The EU-15's New Economy
A Statistical Portrait

Statistics Netherlands

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Preface

With its so-called Lisbon strategy the European Union aims to become significantly more innovative in the coming years. This publication offers a statistical portrait of the EU-15 which makes it possible to benchmark the countries involved in terms of how they are managing to achieve the goals set in Lisbon. It is both comprehensive – covering a broad spectrum of phenomena relevant to the new economy – but at the same time compact, restricting itself to a set of fifty key indicators. Because of this, the publication provides the reader with a well-considered and practical overview of how Europe is performing with regard to the Lisbon agenda.

For its conceptual framework, the publication builds on two thematic books in Dutch, one on the knowledge-based economy (innovation), and one on the digital economy of the Netherlands. Furthermore, it has involved an intensive search for relevant statistical indicators, allowing both international benchmarking and the analysis of time series. As a consequence, the project has also identified several statistical gaps and suggested ways to address them in the future. Statistics Netherlands started a strategic research programme to help measurement issues for the New Economy in 2002 which is expected to lead to final results in 2005.

This publication is one of the results of the EU's New Economy Statistical Information System (NESIS) project (IST-2000-31118). Participation in the NESIS project, in fact, was part of the strategic research programme on the new economy mentioned above. Statistics Netherlands is grateful for the funds it received from the EU to accomplish this work. The publication has been produced by a team from the Division of Business Statistics' science and technology group and support and development department. Among them the book's editor Teun Wolters, and Andries Kuipers and Gerhard Meinen deserve a special mention. Valuable comments on subsequent draft versions were received from various partners within the NESIS project, in particular from Mikael Åkerblom (Statistics Finland) and the NESIS project's coordinator Deo Ramprakash.

I hope that this publication will serve the public on the road towards a better and timely understanding of structural changes in the modern economy, and of public policies aiming to bring about such changes.

Gosse van der Veen
Director-General

General plan of the publication

The publication consists of eight chapters. After chapter 1, which discusses the measurement of the *New Economy*, and introduces a framework to structure the publication, the chapters 2–7 present statistical indicators in line with the framework. The indicators are divided into key and auxiliary indicators, depending on their conceptual resonance, and the quality and availability of the data. The data is presented in histograms, accompanied by a description and commentaries. Each of the chapters 2–7 is followed by four annexes:

– Annexes A and B contain the data on the key and the auxiliary indicators, respectively;
– Annexes C and D contain background data *('metadata')* on the key and auxiliary indicators, respectively, such as source, publication and completeness of the data set.

The final chapter 8 wraps up the publication by dividing the EU-15 countries into four groups, focusing on the history of a set of statistical indicators representing the "knowledge factor." To this end, time-series and cobweb diagrams are used.
Annex 1 discusses the definition of the *New Economy;* Annex 2 describes the selection criteria and process quality of the indicators.

Explanation of signs

Signs

.	=	Data lacking
-	=	Nil

Explanation of colours

Blue	=	Key indicator
Yellow	=	Auxiliary indicator
Grey	=	Box

Country abbreviations

EU-15 countries:

AT	Austria
BE	Belgium
DE	Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GR	Greece
IE	Ireland
IT	Italy
LU	Luxembourg
NL	Netherlands
PT	Portugal
SE	Sweden
UK	United Kingdom

Other countries:

US	United States of America
JP	Japan

Other CBS publications on the New Economy (in Dutch):

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1 Introduction

1.1 New Economy and measurement

This publication gives a statistical portrait of the EU-15's New Economy. The state of the art in the field of statistical measurement of the New Economy is varied. On the one hand, there is an abundance of indicators covering certain aspects of the New Economy. On the other hand, for other aspects – for instance, when it comes to impacts of ICT investments on business processes and the role of intangible capital – there is a severe lack of indicators.

To cope with informational abundance and overloads, it is necessary to restrict oneself to a limited set of indicators. This has been done, based on a general framework that reflects the principal 'dynamic' concerns expressed in the Lisbon Summit Strategy, with a special focus on innovation. From this, a set of key indicators has been selected. For this set, this publication presents the metadata and the figures and puts them into perspective. Moreover, auxiliary statistical indicators have been added for which less stringent quality requirements have been applied than for the key indicators.

To deal with a lack of statistical coverage of certain areas that are recognised as essential elements of the New Economy, the different chapters contain a number of boxes with occasional materials that briefly highlight these areas.

The presented set of indicators reflects the importance that is being attached to benchmarking as a policy instrument. Benchmarking reflects a degree of agnosticism: no branch of social science and economics is deemed capable of giving a full explanation of the change processes (supposedly) inherent in the New Economy. Benchmarking causes a focus on the countries that are leading in a certain area or stand out in a broader sense, inspiring a search for the factors that can explain success in a particular case.

A full definition of the New Economy in one sentence seems to be impossible, given the multifaceted nature of the phenomenon. Nonetheless, it is important to present, even if it is done in broad outlines, a picture of the New Economy that informs on the perspective from which the statistical portrait has been created. Appendix 1 discusses the New Economy as it was seen while making this publication.

1.2 A framework to structure the publication

1.2.1 Different interrelationships

The general framework that has been used to select and structure the indicators, applies to the various national levels in the EU. This publication restricts itself to the so-called EU-15 countries, but could also be applied to all members of the EU.

To take into account the different interrelationships, a systems approach has been chosen that helps to highlight the key interrelationships that influence the economy for the medium range, assuming that today the diffusion of ICT through innovation is a dominant dynamic force in the economy.

The framework was to reflect the four pillars of NESIS (see Table 1 below) and be keen on highlighting innovation as a crucial process by which the New Economy is emerging. Concurrently, the framework had to be open to a variety of approaches, however, without leaning on quantified information that is not available.

The framework recognises the main assumptions of the Lisbon strategy, in particular the significance of intercontinental economic competition, the capacities related to the knowledge-based economy and the relevance of the macroeconomic context.

The system involved and its dynamics are based on certain social values and related aspirations, facilitated by available capacities, including learning capacities. Social values as such will not be subject to measurement. In a sense, these are addressed by the political priorities of the EU as expressed in the Lisbon strategy and later additions (for instance, a high priority for economic growth that, however, should meet certain criteria of sustainability and social inclusion).

The policy goals seem to assume a fairly straightforward relationship between innovation, diffusion of ICT and economic growth. In fact, this relationship is considered as a working hypothesis. Consequently, there has been a search for indicators that can monitor the key variables involved in it.

1.2.2 The framework in broad lines

The framework has been reflected below (see Diagram 1). The arrows of the framework highlight the central idea of an economy that is confronting the threats and opportunities of ICT as a pervasive technology under conditions of ongoing globalisation and intercontinental competition.

Central in the framework – as the actual proof of the pudding – is *innovation* and the *change* in *features and performance* it brings in the economy through diffusion and transformation.
Whether the rate and nature of innovation are sufficient to adequately deal with the international and global ICT threats and benefits from emerging opportunities, strongly depends on the National Innovation System. In other words, adequate innovation depends on the national capacities to generate innovations that lead to the production of competitive goods and services. From a policy point of view, these capacities are extremely important as these can be weakened or reinforced by policy measures.

The pervasive character of ICT means that the New Economy will eventually have an impact at the *macroeconomic level* in terms of economic structure, growth, stability, sustainability and social inclusion. Therefore, monitoring at this level is relevant, although it is difficult to unravel causes and effects. Anyhow, there appears to be a significant correlation between macroeconomic performance and the capacities and policies of a country to bring about innovation.

It should be recognised that there are all kinds of feedback mechanisms involved; there is no simple linear succession of clearly defined stages. To keep a clear view, no feedbacks have been drawn as return arrows. However, when interpreting the figures these may come in as important. Generally, the feedbacks can either reinforce certain effects or mitigate them. Other aspects of the feedbacks may be important: are they directly related to the dynamics of the market or, alternatively, are they the (intended or unintended) result of government policies. Besides the above-mentioned general link between macroeconomic performance and available capacities, macro-level phenomena such as inflation, business cycles, volatile international capital, hypes on the stock exchange and erratic consumer behaviour can have a major impact on how the New Economy develops, irrespective of whether these factors are seen as feedbacks or not.

Diagram 1: Framework for the NESIS statistical publication

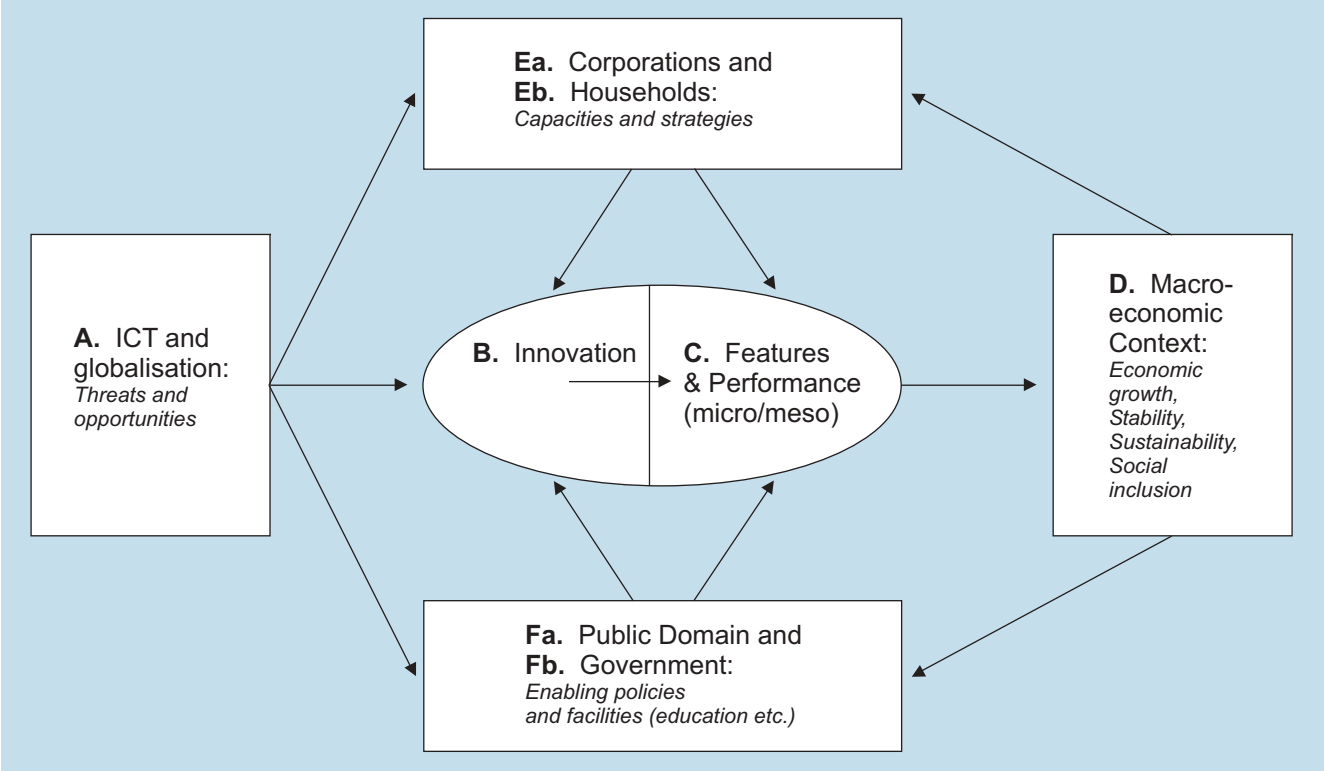


Table 1
The four Pillars of the NESIS project

Pillars	Where in the framework?
Pillar 1 (Macroeconomic stability and sustainability)	Modules A and D
Pillar 2 (Productivity and competition)	Modules B and C
Pillar 3 (Human Investment)	Modules E and F
Pillar 4 (Social Inclusion)	Modules D and Eb

This publication is primarily focused on existing indicators which could be quantified by means of official statistical data. These indicators are designated as 'key' indicators.

1.2.3 Explanation of the framework's modules

The different modules of the framework are briefly characterised below. Further explanation will be given in the chapters 2–7.

Module A. The framework takes as its starting point the global challenges that the New Economy generates for the European Union and its member states. These challenges lie in the ability of the EU economies to play a prominent part in launching interesting innovations, both in terms of advanced ICT-based hard and soft ware and in terms of innovations (better products and processes) in general, which can be assumed to incorporate the best available technology. In particular, the large corporations in the different continents are entangled in survival battles whereby they either work together or cut each other out. Moreover, globalisation implies that high quality and low costs tend to go together, as for each of them the large corporations choose their locations wherever they want. Moreover, relatively cheap but increasingly skilled labour is available in countries like India and China. The role of multinational companies is crucial in the development and launching of new high-tech products, but early adoption, requiring highly skilled labour, innovative SMEs and well-developed supporting structures, will be equally important. Crucial indicators in this module are: GDP, economic growth, productivity as well as international trade and investments.

Module B represents the results of the innovation process. The most convincing evidence of economic advancement and creativity lies in the companies that actually succeeded in launching concrete innovations in a particular period of time. However, R&D efforts and patents also belong to this module; these refer to the initial stages of innovation. Here, it makes sense to look at both innovations in general and innovations produced by the ICT sector and other knowledge-intensive sectors.

Module C reflects the economy at micro level. Innovations (especially those that make use of ICT) promise to lead to a better performance. Here, the adoption of new ICT technology involves changes in processes accompanied by training and other ways of learning. Contributions to economic growth may lead to additional material and human investments that strengthen the existing innovatory capacities. Experience of successes and failures may also feed back to capacity building and to the strategies that companies develop to be successful in the New Economy (module Ea).

Module D represents the macroeconomic context of the emergence of ICT in its different appearances and impacts on the economy at large. It is hardly possible to lay precise links between the emergence of ICT, a national economy's innovatory capacities and economic growth. Nonetheless, economic growth in general is an important reference in considering the effects of the New Economy on the national economy. The same holds for stability and sustainability. Stability is focused on the business cycle, while sustainability is considered by looking at some major environmental impacts of economic activity. Social inclusion is restricted here to indicators on income distribution and long-term unemployment (but also see Module Eb).

Modules E (*Ea* and *Eb*) and *F* (*Fa* and *Fb*) are inspired by the concept of National Innovation System (NIS) and mark the

integration of the digital economy with the knowledge-based economy.

Module Ea represents the capacities and strategies of corporations to launch and adopt innovations. Here the management of knowledge plays an important role. For a great deal knowledge is embodied in a company's workers; therefore HRM is relevant here as well. Moreover, companies derive innovation capacities from their R&D and market strategies as well as from the networks they have in place and participate in.

Module Eb represents the capacities and strategies of households in the New Economy. In B2C relationships a successful application of ICT depends on the readiness of households to make use of the Internet as a means to collect information and participate in e-commerce and e-business.

Module Fa represents the capacities of the public domain to realise and facilitate innovations. Particularly, one has to take account of the merits of the educational system as demonstrated in the size and quality of the educated labour force. Moreover, conditions for entrepreneurship and creativity should be considered.

Module Fb involves government policies that give support to the innovation process.

For each module of the framework indicators were selected. Chapters 2 to 6 deal with the different modules of the framework, showing relevant indicators, offering commentaries and in most cases a composite indicator that summarises the results for the countries involved. For the criteria used to select the key indicators see Appendix 2.

2. ICT and globalisation: opportunities and threats *(Module A)*

– *Between 1990 and 2002, of the largest European countries, only the United Kingdom had growth rates that came close to the American ones. In 1990, GDP per capita in the UK was below the EU-15 average, but because of its higher growth rates, it was above average around 2000.*

– *For the EU-15, Japan and the United States, the share of the business sector services in the total economy was increasing during the nineties of the previous century. The United States was obviously ahead of both Japan and the EU-15 as a service economy.*

– *The United States and Japan have outperformed the EU-countries in terms of the share of high-tech manufactures in the total economy.*

– *Labour productivity in the United States is significantly higher than the EU-15-average. However, in a number of EU-15 countries, labour productivity was comparable to that of the United States, such as France and Italy. Labour productivity in Japan is below the EU-15 average.*

– *In 2002 the EU-15 had a trade-to-GDP ratio which was substantially higher than that of Japan and the United States. This shows that the EU-15's economy is a very open one.*

– *The United States had a level of foreign controlled turnover that is roughly similar to that of the big European countries.*

2.1 Introduction

The New Economy is a worldwide phenomenon, creating a globalised arena for competition within the dynamic context of fast technological change, innovation and light-hearted consumer behaviour. This chapter presents a number of indicators that are helpful in judging the relative economic position of the European Union (EU-15) vis-à-vis the United States (US) and Japan. From a benchmarking point of view, the indicators are there to consider both the opportunities and threats that the EU is confronted with. Whether the EU is capable of becoming the most dynamic economy in the world – which is expressed as a priority by the EU's Lisbon Summit in 2001 – is a tough issue requiring an inquisitive mind and a willingness to take action where and when needed.

The Lisbon Summit goals induce a comparison of competitive strengths of the EU on the one hand and the US and other economic blocks on the other. The international arena creates both opportunities and threats for the EU's economy. These relate to the growing availability of ICT that can be used to improve business processes. Where economies of scale matter, first mover advantage in innovation is likely to be significant. Moreover, the possession of standards or operational demand-led production systems may provide strong competitive advantages. To get at these, it is necessary to develop imaginative strategies and put these into practice.

Where such business gets off the ground, intangible capital – in terms of organisational, informational and human qualities – is being built up, leading to productivity gains and a capacity to innovate. Although the build-up of intangibles is not restricted to certain classes of enterprises, it is of particular importance to the large multinational companies, as they as global players feel strongest the need to be in the forefront of innovation and make use of the best possible technology. In this chapter the United States and Japan represent the global arena for the EU.

2.2 Selected indicators

2.2.1 Selected key indicators

The following key indicators have been selected:
– GDP per capita in PPS
– Value added of business sector services
– Value added of manufacturing ICT sector
– Value added of high-tech manufactures
– Labour productivity per person employed
– Trade-to-GDP ratio
– Export of ICT goods
– Foreign controlled manufacturing
– Foreign controlled services

GDP per capita in PPS. Amongst the indicators suitable for comparing the performance of the economy as a whole, real GDP per capita is the most prominent one. Generally, the overall affluence created by a country's economy in a certain year as expressed in GDP can be criticised as a measure of prosperity or well-being, but it is nonetheless widely used as the main indicator of economic success.

Differentiation of comparative economic performance indicators into high-tech manufactures, knowledge-intensive services and the ICT sector is helpful in better understanding the strengths and weaknesses of the different economic blocks in the world. These productive clusters represent a country's or economic block's participation in the advanced areas of the New Economy. Although preference was given to the knowledge-intensive services, the available materials did not sufficiently permit this. Therefore, the following three key indicators appeared:

– *Value added of the business sector services* as a percentage of the whole economy (GDP) is an indication of the role of services in the economy. The assumption is that the New Economy and the services need each other, especially where these are knowledge-intensive.

– *Value added of manufacturing ICT sector* as a percentage of the whole economy (GDP) is indicative of a country's or block's ability to benefit from the demands for ICT products and services.

– *Value added of high-tech manufactures* as a percentage of the whole economy (GDP) indicate to what extent an economy participate in the technologically advanced segments of the economy. This will also involve the production of ICT products and services.

Labour productivity per person employed is a major source of economic growth. In circumstances where the labour force has been increased by reducing low participation of women in paid jobs and early dropping out of older workers, while at the same time the population is aging, economic growth will strongly depend on increases in labour productivity.

Trade-to-GDP ratio is a measure for the openness of the economy to foreign products and services. It is defined as the sum of imports and exports relative to GDP, and it is an indicator for the relative openness of an economic block to international trade and globalisation.

Export of ICT goods is another measure of the strength and importance of a country's ICT sector. Participation in exports

indicates international competitiveness. This indicator reflects an important aspect of globalisation.

Foreign controlled manufacturing indicates a country's relative integration in the world economy. This can also be seen as a major aspect of globalisation.

Foreign controlled services indicate to what extent a country's services are part of the international economy. This can be seen as a major aspect of globalisation.

2.2.2 Selected auxiliary indicators

The following indicators have been added as auxiliary indicators:
- Real GDP growth rate
- Foreign controlled high-tech manufactures
- Foreign controlled knowledge-intensive services
- Foreign controlled high-tech knowledge-intensive services

Real GDP growth rates show recent economic overall success. Where real GDP growth is bigger than population growth, real GDP per capita will increase ('real' means: in constant prices). To interpret real GDP growth rates, it is important to relate them to the business cycle. If high or low growth rates are shared with many countries, then the business cycle comes into play. Individual countries may have their own specific development, dependent on either structural strengths or weaknesses or on particular economic policies. Comparing intercontinental developments, it is important to take time lags in the business cycles into account (e.g. recovery from a recession may start in the United States).

Foreign controlled high-tech manufactures, knowledge-intensive services and foreign controlled high-tech knowledge-intensive services give a more specific indication of the extent to which certain sectors of a national economy are subject to the globalisation of the international economy.

The table below presents the key indicators, the auxiliary indicators and boxes discussing special issues and how they relate to each other.

Indicators in Module A

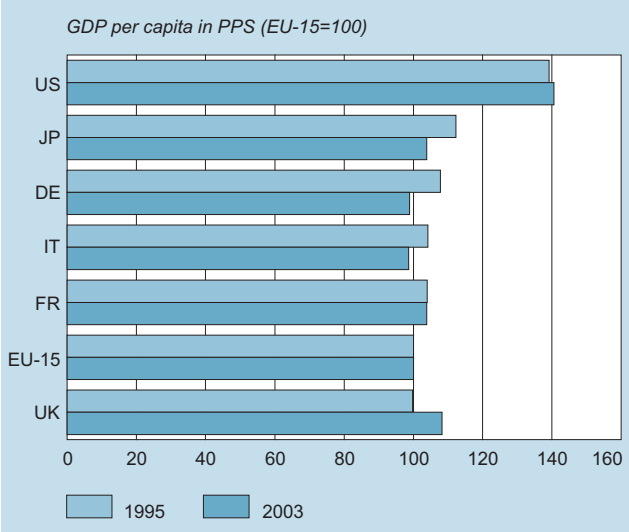
Key indicators	Auxiliary indicators
GDP per capita in PPS	– Real GDP growth rate – BOX A: Growth disparities – BOX B: Americans work on the job, Europeans work at their leisure – BOX C: National Responsibility Index
Value added of business sector services	
Value added of manufacturing ICT sector	– BOX D: The fearful don't win
Value added of high-tech manufactures	
Labour productivity per person employed	– BOX E: Hours actually worked per person employed
Trade-to-GDP ratio	
Export of ICT goods	
Foreign controlled manufacturing	– Foreign controlled high-tech manufactures
Foreign controlled services	– Foreign controlled knowledge-intensive services – Foreign controlled high-tech knowledge-intensive services

2.3 Quantified indicators

2.3.1 GDP per capita in PPS

The GDP per capita is a measure of the prosperity of a country. Although this single figure obviously cannot give a complete picture of the economy and the wealth derived from it, it is seen – as said before – as the main economic success indicator. The statistics are based on Purchasing Power Parities (PPP). [1)]

A01 Gross Domestic Product (GDP) at market prices per capita in Purchasing Power Standards (PPS)



Source: Eurostat: Structural Indicators.

The United States has the highest GDP per capita. In 2000 it was about 40 percent higher than that of the EU and Japan. This reflects the higher labour productivity and labour use rate in the US. The gap in terms of GDP per capita between the US and other economic blocks has grown over the previous 10 years.

GDPs per capita of the largest economies in the EU have converged to similar levels in previous years; since 1990, the difference between the EU-countries was becoming much smaller. The EU-15's GDP per capita also came closer to that of Japan.

BOX A Growth disparities

The growth disparities can only be understood by examining the fundamental determinants of economic growth throughout the OECD-countries. It should be noted that cross-country comparisons of economic performance are complicated by a number of measurement issues, including different approaches used in calculating the value of economic output and the size of the stock of machinery and equipment. However, differences in measurement are unlikely to account for more than a modest proportion of the observed differences in growth rates between countries. In the United States, for example, the use of chain weighted indexes (as opposed to fixed-weighted indexes) to calculate GDP has tended to understate economic growth in recent years. This has been more or less offset, however, by the United States practice of using 'hedonic' price measures, which has tended to boost estimates of real GDP during the same period.

Hedonic price measures adjust the market prices of goods to take account of changes in the characteristics of goods. Hedonic measures are most notably being used at the present time to take account of the rapid pace of change in computer hard ware and software.

Source: OECD, 'Understanding Economic Growth', 2004.

BOX B Americans work on the job, Europeans work at their leisure

One of the explanations for why material wealth in the US is greater than in Europe is that Europeans choose to work less hours than Americans. Viewed in this light, Europe's lower level of material prosperity results from its own choice to have more leisure.

It is true that most European countries have fewer hours worked in the market sector (out of the total number of hours worked) compared with the US. The table below shows the so-called LS ratio (Labour Supply Ratio) in a number of European countries and in the US. This ratio relates the actual number of hours worked in the economy's regular employment sector to the number of hours which would be worked if all individuals of adult age (16–64) worked full time, which of course is unrealistic and undesirable. The table below gives the LS ratio for a number of countries.

Labour-supply ratio

United States	0.74
United Kingdom	0.67
Switzerland	0.67
Sweden	0.66
Finland	0.63
Denmark	0.62
Ireland	0.59
Greece	0.58
Spain	0.57
Netherlands	0.55
Germany	0.53
France	0.53
Belgium	0.51
Italy	0.48

The US uses 74 percent of its total labour potential as against, for instance, 48 per cent in Italy.

It is a well-known fact that not all absence from work amounts to leisure. On top of paid, recorded work, we have unpaid work in the home, the extent of which is of course hard to measure. One Swedish study shows that total informal work, consisting of both moonlighting and work in the house, exceeds the work in the market. Stretching things a little, perhaps Americans work more at the things they specialise in than people in Europe, which of course is basically good for productivity and growth.

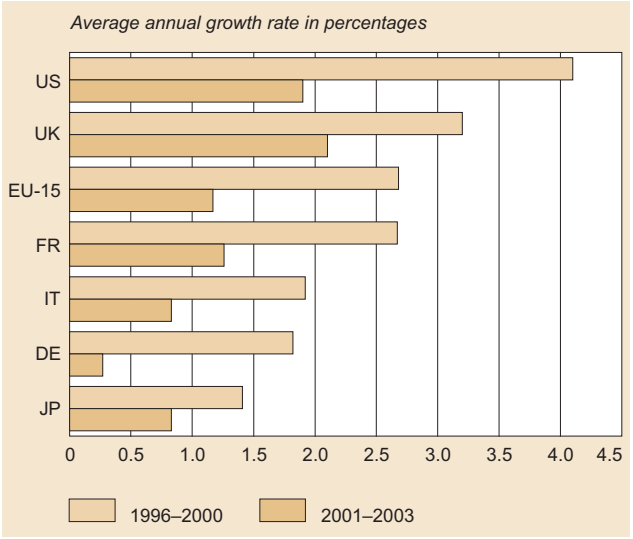
Source: F. Bergström and R. Gidehag, 'EU versus US', TIMBRO, Stockholm (S), 2004

2.3.2 Real GDP growth rate

The growth rates of real GDP show that the US economy continuously grew faster than the EU's economy. The Japanese economy was growing at a high rate until about 1991, but after that, it went through a decline (partly associated with the Asia Crisis) with 1998 as the lowest point.

Of the largest European countries, only the United Kingdom between 1990 and 2002 had growth rates that came close to the American ones. In 1990, GDP per capita of the UK was below the EU average, but because of its higher growth rates, it was above average around 2000. Germany showed the opposite: in 1990 it had the highest GDP per capita but since then, of the four largest EU-economies, it had the lowest growth rates. The main explanation for this could be the German reunification after the fall of the Berlin Wall in 1989.

A01aux Growth rate of the Gross Domestic Product (GDP) at constant prices (1995=100)



Source: Eurostat: Structural Indicators.

As of 2001 all growth rates went down, indicating economic recession.

BOX C National Corporate Responsibility Index

In a globalising economy the behaviour of countries and their business community in terms of corporate responsibility does not only have an impact on prosperity nationally but also internationally, as it, for instance, makes a difference as to the way companies and workers in supplying countries, particularly in developing countries, are treated.

The National Corporate Responsibility Index measures the relative position of countries in terms of corporate responsibility by taking the following factors into account: corporate governance structures, ethical business practices, progressive policy formulation, building human capital, engagement with civil society, aspects of public finance such as spending on education, and environmental management.

Scores of 51 countries are available. The table below gives the scores and ranking of the EU-15 countries Germany, United Kingdom, France and Italy as well as those for the US and Japan.

National Corporate Responsibility Index

Ranking	Country	Score
7	United Kingdom	69.0
12	Germany	66.2
15	France	64.8
19	Italy	60.4
22	Japan	60.0
23	United States	59.4

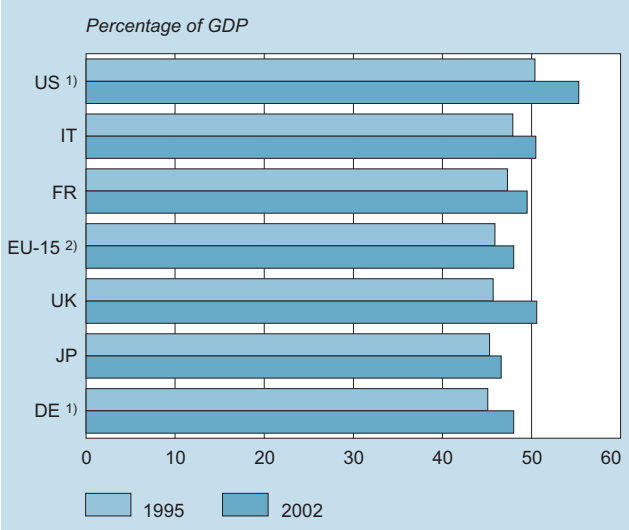
The highest rankings involve the Scandinavian countries, Switzerland and the Netherlands.
Statistical analysis shows that a good record of corporate responsibility is not detrimental to GDP per capita (PPP). On the contrary, there are signals of a positive effect.

Source: A. MaxGillivray, 'Corporate Responsibility: Measuring National Competitiveness', Accountability Forum, nr 1, 2004; p 16–22.

2.3.3 *Value added of business sector services*

In all countries presented, the share of the business sector services in the total economy has been increasing during the nineties of the previous century. The EU-15 average in 2000 is lower than that of the US and Japan. The latter country has overtaken the EU-15, but the difference is small. The US is obviously ahead of both Japan and the EU-15 as a service economy. Of the four big EU-countries, the UK has the highest share of services in the total economy.

A02 Value added of business sector services (ISIC Rev 3 division: 50–74)

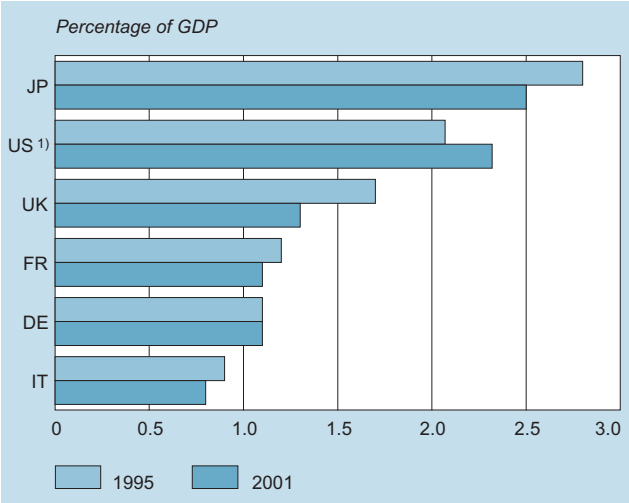


1) 2001. 2) 1999. Source: OECD: STAN Indicators 2004.

2.3.4 *Value added of manufacturing ICT sector*

The manufacturing ICT sectors of Japan and the USA are, relative to GDP, substantially larger than those of the big EU-15 economies. Except for Germany and the USA, the share of the ICT manufacturing level in GDP has diminished somewhat. This can partly be explained by a greater role of the services, also in the knowledge-intensive segments of the economies. What the figures do not reveal here is that a notable part of the ICT production in the big EU-15 countries is owned by foreign enterprises, among which Japanese, American and Korean companies are most dominant.

A03 Value added of manufacturing ICT sector (ISIC Rev 3 classes: 3000, 3130, 3200, 3312 and 3313)



1) Own estimates for the years 1996 and 2000.
Source: OECD: STAN Indicators 2004 / ICT Sector Data & Metadata.

BOX D The fearful don't win

To nurture a successful economy, a country must adopt and adapt new technologies quickly – a practice that turns small companies into big companies.

The difference between the United States and Europe in this respect is demonstrated by the fact that in the United States, many of the biggest companies are relative newcomers, whereas none of Europe's major companies were formed after 1960.

The difference largely stems from differences in attitude towards risks and failure. If new technologies are to be exploited fully, companies have to be bold and experimental. This is not a failsafe process, and some companies will not succeed. Europe needs to recognise this, and be willing to accept that economic success involves – even requires – winners and losers.

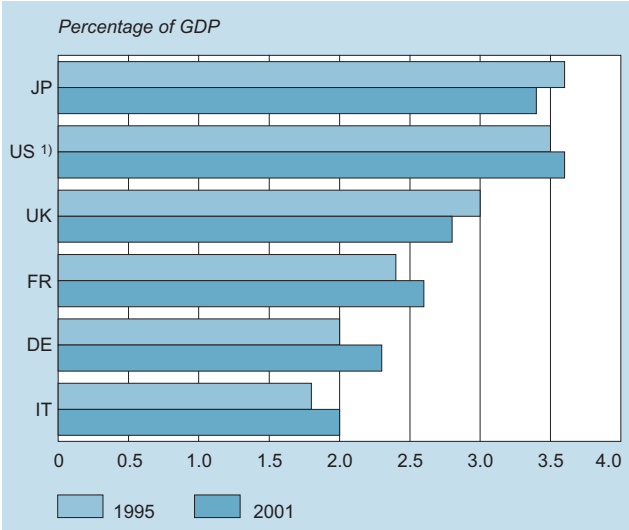
At the same time, it must create a climate in which first-time and second-time losers can be third-time winners. It can do this partly by making it a lot easier for people to form new companies, even after their previous company folded. Europe should also remove the stigma attached to leaving one's current company to form a new one. By embracing these attitudes, by encouraging entrepreneurship and seeing failure as a stepping-stone to better things, Europe can achieve a higher rate of long-term success.

Source: L.C. Thurow, MIT, Innovation Lecture 2002 'Closing the Gap', Ministry of Economic Affairs, The Netherlands (www.innovationlecture.nl).

2.3.5 *Value added of high-tech manufactures*

From figure A04 it appears that the US and Japan have outperformed the EU countries in terms of the share of high-tech manufactures in the total economy. EU-15 figures are not available here, but the positions of the biggest four EU countries lend sufficient support to this conclusion. The UK is the EU country that is strongest in producing high-tech manufactures, although its percentage for 2000 is lower than those for 1995 and 1990. This tendency for a part echoes the rise of services in the UK.

A04 Value added of high technology manufacturing sector (ISIC Rev 3 classes: 2423, 3000, 3200, 3300 and 3530)



1) 2000. Source: OECD: STAN Indicators 2004.

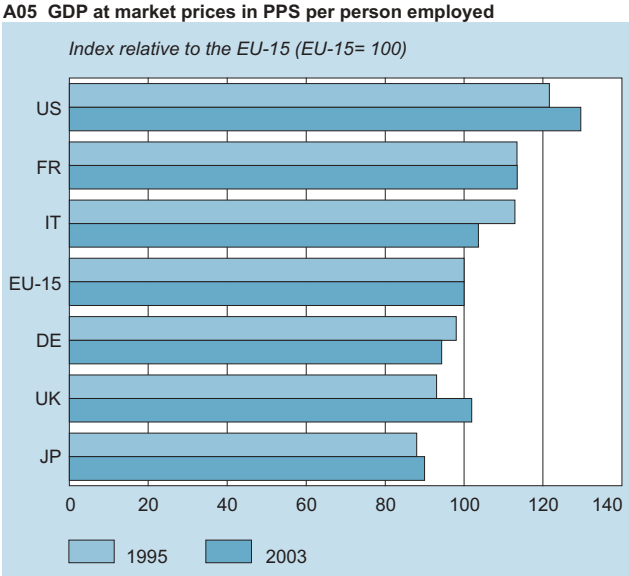
2.3.6 *Labour productivity*

Labour productivity, defined as GDP per employed person, is expressed here as an index, the EU average being 100. GDP is expressed in PPP, meaning that labour productivity is corrected for the effects of exchange rates and differences in purchasing power of the different currencies.

Measured thus, labour productivity in the US is significantly higher than the EU-15 average. However, the European economy is not homogeneous; some countries have a productivity that is comparable to that of the US, such as France and Italy. Labour productivity in Japan is below the EU-15 average.

The difference between labour productivity per employed person between the US and the EU can be partly explained by the higher average number of hours worked per employed person on a yearly basis.

A05 GDP at market prices in PPS per person employed



Source: Eurostat: Structural Indicators.

BOX E Hours actually worked per person in employment

Labour productivity in terms of GDP per person in employment conceals the fact that there are significant differences in the average annual hours actually worked per employed person. The following table provides data in this area.

Hours actually worked per person employed

Country	1990	2000	2003
	Average number of hours per year		
United States	1 829	1 827	1 792
Japan	2 031	1 821	1 801
United Kingdom	1 767	1 708	1 673
Italy	1 655	1 613	1 591
France	1 618	1 500	1 453
Germany	1 541	1 463	1 446

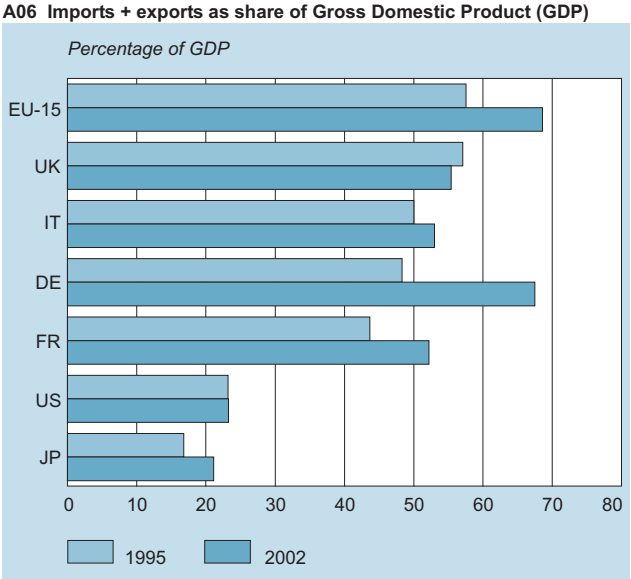
The figures reveal that since the beginning of the nineties of the previous century there is a general tendency for the annual hours actually worked per person in employment to decrease. In 2003 Japan had the highest average. Over the years this average in the US underwent the lowest decrease compared to the largest EU-15 countries and Japan. Germany had the lowest average. For 2003 the German average annual hours actually worked per person in employment was 81 percent of that for the US. Of course, advanced technology and efficient ways of working could offset such differences. However, in the light of these figures, it is no surprise that there is emerging a call by economists and politicians for reversing the tendency in the EU of diminishing working hours per person in employment.

Source: OECD Employment Outlook 2004.

2.3.7 *Trade-to-GDP ratio*

The trade-to-GDP ratio is the sum of the imports and the exports of an economy expressed as a percentage of GDP. The high ratios for the EU-15 and the big EU countries indicate that the EU is a more open economy than the other large blocks, Japan and the US. The difference between the latter blocks and the EU has grown since 1991: while the EU had a large growth of external trade, from 53% to 69% of GDP in 2002, the trade-to-GDP ratios of Japan and the US rose by only 2 and 3 percent, respectively.

A06 Imports + exports as share of Gross Domestic Product (GDP)



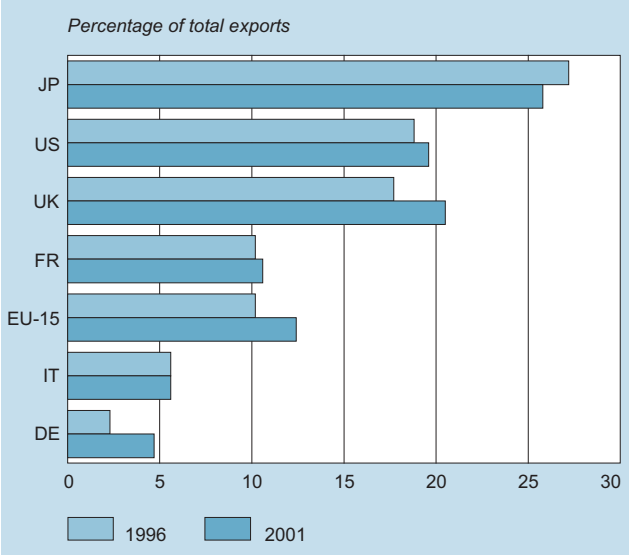
Source: Eurostat.

2.3.8 *Export of ICT goods*

The share of ICT goods in the total exports of goods and services depends mainly on two factors: the size of the ICT sector in a country's economy, and the importance of overseas markets for the sector. Considering the relatively large size of the US's ICT sector, the share of ICT exports is relatively low. The ICT companies in the US have a stronger orientation towards the national markets than, for instance, the Japanese ICT sector. For a broader view, it is also important to consider the overseas establishments of ICT companies and leadership in global ICT product chains.

The UK's ICT exports as a share of total exports are highest within Europe, while Germany has the lowest score. These figures fit in with those about the ICT sectors' value added (see figure A03). Until 2000, the ICT export share of total exports was growing in all three economic blocks. After that, the share of ICT exports in total

A07 Export of ICT goods



Source: Eurostat: Comext database.

exports went down, which can be related to a general economic slowdown (to which obviously ICT products are relatively sensitive).

2.3.9 Foreign controlled services and manufacturing turnover

The large-scale sale of products and services makes it possible to benefit from economies of scale and to recover the costs associated with costly high-tech investments. Often this can be achieved through global markets, which require open borders. The New Economy is stimulated by the possibility of a world-wide market for new products and services.

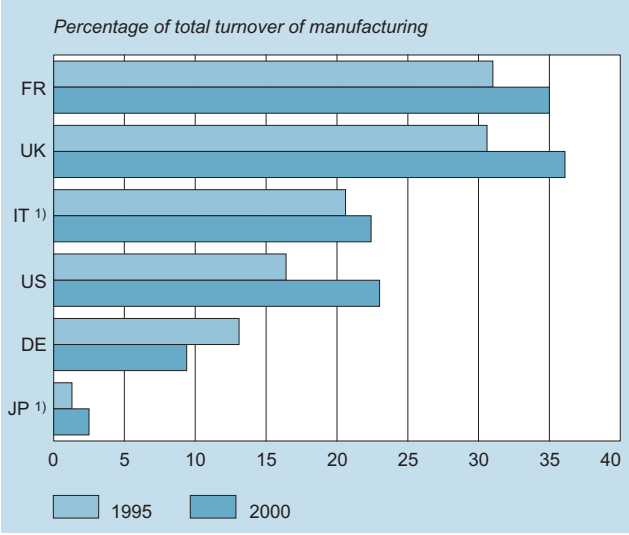
Another important aspect of globalisation is the willingness of a country to allow foreign enterprises to take part in its national economy. Here, this is measured by the fraction of turnover in services and manufacturing that is controlled by foreign corporations, as a result of so-called “inward investments” in a country. This indicates that not only completed products are distributed worldwide, but also that companies based in one country make investments in production sites in other countries. Overseas investments are a phenomenon with a long history. New Economy-inspired globalisation, however, is chain-oriented, for instance combining low-wage locations in one part of the world (for assembly) with advanced knowledge-intensive locations in another part (for R&D and design).

In France and the UK, foreign controlled manufacturing turnover accounts for a third of the total turnover in manufacturing. This is a very high fraction if compared for example with Germany. Relative to the big European countries, the United States has a roughly comparable level of foreign controlled turnover. Japan on the other hand is a closed economy, with only 2.5% of the manufacturing turnover generated in foreign controlled enterprises.

It should be noted that on average about half of the turnover in European countries is controlled by enterprises based in other EU countries. This means that the EU-wide figures will be considerably lower here than those of the individual member states.

The level of globalisation is rising in most countries. Only in Germany, foreign controlled turnover in manufacturing had fallen by about 5% between 1991 and 2001.

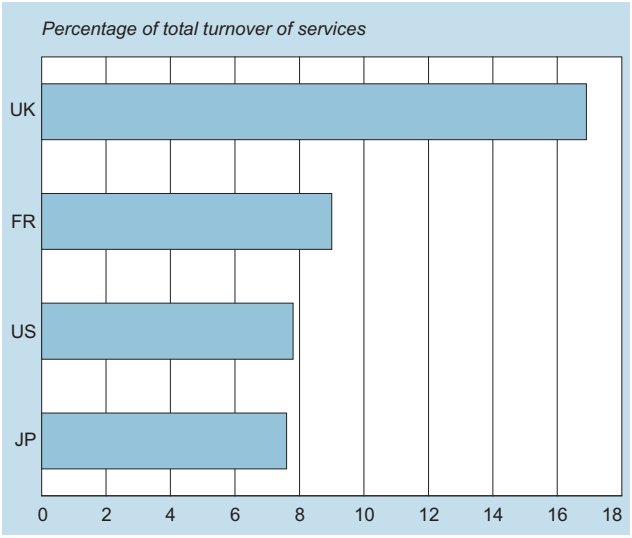
A08 Turnover of enterprises in manufacturing under foreign majority control



1) 1999.

Source: OECD: AFA and FATS databases.

A09 Turnover of enterprises in services under foreign majority control, 1997/1998



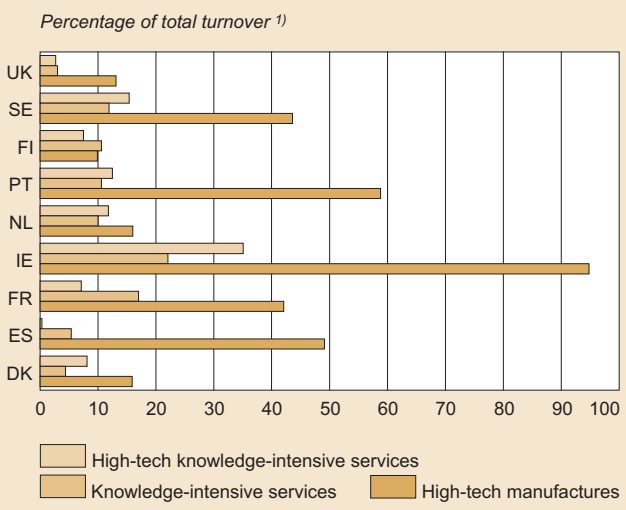
Source: OECD: AFA and FATS-databases.

The statistics on foreign-controlled enterprises in the services sector are sparse. The most complete data date from 1997 or 1998, and cover only a few countries. It is clear that in most countries, the services sector is less international than the manufacturing sector. Japan is the exception here, but also in the services it scores lower than the other large economies.

2.3.10 Foreign controlled high-tech manufactures and knowledge-intensive services

The level of foreign control in European countries is higher in the high-tech sector than in the overall manufacturing sector (see figure A02aux-A04aux). Ireland and Portugal have been prominent in attracting a great deal of foreign investments in the high-tech sector. However, also France, Sweden, Spain and Portugal have shares of high-tech manufacturing under foreign control exceeding 40 percent. Unfortunately, comparable data is not available for the US and Japan.

A02aux-A04aux Foreign controlled high-tech manufactures, knowledge-intensive services and high-tech knowledge-intensive services, 2000



1) Of the relevant industry. Source: Eurostat, OECD FATS database.

2.4 Conclusion

Benchmarking the New Economy achievements of the EU-15, Japan and the US leads to the general conclusion that the US was leading in various ways. GDP per head was higher in the US than in the EU-15 and the big EU-15 countries. The same holds for average growth rates and labour productivity over recent years.

In terms of GDP per head for 2003, the EU-15 average was still below that of Japan, but has come close to it. This was caused by Japan's lower growth rates over recent years. Japan's labour productivity was notably lower than that of the EU-15. This was clearly offset by a higher labour service ratio.

As manufacturers of ICT products, Japan (and the US, considering this country's position as exporter of ICT goods) outperformed the EU-countries. These positions seem hard to challenge. A more important role of the knowledge-intensive services – including design and marketing – could compensate for this, creating new arenas for economic development and competition. The ability to adopt new technologies quickly remains a success factor here, especially when, besides Japan and the US, the emerging economies of countries such as India, China and Brazil are also taken into account.

Note in the text

1) PPP is a fictive currency unit, incorporating not just the exchange rate of the currencies of the various countries, but also relative price levels. GDP in PPS makes it possible to make correct comparisons between countries for a certain period but cannot be used for comparison over time. Changes in the GDP can be compared using the growth rate of the real GDP, the next indicator.

Annex A: Key data tables

Table A01
GDP per capita in PPS

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Index relative to the EU-15 (EU-15=100)													
United States	.	135.8	137.3	140.1	140.7	139.2	140.0	141.0	140.7	142.2	142.6	139.9	139.4	140.6
Japan	.	114.1	114.0	114.9	113.2	112.3	113.9	113.1	108.3	105.9	106.2	104.7	102.9	103.8
EU-15	.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
France	.	105.9	106.1	105.6	104.9	104.0	103.4	104.0	104.1	103.9	103.7	104.7	104.8	103.8
Germany	.	109.2	110.1	109.0	108.6	107.8	107.2	105.1	103.9	103.0	101.9	100.5	99.4	98.9
Italy	.	104.6	104.5	104.1	103.6	104.2	104.0	102.5	103.2	101.9	101.3	100.0	99.8	98.6
United Kingdom	.	95.6	94.8	97.6	99.3	99.7	101.1	103.5	103.3	102.9	103.8	105.1	107.4	108.2

Indicator definition: Gross Domestic Product (GDP) at market prices per capita in Purchasing Power Standards (PPS).
Source: Eurostat: Structural Indicators.

Table A02
Value added of business sector services

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
United States	48.4	49.1	49.4	49.5	49.7	50.4	50.8	51.9	53.4	53.8	55.0	55.3	.	.
Japan	40.5	41.4	42.4	43.4	44.4	45.3	45.2	45.4	45.6	45.4	45.3	46.3	46.6	.
EU-15	43.6	44.1	44.7	45.7	45.8	45.9	46.3	46.9	47.5	48.0	.	.	.	.
France	47.0	47.2	47.2	47.9	47.7	47.3	47.6	48.1	48.2	48.9	49.4	49.3	49.5	.
Germany	41.4	42.0	42.6	44.2	44.5	45.1	45.7	46.3	46.6	47.2	47.6	48.0	.	.
Italy	44.8	45.4	46.0	47.1	47.4	47.9	48.4	48.6	49.0	49.4	50.0	50.0	50.5	.
United Kingdom	43.7	44.3	45.2	45.8	46.0	45.7	46.0	47.1	49.2	49.8	50.1	51.0	50.6	.

Indicator definition: Value added of business sector services (ISIC Rev 3 division: 50–74).
Source: OECD: STAN Indicators 2004.

Table A03
Value added of manufacturing ICT sector

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
United States	.	.	.	.	.	.	1.8	2.1	2.1	2.1	2.3	.	.	.
Japan	.	.	.	.	2.7	2.8	2.9	3.0	2.8	2.9	3.2	2.5	.	.
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.	.
France	1.5	1.4	1.3	1.2	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.1	.	.
Germany	.	.	.	.	.	1.1	1.1	1.1	1.2	1.2	1.4	1.1	.	.
Italy	.	.	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.7	0.9	0.8	.	.
United Kingdom	.	.	.	1.6	1.7	1.7	1.7	1.8	1.7	1.6	1.6	1.3	.	.

Indicator definition: Value added of manufacturing ICT sector (ISIC Rev 3 classes: 3000, 3130, 3200, 3312 and 3313).
Source: OECD: STAN Indicators 2004 / ICT Sector Data & Metadata.

Table A04
Value added of high tech manufactures

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
United States	3.8	3.8	3.7	3.5	3.5	3.5	3.6	3.6	3.6	3.5	3.6	.	.	.
Japan	4.2	4.2	3.8	3.6	3.5	3.6	3.7	3.7	3.5	3.7	3.9	3.4	.	.
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.	.
France	2.4	2.3	2.3	2.2	2.2	2.4	2.3	2.6	2.5	2.6	2.5	2.6	.	.
Germany	3.0	2.9	2.6	2.3	2.2	2.0	2.0	2.1	2.1	2.3	2.5	2.3	.	.
Italy	2.3	2.1	2.0	2.0	2.0	1.8	1.8	1.8	1.8	1.8	1.9	2.0	.	.
United Kingdom	3.3	3.2	3.0	2.9	3.1	3.0	3.0	3.1	3.0	3.0	2.9	2.8	.	.

Indicator definition: Value added of high technology manufacturing sector (ISIC Rev 3 classes: 2423, 3000, 3200, 3300 and 3530).
Source: OECD: STAN Indicators 2004.

Table A05
Labour productivity per person employed

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Index relative to the EU-15 (EU-15=100)													
United States	.	124.2	124.8	124.3	122.9	121.6	121.8	122.3	122.5	124.3	125.3	125.4	127.4	129.6
Japan	.	93.0	90.7	89.4	87.8	88.0	89.0	88.3	86.7	86.9	88.8	89.0	89.0	90.0
EU-15	.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
France	.	116.7	116.3	115.4	114.2	113.4	112.7	114.0	114.5	114.2	113.5	114.2	114.3	113.5
Germany	.	98.1	99.3	98.4	98.0	98.0	97.9	97.1	96.4	95.9	94.9	94.0	93.8	94.3
Italy	.	111.2	109.9	110.4	111.3	112.9	112.3	111.1	112.7	111.7	111.0	108.7	105.3	103.6
United Kingdom	.	85.7	90.8	92.4	93.0	93.0	93.6	95.0	95.6	95.7	97.3	99.2	101.1	101.9

Indicator definition: GDP at market prices in PPS per person employed.
Source: Eurostat: Structural Indicators.

Table A06
Trade-to-GDP ratio

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
United States	20.4	20.4	20.6	20.7	21.7	23.2	23.5	24.2	23.7	24.2	26.2	24.1	23.3	.
Japan	19.9	18.3	17.5	16.0	16.1	16.8	18.9	20.4	19.6	18.6	20.2	20.2	21.1	.
EU-15	.	52.6	51.8	51.7	54.4	57.5	58.1	61.6	62.6	63.6	71.4	71.0	68.6	.
France	43.5	43.5	42.5	40.0	41.6	43.6	44.5	48.0	49.6	49.6	55.9	54.3	52.2	.
Germany	.	52.8	49.3	45.4	46.8	48.3	49.6	54.5	56.6	58.5	67.2	68.6	67.5	.
Italy	39.4	37.1	38.2	41.3	44.2	50.0	46.7	48.7	49.3	49.0	55.6	55.3	53.0	.
United Kingdom	50.6	47.4	48.4	52.0	53.7	57.1	59.1	57.3	54.6	54.6	58.2	57.4	55.4	.

Indicator definition: Imports + exports as share of Gross Domestic Product (GDP).
Source: Eurostat: Structural Indicators.

Table A07
Export of ICT goods

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of total exports													
United States	15.4	.	.	.	.	.	18.8	19.7	19.4	20.7	22.2	19.6	.	.
Japan	26.0	.	.	.	.	.	27.2	27.1	26.3	26.8	28.4	25.8	.	.
EU-15	8.4	.	.	.	.	.	10.2	10.6	11.3	12.0	13.3	12.4	.	.
France	7.6	.	.	.	.	.	10.2	11.0	11.6	11.0	12.2	10.6	.	.
Germany	7.7	.	.	.	.	.	2.3	2.7	3.0	3.4	5.2	4.7	.	.
Italy	5.9	.	.	.	.	.	5.6	5.3	5.5	5.5	5.7	5.6	.	.
United Kingdom	12.4	.	.	.	.	.	17.7	16.5	18.6	19.3	20.5	20.5	.	.

Indicator definition: Export of ICT goods.
Source: Eurostat: Comext database.

Table A08
Foreign controlled manufacturing

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of total turnover of manufacturing													
United States	.	.	.	.	.	16.4	16.8	17.6	21.1	22.2	23.0		.	.
Japan	.	.	1.2	1.2	1.4	1.3	1.2	1.6	1.8	2.5	.	.	.	.
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.	.
France	.	.		30.0	28.7	31.0	31.2	32.0	31.7	33.6	35.0		.	.
Germany	.	14.7	14.8	13.3	13.3	13.1	12.8	12.5	10.8	10.1	9.4	8.2	.	.
Italy	.	.	.	.	.	20.6		21.8	.	22.4	.	.	.	.
United Kingdom	.	.	.	.	.	30.6	33.2	31.4	.	36.1	.	.	.	.

Indicator definition: Turnover of enterprises in manufacturing under foreign majority control.
Source: OECD: AFA and FATS-databases.

Table A09
Foreign controlled services

Country	1990	1991	1992	1993	1994	1995	1996	1997 / 1998	1999	2000	2001	2002	2003
	Percentage of total turnover of services												
United States	.	.	.	.	.	.	.	7.8	.	.	.	.	.
Japan	.	.	.	.	.	.	.	7.6	.	.	.	.	.
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.
France	.	.	.	.	.	.	.	9.0	.	.	.	.	.
Germany	.	.	.	.	.	.	.	.	.	.	.	.	.
Italy	.	.	.	.	.	.	.	.	.	.	.	.	.
United Kingdom	.	.	.	.	.	.	.	16.9	.	.	.	.	.

Indicator definition: Turnover of enterprises in services under foreign majority control.
Source: OECD: AFA and FATS-databases.

