European Foundation for the Improvement of Living and Working Conditions

Advancement of the knowledge society

Comparing Europe, the US and Japan

This report is available in electronic format only

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Introduction and background

In the context of its four-year work programme, *Analysing and anticipating change to support socio-economic progress 2001–2004*, the European Foundation for the Improvement of Living and Working Conditions has undertaken a project on European knowledge society foresight for living conditions, working conditions and industrial relations. The purpose of the project is to increase understanding of the drivers of the knowledge society and to anticipate the potential impact on living conditions, working conditions and industrial relations. The underlying aim is 'to identify and support paths to positive transformation while avoiding unsatisfactory development paths'.

The European knowledge society foresight project is developmental, intended to be at the same time:

- integrative;
- explorative;
- experimental;
- developmental;
- forward looking.

The project should look at life as a mix of living conditions, working conditions and industrial relations, and analyse these strands through experimental, developmental and future-oriented methods. The outcome should support paths to positive transformation.

The project should encompass research, network building and the fostering of exchange of information and expertise with knowledge society specialists, social partners and government. The 'foresight' concept links the project closely to the Commission's sixth European research programme 2002–2006 concerning network-building and the innovation policy framework of the European research area. The project is also closely related to policy strategy goals set out in the Lisbon Summit for Europe to become 'the most competitive and dynamic knowledge-based economy, capable of sustained economic growth with more and better jobs and greater social cohesion'. It aims at investigating how social foresight can fill the gap between the Lisbon employment strategy and technology foresight.

The project has now entered its second phase (2002–2003) aimed at:

- developing a report on advancement indicators of the knowledge society;
- establishing temporary national foresight centres in three different EU Member States;
- creating national knowledge society foresights concerning the drivers and impacts of the knowledge society;
- producing a synthesis report consolidating the project results.

This report provides results on the advancement indicators of the knowledge society.

Following the introduction and background, Chapter 1 provides a brief description of the project framework, briefly elaborating on definitions of 'knowledge society' and 'foresight'. In doing so, it builds on the first phase of the knowledge society work programme. Chapter 2 gives an overview of the project objectives, and specifies the action plan, participants and intended outcomes of the foresight process, with a particular focus on the ongoing second phase. Relevant knowledge society advancement indicators are described in Chapter 3, together with some brief analysis.

These indicators cover the 15 EU Member States and also, where possible, countries like the US and Japan, eastern European countries or OECD countries. Many are based on available statistical information, some of which is already rather dated, and may not have been originally focused on the knowledge society. Where possible, the intention was to identify and present time series data on indicators, which will help in the identification and elaboration of trends. More up-to-date statistical indicators, providing data directly related to the information society, come from ongoing EU-wide projects, funded as part of the EU Information Society Technologies (IST) Programme. An example is the SIBIS project (Statistical indicators benchmarking the information society) (**www.sibis-eu.org**). These indicators provide an important empirical base for the subsequent steps in the knowledge society foresight project, focusing on the identification of trends and the analysis of drivers and impacts of the knowledge society in different countries.

Project framework 1

What is the knowledge society?

There is a unanimous view among researchers that knowledge is becoming an increasingly important driving force for prosperity. The knowledge society advocates what needs to be done to enhance the use of data, information and knowledge. At present, there is no generally accepted view as to what constitutes the knowledge society, and there is uncertainty as to how living conditions, working conditions and industrial relations relate to each other in that society. Another challenge is how to measure the impact of an increasing number of people handling an increasing amount of data and information. Does it automatically lead to better understanding and prosperity for all? Or does it lead to a digital divide and prosperity for few?

To create a more tangible concept of what the knowledge society represents, it helps to consider the societal transitions from agrarian to feudal to industrial and now knowledge. A general hypothesis is that the knowledge society is penetrating the industrial society as the latter penetrated the feudal society. If this hypothesis is correct, it means that the knowledge society will transform living conditions, working conditions and industrial relations as industrial society shaped feudal society. But what is the direction of change? Is living in the knowledge society healthier, safer and less stressful? Are people more equal, is society more democratic and transparent? Will it be possible to avoid a digital divide? What will happen to working life? Will it be less hierarchical? Will knowledge workers replace industrial workers and will knowledge management replace industrial management? Will individual employment relations replace collective industrial relations?

It is self-evident that all societies rely greatly on knowledge and information processing. The knowledge society can be used to characterise the intersection of several related trends in the late twentieth and early twenty-first centuries. In particular, attention needs to be drawn to:

- the development of information societies, based on the large-scale diffusion and use of new information and communication technologies (ICT);
- the increasing importance of innovation (organisational as well as technological) as a source of competitiveness, and an instrument for increasing the efficiency and effectiveness of organisations of all types;
- the development of service economies: where service sectors dominate economic activity and employment, where service is an important management principle in all sectors, and where specialised services provide critical inputs to organisations in all sectors on a vastly increased scale;
- efforts to create learning organisations and institute various forms of knowledge management, to enable improved use of data resources (e.g. data mining), information assets (e.g. enterprise resource systems) and expertise (e.g. human resource development, groupware and collaborative systems);
- other important developments related to the points above, including globalisation, changes in demographic structures and cultural practices, and environmental affairs.

These developments have implications for both living and working conditions and industrial relations. The ways in which they are mutually shaping, and being shaped by, policies and strategies of many kinds are still evolving. Few efforts have been made to consolidate knowledge across this wide range of issues. Thus, it is uncertain just what or how far reaching the implications will be. The purpose of this project is to use foresight methodology to analyse these trends.

What is foresight?

'We cannot plan the future, but we can plan for the future.' (Swedish Technology Foresight, 2000). This richer understanding of what might happen, rather than setting out what will happen, is an essential feature of foresight. Foresight constitutes a systematic attempt to observe the long-term future of science, technology and society, in order to generate knowledge with which to effect societal development, based on well-founded projections. Foresight has been widely used in many countries; technology foresights, in particular, have been very common in the 1990s.

The European Commission has invested in foresight by setting up a high level expert group that proposes to create further foresight processes. In their report, Foresight for Europe (2002), they outline concepts and debates on how the future will possibly be shaped. The group noted in their report that there are many technology foresights but few social foresights, and no European level social foresight. The objective of the European knowledge society foresight is to fill this gap.

Foresight has emerged as a policy approach in the context of the prevailing knowledge society. This reflects two conclusions that are intimately related to the knowledge society. Firstly, social and technological change has immense implications for the longer-term development of all policy areas. Secondly, the knowledge needed to understand many of these critical developments is not possessed by central authorities, but is rather widely diffused throughout society.

Foresight thus involves three elements:

- vision: systematic, well-informed views of the long-term future, developed in part through,
- participation: the involvement of a wide community of knowledgeable parties and stakeholders in processes of dialogue and interaction, so as to inform
- action: the formulation of strategic plans and the setting of priorities, taking into account these longer-term views and wider sources of knowledge.

Foresight is intended to inform policymaking and priority setting, by articulating strategic visions that can be related to present day decisions. The participatory process can help establish a shared sense of commitment to these visions - increased understanding of the issues, and analysis as to what is feasible and desirable. Foresight often involves the establishment of networks within which participants share awareness of each other's knowledge resources, strategic orientations and visions of the future. This in effect establishes new knowledge communities that can act to deal with long-term challenges. The Handbook of the Knowledge Society Foresight, developed in the first phase of the project, uses the term 'fully-fledged foresight' to describe those approaches that go beyond more narrow, less participatory, and/or short-term exercises, or which remain at a lofty remove and are otherwise unrelated to policy.

Objectives 2

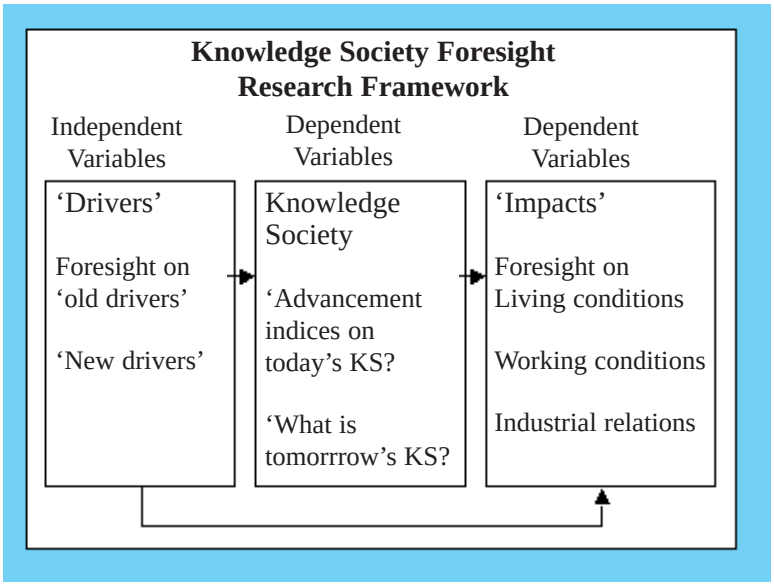
The objectives of the European knowledge society foresight project are:

- to identify and analyse the drivers of the knowledge society in order to increase understanding of the transformation from the industrial society;
- to anticipate the wide range of transformation which the knowledge society brings in order to analyse the impacts on living conditions, working conditions and industrial relations;
- to help decision-makers identify and support paths to positive transformation while avoiding unsatisfactory development paths.

Research setting

The European knowledge society foresight programme is implemented in the context of the transformation from an industrial society to a knowledge society. What are the drivers towards this knowledge society? This has been much discussed but there are not many systematic analyses on the importance of different drivers. What is it like to live and work in the knowledge society? How will industrial relations, working life and living conditions be structured in the knowledge society, compared to the industrial society? These are the basic questions of the project.

Research framework



In foresight thinking, life is one totality where work and life are mixed together and this relationship is regulated by laws and systems of industrial relations. The challenge for the project is to build a foresight process to cover all these elements.

Action plan

The preparation of the European knowledge society foresight project began in 2000 with exploratory workshops concerning foresights and the knowledge society. In 2001, an advisory committee was appointed to support the project, which proposed implementing the project in four phases. In the first phase, the project produced a handbook on foresight

methodology. The second phase is developing national and European level knowledge society foresights for living conditions, working conditions and industrial relations. The third phase targets the dissemination of the results.

Phase 1 2001–2002

- To produce a framework for the knowledge society foresight project (March 2002)
- To produce a handbook on foresight methodology (July 2002)
- To launch the project at European level (November 2002)
- To organise a knowledge society foresight conference (November 2002)

Phase 2 2002–2003

- To produce advancement indicators of the knowledge society (2002)
- To set up national temporary foresight points in three pilot countries based on the advance indicators (2002)
- To produce national knowledge society foresights concerning the drivers and impacts of the knowledge society for three countries as a pilot project (2002–2003)
- To produce a synthesised report on the European knowledge society foresight for living conditions, working conditions and industrial relations (2003)

Phase 3 2004

- To disseminate the results by organising national and EU level conferences for social partners and state representatives
- To implement foresight thinking and debate into the Foundation's research policy

Participants

Participants in the foresight process are the representatives of the national employers' organisations, trade unions, the governments, and NGOs. These organisations represent 'local knowledge' on living conditions, working conditions and industrial relations. Researchers represent 'expert knowledge' based on international comparisons and benchmarking. Local and expert knowledge meet in the national foresight points. The foresight processes in the three selected countries are composed of about 40 experts. Three pilot countries represent well-advanced, medium-advanced and less-advanced knowledge society countries. The members of the temporary national foresight centres in these countries are depicted in the following overview.

Finland	Germany	Greece
• Union of Professional Engineers: Aila Tähtitanner • AKAVA – Confederation of Unions for Academic Professionals: Ulla Aitta • AKAVA – Confederation of Unions for Academic Professionals: Leila Rautjärvi • SAK – Central Organisation of Finnish Trade Unions: Jyrki Hélin • KTV – Trade Union for the Municipal Sector: Marja-Riitta Vehviläinen • Employers' Confederation of Service Industries: Nina Pärssinen • TT – Confederation of Finnish Industry and Employers: Katja Leppänen • TT – Confederation of Finnish Industry and Employers: Marita Aho • Ministry of Education: Olli Poropudas • Ministry of Labour: Tuomo Alasoini • Ministry of Labour: Juha Antila • SITRA, Government Economic Research Institute (VATT): Osmo Kuusi	• BMWA – Federal Ministry of Economics and Work: Thomas de Graat • BMWi – Federal Ministry of Economics and Work: Ralf Franke • BMBF – Federal Ministry of Education and Research: Ursula Zahn-Elliott • BMBF – Federal Ministry of Education and Research: Matthias Kölbel • National Statistics Institute: Susanne Schnorr-Bäcker • IGM – Metal Workers Union: Ulrich Klotz • DGB – German Trade Union Association: Christa Dahme • BDI – German Industry Association: Matthias Krämer • BITKOM – Federal Association of the ICT and Telecommunicaion Industry: Axel Pols • ETUC – European Trade Union Congress: Norbert Kluge • Hanns-Böckler Foundation: Lothar Kamp • Bertelsmann Foundation: Stefan Empter • IAB – Institute for labour market and occupational research: Werner Dostal • VDI/VDE IT: Daniel Bieber • Institute of world economics: Henning Klodt • Technical University Munich: Helmut Krcmar • IAT – Institute for work and technology: Matthias Knuth • Politik-digital: Clemens Lerche	• General Secretariat for Research and Technology, Information Technologies Expert: Vasilios Laopodis • Aristotle University of Thessaloniki, Faculty of Economics: Nikolaos Varsakelis • Federation of Industrialists of Northern Greece: Anastasios Alexandridis • General Associations of Greek Employees: Petros Linardos-Rulmond • National School for Public Health: Dimosthenis Agrafiotis • OCTAL, researcher: Nikolaos Koukoumas • Federation of Industrialists of Greece: K. Tortopidis • General Secretariat for Research and Technology: Dimitris Desypris • Lampraki Research Foundation, ICT and Education: Nikitas Kastis • University of Athens, Faculty of Economics, Sociologist: Alexandros Kyrtsis • Special Sociologist: Stamatis Antoniou • National School for Public Health, Public Policy: Dimitris Kioupkiolis • National School for Public Health, S&T policy: Vasilis Daglas • Atlantis Consulting S.A., Economist, HRM: Thanos Mytilinaios • University of Macedonia, Greece, Cerographist: Fivos Papadimitriou • LGOTECH, Researcher: Nikos Maroulis

Outcome

The European knowledge society foresight project will result in wide-ranging outcomes, from the development of foresight methodology to practical foresight processes, from national foresight analysis to European level analysis.

- Handbook on Foresight Methodology
  - Methodology analysis
- Advancement of the knowledge society in the EU, US and Japan
  - Knowledge society indicator analysis

- National models (‘highways’) towards the knowledge society
    - National analysis of the drivers of the knowledge society by the national foresight points
- National knowledge society foresights
    - National analysis of the impacts of the knowledge society by the national foresight points
- The European knowledge society foresight for living conditions, working conditions and industrial relations
    - Consolidated report

So far, a series of European knowledge society foresight workshops, meetings and conferences have taken place:

- Impacts of knowledge society on living and working conditions and industrial relations workshop, 13-14 July 2000, Dublin
- The knowledge society and European foresight workshop, 12-13 December, 2001, Dublin
- European knowledge society foresight - Towards a framework of the project and a handbook on foresight methodology workshop, 6-7 March 2002, Dublin
- European knowledge society foresight - Towards the handbook on foresight methodology and towards the national knowledge society foresights workshop, 27-28 May 2002, Dublin
- Advisory committee meeting on European knowledge society foresight. Evaluation of the handbook on foresight methodology and phase two opening meeting, 27 September 2002, Dublin
- European knowledge society foresight - the missing link between technology foresight and the Lisbon objective. The European knowledge society foresight conference, 21-22 November 2003, Brussels.

Knowledge society indicators 3

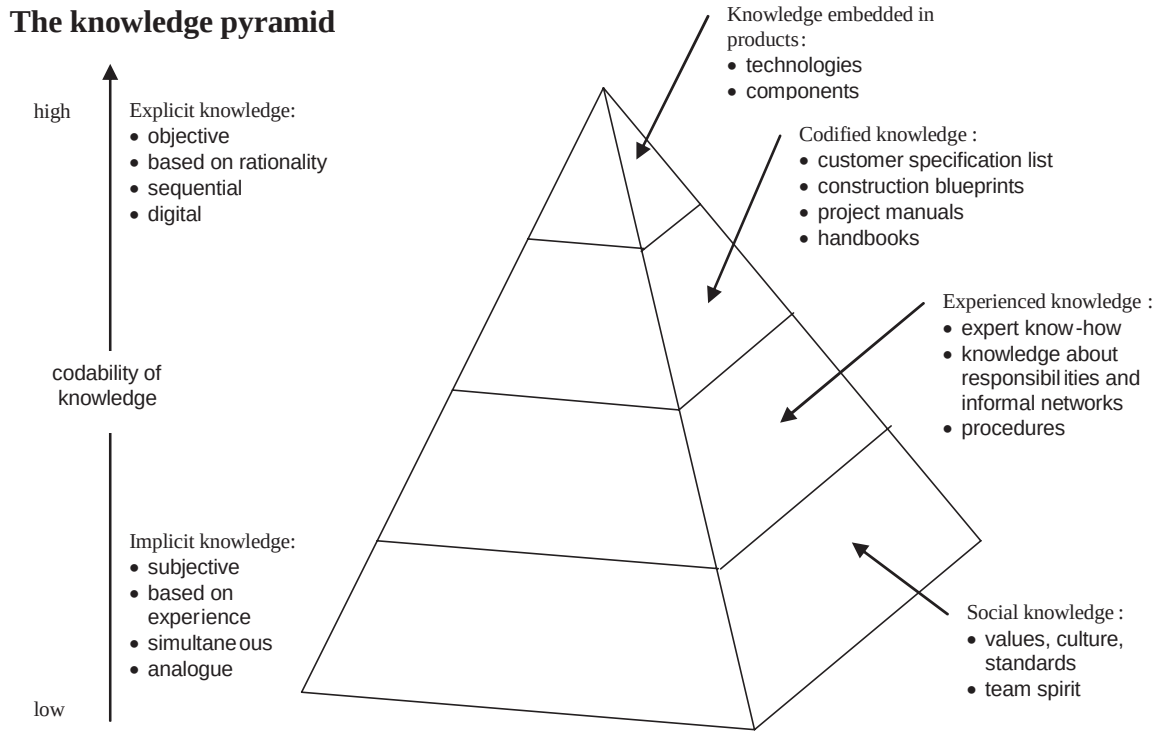
Framework for indicator and data identification and selection

A basic model of the knowledge society

Research on the nature of the knowledge society has grown more popular in recent years. Many models have been developed to explain why and how it works. One of the key elements in this research is the question about what kind of knowledge can be coded (e.g. put into words or numbers) and what can not. Essentially, there are two kinds of knowledge, used for different purposes and in different ways:

- Codified knowledge that is, for example, embodied in a technology, such as in hardware and software or in handbooks and construction blueprints. It tends to be explicit and is suitable for mediation through such media as the Internet or television.
- Tacit knowledge that is embodied in people as individuals and in their organisations, peer groups and networks rather than in a technology. It tends to be implicit and non-codable which means that it cannot be put into words. This kind of knowledge can only be moved around to the extent that people as individuals, organisations or groups can be moved around and is thus not very suitable for mediation.

