check the possibility to adapt them to all EU Member States, also making use of data collected via the SIBIS surveys.

## 9 Health

### 9.1 Domain description

One of the major application areas of Information Society technologies is in the health sector. For many years, ICT systems have been developed which are applied in the clinical, administrative and information dissemination/education areas. Many of these computer based applications do not have a telecommunications component, but recent years have seen increasing usage of telematics in all of these application areas, giving rise to the labels of telehealth and telemedicine.

Parallel to these developments, the health sector has always developed a wide range of statistics for clinical, research, and administrative use. The generation of these statistics is increasingly supported by, and in many cases is only made possible by the use of ICT technology.

The range of materials available to the work in this domain is therefore potentially very large indeed. There are two main reasons for this situation. Firstly, the range of health statistics (as opposed to eHealth statistics) is immense. Secondly, the types of technology underlying eHealth and the range of specific applications is large and growing rapidly. Given the resources available to the project and its focus on developing indicators of eHealth, it was necessary to develop a strategy which enabled the limitation of the range of materials to be treated.

In relation to the first issue, even though more and more mainstream health statistics are gathered, transmitted, analysed and disseminated via ICTs, many of the uses of these statistics are so specialised as to preclude all but the professional classes from using them (for example, undertaking scientific studies in epidemiology). It was decided therefore to limit the analysis which follows in this deliverable to statistics which are 'mainstream' use, i.e. which are widely used by the professional and non-professional consumer. The focus here is on indicators of usage of applications, rather than on the statistics which might form the content of these applications.

A similar approach was taken to the second issue, i.e. the technology question. One of the main objectives of the SIBIS project is on usage of technologies rather than on the technologies themselves. It was therefore decided to focus on indicators of the usage of these technologies rather than on technology *per se*. However, a number of general level indicators of the types of technology in use have been included.

Moreover, when the national and transnational policy in the area of eHealth is examined, especially e-Europe policy, there is a very specific focus to the policy aims which are set out. Specifically, the following actions are indicated:

- Ensure that primary and secondary health care providers have health care telematics infrastructure in place including regional networks
- Best practices in electronic health services in Europe are identified and disseminated, benchmarking criteria set
- Establish a set of quality criteria for health related websites
- Establish health technology and data assessment networks

Given these e-Europe priorities, it was decided to focus on the issues of usage of health care telematics by the public and by clinicians and on health administration system, rather than on the much broader fields of telemedicine and health statistics.

## 9.2 A framework for describing eHealth statistics

It is important to develop an overview of the types of statistics, indicators and questions which may be applied to eHealth systems. Such a framework was developed (on the basis of an extensive literature review) as part of the SIBIS project. There are five elements to the framework. These are:

- Type of users
- Type of usage of systems
- Systems - type of ICT applications
- Types of issues associated with the application
- Types of questions to be asked about systems

Each of these elements was further subdivided into sub-element and they were used to classify the currently available statistics which were identified in the literature search.

In undertaking this process of categorisation, it became clear that there are major gaps in coverage in relation to currently available indicators, especially in relation to systems such as educational systems, data transfer systems and others, in relation to issues such as costs and effectiveness of systems and in relation to users other than patients or clinicians.

## 9.3 Description of major problems and gaps in statistical coverage

Despite the wide range of health statistics available, there are relatively few sources of indicators in the field of eHealth which have achieved widespread usage. Time series data is not yet available for any of the indicators found. This means that all of them can only be described as indicators in development.

Moreover, many of the sources which have come to attention are relatively weak. For example, there are only a few surveys which have used robust sampling techniques while many surveys have been conducted only on the Internet, with attendant biases in their sampling.

The overall impression regarding the state of existing indicators is that there is much work to be done in relation to a wide range aspects of eHealth. For example, the framework proposed in the deliverable points to a number of areas where there is activity in eHealth, e.g. education, for which no or very few indicators could be found.

## 9.4 Currently available indicators

In all, indicators in 83 separate areas were identified from the available literature.

### *Currently available indicators in eHealth*

<b>System quality</b>	<b>System usage</b>
Background of system developers/sponsors	Barriers to system usage
Purpose of the application	Patients and public usage of eHealth systems
Content of the application	Practitioners usage of eHealth systems
Confidentiality procedures	
Design of the web site	
Evaluation of the web site	

Most of the indicators identified have not yet been developed to the extent where they could be used without modification. No full-scale population studies have yet been undertaken with these indicators, and most have come from the tradition of market research.

### **9.5 Proposals for indicators**

The process of selection and development of new indicators was informed by three considerations. First, the framework for describing eHealth indicators was used as a reference to identify potential gaps in coverage of issues in eHealth. Second, the review of important current issues in eHealth is used as a reference to identify gaps in coverage by the currently available indicators. Finally, the criterion of focusing on usage of eHealth systems, rather than their information content is used to further limit the proposals for new indicators.

A number of specific indicators were selected for inclusion in the GPS of SIBIS. These were selected on the basis of the ability of the target sample to provide informed answers to the questions asked. Many of the new indicators which need to be developed are technical in nature and would be more suited to professional samples.

The table below outlines the indicators proposed for use in the General Population Survey as well as other proposed indicators.

Thematic Domain	Sub-domain	Selected new level 1 indicators	Piloting in SIBIS
<b><i>e-Health and the information society</i></b>	Accessing Internet based health information	<ul style="list-style-type: none"> <li>Description of search behaviour</li> <li>Outcomes of search behaviour</li> <li>Satisfaction with outcomes of search behaviour</li> </ul>	SIBIS GPS
	Origin of Internet based health information	<ul style="list-style-type: none"> <li>Geographical origin of Internet based health information</li> </ul>	SIBIS GPS
	Perception regarding the trust placed in online health information providers	<ul style="list-style-type: none"> <li>Levels of trust in commercial, professional and other health information providers</li> </ul>	SIBIS GPS
	Type of usage of Internet based health information	<ul style="list-style-type: none"> <li>Usage of medical consultations/advice via the Internet</li> </ul>	SIBIS GPS
	Rationale and reasons for health information search	<ul style="list-style-type: none"> <li>Types of reason for health information search</li> <li>Comparison of quality of Internet based health information with traditional sources</li> </ul>	SIBIS GPS
	Type of system used	<ul style="list-style-type: none"> <li>Individual usage of a range of eHealth and telemedicine systems</li> </ul>	SIBIS GPS
	Benchmarking good practice (All indicators to be compared to best practice)	<ul style="list-style-type: none"> <li>Comparisons of the usability, utility, effectiveness quality and conformance with best practice in relation to eHealth systems</li> </ul>	—
	The utility or effectiveness of eHealth systems	<ul style="list-style-type: none"> <li>The effectiveness of eHealth systems in relation to costs, information quality and time</li> </ul>	—
Satisfaction with eHealth systems	<ul style="list-style-type: none"> <li>Satisfaction with the utility and effectiveness of eHealth systems</li> </ul>	—	