Annex B: Auxiliary data tables

Table A01aux
Real GDP growth rate

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage change on previous year													
United States	1.9	–0.2	3.3	2.7	4.0	2.5	3.7	4.5	4.2	4.4	3.7	0.8	1.9	3.0
Japan	5.2	3.4	1.0	0.2	1.1	1.9	3.4	1.9	–1.1	0.1	2.8	0.4	–0.3	2.4
EU-15	.	.	1.3	–0.5	2.8	2.4	1.6	2.5	2.9	2.9	3.5	1.7	1.0	0.8
France	2.6	1.0	1.5	–0.9	2.1	1.7	1.1	1.9	3.4	3.2	3.8	2.1	1.2	0.5
Germany	.	.	2.2	–1.1	2.3	1.7	0.8	1.4	2.0	2.0	2.9	0.8	0.1	–0.1
Italy	2.0	1.4	0.8	–0.9	2.2	2.9	1.1	2.0	1.8	1.7	3.0	1.8	0.4	0.3
United Kingdom	0.8	–1.4	0.2	2.3	4.4	2.9	2.8	3.3	3.1	2.9	3.9	2.3	1.8	2.2

Indicator definition: Growth rate of the Gross Domestic Product (GDP) at constant prices (1995=100).
Source: Eurostat: Structural Indicators.

Table A02aux
Foreign controlled high-tech manufactures

Country	2000
	Percentage of total turnover of high-tech manufacturing
EU-15	.
Belgium	.
Denmark	15.9
Germany	.
Greece	.
Spain	49.1
France	42.1
Ireland	94.8
Italy	.
Luxembourg	.
Netherlands	16.0
Austria	.
Portugal	58.8
Finland	9.9
Sweden	43.6
United Kingdom	13.1

Indicator definition: Turnover of enterprises in high-tech manufacturing under foreign majority control.
Source: Eurostat, OECD FATS-database.

Table A03aux
Foreign controlled knowledge-intensive services

Country	2000
	Percentage of total turnover of knowledge-intensive services
EU-15	.
Belgium	.
Denmark	4.4
Germany	.
Greece	.
Spain	5.4
France	17.0
Ireland	22.1
Italy	.
Luxembourg	.
Netherlands	10.0
Austria	.
Portugal	10.6
Finland	10.6
Sweden	11.9
United Kingdom	3.0

Indicator definition: The turnover of enterprises in knowledge-intensive services under foreign majority control.
Source: Eurostat, OECD FATS-database.

Table A04aux
Foreign controlled high-tech knowledge-intensive services

Country	2000
	Percentage of total turnover of high-tech knowledge-intensive services
EU-15	.
Belgium	.
Denmark	8.1
Germany	.
Greece	.
Spain	0.3
France	7.1
Ireland	35.1
Italy	.
Luxembourg	.
Netherlands	11.8
Austria	.
Portugal	12.5
Finland	7.5
Sweden	15.4
United Kingdom	2.7

Indicator definition: The turnover of enterprises in high-tech knowledge-intensive services under foreign majority control.
Source: Eurostat, OECD FATS-database.

Annex C: Metadata on the key indicators

Module A

Indicator label	A01
Indicator name	GDP per capita in PPS
Indicator definition	Gross Domestic Product (GDP) at market prices per capita in Purchasing Power Standards (PPS)
Unit of measurement	Index relative to the EU-15 (EU-15=100)
Source	Eurostat Structural indicators
Period covered	1990–2003
Dissemination	NewCronos
Remarks	The PPS is derived from the Purchasing Power Parities (PPP) 2000. PPP figures can be used for comparing statistics among countries, but not for comparison over time.

Indicator label	A02
Indicator name	Value added of business sector services
Indicator definition	Value added of business sector services (ISIC Rev 3 division: 50–74)
Unit of measurement	Percentage of GDP
Source	OECD
Period covered	1990–2002
Dissemination	STAN indicators 2004

Indicator label	A03
Indicator name	Value added of manufacturing ICT sector
Indicator definition	Value added of manufacturing ICT sector (ISIC Rev 3 classes: 3000, 3130, 3200, 3312 and 3313)
Unit of measurement	Percentage of GDP
Source	OECD
Period covered	1990–2001
Dissemination	STAN indicators 2004 / ICT Sector Data & Metadata

Indicator label	A04
Indicator name	Value added of high-tech manufactures
Indicator definition	Value added of high-technology manufacturing sector (ISIC Rev 3 classes: 2423, 3000, 3200, 3300 and 3530)
Unit of measurement	Percentage of GDP
Source	OECD
Period covered	1990–2002
Dissemination	STAN indicators 2004

Indicator label	A05
Indicator name	Labour productivity per person employed
Indicator definition	GDP at market prices in PPS per person employed
Unit of measurement	Index relative to the EU-15 (EU-15=100)
Source	Eurostat: Structural indicators
Period covered	1991–2003
Dissemination	NewCronos

Indicator label	A06
Indicator name	Trade-to-GDP ratio
Indicator definition	Imports + exports as share of Gross Domestic Product (GDP)
Unit of measurement	Percentage of GDP
Source	Eurostat
Period covered	1990–2002
Dissemination	NewCronos

Indicator label	A07
Indicator name	Export of ICT goods
Indicator definition	Export of ICT goods
Unit of measurement	Percentage of total exports
Source	Eurostat: Comext database
Period covered	1996–2001
Dissemination	Statistics on the information society in Europe 1990–2002 (Eurostat, 2002)

Indicator label	A08
Indicator name	Foreign controlled manufacturing
Indicator definition	Turnover of enterprises in manufacturing under foreign majority control
Unit of measurement	Percentage of total turnover of manufacturing
Source	OECD: AFA and FATS databases
Period covered	Varies greatly; for most countries data is available from 1994/1995 to 1999/2000.
Dissemination	Science, Technology and Industry Scoreboard (OECD, 2003); Measuring globalisation (OECD, 2001)
Remarks	The definition of the sectors for which statistics are given varies considerably between sources. In this publication, the manufacturing sector is defined as NACE section D. Often, country data is provided for Manufacturing and Industry, NACE sections C to F.

Indicator label	A09
Indicator name	Foreign controlled services
Indicator definition	Turnover of enterprises producing services under foreign majority control
Unit of measurement	Percentage of total turnover of services
Source	OECD: AFA and FATS databases
Period covered	1997/1998
Dissemination	Measuring globalisation (OECD, 2001)
Remarks	Data given for only a few countries. The various sources are not consistent for all countries.

Annex D: Metadata of the auxiliary indicators

Module A

Indicator label	A01aux
Indicator name	Real GDP growth rate
Indicator definition	Growth rate of the Gross Domestic Product (GDP) at constant prices (1995=100)
Unit of measurement	Percentage change on previous year
Source	Eurostat: Structural indicators
Period covered	1990–2003 except Germany (1990,1991) and Ireland (1990)
Countries covered	EU-15, US and Japan
Publication	NewCronos

Indicator label	A02aux
Indicator name	Foreign controlled high-tech manufactures
Indicator definition	Turnover of enterprises in high-tech manufacturing under foreign majority control
Unit of measurement	Percentage of total turnover of high-tech manufacturing
Source	Eurostat, OECD FATS-database
Period covered	2000
Countries covered	Nine EU-countries (DK, ES, FR, IE, NL, PT, FI, SE, UK)
Publication	Statistics in focus theme 4, 15/2004: “Foreign controlled enterprises in high tech manufacturing and services”

Indicator label	A03aux
Indicator name	Foreign controlled knowledge-intensive services
Indicator definition	Turnover of enterprises in knowledge-intensive services under foreign majority control
Unit of measurement	Percentage of total turnover of knowledge-intensive services
Source	Eurostat, OECD FATS-database
Period covered	2000
Countries covered	Nine EU-countries (DK, ES, FR, IE, NL, PT, FI, SE, UK)
Publication	Statistics in focus theme 4, 15/2004: “Foreign controlled enterprises in high-tech manufacturing and services”

Indicator label	A04aux
Indicator name	Foreign controlled high-tech knowledge-intensive services
Indicator definition	Turnover of enterprises in high-tech knowledge-intensive services under foreign majority control
Unit of measurement	Percentage of total turnover of high-tech knowledge-intensive services
Source	Eurostat, OECD FATS-database
Period covered	2000
Countries covered	Nine EU-countries (DK, ES, FR, IE, NL, PT, FI, SE, UK)
Publication	Statistics in focus theme 4, 15/2004: “Foreign controlled enterprises in high-tech manufacturing and services”

3. *Innovation* (Module B)

– *On EU-15 level, R&D expenditure by the business enterprise sector relative to its value added has been fairly stable over time. For the larger EU-15 countries, the percentage spent on R&D in 2002 is close to that spent in 1990.*

– *Exceptions to this general finding are Belgium, Denmark, Portugal, Finland and Sweden, whose business enterprise sector's R&D expenditure relative to value added in that period increased up to 100 percent.*

– *In 1990 the differences in the number of patent applications between the EU-15 countries were still relatively small. However, after 1993 in various countries the number of patent applications increased, with Sweden, Finland and Germany in a leading position.*

– *An increasing proportion of the patent applications to the EPO refers to patents in the high technology fields. The share of high-tech patents that is not ICT patent is quite small, which reflects the increasing economic importance of the ICT sector.*

– *Most enterprises with innovation activities in 1998–2000 had introduced onto the market one or more new or significantly improved products, whether or not combined with process innovation. France, Denmark, Finland and the Netherlands appear to have lagged behind in process innovation.*

– *The share of enterprises that implemented organisational change in the period 1998–2000 differs greatly among countries. In Luxemburg, Germany and Austria around half of the enterprises changed their organisational structure; for France, this applied to only 8% of all enterprises.*

– *Comparing 1996 with 2000, enterprises in a number of countries reported a strong increase in the share of turnover derived from new or significantly improved products. This applied to Finland, Portugal and Denmark, and to a lesser extent to Germany.*

3.1 Introduction

Innovation is generally seen as a necessary condition for sustainable economic growth. It is also at the heart of the 'New Economy'. A wide range of radical and incremental innovations, which to a large extent have been shaped by ICT and its application, influences modern business processes. This is a process that will continue as long as this technology has not been used to its full potential.

Besides inventiveness and entrepreneurship, an economy's propensity to innovate depends on different human and institutional capacities, which together make up a National Innovation System (NIS). These capacities are discussed in chapters 4 and 5. This chapter (reflecting module B of the used framework, see chapter one) describes how these conditions translate into actual innovative activity, through, for example, Research and Development (R&D).

In the context of innovation, it is important to pay attention, not only to innovation in terms of new products and processes, but also to major preparatory activities that can be expected to lead to innovations in the foreseeable future. Traditionally, R&D is such a major preparatory activity, especially in manufacturing and the processing industries. Moreover, patents are an important means to protect the economic value of innovative ideas and inventions. Concepts such as the NIS recognise that R&D is important for innovations to emerge, but reject a linear relationship between the two. Furthermore, in an economy that increasingly depends on organisational and service-like innovations, the knowledge base for innovation is broader than technical R&D. Organisations may deploy various kinds of activities that traditionally are not recognised as R&D, but may have similar functions, such as the development of new market channels and efforts to improve the management of quality and knowledge.

ICT opens up opportunities for new trajectories of incremental and more radical innovations whereby learning-by-doing may play a significant part. ICT may have different roles; it may serve as an enabler, catalyst or integrator. For the New Economy to mature, the application of ICT in a wide range of innovations (also when these cannot be characterised as ICT innovations) is as important as the development of new ICT tools. Therefore, it makes sense not only to measure ICT innovations but also to measure innovations in general. ICT being the pervasive, widely applicable technology, it can be expected that most innovations will contain ICT elements, both in process and product innovations. Moreover, innovations in services frequently involve ICT as well.

3.2 Selected indicators

3.2.1 Selected key indicators

In the field of patents and innovation EPO data and data derived from the Community Innovation Surveys were the main data sources.

The following key indicators have been selected:
– Expenditure on R&D by the business enterprise sector
– Patent applications
– ICT patents
– Innovative enterprises in the manufacturing and services sector
– Enterprises that changed their organisational structure
– Turnover due to innovative products new to the market.

Expenditure on R&D by the business enterprise sector, as share of value added in the business enterprise sector. R&D is an important input factor for innovation. And even though no simple linear relation exists between the two, where R&D abounds, there will emerge opportunities for innovation.

Patent applications. Patents are a means to protect the economic value of inventions. Both the expenses that were made to realise an invention and the potential market value of products or processes based on the invention capture this value. The number of patents is a measure of the amount of valuable inventions. However, not all inventions lead to a patent: many businesses prefer lead-time advantage on competitors, secrecy, or complexity of design as a way to protect their inventions. Moreover, not all inventions can be patented: patents are mostly used to protect inventions of a technological nature.

ICT patents, as share of all patents are of particular interest as in the present era ICT plays such a prominent role in the dynamics of the economy and the related quest for competitiveness.

Innovative enterprises in the manufacturing and services sector. The share of enterprises engaged in innovative activities is also called 'innovation rate', measuring the business enterprise sector's involvement in innovation. The innovation rate is given separately for manufacturing and services. Services have increasingly been

recognised as being innovative in their own right, rather than being mere technology users.

Enterprises that changed their organisational structure. This indicator measures the share of enterprises that changed their organisational structure. It is increasingly realised that technological innovations frequently go together with organisational change. The organisational side of an innovation may be the most creative part of an innovation, while, further down the road of ICT applications, ICT may increasingly involve the application of standardised systems.

Turnover due to innovative products new to the market shows the actual commercial effect of innovations that have been newly introduced to the market. For product innovations to be rewarding, a positive effect on turnover is indispensable.

3.2.2 Selected auxiliary indicators

The following indicators have been added as auxiliary indicators:
- Expenditure on R&D by performing sector
- Use of protection methods in enterprises
- High-technology patents
- Innovativeness of total business enterprise sector, by type of innovation
- Non-technological change in enterprises
- Innovation expenditure.

Moreover, the following boxes have been added:
- Research intensity and business enterprise expenditure on R&D.
- Knowledge-intensive services and employment.

Expenditure on R&D by performing sector (business, higher education, government, non-profit) is helpful in putting R&D in the right perspective. It is additional to the key indicator 'R&D expenditure by the business enterprise sector'. To judge a country's R&D efforts, it is important to know its total R&D expenditure. Then, it is of interest to know how this expenditure is divided between different sectors as this is likely to affect the kind of R&D that is taken up (e.g. basic research versus market-driven development).

Use of protection methods in enterprises shows a range of possibilities for companies to protect the economic value of their R&D results or other innovative achievements. This indicator is additional to the key indicator 'Patent applications'.

High-technology patents are a significant indication as to whether a country manages to play a role in high-tech innovations, which in the present era also involve the advanced usage of ICT.

Innovativeness of total business enterprise sector, by type of innovation indicates to what extent innovations involve new products, new processes or a combination of both. This indicator builds on the key indicator 'Innovative enterprises in the manufacturing and services sector'.

Non-technological change in enterprises is helpful in further understanding what enterprises actually mean by non-technological change (in addition to 'organisational change', which is a key indicator); even though it is not easy to interpret differences between countries here.

Innovation expenditure, as a share of total turnover is an additional indicator that shows the relative economic importance of innovation, even though this type of expenditure seems hard to measure.

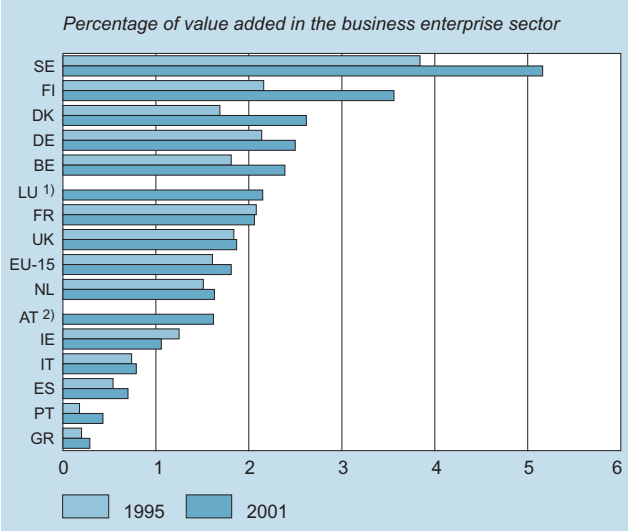
The overview visualises the links between the key indicators and the auxiliary indicators.

3.3 Indicators, statistics and commentaries

3.3.1 Expenditure on R&D by the business enterprise sector

The origin of many innovations lies in Research and Development (R&D). A country that wishes to innovate on a structural basis will have to make available sufficient resources for R&D.

B01a Expenditure on R&D by the business enterprise sector, 1995 and 2001



1) 2000. 2) 1998. Source: OECD: BERD database.

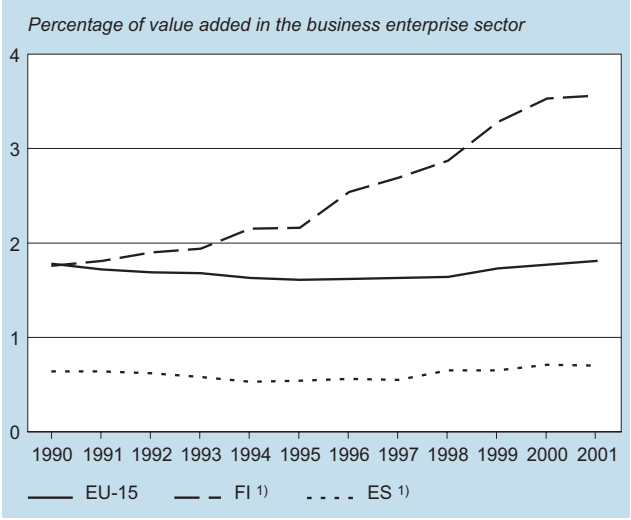
Indicators in Module B

Key indicators	*Auxiliary indicators*
Expenditure on R&D by the business enterprise sector	– Expenditure on R&D by performing sector – BOX A: Research intensity and business enterprise expenditure on R&D
Patent applications ICT patents	– Use of protection methods in enterprises – High-technology patents
Innovative enterprises in the manufacturing and services sector	– Innovativeness of total business enterprise sector, by type of innovation – BOX B: Knowledge-intensive services and employment – Innovation expenditure
Enterprises that changed their organisational structure	– Non-technological change in enterprises
Turnover due to innovative products new to the market	

A key determinant of an economy's competitiveness is the level and intensity of overall expenditure on R&D. However, it is also important to look at the sectors that perform R&D activities. The intramural R&D by the business enterprise sector (compared to R&D executed by public sectors) is likely to be crucial on the medium range. It is near to the market and therefore can be expected to turn new knowledge into saleable products. As R&D expenditure of the business enterprise sector is market-driven, it accounts for most (impending) innovation expenditure. For this reason, R&D expenditure by the business enterprise sector was selected as a key indicator.

Business enterprise expenditure on R&D was especially high in Sweden and Finland. In these countries relative R&D expenditure was even larger than in the USA (2.5%) and Japan (3.0%) and considerably above the EU-15 average. For Denmark, Germany and Belgium R&D expenditure in the business enterprise sector is comparable with that of the USA (2.5%). The Netherlands and Ireland are below the EU-15 average. R&D expenditure of the businesses in the Mediterranean region did not exceed one percent of the value added of the business enterprise sector.
On the EU-level R&D expenditure by the business enterprise sector relative to the value added of the business enterprise sector has been relatively stable over time. For most countries, the percentage spent on R&D in 2002 is close to that spent in 1990. Exceptions to this are Sweden and Finland, whose R&D expenditure in that period increased by (almost) 100 per cent. Germany and Italy showed a decline during the period 1990–1995, but slightly recovered since then (see table B01a).

B01b Expenditure on R&D by the business enterprise sector, 1990–2001



1) Countries with the highest and lowest score in 2001 for which the complete time-serie was available. Source: OECD: BERD database.

BOX A RESEARCH INTENSITY AND BUSINESS ENTERPRISE EXPENDITURE ON R&D

The European Council (Barcelona, March 2002) has set the specific target to increase the average level of R&D expenditure in the EU from 1.9% of GDP to 3% by 2010, of which two thirds should be financed by the business enterprise sector.

Table A below shows the figures for both parameters. It presents the gross domestic expenditure on R&D (GERD) as percentage of GDP, the so - called research intensity (average growth rates 1997–2001 and as a percentage in 2001) and business enterprise expenditure on R&D (BERD) as percentage of GERD (2001).

Table A. Research Intensity and BERD as % of GERD

	Annual average growth rates of R&D intensity, 1997–2001 (%)	*R&D intensity (GERD as % of GDP), 2001*	*BERD as % of GERD, 2001*
SE	4.8	4.27	77.6
FI	5.2	3.49	71.1
DE	1.8	2.50	70.1
DK	5.5	2.40	64.9
FR	0.4	2.20	62.4
BE	3.8	2.17	71.6
EU-15	1.5	1.98	65.6
AT	2.6	1.94	63.6
NL	–1.7	1.94	57.1
UK	0.3	1.84	52.4
LU	.	1.71	.
IE	–2.3	1.17	68.5
IT	0.5	1.07	50.1
ES	4.0	0.96	52.4
PT	4.4	0.77	40.5
GR	15.3	0.67	.

Table A shows that substantial efforts are needed to attain these two goals. Only Sweden and Finland had already met the 3 percent requirement. For 2001, only 5 countries had a BERD as percentage of GERD equal or higher than 66.6 percent. In general, the height of the research intensity as such seems to be the greatest problem for most EU-15 countries, of which nine have percentages below 2. This requires structural changes over the coming years. Table A also indicates that the countries whose research intensity is amongst the greatest, also have relatively high business enterprise sector R&D expenditure. This suggests that increasing a country's research intensity most of all has to be a matter of increasing the business enterprise sector's R&D expenditure.

Source: European Commission, Towards a European Research Area Science, Technology and Innovation. Key Figures 2003–2004 (EUR 20735); page 29.

3.3.2 Expenditure on R&D by performing sector

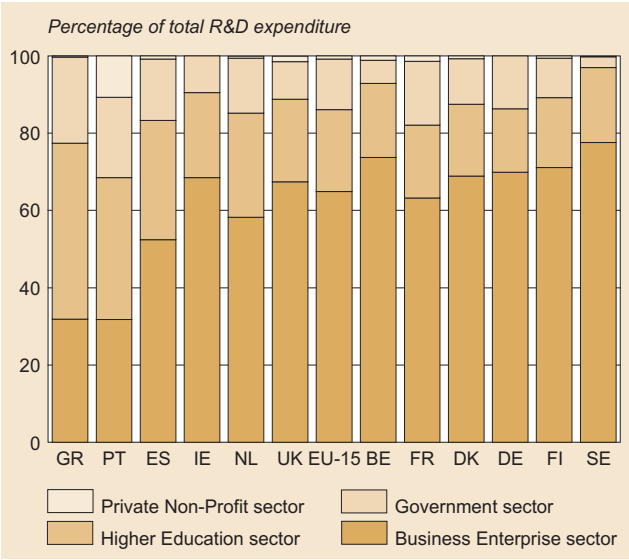
The business enterprise sector is not the only one engaged in R&D. Part of R&D activities are performed in the public sector by higher education institutions, governmental organisations or the private non-profit sector. There are significant differences among countries as to how R&D expenditure is distributed over these sectors. On (EU-15) average 65% of expenditure on intramural R&D is done by the business enterprise sector, 21% by higher education and 13% by government.

Figure B01aux shows the division of R&D expenditure into sectors by country. The countries are put in order according to the level of their R&D intensity (gross domestic expenditure on R&D as percentage of GDP), Sweden having the highest percentage. Portugal appeared to be the only country with a significant proportion of R&D spending by private non-profit institutions (11%). For countries with the lowest R&D intensity, the share of business enterprise expenditure on R&D is relatively low. In those countries, R&D effort by the public sector apparently could not compensate the lagging R&D efforts in the business sector (see also Box on R&D intensity and business enterprise sector R&D expenditure).

3.3.3 Patent applications

The efficiency of the EU's Intellectual Property Rights (IPR) regime is one of the keys to giving incentives to economic growth and innovation. With the recent introduction of the Community Patent, there will be an intellectual property system in which the costs of patenting are moderate; fast speed to trial is available in some jurisdictions 1).

B01aux Expenditure on R&D by performing sector, 2001

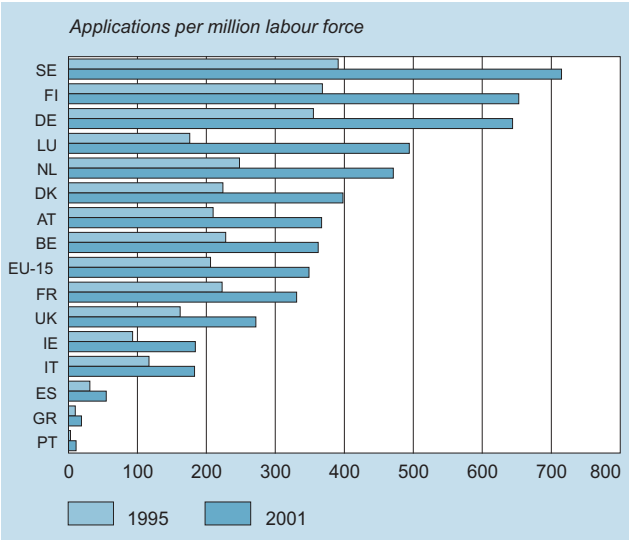


Source: OECD: BERD database.

Enterprises can file a patent application with the European Patent Office (EPO) that either applies to the country of origin or to a group of European countries. At present, the EPO functions in parallel with the national patent bureaus, so that patents may either be filed at the EPO or at one or more national patent bureaus. The EPO has a detailed database of patents, which records both country of origin and type of patent. To allow for the size of an economy, the number of patents per million people in the labour force is used.

Patent statistics are widely used to measure a country's performance in technological output; however, there are notable differences in patenting behaviour between countries. In small countries, for instance, one is more likely to involve the EPO than in larger countries. Furthermore, figures may also be influenced by the countries' industrial structures, because in e.g. manufacturing, patents play a much larger role than in services, where copyrights are more important. Patents are particularly used in sectors such as the chemicals industries, mechanical engineering and electronics. European patent data (EPO) is attractive from a comparability point of view, but the choice between a national patent and European patent still depends on regulatory factors that differ between the EU countries. Patenting facilities in the EU

B02a Patent applications filed with the EPO, by year of filing at the national level, by IPC, 1995 and 2001



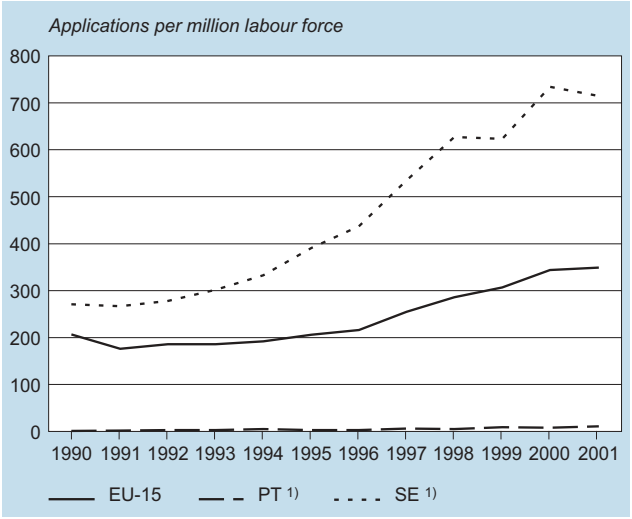
Source: EPO.

are also a matter of global competition, especially in terms of regulatory complexity and costs [2].

There are also differences in patenting behaviour between business enterprises. Some business enterprises prefer to use secrecy, lead-time advantage or a complex production process for protecting innovations rather than patents. Still, patents are among the most valuable output indicators of innovation. Especially, national policies to boost technological innovations take them into account.

The number of patents per million people in the labour force differs strongly between countries, from 11 (Portugal) to 715 (Sweden). The Mediterranean countries and Ireland have the smallest numbers of patents, while the Nordic countries have the higher scores, together with Germany, Luxembourg and the Netherlands.

B02b Patent applications filed with the EPO, by year of filing at the national level, by IPC, 1990–2001



1) Countries with the highest and lowest score in 2001 for which the complete time-serie was available. Source: EPO.

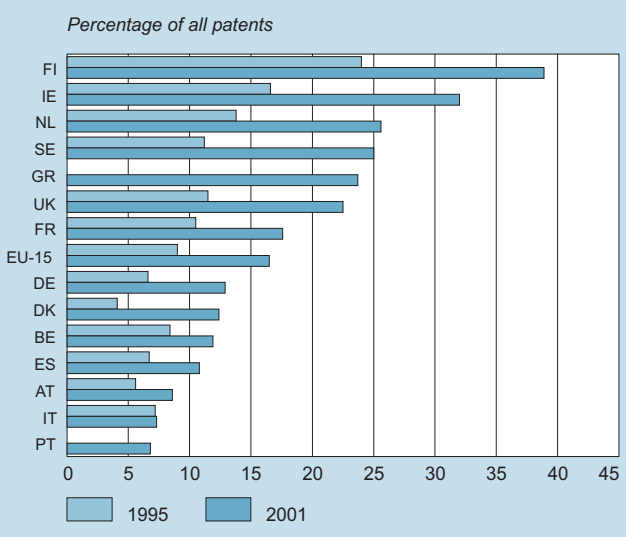
The number of patents per million people in the labour force has increased significantly over time, especially in the period 1994–2000. For most countries the number of patents grew steadily, leading to a doubling or more during the period 1990 to 2001. For a few countries, a temporary decrease appeared during the recession that occurred from 1990 to 1993; this especially applies to Germany, which had the greatest amount of patents per million people in the labour force, until Sweden took the lead in 1994 (see table B02a).

In 1990 the differences between the EU-15 countries in terms of patent applications were still relatively small. However, after 1993 several countries increased their number of patent applications, with Sweden, Finland and Germany at the top.

3.3.4 ICT patents

The type of patent that is likely to give companies a specific New Economy profile is the ICT patent. ICT patents include patents in the field of computing: calculating and counting, basic electric circuitry and electric communication technique. According to figure B03a, ICT patents as share in the total number of patents have increased throughout the nineties of the previous century. This pattern applies to all countries (see table B03). This development was strongest during the period 1995–2001. This underlines that this period is part of the ascending phase of the New Economy in terms of its basic technology.

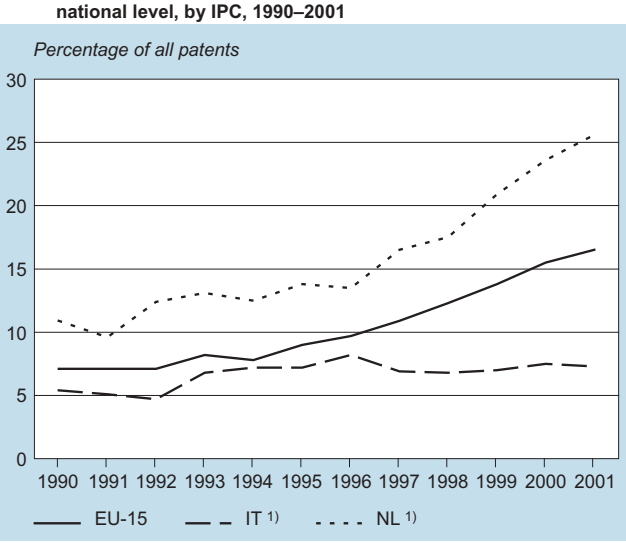
B03a ICT patent applications filed with the EPO, by year of filing at the national level, by IPC, 1995 and 2001



Source: EPO.

If confronted with the number of patents per million people in the labour force, some interesting differences become evident. Finland was leading in both areas. Germany was in the forefront of the total number of patent applications, but was not leading in the production of ICT patents (although in absolute terms it had a prominent position anyway). Greece and Ireland have a modest position in terms of patent applications in general. For a considerable part, these countries' growth in the number of patents consisted of ICT patents.

B03b ICT patent applications to the EPO, by year of filing at the national level, by IPC, 1990–2001



1) Countries with the highest and lowest score in 2001 for which the complete time-serie was available. Source: EPO.

3.3.5 Use of protection methods in enterprises

Patents are not the only means to protect the economic value of inventions. Other formal methods of protection, such as registration of design patterns, trademarks and copyrights, and strategic methods of protection, such as secrecy, complexity of design and lead-time advantages on competitors are also commonly used. Patents are relatively expensive, and take a long time to become effective (up to 5 years!). Other protection methods can serve as an alternative for applying for a patent. Especially small profit margins or short life cycles may give rise to other protection methods.

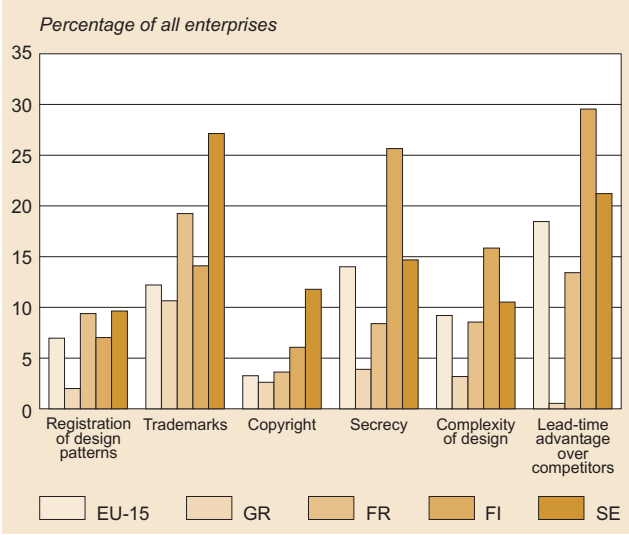
Traditionally, a significant part of innovation patterns in the services sector has been 'soft' or non-technological. Although patent activities do exist, other protection methods are more common [3].

The data used here (see B02 aux) originates from the CIS3 survey. Around 9% of all enterprises applied for a patent during the period 1998 to 2000, varying from 1% in Greece to 16% of the enterprises in Sweden.

The most often cited (strategic) protection method was lead-time advantage over competitors, followed by trademarks (an alternative to patents as a formal protection method), secrecy, and complexity of design. The two remaining formal protection methods registration of design patterns and copyrighting close the ranks. Differences among countries are the smallest for registration of design patterns, although still significant: the proportion of enterprises in Denmark or Austria registering design patterns is approximately four times larger than in Greece or Portugal.

There are clear differences among countries. In Finland, Austria and Germany strategic protection methods such as lead-time advantage and secrecy are frequently reported by enterprises. In Sweden a relatively high proportion of enterprises made use of the formal methods trademarks and copyrights [4]. Denmark and France are relative strong in trademarks and patents, but are less prone to opt for lead-time advantage or secrecy. Enterprises in the Mediterranean countries appear to be relatively small users of protection methods (see also table B02aux).

B02aux Enterprises in the business enterprise sector that protected their innovations, in the period 1998–2000, by protection method



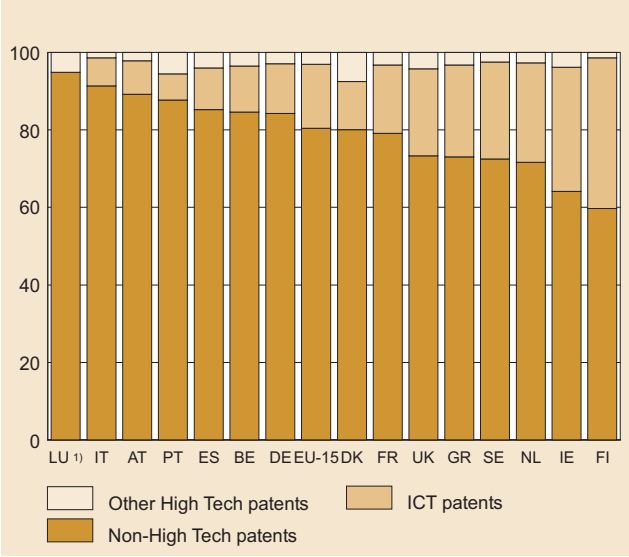
Source: Eurostat: Community Innovation Survey (CIS3).

3.3.6 High-technology patents

Although patent applications to the EPO are growing across all the Member States in the EU, this is especially true for patents in the high technology fields [5]. Of this interesting patenting field, ICT patents are a subset. The share of high-tech patents that is not ICT is quite small. This reflects the growing importance of the ICT sector and strengthens the assertion that ICT is an engine of economic advancement, marking the New Economy.

In Denmark the share of non-ICT patents within the high-tech patents is the largest with 8%. In most countries it is much smaller. The share of patents due to low or medium technologies is 80% and thus still fairly high.

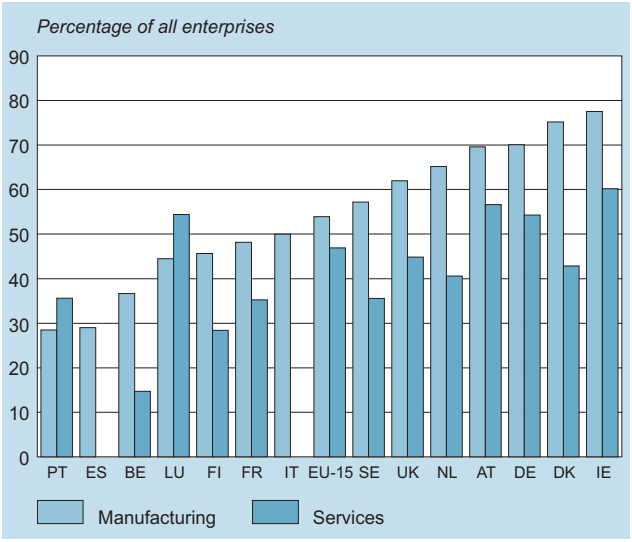
B03aux High-technology patents, 2001



1) No separate data on ICT patents.

Source: EPO.

B04/B05a Enterprises in the manufacturing and services sector with innovative activities in the period 1994–1996



Source: Eurostat: Community Innovation Survey (CIS2).

3.3.7 Innovative enterprises in the manufacturing and services sector

Innovation can be seen as the development and successive refinement of inventions into usable products (product innovation) or techniques (process innovation) that are deemed worthy of being launched on a market or used internally within an enterprise. The propensity to innovate is a ratio that measures the number of enterprises with some form of innovation activity (including enterprises with only on-going or abandoned innovation activity) compared to the total enterprise population. It is an indicator for the innovative activities of a country. This indicator shows the maximum reach of innovative activities within an economy. It measures the space for the adoption of new products and processes. First-tier ICT innovations that can be applied in a broad range of products and processes are conditional on having a strong ICT production sector. However, benefiting from such innovations depend on the willingness and capability to adopt such and other innovations. To a certain extent, the propensity to innovate (from now on indicated as innovation rate) signals this willingness and capability.

Innovation rate was measured by the Community Innovation Surveys of 1996 (CIS2) and 2000 (CIS3).

The comparability of data between CIS2 and CIS3 is limited due to a number of changes with respect to the target population of the two surveys, as well as methodological differences for survey techniques and the definition of indicators. CIS2 covered fewer sectors in the services than the CIS3 and did not incorporate mining and quarrying; CIS2 excluded businesses in manufacturing with 10–20 employees. Therefore, aggregate figures encompassing all sectors cannot be obtained. This makes it difficult to interpret the results for both years. Comparing results for different years should be done separately for manufacturing and services.

Figure B04/B05a and B04/B05b show the innovation rate in 1994–1996 and 1998–2000, presented separately for manufacturing and services. Comparing the figures for 1994–1996 and 1998–2000, the rankings of the countries reveal notable differences.

In CIS2, Ireland, Denmark and Germany had the highest innovation rate in manufacturing, while Luxembourg was second in the services sector. In CIS3 Germany took the lead in services. In CIS2 Belgium had a relatively low innovation rate in manufacturing, but in CIS3 it took the second best position. Germany and Austria were leading in both years, while Spain and France were somewhat in the rear. In both years Finland, Sweden and The Netherlands took an average position.

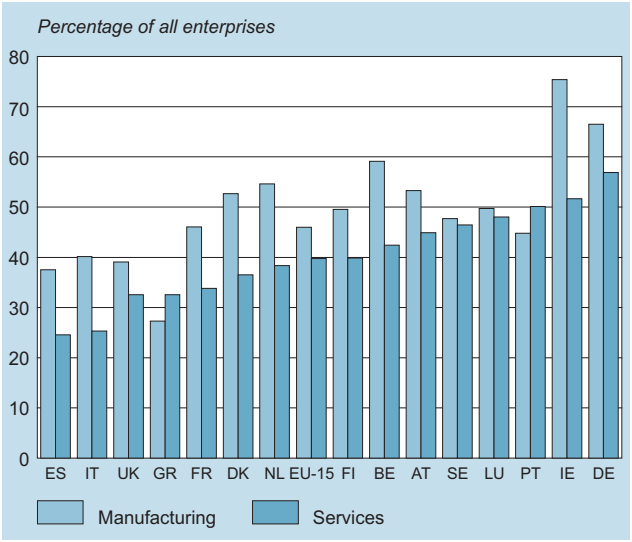
As can be seen in the graphs, innovative activities vary significantly between economic activities. In manufacturing, the propensity to innovate tends to be greater than that in the services. Exceptions occurred in Portugal, Luxembourg and Greece.

3.3.8 Innovativeness of total business enterprise sector, by type of innovation

Successful innovations involve the introduction of new or improved products to the market (product innovation) or using new or improved processes within the production process (process innovation). Thus innovative active enterprises can be divided into four categories based on the kind on innovation that resulted from this activity: none, product only, process only, or both.

Innovativeness that fails to lead to innovation during the reference

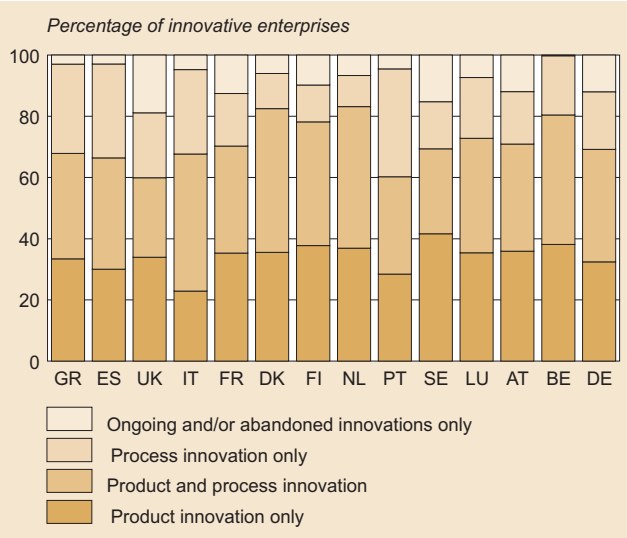
B04/B05b Enterprises in the manufacturing and services sector with innovative activities in the period 1998–2000



Source: Eurostat: Community Innovation Survey (CIS3).

period can be explained either by the fact that an innovation project was aborted or was not completed yet. On average only about 3%, varying from 0% (Belgium) to 19% (UK), of all innovating enterprises did not realise an actual innovation in the reference period. This, however, does not tell much about the success rate of individual innovation projects. Most innovative enterprises have introduced a new or improved product to the market, whether or not combined with process innovation. Process innovations without related product innovation did not occur that much. Portugal is the country where process innovation took place relatively frequently. France, Denmark, Finland and the Netherlands appear to have lagged in process innovation whereas countries like Greece, Spain and the UK stayed behind in product innovation (whether or not combined with process innovation).

B04aux Innovativeness of total business enterprise sector, by type of innovation, in the period 1998–2000



Source: Eurostat: Community Innovation Survey (CIS3).

3.3.9 Enterprises that changed their organisational structure

Non-technological innovation is a relatively new concept, which means that only scarce and recent data is available. As for official sources, only the CIS3 survey has data on this variable, implying that for the time being these are restricted to one year (2000). There is no information on the size of or expenditure on these changes. Of the five kinds of non-technological change that CIS3 distinguishes, organisational change was considered to be superior as representative variable and therefore selected as key indicator. Organisational change is the most common type of non-technological change; moreover, it strongly correlates with all four other changes that CIS3 mentions. Technical change and organisational change often go together and may involve rather informal processes of applied knowledge. Unlike advancement in areas such as algorithm design and processor power, the effectiveness of organisational changes may vary according to cultural, economic and historical factors, both of the organisation and of the environment in which it operates [6]. This may also have influenced the different scores between countries.

In most countries, the relative number of enterprises in the services having experienced organisational change was greater than in the manufacturing sector, Belgium, Germany, and Austria being the exception here.

The share of enterprises that have implemented organisational change differs greatly among countries. In Luxembourg, Germany and Austria about half of the enterprises changed their organisational structure in the period 1998–2000. In France only 8% of all enterprises changed their organisation.

BOX B Knowledge-intensive services and employment

Whereas manufactured products and processes contain a high degree of codified knowledge (they are a 'commodification' of knowledge), products from knowledge-intensive services (KIS) contain a high degree of tacit ('intangible') knowledge. According to Antonelli (1998), the post-war organisational structure of knowledge generation founded on R&D is being replaced by an information exchange based on real-time, on-line interactions between customers and knowledge producers. New ICTs facilitate a change in the nature of information – its divisibility, processing and communication – and the accessibility and tradability of information. Through ICTs, KIS companies interface between a client firm's tacit knowledge base and the wider knowledge base of the economy, improving connectivity and receptivity between the nodes of innovation networks.

In 2003, KIS accounted for one third of total employment in the EU-15, varying from 20% in Portugal to 47% in Sweden. By comparison, the manufacturing sector accounted for 18.6% of total EU-15 employment. In the period 2000–2003, the manufacturing sector experienced a reduction in the number of people employed (annual average growth rate of –1.4%), while the total services sector (1.70%) and especially the sub-sector KIS (2.35%) grew in employment.

A study on knowledge-intensive services and international competitiveness (Windrum and Tomlinsen, 1999) shows, however, that productivity due to knowledge-intensive services differs greatly between countries. The authors conclude that those national economies that have strong, mutually beneficial, links between services and other economic activities, most notably manufacturing, are benefiting most from the transition towards a 'services economy'.

Table B. Total employment in manufacturing and knowledge-intensive services, % of total employment 2003, AAGR [1], 2000–2003

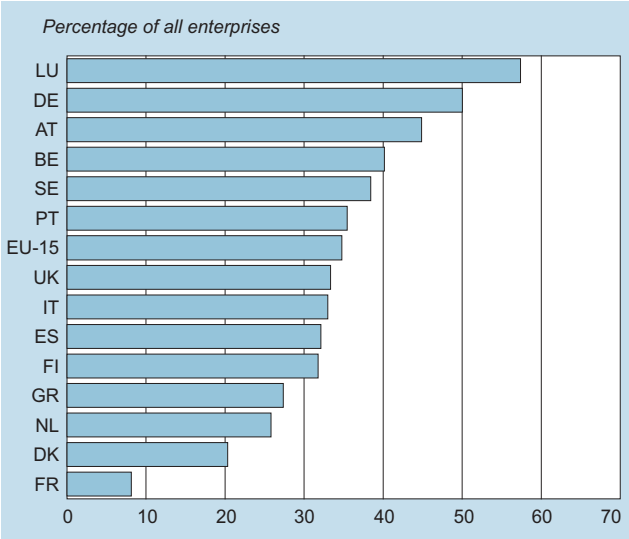
	Knowledge-intensive services		Manufacturing	
	% of total employment	AAGR 2000–2003	% of total employment	AAGR 2000–2003
	%			
SE	47.23	2.91	16.14	–1.86
NO	44.55	1.68	12.47	–1.48
DK	43.21	0.70	15.72	–4.62
IS	41.93	3.29	14.09	–3.21
UK	40.96	2.00	14.85	–3.57
FI	39.72	2.04	18.91	–1.89
NL	38.75	1.37	12.61	–2.96
BE	38.71	1.17	17.76	–2.32
LU	38.59	4.13	9.69	–4.44
FR	35.52	2.12	16.95	–2.04
EU-15	33.66	2.35	18.56	–1.40
IE	33.43	3.95	15.93	–1.03
DE	32.99	2.42	22.98	–1.46
AT	30.26	2.55	19.31	–2.01
IT	27.43	2.73	22.44	0.85
ES	25.90	4.75	17.81	0.98
PT	19.88	2.90	20.05	–1.77

[1] AAGR: Average Annual Growth Rate.

Source: Eurostat, Statistics in Focus, Science and technology 10/2004.

C. Antonelli (1998), Localized technological change, new information technology and the knowledge-based economy: the European evidence, *Journal of Evolutionary Economics,* Vol. 8, pp. 177–198.
P. Windrum and M. Tomlinsen (1999), *Knowledge-intensive services and international competitiveness: a four-country comparison.* MERIT, University of Maastricht.

B06 Enterprises that changed their organisational structure in the period 1998–2000



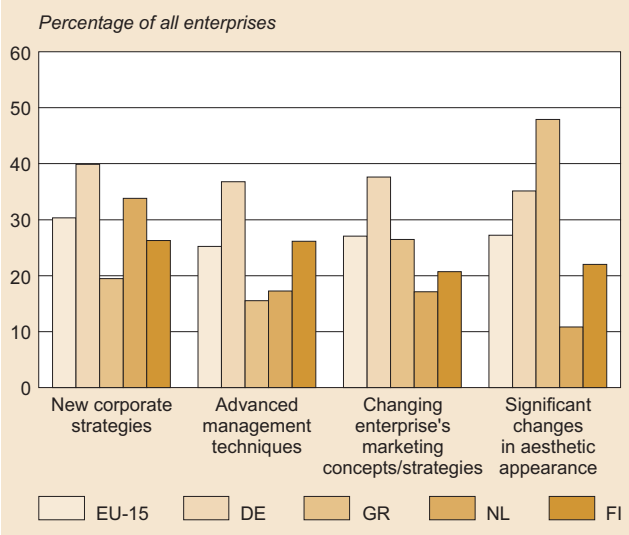
Source: Eurostat: Community Innovation Survey (CIS3).

3.3.10 Non-technological change in enterprises

The five kinds of non-technological innovation that were recorded are: change in organisational structure; different marketing strategy; changed aesthetic appearance; new corporate strategy; use of advanced management techniques. Organisational change was selected as key indicator (see figure B06). As auxiliary indicator, this section presents information on the other kinds of non-technological change.

Germany, and to a lesser extent also Luxembourg and Austria, scored high on all types of non-technological changes. Enterprises in France, Denmark and the Netherlands had least implemented such changes. A different marketing strategy occurred relatively frequently in the UK, where a new corporate strategy or advanced management techniques were relatively popular as well. New management techniques were rarely ticked in Denmark or Sweden. Greece had a high proportion of enterprises that have implemented an aesthetical change (48%). Differences in perception or interpretation may have influenced these scores and thereby hampers comparability.

B05aux Non-technological change in enterprises, in the period 1998–2000



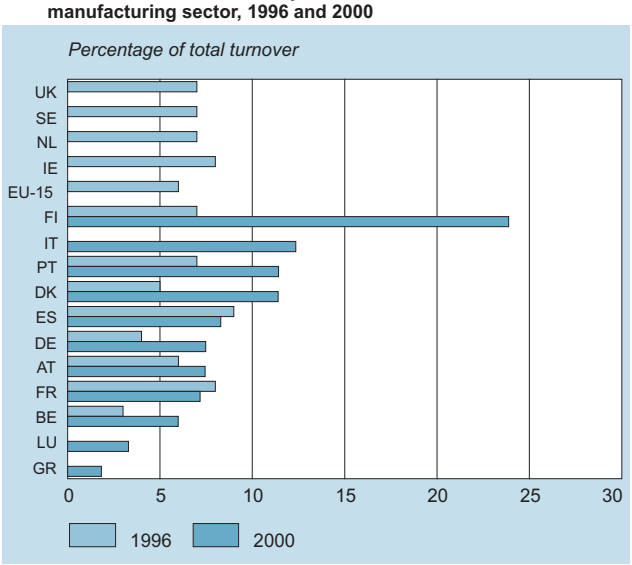
Source: Eurostat: Community Innovation Survey (CIS3).

3.3.11 Turnover due to innovative products new to the market

The previous innovation measures record the share of enterprises that undertake innovative activities, but do not indicate how important innovations are for these enterprises. The share of turnover derived from new innovative products (new to the market) is a measure of the extent to which innovation makes a difference in the market at the corporate level.

During the period 1994–1996, in most EU-15 countries turnover from manufacturing enterprises with products new to the market ranged between three to nine percent. At that time Spain, France and Ireland were the countries where new products had the greatest impact on sales if compared with other EU-15 countries. During the period 1998–2000 manufacturing enterprises in a number of countries strongly increased the share of turnover from new products; this applies to Finland, Portugal and Denmark, and to a lesser extent to Germany. Finnish enterprises were most prominent in increasing this share (up to 24%). In other countries, such as Belgium and Luxembourg, launching new products seemed hardly to have played a role in the sales of companies. In Greece, but also in Luxembourg, new products account for only a small share of turnover (2 and 3%, respectively). Unfortunately, data on 2000 are fragmented, so that it is not possible to evaluate the overall development in this area.

B07 Turnover due to innovative products new to the market, for the manufacturing sector, 1996 and 2000



Source: Eurostat: Community Innovation Surveys (CIS2 and CIS3).

3.3.12 Innovation expenditure

Innovation expenditure (See Figure B06aux on p. 31) as a share of turnover indicates the relative weight of innovative activities undertaken by enterprises. This input indicator is additional to the number of enterprises that actually take up innovations. Especially, if innovation is highly concentrated in a limited number of large enterprises, innovation expenditure as a share of turnover can help to provide balanced view on how well a country performs in the innovation arena. The measurement of this indicator, however, is likely to be rather difficult and hard to interpret.

3.4 Conclusion

This chapter focused on innovation in a broad sense, as it is believed that innovation at large is necessary for the New Economy to thrive and develop to its full potential. The selected indicators closely relate to the innovation process, particularly in

the field of R&D expenditure and patent applications. Moreover this chapter presented statistical information on the share of enterprises that embarked on innovation and corporate expenditure on innovation.

According to the composite indicator, based on relative scores with respect to the above-mentioned indicators, the following three groups of enterprises have been distinguished [7]:

Composite indicator for innovativeness: three country groups according to relative scores [1]

Group 1
Sweden, Finland, Germany, Ireland, Luxembourg

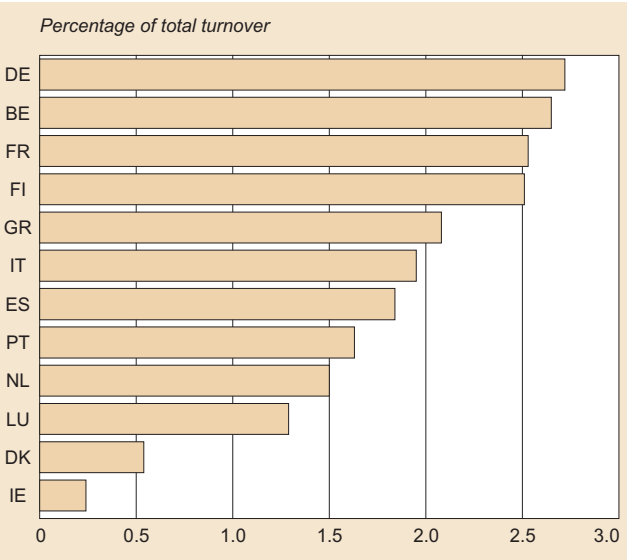
Group 2
Netherlands, Austria, Belgium, EU-15, Denmark, United Kingdom

Group 3
Portugal, France, Italy, Spain, Greece

[1] The countries in group 1 have the higher scores, the countries in group 2 have medium scores while the countries in group 3 are at the lower end of the scores. The clustering has been carried out to prevent an overemphasis on the scores, because it was realised that the indicators used, do not cover the entire spectrum of innovativeness. Moreover, there were some missing values, which required estimates.

This list cannot be subject to subtle interpretations. It is just a rough indication of the countries' relative position in terms of innovation. Sweden, Finland, Ireland, Germany and Luxembourg comprise group 1. These countries are leading in innovative capacity. The second group consist of the Netherlands, Austria, Belgium, Denmark and the United Kingdom. One may argue that if the whole of the EU-15 is to comply with the Lisbon Summit Goals, the other countries could see the leading countries as relevant benchmarks. Given their achievements, there is ample room for improvement. Differences per country can be partly explained by the composition of industries. For instance, the non-service industries have higher R&D intensities than the services. Within the non-service industries, the high-tech and medium-high-tech sectors have higher R&D intensities than the low-tech sector. Countries where the size of the high-tech sectors is relatively small will also have a lower R&D intensity. [8] In general, it is difficult to change a country's economic structure. On the short run, therefore, an increase in R&D intensity is most likely to be achieved by encouraging the existing enterprises to increase their R&D efforts. However, the experience in Finland during the nineties of the previous century demonstrates that a change in the economic structure is possible if to a large extent the economic structure is an endogenous variable susceptible to public policy.

B06aux Innovation expenditure as a share of total turnover, 2000



Source: Community Innovation Surveys (CIS3).

Whether the chosen indicators actually provide a reliable picture, is a matter of further judgement. Additional arguments that may lead to more sophisticated conclusions, for instance, relate to the nature of how the services develop innovations. In the service industries the development of new services and business concepts frequently is a matter of market research and business development, which are not (equally) covered by the R&D statistics.

Moreover – and this may primarily apply to smaller countries – international trade brings in all kinds of novel equipment and systems for which no domestic R&D was required. In general, it is an open question as to where the benefits of R&D will settle. In particular, this applies to R&D activities executed by multinational companies. Globalisation tends to reinforce the footloose nature of economic activities such as research by multinational enterprises.

Having said this, those countries that are far removed from the leaders should not ease their minds too soon by the above arguments. There is no point in expecting that, where traditional R&D and other innovative activities are lagging behind, services innovation will abound or that in other ways opportunities for innovation are picked up easily.

Another point of consideration and concern is the fact that quite some statistical sources whose data are needed to quantify the selected indicators are lacking in timeliness. This applies to the key indicators, let alone the auxiliary indicators. Because of this, a more refined analysis taking into account the most recent events, cannot be carried out. Instead, only some broad conclusions can be drawn. It will take further research to better understand the underlying relationships. However, the next chapter, which will focus on how (ICT) innovations influence operational economic processes, may offer additional insight into what innovation is all about.