The Retine project (2001) represented the distinction between codified and tacit knowledge in the so-called knowledge pyramid. This also emphasises that the two complement rather than substitute one another. Indeed, they tend to co-evolve: the process of codification generating new tacit knowledge, in a type of virtual circle from an implicit to an explicit and back to an implicit knowledge dimension.



Source: *Retine (2001), p. 13, adapted from Grassmann (1977), p. 152*

This knowledge pyramid also shows that codified and tacit knowledge must not be seen as separate entities. They are rather the outermost points of a continuum allowing for a dynamic shift between the two types. As a result, every kind

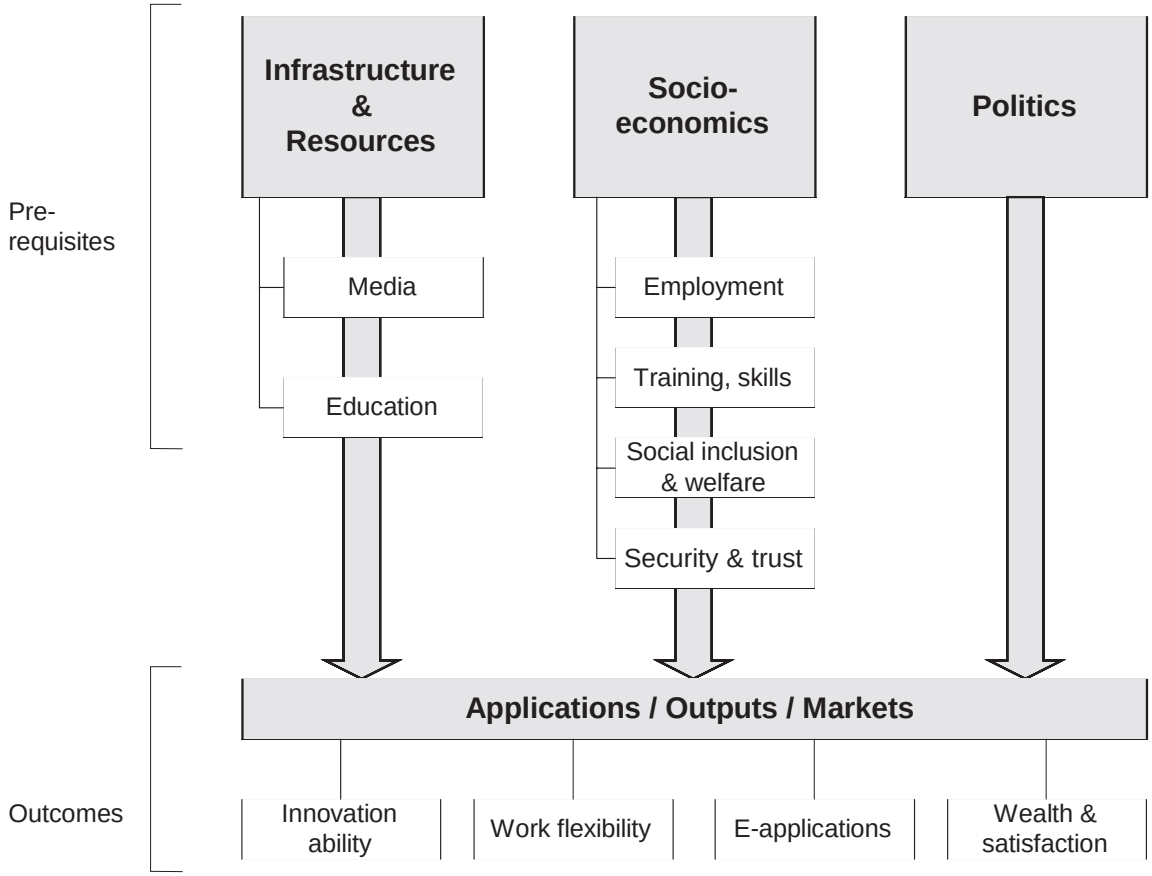
of knowledge has at least a share of codability. Regarding the data available for measuring the knowledge society and its advancement, this characteristic is most important.

A model that is to cover the knowledge society must contain indicators on both kinds of knowledge. Data on explicit knowledge (such as media usage or training participation) do not cause any problems as they are easily available and usually cover wide ranges of space as well as of time. It is, however, the nature of tacit knowledge that renders it hard to fathom and equally hard to measure. Accordingly, data on it are difficult to find in today's official statistics. As a consequence, the challenging task is to identify indicators which can be used for the measurement of tacit knowledge.

Indicator framework

A number of statistics and data for the measurement of the information society or knowledge society exist. Some of this material also lends itself to forecasting developments since it exists as time series data covering different periods of time with national appropriate data. However, not all of this information is suitable or of sufficient quality. This therefore requires: a) careful selection of indicators and b) sorting of the relevant data. Such a task is ideally guided by the use of an appropriate knowledge society indicator framework. The present report suggests the following structure for data use and presentation.

Firstly, all indicators deemed appropriate and which are selected for the project are sorted by whether they measure a prerequisite for the advancement of the knowledge society or whether they measure the outcomes of a knowledge society already in existence. Within this rather rough sorting, a finer differentiation has of course to be made. This is presented in the figure below.



Accordingly, the prerequisites are divided into:

- infrastructure and resources, containing data on media penetration and education;
- socio-economics, containing data on individual requirements such as employment, training and skills, and relevant issues such as social inclusion and security;
- politics, containing data on governmental involvement in the development of the knowledge society.

The outcomes are divided into:

- innovation ability, measuring patent applications and research and development expenditures;
- work flexibility, containing data on flexible working arrangements such as telework;
- e-applications, such as e-commerce and e-health, containing data on usage and usage barriers, as well as digital literacy;
- wealth and satisfaction, containing data on economic wealth and individual attitude towards work.

A detailed list of all indicators contained in the framework is given in the following section.

Secondly, a further structure is used within all indicators on media and its usage, dividing them into ICT-related indicators and traditional indicators. This is due to the fact that ICT, although widespread, covers only a part of the media landscape and is still not available to all citizens and companies. There are also still considerable differences in the content provided, for example, by Internet and television.

The indicator framework described here provides the necessary structure for the selection of data presented in the following section. It was designed to cover the different aspects of the knowledge society as completely as possible in light of the difficulties already described. At the same time, it can be easily expanded to include any new indicator or aspect when the need arises.

Knowledge society indicators and data

List of indicators

This section provides a list of the indicators used within the above framework. For each indicator, the name together with the source of the associated data is set out.

Indicator name	Description	Source
Infrastructure and resources		
Media		
Mobile phone subscribers	Users of portable telephones subscribing to an automatic public mobile telephone service which provides access to the public switched telephone network (PSTN) using cellular technology (per 100 inhabitants)	**Eurostat 2002**
Internet users	Persons using the Internet (per 100 inhabitants)	**Eurostat 2002 / United Nations Statistics Division**
Internet hosts	Computers that are directly connected to the Internet with their own IP address and full two-way access to other nodes on the network (per 100 inhabitants)	**Eurostat 2002**

Indicator name	Description	Source
Infrastructure and resources		
Media		
Personal computers	Includes portables, desktops and personal workstations (per 100 inhabitants)	**Eurostat 2002 / United Nations Statistics Division**
Daily newspapers	A newspaper thus defined and issued at least four times a week is considered to be a daily newspaper (per 1,000 inhabitants)	**UNESCO Institute for Statistics 1995**
Television receivers	All types of receivers for television broadcasts to the general public, including those connected to a cable distribution system; private sets installed in public places are also included as well as communal receivers (per 1,000 inhabitants)	**UNESCO Institute for Statistics 1995**
Radio receivers	All types of receivers for radio broadcasts to the general public, including those connected to a cable distribution system; private sets installed in public places are also included as well as communal receivers (per 1,000 inhabitants)	**UNESCO Institute for Statistics 1995**
Email users	Internet users who are sending and receiving emails for work or for private purposes (as % of total population)	**SIBIS 2002**
Email use and networking	Internet users who are sending and receiving emails and whose friends also have an email address (as % of total population)	**SIBIS 2002**
Broadband Internet access	Number of DSL (Digital Subscriber Lines), cable modem lines, fixed wireless broadband, direct satellite broadband and various forms of 'fibre to the residence' (per 100 inhabitants)	**OECD 2001**
Internet access drop-outs	Internet users who have decided to disconnect from the Internet (as % of total population)	**SIBIS 2002**
Education		
Pupil / teacher ratio (pre-primary, primary, secondary)	Average number of pupils (students) per teacher at a specific level of education in a given school year. Teachers are defined as persons whose professional activity involves the transmitting of knowledge, attitudes and skills that are stipulated in a formal curriculum programme to students enrolled in a formal educational institution	**UNESCO Institute for Statistics 2000**
Number of teaching hours per year in public institutions, by level of education	Net contact time in hours over the school year in public institutions, by level of education	**OECD 2000**
Everyday computer availability at home	Mean percentage of 15-year-olds who reported that computers are available to use at home every day	**OECD 2000**
Everyday computer availability at school	Mean percentage of 15-year-olds who reported that computers are available to use at school every day	**OECD 2000**
Everyday computer usage at home	Mean percentage of 15-year-olds who reported using computers at home every day	**OECD 2000**
Everyday computer usage at school	Mean percentage of 15-year-olds who reported using computers at school every day	**OECD 2000**
General computer availability in schools	Percentage of computers in schools available to 15-year-olds, as reported by school principals, weighted by student enrolment	**OECD 2000**
Computers connected to the Internet	Percentage of computers connected to the Internet in schools, as reported by school principals, weighted by student enrolment	**OECD 2000**

Indicator name	Description	Source
Socio-economics		
Employment		
Standardised overall unemployment rate	Given as ratio of all employees	**Eurostat 2002**
Unemployment rates by level of educational attainment of 25 to 64-year-olds (below upper secondary education)	Upper secondary education is provided at high schools, teacher-training schools at this level, and schools of vocational or technical nature. Secondary education consists of ISCED level three, which students generally begin between 13 and 15 years and finish between 17 and 18 years	**OECD 2000**
Unemployment rates by level of educational attainment of 25 to 64-year-olds (upper secondary and post-secondary non-tertiary education)	The students of post-secondary non-tertiary education are typically older than those in upper secondary programmes	**OECD 2000**
Unemployment rates by level of educational attainment of 25 to 64-year-olds (tertiary type B education)	Tertiary education is provided at universities, teacher-training colleges, higher professional schools and sometimes distance-learning institutions	**OECD 2000**
Unemployment rates by level of educational attainment of 25 to 64-year-olds (tertiary type A and advanced research programmes)	This level is reserved for tertiary programmes which lead to the award of an advanced research qualification. The programmes are therefore devoted to advanced study and original research and are not based on course-work only	**OECD 2000**
Training and skills		
Employees' participation in company-provided courses	Overall participation in all kinds of company-provided training courses as % of total employees	**Continuing vocational training survey (CVTS) 2000**
Training enterprises	Share of enterprises offering training to employees as % of all enterprises	**CVTS 2000**
Enterprises evaluating the effect of CVT courses	Enterprises measuring the outcomes of training by all types of methods as % of all enterprises providing CVT courses	**CVTS 2000**
Employees practising e-learning	Employees using electronic learning materials (online and offline) for training and learning as % of all employees	**SIBIS 2002**
Employees participating in self-directed learning	Employees engaging independently in any kind of training not provided by others as % of total labour force	**SIBIS 2002**
COQS-index of perceived digital literacy	Compound indicator on ICT-related skills (further details given below)	**SIBIS 2002**
Social inclusion		
GINI-index on income disparity	In the GINI index, the value 1 means absolute inequality, in which one person gets everything and all others nothing, and the value 0 means absolute equality, in which everyone gets exactly the same	**NewCronos ILC 1998**
DIDIX: Digital divide index	Compound indicator on digital divide regarding several risk groups (further details given below)	**Empirica 2002**
Security		
Effects of security concerns on e-commerce	Security concerns such as loss, abuse and manipulation of personal data preventing e-commerce use as % of Internet users	**SIBIS 2002**
Politics		
Governmental expenditure on R&D	Given as % of GDP	**OECD 2001**

Indicator name	Description	Source
Applications, outputs, markets		
Innovation ability		
Patent applications	Number of patents handed in at the European Patent Office (EPO) per million workers	**Eurostat 2002**
Expenditure on R&D	Company-internal spending on R&D in all sectors as % of GDP	**Eurostat 2002**
Labour productivity	Value added per person employed, 1980–2000 growth rate	**ILO KILM 2001-2002**
Employees in third sector	Given as ratio of all employees in all sectors	**Eurostat 2002**
Work flexibility		
AWAI: Adaptability of work arrangements index	Compound indicator on company- and worker-centred work flexibility (further details given below)	**Empirica 2002**
Spread of telework (all types) from 1999 to 2002	Telework usage spread rate including all types of TW (home-based TW, mobile TW, self-employed in SOHO)	**SIBIS 2002**
Workers practising tele-cooperation	Tele-cooperation is defined as communication with external contacts through electronic media (such as email, video conference, electronic data transfer). Given as % of all employees	**SIBIS 2002**
E-applications		
E-commerce use	Users having privately used the Internet to order a product/service or to conduct online banking or to buy a financial product as % of all Internet users	**SIBIS 2002**
E-health: search for health related information on the Internet	Users who searched for any kind of health related information on the Internet as % of Internet users	**SIBIS 2002**
E-health: necessity of foreign language abilities for e-health information search	Users who had to rely additionally or solely on websites in other languages than their mother tongue in search for health related information as % of all Internet users	**SIBIS 2002**
Wealth and satisfaction		
Gross domestic product (GDP)	Given as GDP per capita in market prices (PPP per head)	**Eurostat 2002**
Perceived job satisfaction	Employees reporting to be satisfied with their job as % of all employees	**SIBIS 2002**
Perceived job security	Employees reporting to have no concerns about their job security as % of all employees	**SIBIS 2002**

Description of indices (compound indicators)

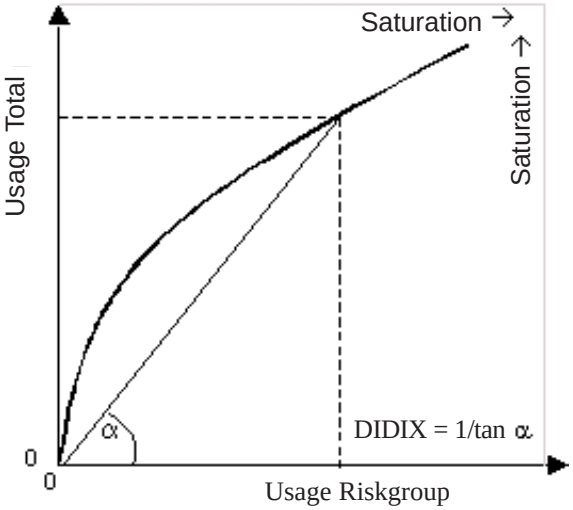
In the main analysis, the indices DIDIX, AWAI and COQS are used. Here, more information is provided about the purpose and the exact composition of these indices.

Digital divide index (DIDIX)

As a means of quickly comparing digital divide symptoms in EU Member States, a digital divide index (DIDIX) was constructed. This index combines the divides by gender, age, education and income in relation to computer use, Internet users and Internet use at home. It measures the relative adoption of ICT by potentially deprived societal groups – relative as compared to the population as a whole[1].

[1] To understand fully the dynamics of change in digital divides in Europe, it is necessary to consider the relative stages of evolution of the information society in the different Member States. Further discussion of these issues can be found in Selhofer and Huesing, 2002.

DIDIX - Curve of relative adoption



The digital divide index (DIDIX) in its most recent form makes SIBIS data comparable to early Eurobarometer surveys. It compares the ICT uptake of four so-called risk groups with the population average. Risk groups are potentially deprived social groups. To permit comparisons between the different surveys, the following groups were chosen:

Independent variable	Definition of the disadvantaged group ('risk group')	Percentage of population in EU (2000)
Gender	women	~ 52%
Age	people aged 50 years or older	~ 40%
Education	low education group (people who finished formal school education at an age of 15 years or below)	~ 30%
Income	low income group (the lowest quartile of the survey respondents)	~ 25%

ICT adoption was measured by using a weighted average of three indicators in order to smooth data to allow for potential outliers and to cover both computer and Internet uptake. The following variables were chosen:

Indicator	Definition / source	Weight [2]
Percentage of computer users	Data for 1997 and 2000 based on Eurobarometer question: 'Do you use a computer at [different locations given for selection]?' Computer users are defined as those who use a computer at least at one of the given locations, e.g. 'at work', 'at home', 'at university'. Data for 2002 based results of the SIBIS General Population Survey (comparable question)	50%
Percentage of Internet users	Data for 1997 and 2000 based on Eurobarometer question: 'Do you use email and/or the Internet at [different locations given for selection]?' Internet users are defined as those who use a computer at least at one of the given locations, e.g. 'at work', 'at home'. Data for 2002 based results of the SIBIS General Population Survey (comparable question)	30%
Percentage of Internet users at home	Data for 1997 and 2000 based on Eurobarometer question: 'Do you use email and/or the Internet at home?'. Data for 2002 based on same question from SIBIS General Population Survey	20%

[2] Each indicator was given a weight to calculate the compound index. The selection of weights is necessarily arbitrary. The rationale was to emphasise the usage of technologies (by increasing the weight from a default average of .25 to .30), but to include home usage indicators, because access at home will probably become more important as more and more everyday life transactions are performed online. A comparison of unweighted index values to the weighted index shows, however, that the difference is minimal and general trends are not affected.