Notes in the text

[1] C. Eustace (editor), The PRISM Report. Research findings and policy recommendations, European Commission, IST programme, October 2003.
[2] See note 1.
[3] For further details on Patenting activities in the services sectors, please refer to: Third European Report on Science and Technology Indicators, Dossier V, p. 407 ff, http://www.cordis.lu/ indicators.
[4] Sweden also has the highest proportion of enterprises applying for at least one patent in 1998–2000 (16%), see Innovation in Europe; Results for the EU, Iceland and Norway, Eurostat, 2004.
[5] Statistics on Science and Technology in Europe, Data 1991–2002, Eurostat, 2004.
[6] See G. Room *et al.*, Final Report on Conceptualisation and Analysis of the New Information Economy, NESIS Deliverable D 5.3, University of Bath, August 2004; p 64.
[7] The composite indicator is comprised of the following indicators presented in this chapter: R&D expenditure in the business sector, share of GDP; Patent applications to EPO, per million labour force; ICT patents, share in total number of patents; Innovative enterprises, share of all enterprises; Innovation expenditure, relative to turnover.
[8] For more details refer to: OECD, Main Science and Technology Indicators, Paris, 2003.

Annex A: Key data tables

Table B01
R&D expenditure in the business enterprise sector

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of value added in the business enterprise sector													
EU-15	1.8	1.7	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.7	1.8	1.8	.	.
Belgium	.	1.6	1.7	1.8	1.8	1.8	1.9	2.0	2.0	2.1	2.2	2.4	2.5	.
Denmark	1.4	1.5	1.6	1.6	.	1.7	1.8	1.9	2.2	2.3	.	2.6	.	.
Germany	2.7	2.5	2.3	2.3	2.2	2.1	2.1	2.2	2.2	2.4	2.5	2.5	2.5	.
Greece	.	0.1	.	0.2	.	0.2	0.2	0.2	.	0.3	.	0.3	.	.
Spain	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.7	.	.
France	2.1	2.1	2.1	2.2	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.0	.
Ireland	0.7	0.8	1.0	1.1	1.2	1.3	1.3	1.3	1.2	1.2	1.1	1.1	.	.
Italy	1.0	1.0	0.9	0.8	0.8	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.8	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	2.2	.	.	.
Netherlands	1.6	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.5	1.7	1.6	1.6	.	.
Austria	.	.	.	1.2	.	.	.	.	1.6	.	.	.	.	.
Portugal	0.2	.	0.2	.	.	0.2	.	0.2	0.2	0.3	0.4	0.4	0.5	.
Finland	1.8	1.8	1.9	1.9	2.2	2.2	2.5	2.7	2.9	3.3	3.5	3.6	.	.
Sweden	.	3.0	.	3.6	.	3.8	.	4.1	.	4.3	.	5.2	.	.
United Kingdom	2.1	2.0	1.9	2.0	1.9	1.8	1.8	1.7	1.7	1.8	1.8	1.9	.	.

Indicator definition: Expenditure on R&D by the business enterprise sector.
Source: OECD: BERD database.

Table B02
Patent applications

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Applications per million people in the labour force													
EU-15	206	176	186	186	192	206	216	255	286	307	344	349	.	.
Belgium	179	153	185	218	219	228	228	271	336	339	366	362	.	.
Denmark	146	160	163	187	214	224	243	269	262	314	374	398	.	.
Germany	450	295	319	317	324	355	372	463	516	567	636	644	.	.
Greece	7	9	11	11	8	10	11	13	17	19	14	19	.	.
Spain	19	22	23	25	30	31	32	41	49	54	56	55	.	.
France	228	216	223	209	211	223	228	253	289	300	329	331	.	.
Ireland	59	51	65	81	65	93	96	104	126	154	206	184	.	.
Italy	107	95	115	108	112	117	127	143	160	168	189	183	.	.
Luxembourg	205	243	209	143	244	176	243	335	347	477	468	494	.	.
Netherlands	271	235	235	236	240	248	285	338	360	394	449	471	.	.
Austria	207	196	197	189	195	210	208	236	299	294	332	367	.	.
Portugal	1	2	3	3	5	3	3	6	5	9	8	11	.	.
Finland	193	228	216	291	317	368	364	441	533	575	667	653	.	.
Sweden	271	267	278	302	333	391	437	535	627	623	734	715	.	.
United Kingdom	164	153	151	154	158	162	169	186	208	227	261	272	.	.

Indicator definition: Patent applications to EPO, by year of filing at the national level, by IPC.
Source: EPO.

Table B03
ICT patents

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of all patents													
EU-15	7.1	7.1	7.1	8.2	7.8	9.0	9.7	10.9	12.3	13.8	15.5	16.5	.	.
Belgium	4.0	6.6	8.2	8.4	6.9	8.4	9.9	7.6	9.0	10.2	9.2	11.9	.	.
Denmark	.	3.3	2.4	.	1.9	4.1	3.2	5.9	10.4	10.2	11.8	12.4	.	.
Germany	6.3	5.9	5.9	6.1	5.7	6.6	7.5	8.8	10.2	11.0	12.5	12.9	.	.
Greece	.	.	7.8	6.7	.	.	.	.	6.4	.	6.5	23.7	.	.
Spain	1.6	4.0	.	4.1	5.6	6.7	4.3	5.2	7.0	10.3	9.4	10.8	.	.
France	8.6	9.2	9.5	10.1	9.9	10.5	9.6	11.2	13.1	15.5	16.5	17.6	.	.
Ireland	8.5	9.9	17.7	.	.	16.6	15.1	.	15.5	16.2	27.5	32.0	.	.
Italy	5.4	5.1	4.7	6.8	7.2	7.2	8.2	6.9	6.8	7.0	7.5	7.3	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Netherlands	10.9	9.6	12.4	13.1	12.5	13.8	13.5	16.5	17.5	20.9	23.6	25.6	.	.
Austria	2.3	3.7	1.8	3.5	3.3	5.6	6.0	5.0	5.9	7.2	8.6	8.6	.	.
Portugal	.	.	.	.	.	.	.	.	.	.	.	6.8	.	.
Finland	5.3	7.5	13.7	.	17.2	24.0	26.1	32.8	36.9	39.6	43.5	38.9	.	.
Sweden	5.7	5.8	6.8	9.9	7.6	11.2	15.1	15.6	21.8	22.2	26.4	25.0	.	.
United Kingdom	9.5	9.5	7.6	10.3	10.5	11.5	12.7	13.7	13.1	16.0	17.2	22.5	.	.

Indicator definition: ICT patent applications to EPO, by year of filing at the national level, by IPC. ICT patent applications are defined as the IPC-codes G06, G11 and H04.
Source: EPO.

Table B04
Innovative enterprises in the manufacturing sector

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of all enterprises													
EU-15	.	.	.	.	.	.	53.9	.	.	.	45.9	.	.	.
Belgium	.	.	.	.	.	.	36.7	.	.	.	59.1	.	.	.
Denmark	.	.	.	.	.	.	75.2	.	.	.	52.7	.	.	.
Germany	.	.	.	.	.	.	70.1	.	.	.	66.5	.	.	.
Greece	.	.	.	.	.	.	.	.	.	.	27.3	.	.	.
Spain	.	.	.	.	.	.	29.0	.	.	.	37.6	.	.	.
France	.	.	.	.	.	.	48.1	.	.	.	46.0	.	.	.
Ireland	.	.	.	.	.	.	77.5	.	.	.	75.4	.	.	.
Italy	.	.	.	.	.	.	50.0	.	.	.	40.2	.	.	.
Luxembourg	.	.	.	.	.	.	44.5	.	.	.	49.7	.	.	.
Netherlands	.	.	.	.	.	.	65.1	.	.	.	54.6	.	.	.
Austria	.	.	.	.	.	.	69.6	.	.	.	53.3	.	.	.
Portugal	.	.	.	.	.	.	28.5	.	.	.	44.8	.	.	.
Finland	.	.	.	.	.	.	45.7	.	.	.	49.5	.	.	.
Sweden	.	.	.	.	.	.	57.2	.	.	.	47.7	.	.	.
United Kingdom	.	.	.	.	.	.	62.0	.	.	.	39.1	.	.	.

Indicator definition: Enterprises in the manufacturing sector with innovative activities in the reference period (1996= 1994–1996; 2000= 1998–2000).
Source: Eurostat: Community Innovation Survey (CIS2 and CIS3).

Table B05
Innovative enterprises in the services sector

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of all enterprises													
EU-15	.	.	.	.	.	.	46.9	.	.	.	39.8	.	.	.
Belgium	.	.	.	.	.	.	14.7	.	.	.	42.4	.	.	.
Denmark	.	.	.	.	.	.	42.9	.	.	.	36.5	.	.	.
Germany	.	.	.	.	.	.	54.3	.	.	.	56.9	.	.	.
Greece	.	.	.	.	.	.	.	.	.	.	32.5	.	.	.
Spain	.	.	.	.	.	.	.	.	.	.	24.5	.	.	.
France	.	.	.	.	.	.	35.3	.	.	.	33.8	.	.	.
Ireland	.	.	.	.	.	.	60.2	.	.	.	51.7	.	.	.
Italy	.	.	.	.	.	.	.	.	.	.	25.3	.	.	.
Luxembourg	.	.	.	.	.	.	54.4	.	.	.	48.0	.	.	.
Netherlands	.	.	.	.	.	.	40.6	.	.	.	38.4	.	.	.
Austria	.	.	.	.	.	.	56.6	.	.	.	44.9	.	.	.
Portugal	.	.	.	.	.	.	35.6	.	.	.	50.1	.	.	.
Finland	.	.	.	.	.	.	28.4	.	.	.	39.9	.	.	.
Sweden	.	.	.	.	.	.	35.6	.	.	.	46.4	.	.	.
United Kingdom	.	.	.	.	.	.	44.9	.	.	.	32.5	.	.	.

Indicator definition: Enterprises in the services sector with innovative activities in the reference period (1996= 1994–1996; 2000= 1998–2000).
Source: Eurostat: Community Innovation Survey (CIS2 and CIS3).

Table B06
Organisational change in enterprises, in the period 1998–2000

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of all enterprises													
EU-15	.	.	.	.	.	.	.	.	.	.	34.8	.	.	.
Belgium	.	.	.	.	.	.	.	.	.	.	40.1	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.	20.3	.	.	.
Germany	.	.	.	.	.	.	.	.	.	.	50.0	.	.	.
Greece	.	.	.	.	.	.	.	.	.	.	27.4	.	.	.
Spain	.	.	.	.	.	.	.	.	.	.	32.1	.	.	.
France	.	.	.	.	.	.	.	.	.	.	8.1	.	.	.
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Italy	.	.	.	.	.	.	.	.	.	.	33.0	.	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	57.4	.	.	.
Netherlands	.	.	.	.	.	.	.	.	.	.	25.8	.	.	.
Austria	.	.	.	.	.	.	.	.	.	.	44.9	.	.	.
Portugal	.	.	.	.	.	.	.	.	.	.	35.4	.	.	.
Finland	.	.	.	.	.	.	.	.	.	.	31.8	.	.	.
Sweden	.	.	.	.	.	.	.	.	.	.	38.4	.	.	.
United Kingdom	.	.	.	.	.	.	.	.	.	.	33.3	.	.	.

Indicator definition: Enterprises that changed their organisational structure in the reference period (2000= 1998–2000).
Source: Eurostat: Community Innovation Survey (CIS3).

Table B07
Turnover due to innovative products new to the market, for the manufacturing sector

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of total turnover													
EU-15	.	.	.	.	.	.	6.0	.	.	.	.	.	.	.
Belgium	.	.	.	.	.	.	3.0	.	.	.	6.0	.	.	.
Denmark	.	.	.	.	.	.	5.0	.	.	.	11.4	.	.	.
Germany	.	.	.	.	.	.	4.0	.	.	.	7.5	.	.	.
Greece	.	.	.	.	.	.	.	.	.	.	1.8	.	.	.
Spain	.	.	.	.	.	.	9.0	.	.	.	8.3	.	.	.
France	.	.	.	.	.	.	8.0	.	.	.	7.2	.	.	.
Ireland	.	.	.	.	.	.	8.0	.	.	.	.	.	.	.
Italy	.	.	.	.	.	.	.	.	.	.	12.4	.	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	3.3	.	.	.
Netherlands	.	.	.	.	.	.	7.0	.	.	.	.	.	.	.
Austria	.	.	.	.	.	.	6.0	.	.	.	7.5	.	.	.
Portugal	.	.	.	.	.	.	7.0	.	.	.	11.4	.	.	.
Finland	.	.	.	.	.	.	7.0	.	.	.	23.9	.	.	.
Sweden	.	.	.	.	.	.	7.0	.	.	.	.	.	.	.
United Kingdom	.	.	.	.	.	.	7.0	.	.	.	.	.	.	.

Indicator definition: Contribution of new or significantly improved products, also new to the market, for the manufacturing sector, as a share of total turnover, as estimated by respondents.
Source: Eurostat: Community Innovation Survey (CIS2 and CIS3).

Annex B: Auxiliary data tables

Table B01aux
R&D expenditure by performing sector, 2001

Country	Business Enterprise sector	Higher Education sector	Government sector	Private Non-Profit sector
	Percentage of total R&D expenditure			
EU-15	64.9	21.2	13.1	0.8
Belgium	73.7	19.2	6.0	1.1
Denmark	68.9	18.6	11.8	0.7
Germany	69.9	16.4	13.7	.
Greece	31.9	45.5	22.3	0.4
Spain	52.4	30.9	15.9	0.8
France	63.2	18.9	16.5	1.4
Ireland	68.5	22.0	9.5	.
Italy	.	.	.	.
Luxembourg	.	.	.	.
Netherlands	58.2	27.0	14.2	0.5
Austria	.	.	.	.
Portugal	31.8	36.7	20.8	10.8
Finland	71.1	18.1	10.2	0.6
Sweden	77.6	19.4	2.8	0.1
United Kingdom	67.4	21.4	9.7	1.4

Indicator definition: Expenditure on R&D by performing sector.
Source: OECD: BERD database.

Table B02aux
Use of protection methods in enterprises, in the period 1998–2000

Country	Registration of design patterns	Trademarks	Copyright	Secrecy	Complexity of design	Lead-time advantage over competitors
	Percentage of all enterprises					
EU-15	7.0	12.2	3.3	14.0	9.2	18.5
Belgium	7.7	13.7	4.3	17.3	8.8	19.8
Denmark	8.4	15.3	3.7	8.7	5.8	14.2
Germany	10.4	12.5	4.5	20.8	12.4	26.3
Greece	2.0	10.7	2.6	3.9	3.2	0.5
Spain	5.2	7.8	1.4	7.5	7.1	7.8
France	9.4	19.2	3.6	8.4	8.6	13.4
Ireland	.	.	.	.	.	.
Italy	4.6	9.9	1.5	14.2	7.3	18.5
Luxembourg	6.7	14.5	6.6	18.5	9.3	22.6
Netherlands	5.2	10.8	4.7	8.3	11.1	24.0
Austria	10.2	13.9	6.1	22.2	15.1	27.0
Portugal	2.4	12.2	1.1	10.5	6.4	12.0
Finland	7.0	14.1	6.1	25.7	15.9	29.6
Sweden	9.7	27.1	11.8	14.7	10.5	21.2
United Kingdom	.	.	.	.	.	.

Indicator definition: Enterprises in the business enterprise sector that protected their innovations in the reference period, by protection method.
Source: Eurostat: Community Innovation Survey (CIS3).

Table B03aux
High-technology patents

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	Percentage of all patents											
EU-15	9.3	9.4	9.5	10.6	10.0	11.3	12.1	13.2	15.0	16.5	18.5	19.6
Belgium	6.4	11.1	11.7	11.7	9.6	11.6	13.0	10.7	12.1	14.6	14.3	15.4
Denmark	10.9	9.3	10.4	9.7	9.9	11.5	9.9	14.6	17.7	17.2	19.3	19.9
Germany	7.8	7.6	7.5	7.6	7.0	8.0	9.2	10.6	12.0	12.9	14.8	15.8
Greece	.	7.3	13.9	10.1	5.1	11.3	6.0	7.4	7.9	10.8	13.3	27.0
Spain	4.1	6.7	6.4	9.1	6.8	8.7	7.1	8.5	9.6	13.2	13.4	14.8
France	11.2	11.7	12.6	12.8	12.5	13.2	12.4	13.9	16.1	18.8	20.1	20.9
Ireland	15.3	14.5	21.0	11.0	9.7	18.4	17.8	18.8	18.5	21.7	31.6	35.9
Italy	6.5	6.5	6.2	8.5	8.6	8.8	9.3	8.2	8.3	8.4	8.9	8.7
Luxembourg	.	.	.	.	.	4.6	1.6	4.3	4.5	4.6	15.4	5.1
Netherlands	14.1	12.8	15.7	17.3	16.6	17.4	16.9	19.6	21.5	24.3	26.7	28.3
Austria	4.1	6.0	4.8	6.1	6.2	7.9	7.7	7.0	7.7	8.9	11.0	10.8
Portugal	8.5	5.8	21.9	16.9	0.5	1.1	3.7	17.0	6.2	9.2	19.0	12.3
Finland	8.5	10.9	15.9	21.3	18.8	25.3	28.0	34.2	38.2	40.9	45.3	40.3
Sweden	8.1	7.2	7.9	11.4	9.4	13.2	16.5	16.8	23.7	23.9	28.2	27.5
United Kingdom	12.8	12.6	11.2	13.8	14.0	15.4	16.5	17.5	18.3	20.6	22.3	26.7

Indicator definition: High-tech patent applications to EPO, by year of filing at the national level, by IPC.
High Tech patents are defined as 46 separate product groups by ENEA, CESPRI and Politecnico di Milano.
Source: EPO.

Table B04aux
Innovativeness of total business enterprise sector, by type of innovation, in the period 1998–2000

Country	Ongoing and/or abandoned innovations only	Process innovation only	Product and process innovation	Product innovation only
	Percentage of innovative enterprises			
EU-15	9.9	.	.	.
Belgium	0.2	19.4	42.3	38.1
Denmark	6.0	11.5	46.9	35.6
Germany	12.0	18.8	36.7	32.4
Greece	3.0	29.2	34.4	33.4
Spain	2.9	30.7	36.3	30.1
France	12.6	17.2	34.9	35.3
Ireland	31.3	.	.	.
Italy	4.7	27.6	44.8	22.9
Luxembourg	7.3	19.9	37.4	35.4
Netherlands	6.7	10.2	46.2	36.9
Austria	12.0	17.1	34.9	35.9
Portugal	4.5	35.2	31.8	28.4
Finland	9.8	12.1	40.4	37.8
Sweden	15.2	15.4	27.7	41.6
United Kingdom	18.9	21.2	25.9	34.0

Indicator definition: Type of innovation employed by enterprises with innovative activities in the reference period.
Source: Eurostat: Community Innovation Survey (CIS3).

Table B05aux
Non-technological change in enterprises, in the period 1998–2000

Country	New corporate strategies	Advanced management techniques	Changing enterprise's marketing concepts / strategies	Significant changes in aesthetic appearance
	Percentage of all enterprises			
EU-15	30.3	25.2	27.1	27.2
Belgium	29.8	23.3	24.1	22.6
Denmark	21.2	8.0	18.2	13.0
Germany	39.9	36.8	37.6	35.1
Greece	19.5	15.5	26.5	47.9
Spain	18.6	24.3	21.2	28.5
France	21.9	18.5	0.0	3.6
Ireland	.	.	.	.
Italy	25.2	17.4	21.7	31.4
Luxembourg	46.9	58.4	32.0	27.7
Netherlands	33.8	17.3	17.1	10.8
Austria	36.6	32.7	35.3	30.9
Portugal	31.9	26.9	24.3	27.8
Finland	26.3	26.1	20.7	22.0
Sweden	33.5	8.1	28.9	18.9
United Kingdom	38.9	32.2	44.5	.

Indicator definition: Enterprises that made various kinds of non-technological changes in the reference period.
Source: Eurostat: Community Innovation Survey (CIS3).

Table B06aux
Innovation expenditure

Country	2000
	Percentage of total turnover
EU-15	.
Belgium	2.65
Denmark	0.54
Germany	2.72
Greece	2.08
Spain	1.24
France	2.53
Ireland	0.24
Italy	1.95
Luxembourg	1.29
Netherlands	1.50
Austria	.
Portugal	1.63
Finland	2.51
Sweden	.
United Kingdom	.

Indicator definition: Innovation expenditure as a share of total turnover.
Source: Community Innovation Survey (CIS3).

Annex C: Metadata of the key indicators

Module B

Indicator label	B01
Indicator name	R&D expenditure in the business enterprise sector
Indicator definition	Expenditure on R&D by the business enterprise sector
Unit of measurement	Percentage of value added in the business enterprise sector
Source	OECD: BERD database
Period covered	1990–2002
Remarks	Data for 2002 are forecasts or estimates

Indicator label	B02
Indicator name	Patent applications
Indicator definition	Patent applications to EPO, by year of filing at the national level, by IPC (International Patent Classification)
Unit of measurement	Applications per million labour force
Source	EPO (European Patent Office)
Period covered	1990–2001
Remarks	Also available as total number or per million inhabitants

Indicator label	B03
Indicator name	ICT patents
Indicator definition	ICT patent applications to EPO, by year of filing at the national level, by IPC. ICT patent applications are defined as IPC-codes G06, G11 and H04
Unit of measurement	Percentage of all patents
Source	EPO
Period covered	1990–2001
Remarks	Also available as total number or per million inhabitants

Indicator label	B04
Indicator name	Innovative enterprises in the manufacturing sector
Indicator definition	Enterprises in the manufacturing sector with innovative activities in the reference period
Unit of measurement	Percentage of all enterprises
Source	Eurostat: Community Innovation Survey (CIS2 and CIS3)
Period covered	1996, 2000
Dissemination	Innovation in Europe (Eurostat 2004)
Remarks	Two harmonised four-yearly Community Innovation Surveys were held. Because of changes in definitions and populations, results from the surveys should to be compared with caution. For 1996 only separate data for manufacturing and services are available; data cannot be combined because definitions are not compatible

Indicator label	B05
Indicator name	Innovative enterprises in the services sector
Indicator definition	Enterprises in the services sector with innovative activities in the reference period
Unit of measurement	Percentage of all enterprises
Period covered	1996, 2000
Source	Eurostat: Community Innovation Surveys (CIS2 and CIS3)
Dissemination	Innovation in Europe (Eurostat 2004)
Remarks	Refer to remarks for indicator B04

Indicator label	B06
Indicator name	Organisational change in enterprises
Indicator definition	Enterprises that changed their organisational structure in the reference period
Unit of measurement	Percentage of all enterprises
Source	Eurostat: Community Innovation Survey (CIS3)
Period covered	2000
Dissemination	Innovation in Europe (Eurostat 2004)
Remarks	The other kinds of non-technological change distinguished in CIS3 are discussed in indicator B05aux. Indicator not included in CIS2 (1996)

Indicator label	B07
Indicator name	Turnover due to innovative products new to the market, for the manufacturing sector
Indicator definition	Contribution of new or significantly improved products, also new to the market, for the manufacturing sector, as a share of total turnover, as estimated by respondents
Unit of measurement	Percentage of total turnover
Source	Eurostat: Community Innovation Surveys (CIS2 and CIS3)
Period covered	1996, 2000
Dissemination	Innovation in Europe (Eurostat 2004)
Remarks	Refer to remarks for indicator B04

Annex D: Metadata of the auxiliary indicators

Module B

Indicator label	B01aux
Indicator name	R&D expenditure by performing sector
Indicator definition	Expenditure on R&D by performing sector. Sectors: business, higher education, government, non-profit
Unit of measurement	Percentage of total R&D expenditure
Source	OECD: BERD database
Period covered	1990–2002
Countries covered	EU-15, excl. Italy, Austria and Luxembourg
Remarks	Values for 2002 are forecasts or estimates.

Indicator label	B02aux
Indicator name	Use of protection methods in enterprises
Indicator definition	Enterprises in the business enterprise sector that protected their innovations in the reference period, by protection method. Methods used: registration of design patterns; trademarks; copyright; secrecy; complexity of design; lead-time advantage over competitors
Unit of measurement	Percentage of all enterprises
Source	Eurostat: Community Innovation Survey (CIS3)
Period covered	2000
Countries covered	EU-15, excl. Ireland and United Kingdom
Publication	Innovation in Europe (Eurostat 2004)
Remarks	Indicator not included in CIS2 (1996)

Indicator label	B03aux
Indicator name	High-technology patents
Indicator definition	High-tech patent applications to EPO, by year of filing at the national level, by IPC (International Patent Classification). High-tech patents = 46 separate product groups as distinguished by ENEA, CESPRI, and Politecnico di Milano.
Unit of measurement	Percentage of all patents
Source	EPO
Period covered	1990–2001
Countries covered	EU-15
Remarks	Also available as total number or per million inhabitants

Indicator label	B04aux
Indicator name	Innovativeness of total business enterprise sector, by type of innovation
Indicator definition	Type of innovation employed by enterprises with innovative activities in the reference period. Types of innovation distinguished: ongoing and/or abandoned innovations only; process innovation only; product innovation only; product and process innovation.
Unit of measurement	Percentage of innovative enterprises
Source	Eurostat: Community Innovation Surveys (CIS2 and CIS3)
Period covered	1996, 2000
Countries covered	EU-15, excl. Ireland
Publication	Innovation in Europe (Eurostat 2004)
Remarks	Two harmonised four-yearly Community Innovation Surveys were held. Because of changes in definitions and populations, results from the surveys should to be compared with caution. For 1996 only separate data for manufacturing and services are available; data cannot be combined because definitions are not compatible.

Indicator label	B05aux
Indicator name	Non-technological change in enterprises
Indicator definition	Enterprises that made various kinds of non-technological changes in the reference period. Kinds of changes distinguished: new corporate strategy; advanced management techniques; changing enterprise's marketing concept / strategies; significant changes in aesthetic appearance.
Unit of measurement	Percentage of all enterprises
Source	Eurostat: Community Innovation Survey (CIS3)
Period covered	2000
Countries covered	EU-15, excl. Ireland
Publication	Innovation in Europe (Eurostat 2004)
Remarks	This indicator comprises kinds of change other than "organisational change", discussed in indicator B06. Indicator not included in CIS2 (1996).

Indicator label	B06aux
Indicator name	Innovation expenditure
Indicator definition	Innovation expenditure as a share of total turnover
Unit of measurement	Percentage of total turnover
Source	Community Innovation Surveys (CIS2 and CIS3)
Period covered	1996, 2000
Countries covered	EU-15, excl. Austria, Sweden and United Kingdom
Publication	Innovation in Europe (Eurostat 2004)
Remarks	Refer to remarks for indicator B04aux

4. Features and performance (Module C)

– *ICT expenditure relative to GDP slightly decreased from 2000 to 2003 because of economic recession and approaching saturation in the mobile-phone market.*

– *Enterprises in France and the Netherlands were most positive about the effect of innovation on market share (2000), whereas Finland was at the tail-end, which may be explained by the 'dialectics of progress'.*

– *The most frequent reported effect of innovation (2000) was improved quality. Other significant effects were an increased range of goods or services, increased production capacity and increased market share.*

– *In 2001 and 2002 Internet use was cheapest in France, Finland, the United Kingdom and Germany. Finland and the United Kingdom also belong to the top four in e-commerce, suggesting some interrelationship between the two.*

– *Especially in the EU and Ireland, the shares of e-commerce in total sales (over 2002) reached a notable volume: one sixth of total turnover, whereas Germany remained below 5 per cent.*

4.1 Introduction

This chapter considers the influence of innovation on businesses. Innovations will involve new technologies, among which ICT features as a dominant one. In particular, there is an interest in what innovation means for the micro and meso levels of the economy in terms of the features and performance of e-business (among which e-commerce). Although ICT applications require special ways of organising one's business processes, the innovations are normally driven by the usual economic advantages that they promise to provide: increased turnover, costs reduction and possibly positive external effects such as less environmental effects. As far as ICT is concerned, innovation leads to a better and more intensive use of the available computers, software and communication equipment. This involves crucial learning effects, which add to the human capital of companies.

In principle, the old issues of cost reduction and growth in revenue are still alive; these determine a company's value added and productivity. However, e-business offers new opportunities to perform in these crucial areas. There are different levels of e-business, without implying the higher the better; each company has to find its own optimal level, although perspectives may change rapidly, so that today's optimal level is not necessarily the optimal level of tomorrow. E-business initially enables selling and buying activities, with firms doing the same type of activities more efficiently (channel enhancement and value chain integration). The next stage is equivalent of the railway and telegraph revolution: complete restructuring of value chains, creation of new virtual firms and industry re-engineering. Finally, process specialists take their expertise to new attractive markets. [1)]

4.2 Selected indicators

4.2.1 Selected key indicators

The following key indicators have been selected:
– ICT expenditure;
– Effects of innovation on market share;
– Number of web hosts;
– Costs of Internet use;
– E-commerce, electronic sales by enterprises;
– Enterprise births;
– Venture capital investments.

ICT expenditure, as a percentage of GDP is a measure of the amount of ICT used by businesses, government, and households. This signals the openness and willingness to buy new products and services that ICT applications can offer.

Effects of innovation on market share is an indicator for the positive effect of innovation on increased turnover. This in turn increases the incentives for innovation for both enterprises and government.

Number of web hosts per 1000 inhabitants indicates connectivity of the population, which is a necessary condition for the New Economy to develop further.

Costs of Internet use is a factor in whether or not entering and using the Internet.

E-commerce, electronic sales by enterprises as a percentage of total turnover makes clear how e-commerce – a major operational manifestation of the New Economy – is developing.

Enterprise births give an impression of the dynamics in the economy, which leads to new business concepts, products and services. It is an important way of applying newly acquired knowledge in R&D and market development.

Venture capital investments indicate that innovations have been launched that despite the risks involved could be facilitated by appropriate financial credits.

4.2.2 Selected auxiliary indicators

The following indicators have been added as auxiliary indicators:
– IT and communications expenditure;
– Effects of innovation;
– Costs of internet use by type;
– Electronic sales and purchases;
– Enterprise births for innovative business sectors in Finland;
– Venture capital investments – early stage.

IT and communications expenditure is a major indicator showing how much ICT plays a part in the running of the economy

Effects of innovation give insight into different effects that innovation may have, such as product quality, product range and environmental effects.

Costs of Internet use by type shows the separate costs of the basket of Internet access as defined by the OECD: line rental, public switched telecommunication network (PSTN) usage charges and Internet service providers fee.

Electronic sales and purchases shows to what extent e-commerce is emerging as a regular way of buying goods and services

Enterprise births for innovative business sectors in Finland shows how more detailed figures on a country's corporate dynamics gives insight into how a country's adapts to the new challenges and to what extent the New Economy is involved.

Venture capital investments – early stage covers private equity raised for investment in companies for financing provided to research, assess and develop an initial concept before a business has reached the start-up phase (seed capital) and financing provided for product development and initial marketing, manufacturing, and sales (start-up). Companies may be in the process of being set up or may have been in business for a short time, but have not yet sold their product commercially.

The relations between key indicators and auxiliary indicators is as follows:

Indicators in Module C

Key indicators	*Auxiliary indicators*
ICT expenditure	– IT and communications expenditure
Effect of innovation on market share	– Effects of innovation
Number of web hosts	
Costs of internet use	– Cost of internet use by type
E-commerce, electronic sales by enterprises	BOX A: Impact of e-business on the value chain performance BOX B: Impacts of B2B projects BOX C: E-commerce and productivity – Electronic sales and purchases BOX D: Aligning information systems to company strategy
Enterprise births	– Enterprise births for some innovative sectors in Finland
Venture capital investments	– Venture capital investments – early stage

4.3 Indicators, statistics and commentaries

4.3.1 ICT expenditure

Many high-tech and organisational innovations require advanced ICT applications. This phenomenon explains the importance of ICT expenditure relative to the size of the economy (here expressed as GDP).
ICT expenditure relative to GDP slightly decreased from 2000 to 2003. For this, two reasons can be given. Firstly, there was an economic recession, a as result of which, in general, investments tended to be postponed. In the ICT sector, this postponement has partly neutralised a shortening of the economic life span of existing equipment because of continuously emerging product improvements. Secondly, the market for basic ICT hardware and software has reached a certain degree of saturation, including the mobile-phone market. This implies that the amount of ICT equipment sold was approaching its replacement level. New inventions in the future may lead to new innovations and their subsequent adoption, inducing additional spending on ICT.

4.3.2 IT and communications expenditure

ICT expenditure can be divided into two functional fields: Information Technology (IT) and Communications. In 2003, the European average is 52% communication and 48% IT. But the shares of IT and communications differ significantly between countries, from 24% IT in Greece to 56% in France. In Figure C01aux the countries are sorted according to their total ICT expenditure as percentage of GDP (see Figure C01). In countries with a low ICT expenditure (like Ireland, Spain and Greece) the share of IT is typically relatively low, thus the differences in ICT expenditure seems mostly due to differences in the IT share in the expenditures.

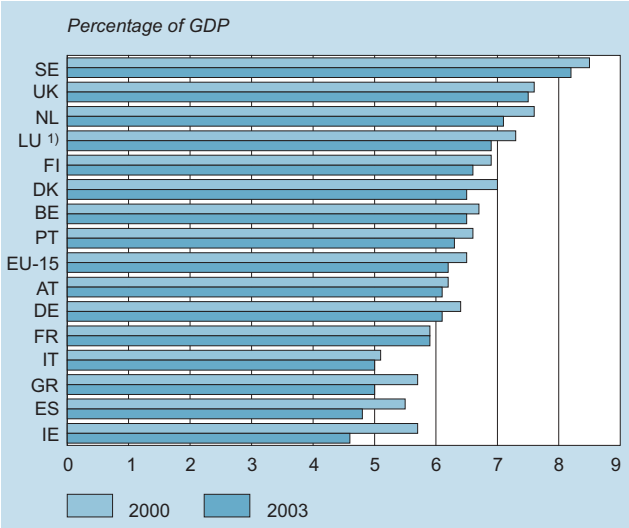
4.3.3 Effects of innovation on market share

An increased market share because of innovation means that the businesses have experienced growing sales by means of creating a better product profile and in this respect have outperformed a number of their competitors. Such achievements create a climate that is conducive to further innovations. It is based on interplay between increasing cash flows and new market opportunities that companies see for themselves. The variable that was measured here is the share of innovating enterprises that consider an increased market or market share to be a highly important effect of innovation.

Enterprises in France and the Netherlands were most positive about the effect of innovation on market share, whereas Finland was at the tail end, which may be explained by the 'dialectics of progress'.

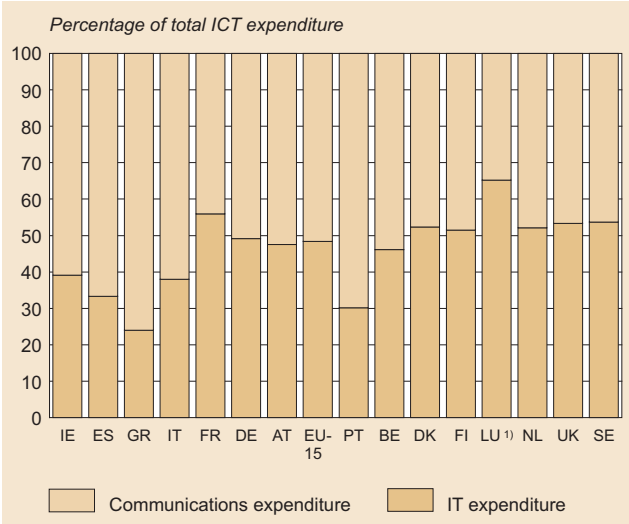
In France and the Netherlands increased market share is a highly important effect of innovation for two of five innovative enterprises. In Finland this is only the case for one out of ten enterprises and for Austria for one out of seven.

C01 ICT Expenditure



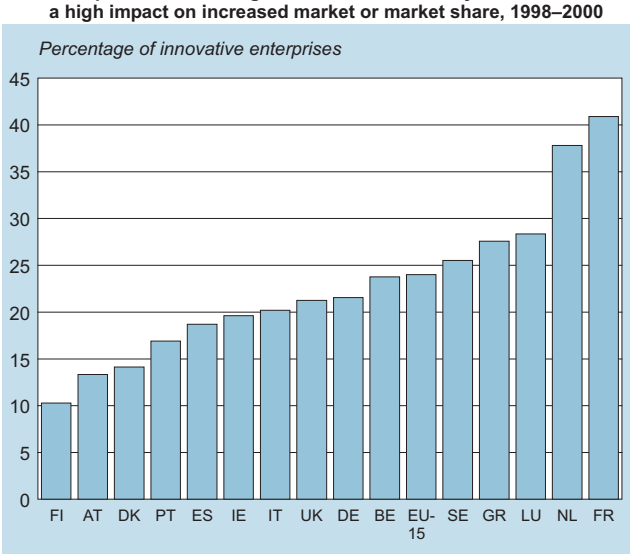
1) 2002 instead of 2003.
Source: OECD/WITSA/IDC, Eurostat NewCronos.

C01aux IT and communications expenditure, 2003



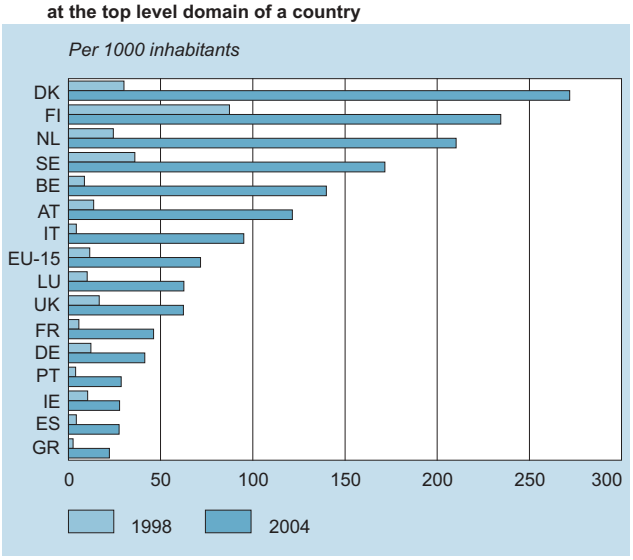
1) 2002 instead of 2003.
Source: OECD/WITSA/IDC, Eurostat NewCronos.

C02 Enterprises considering their innovation activity to have a high impact on increased market or market share, 1998–2000



Source: Eurostat, Third Community Innovation Survey (CIS3).

C03 Number of domain names with an associated IP address record, at the top level domain of a country



Source: ISC (number of hosts); Eurostat (population).

4.3.4 Effects of innovation

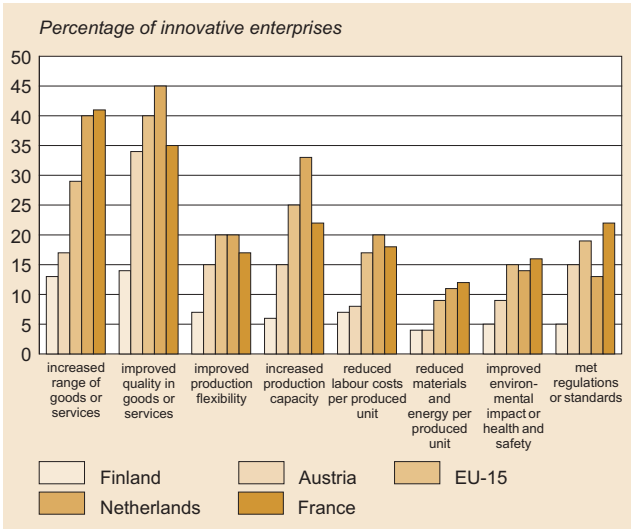
The most frequently reported effect of innovation was improved quality. Other significant effects were an increased range of goods or services, increased production capacity and increased market share. A reduction in materials and energy use was least reported as highly important.

In general, of the countries at the bottom (Finland and Austria) and top (France and Netherlands) of figure C02, the Netherlands and France have the largest share of enterprises that find these effects highly important, while Finland and Austria also here report least effects.

4.3.5 Number of web hosts

A large number of websites echoes the diffusion of ICT, indicating that people and enterprises are actively using the Internet. The availability of websites represents the networks that make it possible to develop e-commerce and other kinds of e-activities.

C02aux Enterprises considering their innovation activity to have a high impact on specified effects, 1998–2000



Source: Eurostat, Third Community Innovation Survey (CIS3).

Competition comes in when a country or region looses business because of a lack of websites by its own citizens and businesses. Then others may come in to take over. Distance is increasingly becoming a less determining factor.

The figures reveal remarkable differences, with Denmark, Finland and the Netherlands having more than 200 websites per 1000 inhabitants and countries like Greece, Spain, Ireland and Portugal having less than 30. It may be no coincidence that the countries with most websites per 1000 inhabitants also have the largest share of ICT expenditure and e-commerce.

4.3.6 Costs of Internet use

One effect of extensive ICT use under conditions of workable competition would be a reduced cost of Internet use. And conversely, when Internet use is relatively cheap, this may stimulate the use of ICT by households, increasing the opportunities for computer-mediated sales.

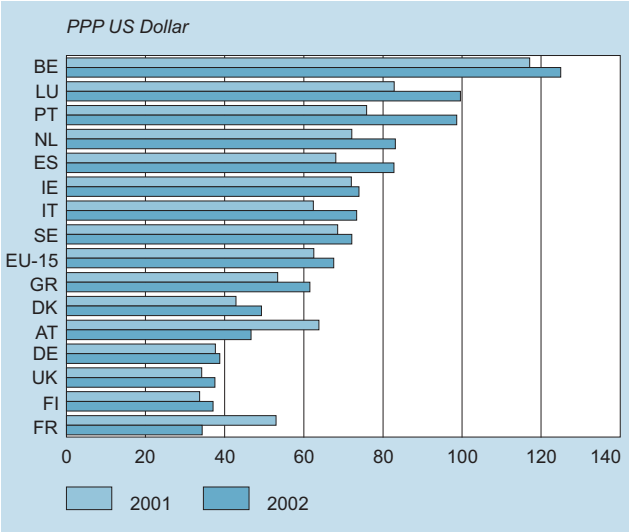
It seems that prices actually increased from 2001 to 2002. But data between years are not comparable, because the amounts are given is PPP US$. Still, even for the US (where the price in PPP US$ equals that in US$) the price of Internet increased (from $23 to $36). Therefore, it is plausible that a similar development holds for the European countries. A relative decrease in price is found in Austria and France. For Austria this is due to the fact that even though ISP costs increased, the telephone usage charge dropped to zero, while in France relative ISP costs decreased.

In 2001 and 2002 Internet use was most expensive in Belgium, Luxemburg and Portugal. These countries' ICT expenditure and e-commerce were – perhaps not by coincidence – below average. Internet was cheapest in France, Finland, the UK and Germany. It is precisely these countries that comprised the top four in e-commerce, suggesting some interrelationship between the two.

4.3.7 E-commerce, electronic sales by enterprises

An ultimate measure of successful ICT investment and innovation is the share of turnover that was realised through electronic orders. For 2002 to begin with, EUROSTAT has gathered data on this subject, which, however, was sparsely disseminated through the New Cronos Internet database.

C04 Internet access basket for 40 hours at daytime discounted public switched telecommunication network (PSTN) rates, including VAT



Source: OECD.

BOX A Impact of e-business on the value chain performance

The table below demonstrates in brief what the impact of e-business is expected to be on a company's value chain performance, both in terms of revenue enhancing opportunities and cost reduction opportunities.

Revenue enhancing opportunities	Cost reduction opportunities
Offering direct sales to customers	Reducing product handling with a shorter supply chain
Providing 24-hour access from any location	Postponing product differentiation until after an order is placed
Aggregating information from various sources	Decreasing delivery cost and time with downloadable product
Providing personalisation and customisation from various sources	Reducing facility and processing costs
Speeding up time to market	Decreasing inventory costs through centralisation
Implementing flexible pricing	Improving supply chain co-ordination through information sharing
Allowing process and service discrimination	
Facilitating efficient fund transfer	

Source: S. Chopra & P. Meindl, 'Supply Chain Management – Strategy, Planning and Operations', Prentice-Hall, New Jersey, 2001.

In some countries electronic sales make up a notable share of turnover. Especially in the UK and Ireland, the shares of e-commerce in total sales reached a notable volume: one sixth of total turnover. Electronic ordering can be done through Internet or other networks. By far the largest share was through EDI or similar networks. The figures show a positive country-based relationship between on the one hand high website intensity and low costs of Internet use and on the other hand the degree to which electronic commerce had developed.

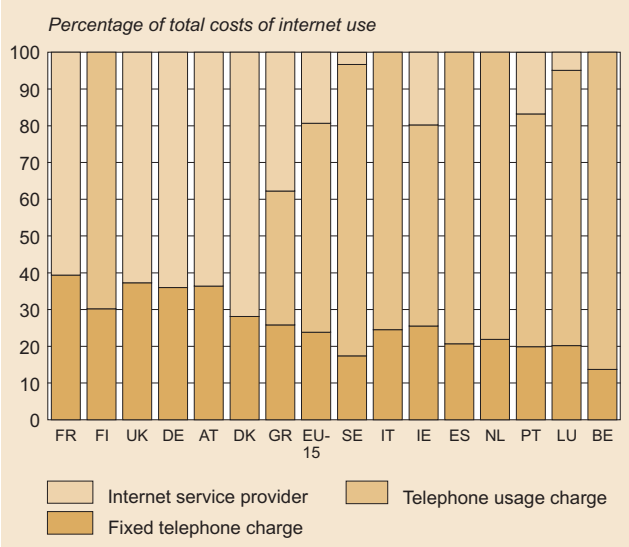
Whereas in a number of service industries ICT was mainly used to automate existing processes, nowadays ICT provides a basis for new service offerings, new ways of relating to clients and reconfiguring service operations. This brings with it a focus not only on technology, but also on marketing strategies, organisation development and logistics.

E-commerce implies that customers become much more influential in setting a company's priorities. By using the Internet, the client can express his or her wishes directly to the producer. The question is whether the supplying company can cope with these demand-led developments as it may imply major changes in business processes while it is not possible to simulteanously abandon the conventional ways of doing business. Within this context, organisational change is seemingly characterised by 'pivoting' in such a way that clients, irrespective of their questions and demands, are served by one front office.

4.3.8 Electronic sales and purchases

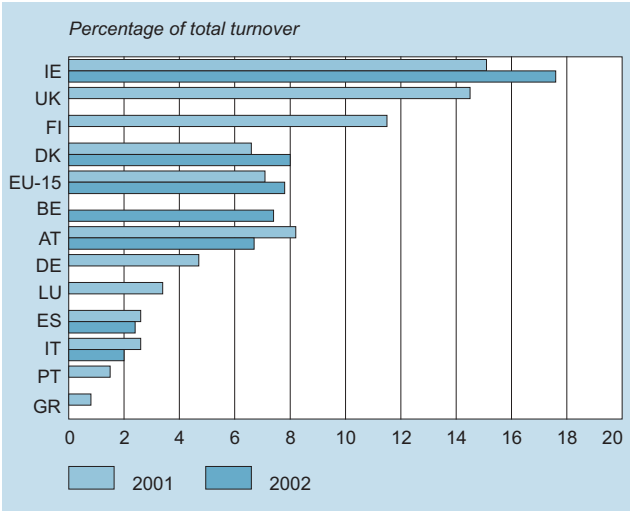
Selling over the Internet (or EDI) typically requires more investment and organisational change than electronic purchasing. This may

C03aux Costs of internet use by type, 2002



Source: OECD.

C05 Sales conducted over computer-mediated (Internet and other) networks



Source:Eurostat: Community Survey on ICT Usage in Enterprises (the former Eurostat e-Commerce Survey).

BOX B Impacts of B2B projects

Survey questions on the impacts of B2B projects in the automotive industry resulted in a relatively high non-response rate. As the interviews have shown, at the time of mailing the questionnaires most firms were about to or had just implemented B2B projects. Some types of projects, such as CRM or R&D collaboration, needed more time for planning and rollout, so that it takes more time before it is possible to see the results. Moreover, certain impacts, especially quality improvements, were difficult to quantify. It became clear as well that quite a number of B2B projects had been based on unrealistic assumptions about return on investment or other desirable effects. Finally, it appeared that many firms did not have a distinct project management organisation or a project controlling system. Under these conditions it was very difficult to identify the impacts of complex technological and organisational change.

Source: B2B Metrics, 'Measuring Forms, Content, Strategy and Impacts of B2B e-Commerce – Overview Report on Survey Results Germany', 2004.

BOX C E-commerce and productivity

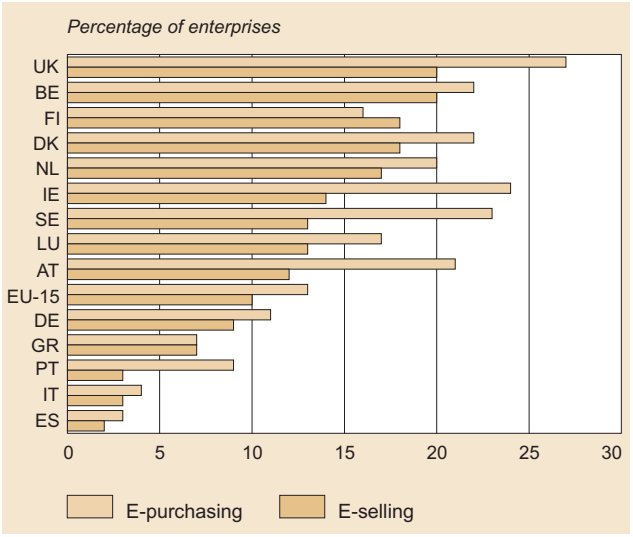
To examine the effects of e-commerce on productivity, output per employee was regressed on inputs per employee and e-commerce measures. In this framework, there are at least three ways in which e-commerce might affect measured productivity, in addition to a simple additive effect to the productive potential of firms. First, e-commerce might allow the cheaper and more efficient sourcing of materials. This raises labour productivity, either by raising value-added directly or improving the materials contribution in gross output. Second, e-commerce might allow different prices to be charged for firm output. If it allows firms to raise (or lower) prices relative to the industry, then measured productivity increases (decreases), since output is deflated by prices for the whole industry (as this is the only data available). Third, e-commerce might be correlated with other unmeasured aspects of a firm's quality, for example able management. Again, to the extent this is unmeasured, this raised productivity.

The regression results show an overall positive correlation between the use of computer networks for trading and firm productivity – on all the three measures listed above. However, a comparison of the gross output results with the value-added results suggests that pricing effects play a large part in the differences. The results indicate a total factor productivity gain associated with e-procurement of 2.3 per cent measured in terms of gross output. However, when output is measured by value-added, gains associated with e-procurement are estimated at seven per cent and loss of value-added associated with e-selling is over four per cent. The gains associated with e-procurement are likely to be partly at the expense of suppliers.

Source: C. Criscuolo and K. Waldron, 'E-commerce and productivity', Economic Trends 600, November 2003, Office for National Statistics, UK, London.

explain the fact that in 2002 the number of companies that embarked on e-commerce was smaller than the number of companies that had adopted electronic purchasing. However, for the countries for which figures over 2001 and 2002 are available, e-commerce is generally growing (see in the annex table C03aux).

C04aux Electronic sales and purchases, 2002



Source: Eurostat: Community Survey on ICT Usage in Enterprises (the former Eurostat e-Commerce Survey).

As for the share of enterprises that implemented e-sales in 2002, United Kingdom, Belgium, and Finland scored highest, with the Denmark and the Netherlands following suit. This picture is quite similar to that of e-purchasing, except for the higher relative position of Finland in the case of e-commerce.

Typically, countries that were in the forefront of R&D expenditure, patent applications and high ICT expenditure also appeared to be in the top of enterprises engaging in e-commerce. A notable exception to this is Luxembourg, which had an unexpectedly low rate of e-commerce.

4.3.9 Enterprise births

Enterprise birth amounts to the creation of a combination of production factors with no other enterprises involved in the event. The share of new start-ups as a share of total number of enterprises in the nine countries for which data is available varies between 7% and 11%. A general trend is hard to detect: in Portugal and Finland the enterprise birth rate declined steadily from 1998 to 2000, in the UK and Denmark it increased from 1998 to 1999 but decreased again in 2000; in Italy and Belgium there was a big drop from 1998 to 2000 (see table C06).

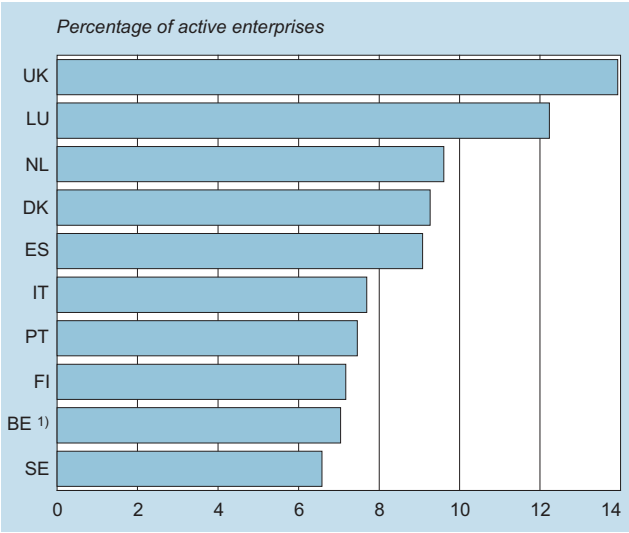
BOX D Aligning information systems to company strategy

Aligning choices of information systems to company strategy appears to be a key issue for SMEs aiming at profitable ICT investments. It is therefore necessary that entrepreneurs make their strategies explicit and coherently assign priorities to the main business processes. In fact, SMEs that have been able to identify strategic processes and consequently allocate ICT resources, perform dramatically better than SMEs with a more improvised approach towards the development of information systems.

Research results show that the strongest relationship between ICT support and company performance occurs for new product development, new market development and R&D activities.

Source: M. Tagliavini, F. Pigui, A. Ravarini and G. Buonanno 'Emprirically testing the impact of ICT on business performance within SME', Università Cattaneo, LIUC, 2001.

C06 Enterprise births, 2001



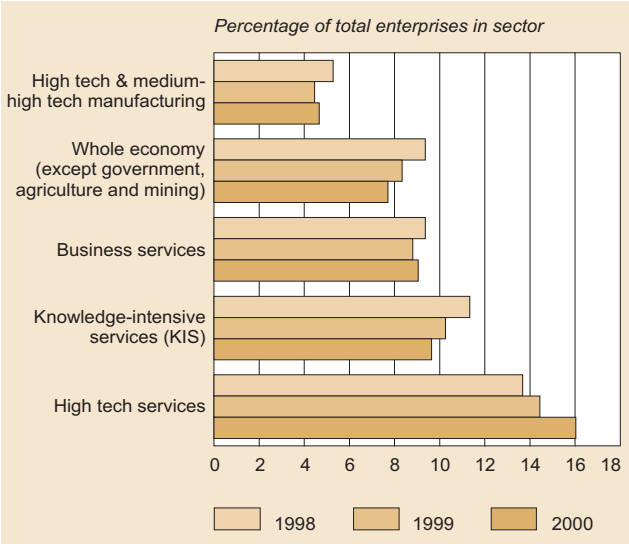
1) 2000 instead of 2001.
Source: Eurostat, Structural Indicators.

BOX E Enterprise births in Finland

Statistics Finland has gathered extensive data on enterprise births, categorised per business sector. Data for some selected sectors gives more insight into enterprise demography. The highlighted sectors are: High-tech services, knowledge intensive services, business services, whole economy, and high and medium tech manufacturing.

In high-tech services and knowledge-intensive services the share of start-ups was substantially higher than in the total business sector (16% versus 9%). Moreover, high-tech services were the only sector where the share of start-ups increased. This may indicate a shift in the economy away from manufacturing towards services, and away from low and medium tech towards high tech.

C05aux Enterprise births for some innovative sectors in Finland

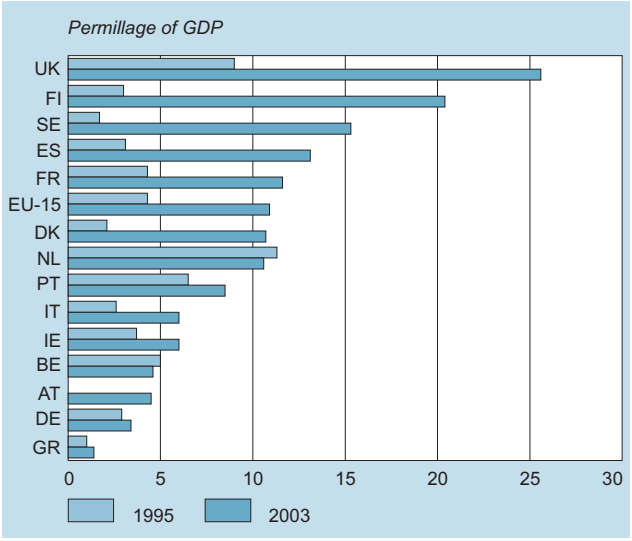


Source: StatFin, NESIS.

4.3.10 Venture capital investments

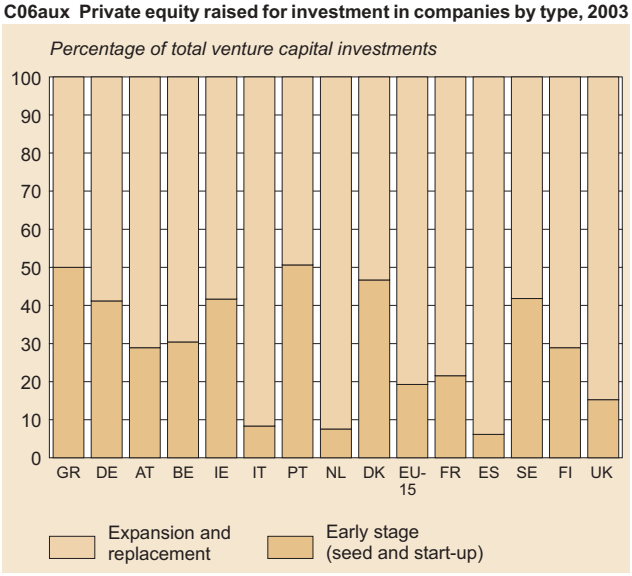
Venture capital investments testify of the use of financial credits available for innovative investments subject to greater risks than usual. In general, Figure C07 makes clear that investments financed by means of venture capital have strongly increased between 1995 and 2003. Moreover, it is striking that there are strong differences between the EU-15 countries, both for the early stages of innovation and the later stages of expansion and replacement as can be seen from Figure C06aux.

C07 Private equity raised for investment in companies: sum of early stage (seed and start-up) and expansion and replacement



Source: EVCA; Eurostat, Structural Indicators.

C06aux Private equity raised for investment in companies by type, 2003



Source: EVCA; Eurostat, Structural Indicators.

4.4 Conclusion

A composite indicator based on the key indicators (Investment and consumption of ICT as a share of GDP, Effects of innovation on increased market share, Websites per 1000 inhabitants, Costs of Internet use, Share of electronic sales in total turnover, Enterprise births) indicates the relative scores of the EU-15 countries. The composite indicators primarily indicates how the operational economy takes ICT on board ands works with it. The leading country in this is the United Kingdom, which comprises group one. This is a relative surprise here, as it is not systematically seen in group one. The Nordic EU-15 countries, in a large number of cases in group one comprise together with the Netherlands and France group 2.

Composite indicator for Features and Performance [1)]

Group 1
United Kingdom

Group 2
Netherlands, France, Sweden, Finland, Denmark

Group 3
Luxembourg, EU-15, Austria, Ireland, Germany, Belgium, Italy, Spain, Greece, Portugal

1) The countries in group 1 have the higher scores, the countries in group 2 have medium scores while the countries in group 3 are at the lower end of the scores. The clustering has been carried out to prevent an overemphasis on the scores, because it was realised that the indicators used, do not cover the entire spectrum of business capacities and strategies. Moreover, there were some missing values, which required estimates.

Group 3 encompasses the other nine EU-15 countries. The results show that the general assumption of the used framework according to which innovation and New Economy go together is not a linear relationship, but involve links with different intensities and time horizons. Moreover, the indicators used are likely to overlook the role of services and differences between small and large countries. These arguments, however, do not affect the repeatedly rear position of the southern EU-15 countries.

Note in the text

1) See: A. Koutsoutos, 'Business Impacts of ICT – Desk Study', SEAMATE Project, WP 2, Bremen, Germany, 2002.

Annex A: Key data tables

Table C01
ICT Expenditure

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
EU-15	.	.	.	.	.	.	.	.	.	.	6.5	6.4	6.1	6.2
Belgium	.	.	.	.	.	.	.	.	.	.	6.7	6.9	6.6	6.5
Denmark	.	.	.	.	.	.	.	.	.	.	7.0	6.7	6.5	6.5
Germany	.	.	.	.	.	.	.	.	.	.	6.4	6.3	6.1	6.1
Greece	.	.	.	.	.	.	.	.	.	.	5.7	5.6	5.2	5.0
Spain	.	.	.	.	.	.	.	.	.	.	5.5	5.2	4.9	4.8
France	.	.	.	.	.	.	.	.	.	.	5.9	6.0	5.8	5.9
Ireland	.	.	.	.	.	.	.	.	.	.	5.7	5.1	4.6	4.6
Italy	.	.	.	.	.	.	.	.	.	.	5.1	5.2	5.1	5.0
Luxembourg	.	.	.	.	.	.	.	.	.	.	7.3	7.4	6.9	.
Netherlands	.	.	.	.	.	.	.	.	.	.	7.6	7.2	7.0	7.1
Austria	.	.	.	.	.	.	.	.	.	.	6.2	6.3	6.1	6.1
Portugal	.	.	.	.	.	.	.	.	.	.	6.6	6.6	6.3	6.3
Finland	.	.	.	.	.	.	.	.	.	.	6.9	6.7	6.6	6.6
Sweden	.	.	.	.	.	.	.	.	.	.	8.5	8.6	8.4	8.2
United Kingdom	.	.	.	.	.	.	.	.	.	.	7.6	7.4	7.1	7.5

Indicator definition: Expenditure (investments and consumption) on ICT (= Information technology (IT) hardware, IT services and software and telecommunications equipment and services).
Source: OECD/WITSA/IDC, Eurostat NewCronos.

Table C02
Effect of innovation on market share

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of innovative enterprises													
EU-15	.	.	.	.	.	.	.	.	.	.	24.0	.	.	.
Belgium	.	.	.	.	.	.	.	.	.	.	23.8	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.	14.1	.	.	.
Germany	.	.	.	.	.	.	.	.	.	.	21.6	.	.	.
Greece	.	.	.	.	.	.	.	.	.	.	27.6	.	.	.
Spain	.	.	.	.	.	.	.	.	.	.	18.7	.	.	.
France	.	.	.	.	.	.	.	.	.	.	40.9	.	.	.
Ireland	.	.	.	.	.	.	.	.	.	.	19.6	.	.	.
Italy	.	.	.	.	.	.	.	.	.	.	20.2	.	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	28.4	.	.	.
Netherlands	.	.	.	.	.	.	.	.	.	.	37.8	.	.	.
Austria	.	.	.	.	.	.	.	.	.	.	13.4	.	.	.
Portugal	.	.	.	.	.	.	.	.	.	.	16.9	.	.	.
Finland	.	.	.	.	.	.	.	.	.	.	10.3	.	.	.
Sweden	.	.	.	.	.	.	.	.	.	.	25.5	.	.	.
United Kingdom	.	.	.	.	.	.	.	.	.	.	21.3	.	.	.

Indicator definition: Enterprises considering their innovation activity to have a high impact on increased market or market share (2000= 1998–2000).
Source: Eurostat, Third Community Innovation Survey (CIS3).

Table C03
Number of web hosts

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	Per 1000 inhabitants													
EU-15	.	.	.	.	.	.	.	11.6	16.3	23.0	33.3	45.5	56.9	71.6
Belgium	.	.	.	.	.	.	.	8.6	16.2	31.3	40.6	64.8	101.7	139.9
Denmark	.	.	.	.	.	.	.	30.1	52.7	63.2	81.4	131.7	214.4	271.9
Germany	.	.	.	.	.	.	.	12.1	16.1	20.7	26.3	32.5	35.0	41.4
Greece	.	.	.	.	.	.	.	2.5	4.7	7.1	13.6	16.7	18.4	22.2
Spain	.	.	.	.	.	.	.	4.3	6.7	10.4	16.4	36.7	40.8	27.5
France	.	.	.	.	.	.	.	5.7	8.3	13.3	20.8	28.2	36.2	46.3
Ireland	.	.	.	.	.	.	.	10.4	14.7	15.8	23.1	24.5	24.6	27.7
Italy	.	.	.	.	.	.	.	4.2	5.9	11.4	28.2	39.6	67.4	95.2
Luxembourg	.	.	.	.	.	.	.	10.1	15.2	22.3	26.8	37.7	38.5	62.6
Netherlands	.	.	.	.	.	.	.	24.3	35.8	51.7	81.9	123.1	149.2	210.3
Austria	.	.	.	.	.	.	.	13.7	17.9	34.3	62.9	81.7	103.9	121.4
Portugal	.	.	.	.	.	.	.	3.9	4.9	8.9	17.3	25.5	28.0	28.6
Finland	.	.	.	.	.	.	.	87.4	105.9	122.1	148.9	181.8	219.1	234.5
Sweden	.	.	.	.	.	.	.	36.1	48.8	67.1	86.0	128.1	135.3	171.6
United Kingdom	.	.	.	.	.	.	.	16.7	24.0	31.9	38.3	41.3	43.5	62.4

Indicator definition: Number of domain names with an associated IP address record, at the top level domain of a country.
Source: ISC (number of hosts); Eurostat (population).

Table C04
Costs of internet use

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	USD PPP													
EU-15	.	.	.	.	.	.	.	.	.	96.00	65.52	68.68	66.34	.
Belgium	.	.	.	.	.	.	.	.	.	147.00	81.35	123.56	124.93	.
Denmark	.	.	.	.	.	.	.	.	.	91.53	48.09	49.13	49.30	.
Germany	.	.	.	.	.	.	.	.	.	76.78	50.71	42.40	38.78	.
Greece	.	.	.	.	.	.	.	.	.	88.46	52.16	58.35	61.51	.
Spain	.	.	.	.	.	.	.	.	.	85.87	77.02	76.80	82.74	.
France	.	.	.	.	.	.	.	.	.	95.73	59.50	57.19	34.35	.
Ireland	.	.	.	.	.	.	.	.	.	83.22	75.38	74.45	73.96	.
Italy	.	.	.	.	.	.	.	.	.	67.91	45.71	70.68	54.69	.
Luxembourg	.	.	.	.	.	.	.	.	.	152.06	99.94	100.04	99.60	.
Netherlands	.	.	.	.	.	.	.	.	.	85.66	81.63	77.92	83.12	.
Austria	.	.	.	.	.	.	.	.	.	128.15	70.51	72.83	46.68	.
Portugal	.	.	.	.	.	.	.	.	.	124.27	77.24	82.52	98.64	.
Finland	.	.	.	.	.	.	.	.	.	43.73	41.18	36.28	37.08	.
Sweden	.	.	.	.	.	.	.	.	.	64.09	58.36	71.85	72.09	.
United Kingdom	.	.	.	.	.	.	.	.	.	105.61	60.41	36.19	37.57	.

Indicator definition: Internet access basket for 40 hours at daytime discounted public switched telecommunication network (PSTN) rates, including VAT.
Source: OECD.

Table C05
E-commerce, electronic sales by enterprises

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of total turnover													
EU-15	.	.	.	.	.	.	.	.	.	.	.	7.1	6.4	.
Belgium	.	.	.	.	.	.	.	.	.	.	.	.	7.4	.
Denmark	.	.	.	.	.	.	.	.	.	.	.	6.6	8.0	.
Germany	.	.	.	.	.	.	.	.	.	.	.	4.7	3.6	.
Greece	.	.	.	.	.	.	.	.	.	.	.	0.8	1.0	.
Spain	.	.	.	.	.	.	.	.	.	.	.	2.6	2.4	.
France	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ireland	.	.	.	.	.	.	.	.	.	.	.	15.1	17.6	.
Italy	.	.	.	.	.	.	.	.	.	.	.	2.6	2.0	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	3.4	.	.
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Austria	.	.	.	.	.	.	.	.	.	.	.	8.2	6.7	.
Portugal	.	.	.	.	.	.	.	.	.	.	.	1.5	3.3	.
Finland	.	.	.	.	.	.	.	.	.	.	.	11.5	.	.
Sweden	.	.	.	.	.	.	.	.	.	.	.	.	.	.
United Kingdom	.	.	.	.	.	.	.	.	.	.	.	14.5	12.8	.

Indicator definition: Sales conducted over computer-mediated (Internet and other) networks.
Source: Eurostat, Community Survey on ICT Usage; E-Commerce in Enterprises.

Table C06
Enterprise births

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of active enterprises													
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Belgium	.	.	.	.	.	.	.	.	8.48		7.04	.	.	.
Denmark	.	.	.	.	.	.	.	.	10.07	10.86	9.98	9.27	.	.
Germany	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Greece	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Spain	.	.	.	.	.	.	.	.	9.73	9.58	9.65	9.08	.	.
France	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Italy	.	.	.	.	.	.	.	.	11.38	7.56	7.76	7.69	.	.
Luxembourg	.	.	.	.	.	.	.	.	13.20	13.43	12.40	12.23	.	.
Netherlands	.	.	.	.	.	.	.	.		9.56	9.45	9.61	.	.
Austria	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Portugal	.	.	.	.	.	.	.	.	9.45	8.00	7.58	7.46	.	.
Finland	.	.	.	.	.	.	.	.	8.49	7.62	7.27	7.17	.	.
Sweden	.	.	.	.	.	.	.	.	.	6.31	7.03	6.58	.	.
United Kingdom	.	.	.	.	.	.	.	.	9.12	9.58	8.92	13.93	.	.

Indicator definition: Enterprise birth amounts to the creation of a combination of production factors with no other enterprises involved in the event.
Source: Eurostat, Structural Indicators.

Table C07
Venture capital investments

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Permillage of GDP													
EU-15	.	.	.	.	.	4.3	5.2	6.4	8.8	14.1	22.9	14.3	11.0	10.9
Belgium	.	5.9	8.0	4.9	4.8	5.0	5.0	8.1	10.7	26.5	21.5	12.1	8.9	4.6
Denmark	.	2.0	0.7	1.3	1.4	2.1	2.4	1.5	2.5	5.2	11.2	18.0	12.8	10.7
Germany	.	3.5	3.0	2.8	3.0	2.9	3.0	4.6	7.2	13.6	19.3	13.5	6.5	3.4
Greece	.	.	.	.	.	1.0	3.2	1.5	1.8	5.7	15.8	7.7	3.2	1.4
Spain	.	3.4	2.5	2.6	2.3	3.1	3.7	3.9	4.0	10.2	13.3	15.7	10.5	13.1
France	.	6.8	6.2	5.4	6.8	4.3	6.1	5.1	7.4	12.8	23.1	9.2	8.9	11.6
Ireland	.	8.8	5.8	5.1	5.6	3.7	6.2	4.9	5.0	8.8	21.2	11.1	8.1	6.0
Italy	.	4.1	4.4	2.3	2.0	2.6	3.7	3.9	5.8	5.6	13.7	9.6	8.5	6.0
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Netherlands	.	7.4	6.1	5.3	8.8	11.3	12.6	13.9	23.5	34.7	38.8	24.3	21.2	10.6
Austria	.	0.3	0.1	0.0	0.0	0.0	0.0	0.5	1.9	3.8	7.2	6.1	5.9	4.5
Portugal	.	6.3	5.9	8.5	9.5	6.5	3.4	6.7	4.9	4.8	12.0	6.4	4.8	8.5
Finland	.	2.0	1.7	2.5	2.5	3.0	3.5	8.3	9.9	14.0	19.3	15.9	21.0	20.4
Sweden	.	0.9	0.7	1.4	4.7	1.7	11.1	3.9	5.6	19.0	21.7	41.2	26.3	15.3
United Kingdom	.	9.7	8.3	7.5	9.1	9.0	8.9	13.4	16.3	20.4	39.7	19.1	17.2	25.6

Indicator definition: Private equity raised for investment in companies: sum of early stage (seed and start-up) and expansion and replacement.
Source: EVCA; Eurostat Structural Indicators.

Annex B: Auxiliary data tables

Table C01aux
IT and communications expenditure

	IT expenditure				Communications expenditure			
	2000	2001	2002	2003	2000	2001	2002	2003
	Percentage of GDP							
EU-15	3.3	3.2	3.0	3.0	3.2	3.2	3.1	3.2
Belgium	3.3	3.3	3.1	3.0	3.4	3.6	3.5	3.5
Denmark	4.0	3.7	3.5	3.4	3.0	3.0	3.0	3.1
Germany	3.4	3.3	3.1	3.0	3.0	3.0	3.0	3.1
Greece	1.6	1.5	1.3	1.2	4.1	4.1	3.9	3.8
Spain	1.8	1.8	1.6	1.6	3.7	3.4	3.3	3.2
France	3.4	3.4	3.3	3.3	2.5	2.6	2.5	2.6
Ireland	2.5	2.1	1.8	1.8	3.2	3.0	2.8	2.8
Italy	2.0	2.0	2.0	1.9	3.1	3.2	3.1	3.1
Luxembourg	5.0	4.9	4.5	.	2.3	2.5	2.4	.
Netherlands	4.2	3.9	3.7	3.7	3.4	3.3	3.3	3.4
Austria	3.1	3.1	2.9	2.9	3.1	3.2	3.2	3.2
Portugal	2.1	2.1	1.9	1.9	4.5	4.5	4.4	4.4
Finland	3.7	3.6	3.5	3.4	3.2	3.1	3.1	3.2
Sweden	4.8	4.8	4.6	4.4	3.7	3.8	3.8	3.8
United Kingdom	4.2	4.0	3.8	4.0	3.4	3.4	3.3	3.5

Indicator definition:Expenditure (investment and consumption) on IT and communication goods and services by type.
Source: OECD/WITSA/IDC, Eurostat NewCronos.

Table C02aux
Effects of innovation, 1998–2000

	Increased range of goods or services	Increased market or market share	Improved quality in goods or services	Improved production flexibility	Increased production capacity	Reduced labour costs per produced unit	Reduced materials and energy per produced unit	Improved environmental impact or health and safety	Met regulations or standards
	Percentage of innovative enterprises								
EU-15	29	24	40	20	25	17	9	15	19
Belgium	32.9	23.8	42.5	19.8	23.3	15.4	5.6	17.0	15.9
Denmark	17.3	14.1	20.2	10.4	12.3	12.2	7.2	7.5	11.6
Germany	28.8	21.6	33.5	18.5	16.9	12.2	6.8	7.2	11.6
Greece	41.0	27.6	62.2	43.8	38.1	17.2	7.2	26.3	45.2
Spain	25.7	18.7	41.0	21.1	29.0	15.2	8.4	16.8	25.0
France	41.5	40.9	35.0	16.9	21.6	18.1	12.1	15.8	21.7
Ireland	28.1	19.6	36.7	26.2	28.4	16.0	8.1	15.2	25.2
Italy	23.3	20.2	46.7	20.3	32.4	25.1	12.1	23.7	24.7
Luxembourg	36.4	28.4	44.3	25.1	29.3	9.7	7.2	13.0	24.5
Netherlands	39.9	37.8	45.0	19.5	32.9	19.5	10.9	14.3	12.6
Austria	16.7	13.4	33.8	15.1	14.6	7.9	3.7	9.2	15.2
Portugal	19.3	16.9	40.2	23.8	27.7	15.3	6.4	19.2	27.1
Finland	13.5	10.3	13.8	6.6	6.5	7.2	4.1	4.8	4.7
Sweden	28.5	25.5	23.2	11.6	15.0	9.6	8.0	9.6	14.9
United Kingdom	22.0	21.3	25.7	14.5	17.5	11.4	6.7	8.3	13.9

Indicator definition: Enterprises considering their innovation activity to have a high impact on specified effects.
Source: Eurostat, Third Community Innovation Survey (CIS3).

Table C03aux
Costs of internet use by type, 2002

	Fixed telephone charge	Telephone usage charge	Internet service provider	Total costs
	USD PPP			
EU-15	16.52	36.74	13.07	66.34
Belgium	17.12	107.81	0.00	124.93
Denmark	13.87	0.00	35.43	49.30
Germany	13.95	0.00	24.84	38.79
Greece	15.87	22.38	23.26	61.51
Spain	17.11	65.64	0.00	82.75
France	13.53	0.00	20.82	34.35
Ireland	18.84	40.48	14.64	73.96
Italy	24.88	29.81	0.00	54.69
Luxembourg	20.07	74.62	4.91	99.60
Netherlands	18.22	64.90	0.00	83.12
Austria	17.00	0.00	29.68	46.68
Portugal	19.67	62.40	16.57	98.64
Finland	11.19	25.89	0.00	37.08
Sweden	12.53	57.15	2.41	72.09
United Kingdom	14.00	0.00	23.57	37.57

Indicator definition: Internet access basket for 40 hours using discounted PSTN rates, daytime, including VAT.
Source: OECD.

Table C04aux
Electronic sales and purchases

	E-selling		E-purchasing	
	2002	2003	2002	2003
	Percentage of enterprises			
EU-15	10	.	13	.
Belgium	20	19	22	41
Denmark	18	25	22	28
Germany	9	.	11	.
Greece	7	.	7	.
Spain	2	.	3	.
France	.	.	.	.
Ireland	14	.	24	.
Italy	3	.	4	.
Luxembourg	13	.	17	.
Netherlands	17	.	20	.
Austria	12	.	21	.
Portugal	3	.	9	.
Finland	18	.	16	.
Sweden	13	20	23	38
United Kingdom	20	.	27	.

Indicator definition: Enterprises having received orders on-line or having purchased on-line.
Source: Eurostat: Community Survey on ICT Usage in Enterprises (the former Eurostat e-Commerce Survey).

Table C05aux
Enterprise births for some innovative sectors in Finland

	1998	1999	2000
	Percentage of active enterprises in sector		
High tech services	13.7	14.4	16.0
Knowledge-intensive services (KIS)	11.3	10.3	9.6
Business services	9.4	8.8	9.0
Whole economy (except government. agriculture and mining)	9.4	8.3	7.7
High tech & medium-high tech manufacturing	5.3	4.5	4.7

Indicator definition: Number of new enterprises for some innovative sectors in Finland.
Source: StatFin, NESIS.

Table C06aux
Venture capital investments – early stage

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Permillage of GDP													
EU-15	.	.	.	.	.	0.5	0.6	1.0	2.0	3.8	7.5	4.5	2.9	2.1
Belgium	.	1.6	0.8	0.6	0.8	0.3	1.0	1.4	6.3	9.0	10.7	3.9	4.2	1.4
Denmark	.	0.5	0.1	0.3	0.3	0.2	0.2	0.2	0.8	1.9	2.0	8.5	7.5	5.0
Germany	.	0.3	0.3	0.3	0.5	0.5	0.5	1.1	2.4	5.1	8.1	5.6	2.7	1.4
Greece	.	.	.	.	.	0.4	0.6	0.5	0.4	1.7	0.7	2.4	0.9	0.7
Spain	.	0.8	0.6	0.4	0.2	0.4	0.2	0.4	0.9	1.6	3.3	1.7	1.5	0.8
France	.	0.3	0.4	0.1	0.2	0.2	0.8	0.7	2.0	3.8	8.1	3.8	3.2	2.5
Ireland	.	1.2	0.3	0.8	0.5	0.2	0.5	0.2	2.7	4.5	10.9	3.3	2.1	2.5
Italy	.	0.6	0.6	0.1	0.4	0.5	0.5	0.7	1.4	1.3	4.6	2.4	0.5	0.5
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Netherlands	.	0.8	0.7	0.7	1.4	2.4	2.8	4.6	4.8	9.9	9.3	4.3	4.5	0.8
Austria	.	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.6	0.7	2.9	2.0	1.3	1.3
Portugal	.	1.1	0.8	0.6	0.9	0.5	0.1	1.2	1.3	0.8	2.7	1.3	0.8	4.3
Finland	.	1.0	0.8	0.9	0.7	0.8	0.9	0.8	5.3	5.7	10.4	10.4	7.1	5.9
Sweden	.	0.1	0.1	0.1	0.1	0.3	0.3	0.2	1.1	10.2	8.8	9.7	9.7	6.4
United Kingdom	.	0.8	0.6	0.6	0.7	0.3	0.4	0.9	1.4	1.9	10.3	5.8	3.6	3.9

Indicator definition: Private equity raised (seed and start-up) for investment in companies.
Source: EVCA; Eurostat Structural Indicators.

Annex C: Metadata on the key indicators

Module C

Indicator label	C01
Indicator name	ICT expenditure
Indicator definition	Expenditure (investments and consumption) on ICT. "ICT"= Information technology (IT) hardware, IT services and software and telecommunications equipment and services.
Unit of measurement	Percentage of GDP
Source	OECD/WITSA/IDC
Period covered	2000–2003
Dissemination	OECD: Science, Technology and Industry Scoreboard. NewCronos: theme4/infosoc/structur/
Remarks	OECD data is based on data from the World Information Technology and Services Alliance (WITSA) and the International Data Corporation (IDC). Private expenditure for packaged software and certain types of R&D related expenditure is subtracted by OECD from IDC data. Data on market growth from EITO was used to extrapolate 1999 results for 2000.

Indicator label	C02
Indicator name	Effect of innovation on market share
Indicator definition	Enterprises considering their innovation activity to have a high impact on increased market or market share
Unit of measurement	Percentage of innovative enterprises
Source	Eurostat: Third Community Innovation Survey (CIS3)
Period covered	2000
Dissemination	*Innovation in Europe* (Eurostat 2004) NewCronos: theme9/innovat/inn_cis3
Remarks	

Indicator label	C03
Indicator name	Number of web hosts
Indicator definition	Number of domain names with an associated IP address record, at the top level domain of a country.
Unit of measurement	Per 1000 inhabitants
Source	ISC (Internet Systems Consortium, Inc.; CA, USA), Domain Survey Data (number of hosts); Eurostat (number of inhabitants)
Period covered	1998–2004
Dissemination	http://www.isc.org (number of hosts); http://www.europa.eu.int/newcronos (population)
Remarks	A domain name is any name representing any record that exists within the Domain Name System. The top-level domain of a country is its two-letter ISO country code. A web host located in a certain country does not necessarily use the country's top level domain (generic domains like .com or .org are also commonly used); a host with a country's domain is not necessarirly located in the country. Population numbers are estimates for 2004, and also some other years for EU–15, GR, IE, IT, LU, AT, and UK.

Indicator label	C04
Indicator name	Costs of internet use
Indicator definition	Internet access basket for 40 hours at daytime discounted public switched telecommunication network (PSTN) rates, including VAT.
Unit of measurement	US Dollars Purchasing power parities (PPP)
Source	OECD
Period covered	1999–2002
Dissemination	*Communication Outlook 2003* (OECD)
Remarks	The basket includes line rental, PSTN usage charges and the ISP (Internet Service Provider) fee. The prices, for all elements of the baskets, are those of the incumbent telecommunication carrier so as to ensure that they are for services that are comparable.

Indicator label	C05
Indicator name	E-commerce, electronic sales by enterprises
Indicator definition	Sales conducted over computer-mediated (Internet and other) networks.
Unit of measurement	Percentage of total turnover
Source	Eurostat: Community Survey on ICT Usage in Enterprises (the former Eurostat e-Commerce Survey)
Period covered	2001–2002
Dissemination	NewCronos: theme4/infosoc/structur/e_com.
Remarks	The survey covers enterprises with 10 or more employed persons. Generally the following NACE-sections are included: D, G, H, I and K.

Indicator label	C06
Indicator name	Enterprise births
Indicator definition	Enterprise birth amounts to the creation of a combination of production factors with no other enterprises involved in the event
Unit of measurement	Percentage of active enterprises
Source	Eurostat, Structural Indicators, Business demography
Period covered	1998–2000
Publication	Eurostat, Structural Indicators
Remarks	Not all countries covered (11)

Indicator label	C07
Indicator name	Venture capital investments
Indicator definition	Private equity raised for investment in companies: sum of early stage (seed and start-up) and expansion and replacement. Management buyouts, management buyins, and venture purchase of quoted shares are excluded. *Seed* is defined as financing provided to research, assess and develop an initial concept before a business has reached the start-up phase. *Start-up* is defined as financing provided for product development and initial marketing, manufacturing, and sales. Companies may be in the process of being set up or may have been in business for a short time, but have not yet sold their product commercially. *Expansion* is defined as financing provided for the growth and expansion of a company which is breaking even or trading profitably. Capital may be used to finance increased production capacity, market or product development, and/or provide additional working capital. It includes bridge financing for the transition from private to public quoted company, and rescue/turnaround financing. *Replacement* capital is defined as purchase of existing shares in a company from another private equity investment organisation or from another shareholder or shareholders. It includes refinancing of bank debt.
Unit of measurement	Permillage of GDP
Source	EVCA; Eurostat, Structural Indicators http://europa.eu.int/comm/eurostat/structuralindicators
Period covered	1991–2003
Dissemination	EVCA Yearbook
Remarks	

Annex D: Metadata of the auxiliary indicators

Module C

Indicator label	C01aux
Indicator name	IT and communications expenditure
Indicator definition	Expenditure (investment and consumption) on IT and communication goods and services by type
Unit of measurement	Percentage of GDP
Source	OECD/WITSA/IDC
Period covered	2000–2003
Countries	EU-15
Publication	OECD: Science, Technology and Industry Scoreboard. NewCronos: theme4/infosoc/structur/
Remarks	OECD data is based on data from the World Information Technology and Services Alliance (WITSA) and the International Data Corporation (IDC). Private expenditure for packaged software and certain types of R&D related expenditure is subtracted by OECD from IDC data. Data on market growth from EITO was used to extrapolate 1999 results for 2000.

Indicator label	C02aux
Indicator name	Effects of innovation
Indicator definition	Enterprises considering their innovation activity to have a high impact on specified effects
Unit of measurement	Percentage of innovative enterprises
Source	Eurostat: Third Community Innovation Survey (CIS3)
Period covered	2000
Countries	EU-15
Publication	*Innovation in Europe* (Eurostat 2004) NewCronos: theme9/innovat/inn_cis3
Remarks	

Indicator label	C03aux
Indicator name	Cost of internet use by type
Indicator definition	Internet access basket for 40 hours at daytime discounted public switched telecommunication network (PSTN) rates, including VAT by type: fixed telephone charge, telephone usage charge and the internet service provider fee
Unit of measurement	US Dollars Purchasing power parities (PPP)
Source	OECD
Period covered	2002
Countries	EU-15
Publication	*Communication Outlook 2003* (OECD)
Remarks	The basket includes line rental, PSTN usage charges and the ISP (Internet Service Provider) fee. The prices, for all elements of the baskets, are those of the incumbent telecommunication carrier so as to ensure that they are for services that are comparable.

Indicator label	C04aux
Indicator name	Electronic sales and purchases
Indicator definition	Enterprises having received orders on-line or having purchased on-line.
Unit of measurement	Percentage of enterprises
Source	Eurostat: Community Survey on ICT Usage in Enterprises (the former Eurostat e-Commerce Survey)
Period covered	2002–2003
Countries	EU-15, ex. France
Publication	Eurostat NewCronos, information society statistics
Remarks	The survey covers enterprises with 10 or more employed persons. Generally the following NACE-sections are included: D, G, H, I and K.

Indicator label	C05aux
Indicator name	Enterprise births for some innovative sectors in Finland
Indicator definition	Number of enterprise births for some innovative sectors in Finland
Unit of measurement	Percentage of active enterprises in sector
Source	Statistics Finland
Period covered	1998–2000
Countries	Finland
Remarks	Figures according to Eurostat's harmonised method

Indicator label	C06aux
Indicator name	Venture capital investments – early stage
Indicator definition	Private equity raised (seed and start-up) for investment in companies. Management buyouts, management buyins, and venture purchase of quoted shares are excluded. *Seed* is defined as financing provided to research, assess and develop an initial concept before a business has reached the start-up phase. *Start-up* is defined as financing provided for product development and initial marketing, manufacturing, and sales. Companies may be in the process of being set up or may have been in business for a short time, but have not yet sold their product commercially.
Unit of measurement	Permillage of GDP
Source	http://europa.eu.int/comm/eurostat/structuralindicators
Period covered	1991–2003
Countries	EU-15
Dissemination	EVCA Yearbook
Remarks	

5. Macroeconomic Context (Module D)

– *The 1995 and 2003 figures make clear that real GDP per capita has increased. The larger EU countries converged to almost the same level.*

– *Ireland attained an unprecedented position. After Luxembourg – whose income position is quite exceptional – Ireland has reached the highest level of GDP per capita within the EU-15.*

– *It is striking that all over the EU-15 the business sector services as a share of the total economy have increased, when comparing 1995 and 2002 figures. Besides Luxembourg, the United Kingdom and Italy have crossed the 50 percent border.*

– *Among the larger member states – above 10 percent of the EU population – Germany and Spain appeared to converge to a productivity level of 95 per cent of the EU average. Germany lost ground, whereas the United Kingdom demonstrated a new economic vitality that boosted its labour productivity. France and Italy showed a relatively high labour productivity throughout the period concerned, although Italy has experienced a downturn since 1998.*

– *In 2002 no EU country had a deficit greater than minus 3 per cent, except for Germany. For 2003 more countries surpassed this threshold, which partly reflects a recent economic slowdown. In 2003 seven EU-15 countries realised a positive public balance.*

– *Germany, the United Kingdom and also Sweden – among others – have managed to reduce their greenhouse gas emission. In spite of these achievements, the EU-15 average for 2002 was higher than that for 1995. From this perspective, the ecological sustainability of the economy is under pressure.*

– *The greatest income inequalities were found in the Mediterranean countries and the United Kingdom. Italy was most pronounced in a development towards less income inequality. The EU-15 average showed a decrease in income inequality, comparing 1995 and 2001.*

– *As for Finland, ICT manufactures are about 90 percent of the high-tech manufactures, whereas for Ireland this percentage is about 50 percent and, for instance, for the United Kingdom 43 percent. The high percentage for Finland affirms the prominent place of this country in the New Economy.*

5.1 Introduction

According to chapter 1, the impacts of ICT as an emerging technology on business processes are being felt in different ways but are mainly working as an undercurrent in the economy. However, it makes sense to expect that more and more the New Economy will become visible in macroeconomic terms. Because of this link, the Lisbon Summit goals – which are central to this publication – inevitably leads to an interest in macroeconomic figures, particularly those concerning economic growth and employment.

Benchmarking, therefore, should be made possible in this area, even when a precise link between the emergence of ICT and macroeconomic performance cannot yet be established. Benchmarking invites to further explore promising cases of economic development and growth, especially if those seems to be a reward of pro-active innovation policies and practices.

It should be noted here that macroeconomic statistics do not only involve figures at the highest possible level of aggregation, but also include a breakdown of the economy into major sectors and industries. For this, the National Accounts and related input-output tables offer a suitable framework for international comparison based on uniform classifications and definitions. Here, the link between the macroeconomic level and national innovation capacities (Modules E and F) comes in. There is a clear correlation between them.
To have comparable figures in this area and consistent figures over time, satellite accounts on the knowledge economy could help out (see box A).

In a number of cases, reaching well-founded conclusions would require in-depth data research.
For instance, further decomposition studies may contribute to a better insight into structural economic changes. Moreover, the macro-economic level of an economy has its own dynamics that relate to the undercurrents in the economy but cannot be reduced to them.

A major issue lies in the effect of the emergence of applied ICT on economic growth. For this purpose it is useful to start having a look at the growth figures in general and at the overall labour productivity of an economy. Distinguishing different industrial sectors, particularly high-tech sectors, add to the value of benchmarking.

The level of GDP per capita is also of interest. How a country performs will always be seen in the light of GDP per capita, which is mostly seen as the main indicator of economic success. Subsequently, issues about stability, sustainability and social inclusion come in as major items in light of the Lisbon Summit goals. Empirical analyses suggest that stability-oriented macroeconomic policies have a fairly substantial impact on economic output (inflation control, moderate tax levels, level of spending on R&D). [1)]

This chapter is strongly influenced by the macroeconomic pillar of the NESIS project. It contains indicators about economic stability and environmental sustainability. Also social inclusion has been taken into account, particularly in terms of income distribution and long-term unemployment.
It is realised that these indicators are not capable of covering these issues to the full. This caveat applies in general, but is especially valid here.

5.2 Selected indicators

5.2.1 Selected key indicators

The following key indicators have been selected:
– GDP per capita in PPS
– Value added of business sector services
– Value added of manufacturing ICT sector
– Value added of high tech manufactures
– Labour productivity per person employed
– Total employment rate
– Inflation rate
– Public balance
– Energy intensity of the economy
– Greenhouse gas emissions
– Inequality of income distribution
– Total long-term unemployment rate

GDP per capita in PPS is broadly seen to reflect wealth and overall economic advancement. From this point of view it reflects an economy's economic success as it was built up over previous decades, particularly if compared with other economies.

Value added of business sector services, manufacturing ICT sector and high tech manufactures – all relative to the whole economy – give a differentiated picture of (advanced) economic activities, which are part of or at least closely related to the New Economy. These indicators show the relative importance of these sectors as engines of advanced production. The greater the share of these sectors, the more prominent the innovations that can be expected from these sectors are.

Labour productivity per person employed is a major source of economic growth and therefore a prominent indicator.

Total employment rate shows the percentage of the labour force that is actually employed. The employment rate is influenced by different factors. The New Economy in full swing is expected to increase the employment rate.

Inflation rate – when exceeding low percentages – is considered to be harmful to the economy, as it destabilises trade patterns and erodes capital funds. Moreover, a relatively high inflation rate may undermine competitive positions in international trade.

Public balance (net borrowing/lending of the consolidated general government sector as a percentage of GDP) figures indicate the soundness of a nation's financial policies]. The aggregate effects of the national financial policies may either strengthen or weaken the international position of the euro and therefore affect international economic positions. It is an indicator of economic stability.

Environmental sustainability is primarily considered by looking at the *energy intensity of the economy*. This energy intensity – mostly based on fossil fuels – is related to the CO2 emissions, which cause climate change that is a serious threat to biodiversity and increases the danger of floods.

Greenhouse gas emissions are in the same domain, but can reveal differences between countries, both structural and policy-wise.

Inequality of income distribution is important as social-inclusion indicator. It is expressed as income quintile share ratio: the sum of the 20% highest incomes divided by the sum of the 20% lowest incomes. This indicator leaves out changes in the income distribution in the middle range. Theil- or Gini- coefficients (that cover the entire range) would therefore be preferable but for these no sufficient figures are available.

Total long-term unemployment rate is a major aspect of social inclusion. Both low incomes and long-term unemployment exclude groups of people from participating in the modern society, as these bring poverty, which hampers or prohibits involvement in communal activities such as education, sports, theatre and club life.

5.2.2 Selected auxiliary indicators

The following auxiliary indicator has been selected:
– Real GDP growth rate

Real GDP growth rate is a major concern for the EU as a whole and for each individual country as it is seen as a necessary condition to reconcile the competing needs of modern society. Also relative performance between countries is anxiously monitored. Hence, the real growth rate is a prominent benchmark indicator.

Indicators in Module D

Key indicators	*Auxiliary indicators*
GDP per capita in PPS	– Real GDP growth rate – BOX A: Satellite Accounts on Knowledge – BOX B: National convergence, regional divergence
Value added of business sector services	
Value added of manufacturing ICT-sector	
Value added of high-tech manufactures	
Labour productivity per person employed	
Total employment rate	
Inflation rate	– BOX C: Stability and the dimensions of change
Public balance	
Energy intensity of the economy	– BOX D: Environmental impact of the online telephony directory
Greenhouse gas emissions	
Inequality of income distribution	
Total long-term unemployment rate	

BOX A Satellite Accounts on Knowledge

As part of the NESIS project Statistics Netherlands has developed accounts on knowledge that are satellites to the official National Accounts. Compared to loose sets of indicators, important advantages of indicators embedded in an integrated accounting structure are consistency and mutual comparability, which clearly add to their cogency.

In summary, the satellite account generates a series of aggregated figures covering various aspects of the knowledge-based economy. The indicators available at the industry level are: Internal (own-account) and external company education; HRST utilisation in full time equivalents and in terms of money (i.e. HRST wages); Expenditure on R&D; Expenditure on ICT.

Table A Knowledge related final expenditure in the Netherlands, 1995–1999

	1995	1996	1997	1998	1999
	%-shares in (extended) GDP [2]				
Gross fixed capital formation [1]	22.1	22.9	23.4	23.4	24.5
ICT capital	2.2	2.5	2.9	3.4	4.0
Computers	0.9	1.0	1.0	1.0	1.1
Software	0.9	1.0	1.3	1.7	1.9
Telecommunication infrastructure	0.4	0.4	0.5	0.6	1.0
R&D	2.0	2.0	1.9	1.9	2.0
Enterprise	1.1	1.1	1.1	1.1	1.2
Government [3]	0.9	0.9	0.8	0.8	0.8
Other intangible assets	0.1	0.2	0.2	0.2	0.1
Other assets	17.8	18.3	18.3	18.0	18.4
Total education (final consumption)	4.3	4.2	4.1	4.1	4.2
Public education	4.2	4.0	3.9	3.9	4.0
Level 1–2	3.2	3.1	3.1	3.1	3.1
Level 3	0.9	0.9	0.9	0.9	0.9
Other education	0.2	0.2	0.2	0.2	0.2
Total knowledge related expenditure [4]	8.7	8.8	9.2	9.5	10.2

[1] Extended total gross fixed capital formation. Including R&D and software revision.
[2] Extended GDP at market prices. Including R&D and software revision.
[3] This concerns all enterprises in the general government sector.
[4] Includes gross fixed capital formation on ICT. R&D and other intangible assets and final consumption expenditure on education.

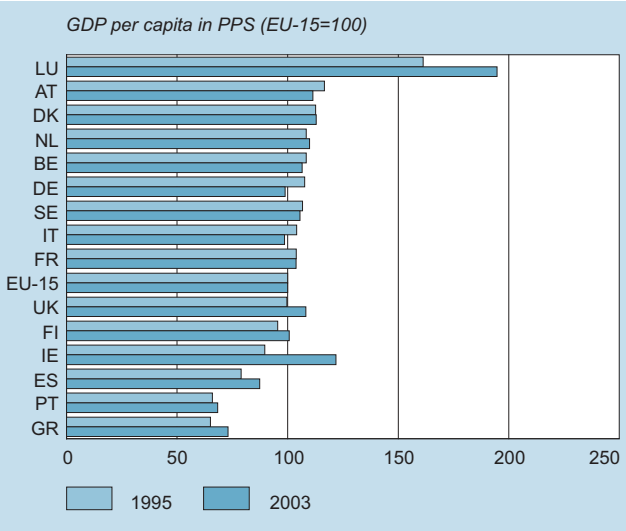
Source: M. de Haan and M. van Rooijen-Horsten, Final report containing conclusions about knowledge-based indicators and recommendations on the relevant parameters of NESIS. NESIS report D5.1.2, 2003.

5.3 Quantified indicators

5.3.1 GDP per capita in PPS

The 1995 and 2003 figures make clear that real GDP per capita has increased. The larger EU countries converged to almost the same level. Ireland obtained an unprecedented position. After Luxembourg (whose income position is quite exceptional), Ireland has reached the highest level of GDP per capita within the EU-15. It should be kept in mind that country averages might conceal notable regional differences. In general, there are pockets of high income per head of population. In Germany there is a marked difference between the wealthy areas in the western and southern part of the country and the structural problems in the eastern part of the country, united with the federal republic after the fall of the Berlin Wall (1989)]. Italy is another example: average income in the northern part of the country is higher than in the south, although the relative high average income in Italy also shows that economic growth has been a country-wide phenomenon. Spain has come closer to the EU average; its 2003 GDP per capita approximately equalled the GDP per capita that the richer countries had in 1995.

D01 Gross Domestic Product (GDP) at market prices per capita in Purchasing Power Standards (PPS)



Source: Eurostat: Structural Indicators.

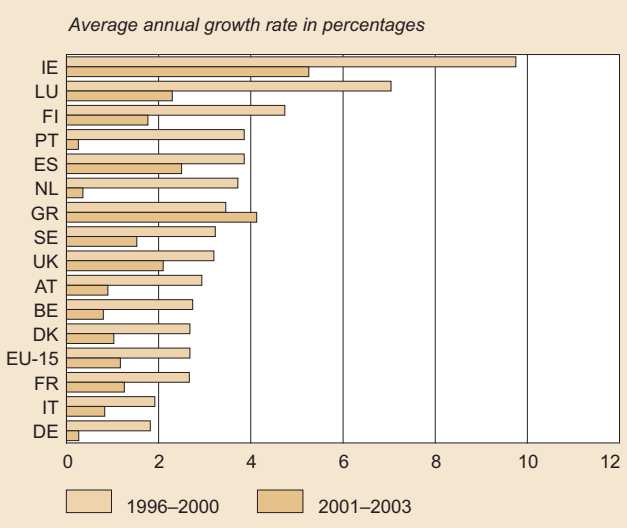
In light of the different innovation capacity indicators (such as R&D, HSTR), the relatively high average GDP in Italy can be explained by the fact that this country has been a successful competitor in the 'old economy' and this advantage still has a positive effect on GDP. On the other hand, the fact that Finland's GDP per capita does not exceed the GDP of the Mid-western EU countries seems to indicate that Finland had to overcome arrears built up in the past.

Figure D01 where GDP is expressed in PPS does not allow a comparative analysis of the development of GDP per capita over time. The relative positions of the countries involved should be judged for each year separately. In 2003 in the EU-15 the level of GDP per capita was just above the 23 thousand PPS euros.

5.3.2 Real GDP growth rate

The figures show that growth rates between countries can be quite different. Figure D01aux gives the average annual growth rates for two periods: 1996–2000 and 2001–2003. The much lower growth rates for the second period mark the relative economic downturn that started in 2000. Greece is the exception here, which can be explained by the works accomplished for the 2004 Olympic Games that took place in Athens. Moreover, for single countries the growth rates show considerable fluctuation over time. For most countries the 2002 growth rate was lower than the 1996 growth rate. They mark a period of a booming economy, with a turning point in 2000.

D01aux Growth rate of the Gross Domestic Product (GDP) at constant prices (1995=100)



Source: Eurostat: Structural Indicators.

The figures make clear that the New Economy does not reduce the well-known concerns about economic growth.

Recent research suggests that cross-country disparities in economic growth are, at least partially, related to differences in the patterns of labour utilisation and skill upgrading of the workforce. Further-

Box B National convergence, regional divergence

According to the European Commission, there are striking differences in economic performance between different parts of Europe, particularly between the central and peripheral regions. As the economic position of countries converges, the divergences tend to be located increasingly within individual countries rather than between them.

For example, there is a clearly delineated core super-region within Europe, whether measured in terms of employment, GDP, research expenditure etc., which stretches as a band from north-west Italy through the south and south-west of Germany, up the Rhine/Ruhr West German corridor, into Flanders (Belgium), southern and central Netherlands, to south-east England and the Ile de France.

The Digital Europe project calls this the 'blue banana super-region'. Its research concluded that measured at the national scale, ICT adoption has tended to weaken this super-region. At the sub-national regional scale the research found a cluster effect associated with the digital economy and the adoption of ICT, although this effect is often better explained by industry characteristics, such as skill intensity, than by purely ICT intensity. This cluster effect leads to regional divergence.

Source: BEEP Knowledge system report: Regional Development.

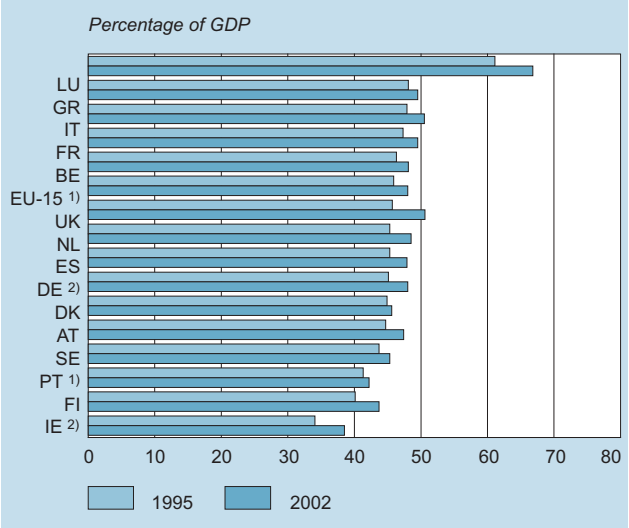
more, in most countries the up-grading of the workforce played a significant role in boosting labour productivity.

The contribution of IT to aggregate productivity growth appeared initially to be disembodied. This resulted from rapid technological progress within the IT-producing industry itself. Since the mid-to-late-1990s, an increasing contribution to embodied productivity growth seems to have stemmed from greater use of highly productive IT equipment by other industries. Not surprisingly, Multi Factor Productivity growth accelerated somewhat later in those OECD countries without a sizeable IT-producing industry. [1)]

5.3.3 Value added of business sector services

It is striking that all over the EU-15 the business sector services as a share of the total economy have increased, when comparing 1995 and 2002 figures (see Figure D02). Besides Luxembourg, the United Kingdom and Italy have crossed the 50 percent border. This is a development that is broader than the New Economy alone. Knowledge-intensive sector are considered to have relatively strong spill-over to other parts of the economy in terms of innovative ideas and knowledge. However, services in general – which are relatively labour intensive – represent promising areas where ICT can be applied, leading to notable productivity gains.

D02 Value added of business sector services (ISIC Rev 3 division: 50–74)



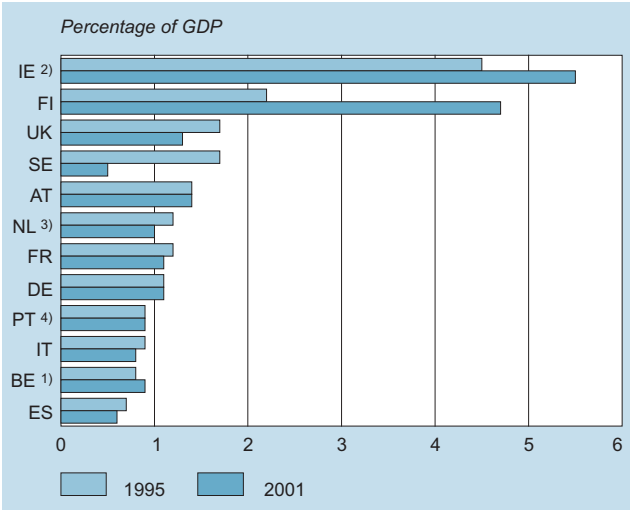
1) 1999 instead of 2002. 2) 2001. Source: OECD: STAN Indicators 2004.

5.3.4 Value added of manufacturing ICT sector

ICT manufactures are a subset of high-technology manufactures (which as non-ICT manufacturer include the production of aircraft and pharmaceuticals). Therefore, a comparison between Figures D03 and D04 make it possible to draw conclusions as to how far a country's high-tech manufactures are dominated by ICT manufactures. As for Finland, ICT manufactures are about 90 percent of the high-tech manufactures, whereas for Ireland this percentage is about 50 percent and for the United Kingdom 43 percent. The high percentage for Finland affirms the prominent place of this country in the New Economy; at the same time this could point to a weakness, especially when certain ICT-based markets get saturated.

The emergence of the New Economy does not mean that the ICT sector in all EU-15 countries will be booming without end. Figure D03 makes clear that relative decreases have already occurred in some cases, although comparing 1995 and 2002 points to an increasing economic importance in general, in spite of the economic

D03 Value added of manufacturing ICT sector (ISIC Rev 3 classes: 3000, 3130, 3200, 3312 and 3313)



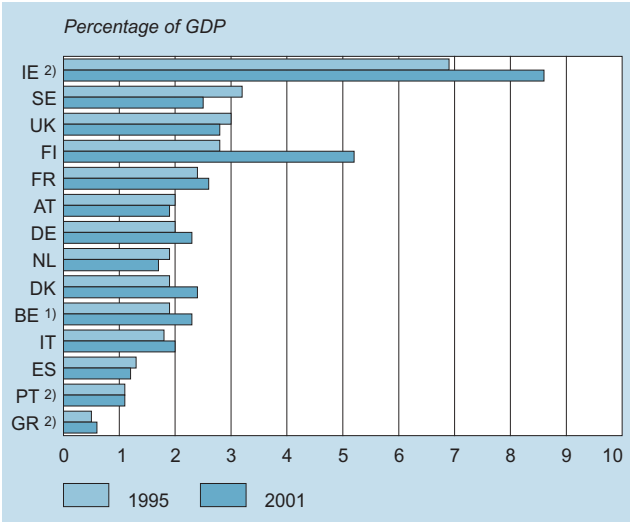
1) 2000. 2) 1999. 3) 1996. 4) 1966 and 1999.
Source: OECD: STAN Indicators 2004 / ICT Sector Data & Metadata.

slowdown that showed up in 2000. Also frequent product innovations – incremental ones included – may cause volatility and unstable competitive relationships. Differences between countries show that country-based specifics should be taken into account here.

5.3.5 Value added of high-tech manufactures

Figure D04 shows that the development of relative positions of the high-tech manufacturing sector in the different countries may vary quite substantially. It seems that in a number of countries the high-tech manufacturing sector has managed to benefit from a generally favourable economic climate during the second half of the nineties of the previous century. In general, it is noted that the high-tech manufacturing sector is a relatively small part of the entire economy. Ireland and Finland are the countries whose economy relatively strongly depends on the manufacturing of ICT-based hardware. Sweden and the United Kingdom followed with positions around 3 percent of GDP, but – in contrast with

D04 Value added of high technology manufacturing sector (ISIC Rev 3 classes: 2423, 3000, 3200, 3300 and 3530)



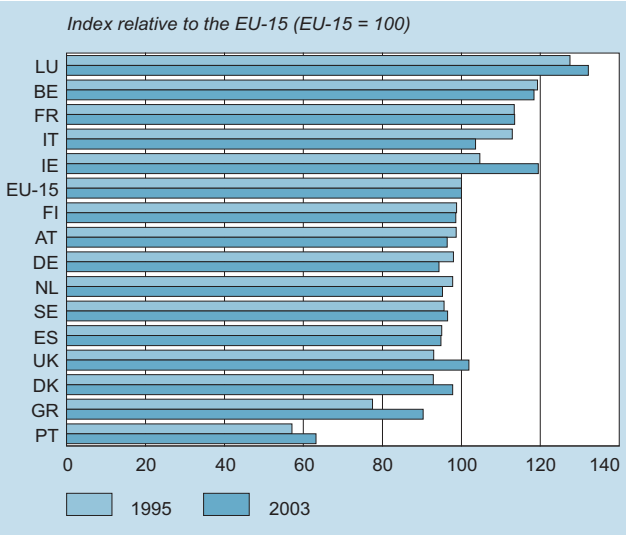
1) 2000. 2) 1999.
Source: OECD: STAN Indicators 2004.

Ireland and Sweden – could not strengthen these positions considering their 1995 and 2001 figures.

5.3.6 *Labour productivity per person employed*

The productivity indicator (Figure D05) gives the development of labour productivity in terms of value added per person employed relative to the EU-15 average. Per 'person employed' implies that the indicator has not been adjusted for differences in the average number of hours worked per worker. The figures varied considerably per country. Luxembourg was leading, while Portugal was in the arrears. Among the larger member states (above 10 percent of the EU population) Germany and Spain appeared to converge to the level of 95 per cent of the EU average (2003). Germany lost ground whereas the United Kingdom demonstrated a new economic vitality that boosted its labour productivity. France and Italy showed a relatively high labour productivity throughout the period concerned, although Italy has experienced a downturn since 1998.

D05 GDP at market prices in PPS per person employed



Source: Eurostat: Structural Indicators.

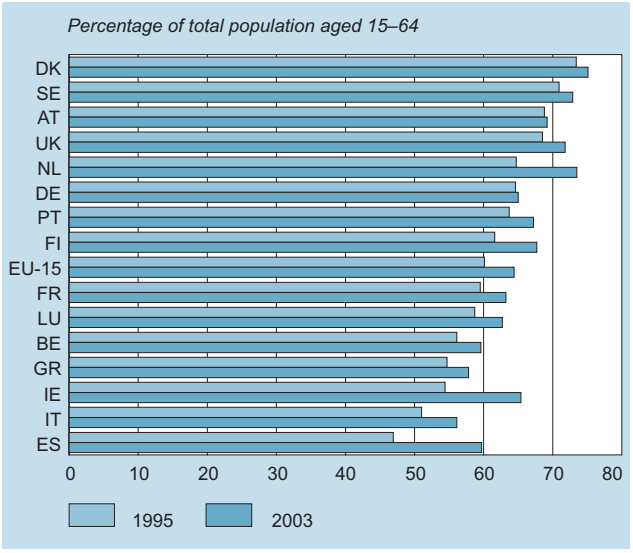
5.3.7 *Total employment rate*

GDP per capita is dependent not only on labour productivity but also on the share of the population that takes part in economic activities, for which employment as a share of population is an instructive indicator (see Figure D06). In general, the share of the population aged 15 to 65 that is employed varied considerably between countries and in the course of time: between 55 and 75 per cent. It should be noted that these figures are not corrected for the number of hours worked per employed worker. Sweden and Finland experienced a downturn in the beginning of the nineties (from leading positions in 1990) but seemed to be on the way back. Ireland and The Netherlands were notable climbers (the latter by boosting part-time labour). Italy, Greece and Spain show low shares of participation in paid jobs, which may explain modest achievements in other areas as well.

5.3.8 *Inflation rate*

Figure D07 gives average inflation rates for two periods: 1996–2000 and 2001–2003. For the entire EU-15 during both periods average annual inflation remained under 3 per cent, while inflation had gone down somewhat during recent years. A few countries showed increasing inflation during recent years, which may partly be due to a steaming economy in previous years.

D06 Employed persons aged 15–64



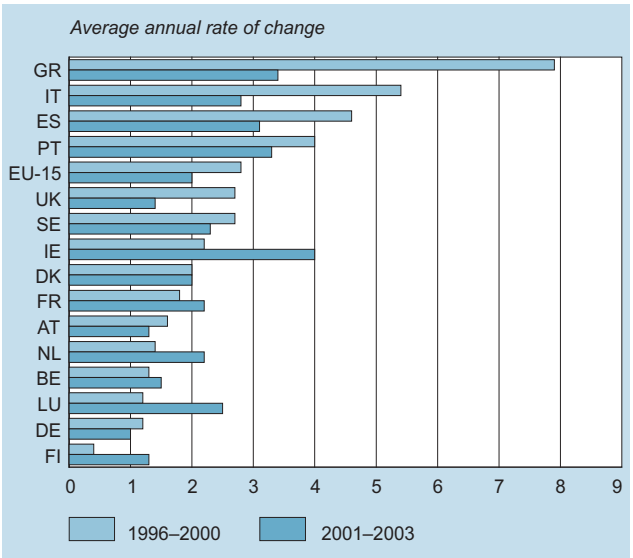
Source: Eurostat: Structural Indicators.

Box C Stability and the dimensions of change

A proper analysis of stability must take both objective and subjective aspects into account. This makes a difference for the kind of indicators that can be logically derived from the analysis. Standard theory based on production functions and the stability assumption quite simply neglects the analysis of qualitative change and thus tends to focus on purely objective or physical indicators (e.g. the amount of computers in the hands of people, the number of people with degrees, etc.), i.e. it just assumes that people's behaviour will be unchanged. An alternative approach seeks to single out indicators that are able to capture the subjective dimension of change as well (for example, how people's attitudes towards money, saving, investment in foreign assets etc., have changed in the New Economy).

Source: T.D. Togati, On the Stability of the New Economy, Pre-proceedings Volume I, The NESIS project's Summative Conference, Athens, Greece; 11–14 October 2004; 297–310.

D07 Inflation rate based on harmonized indices of consumer prices

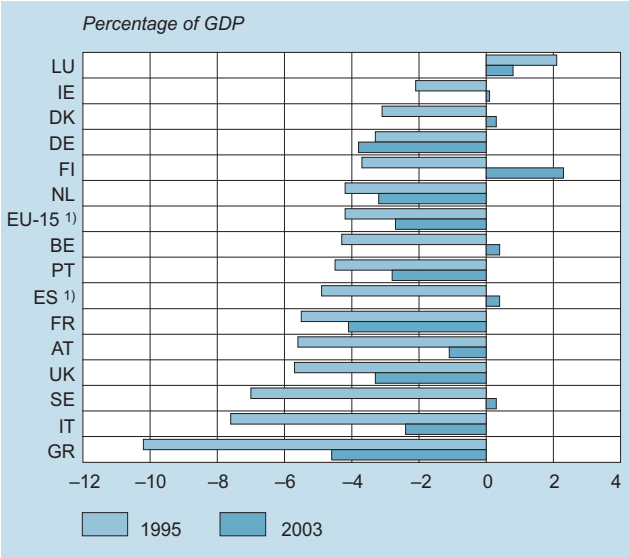


Source: Eurostat: Structural Indicators.