Adaptability of work arrangements index (AWAI)

The Adaptability of work arrangements index consists of two elements: one sub-index measuring worker-centred flexibility and another measuring company-centred flexibility. The changes affecting work organisation can be conceptualised by looking at its four basic dimensions: working time, working place(s), type of contract, and work content (applied skills).

For each of these dimensions, a number of key indicators were identified. The selection of component indicators was not derived using statistical methods, but through consensus-building, involving experts and policymakers at EU and national level. The table below shows the selection of indicators for both sub-indices:

Indicators for measuring adaptability of work arrangements (AWAI)

Dimension	Indicator (source) [3]	
	Worker-centred flexibility	***Company-centred flexibility***
Time	Voluntary part-time working (LFS)	Part-time working (LFS)
Time	Temporal autonomy in job (SIBIS)	Workers with atypical working times (evening, night, weekend work and working long hours) (ESWC)
Place	Home-based teleworking (excluding self-employed) (SIBIS)	Tele-cooperation (SIBIS)
Place	Telework feasibility (SIBIS)	Mobile teleworking (SIBIS)
Contract	Self-reported job security (SIBIS)	Employment Protection Legislation Indicator (OECD)
Contract	Average job tenure (OECD/LFS)	Workers with temporary work contracts (excluding voluntary and contracts for training) (LFS)
Content	Participating in work-related training (lifelong learning) (SIBIS)	Enterprises offering training (CVTS)
Content	Participation in decision-making concerning changes at workplace (ESWC)	Management by objectives (ESWC)

COQS index of digital literacy

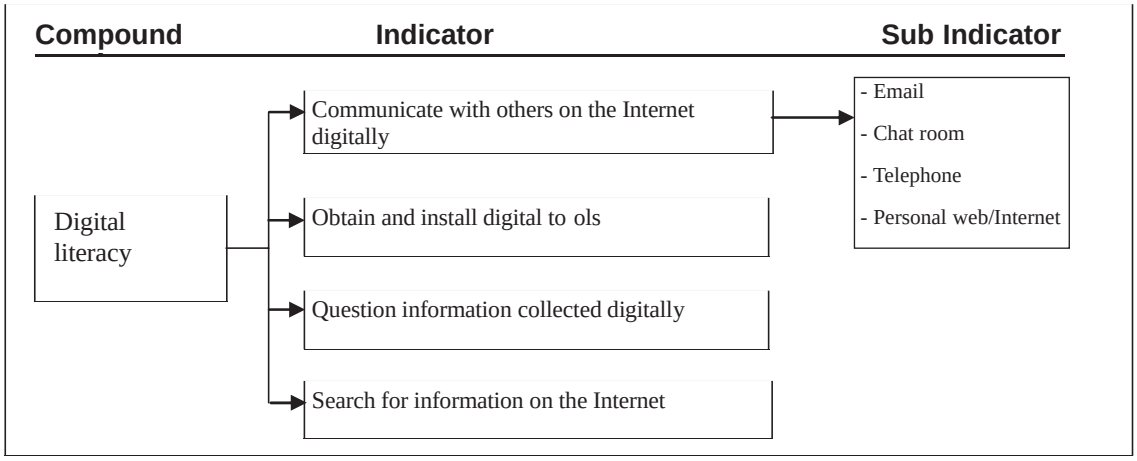
In the knowledge society, where increasingly information and communication with individuals and institutions is digital, the ability to operate in a responsible and critical way on the Internet is essential for taking part in the societal processes of living, working and learning. To be digitally literate is here indicated by the ability to use the Internet for:

- communicating with others, including the ability to use email and chat rooms as well as to create a personal web page;
- obtaining (or downloading) and installing software on a computer, covering installation of new software as well as of supplemental packages to existing programmes (updates, bug fixes, etc);
- questioning information on the Internet, measured as confidence in identifying the source of information on the Internet;
- searching for required information or confidence in using a search engine to find information.

The COQS index is based on weighing the four indicators of digital literacy. The four indicators are seen as parts of a totality and therefore weighted equally against each other (i.e. 25% each).

[3] LFS = Community Labour Force Survey (annually); ESWC = European Survey on Working Conditions (1990; 1995; 2000); CVTS = Continuing Vocational Training Survey (2000)

COQS index of digital literacy



For calculation of the indicator value, scores are assigned to the different response options. For example, for 'Obtain and install digital tools', very confident = 3 points, fairly confident = 1 point, not confident, don't understand the question = 0 points. The national index of digital literacy (COQS) is measured as the average of the four indicators, weighted equally against each other.

Data analysis - highlights and national performances

The aim of the indicator analysis is to give an insight into the development of the knowledge society in Europe. The main focus is on a comparison of the researched EU countries (EU 15 and 10[4] of the ACC): with each other as well as with the US and Japan. This is done by presenting the indicators in the form of a benchmark, where appropriate. The best performer on a certain indicator gains 100 benchmarking points and all other countries are calculated relatively to this. The benchmark is not based on a single indicator but on groups of indicators with a contextual connection, e.g. Internet access, PC ownership, number of Internet hosts and mobile phone subscribers are presented together as they are all ICT and Internet access related indicators. These indicator groups are displayed as a so-called spider-diagram that allows for an easy judgement of the benchmark achievements of a country in terms of the area covered. To prevent this report from becoming too complex, only three graphics are given for each benchmark: representing the best, average and lowest performers.

Additionally, in most cases, or whenever a benchmark was not appropriate, the absolute values of the indicator are given in traditional bar- or column-charts.

With each set of indicators there is a short description as well as an interpretation of the results in terms of knowledge society advancement.

[4] The 10 acceding and candidate countries included in the study are: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Cyprus, Malta and Turkey were not included.

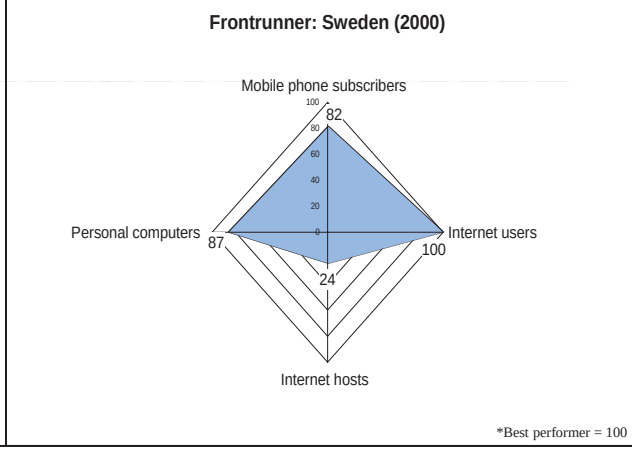
Infrastructure and resources

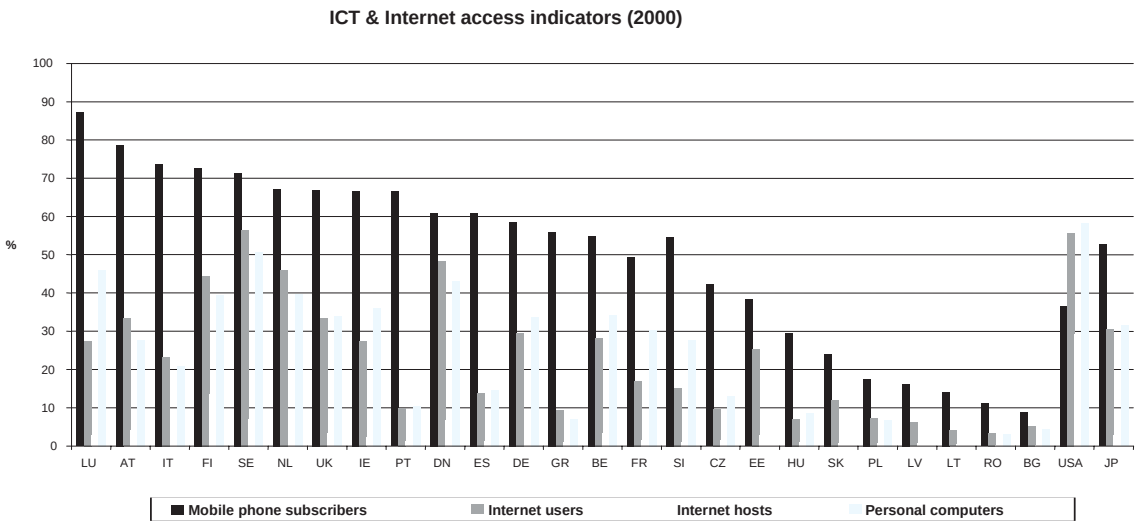
Particularly under this heading, the division between ICT-related and traditional indicators becomes very clear. There will be a distinction between ICT media, e.g. access to computer or Internet and its usage patterns on the one hand, and traditional media, e.g. television penetration, on the other. In the educational sector, the traditional pupil-teacher ratio is found to be in contrast with 'new' ICT education indicators such as computer availability in schools. From these insights, a good overview of the basic infrastructure prerequisites for a knowledge society can be given.

Media

ICT and Internet access

Under the heading of 'ICT availability in households and Internet access', indicators provide information on enablers for the participation of individuals in the information society, including access to the increasing number of related online services in a variety of areas of importance for daily life, well-being, etc. It can be assumed that these ICT-based tools will become even more important for the vast majority of individuals for the fulfillment of many tasks and needs in the future and therefore key tools for life in the knowledge society.





There are huge variations in the penetration and use of these tools across countries, and a distinction needs to be drawn between 'Internet' and 'mobile phone' societies. Specific countries have high penetration rates relating to Internet access and mobile phone use (e.g. Denmark, Finland, the Netherlands, Sweden), whereas in other (mostly southern European) countries, there are very high mobile phone usage but very low Internet access figures, making these countries (e.g. Italy, Spain, Greece, Portugal and also Slovenia) typical 'mobile phone' societies.

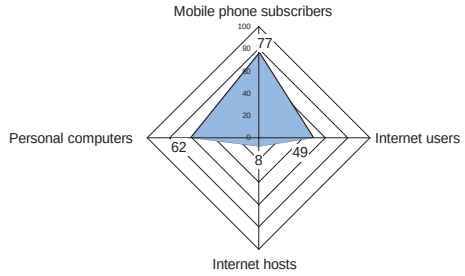
The US stands out with a very high Internet penetration rate but a rather moderate mobile phone use.

Japan ranks slightly lower than Germany, a country with a rather average performance in the EU 15.

The acceding countries surveyed, except Slovenia, lag behind the EU Member States with the poorest performance on these indicators.

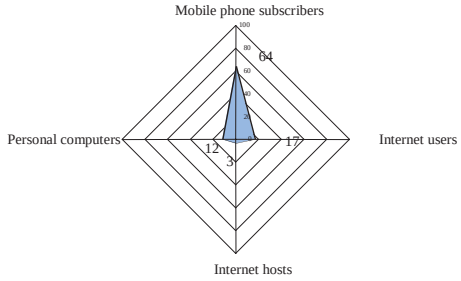
'Internet hosts' was used as an indicator for country and language-specific content provision. It does not come as a surprise that the US is leading the field. Interestingly, the European Internet frontrunners still exceed the figures for Internet hosts in the UK.

Average Performer : Ireland (2000)



*Best performer = 100

Lowest: Greece (2000)



*Best performer = 100

While mobile phone societies like Italy and Spain have to catch up in computer and Internet-related ICT, the countries Denmark, Finland, the Netherlands and Sweden provide the best overall ICT access and use prerequisites which are of high relevance for working and participation in the knowledge society.

Indicators used and sources

Mobile phone subscribers: Users of portable telephones subscribing to an automatic public mobile telephone service which provides access to the public switched telephone network (PSTN) using cellular technology (per 100 inhabitants). Eurostat 2002

Internet users: Persons using the Internet (per 100 inhabitants), Eurostat 2002 / United Nations Statistics Division

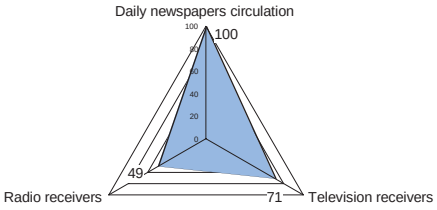
Internet hosts: Computers that are directly connected to the Internet with their own IP address and full two-way access to other nodes on the network (per 100 inhabitants). Eurostat 2002

Note: Data in spider-diagrams are given as standardised benchmarks with the best performing country receiving 100 points.

Traditional media

The chosen indicators 'daily newspaper circulation', 'radio receivers' and 'television receivers' still reflect the most common 'traditional' media used in different life spheres and for different purposes (e.g. for access to news, movies, lifestyle, fashion, music etc). In comparison with new media (e.g. Internet, mobile phones), traditional media is available to almost the whole population of the western world since skill requirements and financial restrictions are lower, while the level of familiarity is extraordinarily high due to an experienced use over decades.

Frontrunner : Denmark (1995)



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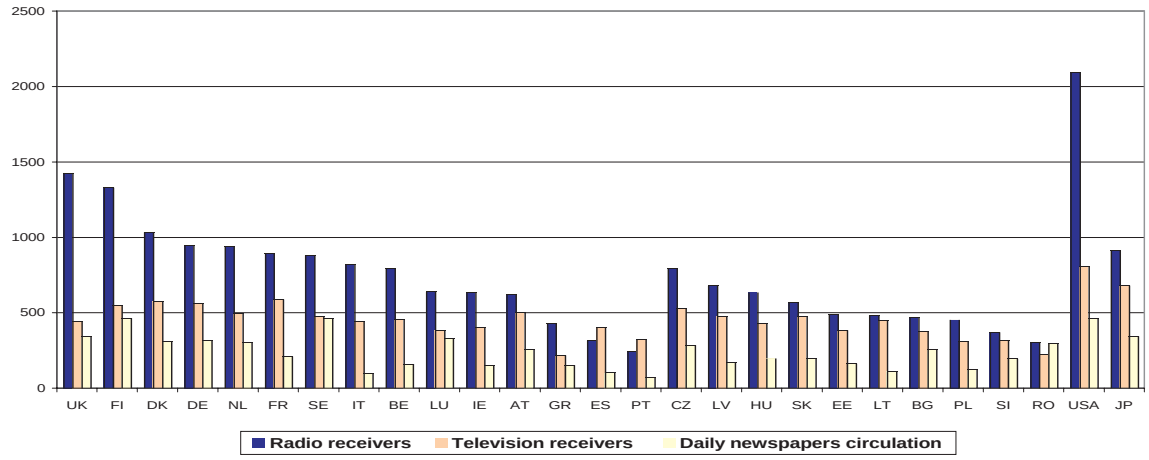
Best performer = 100

Radio and television receivers, daily newspapers per 1000 inhabitants (1995)

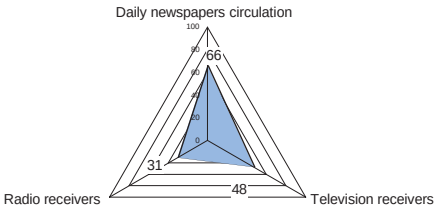


In most countries, radio is the most diffused traditional media, followed by television and newspapers, except for Spain and Portugal where the television enjoys the highest popularity.

Analysing the general development since 1990, newspaper circulation has slightly decreased whereas radio and television dispersion has increased in almost every country.

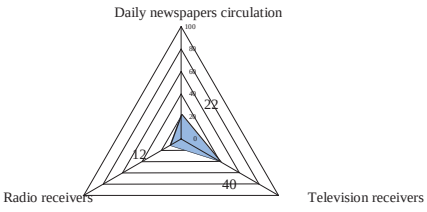
The world's best infrastructure of traditional media can be found in the US with more than two radios and almost one television per inhabitant. The European frontrunners, following the US at some distance are Finland, Sweden, the UK and Denmark. Looking at the lowest numbers, coverage in Portugal, Greece and Spain is even lower than those of the acceding countries surveyed, which reach the EU average in most of the categories. The Czech Republic stands out, with levels of traditional media penetration comparable to France, Germany and Luxembourg. Japan reaches upper EU standards, mainly due to its high television rate.

Average Performer : Luxembourg (1995)



*Best performer = 100

Lowest:Portugal (1995)



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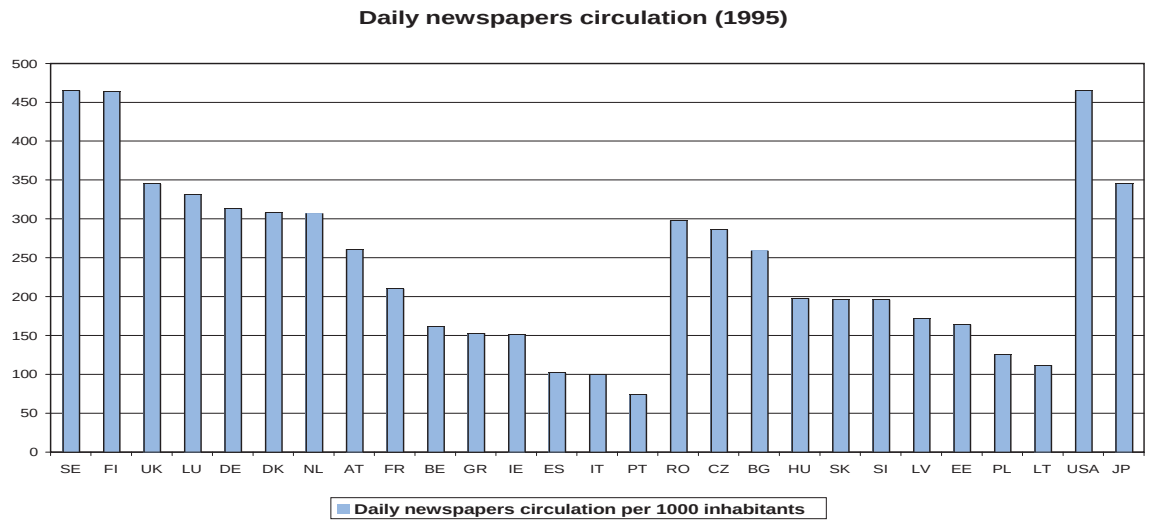
Best performer = 100

Concerning newspaper circulation, the EU candidate countries Romania and Bulgaria equal countries like Germany and Austria, probably primarily due to the low purchasing power for televisions or radio receivers in these countries.