5.3.9 *Public balance*

Public balance figures for the individual member states in the nineties show rather big differences over time. Considering the figures, it appears that since 1995 the public balance deficits have decreased. In 2002 no EU country had a deficit greater than minus 3 per cent, except for Germany. As Figure D08 shows, for 2003 this conclusion cannot be fully maintained; the number of countries that surpassed this borderline increased, most likely because of low economic growth in recent years. In 2003 seven EU-15 countries realised a positive public balance.

D08 Net borrowing / lending of consolidated general government sector



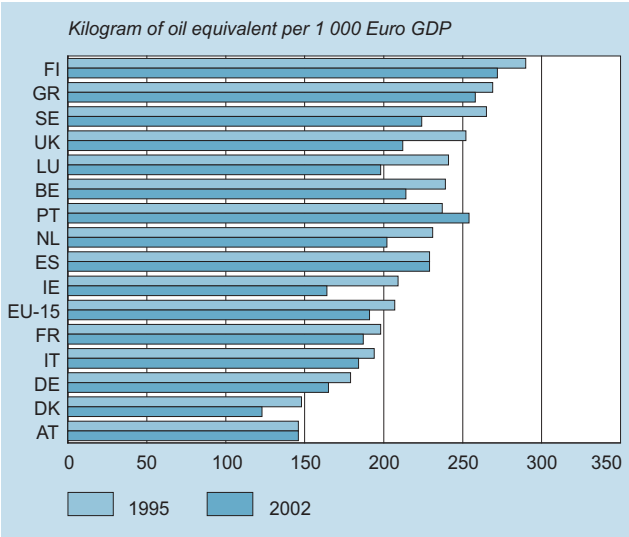
1) 1996.

Source: Eurostat: Structural Indicators.

5.3.10 *Energy intensity of the economy*

In general, the use of energy relative to GDP has decreased over the years, particularly over the period 1995–2002; Spain and Portugal, however, did not follow this trend (see Figure D09). Irrespective of developments, there are still notable differences between countries in the area of energy use. Differences in terms of economic sectors and climate play a role here. Ireland and Luxembourg seem to have made strong efforts to improve their economy's energy efficiency. This also applies to Sweden and Finland, although these countries have a structural high level of energy use.

D09 Gross inland consumption of energy divided by GDP at constant prices (1995=100)



Source: Eurostat: Structural Indicators.

Box D Environmental impact of the online telephone directory

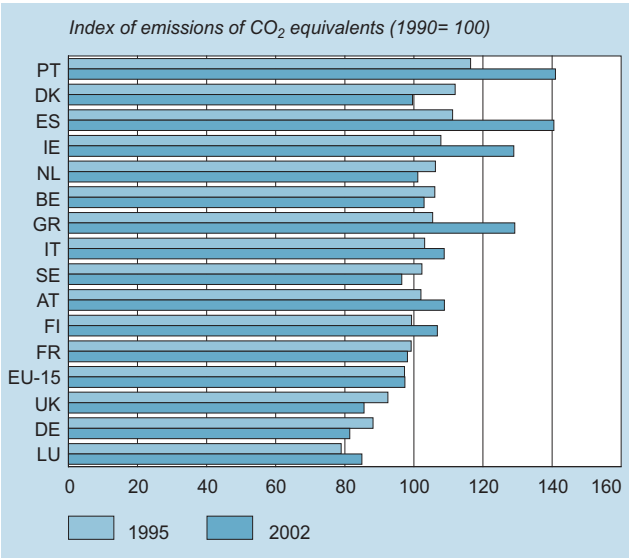
A study revealed that only in the case of low-frequency (twice a week), private use of a telephone directory, the online version has an environmental advantage over the telephone book and the CD-rom (when packed in a cardboard box). In the case of a higher frequency of inquiries – e.g. eight times a week – all of the media generate about the same environmental impact. This is true only if inquiry results are not printed and electricity consumed during use of media is generated to a large extent from renewable energy sources.

Source: M. Zurkirch and I. Reichart, Environmental impacts of Telecommunication Services, *Greener Management International*, issue 32, 2000: p. 70–88.

5.3.11 *Greenhouse gas emissions*

In a number of countries, greenhouse emissions have increased with economic growth. Especially, Greece, Ireland, Spain and Portugal have not succeeded in containing greenhouse gases by using cleaner technologies. In this sense the economic growth these countries have had cannot be seen as sustainable. Germany, the United Kingdom and also Sweden – among others – have managed to reduce their greenhouse gas emission. In spite of these achievements the EU-15 average for 2002 was higher than that for 1995 (see Figure D10). From this perspective, the ecological sustainability of the economy is under pressure.

D10 Emissions of greenhouse gases expressed in CO_2 equivalents

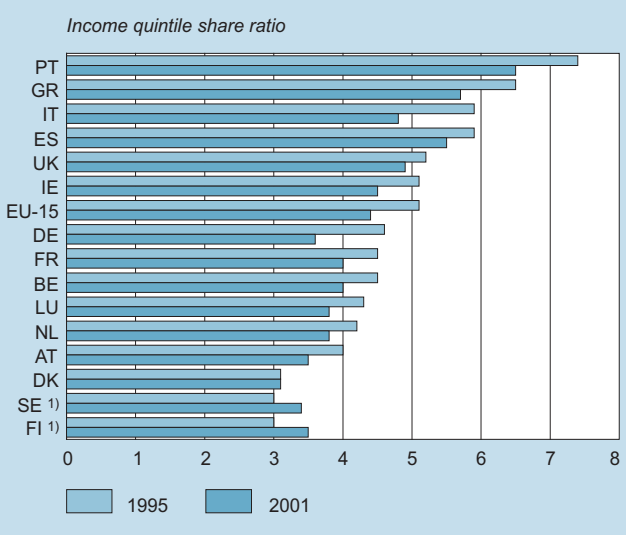


Source: Eurostat: Structural Indicators.

5.3.12 *Inequality of income distribution*

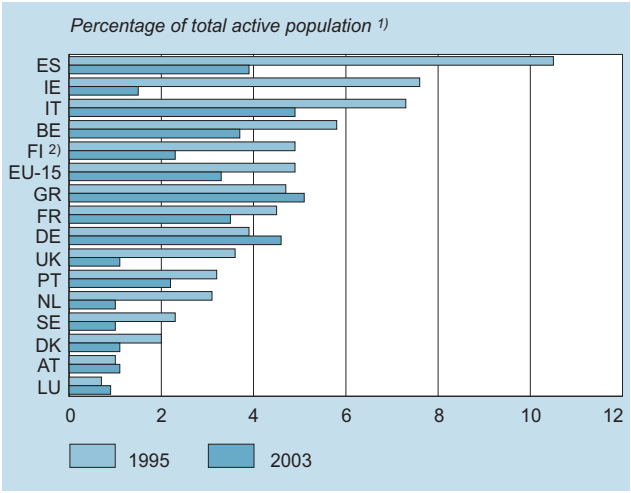
Inequality in income distribution shows a clear pattern from an international perspective: Income equality is strongest in the Nordic countries, although in these countries income distribution became somewhat less equal in recent years. Denmark is leading in income equality. According to Figure D11, the greatest income inequalities were found in the Mediterranean countries and the United Kingdom. Italy was most pronounced in a development

D11 Income quintile share ratio: the sum of the 20% highest incomes divided by the sum of the 20% lowest incomes



1) 1996 instead of 1995. Source: Eurostat: Structural Indicators.

D12 Long-term unemployed (12 months and more)



1) Active population (labour force) is the total number of the employed and the unemployed population.
2) 1997.
Source: Eurostat: Structural Indicators.

towards less income inequality. The EU-15 average showed a decrease in income inequality, comparing 1995 and 2001. The reader is reminded of the fact that the indicator used only considers the highest and the lowest income groups. What happened between the middle-range incomes is left out.

5.3.13 Long-term unemployment rate

The indicator for long-term unemployment shows that on average unemployment in 2003 is lower than in 1995 (see Figure D12). More strikingly is the development over time: Spain and Ireland had significantly reduced their long-term unemployment. Greece and Germany showed an increase in long-term unemployment. These two countries and Italy were the only EU-15 which had a percentage above 4.

5.4 Conclusion

Like the other chapters, this chapter ends up by giving the results of a composite indicator for macro-economic performance. It combines the scores for all key indicators presented in this chapter. These indicators deal with a broad spectrum of issues that are relevant to the Lisbon Summit goals.

The highest scores (group 1) referred to three countries: Luxembourg, Denmark and Finland. The middle group (group 2) involved eight countries, five of them above the EU-15 level and three of them below EU-15 average. Group 3 is comprised of the four Mediterranean countries within the EU-15.

In broad lines there is a correlation between macro-economic performance, innovation capacity and innovation performance. The Nordic countries indicate that strong policies can make a difference in terms of advancement in innovation and making use of the economic possibilities of applying ICT.

The presented indicators cannot (fully) isolate the influence of ICT investments on the macroeconomic figures. Research has already laid a relationship between ICT investment and productivity growth.
While IT investment accelerated in most EU-15 countries, the pace of that investment and its impact on growth differs widely [1]. However, much more information would be needed to understand the underlying relationships.

Composite indicator for macro-economic performance: three country groups according to relative scores [1]

Group 1
Luxembourg, Denmark, Finland

Group 2
Austria, United Kingdom, Sweden, Belgium, Netherlands, EU-15, Ireland, Germany, France

Group 3
Italy, Spain, Portugal, Greece

1) The countries in group 1 have the higher scores, the countries in group 2 have medium scores while the countries in group 3 are at the lower end of the scores. The clustering has been carried out to prevent an overemphasis on the scores, because it was realised that the indicators used, do not cover the entire spectrum of innovativeness. Moreover, there were some missing values, which required estimates.

Notes in the text

1) OECD, 'Understanding Economic Growth', 2004.

Annex A: Key data tables

Table D01
GDP per capita in PPS

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Index relative to the EU-15 (EU-15=100)													
EU-15	.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Belgium	.	108.1	108.6	108.0	108.5	108.5	107.2	106.6	105.4	105.3	106.3	106.9	106.4	106.6
Denmark	.	109.7	109.2	109.7	112.6	112.7	113.9	114.4	113.4	115.7	115.4	115.3	112.2	112.9
Germany	.	109.2	110.1	109.0	108.6	107.8	107.2	105.1	103.9	103.0	101.9	100.5	99.4	98.9
Greece	.	68.5	68.0	67.1	66.5	65.1	64.8	65.5	65.2	65.3	66.0	67.3	70.8	73.1
Spain	.	79.2	79.2	78.8	78.7	79.0	79.4	79.7	80.9	83.5	83.3	84.2	86.0	87.4
France	.	105.8	106.1	105.6	104.9	104.0	103.4	104.0	104.1	103.9	103.7	104.7	104.8	103.8
Ireland	.	77.7	79.2	81.7	84.1	89.7	93.8	102.3	106.3	111.2	115.0	117.4	124.8	121.8
Italy	.	104.6	104.5	104.1	103.6	104.2	104.0	102.5	103.2	101.9	101.3	100.0	99.8	98.6
Luxemburg	.	159.7	159.3	165.1	164.9	161.3	160.9	167.5	175.1	189.2	198.9	194.7	192.2	194.7
Netherlands	.	107.5	107.6	108.4	108.2	108.5	109.0	109.8	110.1	109.6	110.6	113.3	111.5	110.0
Austria	.	114.5	115.0	115.5	115.2	116.6	117.3	115.0	114.0	115.4	116.4	113.6	112.2	111.5
Portugal	.	66.6	66.9	66.0	64.9	66.0	66.1	67.2	68.5	70.2	70.3	70.4	70.2	68.4
Finland	.	99.6	94.6	93.7	94.7	95.5	95.8	100.5	103.2	101.5	104.0	104.1	101.7	100.7
Sweden	.	109.0	106.2	104.4	105.4	106.8	106.5	105.5	104.5	107.6	109.0	106.1	104.7	105.6
United Kingdom	.	95.6	94.8	97.6	99.3	99.7	101.1	103.5	103.3	102.9	103.8	105.1	107.4	108.2

Indicator definition: Gross Domestic Product (GDP) at market prices per capita in Purchasing Power Standards (PPS).
Source: Eurostat: Structural Indicators.

Table D02
Value added of business sector services

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
EU-15	43.6	44.1	44.7	45.7	45.8	45.9	46.3	46.9	47.5	48.0	.	.	.	.
Belgium	44.0	45.5	46.4	46.6	46.5	46.3	46.8	46.8	47.7	48.1	47.9	48.3	48.1	.
Denmark	44.6	45.0	44.8	45.2	45.6	44.9	44.8	45.0	45.0	45.3	45.2	45.6	45.6	.
Germany	41.4	42.0	42.6	44.2	44.5	45.1	45.7	46.3	46.6	47.2	47.6	48.0	.	.
Greece	43.7	44.6	46.5	47.7	47.0	48.1	49.5	50.6	50.2	50.2	50.6	50.3	49.5	.
Spain	42.9	43.4	44.2	45.1	45.6	45.3	45.1	45.8	46.3	46.6	46.8	47.7	47.9	.
France	47.0	47.2	47.2	47.9	47.7	47.3	47.6	48.1	48.2	48.9	49.4	49.3	49.5	.
Ireland	36.3	36.4	34.4	35.3	34.2	34.1	36.0	36.7	37.8	37.8	38.2	38.5	.	.
Italy	44.8	45.4	46.0	47.1	47.4	47.9	48.4	48.6	49.0	49.4	50.0	50.0	50.5	.
Luxembourg	52.4	55.3	56.0	55.6	60.5	61.1	63.6	64.2	63.9	66.1	66.8	66.5	66.8	.
Netherlands	42.1	42.7	43.5	44.5	44.9	45.3	46.1	47.1	48.0	49.0	48.9	48.5	48.5	.
Austria	43.7	44.0	44.7	44.9	44.7	44.7	45.0	45.9	45.9	45.8	46.7	47.2	47.4	.
Portugal	42.5	42.9	41.7	42.3	41.6	41.3	41.2	42.1	42.5	42.2	.	.	.	.
Finland	38.6	39.7	39.4	40.4	40.3	40.1	40.9	41.7	41.6	42.1	42.0	43.0	43.7	.
Sweden	41.2	42.5	43.3	44.5	44.1	43.7	44.1	44.2	44.2	44.6	45.0	45.2	45.3	.
United Kingdom	43.7	44.3	45.2	45.8	46.0	45.7	46.0	47.1	49.2	49.8	50.1	51.0	50.6	.

Indicator definition: Value added of business sector services (ISIC Rev 3 division: 50–74).
Source: OECD: STAN Indicators 2004.

Table D03
Value added of manufacturing ICT sector

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Belgium	.	.	.	.	.	0.8	0.8	0.9	0.7	0.8	0.9	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Germany	.	.	.	.	.	1.1	1.1	1.1	1.2	1.2	1.4	1.1		
Greece	.	.	.	.		.	.	.	.	.	.	.	.	.
Spain	.	.	.	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6	.	.
France	1.5	1.4	1.3	1.2	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.1	.	.
Ireland	.	3.3	3.0	2.8	2.9	4.5	4.2	4.5	4.5	5.5	.	.	.	.
Italy	.	.	1.0	1.0	1.0	0.9	0.9	0.9	0.8	0.7	0.9	0.8	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Netherlands	.	.	.	.	.	.	1.2	1.2	1.2	1.1	1.2	1.0	.	.
Austria	.	.	.	.	.	1.4	1.4	1.3	1.4	1.4	1.6	1.4	.	.
Portugal	.	.	.	.	.	.	0.9	0.9	0.9	0.9	.	.	.	.
Finland	.	.	.	.	.	2.2	2.5	3.1	4.0	5.0	5.8	4.7	.	.
Sweden	.	.	.	1.4	1.6	1.7	2.0	2.3	2.5	2.5	1.8	0.5	.	.
United Kingdom	.	.	.	1.6	1.7	1.7	1.7	1.8	1.7	1.6	1.6	1.3	.	.

Indicator definition: Value added of manufacturing ICT sector (ISIC Rev 3 classes: 3000, 3130, 3200, 3312 and 3313).
Source: OECD: STAN Indicators 2004 / ICT Sector Data & Metadata.

Table D04
Value added of high tech manufactures

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Belgium	.	.	.	.	.	1.9	2.0	2.0	1.8	2.2	2.3	.	.	.
Denmark	1.6	1.7	1.8	1.6	1.9	1.9	1.8	2.1	2.1	2.3	2.4	2.4	2.5	.
Germany	3.0	2.9	2.6	2.3	2.2	2.0	2.0	2.1	2.1	2.3	2.5	2.3	.	.
Greece	.	.	0.8	0.7	0.6	0.5	0.5	0.5	0.5	0.6	.	.	.	.
Spain	1.6	1.6	1.4	1.5	1.4	1.3	1.4	1.3	1.3	1.2	1.2	1.2	.	.
France	2.4	2.3	2.3	2.2	2.2	2.4	2.3	2.6	2.5	2.6	2.5	2.6	.	.
Ireland	4.8	4.8	4.7	4.8	5.3	6.9	6.3	6.7	6.8	8.6	.	.	.	.
Italy	2.3	2.1	2.0	2.0	2.0	1.8	1.8	1.8	1.8	1.8	1.9	2.0	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Netherlands	2.3	2.1	2.2	2.2	2.0	1.9	1.8	1.8	1.8	1.8	1.8	1.7	.	.
Austria	2.2	2.1	2.0	2.0	2.0	2.0	1.9	1.9	2.1	2.0	2.0	1.9	.	.
Portugal	0.9	1.0	1.0	1.0	1.0	1.1	1.2	1.3	1.1	1.1	.	.	.	.
Finland	1.7	1.3	1.7	2.0	2.3	2.8	3.0	3.6	4.6	5.4	6.2	5.2	.	.
Sweden	2.2	2.5	2.5	2.8	3.0	3.2	3.4	3.7	4.2	4.2	3.5	2.5	.	.
United Kingdom	3.3	3.2	3.0	2.9	3.1	3.0	3.0	3.1	3.0	3.0	2.9	2.8	.	.

Indicator definition: Value added of high technology manufacturing sector (ISIC Rev 3 classes: 2423, 3000, 3200, 3300 and 3530).
Source: OECD: STAN Indicators 2004.

Table D05
Labour productivity per person employed

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Index relative to the EU-15 (EU-15=100)													
EU-15	.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Belgium	.	124.6	124.0	122.3	123.1	119.3	117.7	117.0	115.7	115.8	116.9	117.2	117.8	118.4
Denmark	.	92.6	91.7	92.1	92.6	92.9	94.0	94.7	94.1	95.8	97.1	97.9	96.1	97.8
Germany	.	98.1	99.3	98.4	98.0	98.0	97.9	97.1	96.4	95.9	94.9	94.0	93.8	94.3
Greece	.	85.6	82.9	79.9	77.8	77.5	78.0	81.7	77.3	78.8	81.0	83.7	88.3	90.3
Spain	.	95.2	95.1	95.7	95.7	95.0	94.5	92.9	92.5	93.9	92.7	93.1	94.5	94.8
France	.	116.7	116.3	115.4	114.2	113.4	112.7	114.0	114.5	114.2	113.5	114.2	114.3	113.5
Ireland	.	100.9	101.4	101.3	101.0	104.7	106.3	111.7	110.0	111.4	113.3	115.1	122.9	119.5
Italy	.	111.2	109.9	110.4	111.3	112.9	112.3	111.1	112.7	111.7	111.0	108.7	105.3	103.6
Luxembourg	.	136.4	131.9	133.4	131.1	127.5	125.7	129.4	133.2	140.9	144.6	135.9	131.9	132.2
Netherlands	.	102.4	100.1	99.2	98.6	97.8	96.3	95.2	95.0	94.2	95.2	97.0	95.8	95.2
Austria	.	100.2	99.6	99.0	98.7	98.7	99.1	97.0	96.6	97.6	99.2	97.3	96.7	96.4
Portugal	.	56.5	56.6	56.0	55.5	57.1	61.0	61.6	62.3	63.9	64.0	64.0	64.2	63.2
Finland	.	92.0	92.9	96.4	98.7	98.8	98.1	100.5	103.0	100.4	102.6	102.2	99.3	98.6
Sweden	.	90.0	90.8	92.7	94.7	95.6	96.4	97.4	96.5	98.9	99.5	96.1	95.1	96.5
United Kingdom	.	85.7	90.8	92.4	93.0	93.0	93.6	95.0	95.6	95.7	97.3	99.2	101.1	101.9

Indicator definition: GDP at market prices in PPS per person employed.
Source: Eurostat: Structural Indicators.

Table D06
Total employment rate

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of total population aged 15–64													
EU-15	.	.	61.2	60.1	59.8	60.1	60.3	60.7	61.4	62.5	63.4	64.1	64.3	64.4
Belgium	54.6	55.8	56.3	55.8	55.7	56.1	56.2	56.8	57.4	59.3	60.5	59.9	59.9	59.6
Denmark	74.8	74.2	73.7	72.1	72.3	73.4	73.8	74.9	75.1	76.0	76.3	76.2	75.9	75.1
Germany	.	67.7	66.4	65.1	64.7	64.6	64.1	63.7	63.9	65.2	65.6	65.8	65.4	65.0
Greece	54.6	53.4	53.7	53.7	54.2	54.7	55.0	55.1	55.5	55.3	55.7	55.4	56.7	57.8
Spain	50.3	50.4	49.0	46.6	46.1	46.9	47.9	49.4	51.2	53.7	56.2	57.7	58.4	59.7
France	60.7	60.4	59.9	59.3	59.1	59.5	59.5	59.6	60.2	60.9	62.1	62.8	63.0	63.2
Ireland	52.0	51.4	51.2	51.7	53.0	54.4	55.4	57.6	60.6	63.3	65.2	65.8	65.6	65.4
Italy	.	.	.	52.3	51.4	51.0	51.2	51.3	52.0	52.7	53.7	54.8	55.5	56.1
Luxembourg	59.5	60.8	61.4	60.8	59.9	58.7	59.2	59.9	60.5	61.7	62.7	63.1	63.4	62.7
Netherlands	61.8	62.7	64.0	63.6	64.0	64.7	66.3	68.5	70.2	71.7	72.9	74.1	74.4	73.5
Austria	.	.	.	.	68.5	68.8	67.8	67.8	67.9	68.6	68.5	68.5	69.2	69.2
Portugal	67.0	68.4	66.6	65.1	64.1	63.7	64.1	65.7	67.0	67.5	68.4	68.7	68.2	67.2
Finland	74.2	70.3	65.1	61.0	60.3	61.6	62.4	63.3	64.6	66.4	67.2	68.1	68.1	67.7
Sweden	81.4	79.5	75.9	71.3	70.2	70.9	70.3	69.5	70.3	71.7	73.0	74.0	73.6	72.9
United Kingdom	70.8	69.4	67.9	67.4	67.9	68.5	69.0	69.9	70.5	71.0	71.5	71.7	71.7	71.8

Indicator definition: Employed persons aged 15–64.
Source: Eurostat: Structural Indicators.

Table D07
Inflation rate

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Average annual rate of change													
EU-15	5.3	5.2	4.0	3.4	2.8	2.8	2.4	1.7	1.3	1.2	1.9	2.2	2.1	2.0
Belgium	.	.	2.3	2.5	2.4	1.3	1.8	1.5	0.9	1.1	2.7	2.4	1.6	1.5
Denmark	2.5	2.2	1.9	0.9	1.8	2.0	2.1	1.9	1.3	2.1	2.7	2.3	2.4	2.0
Germany	.	.	.	.	.	.	1.2	1.5	0.6	0.6	1.4	1.9	1.3	1.0
Greece	.	.	.	.	.	.	7.9	5.4	4.5	2.1	2.9	3.7	3.9	3.4
Spain	.	.	.	4.9	4.6	4.6	3.6	1.9	1.8	2.2	3.5	2.8	3.6	3.1
France	.	3.4	2.4	2.2	1.7	1.8	2.1	1.3	0.7	0.6	1.8	1.8	1.9	2.2
Ireland	.	.	.	.	.	.	2.2	1.2	2.1	2.5	5.3	4.0	4.7	4.0
Italy	6.2	6.2	5.0	4.5	4.2	5.4	4.0	1.9	2.0	1.7	2.6	2.3	2.6	2.8
Luxembourg	.	.	.	.	.	.	1.2	1.4	1.0	1.0	3.8	2.4	2.1	2.5
Netherlands	2.4	3.2	2.8	1.6	2.1	1.4	1.4	1.9	1.8	2.0	2.3	5.1	3.9	2.2
Austria	2.8	3.1	3.5	3.2	2.7	1.6	1.8	1.2	0.8	0.5	2.0	2.3	1.7	1.3
Portugal	13.3	11.4	8.9	5.9	5.0	4.0	2.9	1.9	2.2	2.2	2.8	4.4	3.7	3.3
Finland	5.8	4.5	3.3	3.3	1.6	0.4	1.1	1.2	1.4	1.3	3.0	2.7	2.0	1.3
Sweden	10.2	8.7	1.3	4.8	2.9	2.7	0.8	1.8	1.0	0.6	1.3	2.7	2.0	2.3
United Kingdom	7.0	7.5	4.2	2.5	2.0	2.7	2.5	1.8	1.6	1.3	0.8	1.2	1.3	1.4

Indicator definition: Harmonized Indices of Consumer Prices (HICP's).
Source: Eurostat: Structural Indicators.

Table D08
Public balance

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
EU-15	.	.	.	.	.	.	–4.2	–2.4	–1.6	–0.7	1.0	–1.1	–2.1	–2.7
Belgium	–6.8	–7.4	–8.0	–7.3	–5.0	–4.3	–3.8	–2.0	–0.7	–0.4	0.2	0.6	0.1	0.4
Denmark	–1.0	–2.4	–3.3	–3.7	–3.2	–3.1	–1.9	–0.5	0.2	2.4	1.7	2.0	0.7	0.3
Germany	.	–3.0	–2.5	–3.1	–2.4	–3.3	–3.4	–2.7	–2.2	–1.5	1.3	–2.8	–3.7	–3.8
Greece	–15.4	–11.4	–11.1	–13.4	–9.4	–10.2	–7.4	–4.0	–2.5	–1.8	–4.1	–3.7	–3.7	–4.6
Spain	.	.	.	.	.	.	–4.9	–3.2	–3.0	–1.2	–0.9	–0.4	–0.1	0.4
France	–2.1	–2.4	–4.2	–6.0	–5.5	–5.5	–4.1	–3.0	–2.7	–1.8	–1.4	–1.5	–3.2	–4.1
Ireland	–2.8	–2.9	–3.0	–2.7	–2.0	–2.1	–0.1	1.1	2.4	2.4	4.4	0.9	–0.2	0.1
Italy	–11.8	–11.7	–10.7	–10.3	–9.3	–7.6	–7.1	–2.7	–2.8	–1.7	–0.6	–2.6	–2.3	–2.4
Luxembourg	4.8	1.2	0.2	1.5	2.7	2.1	1.9	3.2	3.2	3.7	6.0	6.4	2.8	0.8
Netherlands	–5.3	–2.7	–4.2	–2.8	–3.5	–4.2	–1.8	–1.1	–0.8	0.7	2.2	–0.1	–1.9	–3.2
Austria	–2.4	–2.9	–1.9	–4.2	–4.9	–5.6	–3.9	–1.8	–2.3	–2.2	–1.5	0.3	–0.2	–1.1
Portugal	–6.1	–8.1	–6.0	–8.9	–6.6	–4.5	–4.0	–3.0	–2.6	–2.8	–2.8	–4.4	–2.7	–2.8
Finland	5.3	–1.1	–5.6	–7.3	–5.7	–3.7	–3.2	–1.5	1.5	2.2	7.1	5.2	4.3	2.3
Sweden	.	.	.	–11.6	–9.3	–7.0	–2.7	–0.9	1.8	2.5	5.1	2.8	0.0	0.3
United Kingdom	–1.5	–2.8	–6.5	–8.0	–6.8	–5.7	–4.3	–2.0	0.2	1.0	3.8	0.7	–1.7	–3.3

Indicator definition: Net borrowing / lending of consolidated general government sector.
Source: Eurostat: Structural Indicators.

Table D09
Energy intensity of the economy

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Kilogram of oil equivalent per 1 000 Euro GDP													
EU-15	.	216	212	213	207	207	211	205	203	198	193	194	191	.
Belgium	.	249	249	244	241	239	252	249	249	244	236	228	214	.
Denmark	.	153	146	159	152	148	162	146	141	132	125	125	123	.
Germany	.	194	186	188	182	179	184	180	176	169	165	168	165	.
Greece	.	257	263	262	268	269	276	268	273	263	264	261	258	.
Spain	.	221	222	215	223	229	220	223	224	227	227	227	229	.
France	.	207	202	206	194	198	207	199	198	192	188	189	187	.
Ireland	.	240	230	227	229	209	205	194	190	181	166	161	164	.
Italy	.	196	197	196	189	194	192	190	194	194	190	188	184	.
Luxembourg	.	305	301	293	275	241	238	217	198	193	186	191	198	.
Netherlands	.	239	234	236	229	231	233	221	212	202	198	201	202	.
Austria	.	156	146	147	142	146	154	151	149	144	138	146	146	.
Portugal	.	217	229	229	235	237	229	233	239	247	241	238	254	.
Finland	.	299	299	313	319	290	302	299	289	276	261	263	272	.
Sweden	.	276	267	266	272	265	268	255	248	238	215	229	224	.
United Kingdom	.	273	273	270	259	252	256	242	243	234	228	225	212	.

Indicator definition: Gross inland consumption of energy divided by GDP at constant prices (1995=100).
Source: Eurostat: Structural Indicators.

Table D10
Greenhouse gas emissions

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Index of emissions of CO_2 equivalents (1990=100)													
EU-15	100.0	100.2	98.0	96.3	96.4	97.3	99.3	97.6	98.1	96.5	96.6	97.9	97.4	.
Belgium	100.0	102.6	101.7	100.9	104.4	106.0	109.3	102.9	106.4	101.7	102.6	102.4	102.9	.
Denmark	100.0	115.6	106.5	110.0	115.9	111.9	131.3	117.4	110.0	105.5	98.6	100.8	99.6	.
Germany	100.0	95.8	91.8	90.6	88.8	88.2	89.7	86.6	84.6	81.7	81.4	82.3	81.4	.
Greece	100.0	100.0	101.3	101.8	104.3	105.4	109.0	114.1	118.7	118.1	123.8	128.8	129.2	.
Spain	100.0	102.2	105.4	101.5	107.0	111.2	108.9	116.1	119.8	130.1	135.4	134.8	140.5	.
France	100.0	104.3	102.5	98.5	97.7	99.2	102.1	100.7	103.2	99.9	98.8	99.5	98.1	.
Ireland	100.0	101.9	103.5	102.9	106.2	107.8	110.9	116.1	120.0	124.0	127.8	131.1	128.9	.
Italy	100.0	100.3	99.5	98.3	96.8	103.1	101.6	102.8	105.2	106.2	106.9	108.9	108.8	.
Luxembourg	100.0	101.2	99.6	102.3	99.8	78.9	79.9	73.8	65.1	71.0	74.8	76.9	84.9	.
Netherlands	100.0	103.2	103.0	104.3	104.9	106.2	110.8	103.1	105.8	100.6	100.9	102.2	101.1	.
Austria	100.0	105.6	96.6	97.0	98.4	102.0	106.4	105.9	105.4	103.0	103.7	108.5	108.8	.
Portugal	100.0	103.3	109.9	106.6	109.6	116.4	111.7	116.8	124.6	137.4	134.6	135.4	141.0	.
Finland	100.0	97.5	93.5	94.3	102.6	99.3	106.5	105.1	101.8	100.9	97.7	105.0	106.8	.
Sweden	100.0	100.4	100.3	100.0	103.8	102.3	107.0	100.9	101.9	97.1	93.6	94.7	96.5	.
United Kingdom	100.0	100.2	97.1	94.4	93.8	92.5	95.4	92.2	91.6	87.3	87.2	88.4	85.5	.

Indicator definition: Emissions of greenhouse gases expressed in CO_2 equivalents.
Source: Eurostat: Structural Indicators.

Table D11
Inequality of income distribution

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Income quintile share ratio													
EU-15	.	.	.	.	.	5.1	4.8	4.7	4.6	4.6	4.4	4.4	.	.
Belgium	.	.	.	.	.	4.5	4.2	4.0	4.0	4.2	4.3	4.0	.	.
Denmark	.	.	.	.	.	3.1	3.0	2.9	3.0	3.0	3.1	3.1	.	.
Germany	.	.	.	.	.	4.6	4.0	3.7	3.6	3.6	3.5	3.6	.	.
Greece	.	.	.	.	.	6.5	6.3	6.6	6.5	6.2	5.8	5.7	.	.
Spain	.	.	.	.	.	5.9	6.0	6.5	5.9	5.7	5.4	5.5	.	.
France	.	.	.	.	.	4.5	4.3	4.4	4.2	4.4	4.2	4.0	.	.
Ireland	.	.	.	.	.	5.1	5.1	5.0	5.2	4.9	4.7	4.5	.	.
Italy	.	.	.	.	.	5.9	5.6	5.3	5.1	4.9	4.8	4.8	.	.
Luxembourg	.	.	.	.	.	4.3	4.0	3.6	3.7	3.9	3.7	3.8	.	.
Netherlands	.	.	.	.	.	4.2	4.4	3.6	3.6	3.7	3.5	3.8	.	.
Austria	.	.	.	.	.	4.0	3.8	3.6	3.5	3.7	3.4	3.5	.	.
Portugal	.	.	.	.	.	7.4	6.7	6.7	6.8	6.4	6.4	6.5	.	.
Finland	.	.	.	.	.	.	3.0	3.0	3.1	3.4	3.3	3.5	.	.
Sweden	.	.	.	.	.	.	3.0	3.1	3.4	3.2	3.5	3.4	.	.
United Kingdom	.	.	.	.	.	5.2	5.0	4.7	5.2	5.2	5.2	4.9	.	.

Indicator definition: Income quintile share ratio: the sum of the 20% highest incomes divided by the sum of the 20% lowest incomes. Income must be understood as equivalised disposable income.
Source: Eurostat: Structural Indicators.

Table D12
Total long-term unemployment rate

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of total active population													
EU-15	.	.	3.6	4.4	5.0	4.9	4.9	4.9	4.4	4.0	3.5	3.1	3.1	3.3
Belgium	4.3	3.8	4.0	4.5	5.6	5.8	5.6	5.4	5.5	4.9	3.7	3.2	3.5	3.7
Denmark	2.2	2.5	2.4	2.6	2.5	2.0	1.8	1.5	1.3	1.0	1.0	0.8	0.9	1.1
Germany	.	.	2.2	3.1	3.7	3.9	4.2	4.9	4.7	4.3	3.9	3.8	4.1	4.6
Greece	3.0	3.3	3.8	4.2	4.4	4.7	5.2	5.3	5.8	6.4	6.0	5.4	5.1	5.1
Spain	7.9	7.3	7.2	9.2	11.0	10.5	9.7	8.9	7.6	5.9	4.7	3.9	3.9	3.9
France	3.4	3.4	3.4	4.0	4.5	4.5	4.6	4.8	4.6	4.2	3.6	3.0	3.0	3.5
Ireland	8.6	8.9	9.2	9.5	9.2	7.6	7.0	5.6	3.9	2.4	1.6	1.2	1.3	1.5
Italy	.	.	.	5.8	6.7	7.3	7.5	7.5	7.0	6.8	6.4	5.8	5.3	4.9
Luxembourg	0.6	0.4	0.4	0.8	0.9	0.7	0.8	0.9	0.9	0.7	0.6	0.6	0.8	0.9
Netherlands	2.7	2.3	2.5	3.3	3.3	3.1	3.0	2.3	1.5	1.2	0.8	0.7	0.7	1.0
Austria	.	.	.	.	1.1	1.0	1.2	1.3	1.3	1.2	1.0	0.9	0.9	1.1
Portugal	2.1	1.7	1.3	1.8	2.6	3.2	3.3	3.2	2.2	1.8	1.7	1.5	1.8	2.2
Finland	.	.	.	.	.	.	.	4.9	4.1	3.0	2.8	2.5	2.3	2.3
Sweden	0.1	0.2	0.5	1.4	2.3	2.3	2.8	3.1	2.6	1.9	1.4	1.0	1.0	1.0
United Kingdom	2.2	2.6	3.6	4.2	4.1	3.6	3.1	2.5	1.9	1.7	1.5	1.3	1.1	1.1

Indicator definition: Long-term unemployed (12 months and more). Active population (labour force) is the total number of the employed and the unemployed population.
Source: Eurostat: Structural Indicators.

Annex B: Auxiliary data tables

Table D01aux
Real GDP growth rate

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage change on previous year													
EU-15	.	.	1.3	–0.5	2.8	2.4	1.6	2.5	2.9	2.9	3.5	1.7	1.0	0.8
Belgium	3.1	1.8	1.5	–1.0	3.2	2.4	1.2	3.5	2.0	3.2	3.8	0.6	0.7	1.1
Denmark	1.0	1.1	0.6	0.0	5.5	2.8	2.5	3.0	2.5	2.6	2.8	1.6	1.0	0.5
Germany	.	.	2.2	–1.1	2.3	1.7	0.8	1.4	2.0	2.0	2.9	0.8	0.1	–0.1
Greece	0.0	3.1	0.7	–1.6	2.0	2.1	2.4	3.6	3.4	3.4	4.5	4.3	3.6	4.5
Spain	3.8	2.5	0.9	–1.0	2.4	2.8	2.4	4.0	4.3	4.2	4.4	2.8	2.2	2.5
France	2.6	1.0	1.5	–0.9	2.1	1.7	1.1	1.9	3.4	3.2	3.8	2.1	1.2	0.5
Ireland	.	1.9	3.3	2.7	5.8	9.8	8.1	10.8	8.9	11.1	9.9	6.0	6.1	3.7
Italy	2.0	1.4	0.8	–0.9	2.2	2.9	1.1	2.0	1.8	1.7	3.0	1.8	0.4	0.3
Luxembourg	5.3	8.6	1.8	4.2	3.8	1.4	3.3	8.3	6.9	7.8	9.0	1.5	2.5	2.9
Netherlands	4.1	2.4	1.5	0.7	2.9	3.0	3.0	3.8	4.3	4.0	3.5	1.4	0.6	–0.9
Austria	4.6	3.6	2.4	0.3	2.7	1.9	2.6	1.8	3.6	3.3	3.4	0.7	1.2	0.8
Portugal	4.0	4.4	1.1	–2.0	1.0	4.3	3.5	4.0	4.6	3.8	3.4	1.6	0.4	–1.2
Finland	–0.3	–6.4	–3.8	–1.2	3.9	3.4	3.9	6.3	5.0	3.4	5.1	1.1	2.3	1.9
Sweden	1.0	–1.1	–1.3	–2.0	4.2	4.1	1.3	2.4	3.6	4.6	4.3	0.9	2.1	1.6
United Kingdom	0.8	–1.4	0.2	2.3	4.4	2.9	2.8	3.3	3.1	2.9	3.9	2.3	1.8	2.2

Indicator definition: Growth rate of the Gross Domestic Product (GDP) at constant prices (1995=100).
Source: Eurostat: Structural Indicators.

Annex C: Metadata on the key indicators

Module D

Indicator label	D01
Indicator name	GDP per capita in PPS
Indicator definition	Gross Domestic Product (GDP) at market prices per capita in Purchasing Power Standards (PPS)
Unit of measurement	Index relative to the EU-15 (EU-15=100)
Source	Eurostat: Structural indicators
Period covered	1990–2003
Dissemination	NewCronos
Remarks	The PPS is derived from the Purchasing Power Parities (PPP) 2000. PPP figures can be used for comparing statistics among countries, but not for comparison over time.

Indicator label	D02
Indicator name	Value added of business sector services
Indicator definition	Value added of business sector services (ISIC Rev 3 division: 50–74)
Unit of measurement	Percentage of GDP
Source	OECD
Period covered	1990–2002
Dissemination	STAN indicators 2004
Remarks	–

Indicator label	D03
Indicator name	Value added of manufacturing ICT sector
Indicator definition	Value added of manufacturing ICT sector (ISIC Rev 3 classes: 3000, 3130, 3200, 3312 and 3313)
Unit of measurement	Percentage of GDP
Source	OECD
Period covered	1990–2001
Dissemination	STAN indicators 2004 / ICT Sector Data & Metadata
Remarks	–

Indicator label	D04
Indicator name	Value added of high tech manufactures
Indicator definition	Value added of high technology manufacturing sector (ISIC Rev 3 classes: 2423, 3000, 3200, 3300 and 3530)
Unit of measurement	Percentage of GDP
Source	OECD
Period covered	1990–2002
Dissemination	STAN indicators 2004
Remarks	–

Indicator label	D05
Indicator name	Labour productivity per person employed
Indicator definition	GDP at market prices in PPS per person employed
Unit of measurement	Index relative to the EU-15 (EU-15=100)
Source	Eurostat: Structural indicators
Period covered	1991–2003
Dissemination	NewCronos
Remarks	–

Indicator label	D06
Indicator name	Total employment rate
Indicator definition	Employment persons aged 15–64
Unit of measurement	Percentage of total population aged 15–64
Source	Eurostat: Structural indicators
Period covered	1990–2003
Dissemination	NewCronos
Remarks	–

Indicator label	D07
Indicator name	Inflation rate
Indicator definition	Harmonized Indices of Consumer Prices (HICP's)
Unit of measurement	Average annual rate of change
Source	Eurostat: Structural indicators
Period covered	1996–2003; for earlier years estimated figures for several countries
Dissemination	NewCronos
Remarks	–

Indicator label	D08
Indicator name	Public balance
Indicator definition	Net borrowing / lending of consolidated general government sector
Unit of measurement	Percentage of GDP
Source	Eurostat: Structural indicators
Period covered	1990–2003
Dissemination	NewCronos
Remarks	Spain is missing up to until1995 and Sweden until 1993

Indicator label	D09
Indicator name	Energy intensity of the economy
Indicator definition	Gross inland consumption of energy divided by GDP (at constant prices, 1995=100)
Unit of measurement	Kilogram of oil equivalent per 1 000 euro GDP
Source	Eurostat: Structural indicators
Period covered	1990–2002
Dissemination	NewCronos
Remarks	–

Indicator label	D10
Indicator name	Greenhouse gas emissions
Indicator definition	Emissions of greenhouse gases expressed in CO2 equivalents
Unit of measurement	Index of emissions of CO2 equivalents (1990=100)
Source	Eurostat: Structural indicators
Period covered	1990–2002
Dissemination	NewCronos
Remarks	–

Indicator label	D11
Indicator name	Inequality of income distribution
Indicator definition	Income quintile share ratio: the sum of the 20% highest incomes divided by the sum of the 20% lowest incomes. Income must be understood as equivalised disposable income
Unit of measurement	Income quintile share ratio
Source	Eurostat: Structural indicators
Period covered	1995–2001
Dissemination	NewCronos
Remarks	–

Indicator label	D12
Indicator name	Total long-term unemployment rate
Indicator definition	Long-term unemployed (12 months and more) as a percentage of total active population. Active population (labour force) is the total number of the employed and unemployed population
Unit of measurement	Percentage of total active population
Source	Eurostat: Structural indicators
Period covered	1990–2003
Dissemination	NewCronos
Remarks	–

Annex D: Metadata of the auxiliary indicators

Module D

Indicator label	D01aux
Indicator name	Real GDP growth rate
Indicator definition	Growth rate of the Gross Domestic Product (GDP) at constant prices (1995=100)
Unit of measurement	Percentage change on previous year
Source	Eurostat: Structural indicators
Period covered	1990–2003 except Germany (1990,1991) and Ireland (1990)
Countries covered	EU-15
Publication	NewCronos
Remarks	–

6. Capacities and Strategies: Businesses and Households *(Module E)*

– *R&D personnel as percentage of the labour force varies strongly between countries. However, considering the conclusion of chapter 3 about innovation, the countries with the higher percentages demonstrate superior innovation performance.*

– *At the end of the nineties of the previous century the Netherlands and the United Kingdom had the highest number of computer workers as share in total occupations.*

– *Outsourcing is expected to be a major strategy to cope with the growing demand for ICT skills.*

– *There is no overriding trade-off between the use of information within the enterprise and innovation co-operation among innovative firms; both play a role in the majority of cases.*

– *The diffusion of broadband among enterprises varies considerably between countries. However, broadband is expected to be widely used in the future as it opens up new and advanced ways of data interchange, including commercially interesting services and software products.*

– *In 2000 18 percent of the EU-15 households had access to the Internet. In 2003 this was approaching 50 percent. Especially in Germany this growth was fast.*

– *Access to the Internet by individuals does not imply the use of the Internet. A discrepancy in this respect was most pronounced in the UK.*

– *Upsurge of broadband access by household is checked by its availability or public acceptance of certain systems. However, broadband is spreading rapidly.*

– *The higher the level of education, the greater is access to the Internet. Whether this is a temporary effect that will fade away in the near future is not yet known.*

6.1 Introduction

This chapter goes into the measurement of the capacities and strategies of enterprises and households, enabling them to participate in the innovation and diffusion processes that are conditional on the New Economy to emerge and grow.

The emphasis on innovation creates a link with the knowledge economy and the National System of Innovation (NIS). It is believed that the overall effectiveness of the NIS is highly relevant here, involving the presence of research capacities, qualified human resources, mobility of knowledge, company-based training, innovation networks and actual innovative research output. In general, various forms of intellectual capital can be taken into consideration. Advanced knowledge that is available to companies is needed to innovate successfully. Innovative capacity depends on the ability to match knowledge from internal and external sources. Networking and interaction are strategies to achieve that. Co-operation may decrease risks, as costs are shared; other companies may have complementary types of knowledge or organisational capacities that contribute to innovatory success.

Households and enterprises are linked by markets, both the markets for goods and services, and the labour markets. Moreover, households operate as clients of public networks such as the education and health system and influence the way citizens operate in the political system. The greater the number of exchanges and interactions through the Internet (connectivity), the more important it will be for individuals and households to be connected to the Internet and participate in the available networks. Conversely, the use of Internet as a means of communication and interaction depends on whether households and individuals are connected to the Internet.

Strategies refer to the different patterns in the way individual countries have built up their capacities, although it is realised that the available indicator do not allow a complete analysis of them.

6.2 Selected indicators Business Capacities and Strategies (Module Ea)

6.2.1 Selected key indicators

The following key indicators have been selected:
– R&D personnel in the business enterprise sector;
– Innovation co-operation;
– Internet usage by enterprises;
– Use of broadband by enterprises.

R&D personnel in the business enterprise sector (as a percentage of the total labour force) largely represent the R&D capacity of a business community. This is a crucial element of the capacity of enterprises to innovate.

Innovation co-operation (percentage of enterprises with innovative activity that co-operate with other organisations – both enterprises and non-commercial institutions) demonstrates the ability of enterprises to work together and involve other actors that are complementary to an effective innovation team.

Internet usage by enterprises shows the percentage of enterprises that use the Internet as means of communication in the execution of their business. It indicates the maximum reach of doing business over the Internet.

Access to broadband by enterprises (as a percentage of enterprises with Internet) is indicative of whether enterprises are connected to the most advanced and versatile Internet networks.

6.2.2 Selected auxiliary indicators

The following indicators have been added as auxiliary indicators:
– Computer workers;
– Sources of information within the enterprise of high importance.

Moreover five boxes discuss additional aspects of business capacities and strategies.

Computer workers as share in total occupations is an indication of the diffusion of ICT and a professional approach to information management. This auxiliary indicator is additional to the key indicator ‘R&D personnel in the business enterprise sector’.

Sources of information within the enterprise of high importance (as a percentage of innovative firms) shows the capacity of the private sector to tap the various internal sources of information

and to use them to their advantage. This auxiliary indicator is additional to the key indicator 'Innovation co-operation'.

The relations between key indicators and auxiliary indicators is as follows:

Indicators in Module Ea

Key indicators	*Auxiliary indicators*
R&D personnel in the business enterprise sector	– Computer workers BOX A: ICT skills and lifelong learning BOX B: Outsourcing
Innovation co-operation	BOX C: Co-operation and innovation – Sources of information within the enterprise of high importance
Internet usage by enterprises	BOX D: Internet at the workplace and private usage BOX E: Use of ICT by enterprises
Broadband access by enterprises	

6.3 Quantified indicators Business Capacities and Strategies (Module Ea)

6.3.1 R&D personnel in the business enterprise sector

Figure Ea01 shows R&D personnel in the business enterprise sector as a percentage of the total labour force' for the years 1995 and 2001. Finland and Denmark show the highest percentages, Portugal, Greece and Spain the lowest. The increase in R&D personnel during this period was highest in Finland.

Empirical evidence strongly suggests that R&D increases a firm's 'absorptive capacity' (its ability to absorb spillovers from other firms) and also directly contributes to profitability. This finding suggests that there is an optimal mixture of own R&D and outsourced R&D. [1)]

Human resources are the principal asset in R&D work. They comprise people with different skills and levels of training who are involved in a wide range of activities. Qualified scientific personnel is the key component of an R&D establishment, but technicians, specialist services and engineering facilities must support them, and they must draw on many external contacts.

A significant proportion of R&D personnel move on to other departments within the enterprise. This is beneficial from the point of view of the dissemination of knowledge and expertise within the company, and also offers opportunities for R&D personnel whose interests and approach have changed, to take up careers in the new fields of interest. The general opinion is that management should encourage this.

There is currently a shortage of industrial scientists, which may persist, due to long-term demographic trends. It is therefore essential that enterprises create an environment that attracts the right people and that they broadcast knowledge of this environment. [2)]

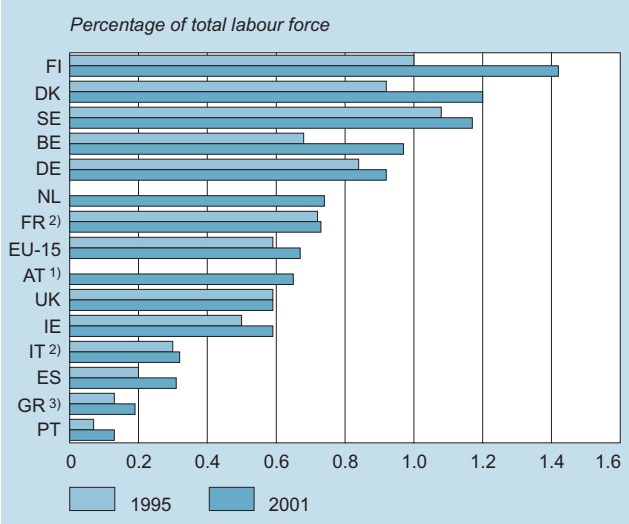
Although R&D is often considered as a nursery for other assignments within the company, some people prefer to make a career in R&D management or stay as research scientists. In order to promote communication and to enhance flexibility within the organisation (which help in motivating people), there is a tendency to simplify the structure of R&D departments. The consequent flattening of the hierarchal pyramid reduces the possibilities of promotion within R&D. To avoid this difficulty, and to avoid the demotivation of high-level scientists, many enterprises apply the dual ladder system. [3)]

6.3.2 Computer workers

Computer workers represent the largest component of high-skilled ICT workers, defined as the sum of ISCO-88 213 (computing professionals) and 312 (computer associate professionals). [3)] Computer workers are given as an auxiliary indicator. ICT workers are needed to implement a great deal of today's innovations that appear on the market. It is striking that in most EU-15 countries the number of computer workers has notably increased (see Figure Eaaux01). This shows that the New Economy was emerging during the nineties of the previous century. The countries that were leading in 1995 have maintained their advanced position in 1999 or even reinforced it.

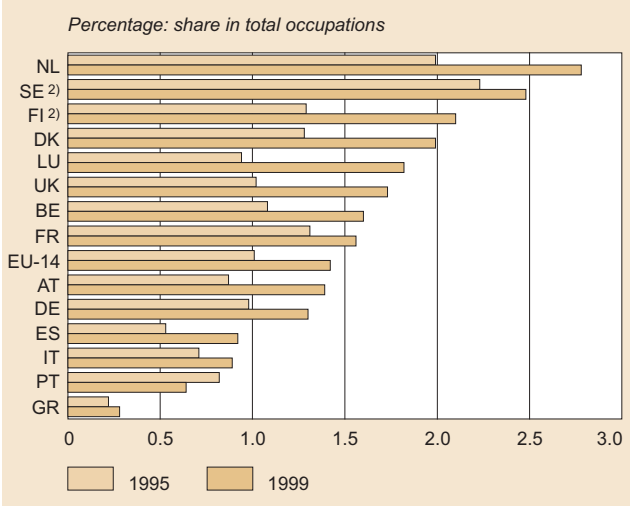
The availability of ICT skills is a matter of both the presence of professional ICT personnel and the level of ICT skills of other personnel who use ICT in their work. The types of higher-level skills most frequently in demand were computer programmers, software developers and ICT security advisers. Experts also mentioned database developers, multimedia developers, ICT

Ea01 R&D personnel in the business enterprise sector



1) 1998 instead of 2001. 2) 2000 instead of 2001. 3) 1999 instead of 2001.
Source: Eurostat, R&D survey.

Eaaux01 Computer workers [1)]



1) Computer workers are defined as ISCO-88 codes 213 and 312.
2) 1997 instead of 1995.
Source: OECD (2002), Measuring the information society.

sales advisors and people with technical or technological skills, particularly with regard to the IT industries, where demand for higher-level skills was greater than in enterprises outside the IT sector. [4)]

Continuous refreshment of knowledge is necessary to keep up with new developments. See below box A on ICT skills and life-long learning.

BOX A ICT skills and lifelong learning

Different researchers have predicted ICT-related skills shortages. The workforce in general needs to be delivered new ICT skills on the job. Evidence suggests that the average half-life for technical knowledge is 3-5 years and complete obsolescence sets in after 6-10 years. Personnel can to a much smaller extent than in the past rely on being able to market the skills they have acquired in the early stages of their life throughout their lifetime, but have to constantly adapt them to the demands of the labour market. This belief is behind the encouragement of uptake of lifelong learning, self-training, and e-learning.

IDC predicted that the demand for skills centred on the Internet working environment will grow most rapidly. The main drivers for this demand are the growing importance of Internet technology, telecommunications devices and infrastructure as well as the increasing use of Internet technology as a foundation for business processes. Other shortages *inter alia* refer to software applications, client server technology and skills that enable organisations to align their ICT investments with the business process.

Source: e-Europe, ICT Skills Monitoring Group, Synthesis Report, 2002.

BOX B Outsourcing

Outsourcing is considered as a useful strategy to provide immediate ICT and e-business skills and processes that a company needs with little investment of time, money and training. As more of the routine operational tasks of a company become automated, the task of turning them over to providers becomes easier and more economical.

Fuelling the growth of European IT outsourcing and business process management is the urgent need to prepare for e-business and e-commerce.

The most commonly outsourced services are application services. An Application Service Provider (ASP) will provide a company with a service, hosting software applications elsewhere. The ASP model is being adopted most rapidly in the early adopter countries such as the Nordic region and the Netherlands. This form of computing is less labour intensive than distributed ICT and is expected to be one of the ways in which SMEs will be able to address the ICT skills shortage.

Other operations that enterprises outsource in Europe are: business process operations (for example, pay roll services, human resources, accounting, procurement and front office), host-based environments, desktop services, network management and Internet/Intranet outsourcing.

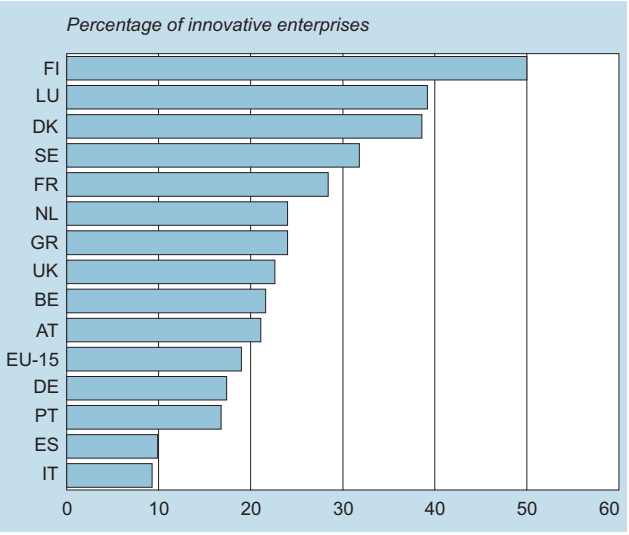
Rapid change in the markets and technologies made enterprises wary of signing up for long-term contracts. Enterprises are opting for shorter outsourcing contracts, but are signing a greater number and paying more for them.

Source: e-Europe, ICT Skills Monitoring Group, Synthesis Report, 2002.

6.3.3 Innovation co-operation

Enterprises that engage in innovation activities may co-operate with external partners. Co-operation means that they actively participate with their partner in joint innovation projects: this excludes contracting out work to develop innovations. In the New Economy flexible forms of co-operation with enterprises in the

Ea02 Innovative enterprises with co-operation arrangements on innovation activities, 1998-2000



Eurostat: Community Innovation Survey (CIS3).

BOX C Co-operation and innovation

The Lambert Review of Business-University Collaboration, commissioned by the UK Treasury and published in 2003, called for more co-operation between firms and universities, to boost knowledge transfer, innovation and economic growth. A paper by Frenz et al. (2004) looks at the evidence from the third Community Innovation Survey to test between co-operation and innovation. It finds that there is a statistically significant positive association between co-operation on the one hand and innovation on the other. This is true both for co-operation with other firms, and co-operation with universities. However, the paper finds a surprisingly low amount of such co-operative activity. One reason for this may be that the pay-back from such activity may vary, depending on a range of factors including the degree of absorptive capacity within the firm in question. Such capacity might require skilled personnel, investment in equipment, and a degree of internal R&D. The paper therefore tests for such factors, and finds a statistically significant correlation between these and the propensity to innovate. The results thus provide empirical support for the policy agenda outlined in the Lambert Review. It is important to encourage firms to co-operate, including with universities. It is also vital to enhance the absorptive capacity of these firms.

Source: M. Frenz, J. Mitchie and C. Oughton, 'Co-operation and innovation: evidence from the Community Innovation Survey', University of London, 2004.

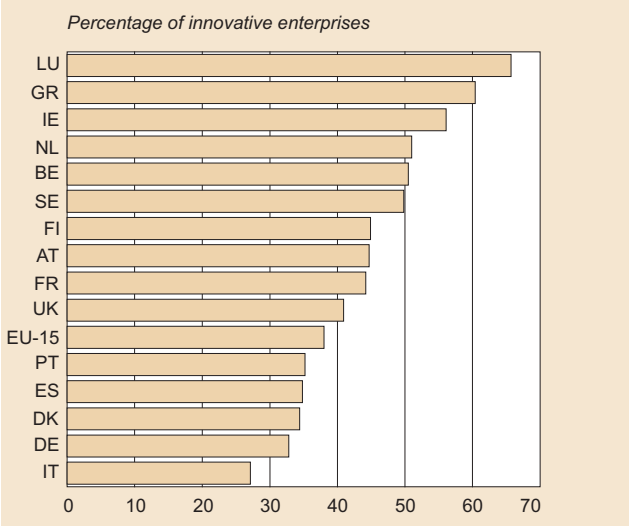
supply chain or with other supporting enterprises and knowledge institutes may be a major source of competitive advantage. Co-operation in innovation processes is not without risks. In particular, it may make it difficult to protect new knowledge against unpaid use by others or to guarantee discretion about certain commercially sensitive arrangements with trading partners.

Figure Ea02 shows the percentage of innovative enterprises that opted for co-operation. In the period 1998–2000, innovative firms in Italy and Spain showed least co-operation, while Finland took the lead.

6.3.4 Sources of information within the enterprise of high importance

Not all enterprises engage in innovation co-operation. To obtain the knowledge needed for carrying out their innovation projects, they have to turn to other sources of information. This can be conferences, journals or exhibitions, institutional sources (universities or other research institutes), market sources (suppliers, clients or competitors) or internal sources (within the enterprise, or other enterprises within the enterprise group). Use of external information sources allows an enterprise to increase its knowledge base, if it has the capability of incorporating it in its innovation processes.

Eaaux02 Innovative enterprises citing information sources within the enterprise as highly important, 1998–2000



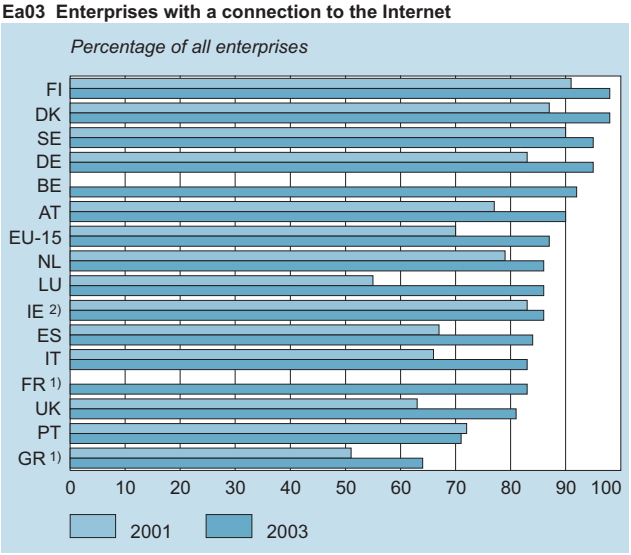
Source: Eurostat, Community Innovation Survey (CIS3).

The majority of enterprises with innovation activity indicated their own enterprise as their most important source of information for innovations. During the period 1998-2000 more than half of the innovative enterprises in Luxembourg, Greece, Ireland, The Netherlands and Belgium cited information sources within the enterprise as highly important for innovation.

6.3.5 Internet usage by enterprises

Figure Ea03 shows that the use of Internet by enterprises in 2003 was widespread. The Scandinavian countries in the EU-15, Germany and Belgium had a percentage above 90. It can be expected that in a few years' time the use of Internet will be as common as the use of telephone and fax. Most of all, besides e-mailing, enterprises use the Internet to search for information. Other uses are banking, downloading digital products and dealing with the authorities.

Ea03 Enterprises with a connection to the Internet



1) 2002 instead of 2003. 2) 2002 instead of 2001.
Source: Eurostat: Community Survey on ICT Usage in Enterprises.

BOX D Internet at the workplace and private usage

Internet at the workplace confronts the problem of usage for personal purposes. Secret monitoring by the U.S. Treasury Department of Internet use among Internal Revenue Service employees found that activities such as personal e-mail, online chats, shopping and checking personal finances and stocks accounted for 51 percent of employees' time spent online.

The top non-work Web activity favoured by IRS employees was going to financial sites. Chat and email ran a close second, followed by miscellaneous activities (which included visiting adult sites), search requests, and looking at or downloading streaming media.

Source: www.business2.com.

BOX E Use of ICT by enterprises

According to Eurostat's e-commerce surveys the use of ICT by enterprises has in a statistical sense a stratal structure involving the following ICT applications: use of computers, Internet access, own website, buying online, selling online.

Over 2001, the EU average figures, differentiating large firms and SMEs, show the following percentages:

Use of ICT by enterprises, EU average 2001

Type of use	Large companies	SMEs
	%	
Use of computers	97	92
Internet access	81	68
Own website	80	44
Buying online	47	25
Selling online	42	17

Source: Eurostat, e-commerce surveys.

6.3.6 *Use of broadband by enterprises*

Internet is mostly used to search and download information, but can also be used to upload content and applications. In general, broadband ensures prompt access to Internet websites and helps to download and upload documents quickly. Certain advanced Internet applications require the availability of broadband.

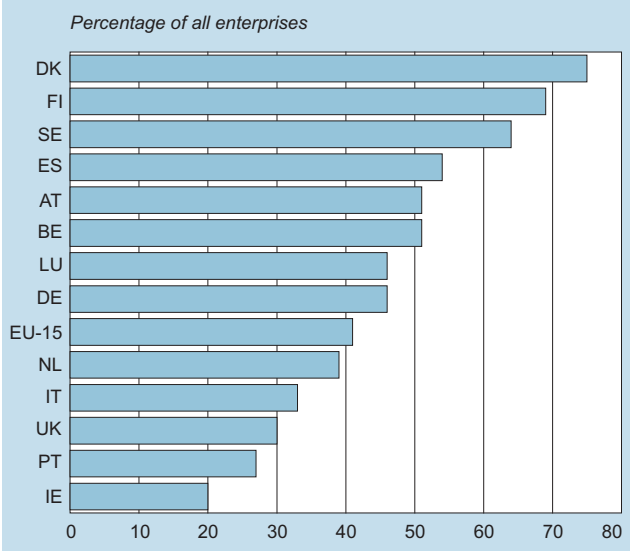
For the private sector, broadband is an enabler of e-business and new market opportunities, allowing firms, including SMEs, to realise growth through productivity increases stemming from improved information exchange, value chain transformation and process efficiency (Figure Ea04).

There is no universally accepted definition of broadband, and national definitions vary, but it is generally agreed that it applies to always-on services considerably faster than ISDN. The capabilities of and the demand for broadband will continue to evolve. There are at least three broadband trends likely to shape the future of the next decade.
First, broadband adoption will continue. Second, broadband connections will become 'faster', that is, will be able to transmit increasing volumes of data during a given interval. Third, a wide array of technologies will be able to deliver broadband to consumers and businesses.

Network operators will need to consider future demand for improved performance when designing and investing in broadband networks. New technological developments are competing with more established DSL and cable modem technologies, which are themselves evolving rapidly.
These include new forms of fixed wireless, mobile wireless and other options including Ethernet LANs, fibre to the home, satellite, digital terrestrial television, and broadband through electrical power lines. Significantly, broadband access may rely on a combination of interoperable technologies to deliver services to users such as access via a local fixed wireless system with backhaul via satellite. [5)]

The diffusion of broadband differs per country. In 2001, Denmark was leading.

Ea04 Enterprises with a broadband connection to the Internet, 2003



Source: Eurostat: Community Survey on ICT Usage in Enterprises.

6.4 Selected indicators Household Capacities and Strategies (Module Eb)

6.4.1 *Selected key indicators*

The following key indicators have been selected:
– Internet usage by households;
– Internet usage by individuals;
– Use of broadband by households.

Internet usage by households is a major indicator showing to what extent households are ready to participate in computer-mediated activities, such as searching, sharing and downloading information or software, buying and selling goods or services and other forms of communication. Not-for-profit organisations such as schools and sport clubs increasingly communicate through the Internet with households and individuals.

Internet usage by individuals is not limited to households. Individuals' use of Internet can also take place elsewhere, for instance at work, in a library, or in an Internet café. This means that individuals can benefit from the Internet and related ICT applications even when their homes are not connected.

Use of broadband by households shows how far households are ready to use advanced Internet applications. Cable and DSL are two types of broadband. Broadband provides a continuous connection with the worldwide web at a fixed price as well as fast downloads and uploads of large documents or multimedia data carriers. More and more new facilities require the availability of broadband.

6.4.2 *Selected auxiliary indicators*

The following auxiliary indicators have been selected:
– Internet usage of individuals by education level;
– E-commerce by individuals;
– Broadband access.

Moreover, two boxes are added: one on the determinants of PC possession, access to Internet and Internet buying and one on young people and ICT.

Internet usage of individuals by education level is important to find out how far the level of education determines access to Internet.

E-commerce by individuals is a clear signal about the emergence of e-commerce by consumers. It tells how far consumers have shown an interest in ordering goods and services through the Internet. The upsurge of the New Economy is dependent on a growing share of individuals buying on line.

Broadband access (per 100 inhabitants) is indicative of to what extent a country's population (both enterprises and households) are connected to the most advanced and versatile Internet networks. This auxiliary indicator is additional to the key indicator 'Broadband access by households'.

Indicators in Module Eb

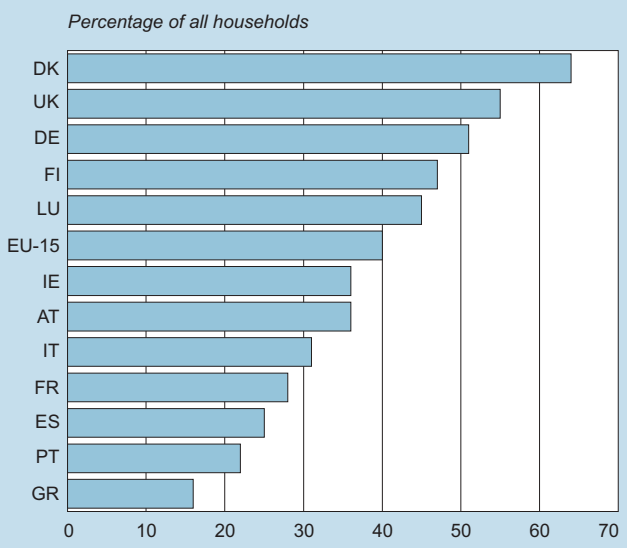
Key indicators	*Auxiliary indicators*
Internet usage by households	BOX F: Determinants of PC possession, Internet access and Internet buying
Internet usage by individuals	– Internet usage of individuals by education level – E-commerce by individuals BOX G: Young people and ICT
Use of broadband by households	– Broadband access

6.5 Quantified indicators
Household Capacities and Strategies (Module Eb)

6.5.1 Internet usage by households

Figure Eb01 shows that in 2003 access to Internet by households was highest in Denmark, United Kingdom and Germany and lowest in Greece and Portugal. In 2003 40% of all households in the EU had access to the Internet.

Eb01 Households with a connection to the Internet, 2003



Source: Eurostat, Community Survey on ICT Usage in Households.

Figure Eb01 makes clear that in 2003 there were notable differences between countries in the percentage of households that have access to the Internet. These differences are likely to reduce in the course of time. Advancement in this area at a national level depends on national developments and policies in innovation, education and the promotion of ICT.

The distribution of Internet access among households, however, is not equal. It varies with certain properties of persons or households. For example, both the level of education and income of the breadwinner positively correlate with having Internet access (see BOX F). Now, more than ever, unequal adoption of technology excludes many from reaping the fruits of the economy. The term “digital divide” refers to this gap between those who can effectively use new information and communication tools, such as the Internet, and those who cannot. While a consensus does not exist on the extent of the divide (and whether the divide is growing or narrowing), researchers are nearly unanimous in acknowledging that some sort of divide exists at this point in time (digitaldividenetwork.org).

Data about the Netherlands suggest that the catch up of the late majority will probably be just a matter of time. If that is going to occur, a possible divide will not lie in Internet access but in the kind of use made of ICT, e.g. as a major source of advanced information or primarily to play games. However, some groups may wish to decline the use of ICT, in particular the Internet. Reasons for not having access to the Internet and making use of it may be a lack of need, absence of a computer, no interest, lack of knowledge for its use and the costs involved.

As various factors that influence Internet access correlate with users’ background characteristics, it is difficult to value the relevance of factors like income, educational level, age, gender and so on. BOX F discusses the determinants of possession of a pc, having Internet access and Internet buying behaviour, based on Dutch research.

BOX F Determinants of PC possession, Internet access and Internet buying

PC possession, Internet access and Internet buying appear to link with different variables, such as income, education and household composition, but also gender and age. Unfortunately, descriptive tables cannot reveal which factor is the most relevant one. However, statistical analysis makes it possible to find the relevant, unique influence of each factor: determinants. Certain factors that seemed to be important were found to fail as explanatory variables. This type of analysis has been applied to Dutch statistical data. The findings are as follows [1]:

– Differences in PC possession by households are best explained by differences in level of education of the breadwinner and composition of a household. The higher the level of education, the greater is the probability that a household possesses a PC. Children increase the chance that there is a PC in the house (this factor is stronger than the number of persons in a household);

– For those households that have a PC at their disposal, an Internet connection at home is mostly determined by household income and – again – by the breadwinner’s level of education. The higher the income, the greater is the chance that a household has an Internet connection.

– For households that possess a PC and have an Internet connection at home, differences in buying on line are best explained by household income, and age and gender of the breadwinner. Elderly people buy on line less frequently. Men buy on line more frequently than women.

Adoption of ICT is dependent on the ‘classical’ factors education, household composition and household income. Age and gender also correlate with these factors and therefore are no independent explanatory variables here.

Internet access at home by education level of the head of household / breadwinner, 2003

	Primary Education	Initial Profes-sional Education	Lower General Secundary Education	Higher General Secundary Education	Higher Vocational Education, Higher Education
	Percentage of all individuals of 12 years or older				
Netherlands	47	56	73	75	85

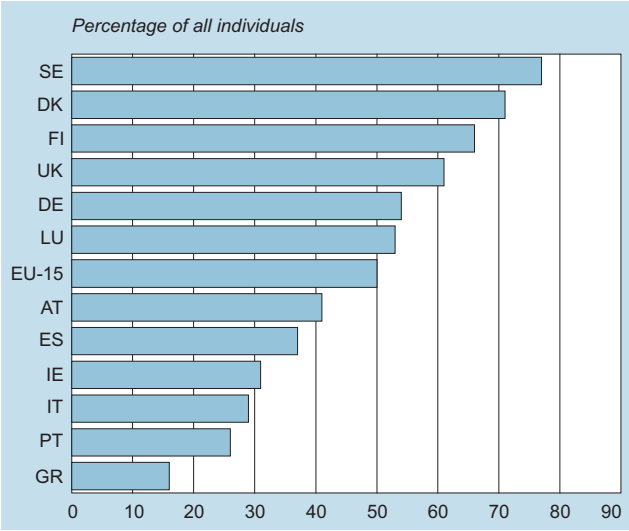
[1] Source: Fructuoso van der Veen, V.A. ‘Determinants of possession of PC, Internet access and Internet buying of the Dutch population’, Statistics Netherlands, 2003.

6.5.2 Internet usage by individuals

The indicator on individuals accessing the Internet in the 3 months prior to the survey provides information about the use of Internet. Figure Eb02 shows the use of Internet by individuals, regardless of location.

Figure Eb02 has a pattern that is similar to that of Figure Eb01. This suggests that Internet use at home is the dominant type. However, important (preceding) learning effects could result from Internet use at work, school or elsewhere. In 2003 the differences between the various EU-15 countries were still notably significant.

Eb02 Individuals accessing the Internet in the 3 months prior to the survey, 2003



Source: Eurostat, Community Survey on ICT Usage in Households.

The three Nordic countries and the UK had over 60 percent of all individuals who had accessed the Internet (during the indicated period of time), whereas other countries' percentages were below 30 and 20. The 2003 EU-15 average was 50 percent. The countries with the lower scores might undergo adverse effects from a lack of connectivity, especially with regard to the birth of new national media enterprises for which sufficient Internet connectivity is a *sine qua none*.

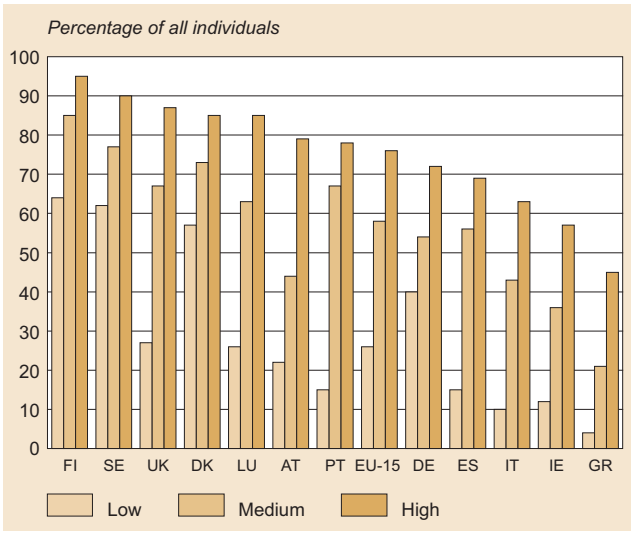
BOX G Young people and ICT

A special point of concern is the position of young people and the opportunities they have to acquaint themselves with ICT. To thrive in the 21st Century workplace, it is increasingly vital for young people to be proficient, not just in technology, but in critical thinking and teamwork. There is concern about the application of technology in children's education. It is important to develop strategies for integrating technology into elementary school curricula. For these to succeed, teachers need to be trained to integrate computers into the learning process effectively and to discover if students' time spent in front of a computer translates into higher academic performance. Teachers should be aware of potentially damaging gender stereotypes in classrooms, game software and on the Internet and the subsequent impact these have on middle school girls.

Source: www.pbs.org/digitaldivide.

Figure Eb02 defines an Internet user as a person who used the Internet during the last three months (at the time of interviewing). In 2003 the Scandinavian countties reported that two third of the population used Internet (according to the previous definition). As stated before, this indicator is likely to correspond with the first indicator (Internet usage by households, see Figure Eb01). From this, one may conclude that in a number of countries Internet use outside the home is more widely spread than in other countries. On the other hand, having access to Internet at home does not necessarily mean that Internet was (frequently) used. This could explain the conspicuous discrepancy between access and use in the United Kingdom.

Ebaux01 Internet usage by individuals with low, medium or high level of education, 2003



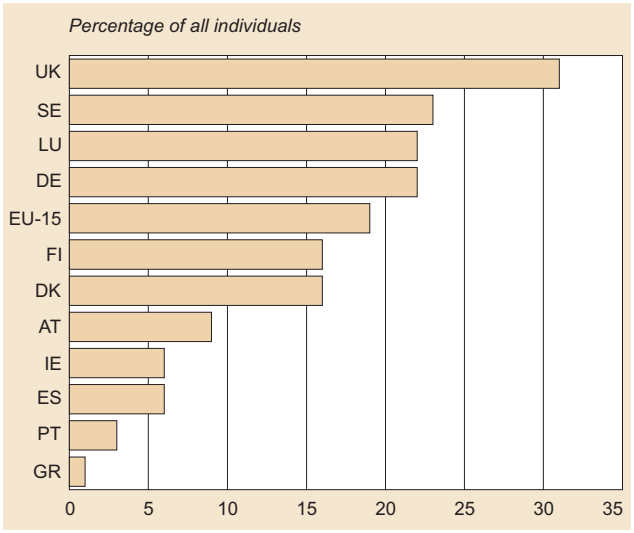
Source: Eurostat, Community Survey on ICT Usage in Households.

Figure EBaux01 shows that the level of education has an effect on the extent to which individuals have access to the Internet. The higher the level of education, the greater this access is. Whether this is a temporary effect that will fade away in the near future is not yet known. It can, however, be expected that education will have a structural effect on the (kind of) use of the Internet.

The economic significance of the different kinds of Internet use varies. Internet transactions that involve billing or paying are from an economic point of view extremely relevant and strongly relate to the indicator e-commerce (Business to Consumer): the share of individuals that buys online; see figure 3.2.b. Although buying online is still a small percentage of total purchases, it is rapidly growing in importance.

Unfortunately, Figure Ebaux02 cannot give but an incomplete picture about the share of people that buy online. This use of the Internet is likely to have a substantial impact on how markets will develop in the future. Potentially, the changing markets can lead

Ebaux02 Usage of Internet by individuals for purchasing/ordering goods or services, 2003



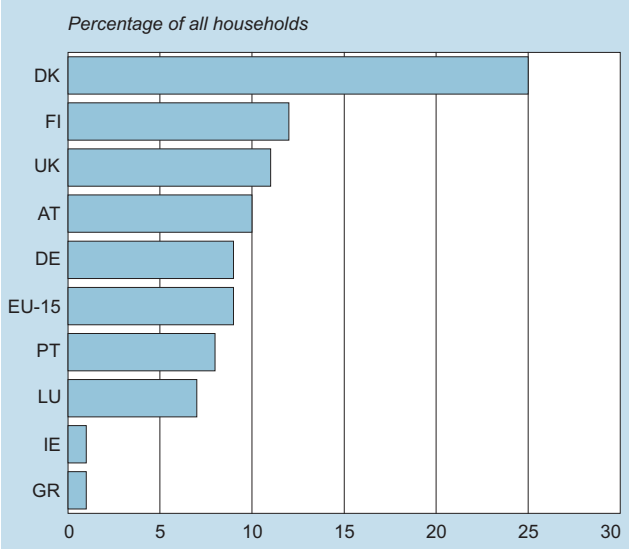
Source: Eurostat, Community Survey on ICT Usage in Households.

to major structural changes in the way economic sectors and supply chains operate and organise themselves, reshuffling competitive relationships, both nationally and internationally.

6.5.3 Access of broadband by households

The use of Internet can vary in intensity. People who use the Internet for many hours a week at home tend to adopt broadband connections (cable or xDSL) rather than continue the use of a dial-up access. Because of lump-sum prices, broadband will involve cost reductions for the intensive Internet users. Broadband increases the speed by which documents or programmes can be downloaded and uploaded. As general tendency, people with broadband Internet are bigger consumers of electronic media and entertainment. Satisfaction with broadband tends to be high, primarily because it delivers on the speed promise users signed up for.

Eb03 Households with a broadband connection to the internet, 2003



Source: Eurostat: Community Survey on ICT Usage in Households.

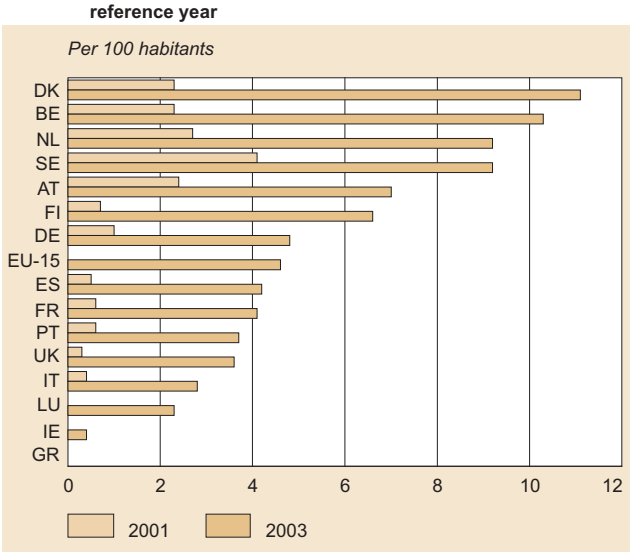
Developments in de USA (www.cato.org) suggest that broadband connectivity is rapidly increasing whereby income matters less, although the cost of broadband is still an issue for many. Moreover, at present for Internet access belonging to an ethnic minority group or geography makes less difference.

6.5.4 Broadband access

This auxiliary indicator gives the combined availability of broadband to both enterprises and households. This indicator is added to the key indicator 'Use of broadband by enterprises' and 'Use of broadband by households' as it is quicker in providing recent information.

Broadband is most popular in Denmark and Belgium (defined as number of subscribers per 100 inhabitants). However, the maximum use of broadband is limited by the availability of broadband. In this regard, striking differences emerge. For example, a DSL network is amply available in Germany, Luxembourg and Spain, but has a hard time in winning the public's favour.
In the Netherlands, on the other hand, the number of subscribers is higher than could be expected, given that broadband is not yet available in all parts of the country.

Ebaux03 Broadband connections to the internet, end of June of the reference year



Source: OECD.

6.6 Conclusion

Sections 6.2 and 6.3 focused on the capacities and strategies of the business enterprise sectors of the EU-15 countries. These capacities and strategies determine whether a country's business community is capable to invest in innovative products and production processes, including advanced ICT innovations and other innovations that make use of available ICT applications. The composite indicator for the business enterprise sectors' innovative capacities and strategies includes the following key indicators discussed in this chapter: R&D personnel; Innovation co-operation; Internet usage and use of broadband. According to the composite indicator, based on relative scores with respect to the above-mentioned indicators, the following three groups appear:

Composite indicator for business capacities and strategies: three country groups according to relative scores [1)]

Group 1
Finland, Denmark, Sweden

Group 2
Luxembourg, Belgium, Germany, Austria, France, Netherlands, EU-15, Greece, United Kingdom, Spain, Ireland, Italy

Group 3
Portugal

1) The countries in group 1 have the higher scores, the countries in group 2 have medium scores while the countries in group 3 are at the lower end of the scores. The clustering has been carried out to prevent an overemphasis on the scores, because it was realised that the indicators used, do not cover the entire spectrum of business capacities and strategies. Moreover, there were some missing values, which required estimates.

Finland, Denmark and Sweden comprise group 1; these are the leading countries in terms of innovative capacity. Group 2 consists of six countries with score of the same magnitude Sweden and Belgium. France and Germany had equal scores (42%), just above the EU-15 average. There are significant differences between the countries in innovative capacities, which involve both the capacity to absorb knowledge from external sources and an ability to launch novel products and processes. The figures probably understate the innovative capacities of the services (such as consultancy and tourism). The availability of broadband is indicative of a capacity to benefit from the new services that Internet can offer. The diffusion of broadband is taking place at considerable speed in many EU countries, so that historical data should be interpreted with caution.

Sections 6.4 and 6.5 focused on household capacities and strategies. Group 1 shows the leading countries in the area of household capacities and strategies relevant to the New Economy: Sweden and Denmark. Group 2 consists of five EU-15 countries, while six countries comprised group 3. It should be kept in mind that the diffusion and Internet and broadband is occurring rapidly. Although being in the forefront as a country may be important, analysis of structural problems in the adoption of Internet and broadband can take place more effectively when a certain degree of saturation has been reached throughout the EU-15. Then, it will be possible to find out whether certain groups in society lag behind and what policies would be appropriate to prevent certain digital divides.

Composite indicator for household capacities and strategies: three country groups according to relative scores [1)]

Group 1
Sweden, Denmark

Group 2
United Kingdom, Finland, Germany, Luxembourg, EU-15, Austria

Group 3
Spain, Italy, France, Ireland, Portugal, Greece

1) The countries in group 1 have the higher scores, the countries in group 2 have medium scores while the countries in group 3 are at the lower end of the scores. The clustering has been carried out to prevent an overemphasis on the scores, because it was realised that the indicators used, do not cover the entire spectrum of business capacities and strategies. Moreover, there were some missing values, which required estimates. For Belgium and the Netherlands, no figures for any of the key indicators for module Eb are available, so these countries could not be included in this table.

Finally, a composite indicator for the combined business and household capacities and strategies has been put together. It is clear that Finland, Sweden and Denmark have a strong position when it comes both business and household capacities. A number of countries have different positions depending on whether it is a matter of business or household capacity. For instance, in countries like the Netherlands, United Kingdom and Italy household capacities (in particular connection to the Internet) are relatively greater than business capacities, whereas the opposite applies to Belgium and France.

Composite indicator for capacities and strategies: three country groups according to relative scores [1)]

Group 1
Denmark, Finland, Sweden

Group 2
Belgium, Germany, Luxembourg, Austria, United Kingdom, Netherlands, EU-15, Ireland, Greece, France, Italy, Spain

Group 3
Portugal

1) The countries in group 1 have the higher scores, the countries in group 2 have medium scores while the countries in group 3 are at the lower end of the scores. The clustering has been carried out to prevent an overemphasis on the scores, because it was realised that the indicators used, do not cover the entire spectrum of business capacities and strategies. Moreover, there were some missing values, which required estimates.

Notes in the text

1) See: D. Leahy and J.P. Neary, Absorptive Capacity, R&D Spillovers and Public Policy, C.E.P.R. Discussion Papers, number 4171.
2) EIRMA Working Group Report Nr 40.
3) See footnote 2.
4) This definition follows OECD, Measuring the information society, 2002.
5) A. West, E. Stokes, A. Bäcklund, M. Freudental, M. Meusy, E. Poux, S. Schöpper-Grabe, ‘ICT Perspectives on the Future’ (ICT learning and training: data, policies and practice in selected EU countries); WP3 – Synthesis Report.
6) OECD, Broadband driving growth; policy responses, 2003.

Annex A: Key data tables

Table Ea01
R&D personnel in the business enterprise sector

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of total labour force													
EU-15	.	.	.	.	.	0.59	0.59	0.60	0.62	0.63	0.65	0.67	0.67	.
Belgium	.	0.66	.	0.63	0.66	0.68	0.76	0.78	0.81	0.83	0.88	0.97	0.97	.
Denmark	.	0.76	.	0.76	.	0.92	.	0.94	1.01	1.03	1.12	1.20	.	.
Germany	.	0.96	0.91	0.87	.	0.84	0.82	0.85	0.85	0.90	0.92	0.92	.	.
Greece	.	0.08	.	0.11	.	0.13	0.12	0.13	.	0.19	.	.	.	.
Spain	0.23	0.24	0.22	0.22	0.21	0.20	.	0.22	.	0.27	.	0.31	.	.
France	0.70	0.72	0.74	0.73	0.72	0.72	0.71	0.73	0.73		0.73		.	.
Ireland	0.27	0.34	0.36	0.38	0.44	0.50	0.50	0.53	0.55	0.57	0.58	0.59	.	.
Italy	0.31	0.30	0.30	0.30	0.31	0.30	0.30	0.30	0.31	0.29	0.32		.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Netherlands	.	.	.	.	.	.	.	.	.	0.78	0.77	0.74	.	.
Austria	.	.	.	.	.	.	.	.	0.65	.	.	.	.	.
Portugal	0.06	.	.	.	.	0.07		0.08		0.11		0.13	.	.
Finland		.	.	.	.	1.00	1.08	1.17	1.29	1.38	1.43	1.42	.	.
Sweden		.	.	.	.	1.08		1.13		1.14		1.17	.	.
United Kingdom	0.68	0.64	0.64	0.66	0.63	0.59	0.57	0.55	0.59	0.60	0.56	0.59	0.56	.

Indicator definition: R&D personnel in the business enterprise sector.
Source: Eurostat: R&D surveys.

Table Ea02
Innovation co-operation

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of innovative enterprises													
EU-15	.	.	.	.	.	.	25.2	.	.	.	19.0	.	.	.
Belgium	.	.	.	.	.	.	36.8	.	.	.	21.6	.	.	.
Denmark	.	.	.	.	.	.	60.7	.	.	.	38.6	.	.	.
Germany	.	.	.	.	.	.	19.9	.	.	.	17.4	.	.	.
Greece	.	.	.	.	.	.	.	.	.	.	24.0	.	.	.
Spain	.	.	.	.	.	.	20.8	.	.	.	9.9	.	.	.
France	.	.	.	.	.	.	35.2	.	.	.	28.4	.	.	.
Ireland	.	.	.	.	.	.	28.7	.	.	.	.	.	.	.
Italy	.	.	.	.	.	.	11.2	.	.	.	9.3	.	.	.
Luxembourg	.	.	.	.	.	.	42.7	.	.	.	39.2	.	.	.
Netherlands	.	.	.	.	.	.	28.4	.	.	.	24.0	.	.	.
Austria	.	.	.	.	.	.	20.2	.	.	.	21.1	.	.	.
Portugal	.	.	.	.	.	.	21.5	.	.	.	16.8	.	.	.
Finland	.	.	.	.	.	.	66.7	.	.	.	50.0	.	.	.
Sweden	.	.	.	.	.	.	53.5	.	.	.	31.8	.	.	.
United Kingdom	.	.	.	.	.	.	30.3	.	.	.	22.6	.	.	.

Indicator definition: Innovative enterprises with co-operation arrangements on innovation activities (1996= 1994–1996; 2000= 1998–2000).
Source: Eurostat: Community Innovation Survey (CIS2 and CIS3).

Table Ea03
Internet usage by enterprises

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of all enterprises													
EU-15	.	.	.	.	.	.	.	.	.	.	.	70	80	87
Belgium	.	.	.	.	.	.	.	.	.	.	.	.	.	92
Denmark	.	.	.	.	.	.	.	.	.	.	.	87	95	98
Germany	.	.	.	.	.	.	.	.	.	.	.	83	84	95
Greece	.	.	.	.	.	.	.	.	.	.	.	51	64	.
Spain	.	.	.	.	.	.	.	.	.	.	.	67	82	84
France	.	.	.	.	.	.	.	.	.	.	.	.	83	.
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	83	86
Italy	.	.	.	.	.	.	.	.	.	.	.	66	74	83
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	55	78	86
Netherlands	.	.	.	.	.	.	.	.	.	.	.	79	85	86
Austria	.	.	.	.	.	.	.	.	.	.	.	77	85	90
Portugal	.	.	.	.	.	.	.	.	.	.	.	72	69	71
Finland	.	.	.	.	.	.	.	.	.	.	.	91	96	98
Sweden	.	.	.	.	.	.	.	.	.	.	.	90	95	95
United Kingdom	.	.	.	.	.	.	.	.	.	.	.	63	74	81

Indicator definition: Enterprises with a connection to the internet.
Source: Eurostat: Community Survey on ICT Usage in Enterprises.

Table Ea04
Use of broadband by enterprises

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of all enterprises													
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.	41
Belgium	.	.	.	.	.	.	.	.	.	.	.	.	.	51
Denmark	.	.	.	.	.	.	.	.	.	.	.	.	.	75
Germany	.	.	.	.	.	.	.	.	.	.	.	.	.	46
Greece	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Spain	.	.	.	.	.	.	.	.	.	.	.	.	.	54
France	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	20
Italy	.	.	.	.	.	.	.	.	.	.	.	.	.	33
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	46
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	.	39
Austria	.	.	.	.	.	.	.	.	.	.	.	.	.	51
Portugal	.	.	.	.	.	.	.	.	.	.	.	.	.	27
Finland	.	.	.	.	.	.	.	.	.	.	.	.	.	69
Sweden	.	.	.	.	.	.	.	.	.	.	.	.	.	64
United Kingdom	.	.	.	.	.	.	.	.	.	.	.	.	.	30

Indicator definition: Enterprises with a broadband connection to the internet.
Source: Eurostat: Community Survey on ICT Usage in Enterprises.

Tabel Eb01
Internet usage by households

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of all households													
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	36	40
Belgium	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.	.	.	56	64
Germany	.	.	.	.	.	.	.	.	.	.	.	.	43	51
Greece	.	.	.	.	.	.	.	.	.	.	.	.	12	16
Spain	.	.	.	.	.	.	.	.	.	.	.	.	17	25
France	.	.	.	.	.	.	.	.	.	.	.	.	23	28
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	36
Italy	.	.	.	.	.	.	.	.	.	.	.	.	27	31
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	40	45
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	58	.
Austria	.	.	.	.	.	.	.	.	.	.	.	.	31	36
Portugal	.	.	.	.	.	.	.	.	.	.	.	.	16	22
Finland	.	.	.	.	.	.	.	.	.	.	.	.	44	47
Sweden	.	.	.	.	.	.	.	.	.	.	.	.	.	.
United Kingdom	.	.	.	.	.	.	.	.	.	.	.	.	50	55

Indicator definition: Households with a connection to the internet.
Source: Eurostat: Community Survey on ICT Usage in Households.

Table Eb02
Internet usage by individuals

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of all individuals													
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	40	50
Belgium	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.	.	.	64	71
Germany	.	.	.	.	.	.	.	.	.	.	.	.	49	54
Greece	.	.	.	.	.	.	.	.	.	.	.	.	15	16
Spain	.	.	.	.	.	.	.	.	.	.	.	.	20	37
France	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	31
Italy	.	.	.	.	.	.	.	.	.	.	.	.	28	29
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	40	53
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Austria	.	.	.	.	.	.	.	.	.	.	.	.	37	41
Portugal	.	.	.	.	.	.	.	.	.	.	.	.	17	26
Finland	.	.	.	.	.	.	.	.	.	.	.	.	62	66
Sweden	.	.	.	.	.	.	.	.	.	.	.	.	71	77
United Kingdom	.	.	.	.	.	.	.	.	.	.	.	.	56	61

Indicator definition: Individuals accessing the internet in the 3 months prior to the survey.
Source: Eurostat: Community Survey on ICT Usage in Households.

Table Eb03
Use of broadband by households

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of all households													
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.	9
Belgium	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Denmark	.	.	.	.	.	.	.	.	.	.	.	.	.	25
Germany	.	.	.	.	.	.	.	.	.	.	.	.	.	9
Greece	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Spain	.	.	.	.	.	.	.	.	.	.	.	.	.	.
France	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Italy	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	7
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Austria	.	.	.	.	.	.	.	.	.	.	.	.	.	10
Portugal	.	.	.	.	.	.	.	.	.	.	.	.	.	8
Finland	.	.	.	.	.	.	.	.	.	.	.	.	.	12
Sweden	.	.	.	.	.	.	.	.	.	.	.	.	.	.
United Kingdom	.	.	.	.	.	.	.	.	.	.	.	.	.	11

Indicator definition: Households with a broadband connection to the internet.
Source: Eurostat: Community Survey on ICT Usage in Households.

Annex B: Auxiliary data tables

Table Eaaux01
Computer workers

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage: share in total occupations													
EU-15	.	.	.	.	.	1.01	.	.	.	1.42	.	.	.	.
Belgium	.	.	.	.	.	1.08	.	.	.	1.60	.	.	.	.
Denmark	.	.	.	.	.	1.28	.	.	.	1.99	.	.	.	.
Germany	.	.	.	.	.	0.98	.	.	.	1.30	.	.	.	.
Greece	.	.	.	.	.	0.22	.	.	.	0.28	.	.	.	.
Spain	.	.	.	.	.	0.53	.	.	.	0.92	.	.	.	.
France	.	.	.	.	.	1.31	.	.	.	1.56	.	.	.	.
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Italy	.	.	.	.	.	0.71	.	.	.	0.89	.	.	.	.
Luxembourg	.	.	.	.	.	0.94	.	.	.	1.82	.	.	.	.
Netherlands	.	.	.	.	.	1.99	.	.	.	2.78	.	.	.	.
Austria	.	.	.	.	.	0.87	.	.	.	1.39	.	.	.	.
Portugal	.	.	.	.	.	0.82	.	.	.	0.64	.	.	.	.
Finland	.	.	.	.	.	1.29	.	2.10	.	.	.	.	.	.
Sweden	.	.	.	.	.	2.23	.	2.48	.	.	.	.	.	.
United Kingdom	.	.	.	.	.	1.02	.	.	.	1.73	.	.	.	.

Indicator definition: Computer workers, defined as ISCO-88 codes 213 and 312.
Source: OECD.

Table Eaaux02
Sources of information within the enterprise of high importance

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of innovative enterprises													
EU-15	.	.	.	.	.	.	48.7	.	.	.	38.0	.	.	.
Belgium	.	.	.	.	.	.	43.6	.	.	.	50.5	.	.	.
Denmark	.	.	.	.	.	.	32.1	.	.	.	34.4	.	.	.
Germany	.	.	.	.	.	.	58.2	.	.	.	32.8	.	.	.
Greece	.	.	.	.	.	.	.	.	.	.	60.4	.	.	.
Spain	.	.	.	.	.	.	73.3	.	.	.	34.8	.	.	.
France	.	.	.	.	.	.	48.2	.	.	.	44.2	.	.	.
Ireland	.	.	.	.	.	.	51.8	.	.	.	56.1	.	.	.
Italy	.	.	.	.	.	.	35.9	.	.	.	27.1	.	.	.
Luxembourg	.	.	.	.	.	.	67.9	.	.	.	65.7	.	.	.
Netherlands	.	.	.	.	.	.	42.2	.	.	.	51.0	.	.	.
Austria	.	.	.	.	.	.	32.0	.	.	.	44.7	.	.	.
Portugal	.	.	.	.	.	.	36.7	.	.	.	35.2	.	.	.
Finland	.	.	.	.	.	.	43.1	.	.	.	44.9	.	.	.
Sweden	.	.	.	.	.	.	56.3	.	.	.	49.8	.	.	.
United Kingdom	.	.	.	.	.	.	40.8	.	.	.	40.9	.	.	.

Indicator definition: Enterprises with innovation activity in the reference period citing information sources within the enterprises as highly important (1996= 1994–1996; 2000= 1998–2000).
Source: Eurostat: Community Innovation Survey (CIS2 and CIS3).

Table Ebaux01
Internet usage by individuals by education level

Country	2002			2003		
	Low	Medium	High	Low	Medium	High
	Percentage of all individuals					
EU-15	20	48	67	26	58	76
Belgium	.	.	.	.	.	.
Denmark	49	67	81	57	73	85
Germany	36	44	63	40	54	72
Greece	4	21	39	4	21	45
Spain	7	32	46	15	56	69
France	.	.	.	.	.	.
Ireland	.	.	.	12	36	57
Italy	12	46	66	10	43	63
Luxembourg	17	48	84	26	63	85
Netherlands	.	.	.	.	.	.
Austria	21	40	68	22	44	79
Portugal	9	51	65	15	67	78
Finland	60	81	90	64	85	95
Sweden	50	73	89	62	77	90
United Kingdom	27	64	85	27	67	87

Indicator definition: Internet usage by individuals with low, medium or high level of education.
Source: Eurostat, Community Survey on ICT Usage in Households.

Table Ebaux02
E-commerce by individuals

Country	2003
	Percentage of all individuals
EU-15	19
Belgium	.
Denmark	16
Germany	22
Greece	1
Spain	6
France	.
Ireland	6
Italy	.
Luxembourg	22
Netherlands	.
Austria	9
Portugal	3
Finland	16
Sweden	23
United Kingdom	31

Indicator definition: Usage of internet by individuals for purchasing/ordering goods or services (excl. shares / financial services).
Source: Eurostat, Community Survey on ICT Usage in Households.

Table Ebaux03
Broadband access

Country	2001	2002	2003
	Per 100 inhabitants		
EU-15	.	2.3	4.6
Belgium	2.3	6.3	10.3
Denmark	2.3	6.6	11.1
Germany	1.0	3.0	4.8
Greece	0.0	0.0	0.0
Spain	0.5	2.0	4.2
France	0.6	1.6	4.1
Ireland	0.0	0.1	0.4
Italy	0.4	1.2	2.8
Luxembourg	0.0	0.6	2.3
Netherlands	2.7	3.9	9.2
Austria	2.4	4.2	7.0
Portugal	0.6	1.5	3.7
Finland	0.7	2.2	6.6
Sweden	4.1	7.0	9.2
United Kingdom	0.3	1.3	3.6

Indicator definition: Broadband connections to the internet, end of June of the reference year.
Source: OECD.

Annex C: Metadata on the key indicators

Module E

Indicator label	Ea01
Indicator name	R&D personnel in the business enterprise sector
Indicator definition	R&D personnel in the business enterprise sector. Research and experimental development (R&D) comprise (a) creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and (b) the use of this stock of knowledge to devise new applications. R&D personnel: all persons employed directly on R&D, as well as those providing direct services such as R&D managers, administrators, and clerical staff.
Unit of measurement	Percentage of total labour force
Period covered	1990–2002
Source	Eurostat: R&D surveys
Dissemination	Statistics on Science and Technology in Europe (1991–2002) NewCronos: theme9/r_d/rd_pers/nat_pers/perlf.
Remarks	Data for 2002 are forecasts or estimates

Indicator label	Ea02
Indicator name	Innovation co-operation
Indicator definition	Innovative enterprises with co-operation arrangements on innovation activities. Innovation co-operation means active participation in joint R&D and other innovation projects with other organisations (either other enterprises or non-commercial institutions). It does not necessarily imply that both partners derive immediate commercial benefit from the venture. Pure contracting out of work, where there is no active collaboration, is not regarded as co-operation. This data is available by location (National, EU/EFTA, EU-CC, US, Japan and Other) and type of partner: Other enterprises within your enterprise group, Suppliers, Clients or customers, Competitors and other firms from the same industry, Consultants Commercial laboratories /R&D enterprises, Universities or other higher education institutes, Government or private non-profit research institutes.
Unit of measurement	Percentage of innovative enterprises
Period covered	1996, 2000
Source	Eurostat: Community Innovation Surveys (CIS2 and CIS3)
Dissemination	Innovation in Europe (Eurostat, 2004) NewCronos: theme9/innovat/inn_cis2 and inn_cis3
Remarks	CIS2 (1994–1996) only covers manufacturing and services sector. For Spain and Italy 1996 (CIS2) only covers manufacturing.

Indicator label	Ea03
Indicator name	Internet usage by enterprises
Indicator definition	Enterprises with a connection to the internet
Unit of measurement	Percentage of all enterprises
Period covered	2001–2003
Source	Eurostat: Community Survey on ICT Usage in Enterprises (the former Eurostat e-Commerce Survey)
Dissemination	NewCronos, Statistics in Focus (Industry, trade and services theme 4, 16/2004, url = http://epp.eurostat.cec.eu.int/portal/page?_pageid=1073,1135281,1073_1135295&_dad=portal&_schema=PORTAL&p–product_code=KN-NP-04–016
Remarks	The survey covers enterprises with 10 or more employed persons. Generally the following NACE-sections are included: D, G, H, I and K.

Indicator label	Ea04
Indicator name	Use of broadband by enterprises
Indicator definition	Enterprises with a broadband connection to the internet
Unit of measurement	Percentage of all enterprises
Period covered	2003
Source	Eurostat: Community Survey on ICT Usage in Enterprises (the former Eurostat e-Commerce Survey)
Dissemination	Statistics in Focus (Industry, trade and services theme 4, 16/2004, url = http://epp.eurostat.cec.eu.int/portal/page?_pageid=1073,1135281,1073_1135295&_dad=portal&_schema=PORTAL&p–product_code=KN-NP-04–016
Remarks	For the purpose of this survey broadband is defined as xDSL or another bandwidth greater than 2Mb/s. It is possible that enterprises do have more than one (broadband) connection to the internet. See for remarks concerning the scope of the survey the remarks under Ea03.

Indicator label	Eb01
Indicator name	Internet usage by households
Indicator definition	Households with a connection to the internet
Unit of measurement	Percentage of all households
Period covered	2002–2003
Source	Eurostat: Community Survey on ICT Usage in Households
Dissemination	NewCronos, Statistics in Focus (Industry, trade and services theme 4, 16/2004, url = http://epp.eurostat.cec.eu.int/portal/page?_pageid=1073,1135281,1073_1135295&_dad=portal&_schema=PORTAL&p–product_code=KN-NP-04–016.
Remarks	–

Indicator label	Eb02
Indicator name	Internet usage by individuals
Indicator definition	Individuals accessing the internet in the 3 months prior to the survey
Unit of measurement	Percentage of all individuals
Period covered	2002–2003
Source	Eurostat, Community Survey on ICT usage in households
Dissemination	Statistics in Focus (Industry, trade and services theme 4, 16/2004, url = http://epp.eurostat.cec.eu.int/portal/page?_pageid=1073,1135281,1073_1135295&_dad=portal&_schema=PORTAL&p–product_code=KN-NP-04–016
Remarks	The survey covers individuals from 16–74 years old. The reference period is the first quarter of the reference year.

Indicator label	Eb03
Indicator name	Use of broadband by households
Indicator definition	Households with a broadband connection to the internet
Unit of measurement	Percentage of all households
Period covered	2003
Source	Eurostat: Community Survey on ICT Usage in Households
Dissemination	Statistics in Focus (Industry, trade and services theme 4, 16/2004, url = http://epp.eurostat.cec.eu.int/portal/page?_pageid=1073,1135281,1073_1135295&_dad=portal&_schema=PORTAL&p–product_code=KN-NP-04–016
Remarks	For the purpose of this survey broadband is defined as xDSL or another bandwidth greater than 2Mb/s. It is possible that enterprises do have more than one (broadband) connection to the internet.

Annex D: Metadata of the auxiliary indicators

Module E

Indicator label	Eaaux01
Indicator name	Computer workers
Indicator definition	Computer workers, defined as ISCO-88 codes 213 and 312
Unit of measurement	Share in total occupations
Source	OECD
Period covered	1995, 1999
Countries covered	EU-15, excl. Ireland
Publication	Measuring the information economy (OECD 2002).
Remarks	Computer workers are part of the High-skill ICT-related occupations defined as ISCO-88 classes 213, 312 and 313.

Indicator label	Eaaux02
Indicator name	Sources of information within the enterprise of high importance
Indicator definition	Enterprises with innovation activity in the reference period citing information sources within the enterprises as highly important for launching new innovation projects or contributing to completion of existing projects are specified. Other sources of information available from CIS3: Other enterprises within the enterprise group, Suppliers, Clients or customers, Competitors and other enterprises from the same industry, Universities or other higher education institutes, Government or private non-profit research institutes, Professional conferences, meetings, journals, fairs, exhibitions
Unit of measurement	Percentage of innovative enterprises
Period covered	1996, 2000
Countries covered	EU-15
Publication	Innovation in Europe (Eurostat 2004) NewCronos: theme9/innovat/inn_cis2 and inn_cis3
Remarks	CIS2 (1994–1996) only covers manufacturing and services sector. For Spain and Italy 1996 (CIS2) only covers manufacturing.

Indicator label	Ebaux01
Indicator name	Internet usage of individuals by education level
Indicator definition	Internet usage by individuals with low, medium or high level of education
Unit of measurement	Percentage of all individuals
Source	Eurostat: Community Survey on ICT Usage in Households
Period covered	2002–2003
Countries covered	EU-15, excl. Belgium, France, Ireland (2002) and Netherlands
Publication	Eurostat, Statistics in Focus (Industry, trade and services theme 4, 16/2004, url = http://epp.eurostat.cec.eu.int/portal/page?_pageid=1073,1135281,1073_1135295&_dad=portal&_schema=PORTAL&p–product_code=KN-NP-04–016
Remarks	Education level: Low is ISCED 1 and 2; Medium is ISCED 3 and 4; High is ISCED 5 and 5. See also Eb02.

Indicator label	Ebaux02
Indicator name	E-commerce by individuals
Indicator definition	Usage of internet by individuals for purchasing/ordering goods or services (excl. shares/financial services)
Unit of measurement	Percentage of all individuals
Source	Eurostat, Community Survey on ICT usage in households
Period covered	2003
Countries covered	EU-15, excl. Belgium, France, Italy and Netherlands
Publication	Eurostat, Statistics in Focus (Industry, trade and services theme 4, 16/2004, url = http://epp.eurostat.cec.eu.int/portal/page?_pageid=1073,1135281,1073_1135295&_dad=portal&_schema=PORTAL&p–product_code=KN-NP-04–016
Remarks	See Eb02

Indicator label	Ebaux03
Indicator name	Broadband access
Indicator definition	Broadband connections to the internet, end of June of the reference year
Unit of measurement	Broadband access per 100 inhabitants
Period covered	2001–2003
Countries covered	EU-15
Publication	OECD, Information and Communication Technology, Information and Communications Statistics, Communications Outlook, www.oecd.org/document/60/0,2340,en_2825_495656_2496764_1_1_1_1,00.html
Remarks	Broadband includes xDSL, cable, satellite, fibre-to-home, ethernet LAN's and fixed wireless subscribers (at downstream speeds greater than 256 kbits/s)

7. Public Domain and Government (Module F)

– *Over the last decade human resources in science and technology (HRST) have risen in all EU-15 countries.*

– *For most EU-15 countries, over recent years the level of education has risen steadily.*

– *Spain's increase in the level of education was the strongest of all EU countries.*

– *Throughout the years there has been some convergence so that the percentage of R&D workers in the public sector (relative to the total of employed persons) now ranges between 0,4 and 0,6 percent. Achieving the Lisbon and Barcelona objectives will roughly require a minimum of 0,8 per cent.*

– *In 2000 graduation rates at PhD level vary considerably between countries, with Sweden, Finland, and Germany at the top.*

– *In 2002 Ireland was leading in the relative number of PhD's in science and engineering.*

– *Although over the period 1998–2000 innovating enterprises in Finland, Italy and Austria most often received financial support for their innovating activities, the number of innovating enterprises in these countries varied considerably.*

– *Between the EU-15 countries, there is no significant correlation between public financial support for innovations in the business sector and public financing of research in the public sector.*

– *The most on-line connected governments in 2003 were those of Sweden, Ireland, Denmark and Austria.*

7.1 Introduction

The public domain refers to capacities that cannot be (easily) seen as belonging to either the business community or the government. These societal assets involve educational levels, productive human resources, R&D capacities of public research labs etc. In fact, there are many intangible assets in the public domain that belong to the National Innovation System, and which may also relate to items such as public trust and civil society. These latter items, by their very nature, are difficult to capture by means of indicators.

Government policies can be so designed as to directly promote inventions and innovations. Moreover, governments influence the operational side of the economy, and therefore indirectly the success rate of (ICT) innovations, by regulations, facilitating roles, fiscal measures and operating as an economic agent itself. To these policies belong electronic means that make services more accessible and reduce the administrative costs of both government agents and companies (e-Government). In terms of promoting innovation, these supportive policies may be as relevant as the financing of public R&D capacity, and all kinds of subsidies to support the adoption of ICT.

7.2 Selected indicators Public Domain (Module Fa)

7.2.1 Selected key indicators

The following key indicators have been selected:
– Human resources in science and technology (HRST)
– Upper secondary graduation rate
– R&D personnel in the public sector
– Number of mobile phones per capita
– Graduation rates at PhD level
– PhDs in Science and Engineering

Human resources in science and technology (HRST) consist of a group of high-level professionals and managers in certain areas that are able to carry or arrange the build-up of knowledge and its application in innovations. It is evident that the (relative) size of this group is a decisive factor in realising the innovations that are needed to have the New Economy in full swing. The definition goes far beyond R&D by including workers actively involved in the creation and diffusion of knowledge and technological innovation.

Upper secondary graduation rate is a measure for the extent to which the population aged 25 to 64 is capable of using the new technologies and computer-mediated networks that are part of the New Economy.

R&D personnel in the public sector is indicative of the capacity of a country to carry out basic, pre-competitive R&D. This research creates the basis for the training of high-level researchers and for the development of innovative products in private industry.

Number of mobile phones per capita indicates the availability of a (more or less) developed mobile network that enhances the possibilities for communication and the development of new products and services in this field, such as SMS and i-Mode, which facilitate all kinds of e-business.

Graduation rates at PhD level is a measure of the degree of advanced training of academic researchers, who will be able to take up new basic research or promote the transfer of scientific knowledge to the areas where it can be applied.

PhDs in Science and Engineering indicate the human interest and capacities in the field of science and engineering, which are conditional on a country's ability to attract R&D activities in fields that are key to international competitiveness.

7.2.2 Selected auxiliary indicators

The following auxiliary indicators have been selected:
– Euro-Creativity Index
– Continued vocational training
– Number of computers in schools
– Number of scientific publications

Euro-Creativity Index gives expression to the possibility a society offers to its citizen to express themselves freely and therefore to develop their creativity. This is an important aspect of the New Economy, as its progress depends on innovative products.

Continued vocational training is important to keep the labour force informed of new techniques and knowledge and as such is an indicator of the knowledge-based economy.

Number of computers in schools per 100 pupils is an indication for the way the educational system has acquainted itself with New Economy facilities. This also contributes to preparing pupils for the use of ICT in their later professional life.

Number of scientific publications indicates the scientific productivity of workers (although there are different practices depending on the discipline and scientific community).

The table below lists the key indicators, showing how they relate to the different auxiliary indicators.

Indicators in Module Fa

Key indicators	*Auxiliary indicators*
Human resources in science and technology (HRST)	– Euro-Creativity Index
Upper secondary graduation rate	– Continued vocational training – Number of computers in schools
R&D personnel in the public sector	– Number of scientific publications BOX A: A need for more research personnel BOX B: Government support to business R&D
Number of mobile phones per capita	
Graduation rates at PhD level	BOX C: Graduates in the future
PhDs in Science and Engineering	

7.3 Quantified indicators Public Domain (Module Fa)

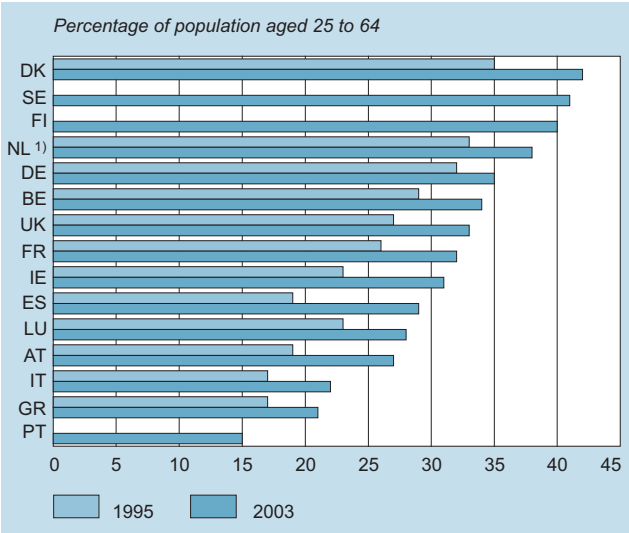
7.3.1 Human resources in science and technology (HRST)

The availability of highly skilled workers is measured by HRST (Human Resources in Science and Technology). Included in the definition of HRST are persons who have successfully completed a tertiary education and those who have an S&T occupation for which such an educational level is normally required. These persons can be expected to play a role in the process of developing and implementing innovations.