All in all, European countries like Finland, Sweden and the UK have the highest penetration rates of traditional media and therefore a population with good access to information and knowledge. But the quality aspect of traditional media must not be forgotten, i.e. accurate enquiry and an unbiased presentation style must be maintained. Indeed, there are huge differences in the types of shows, reports and articles on offer both at national and European level. To guarantee at least some non-manipulated information, independent media organisations should be sustained under public law.

Indicators used and sources

Daily newspapers circulation: A newspaper thus defined and issued at least four times a week is considered to be a daily newspaper (per 1,000 inhabitants). UNESCO Institute for Statistics 1995

Television receivers: All types of receivers for television broadcasts to the general public, including those connected to a cable distribution system; private sets installed in public places are also included as well as communal receivers (per 1,000 inhabitants). UNESCO Institute for Statistics 1995

Radio receivers: All types of receivers for radio broadcasts to the general public, including those connected to a cable distribution system; private sets installed in public places are also included as well as communal receivers (per 1,000 inhabitants). UNESCO Institute for Statistics 1995

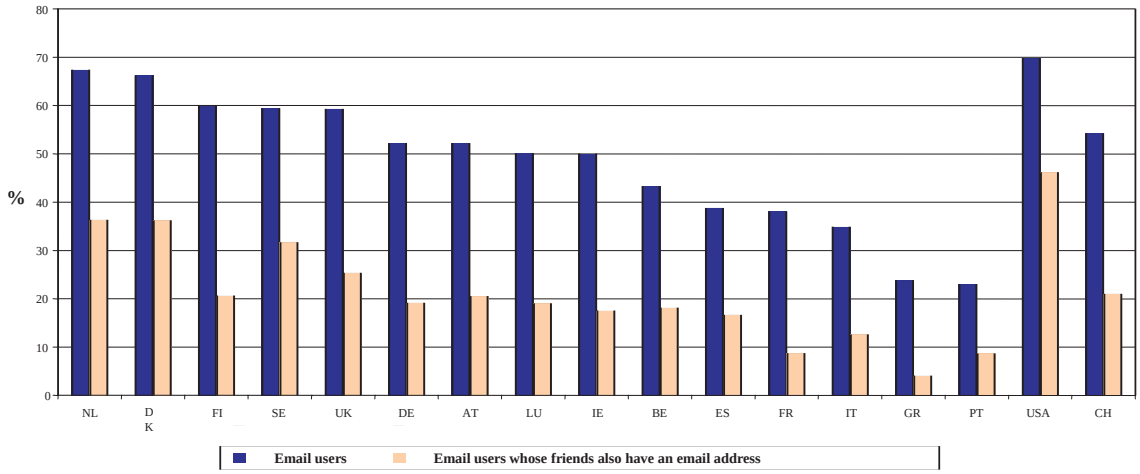
Note: Data in spider-diagrams are given as standardised benchmarks with the best performing country receiving 100 points.

Patterns of ICT usage

Networking forms an essential part of the knowledge society, supporting group work and communication processes and thereby leading to further productivity and work quality improvements. Social networks are enhanced through ICT-based communication, and new networks are established.

Email has revolutionised the communication world and networking since it provides the fastest way to transmit large amounts of data. The number of 'email users whose friends also have an email address' indicates the penetration email already has as a communication medium among and between friends and business partners, increasingly substituting for telephony or postal letters. European frontrunners like the Netherlands and Denmark are almost at US levels of penetration, but in most other, particularly southern, European countries, this medium is not yet as widespread as in the US.

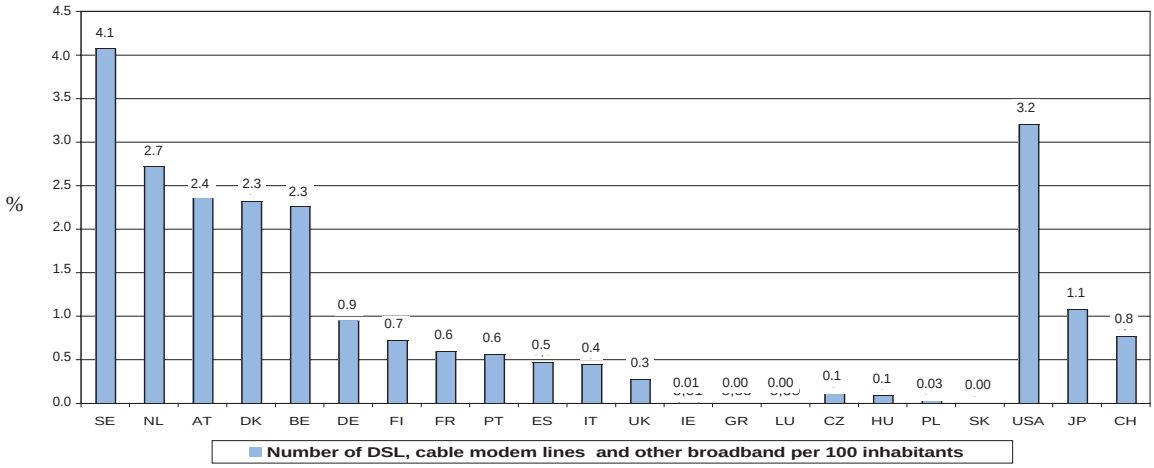
Email usage and networking (2002)



DSL, cable modem and other broadband lines are the most advanced and fastest but also the most expensive Internet access technologies, overtaking analogue and ISDN lines. Improved high-speed access to online data speeds up networking and therefore becomes necessary in a competitive working environment. Broadband connections in private households are also used for online games as well as music and video downloading. However, the more office work moves into the homes of employees as telework, the higher the work-related usage purposes will become.

Sweden, the US and the Netherlands rank highest with respect to broadband connectivity, while surprisingly in Luxembourg and also in Ireland and the UK hardly any broadband connection lines can be found. The latter is also the case in the ACC surveyed.

Broadband access (2001)

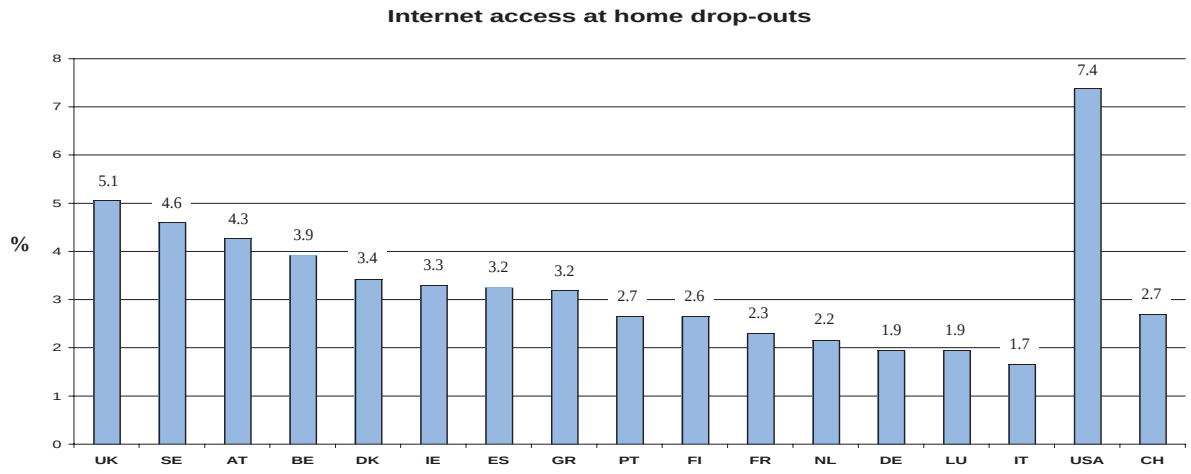


Email is already common in Europe, although fast internet access technology is still a novelty. The development of both will continue to spread in working environments and further enhance flexible working opportunities from different locations, including the home, as well as productivity and competitiveness. Countries where broadband access is offered at competitive prices will reap the benefits first.

In addition, broadband connections at home will pave the way for new entertainment and communication applications which require large and fast data transmission, such as video-conferencing, games and media-on-demand services.

An increasing number of Internet users have started to review critically the need for private Internet access and the costs involved. Some have started to question its usefulness and have decided to disconnect from the Internet. In this report, these are called Internet 'drop-outs'.

At first glance, Internet drop-out rates are high in mature Internet countries like the US, UK and Sweden, which means that people, after using the Internet at home for a certain time, realise that it does not bring enough advantages to maintain an access at home. There may be several reasons for this. On the one hand, the Internet may increasingly be used at work, making a private Internet access superfluous. Additionally, cost aspects may play a role, particularly among low-income households. On the other hand, existing Internet applications and offers may not satisfy consumer needs. However, the latter aspect has not yet gained any significant importance since real Internet drop-outs (persons who have stopped using the Internet completely) remain at just about 1% in all countries.



So far, this indicator does not provide for any reliable conclusions. But it is recommended that, in the future, Internet drop-outs and the reasons for their decision should be monitored in order to identify possible problems or conflicts concerning the relation between the population and the Internet.

Indicators used and sources

Email users: Internet users who are sending and receiving emails for work or for private purposes (as % of total population). SIBIS 2002

Email use and networking: Internet users who are sending and receiving emails and whose friends also have an email address (as % of total population). SIBIS 2002

Broadband Internet access: Number of DSL (Digital Subscriber Lines), cable modem lines, fixed wireless broadband, direct satellite broadband and various forms of 'fibre to the residence' (per 100 inhabitants). OECD 2001

Internet access drop-outs: Internet users who have started to question their private Internet access and have decided to disconnect from the Internet (as % of total population). SIBIS 2002

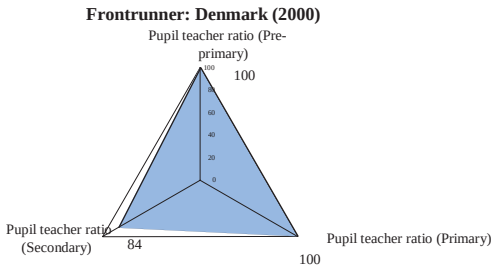
Education

Infrastructure of education

Pre-primary, primary and secondary education builds the foundation of the knowledge society, enabling pupils to learn and think while transferring the basic accepted values.

In this context, the pupil/teacher ratio indicates education quality: a low ratio stands for a better attendance and control of the pupils and thus supports better learning.

The number of teaching hours as another indicator represents the learning input of the pupils, simply providing a quantitative measurement without the possibilities of qualitative conclusions.



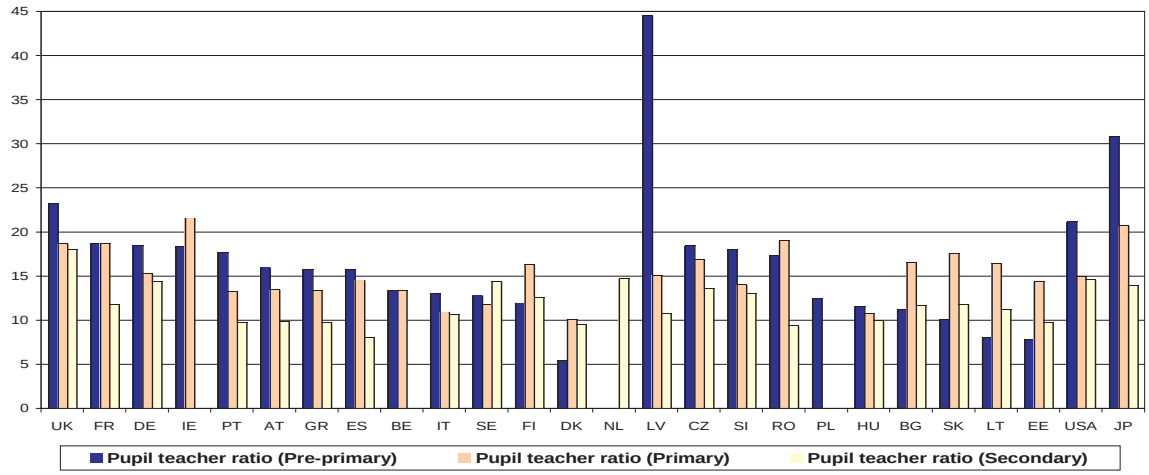
* Best performer = 100

Pupil/teacher ratio

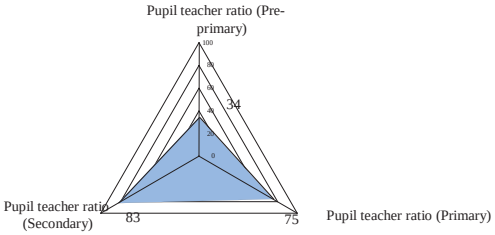
Looking at the general EU trend, it can be noticed that fewer teachers per pupil exist, the younger the pupils are. In several ACC, pupil/teacher ratios are notably higher at this level.

Denmark takes the European lead, maintaining a maximum attendance of 10 pupils per teacher, while Italy, Spain, Greece and Austria also provide a good education infrastructure with better ratios. In pre-primary and secondary schools, the United Kingdom has the highest (worst) pupil/teacher ratio within the EU. With 23 pupils per teacher, Ireland shows the worst performance in primary schools.

Pupil/teacher ratio by level of education (2000)

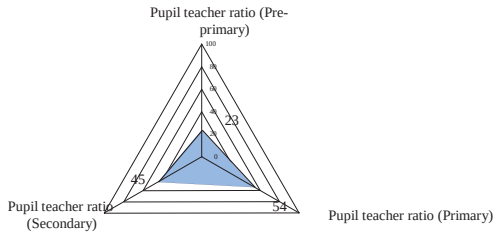


Average Performer: Greece (2000)



*Best performer = 100

Highest ratio: UK (2000)



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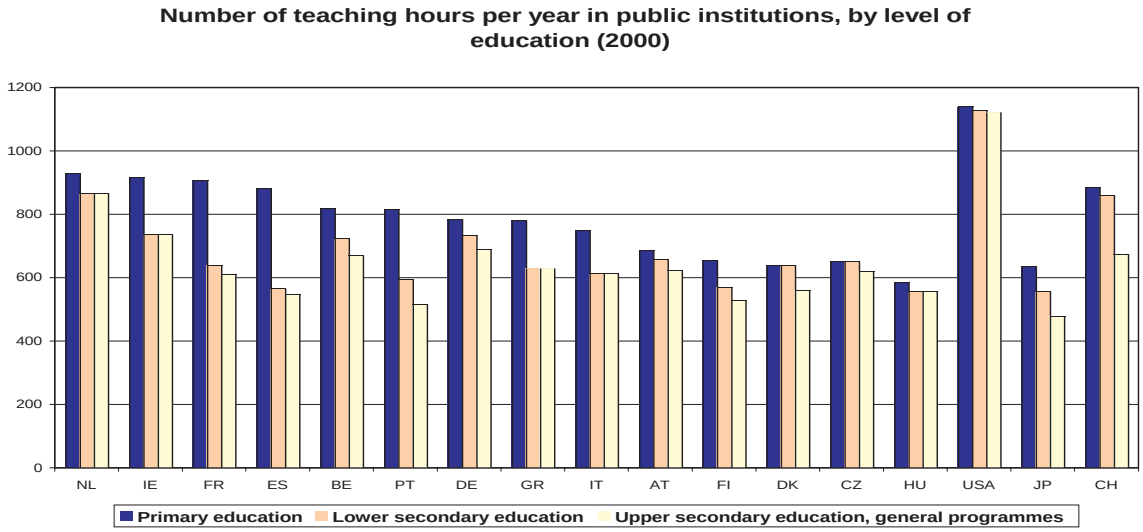
Best performer = 100

Number of teaching hours

Concerning the number of teaching hours, the US by far surpasses other countries. At the other end, Japan's education system, famous for attaining a broad middle class, is characterised by few teaching hours per year and a high pupil/teacher ratio. This shows that high effectiveness of a school system can also be supported by other means, such as, for example, a higher disciplinary standard which one would assume for Japan where discipline and effectiveness are embedded in the cultural system.

Restrictive government policies and teacher supply problems can be problematic due to the low level of attraction of the teaching profession in certain countries.

European countries have a long and costly way to go to catch up with the frontrunner Denmark. Reaching this standard has to be seen as an absolute requirement. Without a good early and middle education system, people's abilities to think, to acquire knowledge and to respect the values of society will not be sufficiently developed and will suffer in a significant way. Playing an active role in a knowledge society would become impossible.



Indicators used and sources

Pupil/teacher ratio: Average number of pupils (students) per teacher at a specific level of education in a given school-year. UNESCO Institute for Statistics 2000

Number of teaching hours: Net contact time in hours over the school year in public institutions, by level of education. OECD 2000

Note: Data in spider-diagrams are given as standardised benchmarks with the best performing country receiving 100 points.

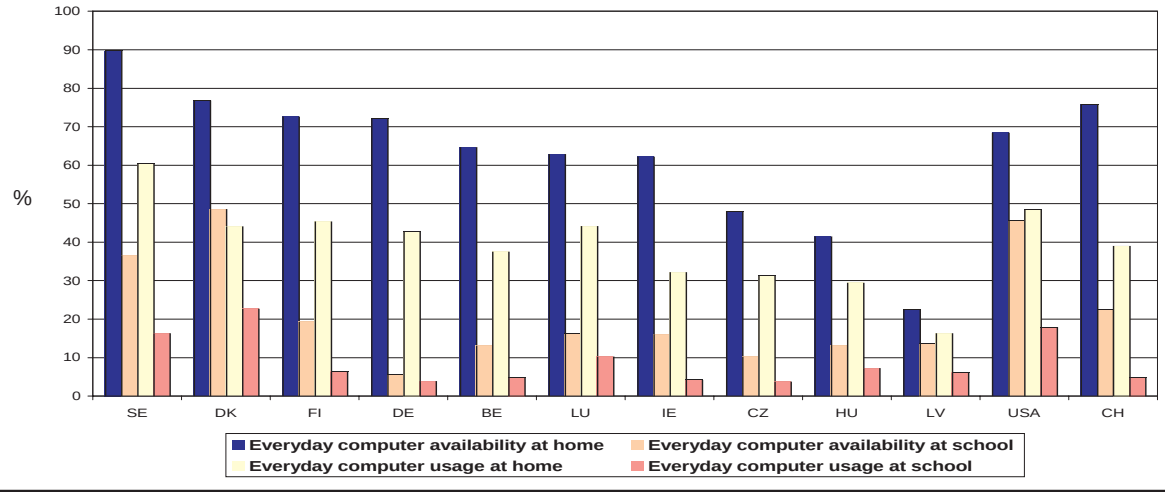
ICT education

The 15-year-olds of today constitute the future generation of young workers in 2015.

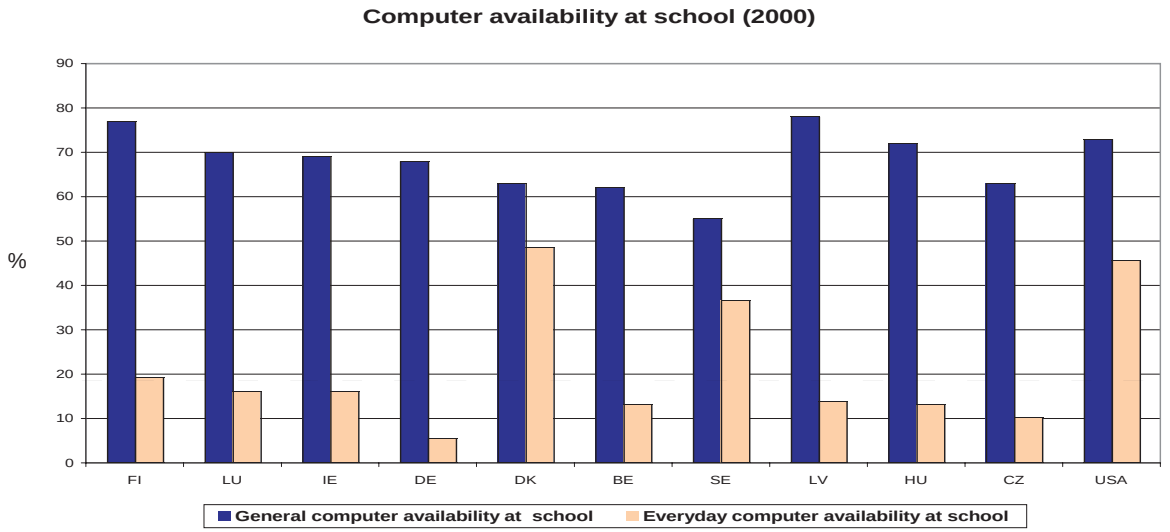
Since computer use and the Internet will become more and more indispensable in most jobs as well as in education, the necessary skills need to be learned at the earliest stage possible. Skills in this case do not only mean technical abilities (such as how to operate a PC or access the Internet) but also refer to qualitative faculties: helping the pupil, for example, to assess the quality of content on the web or to recognise media manipulation.

Widespread ICT availability in public schools also helps to avoid the development of a digital divide, allowing access to pupils who do not have and cannot afford Internet access at home.

Due to the few existing data, the following analysis can only be made for a certain range of countries.

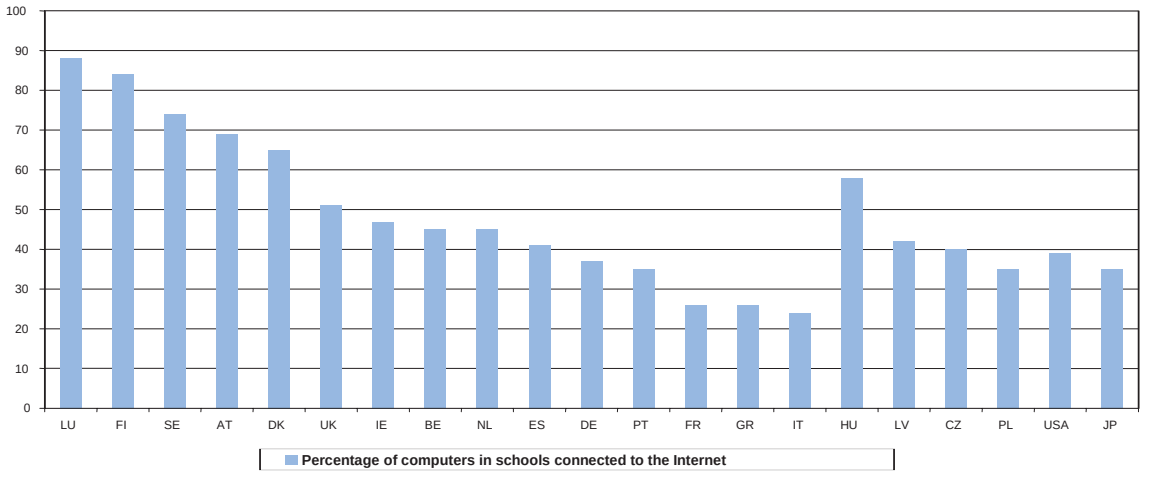


Regarding everyday ICT availability, school access is still less common than home access. Remarkably, the US, which leads in the category 'personal computers per inhabitant', lags substantially behind Sweden, the 'home availability' frontrunner, where almost every child gets computer access at home.



Another conspicuous aspect is that, in most countries, a huge gap can be found between general computer availability and everyday computer availability in schools. This gap obviously marks the difference between schools giving computer lessons in closed computer rooms compared with those also providing free access at any time or using it as a complementary element for other subjects taught. Germany is a good example of the former. Denmark, the US and Sweden have reached a higher stage of provision, with general and everyday availability approaching a closer range. The acceding countries Czech Republic, Hungary and Latvia are close to the average EU level of school ICT equipment; their home access rates remain low, however.

Germany falls behind along with Portugal, France, Greece and Italy when looking at Internet connectivity of schools, whereas in Luxembourg and Finland almost all computers in schools have web access.



On the whole, in wealthy countries like the US, Sweden and Denmark, children have the best ICT availability at home and in schools. To avoid digital divide at an early age, it appears to be necessary to make ICT available to all pupils in all countries. This means that ICT cannot only be used in school lessons but should be also freely accessible in school for other purposes during free periods. Another step would be the provision of free ICT access in public locations like youth clubs in order to compensate for the shortcomings in computer and Internet access in poorer households and countries.

Indicators used and sources

Everyday computer availability at home: Mean percentage of 15-year-olds who reported that computers are available to use at home every day. OECD 2000

Everyday computer availability at school: Mean percentage of 15-year-olds who reported that computers are available to use at school every day. OECD 2000

Everyday computer usage at home: Mean percentage of 15-year-olds who reported using computers at home every day. OECD 2000

Everyday computer usage at school: Mean percentage of 15-year-olds who reported using computers at school every day. OECD 2000

General computer availability in schools: Percentage of computers in schools available to 15-year-olds, as reported by school principals, weighted by student enrolment. OECD 2000

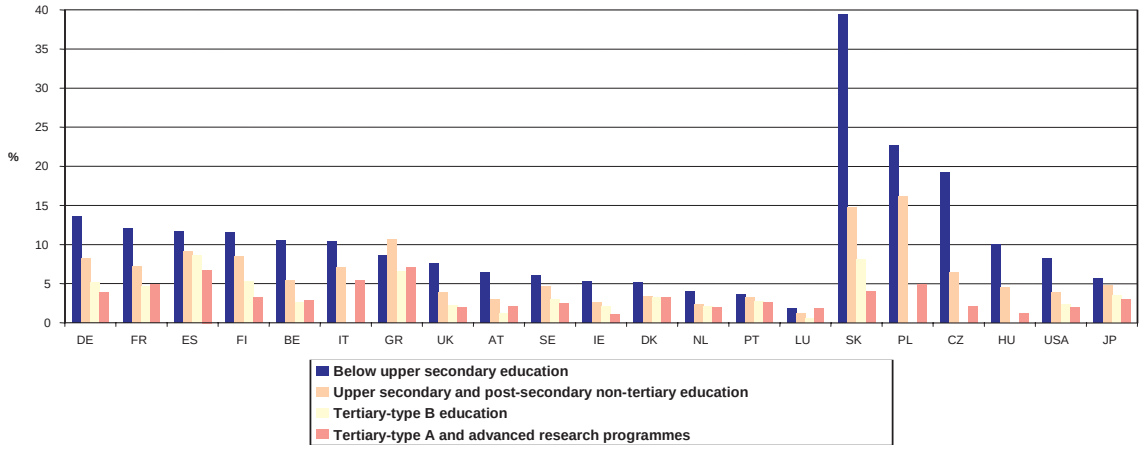
Socio-economics

Besides the resources used by a knowledge society there are other prerequisites termed here as socio-economics. The indicators in this section cover the topics of (un-)employment, different kinds of training (work-related, self-directed, e-learning) and the area of social inclusion and the digital divide. The aim is to cover the individual prerequisites for access to and use of the knowledge society.

Employment

Employment stands for participation in society, social status and life fulfillment, while unemployment, which in general is linked to the economic situation of a country, can lead to income problems and social exclusion.

Unemployment rates by level of educational attainment of 25 to 64-year-olds (2001)

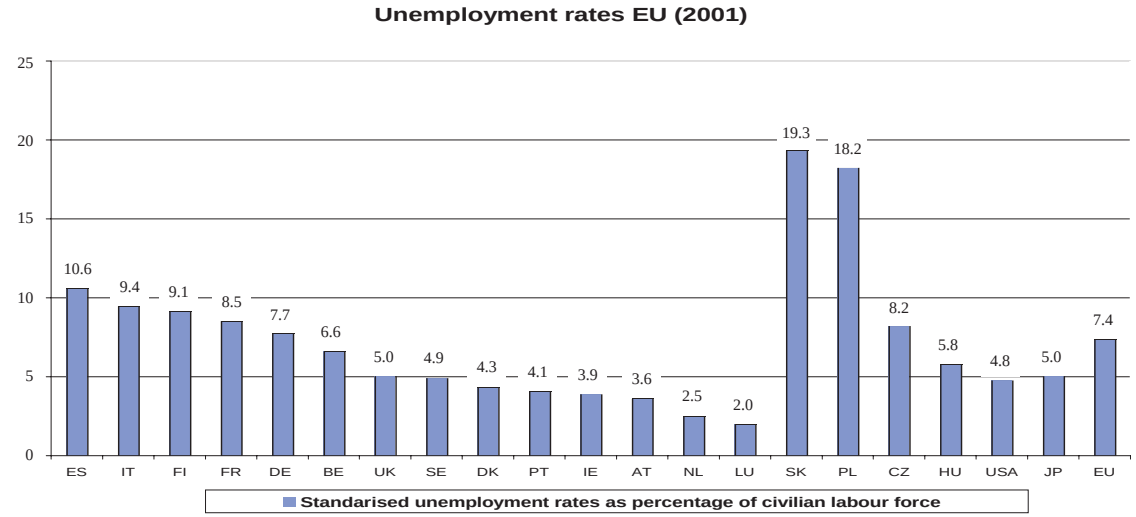


Examining the unemployment situation according to educational attainment, low-skilled worker unemployment rates far exceed the unemployment rates of higher-educated workers. This long-range effect is due to the substitution of a low-skilled labour force by machines and the outsourcing of such labour to low-cost third-world countries, moves which are fostered by advances in ICT and the lowering of trade barriers.

Knowledge and technologically advanced societies can therefore be identified by a relatively high unemployment rate among low-educated workers compared with a low unemployment rate among high-educated employees. This is true also of economies with low general levels of unemployment but which have managed to include formerly unemployed people into the employed workforce by means of further education and qualification. The former can be observed in France and Germany, the latter in the Netherlands and Denmark. Spain and Greece, however, maintain high rates of joblessness in the higher-educated labour force as well as among low-skilled workers. Possible reasons, besides a lower level of knowledge society achievement, may be the relative immobility of the labour force as well as a scarcity of high quality jobs on offer. It may also be due to the rather strict and inflexible labour market regulations in these countries.

Luxembourg and the Netherlands are the European frontrunners with respect to low unemployment rates, while high levels can be seen in Spain, Italy and even Finland, one of the most advanced countries, considering other knowledge society aspects. Portugal, as a country which is lagging behind technologically and educationally, maintains a low general unemployment rate. The US and Japan have average but rising levels of unemployment.

High rates in the EU acceding and candidate countries are mainly due to the economic transformation and job cuts caused by privatisation and rationalisation.



In conclusion, half of the EU Member States face serious unemployment problems, true for Spain and Greece in the high-educated sector as well as for its low-skilled workers.

However, ranking high on many information society and knowledge society indicators does not automatically lead to low unemployment, as can be seen in Finland. Nor does the converse situation necessarily hold, as Portugal shows.

Further investigations reaching beyond the scope of this report are needed to obtain a more thorough and better insight into the mechanisms responsible for these developments.

Indicators used and sources

Unemployment rate: Standarised unemployment rate as percentage of civilian labour force. OECD 2002

Unemployment rates by level of educational attainment of 25 to 64-year-olds:

Below upper secondary education: Upper secondary education is provided at high schools, teacher-training schools at this level, and schools of vocational or technical nature. Secondary education consists of ISCED level three, which students generally begin between 13 and 15 years and finish between 17 and 18 years. OECD 2000

Upper-and post-secondary non-tertiary education: The students of post-secondary non-tertiary education are typically older than those in upper secondary programmes. OECD 2000

Tertiary type B education: Tertiary education is provided at universities, teacher-training colleges, higher professional schools and sometimes distance-learning institutions. OECD 2000

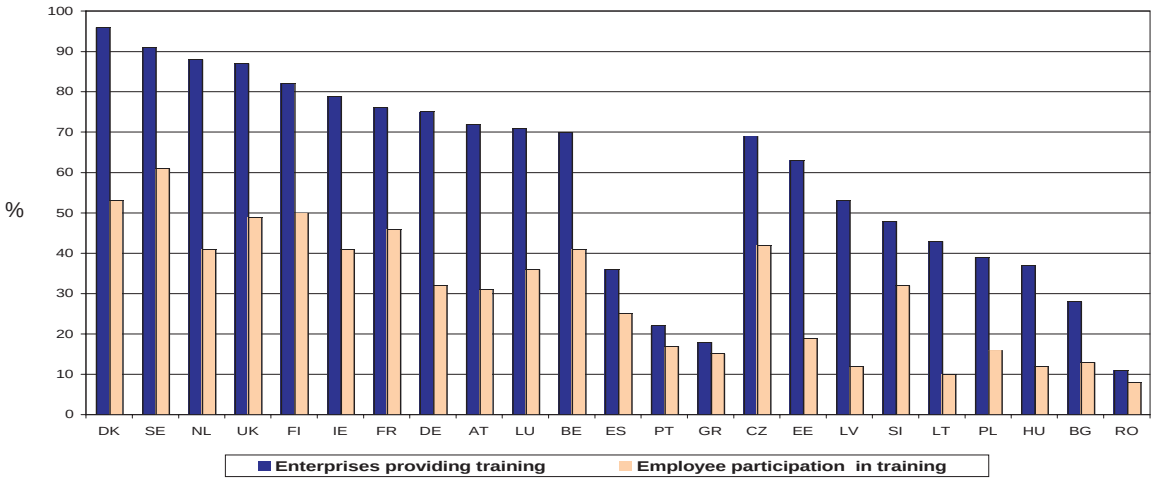
Tertiary type A and advanced research programmes: This level is reserved for tertiary programmes which lead to the award of an advanced research qualification. The programmes are therefore devoted to advanced study and original research and are not based on course-work only. OECD 2000

Training

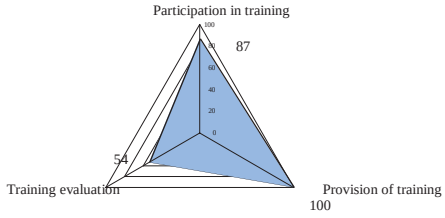
Modern societies are characterised by rapid change and development of knowledge and technology. For this reason, after school education and learning become increasingly important. This can best be fulfilled by company training or self-directed learning. In addition to that, e-learning helps to acquire new knowledge.

Company training in general can be described as training opportunities which a company offers (training provision), employee participation in such courses, or self-directed learning by employees. Through training evaluation, companies try to measure the success of training activities by supervising results and improvements in employees' skills or behaviour in order to check for its usefulness, and subsequently optimise training procedures.

Provision and participation of training (1999)



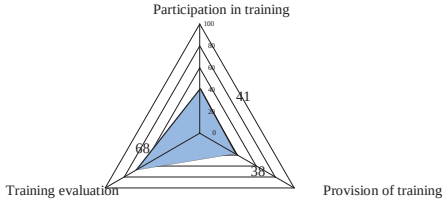
Frontrunner: Denmark (1999)



*Best performer = 100

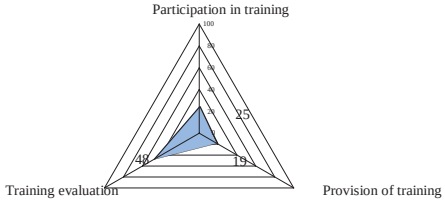
In most of the EU countries, training provision is high, with Denmark taking the lead. Almost 100% of Danish employees are offered training opportunities. Greece, Portugal and Spain do not meet the EU-wide high standard. In these three countries, training participation compared with training provision notably exceeds the ratios of other European Member States, with only half of the employees taking advantage of training possibilities offered to them.

Average performer: Spain (1999)



*Best performer = 100

Lowest: Greece (1999)



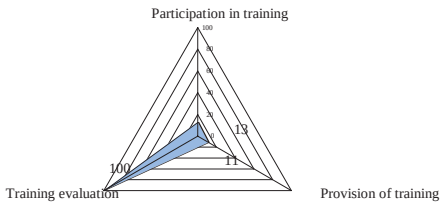
*Best performer = 100

Comparing the 1993 and 1999 figures, training provision and participation among all employees have increased, but the provision / participation ratio itself remains constant, i.e. training provision and use has reached higher levels in absolute terms but not in relation to each other.

The ratio is lower than the EU average in most of the acceding and candidate countries, though training provision levels fall within the EU range. The Czech Republic is at a level with upper EU provision and participation standards.