Numbers of HRST workers vary considerably between the EU countries. In Denmark, Sweden, and Finland, more than 40% of the population between 15 and 64 years of age is part of the HRST. On the other hand, HRST in Portugal, Greece, and Italy is considerably lower.

There have been definition changes, for example in 1998, when a new OECD education classification was introduced. The comparability of figures before and after 1998 is therefore limited.

Fa01 Human resources in science and technology (HRST)



1) 1996 instead of 1995; 2002 instead of 2003.
Source: Eurostat, Labour Force Survey.

It can be concluded that through the years the level of HRST has risen in all EU countries. However, growth in the numbers of HRST workers differs. Spain has undergone a constant increase in HRST, implying a remarkable growth rate from 1995 to 2001. The countries that were at the higher ranks in 1998 have continued to grow in HRST since then. In this group Germany was lagging behind. Greece seems to have difficulty in strengthening its HRST.

BOX A A need for more research personnel

To attain the EU's research objectives of increased investment in research, about 1.2 million additional research personnel, including 700 000 additional researchers are deemed necessary, on top of the expected replacement of the ageing workforce in research. It became apparent that this target would not be attainable without deliberate and sustained positive action. Major structural changes will be required, at all levels, in the various national procedures by which researchers are educated, trained and recruited.

The Lisbon and Barcelona EU objective of attaining 3% of GDP for R&D (from the present level of around 2%) will roughly require a minimum level of eight researchers per thousand of the workforce. However, this objective will not be attainable within a few years' time. It will require important changes in the most relevant factors affecting this outcome.

Achieving the challenging objectives set at Lisbon and Barcelona must involve a dramatic increase of capacity in the education system, and care must be taken that this increase of quantity is not achieved at the cost of lowering quality standards.

Much of the workforce in science, technology and engineering will continue to be absorbed in the public sector. European policy-makers should therefore give more consideration to providing entrepreneurial opportunities in this sector. They might, for example, encourage public research organisations and universities to create spin-off companies and other techno-starters, thus realising the economic externalities of public research, rather than looking at incentives for the private sector.

Source: J. M. Gago *et al.*, 'Increasing *human resources for science and technology in Europe'*, report for the EC conference 'Europe needs for scientists', Brussels, 2 April 2004.

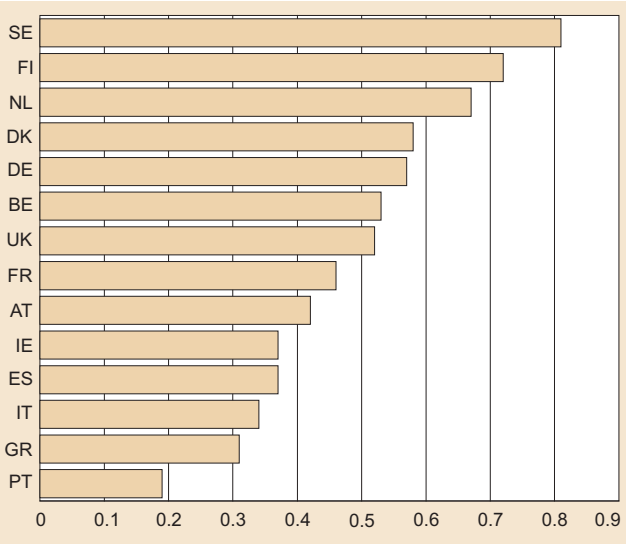
7.3.2 Euro-Creativity Index

The emphasis here is on human resources, a necessity for the knowledge-based economy. Florida (2002) has studied the factors that generate and attract these human resources, especially creativity. In addition to the more traditional indicators on technological development and education, he has included indicators on the subject of tolerance. Regions with an open and tolerant atmosphere can attract creative talent and attain a competitive advantage.

Although R&D is important, competition is not just a matter of intrinsic product quality. More and more, products need to radiate a feel for the consumers' social world. To this effect, products need to incorporate cultural and creative values. Therefore, the creative industries such as the performing arts, media, design and promotion, and the human resources involved, need more attention when thinking about competitive strength and innovation. 1)

The Euro-Creativity Index is partially based on indicators on attitudes, value systems and the opportunities for self-expression. These tolerance indicators are a part of the explanation for the high positions of Sweden, the Netherlands and Denmark in this index. Although Ireland is rather low on this list, it has by far the highest so-called Euro-Creativity Trend Index. This indicates that Ireland has a fast growing creative class, and its index position will probably be rising in the future.

Fa01aux Euro-creativity index, 2004

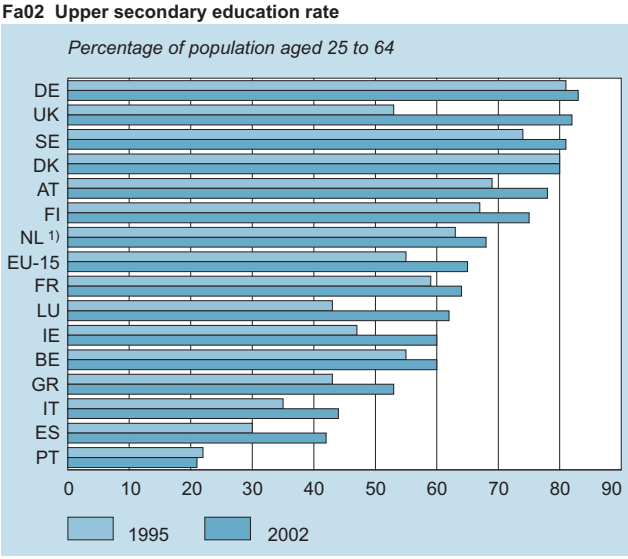


Source: Florida and Tinagli (2004), Europe in the Creative Age.

7.3.3 Upper secondary graduation rate

The group of workers involved in implementing and adopting innovations is larger than the group of HRST workers alone. For example, in the 1980s a large share of the employees had to be trained to work with computers. Since then, new additional ICT applications became common practice. To adapt to innovations at the workplace through training and learning by doing, employees need to have a certain level of education which goes beyond primary education.

Fa02 Upper secondary education rate



1) 1996 instead of 1995.
Source: Eurostat, Labour Force Survey.

The proportion of the population from 25 to 64 years of age that has reached the upper secondary level of education is shown in figure Fa02. The requirements for this level of education differ across countries, so that comparability is not fully secured. However, there are notable differences between top and bottom, which cannot be explained by these differences.

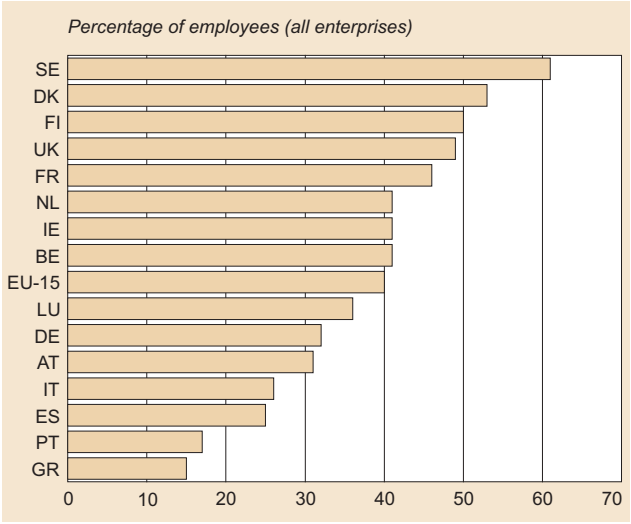
In general, there is a high correlation between the share of HRST workers and the share of the population that has attained the level of secondary education. Here also, the Nordic countries and Germany scored very high, with percentages around 80% in 2002. A remarkable exception was Austria, whose high share of population that has attained at least upper secondary education was not matched by the number HRST workers.

For most countries, over recent years the level of education has risen steadily. The only countries where this level has remained almost constant are Denmark and Germany (both of which were already at the top of the list), and Portugal. Spain's increase in the level of education was the strongest of all EU countries.

7.3.4 Continued vocational training

The changing requirements that the New Economy imposes on the labour force call for a continuous refreshment of the worker's knowledge. The last European survey on continued vocational training (CVT), over 1999, showed that there were considerable differences between EU member states here as well. Sweden, Denmark, Finland and the UK show the highest number of employees who have received CVT. These countries also have the largest share of the population with secondary education. However, only less than a third of German and Austrian employees have taken part in CVT, even though general education levels are high in these countries.

Fa02aux Employees participating in continued vocational training (CVT) courses, 1999



Source: Eurostat, Continuing Vocational Training survey.

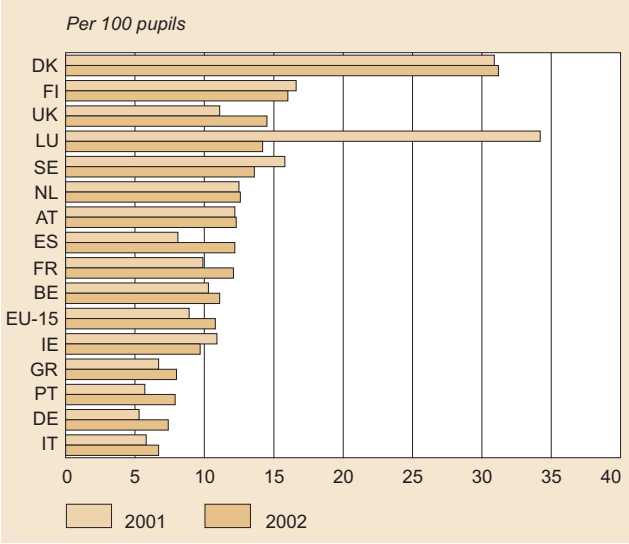
7.3.5 Number of computers in schools

In 2002, on the average, in schools there were about 11 computers per 100 pupils, which indicates a still fairly marginal role of computers in education. Denmark was leading with more than 30 computers per 100 pupils.

7.3.6 R&D personnel in the public sector

In general, R&D at public research institutions and at universities differs from research at private enterprises. Usually, Public R&D

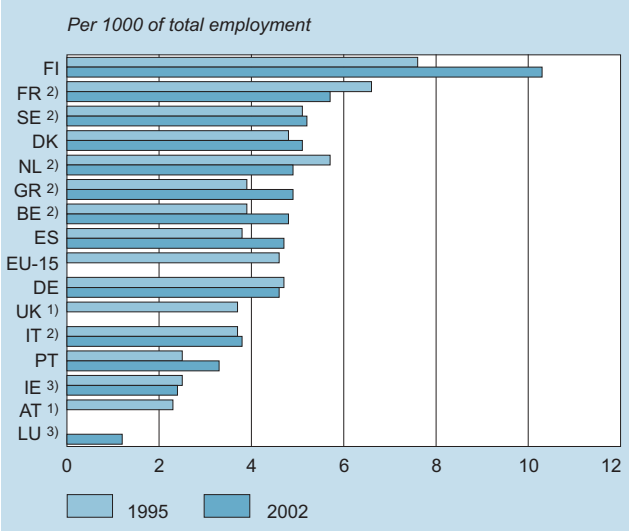
Fa03aux Number of computers in schools



Source: EuroBarometer.

focuses on basic research and pre-competitive development rather than on applied research and development of implementable systems or marketable products. Thus, the number of R&D workers in the public sector is an indicator for a country's capacity to generate fundamental knowledge. Furthermore, R&D at universities often involves PhD students, who will later qualify for R&D staff of private companies.

Fa03 R&D personnel in the higher education and government sector



1) 1993 instead of 1995. 2) 2001 instead of 2002. 3) 2000 instead of 2002.
Source: OECD, MSTI 2004/1.

The number of R&D workers in the public sector (in full-time equivalents) per 1000 employed persons was highest in Finland: more than 1 percent of the employed working population. This is much more than in the other countries. The other countries with relatively high scores, France and Sweden, both had less than 0,6 percent. The lowest relative numbers of R&D workers were found in Austria and Luxembourg.

Except for Finland, throughout the years there has been some convergence so that the percentage of R&D workers in the public sector (relative to the total of employed persons) now ranges between 0.4 and 0.6 percent.

BOX B Government support to business R&D

Government support to R&D can also be given by means of subsidies. In OECD countries, governments finance around 9–10 percent of business expenditure on R&D. The broad consensus on the worth of public support to R&D is based upon the existence of market failures that create a gap between the private and the social benefits derived from R&D activities. This gap means that private resources dedicated to R&D activities will always be below the social optimum. It derives from incomplete appropriability of the results of the research.

Even though the existence of market failures is widely accepted as a justification for public support to R&D, for firms it is necessary to demonstrate that public support to R&D programmes is effective. To do this, it must be shown that the principle of additionality is fulfilled. This principle demands that public subsidies to firms really are transformed into an increase in their research and innovation effort, and that they do not merely substitute private expenditure that would have been made in any case.

Until now evidence on the relation between public funding of business R&D and private R&D expenditure is ambiguous. Therefore, it is necessary that evaluation forms an integral part of the design of technology policy and the concession of subsidies, common methodologies being agreed upon in the various countries, in the same way as done for the definition and collection of R&D and innovation indicators.

Source: J. Garcia-Quevedo, 'Evaluation of Government Funded R&D Activities. Do public subsidies complement business R&D? A meta-analysis of the econometric evidence'. Zew, May 15–16, 2003, Vienna.

7.3.7 Number of scientific publications

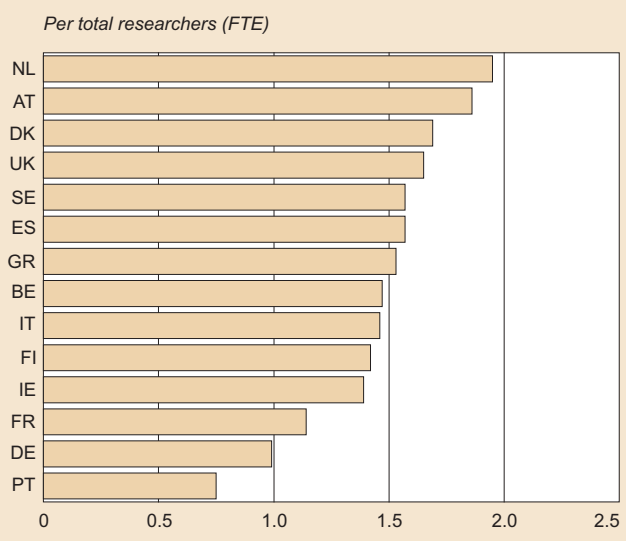
The objective of R&D in the public sector is to increase the scientific knowledge. Results of this research are generally disseminated through publications in scientific journals. The number of publications can be seen as a quantitative measure of the output of public R&D, analogous to the number of patents, which is a measure of private R&D.

The statistics given here are based on the 'Science Citation Index' of the Institute for Scientific Information (ISI). They show the number of publications authored or co-authored by researchers in a particular country, divided by the number of researchers (FTE). Publications written by researchers from two or more countries are fully included in the count for each of those countries.

Researchers in the Netherlands and Austria are shown to be particularly productive. The only countries with a ratio below 1 are Germany and Portugal. It should be noted that journals in other languages than English are not covered in the SCI database, which can explain the low score of particularly France and Germany.

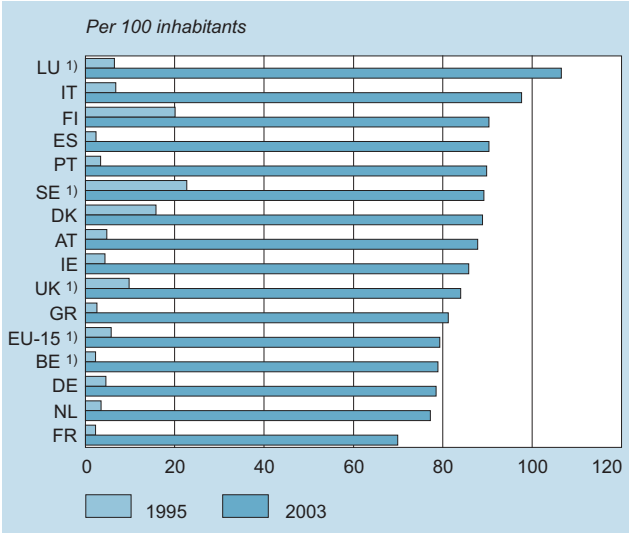
One aspect of scientific publications that is not measured by the publication index shown here, is the quality of the publications. Qualitative measurements are generally done by counting the number of times a publication is cited. Publications that are cited often are generally the better and more relevant ones. A measure like the number of citations per article can give valuable information about R&D in public research institutions.

Fa04aux Total number of publications in scientific journals, 1996–1999



Source: DG Research; data: ISI, CWTS (treatments), OECD.

Fa04b Number of mobile phones per capita



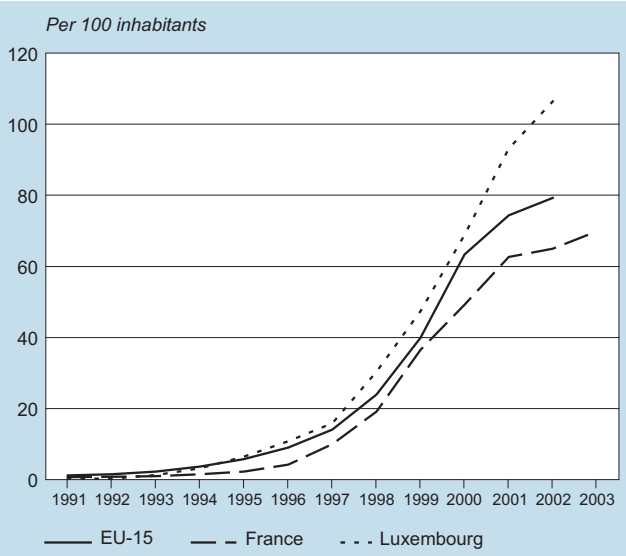
1) 2002 instead of 2003.
Source: ITU.

7.3.8 Number of mobile phones per capita

A new technology that has been introduced with enormous speed into our society over the last ten years is mobile communication. The number of mobile phone subscriptions has risen to more than 70 per 100 inhabitants in 2001. This creates possibilities for businesses to expand their e-business operations to this new field, using technologies like SMS and i-Mode.

The comparison of the number of subscriptions between countries is hampered by differences in the mobile communications market. The number of unused subscriptions, that are included in the numbers shown here, varies with the availability of pre-paid phones. This leads to an overestimation of mobile phone use in those countries where pre-paids are a considerable part of the mobile phone market. However, a number of conclusions about the development of mobile communications in various countries can be made.
The first countries where mobile phones were adopted by the public at large were Finland, Sweden and Denmark. The other countries in Europe followed about two years later. The saturation point for this technology has already been reached or will be reached in a few years' time in all countries of the EU. In 2001 the growth of the number of subscriptions slowed down in a number of countries.

Fa04a Number of mobile phones per capita

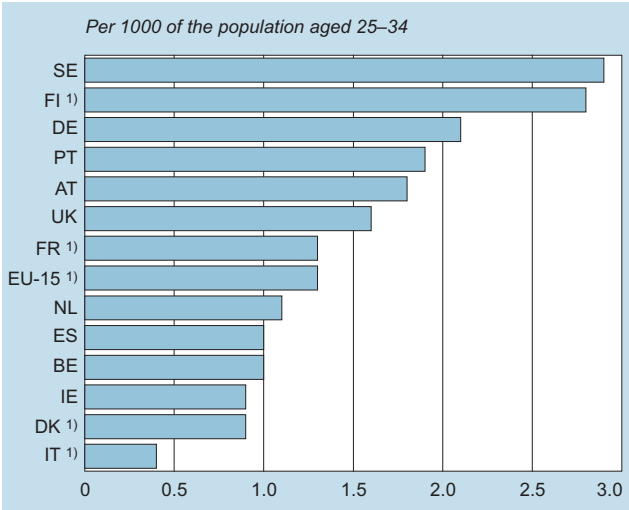


Source: ITU.

7.3.9 Graduation rates at PhD level

Graduation rates at PhD level vary considerably between countries, with Sweden, Finland and Germany at the top. Here both older traditions as policies over recent years to promote PhD studies have played a role.
This also has to do with the job opportunities for those who acquire a PhD, not in the least at universities.

Fa05 Number of graduates at second stage of tertiary education leading to an advanced research qualification ISCED6, 2002

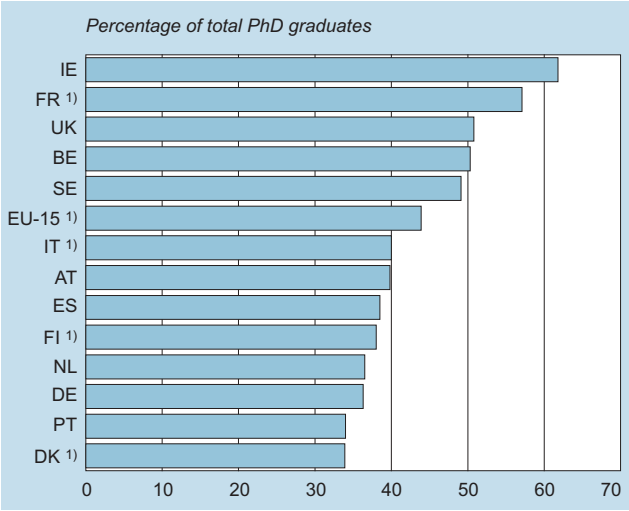


1) 2001 instead of 2002.
Source: Joint Unesco/OECD/Eurostat questionnaires on education.

7.3.10 PhDs in Science and Engineering

PhDs in science and engineering have a stronger bearing on a country high-technology developments. Especially, for attracting R&D activities, the availability of highly trained scientist is essential. Ireland and France are leading here, followed by the UK, Belgium and Sweden.

Fa06 ISCED 6 graduates in science, mathematics, computing, engineering, manufacturing and construction, 2002



1) 2001 instead of 2002.
Source: Joint Unesco/OECD/Eurostat questionnaires on education.

BOX C Graduates in the future

National statistics on higher education provide the number of students entering an academic field at their entrance into the university system and on the resulting diploma obtained by those who stayed in the system. A study for three countries – France, Germany and the UK – shows clear evidence of disinterest as regards 'classical' fields, such as mathematics and physical sciences (which includes physics and chemistry, among others). Student interests have shifted to life sciences and computer sciences whereas engineering fluctuates (1998–2001). But the paradox is that the number of higher tertiary graduates is increasing at times when the numbers of lower graduates are diminishing. Consequently, there is a clear risk of numbers of highly qualified tertiary graduates (PhDs) diminishing in the near future. Students entering universities can react quickly to changes in the work market by shifting to another more promising sector, but this is not the case for advanced graduates who are stuck in their speciality after several years of study and may fall victim to an unfavourable economic cycle situation. This shows how important it is to provide counter cycle measures to prevent the wasting of human capital in such situations.

Source: J. M. Gago *et al.*, 'Increasing human resources for science and technology in Europe', report for the EC conference 'Europe needs for scientists', Brussels, 2 April 2004.

7.4 Choice of indicators Government Supportive Policies (Module Fb)

7.4.1 Selected key indicators

The following key indicators have been selected:
– Public funding of innovation activities in private enterprises
– Government-financed gross domestic expenditure on R&D
– On-line government services

Public funding of innovation activities in private enterprises indicates the extent to which the government supports the business sector in developing innovations. The prime motive will be to have the business sector overcome certain barriers that prevent it from taking the final steps to launch or adopt innovations. This can be justified by the positive external effects that certain innovations are expected to have.

Government-financed gross domestic expenditure on R&D, is informative of the capacity of society to rally funds for basic research that is at the heart of new break-throughs and promising inventions.

On-line government services (e-Government) make clear to what extent governments are using ICT as a means to improve their services by integrating the underlying processes, making them more transparent and pro-active, and by reducing the paper work for businesses and civilians.

7.4.2 Selected auxiliary indicators

The following indicators have been added as auxiliary indicator:
– Education expenditure
– Public administration expenditure on ICT

Education expenditure as a percentage of GDP indicates the priority that a country's government gives to education. As education is a prominent factor in the knowledge-based economy, this is an important policy factor.

Public administration expenditure on ICT shows how much governments wish to modernise their administration, making use of the potential benefits of ICT in integrating processes and improving the quality of services.

The following table summarises the indicators and lays a link between the key indicators and the auxiliary indicators.

Relation of indicators in Module Fb

Key indicators	*Auxiliary indicators*
Public funding of innovations in private enterprises	
Government-financed expenditure on R&D	– Education expenditure
Online government services	BOX D E-Governance – Public administration expenditure on ICT

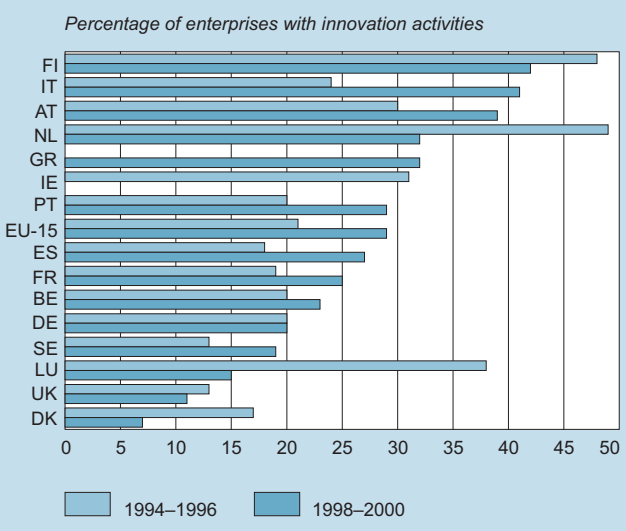
7.5 Quantified indicators Government Supportive Policies (Module Fb)

7.5.1 Public funding of innovation activities in private enterprises

Governments can actively support corporate innovations by granting subsidies for R&D and launching innovations. This financial support is provided at different governmental levels: local, national, and the EU. In the Community Innovation Surveys, innovating enterprises were asked if they benefited from financial support by any government.

Innovating enterprises in Finland, Italy and Austria most often received financial support for their innovating activities (Figure Fb01). In these countries, about 40% of the innovating enterprises claimed to have received subsidies. Interestingly, the number of innovating enterprises in these three countries varied considerably. In Italy, the number of innovating enterprises is relatively low, and the high level of subsidised innovation probably represents an attempt by the government to increase this level. Enterprises in Austria, on the other hand, already innovate in relatively great numbers. This relatively high level of innovation may have been induced by government support.

Fb01 Public financial support in terms of grants and loans for innovation activities in private enterprises



Source: Eurostat, Community Innovation Surveys

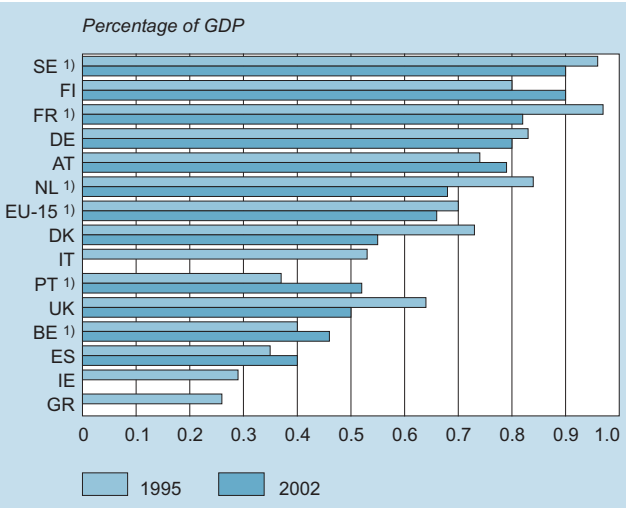
Most of the countries that score low on this indicator have a high level of innovating enterprises. This particularly applies to Germany, which has an exceptionally high number of innovating businesses.

7.5.2 Government-financed gross domestic expenditure on R&D

The funding of R&D by the public sector is an indicator for the level of support the government is willing to give to the generation of knowledge. It is highly correlated with the number of R&D workers in the universities and public research organisations (indicator Fa03).

The governments of Sweden and Finland excelled in allocating funds for R&D (Figure Fb02), but the difference with the rest is not as great as that in terms of the number of R&D workers in the public sector (when funding is expressed per R&D worker in the public sector). This is much different from, for example, Austria, which had a relatively high expenditure (close to the EU average), but a relatively low number of R&D workers in the public sector.

Fb02 Gross domestic expenditure on R&D (GERD) financed by direct government and public general university funds



1) 2001 instead of 2002.
Source: OESO, MSTI.

Public R&D funding in the EU is about half that of the private financing of R&D. This is in keeping with the Lisbon goal which specifies that at least two-thirds of the R&D expenditure should be private. However, there are some countries which are still far from that goal. The governments of Portugal, Spain, Greece, Italy and the Netherlands all pay for more than 40% of R&D that takes place on their territory. Luxembourg has the lowest ratio of publicly paid R&D, below 10%.

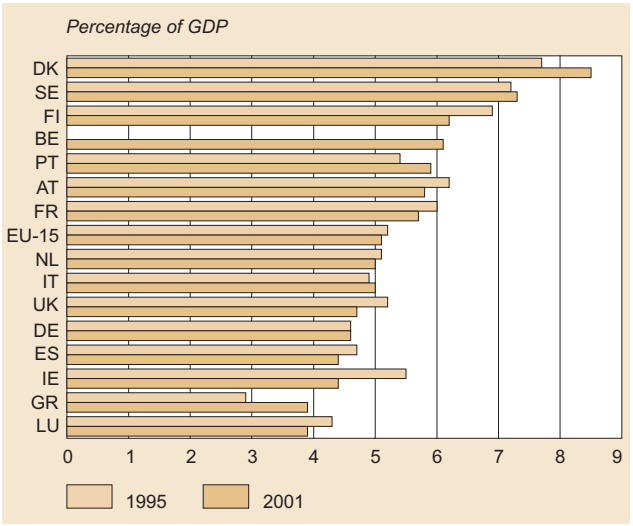
There is no significant correlation between public financial support for innovations in the business sector and public financing of research in the public sector itself. Some countries score equally high or low on both counts. For example, the Finnish government spent a large amount on research in both the public and the private sector. On the other hand, a country like Sweden, which also spent considerable amounts on research in the public sector, had one of the lowest levels of government-supported innovation in the private sector.

7.5.3 Education expenditure as share of GDP

Education expenditure largely varies between 4 and 6 percent of GDP, 5 percent being the EU-average (Figure Fb01aux). Denmark and Sweden are above 7 percent, which shows that education has been given priority in governmental spending. Italy and the Netherlands have an average score, while Germany is below average here.

A fairly large number of countries had lower education expenditure as share of GDP in 2000 and 2001 compared to those in 1995. This seems to imply diminishing marginal productivity as enrollment ratios approach saturation and as education must compete with other sources of investment and consumption decisions. However, the Lisbon Summit goals suggest that the benefits of (good) education are underestimated in light of competitive pressures from low-wage countries and the primacy of the knowledge-based economy. A rising public share of education finance as a share of GDP, however, will be a challenge in terms of the technical efficiency of educational institutions as well as in terms of maintaining competitive rates of returns on investment in education.

Fb01aux Total public expenditure on education, for all levels of education combined



Source: Eurostat.

7.5.4 On-line sophistication of basic public services

To optimise its enabling and facilitating roles, governments should not only give financial support to R&D activities, but should also

be a major user of innovative products. One major issue here is the degree to which governments offer their services to both companies and the public on-line. This indicator measures how many of the services of the government, both directed at enterprises and individuals, can be conducted on-line at the websites of local, regional, and national governments.

The most "connected" governments are those of Sweden, Ireland, Denmark and Austria (Figure Fb03). In these countries, the score for selected services that are also offered on-line is higher than 80%. Most countries are considered to have a reasonable government presence on the Internet, but for instance in Luxembourg and Germany, you still had to visit a post office or town hall for around 50% of the selected services.

Note that there are some problems with comparability for the various countries. For example, some countries render certain services (for example, payment of child benefits) automatically, so that citizens do not have to apply for them. Such services are certainly dealt with by means of ICT but are not offered on-line as available on request.

The diffusion of e-Government has to overcome different obstacles that may retard its pace. Major obstacles are a lack of integration between applications, and errors in supplied software. These problems may be caused by a premature introduction of new versions of existing software. There is also a human factor involved. The municipality may lack an up-to-date ICT strategy. The management may show a lack of commitment or staff members may be reluctant to use ICT or even suppliers may be reluctant to speed up the process.

The development of front-office e-Government in the EU area has until now been primarily guided by supply-side factors. Moreover, most e-Government applications are not evaluated ex-post with regard to impacts on users and other stakeholders. Users tend to be satisfied with on-line public services. However, the large group of non-users are likely to include a considerable number of people who would dismiss the usefulness of present e-Government services. Findings from the SIBIS survey showed that even among regular Internet users, the majority would prefer to use traditional channels such as the telephone, postal mail or face-to-face exchange rather than the Internet to interact with public administration for service provision. [2)]

A group of organisations was asked what conditions led them to deploy network applications to automate citizen service and support activities. According to (non-technical) organisational decision-makers, the five most frequently cited business triggers involve a desire to increase the speed at which the organisation operates, and the desire to more effectively meet citizen services demands. Other major motives were: desire for innovation, need to expand citizen services capacity with existing resources, need to meet new citizen demands and potential for cost savings. [3)]

BOX D E-Governance

Although the term e-Government usually represents a wide range of aspects of governmental roles, a distinction could be made between government and governance. Likewise, it is possible to distinguish between e-Government and e-Governance. Governments are specialised institutions that contribute to governance.

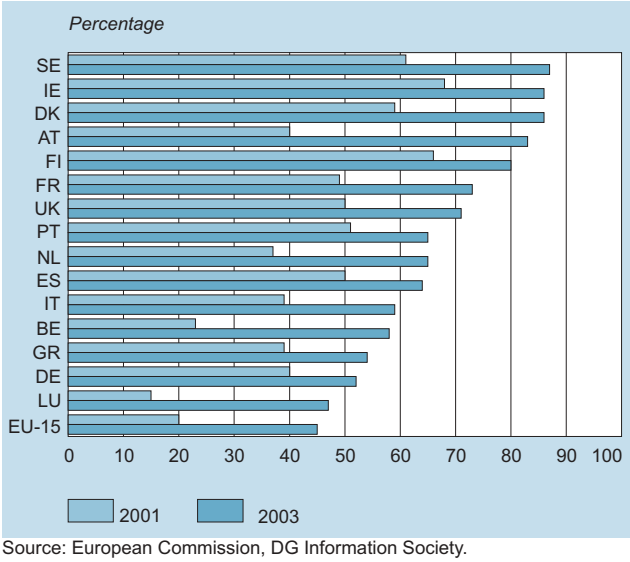
According to this dichotomy, government (including programme design and service delivery) refers to superstructure, decisions, rules, roles, implementation and outputs; whereas governance appeals to functionality, processes, goals, performance, coordination and outcomes. Along these lines e-Government and e-Governance could be characterised as follows:

e-Government	e-Governance
Electronic service delivery	Electronic consultation
Electronic workflow	Electronic controllership
Electronic voting	Electronic engagement
Electronic productivity	Networked societal guidance

It seems plausible that e-Government is easier to be measured than e-Governance. However, the latter is closer to the final goals of effective democracy and participation.

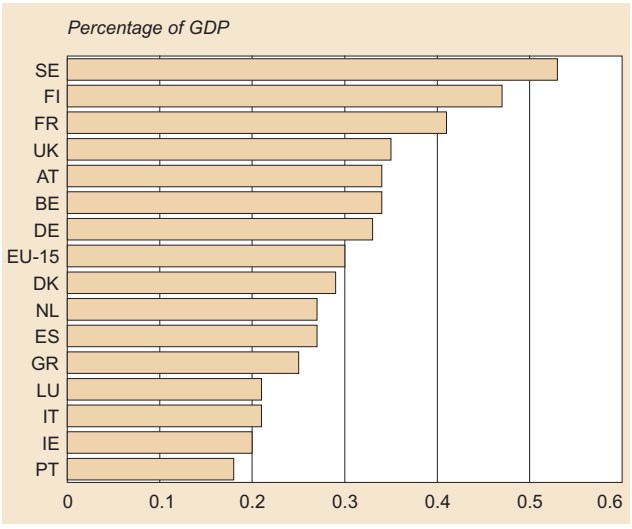
Source: Th. B. Riley, *'E-Government versus E-Governance: Examining the difference in a changing public sector climate'*, Commonwealth Centre for Electronic Governance, Ottawa, Canada, 2003.
See for a detailed discussion of e-Government definitions: Joint Research Centre, *'Workshop Report "e-Government indicators from eEurope 2005 on"*, NESIS project, Deliverable D1.3.8., Ispra, 2004.

Fb03 Indicator for online sophistication of basic public services available on the Internet



Source: European Commission, DG Information Society.

Fb02aux Expenditure on public administration ICT on central, regional and local levels, 2000



Source: EITO, Kable.

7.5.5 Public administration expenditure on ICT

The improvement of on-line services is only one of the targets of government expenditure on ICT. Public administration ICT expenditure accounts for almost half of the total ICT expenditure of the public sector. In 2000, Sweden spent more than 0,5 percent of GDP on public administration ICT. This percentage was almost three times the percentage of Portugal (Figure Fb02aux).

To ensure that diverse ICT capabilities are effectively harnessed, there is a need to establish a coherent strategy that coordinates ICT policies with closely related areas such as regionalisation, industrial development, employment, privacy, data protection, and regulation of the mass media. For instance, policies that will enable citizens to gain access to vital facilities are crucial to gaining widespread commitment to innovations. [4)]

7.6 Conclusion

A composite indicator for a country's public domain capacities to innovate, based on the key indicators involved (HRST, Upper secondary education rate, R&D personnel in the public sector, number of mobile phones per capita, graduation rates at PhD level and PhDs in Science and Engineering), gives the following results. Group 1 (the group with the highest scores) consisted of Finland, Sweden and the United Kingdom. Especially, the position of the UK is striking, as it did not range that high in other areas. Group 2 encompasses about half of the number of EU-15 countries, including Germany and France. The Netherlands is in group 3, which in other areas is not the case. This underlines the relatively poor public sector performance in terms of the knowledge-based economy of this country. In spite of the fact that the arrears are being recognised, a drive to contain public spending seems to prevail.

Composite indicator for public domain: three country groups according relative scores [1)]

Group 1
Finland, Sweden, United Kingdom

Group 2
Ireland, Luxembourg, Austria, Denmark, Germany, Belgium, EU-15, France

Group 3
Spain, Greece, Netherlands, Italy, Portugal

1) The countries in group 1 have the higher scores, the countries in group 2 have medium scores while the countries in group 3 are at the lower end of the scores. The clustering has been carried out to prevent an overemphasis on the scores, because it was realised that the indicators used, do not cover the entire spectrum of business capacities and strategies. Moreover, there were some missing values, which required estimates.

Likewise (see below), a composite indicator was made for the government supportive services, based on the key indicators for this area (public funding of innovations activities in private enterprises, government-financed gross domestic expenditure on R&D and on-line government services). Here Italy and the Netherlands managed to be part of group 1, while now Luxembourg is the only country that is down below, which is an exceptional score for this country.

Composite indicator for government supportive policies: three country groups according relative scores [1)]

Group 1
Ireland, Finland, Austria, Sweden, France, Italy, Netherlands

Group 2
Denmark, Portugal, Greece, Germany, EU-15, Spain, United Kingdom, Belgium

Group 3
Luxembourg

1) The countries in group 1 have the higher scores, the countries in group 2 have medium scores while the countries in group 3 are at the lower end of the scores. The clustering has been carried out to prevent an overemphasis on the scores, because it was realised that the indicators used, do not cover the entire spectrum of business capacities and strategies. Moreover, there were some missing values, which required estimates.

Taking the two areas (public domain and government supportive policies) together, the overall composite indicator (which may be said to represent the public factor) has Finland and Sweden in group 1 and Austria, Ireland, France and Denmark in group 2. All other countries, having comparable scores, comprise group 3. Because of rather staggering positions, it is necessary to go back to underlying indicators before reaching certain conclusions about a country's relative strengths and weaknesses.

Composite indicator for public domain and government: three country groups according relative scores [1)]

Group 1
Finland, Sweden

Group 2
Austria, Ireland, France, Denmark

Group 3
United Kingdom, Portugal, EU-15, Germany, Italy, Netherlands, Belgium, Spain, Greece, Luxembourg

1) The countries in group 1 have the higher scores, the countries in group 2 have medium scores while the countries in group 3 are at the lower end of the scores. The clustering has been carried out to prevent an overemphasis on the scores, because it was realised that the indicators used, do not cover the entire spectrum of business capacities and strategies. Moreover, there were some missing values, which required estimates.

Notes in the text

1) P. Rutten in TNO-STB Berichten, April 2004.
2) Source: K. Garies, 'Towards User-centred e-Government – Understanding Potential demand for On-line Public Services" Empirica, Bonn, Germany, 2004.
3) See: Momentum Research Group, 'Net Impact – From Connectivity to Productivity (Net Impact 2004).
4) See: C. Westcott, M. Pizarro and S. Schiavo-Campo, 'The Role of Information and Communication Technology in Improving Public Administration; Chapter 19 in: ADB, 'To Serve and to Preserve: Improving Public Administration in a Competitive World', Manila, Philippines, 2000.

Annex A: Key data tables

Table Fa01
Human resources in science and technology (HRST)

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of population aged 25 to 64													
EU-15	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Belgium	.	.	.	.	28	29	30	31	31	33	33	34	34	34
Denmark	.	.	.	.	34	35	36	35	36	37	37	38	40	42
Germany	.	.	.	.	30	32	32	33	.	33	34	34	34	35
Greece	.	.	.	.	17	17	18	18	20	20	20	20	21	21
Spain	.	.	.	.	18	19	21	22	23	24	26	27	28	29
France	.	.	.	.	.	26	26	27	28	29	29	30	31	32
Ireland	.	.	.	.	22	23	26	26	.	.	26	28	30	31
Italy	.	.	.	.	16	17	17	18	18	19	20	21	21	22
Luxembourg	.	.	.	.	29	23	25	28	.	29	29	28	28	28
Netherlands	.	.	.	.	.	.	33	35	35	36	37	37	38	.
Austria	.	.	.	.	.	19	20	20	21	25	25	25	27	27
Portugal	.	.	.	.	.	.	.	.	13	13	14	14	14	15
Finland	.	.	.	.	.	.	.	.	38	41	42	43	40	40
Sweden	.	.	.	.	.	.	.	37	38	39	40	40	40	41
United Kingdom	.	.	.	.	27	27	28	29	.	31	31	32	32	33

Indicator definition: HRST includes people who successfully completed education at the third level in a Science & Technology field of study, and people employed in an S&T occupation where those qualifications are normally required.
Source: Eurostat, Labour Force Survey.

Table Fa02
Upper secondary graduation rate

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of population aged 25 to 64													
EU-15	.	.	.	.	.	55	56	57	.	62	63	64	65	.
Belgium	.	.	50	51	53	55	57	58	57	57	58	59	60	.
Denmark	.	.	74	82	76	80	78	79	79	80	80	80	80	.
Germany	.	.	80	79	82	81	79	80	.	80	81	83	83	.
Greece	.	.	37	39	41	43	44	46	48	50	51	52	53	.
Spain	.	.	24	26	28	30	32	34	34	36	38	40	42	.
France	.	.	.	56	58	59	59	60	60	61	62	63	64	.
Ireland	.	.	42	45	45	47	50	49	.	.	58	59	60	.
Italy	.	.	33	32	34	35	37	39	42	43	45	43	44	.
Luxembourg	.	.	35	40	47	43	45	46	.	62	61	59	62	.
Netherlands	.	.	.	.	.	.	63	65	64	65	66	67	68	.
Austria	.	.	.	.	.	69	71	73	74	75	76	77	78	.
Portugal	.	.	20	20	21	22	22	22	20	19	20	20	21	.
Finland	.	.	.	.	.	67	68	70	70	72	73	74	75	.
Sweden	.	.	.	.	.	74	74	75	76	77	77	81	81	.
United Kingdom	.	.	49	50	52	53	53	55	.	80	81	81	82	.

Indicator definition: Persons (aged 25–64) having completed at least upper secondary education according to the International Standard Classification of Education (ISCED).
Source: Eurostat: Labour Force Survey.

Table Fa03
R&D personnel in the public sector

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Per 1000 of total employment													
EU-15	.	4.3	.	.	.	4.6	.	.	.	4.6	.	.	.	.
Belgium	.	4.6	.	3.9	4.1	3.9	3.9	4.0	4.2	4.5	4.7	4.8	.	.
Denmark	3.8	3.9	4.1	4.3	.	4.8	5.0	5.1	.	5.1	4.9	4.9	5.1	.
Germany	.	5.0	.	.	.	4.7	4.7	4.7	4.6	4.5	4.4	4.5	4.6	.
Greece	.	2.5	.	3.2	.	3.9	.	4.6	.	5.6	.	4.9	.	.
Spain	3.0	3.1	3.2	3.5	3.9	3.8	4.1	4.0	4.2	4.1	4.6	4.8	4.7	.
France	5.9	6.0	6.2	6.4	6.5	6.6	6.6	5.8	5.8	5.8	5.9	5.7	.	.
Ireland	3.1	3.2	3.4	2.6	2.5	2.5	2.6	2.6	2.5	2.2	2.4	.	.	.
Italy	3.4	3.4	3.5	3.6	3.7	3.7	3.7	.	3.8	3.7	3.7	3.8	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	1.2	.	.	.
Netherlands	6.0	6.0	5.9	6.0	6.0	5.7	5.5	5.4	5.2	5.1	4.9	4.9	.	.
Austria	.	.	.	2.3	.	.	.	.	2.7	.	.	.	.	.
Portugal	2.0	.	2.2	.	.	2.5	.	3.0	3.0	3.1	3.2	3.2	3.3	.
Finland	.	6.1	.	7.4	7.6	7.6	.	8.7	9.6	9.9	9.9	9.8	10.3	.
Sweden	.	4.4	.	5.1	.	5.1	.	5.4	.	5.4	.	5.2	.	.
United Kingdom	3.3	3.4	3.7	3.7	.	.	.	.	.	.	.	.	.	.

Indicator definition: R&D personnel in the higher education and government sector.
Source: OECD, MSTI 2004/1.

Table Fa04
Number of mobile phones per capita

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Per 100 inhabitants													
EU-15	.	1.2	1.5	2.3	3.7	5.8	9.0	14.1	24.0	40.0	63.4	74.4	79.3	.
Belgium	.	0.5	0.6	0.7	1.3	2.3	4.7	9.6	17.3	31.4	52.5	75.0	78.9	.
Denmark	.	3.4	4.1	6.9	9.7	15.8	25.1	27.4	36.4	49.5	63.1	74.0	83.4	88.9
Germany	.	0.7	1.2	2.2	3.1	4.6	6.7	10.1	17.0	28.5	58.6	68.4	72.8	78.5
Greece	.	.	.	0.5	1.5	2.6	5.1	8.9	19.3	36.7	56.1	72.9	84.8	81.2
Spain	.	0.3	0.5	0.7	1.1	2.4	7.6	11.0	17.9	30.6	61.7	73.4	82.1	90.3
France	.	0.7	0.8	1.0	1.5	2.3	4.2	10.0	19.2	36.6	49.3	62.7	65.0	69.9
Ireland	.	0.9	1.2	1.7	2.5	4.4	8.0	14.6	25.5	44.3	65.7	77.6	76.9	85.8
Italy	.	1.0	1.4	2.1	3.9	6.8	11.2	20.5	35.7	52.8	73.7	88.6	93.0	97.6
Luxembourg	.	0.3	0.3	1.3	3.2	6.5	10.8	15.9	30.4	47.5	68.9	93.2	106.5	.
Netherlands	.	0.8	1.1	1.4	2.1	3.5	6.5	11.0	21.3	42.5	67.3	77.3	74.9	77.2
Austria	.	1.5	2.2	2.8	3.5	4.8	7.4	14.4	28.2	52.0	77.0	81.5	83.8	87.8
Portugal	.	0.1	0.4	1.0	1.8	3.4	6.7	15.1	30.8	46.7	66.5	77.7	82.6	89.8
Finland	.	6.3	7.6	9.6	13.3	20.1	29.3	42.0	55.2	63.3	72.0	80.6	86.9	90.3
Sweden	.	6.6	7.5	8.9	15.7	22.7	28.2	35.8	46.4	58.3	71.7	80.8	89.2	.
United Kingdom	.	2.2	2.6	3.9	6.7	9.8	12.3	15.0	25.1	45.7	72.7	77.3	84.0	.

Indicator definition: Number of mobile phone subscriptions per 100 inhabitants.
Source: ITU.

Table Fa05
Graduation rates at PhD level

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Per 1000 of the population aged 25–34													
EU-15	.	.	.	.	.	.	.	.	1.2	1.2	1.3	1.3	.	.
Belgium	.	.	.	.	.	.	.	.	.	.	0.8	0.9	1.0	.
Denmark	.	.	.	.	.	.	.	.	0.6	1.1	1.0	0.9	.	.
Germany	.	.	.	.	.	.	.	.	1.9	1.9	2.1	2.1	2.1	.
Greece	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Spain	.	.	.	.	.	.	.	.	0.9	1.0	0.9	1.0	1.0	.
France	.	.	.	.	.	.	.	.	1.2	1.2	1.2	1.3	.	.
Ireland	.	.	.	.	.	.	.	.	0.9	.	0.9	1.0	0.9	.
Italy	.	.	.	.	.	.	.	.	0.4	0.4	0.4	0.4	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Netherlands	.	.	.	.	.	.	.	.	1.0	1.0	1.0	1.0	1.1	.
Austria	.	.	.	.	.	.	.	.	1.4	1.4	1.4	1.5	1.8	.
Portugal	.	.	.	.	.	.	.	.	1.6	1.5	1.6	1.8	1.9	.
Finland	.	.	.	.	.	.	.	.	2.5	2.8	2.7	2.8	.	.
Sweden	.	.	.	.	.	.	.	.	2.2	2.3	2.5	2.8	2.9	.
United Kingdom	.	.	.	.	.	.	.	.	1.2	1.2	1.3	1.6	1.6	.

Indicator definition: Number of graduates at second stage of tertiary education leading to an advanced research qualification – level 6 (ISCED 1997).
Source: Joint Unesco/OECD/Eurostat questionnaires on education.

Table Fa06
PhDs in Science and Engineering

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of total PhD graduates													
EU-15	.	.	.	.	.	.	.	.	44.6	44.3	44.1	43.9	.	.
Belgium	.	.	.	.	.	.	.	.	.	.	55.1	52.4	50.3	.
Denmark	.	.	.	.	.	.	.	.	58.9	43.1	49.9	33.9	.	.
Germany	.	.	.	.	.	.	.	.	38.5	38.9	38.1	37.0	36.3	.
Greece	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Spain	.	.	.	.	.	.	.	.	38.0	41.2	36.5	37.9	38.5	.
France	.	.	.	.	.	.	.	.	60.4	57.3	57.1	57.1	.	.
Ireland	.	.	.	.	.	.	.	.	63.4	:	56.4	62.3	61.8	.
Italy	.	.	.	.	.	.	.	.	36.9	41.5	40.3	40.0	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Netherlands	.	.	.	.	.	.	.	.	37.1	35.6	33.8	36.3	36.5	.
Austria	.	.	.	.	.	.	.	.	39.3	39.8	42.3	43.1	39.8	.
Portugal	.	.	.	.	.	.	.	.	34.1	34.9	32.9	32.5	34.0	.
Finland	.	.	.	.	.	.	.	.	38.0	38.1	37.1	38.0	.	.
Sweden	.	.	.	.	.	.	.	.	49.7	50.3	50.2	48.9	49.1	.
United Kingdom	.	.	.	.	.	.	.	.	53.2	51.2	53.2	52.3	50.8	.

Indicator definition: Graduates (ISCED 6) from fields of education 400 and 500 (science, mathematics, computing, engineering, manufacturing and construction).
Source: Joint Unesco/OECD/Eurostat questionnaires on education.

Table Fb01
Public funding of innovations in private enterprises

Country	1990	1991	1992	1993	1994	1995	1996 [1)]	1997	1998	1999	2000	2001	2002	2003
	Percentage of enterprises with innovation activities													
EU-15	.	.	.	.	.	.	21	.	.	.	29	.	.	.
Belgium	.	.	.	.	.	.	20	.	.	.	23	.	.	.
Denmark	.	.	.	.	.	.	17	.	.	.	7	.	.	.
Germany	.	.	.	.	.	.	20	.	.	.	20	.	.	.
Greece	.	.	.	.	.	.	.	.	.	.	32	.	.	.
Spain	.	.	.	.	.	.	18	.	.	.	27	.	.	.
France	.	.	.	.	.	.	19	.	.	.	25	.	.	.
Ireland	.	.	.	.	.	.	31	.	.	.	.	.	.	.
Italy	.	.	.	.	.	.	24	.	.	.	41	.	.	.
Luxembourg	.	.	.	.	.	.	38	.	.	.	15	.	.	.
Netherlands	.	.	.	.	.	.	49	.	.	.	32	.	.	.
Austria	.	.	.	.	.	.	30	.	.	.	39	.	.	.
Portugal	.	.	.	.	.	.	20	.	.	.	29	.	.	.
Finland	.	.	.	.	.	.	48	.	.	.	42	.	.	.
Sweden	.	.	.	.	.	.	13	.	.	.	19	.	.	.
United Kingdom	.	.	.	.	.	.	13	.	.	.	11	.	.	.

Indicator definition: Public financial support in terms of grants and loans for innovation activities (1996= 1994–1996, 2000= 1998–2000).
[1)] Only for enterprises in the manufacturing sector.
Source: Eurostat, Community Innovation Surveys.

Table Fb02
Government-financed gross domestic expenditure on R&D

Country	1990	1991	1992	1993	1994	1995	1996 [1)]	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP													
EU-15	0.79	0.78	0.74	0.74	0.71	0.70	0.68	0.67	0.65	0.65	0.65	0.66	.	.
Belgium	.	0.51	.	0.40	0.39	0.40	0.42	0.41	0.45	0.46	0.46	0.46	.	.
Denmark	0.67	0.65	0.65	0.66	.	0.73	0.66	0.70	.	0.68	.	0.67	0.55	.
Germany	0.90	0.90	0.86	0.85	0.82	0.83	0.83	0.82	0.81	0.78	0.78	0.79	0.80	0.80
Greece	.	0.21	.	0.22	.	0.26	.	0.27	.	0.33	.	.	.	.
Spain	0.37	0.38	0.44	0.45	0.43	0.35	0.36	0.36	0.35	0.36	0.36	0.38	0.40	.
France	1.15	1.16	1.03	1.05	0.97	0.97	0.95	0.86	0.81	0.80	0.84	0.82	.	.
Ireland	0.25	0.26	0.26	0.33	0.27	0.29	0.32	0.31	0.29	0.29	0.26	.	.	.
Italy	0.66	0.61	0.57	0.58	0.53	0.53	0.51	.	.	.	.	.	.	.
Luxembourg	.	.	.	.	.	.	.	.	.	.	0.13	.	.	.
Netherlands	1.00	0.95	0.93	0.94	0.86	0.84	0.84	0.80	0.73	0.72	0.66	0.68	.	.
Austria	0.62	0.68	0.69	0.70	0.76	0.74	0.70	0.70	0.67	0.74	0.74	0.79	0.79	0.78
Portugal	0.32	.	0.36	.	.	0.37	.	0.42	0.48	0.53	0.52	0.52	.	.
Finland	.	0.83	.	0.86	.	0.80	.	0.84	0.87	0.94	0.89	0.87	0.90	.
Sweden	.	0.92	.	1.05	.	0.96	.	0.91	.	0.89	.	0.90	.	.
United Kingdom	0.76	0.72	0.67	0.66	0.66	0.64	0.59	0.55	0.55	0.55	0.53	0.53	0.50	.

Indicator definition: Gross domestic expenditure on R&D (GERD) financed by direct government and public general university funds.
Source: OECD, MSTI 2004/1.

Table Fb03
Online government services

Country	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage													
EU-15	.	.	.	.	.	.	.	.	.	.	.	20	35	45
Belgium	.	.	.	.	.	.	.	.	.	.	.	23	47	58
Denmark	.	.	.	.	.	.	.	.	.	.	.	59	82	86
Germany	.	.	.	.	.	.	.	.	.	.	.	40	48	52
Greece	.	.	.	.	.	.	.	.	.	.	.	39	52	54
Spain	.	.	.	.	.	.	.	.	.	.	.	50	64	64
France	.	.	.	.	.	.	.	.	.	.	.	49	63	73
Ireland	.	.	.	.	.	.	.	.	.	.	.	68	85	86
Italy	.	.	.	.	.	.	.	.	.	.	.	39	57	59
Luxembourg	.	.	.	.	.	.	.	.	.	.	.	15	32	47
Netherlands	.	.	.	.	.	.	.	.	.	.	.	37	54	65
Austria	.	.	.	.	.	.	.	.	.	.	.	40	56	83
Portugal	.	.	.	.	.	.	.	.	.	.	.	51	58	65
Finland	.	.	.	.	.	.	.	.	.	.	.	66	76	80
Sweden	.	.	.	.	.	.	.	.	.	.	.	61	87	87
United Kingdom	.	.	.	.	.	.	.	.	.	.	.	50	62	71

Indicator defnition: Indicator for online sophistication of basic public services available on the Internet.
Source: European Commission, DG Information Society.

Annex B: Auxiliary data tables

Table Fa01aux
Euro-Creativity Index

	2004
EU-15	
Belgium	0.53
Denmark	0.58
Germany	0.57
Greece	0.31
Spain	0.37
France	0.46
Ireland	0.37
Italy	0.34
Luxembourg	
Netherlands	0.67
Austria	0.42
Portugal	0.19
Finland	0.72
Sweden	0.81
United Kingdom	0.52

Indicator definition: The Euro-Creativity Index is a composite measure to describe the competitiveness of European nations with respect to the so-called creative class.
Source: Florida and Tinagli (2004), Europe in the Creative Age.