Evaluation of Training:

Best performer - Romania (1999)

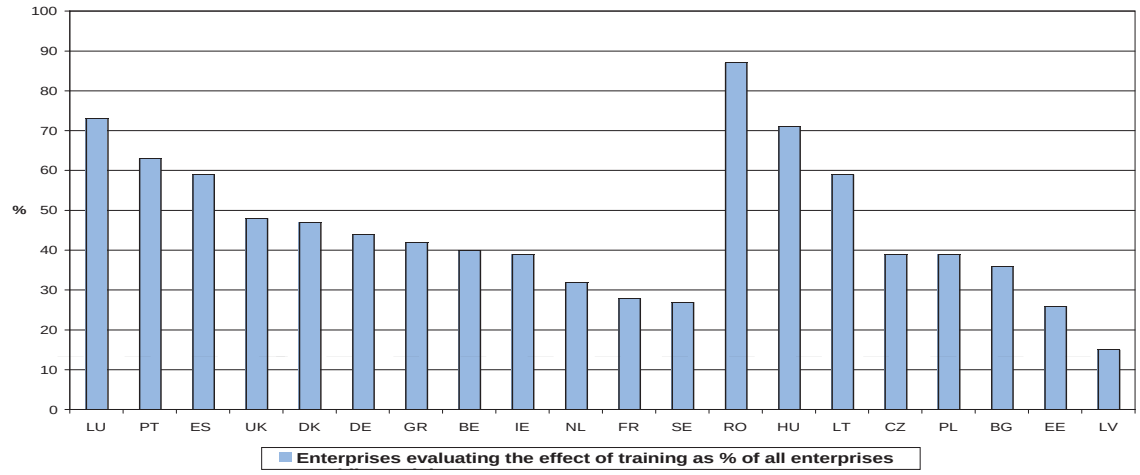


*

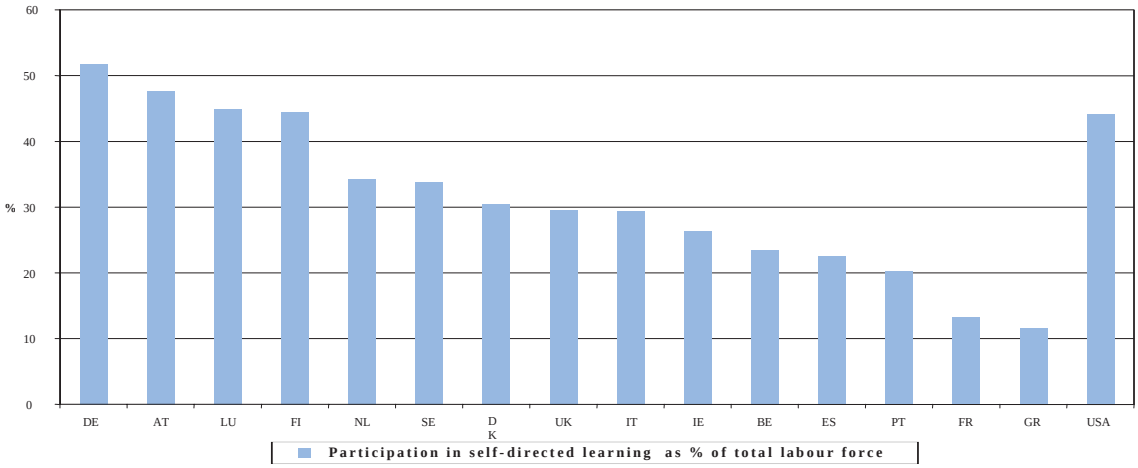
Best performer = 100

In Romania, employee education is so exceptional that almost each training activity is evaluated and its usefulness controlled. Luxembourg, Hungary, Portugal and Spain are the European frontrunners in training evaluation.

Training evaluation (1999)

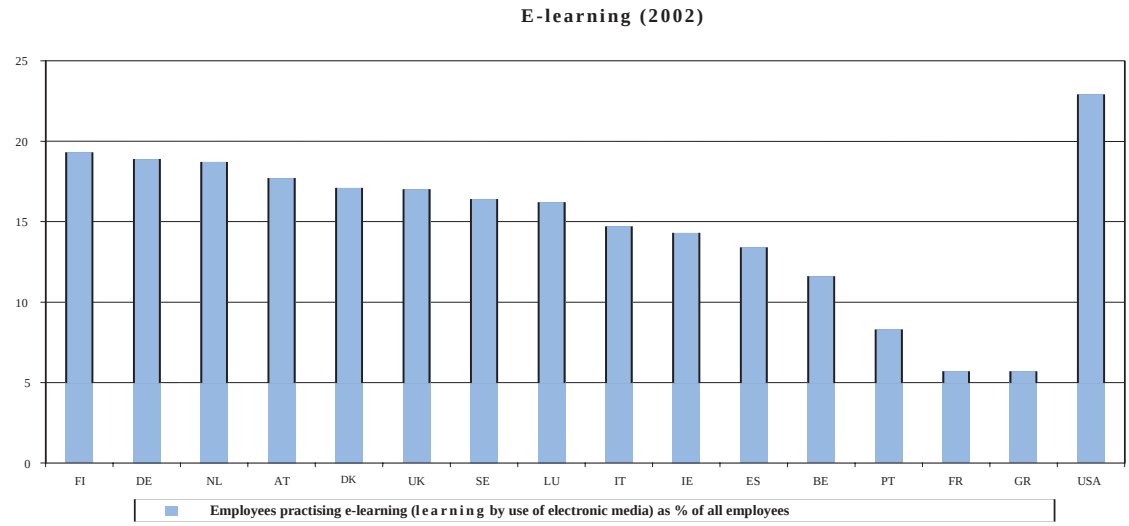


Self-directed learning (2002)



Self-directed learning, i.e. the voluntary learning of individuals based on an intrinsic motivation to do so, is most common in Germany.

E-learning, learning using electronic support tools either offline or online, is becoming more common as the Internet penetrates more widely. The US ranks first on e-learning. Countries like Greece, France and Portugal fall behind in both e-learning and self-directed training.



Many EU companies provide training opportunities, but in several countries, they are not widely used by the employees. Training evaluation, self-directed learning and e-learning ought to develop further in most of the countries to better and more efficiently prepare the population and workforce for the knowledge society.

Indicators used and sources

Employees' participation in company-provided courses: Overall participation in all kinds of company-provided training courses in % of total employees. CVTS 2000

Training enterprises: Share of enterprises offering training to employees as % of all enterprises. CVTS 2000

Enterprises evaluating the effect of training: Enterprises measuring the outcomes of CVT courses (Continual Vocational Training) by all types of methods as % of all enterprises providing CVT courses. CVTS 2000

Employees practising e-learning: Employees using electronic learning materials (online and offline) for training and learning as % of all employees. SIBIS 2002

Employees participating in self-directed learning: Employees engaging self dependently in any kind of training not provided by others as % of total labour force. SIBIS 2002

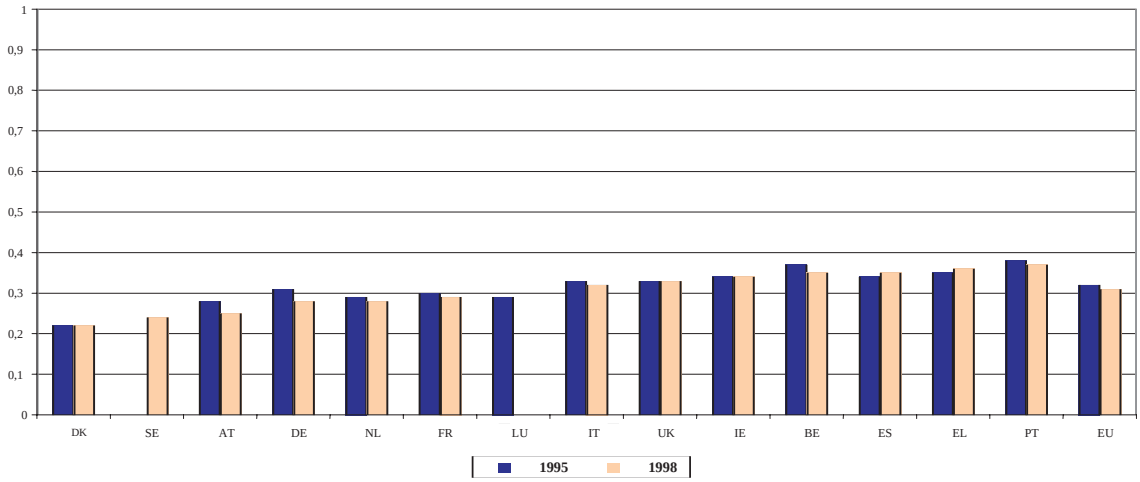
COQS-Index of perceived digital literacy: Compound indicator on ICT-related skills (for further details, see previous section). SIBIS 2002

Note: Data in spider-diagrams are given as standardised benchmarks with the best performing country receiving 100 points.

Social inclusion

Social inclusion serves to solve different types of allocation problems among which income disparity and digital divide are analysed here. Income disparity is described by the GINI-index, where a score of one would mean absolute inequality in which one person gets everything and all others nothing. The digital divide index (DIDIX) combines the divides by gender, age, education and income in relation to computer use, Internet users and Internet use at home. It measures the relative adoption of ICT by potentially deprived societal groups – relative compared with the population as a whole. (An ICT adoption of risk groups equal to the population average would result in a DIDIX value of 100; for a further explanation, see previous section.) In total, social inclusion supports a society's stability and is a widely diffused principle of equity.

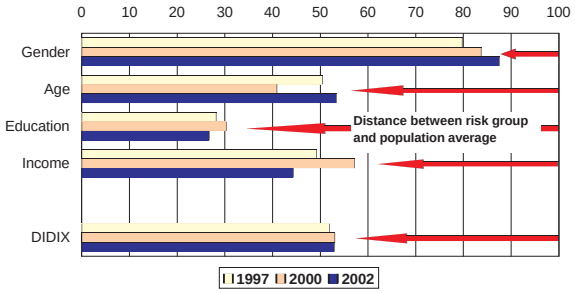
GINI-index on income disparity (1995/1998)



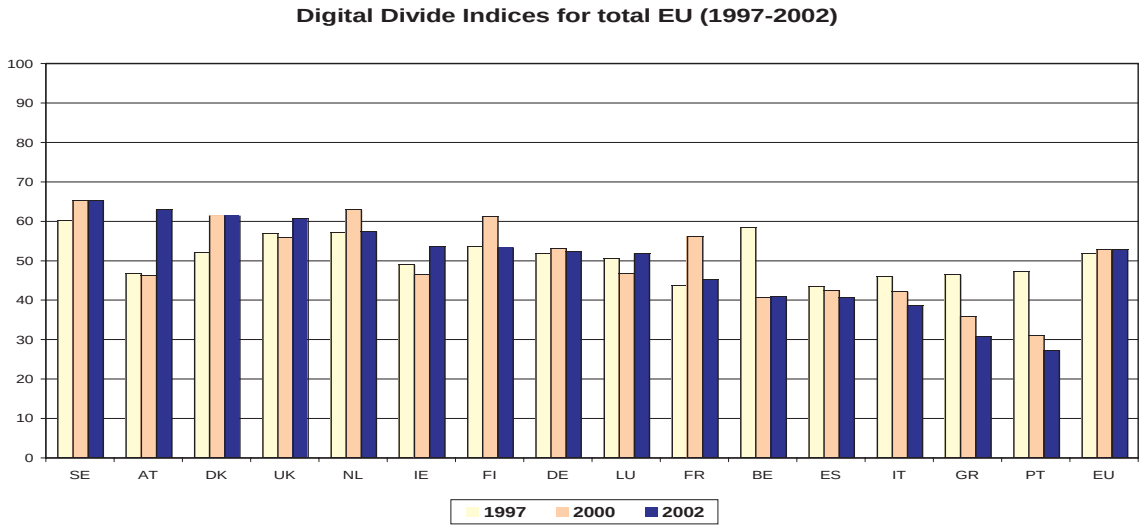
Income disparity can only roughly be analysed due to the scarcity of existing data. Generally, disparity seems to be decreasing throughout Europe. Denmark, Sweden, Austria, Germany and the Netherlands show low disparity levels. In Belgium, Spain, Greece and Portugal, incomes are allocated more unequally.

The most apparent digital divide exists within the education dimension. ICT diffusion among people who left school before 16 years of age is only about 25% of that in the whole population. Even allowing for the fact that older people are on average less well educated than younger ones, education appears to exert greater effects than age. The index shows that the overall divide in the EU has changed little, but the gender and age divides are diminishing, the educational divide persists, and the income divide seems to be increasing.

Digital Divide Indices for total EU-15 (1997-2002)



Comparing indications of changes in national divides, differences between Member States are widening. Sweden, Denmark, Netherlands and the UK are moving toward social equality but in other countries, especially in Portugal and Greece, the divide is getting wider.



In pursuing the aim of social inclusion and equality, promotion and support of the lower end of the scale must not restrict the 'better than average players', since those are the ones pushing a country forward technologically.

Indicators used and sources

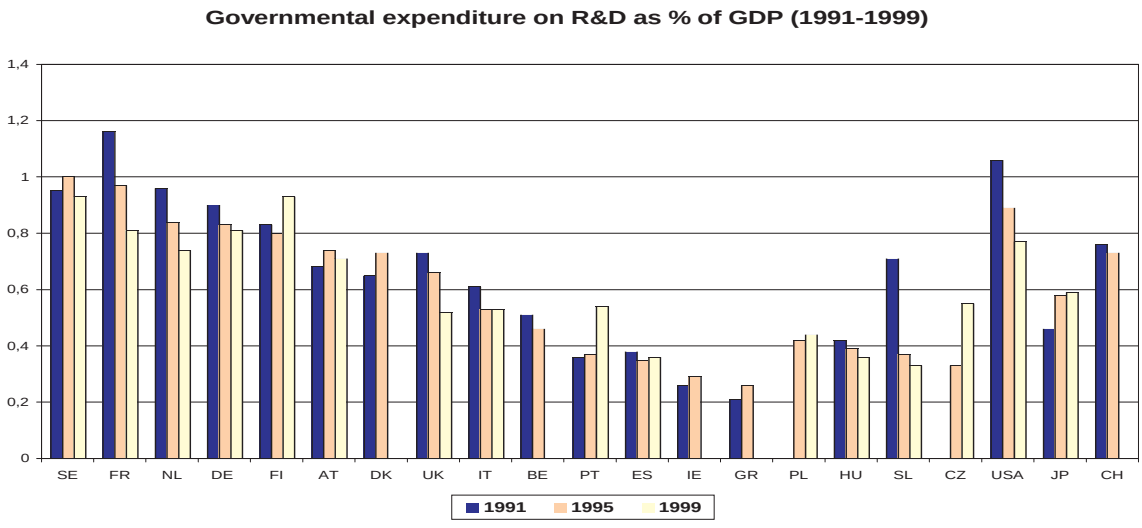
GINI-index on income disparity: In the GINI index, the value one means absolute inequality, in which one person gets everything and all others nothing, and the value zero means absolute equality, in which everyone gets exactly the same. NewCronos ILC 1998

DDIX (Digital divide index): Compound indicator on digital divide regarding several risk groups (for further details, see previous section). Empirica 2002

Politics

Beyond population and organisational aspects, political decisions affect the knowledge society. Due to a general shortage of available data, only one indicator, governmental expenditure on innovation, is analysed.

Governmental expenditure on research and development reveals the political concern for technological innovation, especially where the further development and commercialisation of R&D results is difficult and problematic or still at an early stage. Sweden, Germany and Finland head the table. Improvements have also been made in Portugal and the Czech Republic.



In order to achieve positive economic performance and growth, there is a belief that government support for research and development and technological development is required. Governments must serve as a role model for private companies and invest an adequate percentage of GDP in R&D. Additionally, prospering but not yet competitive technologies like wind or solar energy need to be fostered to boost overall technological development, growth and employment.

Indicators used and sources

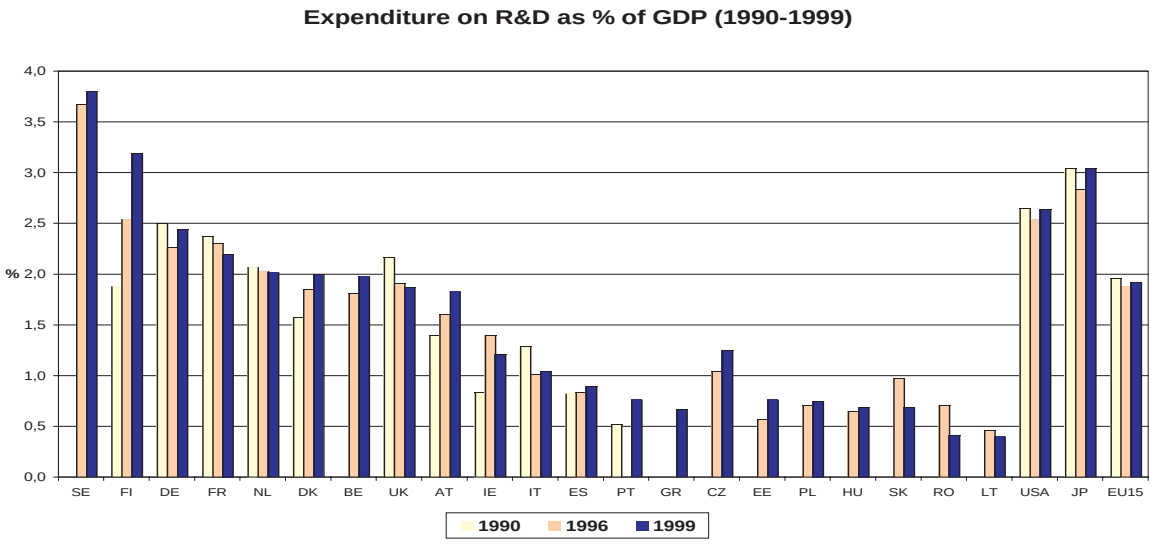
Governmental expenditure on R&D: Given as % of GDP. OECD 2001

Applications, outputs, markets

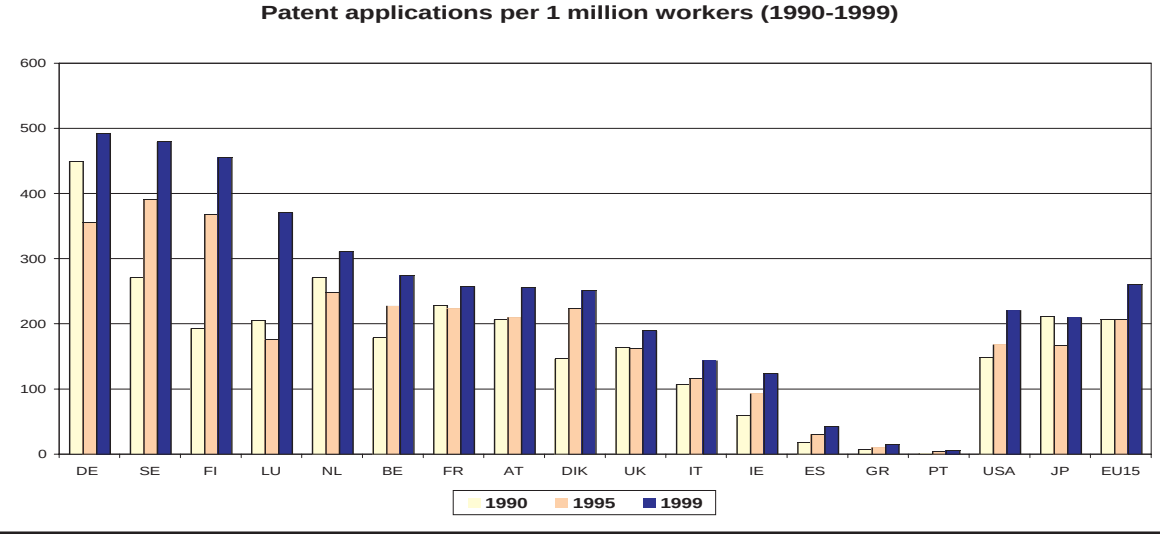
Having analysed the prerequisites for a knowledge society - infrastructure and resources, socio-economics and politics - this section will examine its outcomes. This implies measuring the ability for innovation, work flexibility, different e-applications, wealth and satisfaction of the different EU economies and societies.

Innovation

One measure for the perceived importance of innovation in a society is the total expenditure on research and development. Whether the aim is reached in the end can be determined by the number of patent applications as an indicator of innovative behaviour and performance, and by labour productivity growth as an indicator of improvements in effectiveness.



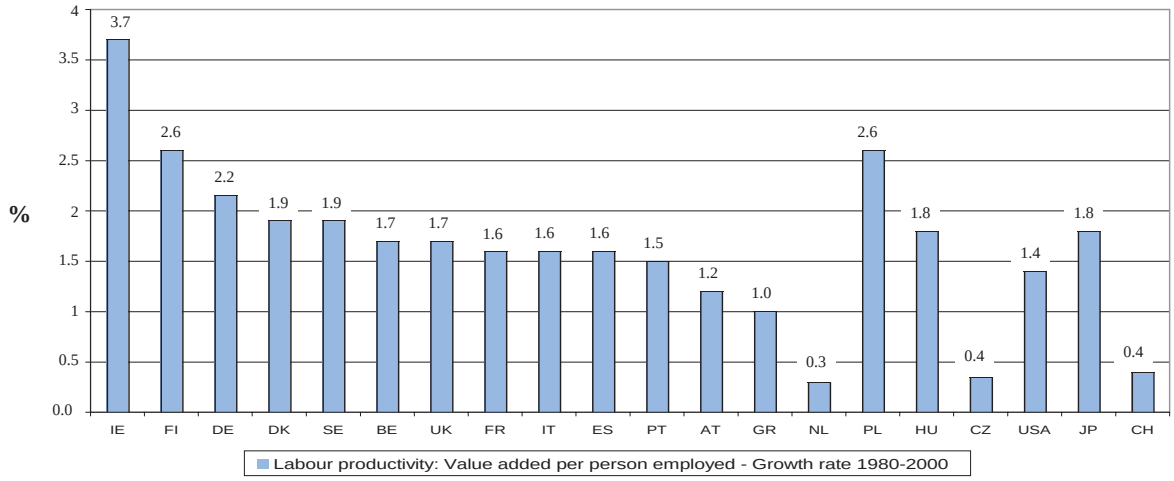
As for R&D expenditure, Sweden and especially Finland, with a growth of 70% from 1990 to 1999, show outstanding results. They outperform the US and Japan and other European countries.



Huge differences exist between EU countries in the number of patent applications, where Germany takes the lead. In this category, the EU is ahead of the US and Japan.

High labour productivity growth in Ireland is mainly due to significant capital inflows, since investments in R&D and patent applications are low. The acceding and candidate countries and Greece have been catching up, particularly in recent years, while the Netherlands shows that full employment can be reached even with low labour productivity growth.

Labour productivity growth (1980-2000)



In order to improve overall European competitiveness, strong efforts have to be made to reduce the extreme innovation backlog in Spain, Greece and Portugal. The driving countries within the EU at the moment are Germany, Sweden and Finland.

Indicators used and sources

Patent applications:	Number of patents handed in at the European Patent Office (EPO) per million workers. Eurostat 2002
Expenditure on R&D:	Company-internal spending on R&D in all sectors as % of GDP. Eurostat 2002
Labour productivity:	Value added per person employed, 1980-2000 growth rate. ILO KILM 2001-2002

Flexibility

ICT-enabled methods of working are generally associated with increased flexibility and, as such, are central to the European employment strategy endorsed by all EU Member States. However, the issue of flexibility also contains the question of how it is distributed between the supply and demand side of the labour process. Flexibility which is company-centred means enabling companies to adapt their labour input to changes in the production process. The European Employment Strategy emphasises that, while a high degree of company-centred labour flexibility is necessary, it has to be accompanied by worker-centred flexibility in order to be socially sustainable. It has been shown that worker-centred flexibility increases employee satisfaction and motivation, and thus positively affects labour productivity. In addition, a working environment which is adaptable to the needs of the workers has a positive effect on work–life balance, i.e. individual well-being.

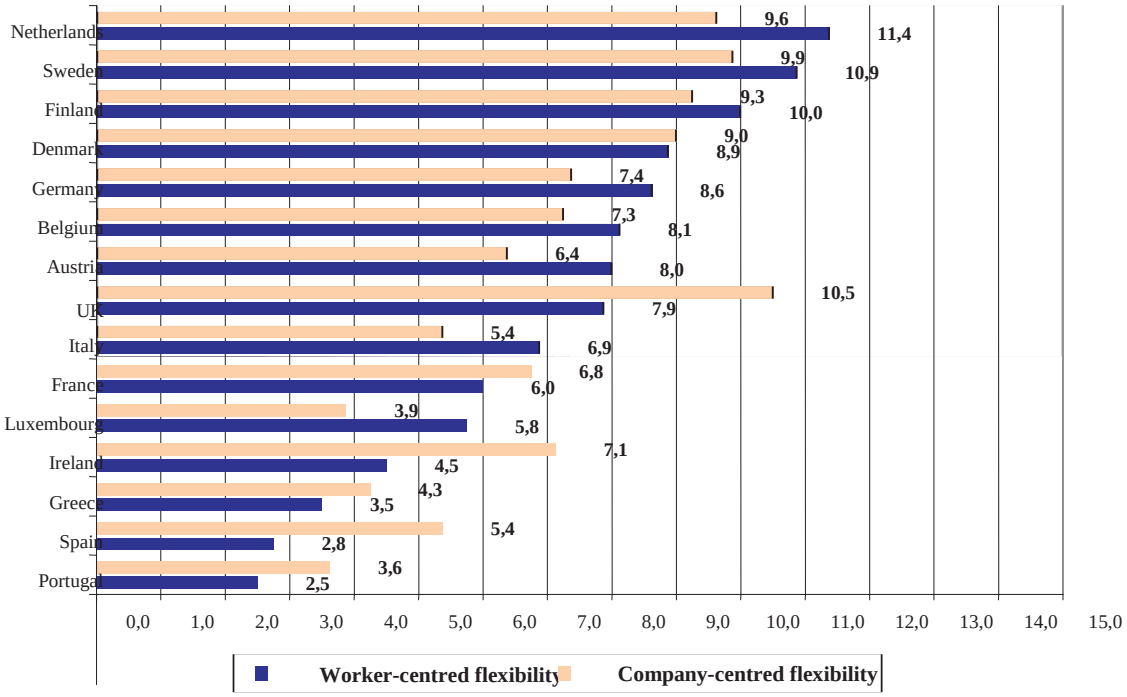
'Company-centred' and 'work-centred' flexibility are included as sub-indices in the adaptability of work arrangements index (AWAI – for further detail, see previous section). Comparing the results for both categories in the figure below (a high score value indicates high flexibility), there are marked differences between both rankings, with some countries performing well in one sub-index and below average in the other.

Some countries, such as the UK and Ireland, gain a higher score on the company-centred index than on the worker-centred index. In these EU Member States, flexibility in labour markets seems to benefit mainly employers. On the other hand, in countries like Austria, Italy and Luxembourg flexibility in labour markets seems to be distributed in favour of workers, while companies may be in need of a more flexible regulatory environment (or make better use of the potential for flexibility that exists).

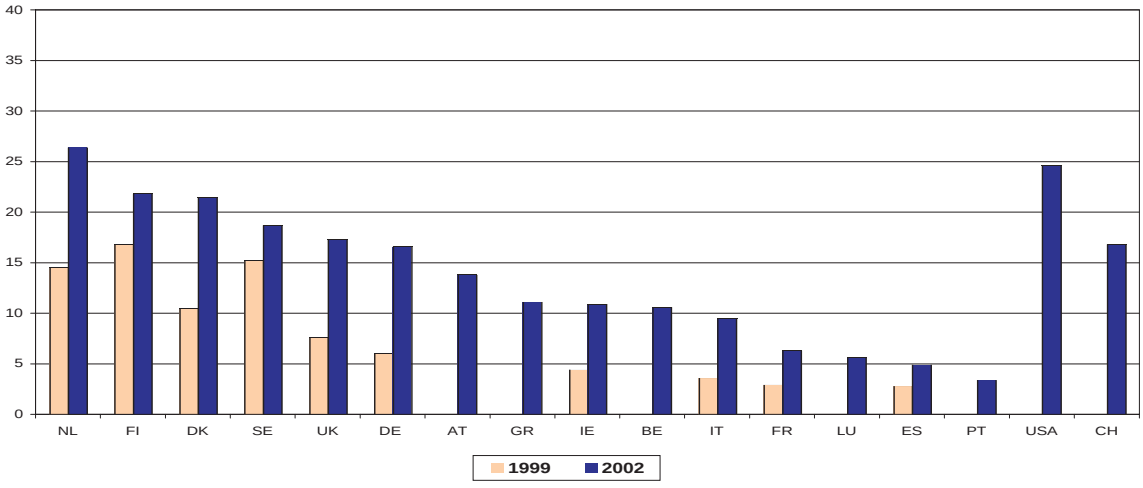
The Nordic countries and the Netherlands stand out as scoring high in both indices. These Member States seem to come closest to reaching the aims of the European employment policy. At the other end of the ranking order, Spain, Greece and Portugal seem to have a long way to go before they reach average EU levels of labour market flexibility and adaptability.

Adaptability of work arrangements index - AWAI (2002)

Index values, MAX = 15



Spread of telework - all types (1999/2002)

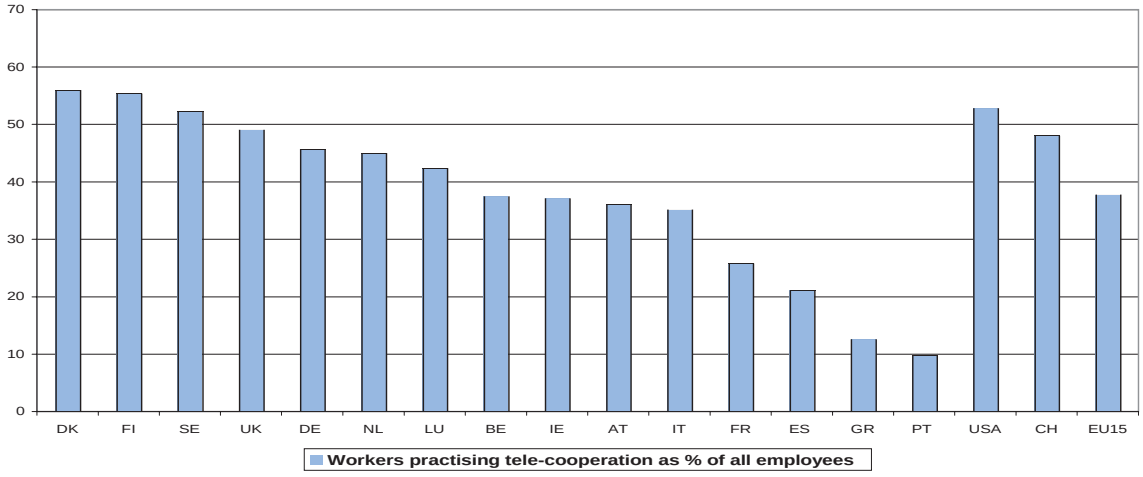


Looking at specific indicators used for the development of the AWAI index, namely teleworking and telecooperation (inter-organisational communication via email, video-conferencing, etc), shows that only a few European members are reaching US levels. However, the different types of telework are growing in almost every country, with mobile and home-based telework on less than one day per week spreading as fast as the number of self-employed people in SOHOs (small office, home office). However, home-based telework (where the worker spends at least a full day per week at home) remains steady at around 2% of the workforce.

Spread of telework in EU15

	1999	2002
homebased telework >= 1 day per week	2.0%	2.1%
homebased telework < 1 day per week	2.0%	5.3%
mobile telework	1.6%	4.0%
Self-employed in SOHOs	0.9%	3.4%
all types	6.1%	13.0%

Tele-cooperation (2002)



In technologically fast developing societies with economic ups and downs, flexibility is absolutely essential to maintain competitiveness, together with social sustainability. This high flexibility is only possible with high levels of ICT experience based on good ICT access, which therefore should be the preferred area to begin improvements.

Indicators used and sources

AWAI: Adaptability of work arrangements index: Compound indicator on company- and worker-centred work flexibility (for further details, see previous section). Empirica 2002

Spread of telework – all types: Telework usage spread rate including all types of telework (home-based, mobile, self-employed in SOHO). SIBIS 2002

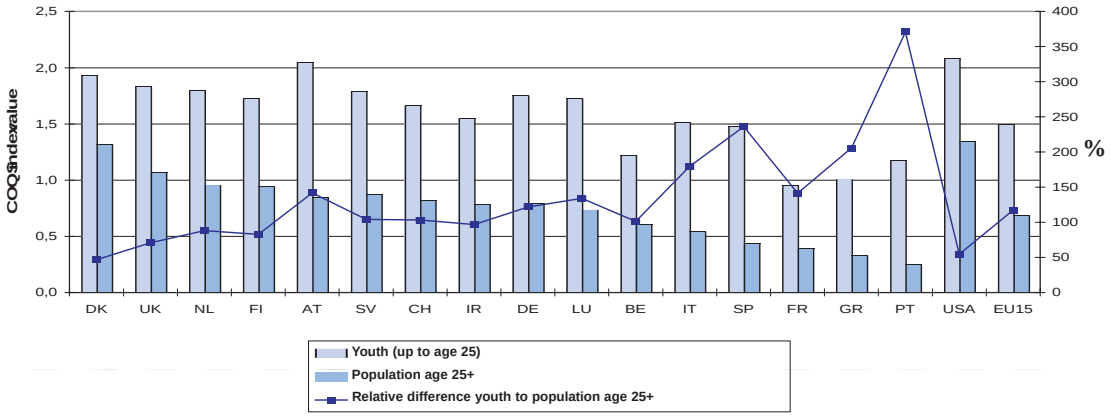
Workers practising tele-cooperation: Tele-cooperation is defined as communication with external contacts through electronic media (such as email, video conference, electronic data transfer). Given as % of all employees. SIBIS 2002

E-applications

Digital literacy

In the knowledge society, the ability to operate a computer and the Internet in a responsible and critical way is essential for taking part in the societal processes of living, working and learning. The skills of web communication, downloading/installing, searching and questioning information on the web are reflected in the COQS index of digital literacy. (The index ranges from a minimum of zero to a maximum of three, the latter indicating a perfect handling of all four digital abilities. For further explanation, see previous section.) Overall, digital literacy represents the outcome of the ICT infrastructure and education already outlined.

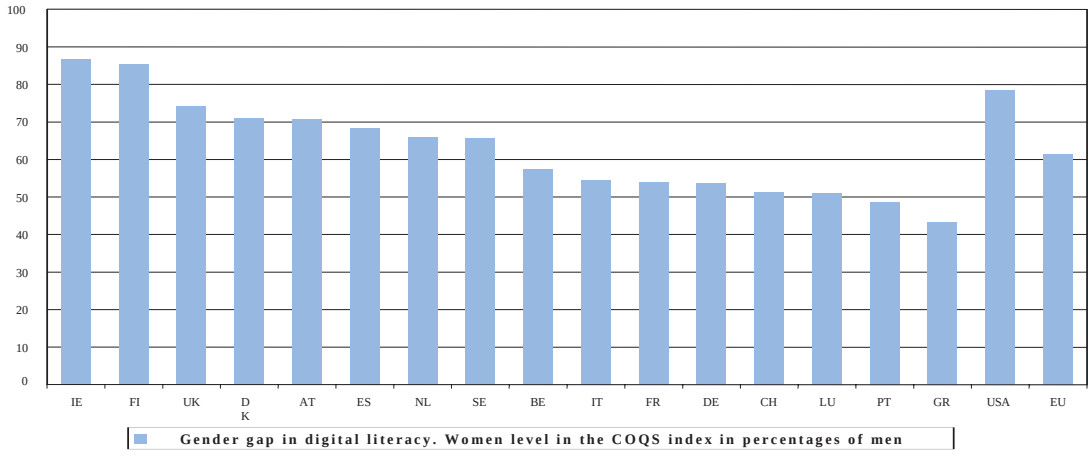
Digital Literacy index - average national index value in age groups relative difference between age groups (2002)



According to the COQS, the level of digital literacy in the EU as a whole is still rather low. A clear gender gap and an age gap can be seen. EU women only reach 62% of the average digital literacy of EU men, while young people score notably higher than adults. There are also huge differences in the level of digital literacy between the countries surveyed. Within the EU, there is a factor of three between the EU country with the highest (Denmark) and the lowest score (Portugal). In the EU as well as in the US, there is still a way to go towards achieving total digital literacy, which should be an important aim in a knowledge society.