Table Fa02aux
Continued vocational training

	1999
	Percentage of employees (all enterprises)
EU-15	40
Belgium	41
Denmark	53
Germany	32
Greece	15
Spain	25
France	46
Ireland	41
Italy	26
Luxembourg	36
Netherlands	41
Austria	31
Portugal	17
Finland	50
Sweden	61
United Kingdom	49

Indicator definition: Employees participating in continuing vocational training (CVT) courses.
Source: Eurostat: CVT Survey.

Table Fa03aux
Number of computers in schools

	2001	2002
	Per 100 pupils	
EU-15	8.9	10.8
Belgium	10.3	11.1
Denmark	30.9	31.2
Germany	5.3	7.4
Greece	6.7	8.0
Spain	8.1	12.2
France	9.9	12.1
Ireland	10.9	9.7
Italy	5.8	6.7
Luxembourg	34.2	14.2
Netherlands	12.5	12.6
Austria	12.2	12.3
Portugal	5.7	7.9
Finland	16.6	16.0
Sweden	15.8	13.6
United Kingdom	11.1	14.5

Indicator definition: Number of computers used in schools of all levels for purposes of education.
Source: Eurobarometer.

Table Fa04aux
Number of scientific publications

	1996–1999
	Per total researchers (FTE)
EU-15	
Belgium	1.47
Denmark	1.69
Germany	0.99
Greece	1.53
Spain	1.57
France	1.14
Ireland	1.39
Italy	1.46
Luxembourg	
Netherlands	1.95
Austria	1.86
Portugal	0.75
Finland	1.42
Sweden	1.57
United Kingdom	1.65

Indicator definition: Total number of publications in scientific journals.
Source: DG Research; data: ISI, CWTS (treatments), OECD.

Table Fb01aux
Education expenditure

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	Percentage of GDP												
EU-15					5.2		5.1		5.0	5.0	5.1	5.1	5.1
Belgium											6.1	6.1	6.1
Denmark					7.7	8.1	7.9	8.3	8.1	8.4	8.5	8.5	8.5
Germany					4.6		4.6		4.6	4.5	4.6	4.6	4.6
Greece			2.7	3.0	2.9	3.1	3.4	3.5	3.6	3.8	3.9	3.9	3.9
Spain		4.8	4.9	4.7	4.7	4.7	4.5	4.5	4.5	4.4	4.4	4.4	4.4
France	5.4	5.7	6.1	6.0	6.0	6.0	6.0	6.0	5.9	5.8	5.7	5.7	5.7
Ireland	5.4	5.6	5.9	5.9	5.5	5.3	5.2	4.9	4.6	4.4	4.4	4.4	4.4
Italy	5.4	5.4	5.4	5.0	4.9	4.9	4.5	4.7	4.8	4.6	5.0	5.0	5.0
Luxembourg					4.3	4.0	4.1				3.9	3.9	3.9
Netherlands	5.1	5.4	5.2	5.1	5.1	5.0	4.8	4.8	4.8	4.9	5.0	5.0	5.0
Austria					6.2	6.0	5.9	5.8	5.9	5.8	5.8	5.8	5.8
Portugal					5.4	5.5	5.6	5.6	5.7	5.7	5.9	5.9	5.9
Finland	7.2	7.3	6.9	6.7	6.9	7.0	6.5	6.3	6.3	6.1	6.2	6.2	6.2
Sweden	6.9	7.8	7.4	7.1	7.2	7.4	7.6	7.7	7.5	7.4	7.3	7.3	7.3
United Kingdom	5.2	5.3	5.4	5.4	5.2	5.1	4.9	4.8	4.6	4.6	4.7	4.7	4.7

Indicator definition: Total public expenditure on education, for all levels of education combined.
Source: Eurostat.

Table Fb02aux
Public administration expenditure on ICT

	2000
	Percentage of GDP
EU-15	0.30
Belgium	0.34
Denmark	0.29
Germany	0.33
Greece	0.25
Spain	0.27
France	0.41
Ireland	0.20
Italy	0.21
Luxembourg	0.21
Netherlands	0.27
Austria	0.34
Portugal	0.18
Finland	0.47
Sweden	0.53
United Kingdom	0.35

Indicator definition: Expenditure on public administration ICT on central, local and regional levels.
Source: EITO, Kable.

Annex C: Metadata on the key indicators

Module F

Indicator label	Fa01
Indicator name	Human resources in science and technology (HRST)
Indicator definition	Human resources in science and technology (HRST) includes people who successfully completed education at the third level in a Science & Technology field of study, and people employed in an S&T occupation where those qualifications are normally required.
Unit of measurement	Percentage of population aged 25 to 64
Period covered	1994–2003
Source	Eurostat: Labour Force Survey
Dissemination	NewCronos: theme9/hrst/h_stock/hrst_reg/hr_cas
Remarks	

Indicator label	Fa02
Indicator name	Upper secondary graduation rate
Indicator definition	Persons (aged 25–64) having completed at least upper secondary education according to the International Standard Classification of Education (ISCED)
Unit of measurement	Percentage of population aged 25 to 64
Period covered	1992–2002; for some countries data start in 1995
Source	Eurostat: Labour Force Survey
Dissemination	NewCronos: theme3/educ/ed_indic/edatt Education at a glance (OECD, 2003)
Remarks	The definition of secondary education varies among countries. Some of the data are of uncertain reliability; most importantly, this holds for the UK data for 1999 and later.

Indicator label	Fa03
Indicator name	R&D personnel in the public sector
Indicator definition	R&D personnel in higher education and government sector
Unit of measurement	Per 1000 of total employment
Period covered	1990–2002. Austria and Luxembourg: only few data available.
Source	OECD Main Science and Technology Indicators
Dissemination	OECD MSTI publication
Remarks	Figures represent the sum of two statistics that are published separately by OECD: Higher Education Total R&D personnel (FTE), Government Total R&D personnel (FTE). Total employment (thousands): background economic indicators, same source. There are some differences between countries sometimes concerning the boundary between Government and Private Non Profit sector. Government figures for Sweden only concern central government.

Indicator label	Fa04
Indicator name	Number of mobile phones
Indicator definition	Number of mobile phone subscriptions per capita
Unit of measurement	Per 100 inhabitants
Period covered	1991–2001
Source	ITU
Dissemination	ITU: ICT free statistics, http://www.itu.int/ITU-D/ict/statistics Statistics on the information society in Europe, Data 1990–2002, (Eurostat 2002) NewCronos theme3/demo/dgen/gind
Remarks	Series for Greece starts in 1993.

Indicator label	Fa05
Indicator name	Graduation rates at PhD level
Indicator definition	Number of graduates at second stage of tertiary education leading to an advanced research qualification – level 6 (ISCED 1997)
Unit of measurement	Per 1000 of the population aged 25–34
Period covered	1998–2002
Source	Joint Unesco/OECD/Eurostat questionnaires on education
Dissemination	NewCronos theme3//educ/ed_indic/edtertc
Remarks	

Indicator label	Fa06
Indicator name	PhDs in Science and Engineering
Indicator definition	Graduates (ISCED 6) from fields of education 400 and 500 (science, mathematics, computing, engineering, manufacturing and construction).
Unit of measurement	Percentage of total PhD graduates
Period covered	1998–2002
Source	Joint Unesco/OECD/Eurostat questionnaires on education
Dissemination	NewCronos theme3//educ/ed_indic/tc09_1
Remarks	

Indicator label	Fb01
Indicator name	Public funding of innovation activities in private enterprises
Indicator definition	Public financial support in terms of grants and loans for innovation activities in private enterprises
Unit of measurement	Percentage of enterprises with innovation activity
Period covered	1998–2000
Source	Eurostat: Community Innovation Surveys
Dissemination	Innovation in Europe (Eurostat 2004) NewCronos: theme9/innovat/inn_cis3/inn_pub
Remarks	This question was asked in CIS-2 (1996), but the comparability with CIS-3 data is questionable.

Indicator label	Fb02
Indicator name	Government-financed gross domestic expenditure on R&D
Indicator definition	Gross domestic expenditure on R&D (GERD) financed by direct government and public general university funds
Unit of measurement	Percentage of GDP
Period covered	Most countries: 1990–2001 Luxembourg and Italy: only limited data available
Source	OECD Main Science and Technology Indicators 2004/1
Dissemination	
Remarks	

Indicator label	Fb03
Indicator name	Online government services
Indicator definition	Indicator for online sophistication of basic public services available on the Internet. A selection of twenty basic public services is used. For twelve of these services, the citizens are the target group; while for eight of them businesses are the target group.
Unit of measurement	Percentage
Period covered	October 2001–October 2002
Source	European Commission DG Information Society
Dissemination	Online Availability of Public Services: How Does Europe Progress? Web Based Survey On Electronic Public Services Report Of The Fourth Measurement October 2003 (Cap Gemini Ernst & Young, January 2004)
Remarks	

Annex D: Metadata of the auxiliary indicators

Module F

Indicator label	Fa01aux
Indicator name	Euro-Creativity Index
Indicator definition	The Euro-Creativity Index is a composite measure to describe the competitiveness of European nations with respect to the so-called creative class. Next to more traditional components on level of technology and human resources, it contains a number of indicators on tolerance. This is assumed to be an important factor in attracting the creative class.
Unit of measurement	–
Source	Florida and Tinagli (2004)
Period covered	–
Countries	EU-15 except Luxembourg
Publication	Europe in the Creative Age, Richard Florida and Irene Tinagli, 2004
Remarks	

Indicator label	Fa02aux
Indicator name	Continued vocational training
Indicator definition	Employees participating in continued vocational training (CVT) courses, paid by their employers during a year. The employees exclude apprentices and trainees.
Unit of measurement	Percentage of employees (all enterprises)
Source	Eurostat: CVT Survey
Period covered	1999
Countries covered	EU-15
Publication	NewCronos: theme3/training/cvts/cvt2
Remarks	The first survey on continuing vocational training (reference period 1993) is of pioneering nature.

Indicator label	Fa03aux
Indicator name	Number of computers in schools
Indicator definition	Number of computers used in schools of all levels for purposes of education
Unit of measurement	Per 100 pupils
Source	Eurobarometer
Period covered	2001, 2002
Countries	EU countries
Publication	Eurobarometer Flash 94/101, Flash 118
Remarks	

Indicator label	Fa04aux
Indicator name	Number of scientific publications
Indicator definition	Number of publications in scientific journals
Unit of measurement	Per total researchers (FTE)
Source	CWTS, based on data from ISI
Period covered	Number of publications: 1996–1999 (total) Number of researchers (FTE): 1995
Countries covered	EU-15
Publication	Third European Report on Science & Technology Indicators, European Commission, 2003
Remarks	Included in this count are mainly publications in English-language journals. This results in lower ratios for countries with a significant number of journals in other languages (e.g. Germany and France).

Indicator label	Fb01aux
Indicator name	Education expenditure
Indicator definition	Total public expenditure on education, for all levels of education combined
Unit of measurement	Percentage of GDP
Source	Eurostat
Period covered	1991–2001, but early data is missing for several countries
Countries covered	EU-15
Publication	NewCronos: theme3/educ/finance/edgdp
Remarks	

Indicator label	Fb02aux
Indicator name	Public administration expenditure on ICT
Indicator definition	Expenditure on public administration ICT on central, local and regional levels
Unit of measurement	Percentage of GDP
Source	EITO; Kable
Period covered	2000
Countries	EU countries
Publication	EITO 2002
Remarks	

8. The knowledge factor

8.1 Introduction

By way of analysis, this chapter focuses on a group of indicators that represent the knowledge factor. The knowledge factor consists of a group of indicators about innovation capacity and macro-economic performance. To a large extent this group was determined by means of factor analysis applied to a set of indicators for which a (nearly) complete dataset was available.

This chapter focuses on time series for each of the distinguished indicators. However, here rather than following the development for each individual country, four regions have been defined that as far as the statistical 'knowledge factor' indicators over recent years are concerned, seem to represent relevant clusters.

8.2 Choice of indicators

The following indicators were selected:

B01	R&D expenditure in the business enterprise sector
B02	Patent applications
B03	ICT patents
D01aux	Real GDP growth rate
D06	Total employment rate
D12	Total long-term unemployment rate
Fa01	Human Resources in Science and Technology (HRST)
Fa03	R&D personnel in the public sector

8.3 Quantified indicators

8.3.1 Grouping the EU-15 countries

First, a distinction was made between Northern Europe, West-Mid Europe and Southern Europe. As West-Mid Europe encompassed a relatively great number of countries, it was split into West-Mid Europe, large (Germany, France and the United Kingdom) and West-Mid Europe, small (Ireland, Belgium, Luxemburg, the Netherlands and Austria). The idea was to explore the development over more than a decade that led to the situation where North, West-Mid and South appeared to be almost equal to high scores, medium scores and low scores, respectively. This observation is not new but there have been some developments during the last decade which can place the four regions and their relative positions in perspective.

In the following sections the quantified indicators will be discussed individually. At the end a total picture is given by means of cobweb diagrams.

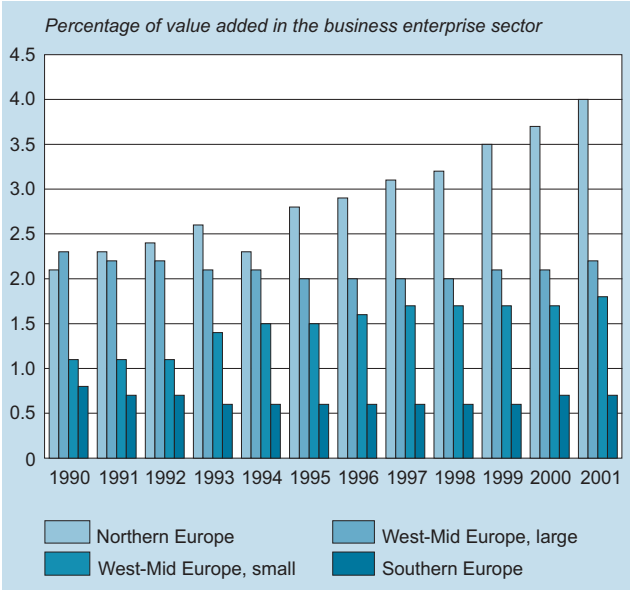
8.3.2 "From North to South" a regional view of the EU-15

The EU-15 zone has been divided into four regions:

Northern Europe:	Denmark, Finland, and Sweden
West-Mid Europe, large:	France, Germany, United Kingdom
West-Mid Europe, small:	Ireland, Luxembourg, the Netherlands, Belgium, Austria
Southern Europe:	Greece, Italy, Portugal, Spain

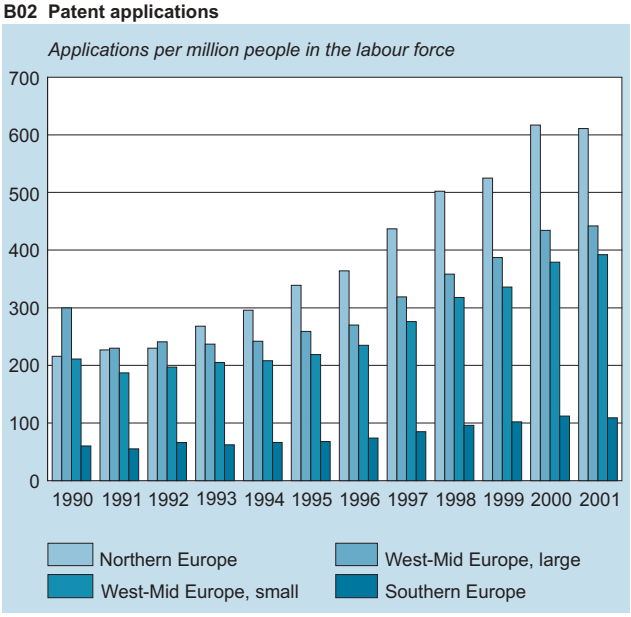
In the beginning of the nineties of the previous century region West-Mid large had a higher R&D expenditure than the northern countries. However, at that time the northern countries had set in a trajectory of strong efforts to increase R&D expenditure, whereas the West-Mid large countries and the southern countries did not follow this pattern. They rather decreased R&D expenditure relative to the business sector's value added in the middle of the nineties and only increased it slightly later. The small West-Mid countries managed to have a structural rise as of 1993 but could not reach the levels of the northern and large West-Mid countries.

B01 R&D expenditure in the business enterprise sector

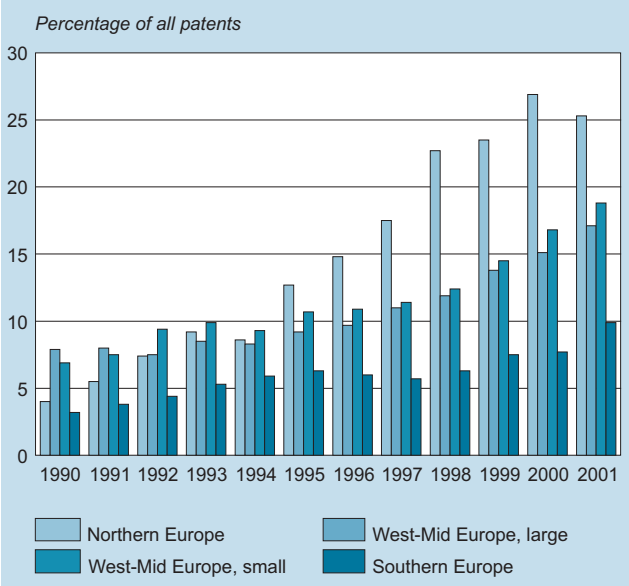


When looking at the total number of patent applications per million people in the labour force (see figure B02), it can be seen that in the beginning of the nineties of the previous century the large West-Mid countries were leading in patent applications, but they soon started loosing ground to the northern countries. After 1993 the West-Mid countries (both large and small) followed a growth path in the number of patent applications, but did not reach the

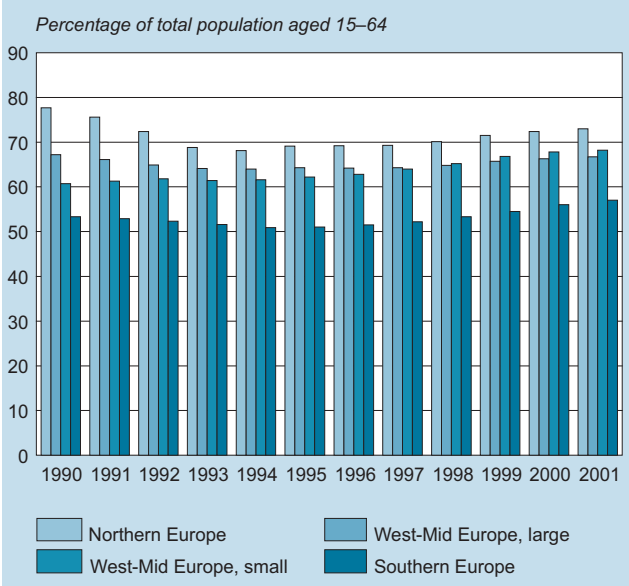
B02 Patent applications



B03 ICT patents



D06 Total employment rate



levels of the northern countries. The southern region, however, did hardly cope with the pace of development in the other three regions.

Figure B03 indicates that throughout the nineties of the previous century there was a tendency for the share of ICT patents in the total number of patents to grow. This applied to all four regions (with some fluctuation at different episodes). This tendency affirms that the New Economy became stronger throughout the decade. The strong position of the northern countries in patents to a considerable extent appeared to be a matter of ICT patents.

During the first three years of the nineties of the previous century the northern region went through a time of economic decline, but later on the northern region appeared to have the highest growth rates (see Figure D01aux). It is notable that since 1994 the growth rates of the southern countries are higher than the growth rates of the large West-Mid countries but below those of the northern and the small West-Mid countries.

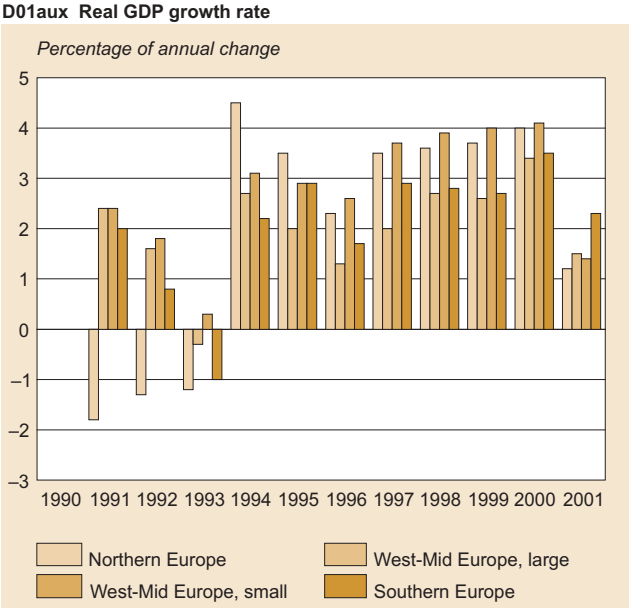
As regards the rate of employment (see Figure D06), throughout the nineties of the previous century the initial distance between the three regions remained in tact, although since 1996 the difference in employment rate had become smaller. The relative growth in employment rate in the southern countries at that period was stronger than in the other regions.

Since 1995 long-term unemployment rates had decreased in the four regions. It is obvious that in the southern region long-term unemployment is a bigger problem than in the three other regions.

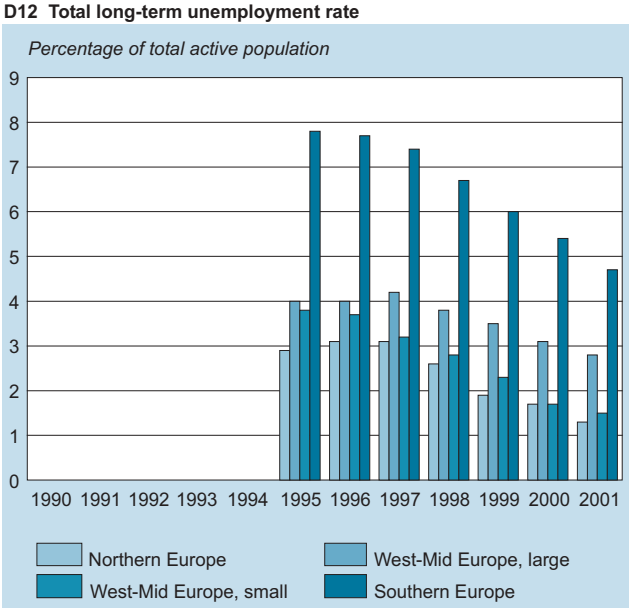
At least since 1995 Human Resources in Science and Technology (HRST) were increasing as a percentage of the labour force in all four regions (see Figure Fa01), although the northern countries' 2001 level was equal to that for 2000. After the northern countries, it was the small West-Mid countries that took the second position.

Both in 1995 and the period 1999–2001 the number of R&D personnel in the public sector relative to total employment was

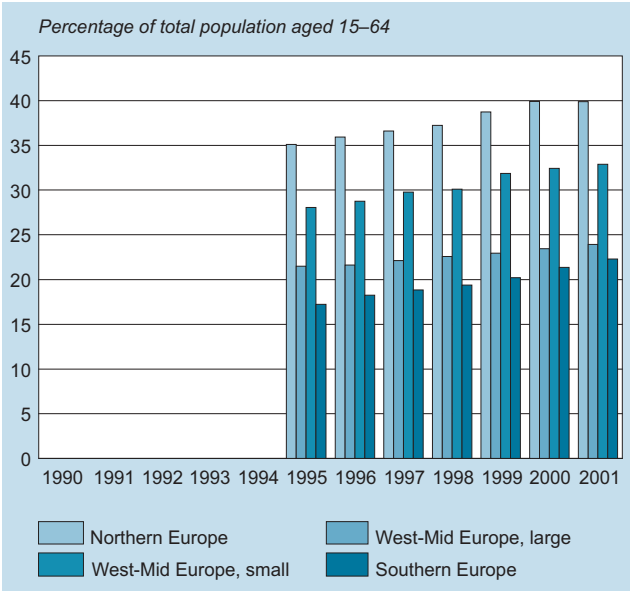
D01aux Real GDP growth rate



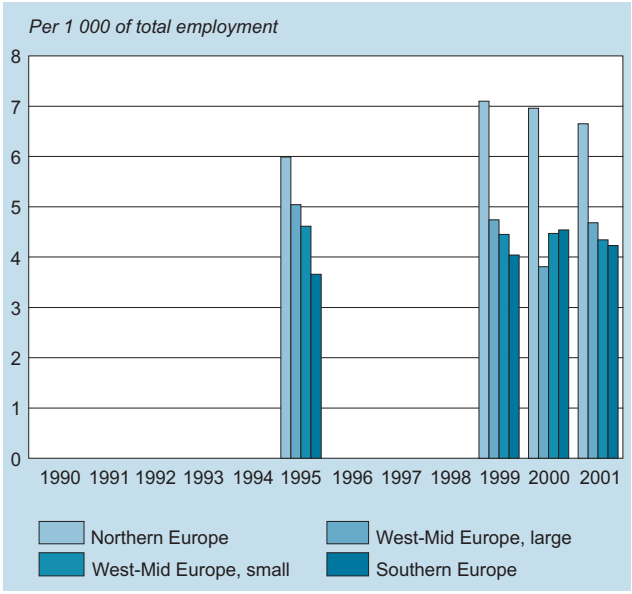
D12 Total long-term unemployment rate



Fa01 Human resources in science and technology (HRST)



Fa03 R&D personnel in the public sector



highest in the northern countries. Here the difference between the southern countries and the other regions appeared to have become smaller. The diagrams brought to light some golf movement (at different episodes per country) in the figures, indicating that the number of R&D personnel in the public sector is highly sensitive to (short-term) policies.

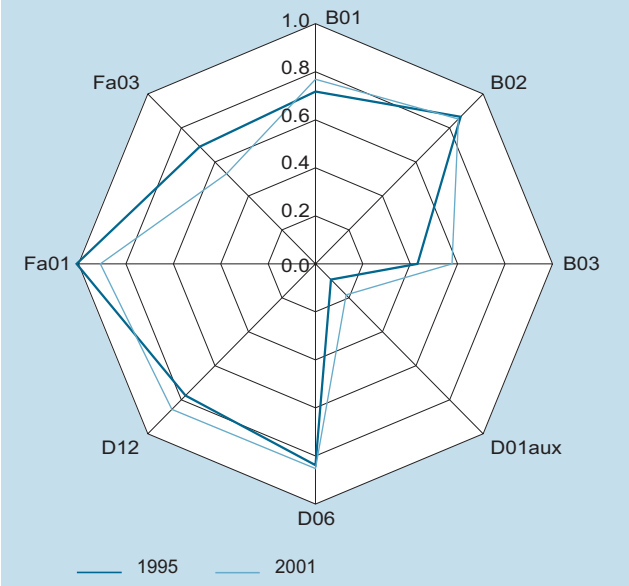
8.4 Conclusion

Below the cobweb diagrams visualise the knowledge factor for the four regions, both for 1995 and 2001. The real GDP growth rate (D01aux) is expressed here as average growth rate for the periods 1992–1996 and 1997–2001 respectively. The diagrams confirm the leading position of the northern countries.

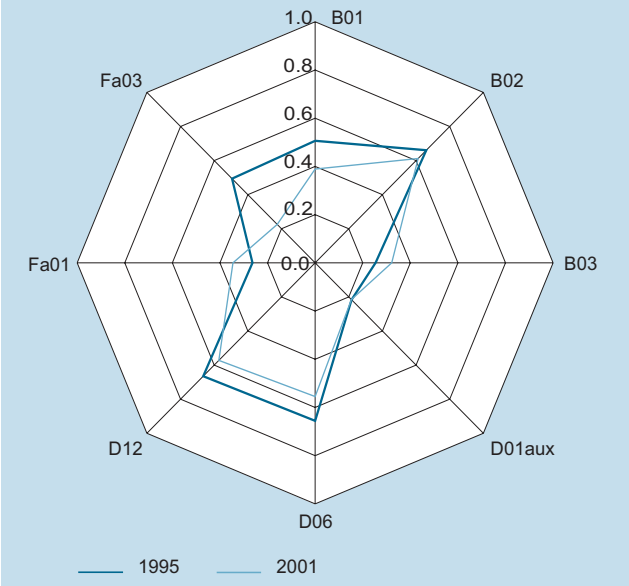
However, it is important to realise that this does not present a 'natural' order. The previous time series reveal that in the beginning of the nineties the situation was different. The northern countries had negative growth rates and were not leading in terms of patents and business sector R&D. The change the northern countries underwent was obviously based on new strong policies geared at a change for the better. The message of this observation is that the other regions could also improve themselves by adopting strong policies.

This does not necessarily mean that the same policies can be simply copied. For instance, large countries are unlikely to be able to follow such a strong export-oriented strategy as a country like Finland. It should also be realised that the southern countries still have strong positions in certain 'old economy' sectors. This has to be taken into account when considering how to further the New Economy. The pervasive nature of ICT will undoubtedly also transform the way conventional sectors operate, influencing their basic success factors.

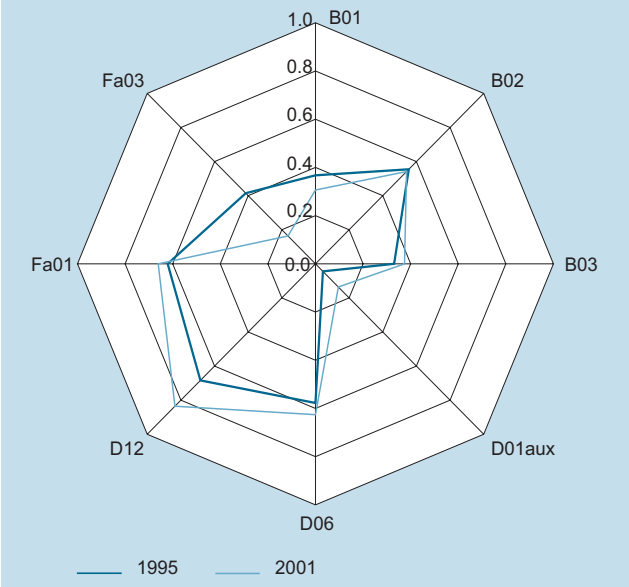
A Knowledge factor indicators, Northern Europe



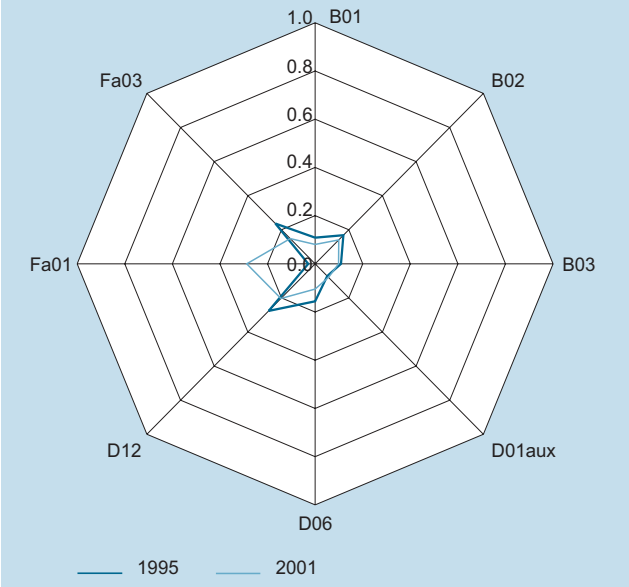
B Knowledge factor indicators, West-Mid Europe, large



C Knowledge factor indicators, West-Mid Europe, small



D Knowledge factor indicators, Southern Europe



Annex A: Summary table chapter 8

Knowledge factor indicators by European region, 1990–2001

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
	Percentage of value added in the business enterprise sector											
B01 R&D expenditure in the business enterprise sector												
Northern Europe	2.1	2.3	2.4	2.6	2.3	2.8	2.9	3.1	3.2	3.5	3.7	4.0
West-Mid Europe, large	2.3	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.1	2.2
West-Mid Europe, small	1.1	1.1	1.1	1.4	1.5	1.5	1.6	1.7	1.7	1.7	1.7	1.8
Southern Europe	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
	Applications per million people in the labour force											
B02 Patent applications												
Northern Europe	216	227	230	268	296	339	364	437	502	525	617	611
West-Mid Europe, large	300	230	241	237	242	259	270	319	358	387	434	442
West-Mid Europe, small	211	187	197	205	208	219	235	276	318	336	379	392
Southern Europe	60	55	66	62	66	68	74	85	96	102	112	109
	Percentage of all patents											
B03 ICT patents												
Northern Europe	4.0	5.5	7.4	9.2	8.6	12.7	14.8	17.5	22.7	23.5	26.9	25.3
West-Mid Europe, large	7.9	8.0	7.5	8.5	8.3	9.2	9.7	11.0	11.9	13.8	15.1	17.1
West-Mid Europe, small	6.9	7.5	9.4	9.9	9.3	10.7	10.9	11.4	12.4	14.5	16.8	18.8
Southern Europe	3.2	3.8	4.4	5.3	5.9	6.3	6.0	5.7	6.3	7.5	7.7	9.9
	Percentage change on previous year											
D01aux Real GDP growth rate												
Northern Europe	.	–1.8	–1.3	–1.2	4.5	3.5	2.3	3.5	3.6	3.7	4.0	1.2
West-Mid Europe, large	.	2.4	1.6	–0.3	2.7	2.0	1.3	2.0	2.7	2.6	3.4	1.5
West-Mid Europe, small	.	2.4	1.8	0.3	3.1	2.9	2.6	3.7	3.9	4.0	4.1	1.4
Southern Europe	.	2.0	0.8	–1.0	2.2	2.9	1.7	2.9	2.8	2.7	3.5	2.3
	Percentage of total population aged 15–64											
D06 Total employment rate												
Northern Europe	77.7	75.6	72.4	68.8	68.1	69.1	69.2	69.3	70.1	71.5	72.4	73.0
West-Mid Europe, large	67.2	66.1	64.9	64.1	64.0	64.3	64.2	64.3	64.8	65.7	66.3	66.7
West-Mid Europe, small	60.7	61.3	61.8	61.4	61.6	62.2	62.8	64.0	65.2	66.8	67.8	68.2
Southern Europe	53.3	52.9	52.3	51.6	50.9	51.0	51.5	52.2	53.3	54.5	56.0	57.0
	Percentage of total active population											
D12 Total long-term unemployment rate												
Northern Europe	.	.	.	.	.	2.9	3.1	3.1	2.6	1.9	1.7	1.3
West-Mid Europe, large	.	.	.	.	.	4.0	4.0	4.2	3.8	3.5	3.1	2.8
West-Mid Europe, small	.	.	.	.	.	3.8	3.7	3.2	2.8	2.3	1.7	1.5
Southern Europe	.	.	.	.	.	7.8	7.7	7.4	6.7	6.0	5.4	4.7
	Percentage of total population aged 15–64											
Fa01 Human resources in science and technology (HRST)												
Northern Europe	.	.	.	.	.	35.1	35.9	36.6	37.2	38.7	39.9	39.9
West-Mid Europe, large	.	.	.	.	.	21.5	21.6	22.1	22.6	22.9	23.4	23.9
West-Mid Europe, small	.	.	.	.	.	28.0	28.7	29.8	30.1	31.8	32.4	32.9
Southern Europe	.	.	.	.	.	17.2	18.3	18.9	19.4	20.2	21.4	22.3
	Per 1 000 of total employment											
Fa03 R&D personnel in the public sector												
Northern Europe	.	.	.	.	.	6.0	.	.	.	7.1	7.0	6.7
West-Mid Europe, large	.	.	.	.	.	5.0	.	.	.	4.7	3.8	4.7
West-Mid Europe, small	.	.	.	.	.	4.6	.	.	.	4.5	4.5	4.3
Southern Europe	.	.	.	.	.	3.7	.	.	.	4.0	4.5	4.2

Northern Europe = FI, S and DK.
West-Mid Europe, large = UK, DE and FR.
West-Mid Europe, small = LU, AT, IE, NL and BE.
Southern Europe = IT, PT, ES and GR.

Appendix 1 Definition of the New Economy

1. Emergence of ICT as an undercurrent

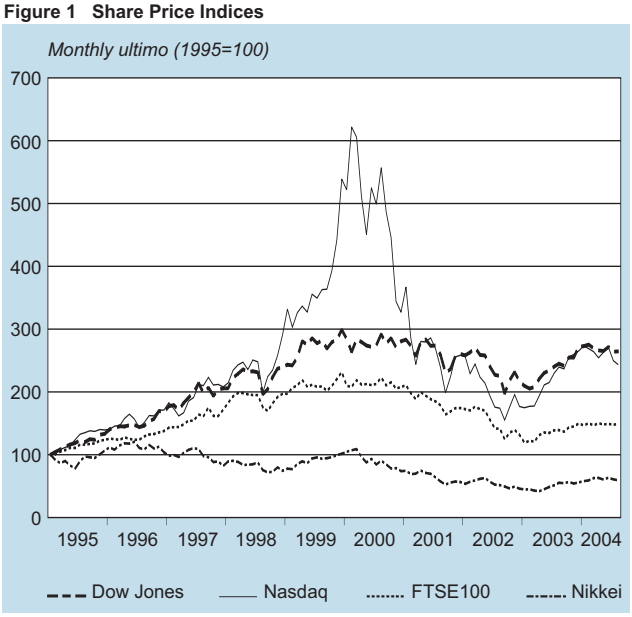
The *Lisbon Summit Goals* (and later additions to them), which comprise a major background to the NESIS project as a whole, suggest a number of policy-based assumptions that have been kept in mind when shaping the statistical portrait. The first one is that ICT is seen as an important broadly applicable technology and (therefore) as a major contemporary manifestation of the knowledge-based economy. Secondly, the knowledge-based economy needs to be dynamic so as to lead to macroeconomic growth. Therefore, the e-revolution that the New Economy represents has to be put both in the institutional context of the knowledge-based economy as well as in the macroeconomic context of a country or region. Thirdly, the success of the European knowledge-based economy is not self-contained but dependent on worldwide competition, in particular with the USA and Japan. Here, one may add that other non-European countries are getting involved in this competitive struggle, such as China and India. It is globalisation that intensifies this intercontinental arena, with a dominant role to play by transnational corporations.

There have been discussions on how real the New Economy is. Macroeconomic effects of investments in e-business on growth and productivity have long been embryonic, while the high expectations that shareholders fostered during the late nineties of the previous century about the profitability of the ICT sector resulted in costly disillusions.

Figure 1 on share price indices shows the development of share values over the nineties of the previous century up to ultimo August 2004.[1)] The NASDAQ, representing a large group of high-tech companies (among them many ICT-based companies), clearly reveals an erratic upsurge of share values, followed by a stark downturn, signifying the New Economy hype, which brought so much disappointment.

However, a distinction should be made between the stock market for ICT companies and the significance of ICT as an important emerging technology in the modern economy. The impact of ICT can be seen as a significant undercurrent in the modern economy that, while emerging, will eventually have a major effect on business processes and their performance.[2)] We still are at the initial stages of a process of innovation and transformation enabled or at least facilitated by ICT. The immature nature of the present state of the New Economy hampers its measurement. However, if it is not only a matter of tracking the relevant transformations but also of promoting and steering them, early measurement is a sine qua non.

Figure 1 Share Price Indices



2. ICT and innovative enterprises

Although ICT as a major technology cannot be ignored without consequences (technology push), its application is not expounded as a foremost deterministic process. Basic technological tools need to be transformed into practical and saleable products and into effective and efficient processes. This requires the innovative aspirations, creativity and willingness to take risks of entrepreneurs, which in no way can be taken for granted. On the one hand, there are the promises of unprecedented benefits that the New Economy entails, but on the other hand there are complicated transformations to go through, which take time and are risky because of concomitant mental and organisational adaptation processes that impinge on existing (power) relationships. International competitive forces keep the stakeholders of the innovation processes in suspense. In fact, it is these processes' inherent 'voluntarism' that inspires policies such as the Lisbon Summit Strategy.

3. Innovations and the modern economy

(ICT) innovations will have to be attuned to the modern economy, whose characteristics can be summarised by means of three types of 'economy': the knowledge-based economy, the information society, the network economy (see also Lehtoranta, 2002). The knowledge-based economy refers to the importance of continuous innovation. The information society focuses on the access and competent use of information (that in principle is abundant and freely available) as a key success factor in the modern economy. The network economy is about the many kinds of interrelationships – both transactional and non-transactional – in today's economy that seem to be crucial to the creation of economic value. Globalisation is a worldwide manifestation of the network economy.

4. Globalisation

The previously described emergence of ICT goes together with ongoing globalisation. There is a growing tendency of companies and consumers to ignore barriers once imposed by national or supranational boundaries. The world trade system is capable of facilitating an increasing number of companies wishing to behave as if the world consists of a single market for goods and services, for ideas and for capital (Clayton and Lynch, 2003). Investments by multinational enterprises have moved into the direction of vertical chains during the 1990s, creating part of a production chain run as linked elements in an integrated international system. Outsourcing gave rise to emergence of contract manufacturers, for example in the Far East, which produce goods for Western brands. Economic and social analysis of the effects of globalisation has to address key concerns related to identifying the competition impact of multinational activity, with its implications for welfare. One should recognise that large companies no longer think in terms of national boundaries (Clayton and Lynch, 2003).

5. The National Innovation System (NIS)

As the New Economy is highly related to an economy's capacity to innovate, it seems worthwhile to elaborate the concept of *knowledge-based economy* somewhat further. The knowledge-based economy refers to the capacity of an economy to develop and implement products, services and systems according to the state of the art in science, technology and business concepts. In other words: the capacity to innovate.

For innovations to take place, it is entrepreneurs that have to take action, but at the same time it is recognised that innovatory success strongly depends on certain capacities of a society to enable or facilitate innovations. These capacities refer to the educational system and its ability to produce advanced, productive human capacities, as well as to the available research and development infrastructure that provides the scientific and professional knowledge for innovative processes. Moreover, there is a need for different kinds of intermediate organisations that generate productive flows of practical knowledge, interaction and advice, and financial and fiscal amenities that are supportive of those organisations that seek to innovate. Special government policies to promote (high-tech) innovations can be of importance as well. This complex of innovatory factors is called a *system of innovation* (see also Wolters, 2003). To a large extent, systems of innovation are considered at a national level, which explains the term *National Innovation System* (NIS). It is recognised that certain innovation processes are predominantly operated at sectoral, regional and international levels. However, this publication focuses on the national level. The important role of multinational companies in the New Economy may seem to reduce the importance of the national systems of innovation. It can be expected that international competition requires a greater role for innovation supporting systems at the EU level. However, there is some dialectics involved. Like globalisation promotes a greater role for regions, so does international competition in business increase policy competition at the national level in terms of offering attractive business places and infrastructures. Besides, the diffusion of high-tech innovations depends on the absorptive capacities of SMEs, which for the greater part are dependent on national support structures. Moreover, it should be realised that EU innovation policies will largely feed into the national innovation policies.

Differences in National Innovation Systems between countries go back to historical developments leading to different forms of power sharing, conflict management and social capital. Such differences inspire benchmarking, calling for adequate statistical indicators. Excellence in certain areas of education, research and professional advancement may have been boosted in previous 'golden ages' during which a country was leading in science, art or commerce. However, in the course of time, countries may take over new best practices from each other, leading to a certain degree of convergence. One may say that the NISs are the learning systems of national economies (B.-Å.Lundvall), but their successes in doing this is only partial, while some NISs do better than others. Like firms and other organisations, also NISs are x-efficient as their agents satisfy below minimal or ideal levels of efficiency (Niosi, 2002).

6. The New Economy and ICT as a dominant technology

Why should ICT be considered to have such a prominent role in the New Economy? The answer is that at present ICT is the dominant technology that can be applied for many purposes, in different ways.

The New Economy (NE) is difficult to capture by identifying a single or a few features. Rowlett et al. (2002) bring forward that there have always been 'new economies' – the concept is not tied to time or technology. They continue: "For centuries there have been periods when changes in technology or social organisation brought:

- Radical changes to market boundaries, expanding the scope to exploit intellectual capital;
- Access to new products and services for major sections of society and new consumers;
- Significant changes in the interactions and operating processes of enterprises;
- Redefinition of the relationship between customers and suppliers.

In the past different technologies ranging from printing, to steam engines, canals and railroads, or mass media had that capacity. Today, it is developments in ICT, which have the potential to make available global information, entertainment and access to products on an individual and interactive basis, which leave their mark on the latest New Economy.

The literature on technical change invites one to see the New Economy as a pervasive innovation process based on a new techno-economic paradigm. As Freeman and Perez (1988) put it, some changes in technological systems are so far-reaching in their effects that they have a major influence on the behaviour of the entire economy. A change of this kind carries with it many clusters of radical and incremental innovations, and may eventually embody a number of new technological systems. A vital characteristic of a new technological paradigm is its *pervasive* effects throughout the economy, i.e. not only does it lead to the emergence of a new range of products, services, systems and industries in its own right; it also affects directly or indirectly almost every other branch of the economy. The changes involved go beyond engineering trajectories for specific product or process technologies and affect the input cost structure and conditions of production and distribution throughout the system. The changes also relate to other phenomena, such as destabilising market forces and the turbulent relationship between financial capital and the upsurge of new technologies (Perez, 2002).

7. Innovations in general and ICT innovations

When talking about measuring the New Economy, the question arises whether one should focus on innovations in general rather than on ICT innovations. The notion of ICT as a change in techno-economic paradigm suggests that both are important. Basic high-tech ICT innovations and advanced ICT applications by the ICT sector and other high-tech sectors are of crucial importance as these to a great extent determine which countries will be in a leading position as far as the New Economy is concerned. However, it is innovations at large, whether in high-tech or low-tech sectors, that determine the further diffusion of available ICT technology as component of a wide variety of products.

Diagram 1: Different layers of the ICT sector and the economy at large

Different layers	Specifications
Layer 1: Telecommunications infrastructure	Network hardware and software; basic networks (backbone), local (cable and wireless) infrastructure, Internet service providers
Layer 2: Software applications	Security software, software for search engines, web development software, e-commerce software, database technology, multi-media applications
Layer 3: Electronic intermediaries	E-marketplaces, portals, search engines, content aggregators
THE ECONOMY AT LARGE	ICT applied to innovations in general

Source: Statistics Netherlands.

Within the domain of ICT innovations different layers can be defined, whereby progressively non-technological aspects play a

role. Finally, one arrives at the economy at large where there are many types of innovations that apply ICT. As ICT is a pervasive technology, one can expect that for a broad spectrum of innovations ICT will be used in one way or other. Diagram 1 shows the different layers of the ICT sector, and innovations in these different areas can be called ICT innovations. Innovations outside the ICT sector are not called ICT innovations but innovations without further qualifications, even though these frequently imply the use of ICT (see also www.internet-indicators.com.

BOX A Definition of the ICT sector

In the OECD publication on measuring the ICT Sector (OECD, 2000) the ICT sector's definition has been based on the industrial classes of revision 3 of the International Standard Classification (ISIC). The classes included in this definition are as follows:

ICT sector: NACE codes

Manufacturing	
3000	Office, accounting and computing machinery
3130	Insulated wire and cable
3210	Electronic valves and tubes and other electronic components
3220	Television and radio transmitters and apparatus for line telephony and line telegraphy
3230	Television and radio receivers, sound or video recording or reproducing apparatus, and associated goods
3312	Instruments and appliances for measuring, checking, testing, navigating and other purposes, except industrial process equipment
3313	Industrial process control equipment
Services sector	
5150	Wholesaling of machinery, equipment and supplies
7123	Renting of office machinery and equipment (including computers)
6420	Telecommunications
72	Computer and related activities

To bring about some differentiation within the large group of investments and innovations (which under conditions of rapid technological change will largely overlap) outside the ICT sector, a distinction can be made between different groups of sectors that are seen as major users of ICT. For instance, one could distinguish a content sector (publishers, advertising, and consultancies) but no international consensus exists yet about its definition. However, there is agreement about two other interesting user groups: high-tech industry and knowledge-intensive sectors. These are defined in Lethoranta (2003) as follows in terms of NACE.

ICT: Two important user groups

High technology industry	
35	Aerospace (353 production of aircraft)
244	Pharmaceuticals
30	Computers, office machinery
32	Electronics, communication equipment
33	Scientific instruments
Knowledge-intensive market services	
64	Post and telecommunications
65–67	Finance and insurance
71–74	Business activities (not including real estate)

8. A need for additional concepts and indicators

Although the concept of ICT as a change in techno-economic paradigm is helpful in understanding the pervasive nature of ICT involving the entire economy, it cannot explain the entire New Economy (see also Togati, 2003b). Reference to the National Innovation Systems already opens one's eyes for the many interdependencies within an economy that forbid a linear (cause-and-effect) approach.

Moreover, at the macro level there is a need for further conceptual models concerning the relationship between the New Economy and macroeconomic stability and sustainability. Within the NESIS project contributions have been made to identify the major questions arising in these fields.

Winnett (2002) and Levett (2002) highlight the major question marks as to whether the New Economy can be expected to be heading for ecological sustainability. ICT-related investments seem to involve dematerialisation, but the New Economy's productivity gains are likely to increase spending in the conventional, materials-based economy. To some extent, these questions can be addressed by launching indicators allowing to monitor ongoing trends.

A major element of the New Economy is a new approach of capital. The conventional 'hardware' concept of capital defines what can be seen as additions to capital (investments) and what as deductions from capital (depreciations). However, New Economy thinking distinguishes different forms of capital that under current accounting practices are considered 'intangible,' but nonetheless are at least as important as conventional capital. A new market model is emerging where sustainable value-creation is geared less to economies of scale than to the exploitation of innovation, arbitrage and scope effects. Subtly, and incrementally over several decades, this has resulted in a fundamental shift in the corporate value system, away from physical and financial assets (now commoditised) towards the creative exploitation of a nexus of intangible assets, quasi-assets and competencies – mainly in the form of distinctive capabilities deriving from knowledge intangibles – that have become essential ingredients of the economic production process (Eustace, 2003). Present accounting and statistical systems are insufficiently capable of coping with this development. However, there are yet indicators in areas such as R&D or education and training that can to some extent reflect the intangible capacities of an economy [3]. Other aspects such as marketing strategies, knowledge management, organic learning and trust largely remain unmeasured.

Social inclusion is seen as an outcome category and is as such placed in a macro-economic context. However, the interrelationships in the economy also allow one to consider social inclusion as belonging to the capacity of households to participate in the New Economy. Social inclusion in terms of participation of households and individuals in Internet communications has raised discussions about the Digital Divide (connectivity related to different social groups [4]). Whether there is a real Digital Divide can only be judged later when the adoption of Internet by the population has reached its saturation level. As Gould *et al.* (2003) have observed, the differential patterns of access to the Internet is not specifically digital, but mirrors 'traditional' socio-economic stratification. While selecting the key indicators, priority was given to the traditional 'social divides', especially inequality of income and unemployment. The transformations that the New Economy implies may involve redistributions of income whose final outcome (less or more inequality or poverty) cannot be predicted.

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Notes in the text

[1] **Dow Jones** (*Dow Jones Industrial Average*): The index consists of a balanced selection of 30 stable large cap enterprises, the so-called 'blue chips', traded at the New York Stock Exchange.
NASDAQ (*NASDAQ US National Stockmarket*): After the Dow Jones, US largest and electronic stock market, covering 3,300 firms. While the Dow Jones may be said to represent the Old Economy, the NASDAQ contains many high-tech firms, and may be held to stand for, though not exclusively, the New Economy.
FTSE (*FTSE 100*): An index consisting of the 100 largest firms traded at the London Stock Exchange.
Nikkei (*Nikkei Stock Average*): The leading Japanese stock price index, consisting of the 225 biggest firms traded at the Tokyo Stock Exchange.

[2] See also the different papers presented at the NESIS Workshop on Productivity, Competitiveness and the New Information Economy: Business, Systemic and Measurement Issues. See for a summary: De Panizza *et al.*, 2003.

[3] See also Informer S.A. (2003) and Åkerblom (2003).

[4] See for a discussion of the different dimensions of the Digital Divide, Gould *et al.* (2003), Chapter 4.

Appendix 2 Selection criteria and process quality

1. Criteria for the choice of indicators

First of all, the indicators belonging to the key set have been chosen to reflect the phenomena that one wishes to measure. Moreover, the selection criteria have been: availability of statistical data for the different EU-15 countries, regular updates of the figures, and reliable and transparent methods. In general, the above criteria have led to a preference for official statistical data. Although, if these failed to be available, other (non-official) sources have been used as well.

While searching for suitable indicators, it has become evident that in a considerable number of cases there are gaps. It should be noted that this publication, while discussing the various modules of the framework, does not deal with these gaps in any systematic way. However, these gaps have been discussed in a separate document (see Åkerblom & Wolters, 2004).

For each module two types of statistical indicators are distinguished:

- The first type – *key indicators* – involves the indicators that belong to the core set of about 50 indicators that highlight the New Economy;
- The second type involves a number of *auxiliary indicators* that can further enlighten a particular subject. Here the requirements of transparency and regular updates have been relaxed to give precedence to conceptual resonance and peculiarity.

To arrive at the point of making the definitive choice of key indicators and auxiliary indicators, Statistics Netherlands has gone through a careful process of stepwise progress. Major point of departure was Statistics Netherlands' experience in making two annual publications: one on Knowledge and Economy (CBS, 2005) and one on the Dutch digital economy (CBS, 2003).

For the selection of the indicators, use has been made of two major stock-taking reports that are deliverables of the NESIS project. The first one (Devilee and Wolters, 2003) contains a comprehensive inventory of the official and non-official sources of available New Economy indicators and also describes the indicators that emanate from them. The second one (Room et al., 2004) offers a basic assessment of available indicators in light of what ICT-related innovations involve against the background of the four NESIS pillars.

In the area of the knowledge-based economy and the New Economy, use could be made of a considerable number of existing overview publications [1)] and some studies from national statistical institutes [2)]. Even though these are overviews, together they comprise a huge and complex amount of indicators, making it difficult to differentiate and keep apart main issues from side issues.

2. Process quality

The making of this publication has been subject to a careful process of stepwise choices of concepts, indicators and statistical materials.

A major point of quality is Statistics Netherlands's own experience over recent years in making national publications on the digital economy and the knowledge-based economy. The development of the statistical publication on the digital economy issued by Statistics Netherlands was initiated and specifically financed by the Dutch Ministry of Economic Affairs, showing that policy makers see this statistical output as highly relevant to their work.

In the context of the above publications, statisticians of Statistics Netherlands are in contact with the various working parties and other gatherings of Eurostat and the OECD concerning the Information Society Statistics and the Community Innovation Statistics. Statistics Netherlands also participated in consultations about the e-Europe indicators.

In the beginning the main concepts and scope of the publication were decided upon. At different NESIS workshops the frameworks that Statistics Netherlands had in mind were explained and discussed. Eventually this led to an Outline paper, which presented a framework to structure the publication and a tentative selection of indicators for each of the modules of the framework. The Management Steering Committee of the NESIS project accepted this outline paper.

The first round of selecting data and metadata for the indicators as mentioned in the outline paper was published in the Second Descriptive Publication, which was commented on by a number of NESIS partners and external contributors to the project's Indicator Development Working Party (IDWG III).
Meanwhile, Statistics Netherlands issued an additional intermediate paper, the so-called Demo-draft, which followed on the Second Descriptive Publication by giving commentaries on the selected indicators and by extending the metadata. The Demo-draft was the stepping-stone towards the draft publication. Considering the comments received, a number of new indicators were added. Moreover, a set of auxiliary indicators was defined and the associated statistical data and metadata were collected and documented. This led to the formal Deliverable D.2.2.2 and this printed publication.

In general, the different NESIS documents were helpful in exploring the relevant conceptual areas. In particular the final report on the conceptualisation and analysis of the New Information Economy of the University of Bath (Room *et al*, 2004; NESIS Deliverable D.5.3) and ISTAT's Report on Productivity and Competitiveness Indicators (Panizza *et al.*, 2004; NESIS Deliverable D.5.3.2). In terms of selection of key indicators, these reports were of limited value because of this publication's strong focus on available statistical materials from official sources. However, the report of the University of Bath proved particularly useful for the Remedial Statistical Programme, as it made quite some interesting suggestions for the development of new indicators capable of describing the New Economy.

The process quality has been examined by means of applying a process quality model developed by NESIS partner Joint Research Centre (Ispra, Italy; see Girardi & Sejeva, 2005). The intragroup interaction about the contours and nature of the indicators to be chosen was mainly a matter of collaboration between Statistics Finland and Statistics Netherlands, which made it possible to combine the expertises of both statistical institutes. The intragroup 'negotiation' aspect involving other partners appeared to be somewhat meagre; this can be explained by the fact that most work packages involved the exploration of new areas rather than working with existing official statistics. Moreover, insofar as assessment of existing indicators was at play, the conceptual resonance of indicators from a particular ICT innovation perspective was focused upon, whereas for Statistics Netherlands the availability of relevant statistical materials was the key issue. Statistics Netherlands' involvement in other international networks in the field (Eurostat, OECD, E-Europe) and materials produced by the NESIS project's Indicator Development Working Group, however, further secured a well-considered, but not necessarily unchallenged, selection of the indicators.

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Room, G. and others (2004), 'The final report on the conceptualisation and analysis of the New Information Economy', University of Bath (NESIS Deliverable D. 5.3).

Statistics Sweden (2002), 'Reflecting what is New in the Economy', November 2002.

Notes in the text

[1] To mention a relevant but not exhaustive set:

OECD publications:
- OECD Science, Technology and Industry Scoreboard
- Measuring the Information Economy
- Measuring the ICT Sector
- OECD Information Technology Outlook
- OECD Basic (R&D) Statistics
- Main Science and Technology Indicators

Eurostat publications:
- E-Commerce in Europe
- Statistics on the Information Society
- Information Society Statistics
- Third European Report on Science & Technology Indicators
- Different Statistics in Focus Bulletins
- Community Innovation Statistics (CIS)
- R&D publications

EU initiatives:
- EU barometer publications (however, quality a problem)
- E-Europe indicators
- Structural indicators

[2] See for instance: Statistics Sweden (2002).