Seen at national levels, the skills of digital literacy are highest among men in all countries. The size of the gender divide varies within the EU, the smallest gap existing in Ireland and Finland. The digital literacy gap is expected to narrow or even close in the near future.

Digital Literacy: Gender gap (2002)



All in all, the future of digital literacy will be brighter than at present. Young people (16-24 years) show a much higher general level of digital literacy than the total population. The national scores among young people are nearly twice as high as adults in most countries. Thus, one can expect high digital literacy levels in European populations in the future.

Indicators used and sources

COQS-Index of perceived digital literacy: Compound indicator on ICT-related skills (for further detail, see previous section). SIBIS 2002

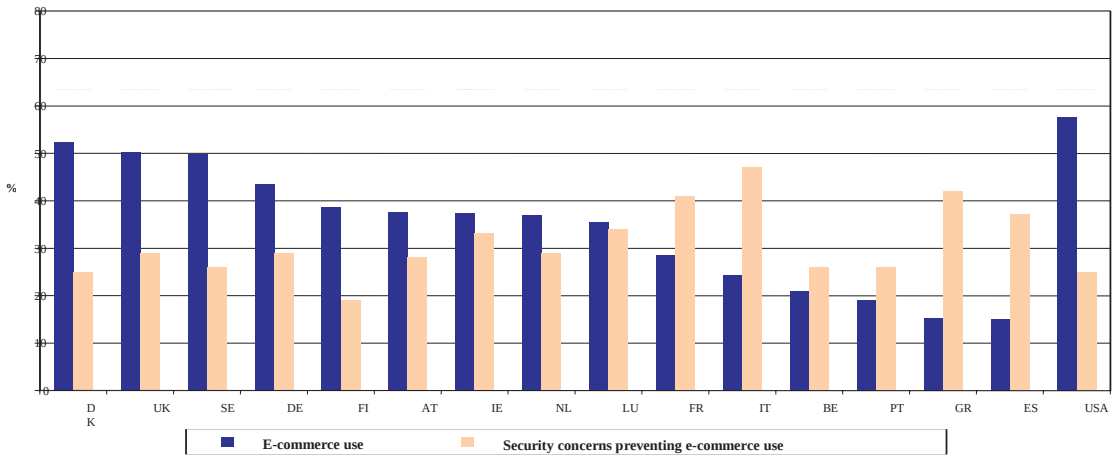
Internet application and usage barriers

E-commerce and e-health are taken here as two specific applications or services of the Internet in general, thus measuring Internet usage at different levels. E-commerce can also be seen as an indicator on the economic outcomes of the Internet.

The US again takes the lead in e-commerce usage, with Denmark, the UK and Sweden following closely. On average (EU 15 and US), only 35% of all Internet users also use e-commerce. This illustrates that there is still an enormous economic potential to be tapped.

E-health or the search for health-related information on the Internet is slightly more popular than e-commerce, with an average spread of about 38% and a slightly more even distribution of usage throughout the EU countries. The untapped potential, however, is still very great, not taking into account that a rather 'soft' definition of e-health has been used, to say nothing of such advanced services as tele-medicine or tele-healthcare.

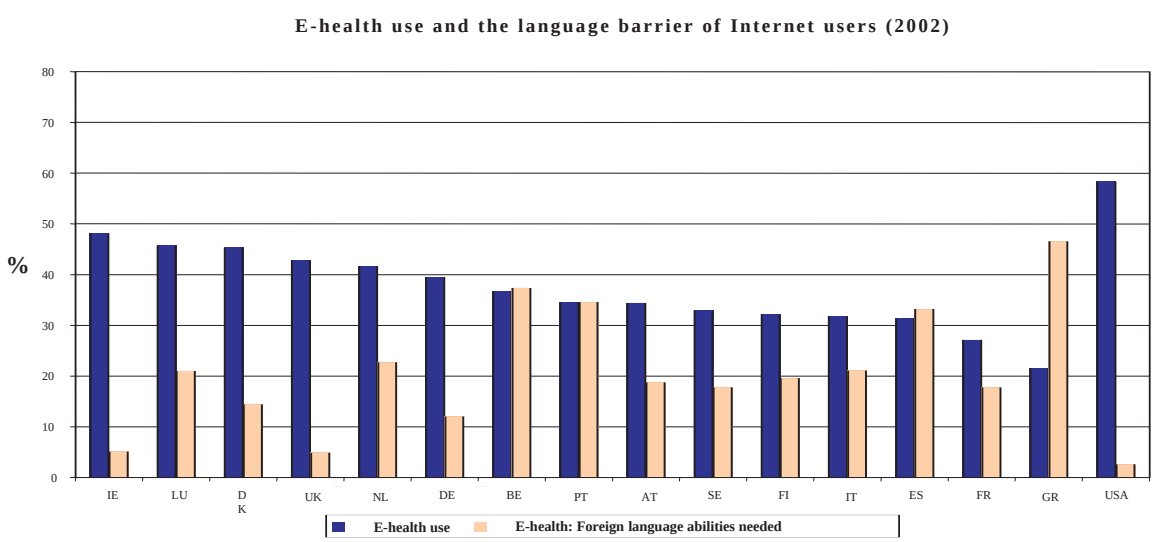
E-commerce use and security objections of Internet users (2002)



Barriers against usage of the different Internet services are manifold. Users who do not use a certain service can be divided into two groups: those who do not want to use it (for whatever reason) and those who cannot use it (due to a lack of skills, availability of access, etc).

The first group is represented by those who do not use e-commerce due to security reasons (such as fear of the loss or manipulation of data, or concerns about privacy and confidentiality of personal data). This group represents 31% of Internet users. If these security concerns were allayed, the share of e-commerce users would be notably higher. It is worth noting that there is a relatively high negative correlation between e-commerce use and security concerns, which means that active use of e-commerce tends to soothe users' apprehensions.

The second group of non-users consists of e-health users who reported needing foreign language abilities to find health-related information on the Internet. On average, 24% of all Internet users (disregarding the English-speaking countries) had to rely on languages other than their own. The US, UK and Ireland are left out as most Internet offers are in English or can be found on the numerous US web sites so the problem does not apply. The e-health sector reflects the dominance of English on the web (about 56% of all web pages are in English, whereas about 37% of Internet users are English-speaking). This forces many users either to learn that language or to be left out of the game. Recent projections for coming years show only a slight improvement in the situation, with German and maybe French becoming additional standard languages of the Internet.



Based on this analysis, learning English seems to be absolutely essential to benefit from the advantages of the Internet. However, for such crucial fields as electronic health care, the development of language and/or country specific content will be necessary to guarantee unrestricted access, especially for lower educated and older population groups. Altogether, the untapped potential of e-applications is high, and the lowering of access barriers such as security concerns and language difficulties will help greatly in unlocking this potential.

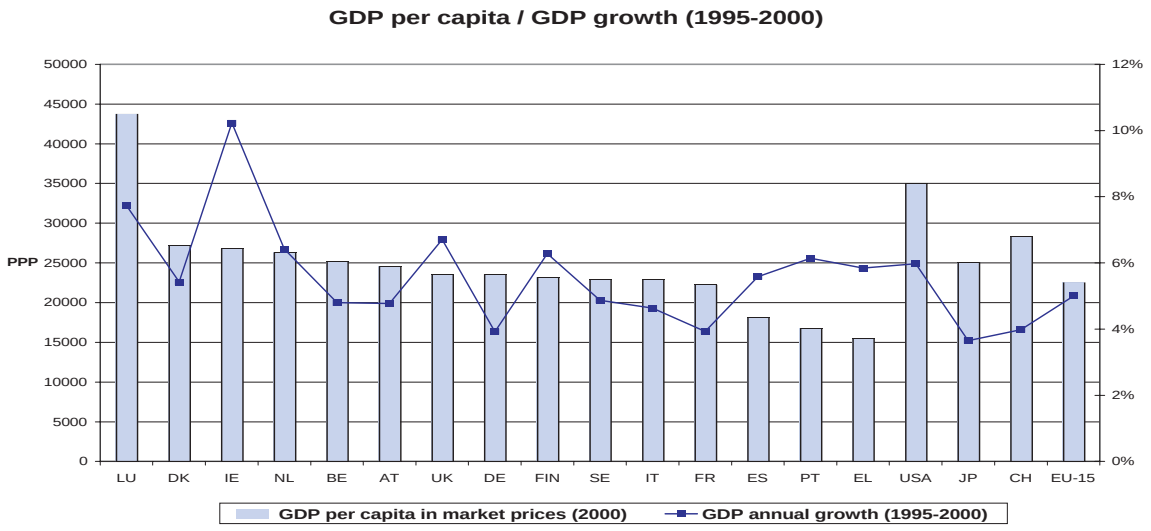
Indicators used and sources

E-commerce use	Users having privately used the Internet to order a product/service or to conduct online banking or to buy a financial product as % of all Internet users. SIBIS 2002
E-health: Search:	Users who searched for any kind of health related information on the Internet as % of Internet users. SIBIS 2002
E-health: Language barrier:	Users who had to rely additionally or solely on web sites in other languages than their mother tongue in search for health related information as % of all Internet users. SIBIS 2002
Security concerns:	Security concerns such as loss, abuse and manipulation of personal data preventing e-commerce use as % of Internet users. SIBIS 2002

Wealth and satisfaction

GDP and GDP growth

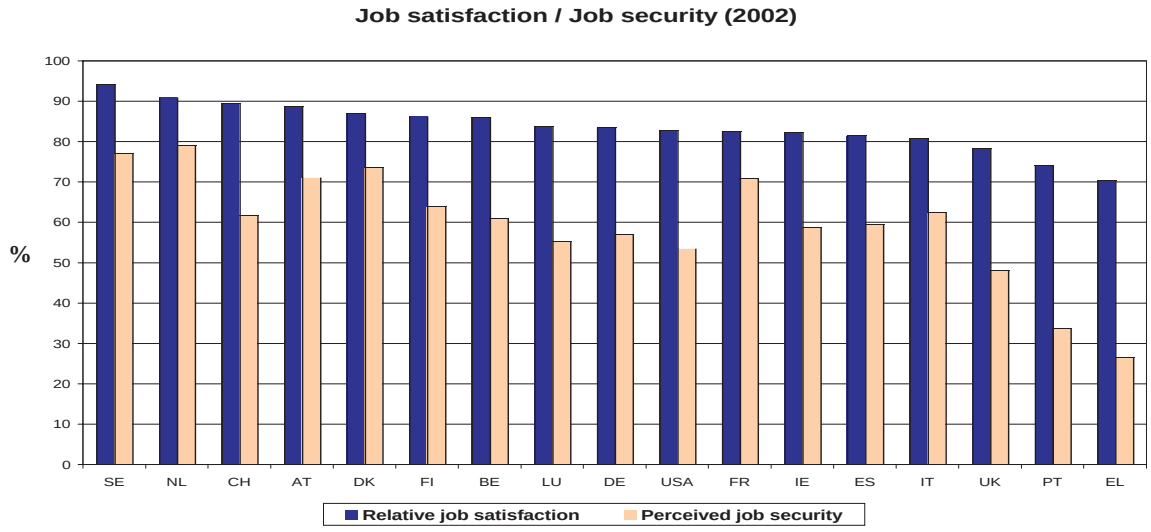
A country's gross domestic product and high ratings on the softer indicators 'job satisfaction' and 'job security' can be seen as the final targets of a knowledge society. The GDP reflects the economic wealth of a society. A sufficient income enables people to acquire more of the 'prerequisites' like ICT infrastructure and media, starting thereby a virtual circle of growth into a knowledge society. Furthermore, higher job satisfaction and perceived job security decrease pressure and stress, leading to improved learning and working capacities, as well as to a higher overall life satisfaction.



On a per head basis, Luxembourg is Europe's richest country, due to its small population and high tax attractiveness. In Ireland, tax incentives have led to huge foreign investments and therefore to an extremely fast growth. Europe's poorest countries Greece, Portugal and Spain are catching up as their growth notably exceeds the European average. Slowest for growth are Germany and France, together with Japan whose openness to economic reforms may be questioned.

Job satisfaction and job security

When it comes to the views of workers, job satisfaction is generally high, whereas perceived job security differs remarkably throughout Europe. In Sweden and the Netherlands, strong satisfaction and security levels seem to be based on the high levels of work- and company-related flexibility (see above). In contrast, only one third of Portuguese and Greek workers feel secure. Surprisingly, the 'inflexible' countries France and Spain score relatively high in both categories. Another remarkable aspect is that strict work regulations in Germany compared with the US do not affect perceived job security: both countries rank at comparable levels on both indicators.



Altogether, southern European countries have started to slowly close the gap with the rest of Europe, due to stronger economic growth. Whether this will have a positive effect on other knowledge society-related aspects, such as digital literacy or work-related flexibility, remains to be seen. Cultural aspects also play an important role.

Indicators used and sources

Gross domestic product (GDP):	Given as GDP per capita in market prices (PPP per head). Eurostat 2002
Relative job satisfaction:	Employees reporting to be satisfied with their job as % of all employees. SIBIS 2002
Perceived job security:	Employees reporting to have no concerns about their jobs security as % of all employees. SIBIS 2002

4 Summary and conclusion

This report includes a collection of some advancement indicators of the knowledge-based society for EU countries and where possible enhanced by data from the EU acceding and candidate countries, the US and Japan. It is based on available statistical information. For quite a few indicators, the most recent data were taken from the SIBIS project (Statistical indicators benchmarking the information society), a project in the EU's IST Programme. Led by empirica (**www.sibis-eu.org**), this project carried out a large-scale representative survey of the population in 2002 in all 15 EU Member States, the US and Switzerland, as well as a survey of decision-makers in companies in Finland, France, Germany, Greece, Italy, Spain and the United Kingdom.

This report gives a brief description of the current situation and past developments concerning major dimensions of the European knowledge society, such as economic, social and technological development, quality of work and life, etc. It can be used as a starting point in the foresight process.

It can be said that the knowledge society has arrived in Europe but not everywhere and not for everyone. It has been slow to arrive in some EU Member States. A knowledge society north–south divide can still be observed in Europe, with the Nordic countries and the Netherlands leading on nearly all of the knowledge society indicators. The divide is particularly strong on ICT aspects. The southern countries Portugal, Greece, Spain and partly Italy and France lag far behind the other countries. This digital divide is paralleled by a strong economic north–south divide.

Throughout the EU countries, the DIDIX (digital divide index) also shows a divide in terms of education and income. Concerning age, the gap will close, as young people in today's Europe are digitally literate, irrespective of country.

In order to form a complete and balanced knowledge society across Europe, taking in each country and population group, the prerequisites have to be tackled. The education sector plays the most important role, since the basis for a knowledge society has to be built, starting in schools. The development of human capital is and will continue to be one of the driving forces for the knowledge society in the future. Special attention needs to be drawn to the following aspects:

- ICT provision and education. ICT lessons and free access to ICT for pupils in schools and at other public locations at any time will ensure digital literacy, independent of social and income aspects;
- English as a language. A good command of the English language is indispensable to guarantee access to the wealth of information on the Internet, as well as enabling communication in a globalised world;
- pupil/teacher ratios. A low pupil/teacher ratio, i.e. a small number of pupils per teacher, can be seen as one indicator for high levels of attention as an effective learning support for pupils. This attention helps to facilitate the training and development of the human and social skills of individuals. These skills are an important factor for participation in a knowledge society that encompasses all life and work-related spheres, such as the ability for teamwork, development of better work-family balances as well as job satisfaction and satisfaction with life in general. However, there are further factors (e.g. the education system structure) which also need to be considered and which are just as relevant to ensure a maximum and active participation in the knowledge society;
- flexibility, sense of responsibility and self-management. The development of critical and logical thinking, together with the ability to take responsibility, is essential and supports individuals in developing the appropriate skills to survive and actively participate in a knowledge society. These skills include the ability to engage in self-directed learning, independent job searches, and flexibility in all life spheres, to name just a few.

On the workers' side, excelling in these aspects will foster digital literacy, global teamworking and flexibility, and will form the basis for employment, wealth and well-being.

On the company side, rigid regulations still need to open up in a few EU Member States to allow for more flexibility for both companies and workers. Openness to innovation becomes a key factor. This includes the willingness and readiness to practise new forms of working, including different forms of teleworking, life-long learning, and greater autonomy for workers.

Looking at competition and innovation, the EU has the potential to find its own way, which is likely to differ to that of its competitors, the US and Japan. Currently, Europe lags behind the US and has to close the gap in terms of ICT use and other knowledge society prerequisites. But the EU brings to bear many advantages which can probably best be described as the availability of 'tacit' knowledge, cultural and societal tradition, well-established social partnership models and the existence of further regulatory institutional entities supporting a balanced and socially acceptable development and diffusion of innovations.

The population's ability for thinking and acting critically, independently and responsibly, its cultural variety together with tolerance and a well-developed social sense may result in a better working environment and innovation, which, in the end, is likely to be turned into a competitive advantage. To some extent, this is already reflected by labour productivity and patent applications. In addition, governments can improve innovation ability, not only by creating a good education system but also by investing in R&D and thereby pushing technological advances and other innovations forward much faster. There are already some excellent examples of successful Member States in this area, but some European countries lag behind others, hampering a faster development.

The EU acceding and candidate countries match the EU Member States in terms of traditional education measures. However, a considerable gap exists in the penetration of ICT, vocational training and other knowledge society indicators. In order to facilitate a fast catch-up for these countries, positive trends – some of which are already apparent, such as good computer availability at schools or good training evaluation – need to be sustained. An intensification of a knowledge and human capital transfer (e.g. multinational workshops and training, visiting professors, etc) could be another means to improve educational systems and foster innovation. These should be seen as parallel activities to financial aids, and likely to have a direct impact on the development of a knowledge society in the different states.

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